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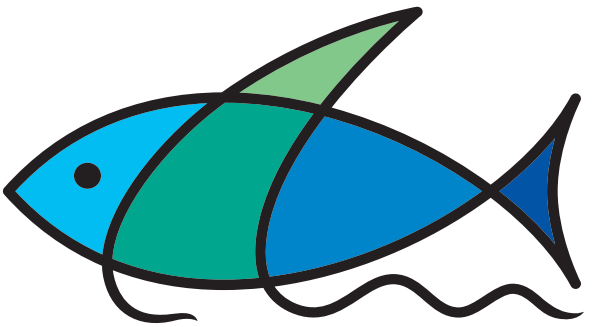
Indian Council of Agricultural Research

Central Marine Fisheries Research Institute

Annual Report 2024



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CMFRI

Indian Council of Agricultural Research

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

(ICAR-CMFRI)

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ICAR-CMFRI Annual Report 2024
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Mandate

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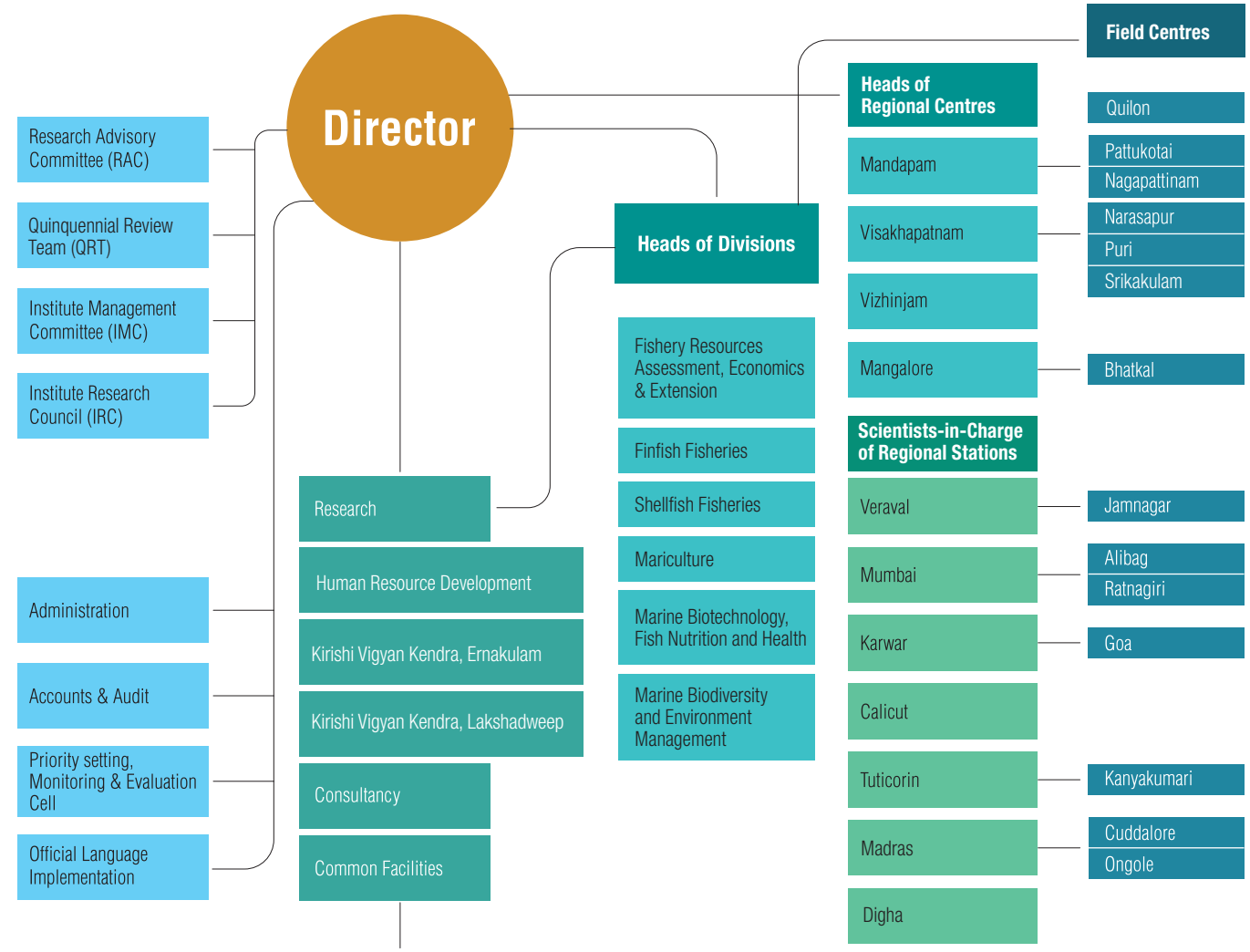
2. Basic and strategic research in mariculture to enhance production

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

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

Organogram



*Agricultural Technology Information Centre

Preface

In 2024, the ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI) made remarkable strides in advancing marine fisheries research, technology development, and resource management across India's maritime boundaries. Through its headquarters in Kochi, regional centres, research stations, and Krishi Vigyan Kendras, the Institute played a pivotal role in shaping science-driven fisheries management, conservation strategies, sustainable mariculture practices, innovative technologies and products, commercialisation and socioeconomic assessments.

ICAR-CMFRI's resource assessment efforts provided a comprehensive overview of marine fish landings in India, estimated at 3.45 million t in 2024, reflecting a 2% decline from 3.53 million t in 2023. Gujarat retained its top position in fish landings with 7.54 lakh t, despite an 8% decline, contributing approximately 22% of the total landings. Tamil Nadu, West Bengal, and Maharashtra recorded notable increases, with Maharashtra experiencing the highest growth of 47% compared to the previous year. The valuation of these landings reached ₹ 62,702 crores at landing centres and ₹ 90,104 crores at retail markets, reflecting notable growth from the previous year. These assessments, along with key economic indicators, contributed to a deeper understanding of sectoral performance, supporting policy frameworks for sustainable fisheries.

A major milestone was the release of a revised species codebook, offering a systematic phylogenetic classification for over 2,800 species across multiple taxa. ICAR-CMFRI prioritised national stock assessments, providing critical species data to the Department of Fisheries (DoF), Ministry of Fisheries, Animal Husbandry and Dairying, New Delhi and the Food and Agriculture Organization (FAO), Rome. The Institute actively contributed to conservation efforts, including the International Union for Conservation of Nature (IUCN) identified Important Shark and Ray Areas (ISRA) regional compendium and the web-GIS ISRA e-atlas, and facilitated international collaborations in shark conservation through the India-Oman workshop on taxonomy and fisheries management.

The Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, has entrusted the ICAR-CMFRI to conduct the 5th Marine Fishery Census 2025, following its conceptual launch on World Fisheries Day on 21 November 2024, reiterating the pivotal role of ICAR-CMFRI in generating data support for sustainably managing India's marine fisheries.

Significant breakthroughs were achieved in the breeding and seed production of golden trevally (*Gnathanodon speciosus*) and giant trevally (*Caranx ignobilis*). Advances in ornamental fish aquaculture saw the breeding of lemon coralgoby (*Gobiodon citrinus*) and talbot's demoiselle (*Chrysiptera talboti*), with standardised seed production protocols established for additional species. CMFRI's innovations in live feed technology included mass culture and resting egg storage solutions for the copepod, *Acartia sarojus*, enhancing hatchery efficiency.

Mariculture grow-out advanced with successful pond and cage farming of *Acanthopagrus berda*, polyculture of rabbitfish and pompano, and cage culture of golden trevally. Trials with John's snapper improved survival while mussel and oyster farming optimised and successful IMTA systems integrating fish, mussels, and seaweed. Seaweed farming expanded with improved methods and community participation, especially in Kutch, Gujarat. Environmental resilience studies identified optimal thermal conditions for *Trachinotus blochii* embryogenesis and critical temperature thresholds for *Trachinotus mookalee* cage culture.

Under the PMMSY programme, ICAR-CMFRI ranched 19.6 million *Penaeus semisulcatus* postlarvae in Palk Bay and the Gulf of Mannar, Tamil Nadu and facilitated stock enhancement by releasing 3.0 million yellow-neck clams (*Paphia malabarica*) into Ashtamudi Lake, Kerala alongside large-scale distribution of oyster and mussel seeds to Maharashtra.

The Mandapam Regional Centre of ICAR-CMFRI has been recognised by the Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India, as both the Centre of Excellence for Seaweed Cultivation and Nucleus Breeding Centre for Marine Fish Species, strengthening its role in advancing mariculture and seaweed farming.

Marine biodiversity research led to the discovery of two new needlefish species (*Ablennes joseberchmansis* sp. nov. and *Ablennes gracalii* sp. nov.), along with two novel myxosporean species. Ichthyoplankton studies employed molecular tools to identify 48 species, refining taxonomic accuracy. Research on jellyfish ecology successfully developed temperature-controlled strobilation techniques for *Cassiopea polyp*, offering insights for bloom forecasting.

Marine biotechnology witnessed significant advancements, including the discovery of PhPV1.2, a lytic bacteriophage targeting *Vibrio parahaemolyticus*. The whole genome of a number of species has been sequenced. Established two immortal fish cell lines from *Cromileptes altivelis* and a novel brain cell line from *Premnas biaculeatus*. Aquafeed innovation progressed with the commercialisation of black soldier fly larval protein-based fish feed, and Cadalmin™ Microfin. Developed Cadalmin™ LivCure Extract, marketed as GreenRex™, for liver health and Cadalmin™ Cardioocto Extract for cardiac hypertrophy treatment.

In the socio-economic domain, ICAR-CMFRI spearheaded initiatives for gender inclusion, integrating 145 transgender stakeholders into fisheries microenterprises. Assessed 120 fishing centres and enabled the development of a well-being index for migrant fishery workers and evaluation of the labour demand-supply gap in the sector.

Digital innovations included the launch of MARLIN@CMFRI, a citizen-science media-sharing app, a geo-referenced fisheries monitoring platform, and an interactive beach litter mapping tool. Fisheries resource mapping provided insights into the monsoon-driven migration of *Parapenaeopsis stylifera*.

The Institute strengthened its intellectual property portfolio with three trademarks, one design registration, four patents, and the commercialisation of four technologies.

In 2024, ICAR-CMFRI scientists garnered several prestigious national and international recognitions for their scientific excellence. The Institute also received the Kshetriya Rajbhasha Puraskar and the Rolling Trophy for outstanding performance in Official Language implementation and for its Hindi magazine *Matsyagandha*.

The Institute has also imparted several HRD initiatives in the form of summer and winter schools on topics of contemporary relevance to marine science, training to national and international stakeholders, including fishers, and entrepreneurs and conducted numerous awareness programmes. Under the *Swachh Bharat Abhiyan*, cleanliness drives, digital office record management, and public awareness programmes were conducted. The Women's Cell organised events for International Women's Day across multiple locations.

In 2024, the ICAR-CMFRI Library expanded its collection with new books, journals, and e-books, and published several documents and training materials.

This Annual Report encapsulates ICAR-CMFRI's significant achievements in 2024, reaffirming its role as a leader in marine fisheries research, sustainability, innovation, product development and socio-economic impact assessments.
I extend my sincere appreciation to all scientists and staff of ICAR-CMFRI for their contributions, as well as to the committee members responsible for compiling and editing this report.

On behalf of the ICAR-CMFRI team, I express our deepest gratitude to Dr Himanshu Pathak, Secretary (DARE) & DG (ICAR); Dr J. K. Jena, DDG (Fisheries Science); Dr Shubhadeep Ghosh, Assistant Director General (Marine Fisheries); and the entire SMD Fisheries team at ICAR, New Delhi, for their unwavering support and guidance throughout the year.

Dr Grinson George
Director, ICAR-CMFRI

Major Achievements

Estimate of Marine Fish Landings in India: The marine fish landings along the mainland of India were estimated at 3.45 million t, reflecting a 2% decline from 3.53 million t in 2023. The Andaman and Nicobar Islands contributed an additional 16,990 t, bringing the nation's total marine fish landings to 3.47 million t.

Valuation of Marine Fish Landings: The total value of the landings in mainland India was estimated at ₹ 62,702 crores at the landing centres reflecting a 4.22% increase from 2023. At retail centres, the value reached ₹ 90,104 crores, marking an 8.46% rise. The average price per kilogram was ₹ 182.59 at landing centres, showing a 6.98% increase over the previous year, while at retail centres, it stood at ₹ 262.38, which is 11.33% higher than in 2023.

Macroeconomic Indicators: Estimated the contribution of the marine fisheries sector to the country's gross value added (GVA) in 2024 at ₹ 39,5254 crore, accounting for 63.04% of the gross revenue. The capital productivity ratio was estimated to be 0.56, with an input-output ratio of 0.34, and a labour share of 28% across different fishing operations.

Species Codebook: Released a revised species codebook covering 9 phyla, 24 classes, 121 orders, 377 families, 978 genera, and 2,835 species, introducing a systematic phylogenetic coding system.

Gender Mainstreaming and Livelihood: A total of 145 transgender stakeholders were integrated into fisheries microenterprises through targeted sensitisation programmes and entrepreneurial capacity-building training, promoting inclusive and sustainable livelihood opportunities. The DST-funded STI-Hub launched 84 microenterprises across Kerala, benefiting 490 people. The ATIC at ICAR-CMFRI generated ₹21.5 lakh in revenue and hosted 14,090 visitors.

Mobile Application: Developed an innovative mobile application, MARLIN@CMFRI, to facilitate authenticated media sharing and promote citizen science in the field of marine fisheries. The app enables the public to effortlessly upload photographs of marine fish species encountered within the vast expanse of the Indian Exclusive Economic Zone (EEZ), thereby contributing to the creation of a rich visual repository of marine fishery resources.

Food Fish Breeding and Seed Production: Achieved the successful spawning and seed production of three food fish species (Golden trevally- *Gnathanodon speciosus* through LhRH induction; giant trevally- *Caranx ignobilis* through GnRH- analogue induction and the spangled emperor- *Lethrinus nebulosus*).

Ornamental Fish Breeding and Seed Production: Successfully bred the ornamental fishes, lemon coralgoby- *Gobiodon citrinus* and talbot's demoiselle- *Chrysiptera talboti,* and standardised seed production protocols for lemon damsel- *Pomacentrus moluccensis*, azure damsel- *Chrysiptera hemicyanea*, ornate goby- *Istigobius ornatus.* Two species (*Istigobius ornatus* and Chrysiptera *hemicyanea*) were released to aquarium entrepreneurs.

Ranching: In Palk Bay and the Gulf of Mannar, Tamil Nadu, 19.6 million *Penaeus semisulcatus* postlarvae were sea-ranched in 2024, which added to the 115.14 million *P. semisulcatus* seeds that have been ranched since the project's start in 2022 to promote sustainable shrimp production in the region. Released 3.0 million yellow-neck clams (*Paphia malabarica*) into Ashtamudi Lake, Kerala to enhance its fishery.

Centre of Excellence: The Mandapam Regional Centre of ICAR-CMFRI has been declared as a 'Centre of Excellence (CoE) for Seaweed Cultivation' by the Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India on 03 September 2024.

Nucleus Breeding Centre: The Department of Fisheries; Ministry of Fisheries, Animal Husbandry & Dairying, Government of India, has notified the Mandapam Regional Centre of ICAR-CMFRI, as a 'Nucleus Breeding Centre for Marine Fish Species', on 9 December 2024.

Seaweed Propagation: Protocol standardised for sporulation and plantlet production of edible green seaweed, *Ulva lactuca*, through temperature and photoperiod manipulation.

Live Feed Development: Isolated the copepod, *Acartia sarojus* and developed its mass culture protocol for live feed in marine hatcheries and a basic protocol standardised for storage of its resting eggs for up to 60 days.

Cage Culture and Economic Modelling: Developed an economic decision-support model for *Lates calcarifer* cage farming under climate change and cost fluctuation scenarios.

Environment and Climate Resilience: Identified optimal thermal conditions (30 ± 0.5 °C) for embryogenesis and larval rearing of silver pompano- *Trachinotus blochii* and the critical thermal maximum and minimum ranges for cage culture of Indian pompano- *Trachinotus mookalee* as CT*max* 37.02 °C to 43.22 °C and CT*min* 12.66 °C to 19.22 °C.

Stock Assessment: Prioritized species for national stock assessments, with an identified list submitted to DoF (MoFAH&D, New Delhi) and FAO (Rome).

New Species Discovery: Identified two new needlefish species (*Ablennes joseberchmansis* sp. nov. and *Ablennes gracalii* sp. nov.) from the Indian seas. Two novel species of myxosporeans, *Myxobolus rakeri* n. sp. infecting the gill rakers, and *Myxobolus mali* n. sp. infecting the gill arch of *Planiliza macrolepis* were described.

Elasmobranch Conservation: Contributed to IUCN's Important Shark and Ray Areas regional compendium, factsheets, and the web-GIS ISRA e-atlas, documenting key sites along India's coasts, while also advancing regional elasmobranch conservation through an interactive India-Oman workshop on taxonomy, fisheries management, and conservation strategies to strengthen collaborative shark fisheries management.

Oyster and Mussel Seed Supply: To expand molluscan mariculture along the Maharashtra coast, 0.2 million oyster seeds and 1.0 million mussel seeds were supplied to the Maharashtra government.

Jellyfish Strobilation: Successfully induced temperature-controlled strobilation in the upside-down jellyfish polyp (*Cassiopea xamachana*) under captive conditions, with potential applications in forecasting jellyfish blooms.

Intellectual Property and Product Commercialization: In 2024, the Institute received registration for 3 trademarks, 1 design, 4 patents granted and commercialised 4 technologies.

Digital Platforms and Interactive Maps: A suite of geo-referenced digital platforms and interactive web-based maps were developed to enhance coastal fisheries and mariculture management, including a system to monitor fishing and fishery-related activities along the Indian coast, a dynamic beach litter visualisation tool featuring state-wise and site-specific litter densities, and a marine environmental map displaying real-time ocean currents, wind velocity, and wave heights within a 20 km coastal buffer—supporting the planning and installation of mariculture cage structures.

Advancing Sustainable Aquafeeds and Nutraceuticals: Licensed black soldier fly larval protein-based fish feed technology to a private company for commercial production, while also launching the Cadalmin™ Microfin, a novel fish feed designed for mariculture species. Additionally, developed a seaweed-based nutraceutical Cadalmin™ LivCure Extract (LCe) for liver health, marketed as GreenRex™ and a highly polymerized phlorotannin-based nutraceutical product CadalminTM Cardioocto extract for use against cardiac hypertrophy.

Regional Committee Meeting of ICAR: The 28th meeting of the ICAR Regional Committee-VIII comprising Karnataka, Kerala, Tamil Nadu, and the UTs of Puducherry and Lakshadweep was coordinated by ICAR-CMFRI in Chennai on 16th February 2024 with 272 participants.

Novel Lytic Bacteriophage Discovery: Characterised PhPV1.2, a marine lytic bacteriophage (GenBank Accession No. PQ511476) targeting multidrug-resistant, biofilm-forming *Vibrio parahaemolyticus* strain PV1.2, using De Novo whole-genome sequencing and TEM analysis.

Genetics and Genomics: Identified 48 species of ichthyoplankton using advanced molecular techniques, enhancing taxonomic precision in early life-stage fish studies. A high-quality chromosome-level assembly of the whole genome of Asian green mussel, *Perna viridis* and de-novo reference transcriptomes of the Indian squid, *Uroteuthis duvaucelii,* Indian halibut, *Psettodes erumei,* and Indian black clam, *Villorita cyprinoides,* and the mitogenomes of mud spiny lobster, *Panulirus polyphagus* and the shrimp, *Penaeus semisulcatus* were sequenced.

Awards and Recognitions: ICAR-CMFRI scientists received several top honours in 2024. Dr Kajal Chakraborty was elected NASI Fellow; Dr Grinson George won the Prof. H. P. C. Shetty Award; Dr Sandhya Sukumaran received the UK–British Council Alumni Award; Dr Reshma Gills was inducted into INYAS-INSA and won the CMSD–Young Scientist Award; and Dr Subal Kumar Roul received both IFSI Dr B. C. Jha and AFSIB Young Scientist Awards. ICAR-CMFRI also won First Place for Best Stall at 13 IFAF.

The institute received the Kshetriya Rajbhasha Puraskar for 2023–24 from the Department of Official Language, Ministry of Home Affairs, and also bagged the Rolling Trophy – First Position for excellence in Official Language implementation and for the in-house Hindi magazine *Matsyagandha* among Central Government organizations in Kochi for 2022–23.

Establishment of Immortal Cell Lines: Developed two immortal cell lines—CA1F3Ex (OM131589) and CA1F4Tr (OM131590)—from the humpback grouper (*Cromileptes altivelis*), and a novel brain cell line PB1BrTr (OR290980) from the maroon clownfish (*Premnas biaculeatus*).

Executive Summary

This executive summary presents the key outputs of ICAR-CMFRI in 2024, reflecting the work carried out through 37 in-house projects, 40 externally funded projects, 14 consultancy projects and other regular in-house activities.

India's marine fish landings experienced a marginal decline of 2%, decreasing from 3.53 million t in 2023 to 3.45 million t in 2024. A downturn along the West Coast drove this overall dip, although the East Coast recorded growth, with Maharashtra and Andhra Pradesh standing out as exceptions. The Andaman & Nicobar Islands contributed 16,990 t bringing the total national marine fish landings of India, including Andaman & Nicobar Islands to 3.47 million t.

Regional trends varied widely, with Karnataka, Goa, Daman and Diu experiencing sharp declines of 34%, 50%, and 44%, while West Bengal (+35%), Odisha (+18%), and Tamil Nadu (+20%) showed significant increases. The northwest coast slightly surpassed the southwest in landings, largely due to Karnataka's decline and Maharashtra's surge in landings. Pelagic species remained dominant, comprising 54% of total landings, followed by demersal finfishes, crustaceans, and molluscs, closely mirroring previous trends. The motorised sector experienced a significant increase of around 1.0 lakh t, particularly in Tamil Nadu and the other East Coast regions, while the mechanised sector experienced a decline of about 1.7 lakh t, making the contributions to 76% and 23% for mechanised and motorised respectively. Seasonally, the fourth quarter contributed the highest share of annual landings (31.8%), followed by the first and third quarters. In 2024, marine fish landings were valued at ₹62,702 crore at the landing centres and ₹90,104 crore at the retail centres, registering an increase of 4.22% and 8.46%, respectively, compared to 2023. Gujarat led in price realisation, while Indian mackerel dominated landings (9.71%) and penaeid shrimps had the highest value share. The sector contributed ₹43,252 crore to the country's Gross Value Added (68.98% of revenue).

A significant shift in fisheries data collection has been driven by digital transformation, with the Fish Catch Survey and Analysis (FCSA) 2.0 app., revolutionising real-time monitoring. This provides insights into landing centre dynamics, fish quality, and fishing ground geolocations, enabling improved catch per unit effort (CPUE) and biomass calculations. In 2024, around 70,000 boat trips were closely monitored out of 2.6 lakh total trips, significantly enhancing data accuracy for the National Marine Fisheries Data Centre (NMFDC).

An innovative mobile application, 'MARLIN@CMFRI (comprehensive media share base for marine fishery machine learning routines of Indian EEZ)' has been developed to engage the public in marine fisheries research. This serves as a comprehensive media-sharing platform, revolutionising marine fishery research, species identification, and assessment efforts

within India's Exclusive EEZ. Through 'MARLIN@CMFRI,' users can seamlessly upload photographs of marine fish species encountered in Indian waters, contributing to the creation of an extensive visual repository of marine fishery resources.

As part of sustainable fisheries management initiatives, the spawning seasons of key commercial species were identified through biological analysis, leading to the development of region-specific spawning calendars. To ensure inclusive decision-making, a series of stakeholder meetings were held across the country in 2024, bringing together traditional fishers, processors, and fish farmers to discuss sustainable practices and resource management strategies.

A study on purse seine fisheries in India found that stocks of most target species were healthy but recorded mixed stakeholder views and compliance issues, with Tamil Nadu raising concerns over bulk landings and price drops. At the same time, Maharashtra showed significant rule violations (61.3%) and documentation lapses (97.9%) with compliance linked to education, income, and awareness.

The 5th Marine Fishery Census 2025 was conceptually launched on World Fisheries Day, 21 November 2024, at Sushma Swaraj Bhawan, New Delhi. ICAR-CMFRI has been entrusted with the responsibility of conducting the census, following administrative approval under the Pradhan Mantri Matsya Sampada Yojana

A gender initiative supported 145 transgender stakeholders in the fisheries sector, focusing on microenterprises and capacity building. The DST-funded STI-Hub launched 84 microenterprises across Kerala, benefiting 490 people, while ATIC generated ₹ 21.5 lakh in revenue and hosted 14,090 visitors.

Significant advancements have been made in broodstock development for *Caranx sexfasciatus, Siganus canaliculatus, Siganus javus, Acanthurus xanthopterus, Trachinotus baillonii*, 11 ornamental finfish species, and three invertebrates. Captive breeding and seed production protocols are being standardised for *Acanthopagrus berda, Siganus vermiculatus, Lethrinus nebulosus, Lethrinus lentjan*, and *Pomadasys furcatus*, with notable breakthrough achieved in captive breeding of *Gnathanodon speciosus* and *Caranx ignobilis*. Captive spawning was successfully induced in eight ornamental species, with seed production accomplished for *Pictichromis paccagnellorum, Istigobius ornatus*, and *Gobiodon citrinus*. A total of 19.6 million *Penaeus semisulcatus* postlarvae were sea ranched in 2024 in Palk Bay and the Gulf of Mannar, Tamil Nadu, besides releasing 3.0 million yellow-neck clams (*Paphia malabarica*) into Ashtamudi Lake, Kerala alongside large-scale distribution of oyster and mussel seeds to Maharashtra.

Grow-out trials of *Acanthopagrus berda* advanced with pellet feed testing, while it has been optimised for *Siganus vermiculatus–Trachinotus blochii* polyculture. *Gnathanodon speciosus* reached 285 g in 180 days, and *Lutjanus argentimaculatus* grew to 243 mm in six months in grow-out trials. John's snapper showed 16% better growth at 20 ppt salinity, with hideouts boosting survival. Mussel farming trials refined stocking densities, and *Gracilaria edulis* was integrated with cobia cages at Mandapam. Tube net culture of *Kappaphycus alvarezii* in exposed seas achieved 3.52 % daily growth. ICAR-CMFRI supported the formation of Fish Farmer Producer Organisations (FFPOs).

The All-India Network Project on Mariculture, led by ICAR-CMFRI, coordinated research across 12 centres on grow-out technologies and seed production. John's snapper grew to 615±50g with a mixed diet in sea cages, while lower pond densities yielded 670 g. Cobia stocked in cages in Palk Bay reached 2.4 kg in seven months, with 90% survival. Farming trials with silver pompano, giant trevally, and maze rabbitfish showed promising growth. A 15 m diameter sea cage feasibility study indicated structural stability but required reinforcement.

The Mandapam Regional Centre of ICAR-CMFRI has been declared as a 'Centre of Excellence (CoE) for Seaweed Cultivation' by the Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India on 03 September 2024.

The Department of Fisheries; Ministry of Fisheries, Animal Husbandry & Dairying, Government of India, has notified the Mandapam Regional Centre of ICAR-CMFRI, as a 'Nucleus Breeding Centre for Marine Fish Species', on 9 December 2024.

Species Distribution Models (SDMs) were employed to map the spatial distribution of scads along the west coast of India by incorporating environmental factors and the validated ensemble models revealed potential shifts in scads' niches under various climate change scenarios, highlighting the strong influence of climate on their spatial distribution. GAM analysis (1998–2023) showed Sea Surface Temperature (SST), Sea Surface Salinity (SSS) and chlorophyll-a (Chl-a) significantly influenced Indian oil sardine CPUE along the Kerala coast, with future SSP projections indicating a decline. Thermal studies highlighted silver and Indian pompano as climate-

resilient for mariculture. Higher temperatures accelerated *Oryzias dancena* development and early maturity without affecting larval survival. Elevated temperatures hindered *Gracilaria corticata* growth and reproduction.

ICAR-CMFRI partnered with ABIS Exports India Pvt Ltd to demonstrate cage farming of silver pompano using Cadalmin™ SilverGrow aquafeed. Launched Cadalmin™ SilverGrow and Cadalmin™ Microfin, novel micro-feeds for marine finfish larvae. A Black Soldier Fly Larvae-based bioconversion unit was inaugurated for zero-waste processing, along with an MoU signed for insect protein-based fish feed technology. Additionally, a microbial consortium for fish waste degradation was developed, producing compost suitable as a plant fertiliser.

Pathogen profiling of finfish identified two new myxosporean species, *Myxobolus rakeri* and *Myxobolus mali*, along with parasitic and bacterial infections in key species from hatcheries and cage farms. A multiplex PCR was optimised for detecting five *Vibrio* species, and nanoparticle-based vaccine formulations were developed. Surveillance detected *Perkinsus* infections in farmed and wild bivalves. Immunome research in *Trachinotus blochii* revealed *TNF-α* gene involvement in bacterial defence, while bioprospecting identified marine-derived bioactives with anti-inflammatory, anticoagulant, and antihypertensive properties.

A chromosome-level whole genome of *Perna viridis* offered insights for cancer research and aquaculture, while *Uroteuthis duvaucelii* transcriptome enriched cephalopod genomics. Genetic analyses of *Nemipterus randalli* showed coastal differentiation and otolith chemistry of *Decapterus russelli* confirmed spatial structuring for conservation. The first mitogenomic study of *Panulirus polyphagus* revealed deep conspecific lineages. Similarly, the complete mitochondrial genome of *Penaeus semisulcatus* was sequenced. Cellular mariculture trials with *Nemipterus* muscle cells achieved scaffold-supported proliferation.

The marine biodiversity research surveys documented 509 marine mammals, 682 finfish, and 314 mollusc species, identifying 41 threatened species. A total of 20 jellyfish species were recorded, including *Chironex indrasaksajiae*. A specially developed JellySpray by ICAR-CMFRI proved effective in treating stings. A novel bacteriophage, *PhPV1.2*, targeting *Vibrio parahaemolyticus*, was genome-sequenced and archived in GenBank.

Recorded marine heatwaves in the Lakshadweep Sea, impacting coral reefs, and documented 70 fishing suspension days due to cyclones. A web-based litter map revealed high plastic accumulation off Kerala and Karnataka coasts, while microplastics were higher in Karnataka than in Lakshadweep.

Surveys mapped Essential Fish Habitats across 24.27% of India's coastal wetlands. Mangrove restoration efforts in Lakshadweep, Thoothukudi, and Ernakulam showed success. Optical oceanography studies highlighted CDOM dynamics, with a major *Trichodesmium* bloom off Kochi confirmed via Sentinel-2 imagery.

The Marine Biodiversity Museum at ICAR-CMFRI added 70 new specimens, including 47 fish species, a whale skeleton (*Balaenoptera edeni edeni*), and the holotype of *Magnafuscus marianus* gen. nov. sp. nov. In 2024, the Museum welcomed approximately 8,966 visitors with 80% being students, highlighting the museum's significance as an educational resource.

ICAR-CMFRI promoted livelihood enhancement under the Tribal Sub-Plan and Scheduled Castes Sub-Plan by establishing cage fish farming units, biofloc, and pen culture systems across multiple regions. Key achievements include increased tribal income from farming of pearl spot, seabass, pompano, mussel, spiny lobster, and large-scale seaweed farming in Puthukudi, now recognised as a Seaweed Seed Village.

KVK Ernakulam revitalised sugarcane farming, mechanised lemongrass harvesting, and expanded the Viksit Bharat Sankalp Yatra across 82 Panchayats. It transformed Kadappuram Fresh Fish Vitharana Sangham SHG into a major brand, boosting daily sales from 100 kg to 700 kg, and established fruit gardens in 20 educational institutions. KVK Lakshadweep promoted seaweed culture, marine ornamental hatchery development, and coconut-based enterprises while advancing soilless media and vegetable cultivation across 10 islands. A baseline survey identified seaweed farming potential and the Coco Fest-2024 engaged 8,000 stakeholders.

Several training and capacity-building programmes were organised by the institute for stakeholders in fisheries, including fishers, entrepreneurs, researchers, and students, covering areas like responsible fisheries management, mariculture, hatchery techniques, and genetic tools. During the year, 20 programmes benefited over 700 participants. Employee training was structured through an Annual Training Plan (ATP), with 125 staff undergoing skill enhancement. A 21-day winter school on high-value compound development from

seaweed was held, alongside several short-term courses.

The institute secured three trademarks, one design, and four granted patents while commercialising four technologies. A key milestone was the transfer of its insect protein-based fish feed technology to M/s Amala Ecoclean Pvt. Ltd., supporting sustainable aquaculture. The Institute also launched *GreenRex™*, a seaweed-based nutraceutical for liver health, in collaboration with Emineotech Private Limited. Twelve technologies received ICAR certifications.

The library and Documentation Centre of the institute enhanced marine fisheries research with expanded digital and physical resources. *eprints@CMFRI* surpassed 18,500 publications with 5.4 million downloads, while *DSpace@CMFRI* archived 6,000 rare documents. Access to J-Gate, Indiastat Agri, ASFA, and CeRA strengthened research support. Plagiarism checks via iThenticate, publication coordination, and a new graphic design unit improved scholarly outputs.

The institute coordinated the 28th ICAR Regional Committee-VIII meeting, held in Chennai, bringing together 272 participants, including ICAR officials, SAU leaders, and State Line Department representatives. Chaired by the Secretary DARE and DG ICAR, the meeting prioritised 26 key agricultural issues, formulated action plans, and assigned responsibilities to ICAR institutes and SAUs for timely resolution.

The institute held its 28th RAC meeting (April 2024), 31st IRC meeting (July 2024), and 90th and 91st IMC meetings (September and November 2024). Key discussions covered research progress, policy briefs, conservation strategies, offshore aquaculture, technological scaling, and future research directions.

ICAR-CMFRI scientists received several top honours in 2024. Dr Kajal Chakraborty was elected NASI Fellow; Dr Grinson George won the Prof. H. P. C. Shetty Award; Dr Sandhya Sukumaran received the UK–British Council Alumni Award; Dr Reshma Gills was inducted into INYAS-INSA and won the CMSD–Young Scientist Award; and Dr Subal Kumar Roul received both IFSI Dr B. C. Jha and AFSIB Young Scientist Awards. ICAR-CMFRI also won First Place for Best Stall at 13 IFAF.

The institute received the *Kshetriya Rajbhasha Puraskar* for 2023–24 from the Department of Official Language, Ministry of Home Affairs, and also bagged the Rolling Trophy – First Position for excellence in Official Language implementation and for the in-house Hindi magazine *Matsyagandha* among Central Government organisations in Kochi for 2022–23.

The institute actively involved in the *Swachh Bharat Abhiyan* through major campaigns in 2024 (*Swachhta Hi Seva*, Special Campaign 4.0, and *Swachhta Pakhwada*) across its headquarters, regional centres, and KVKs. Initiatives included cleanliness drives, awareness programmes, coastal clean-ups, and waste management training.
The institute also released a report 'Decade-long *Swachh Bharat* activities at ICAR-CMFRI'.

Women Cell of the institute promoted gender inclusivity and empowerment in 2024 through initiatives focused on leadership development and health awareness campaigns at various centres. The institute celebrated International Women's Day with inspiring guest speakers and honoured women entrepreneurs for their contributions.

कार्यकारी सारांश

भा कृ अनु प- सी एम एफ आर आइ में वर्ष 2024 के दौरान 37 गृहांदर परियोजनाएँ, 40 बाहरी वित्त पोषित परियोजनाएँ, 14 परामर्श परियोजनाएँ और अन्य गृहांदर गतिविधियाँ संचालित की गयीं।

वर्ष 2024 के दौरान भारत के समुद्री मछली अवतरण में 2% की कमी हुई, वर्ष 2023 की तुलना में 3.53 मिलियन टन से घटकर 3.45 मिलियन टन तक आकलित की गयी। पश्चिमी तट के समुद्री मछली अवतरण में घटती के कारण यह कमी पायी गयी जब कि पूर्वी तट पर समुद्री मछली अवतरण में वृद्धि पायी गयी, इसके अपवाद में महाराष्ट्र और आंध्र प्रदेश राज्य आते हैं। अंदमान एवं निकोबार द्वीप में 8 % की कमी के साथ 16,990 टन योगदान दिया गया, जिससे कुल राष्ट्रीय समुद्री मछली अवतरण 3.47 मिलियन टन आकलित किया गया।

कर्नाटक, गोआ, दामन एवं दियु राज्यों में क्रमशः 34%, 50%, एवं 44% की कमी पायी गयी जब कि पश्चिम बंगाल (+35%), ओडीषा (+18%) एवं तमिल नाडु (+20%) में वृद्धि पायी गयी। कर्नाटक में समुद्री मछली अवतरण की कमी और महाराष्ट्र में वृद्धि के कारण दक्षिण पश्चिम तट की तुलना में उत्तर पश्चिम तट आगे आया। कुल समुद्री मछली अवतरण में 54% सहित वेलापवर्ती प्रजातियाँ अधिक पायी गयीं जिसके बाद तलमज्जी पख मछलियाँ, क्रस्टेशियन एवं मोलस्क आते हैं। तमिल नाडु और अन्य पूर्व तटीय क्षेत्रों में मोटरीकृत क्षेत्र द्वारा मछली पकड़ में 1.0 लाख टन की वृद्धि हुई जबकि यंत्रीकृत क्षेत्र में 1.7 लाख टन की कमी हुई। यंत्रीकृत और मोटरीकृत क्षेत्र का योगदान क्रमशः 76% से 23% तक था। मौसमी तौर पर, वार्षिक अवतरण में चौथी तिमाही (31.8%) में सबसे अधिक योगदान दिया जिसके बाद पहली और तीसरी तिमाहियाँ आती हैं। वर्ष 2024 में,समुद्री मछली अवतरण 62,702 करोड़ रु. अवतरण केन्द्रों में और खुदरा केन्द्रों में 90,104 करोड़ रु. आकलित किया गया और वर्ष 2023 की तुलना में क्रमशः 4.22% एवं 8.46% की वृद्धि हुई। कीमत प्राप्ति में गुजरात राज्य सबसे आगे रहा जब कि अवतरण में भारतीय बांगडा (9.71%) और उच्च मूल्य में पेनिआइड चिंगट सबसे आगे रहा। देश के सकल मूल्य वर्धन में मात्स्यिकी क्षेत्र का योगदान 43,252 करोड़ रु. था (राजस्व का 68.98%)।

डिजिटल परिवर्तन के कारण मात्स्यिकी डेटा संग्रह में महत्वपूर्ण बदलाव आया है, जिसमें मछली पकड सर्वेक्षण एवं विश्लेषण (FCSA) 2.0 ऐप ने वास्तविक समय की निगरानी में क्रांति ला दी है। यह ऐप अवतरण केंद्र की गतिशीलता, मछली की गुणवत्ता और मत्स्यन तल की भौगोलिक स्थिति के बारे में जानकारी प्रदान करती है, जिससे प्रति यूनिट पकड और जैवमात्रा गणना में सुधार होता है। वर्ष 2024 में, कुल 2.6 लाख यात्राओं में से 70,000 नाव यात्राओं की बारीकी से निगरानी की गई, जिससे राष्ट्रीय समुद्री मात्स्यिकी डेटा केंद्र (NMFDC) के लिए डेटा सटीकता में उल्लेखनीय वृद्धि हुई।

समुद्री मात्स्यिकी अनुसंधान में जनता को शामिल करने के लिए एक अभिनव मोबाइल अनुप्रयोग ‘MARLIN@CMFRI (भारतीय अनन्य आर्थिक क्षेत्र के समुद्री मात्स्यिकी मशीन अध्ययन दिनचर्या के लिए व्यापक मीडिया शेयर बेस) विकसित किया गया। यह ऐप एक व्यापक मीडिया-शेयरिंग प्लेटफ़ॉर्म के रूप में कार्य करता है, जो भारत के अनन्य आर्थिक क्षेत्र के भीतर समुद्री मात्स्यिकी अनुसंधान, प्रजातियों की पहचान और मूल्यांकन प्रयासों में क्रांतिकारी बदलाव करता है।’MARLIN@CMFRI’ के माध्यम से, उपयोगकर्ता भारतीय समुद्र में पायी जाने वाली समुद्री मछली प्रजातियों की तस्वीरें सहजता से अपलोड कर सकते हैं, जिससे समुद्री मात्स्यिकी संसाधनों के व्यापक दृश्य भंडार के निर्माण में योगदान मिलता है।

टिकाऊ मात्स्यिकी प्रबंधन पहल के रूप में, जैविक विश्लेषण के माध्यम से वाणिज्यिक प्रमुख प्रजातियों के अंडजनन मौसम की पहचान की गयी, जिससे क्षेत्र-विशिष्ट अंडजनन कैलेंडर विकसित किया गया। समावेशी निर्णय लेने को सुनिश्चित करने के लिए, वर्ष 2024 में देश भर में हितधारक बैठकों की एक श्रृंखला आयोजित की गयी, जिनमें पारंपरिक मछुआरों, प्रसंस्करणकर्ताओं और मछली पालनकारों को एक साथ लाकर टिकाऊ प्रथाओं और संसाधन प्रबंधन रणनीतियों पर चर्चा की गयी।

भारत में पर्स सीन मात्स्यिकी पर अध्ययन किया गया और यह पाया गया कि अधिकाँश लक्षित प्रजातियों के प्रभव स्वस्थ पाए गए लेकिन हितधारकों के मिश्रित विचार और अनुपालन संबंधी मुद्दे दर्ज किए गए। तमिलनाडु ने अधिक अवतरण और मूल्य में गिरावट पर चिंता जताई जब कि महाराष्ट्र ने महत्वपूर्ण नियम उल्लंघन (61.3%) और अनुपालन शिक्षा, आय और जागरूकता सहित दस्तावेज़ीकरण में त्रुटि(97.9%) दिखायी।

मात्स्यिकी क्षेत्र में 145 ट्रांसजेंडर हितधारकों को जेंडर पहल का समर्थन मिला, जिसका मुख्य ध्यान सूक्ष्म उद्यमों और क्षमता निर्माण पर था। डी एस टी द्वारा वित्तपोषित एस टी आई-हब ने केरल में 84 सूक्ष्म उद्यम शुरू किए, जिससे 490 लोग लाभान्वित हुए, जबकि ए टी आई सी ने 21.5 लाख रुपए का राजस्व अर्जित किया और 14,090 आगंतुकों ने केंद्र का दौरा किया।

कैरंक्स सेक्सफासियेटस, सिगानस कनालिकुलेटस, सिगानस जावुस, अकान्तुरस सान्तोप्टेरस, ट्रकिनोटस बैलोनी, 11 अलंकारी पख मछली प्रजातियाँ और 3 अकेशरुकियों के ब्रूडस्टॉक विकास में महत्वपूर्ण प्रगति हुई। *एकेंथोपाग्रस बर्डा, सिगनस वर्मीकुलैटस, लेथ्रिनस नेबुलोसस, लेथ्रिनस लेंटजन और पोमाडासिस फरकैटस* के लिए प्रग्रहण अवस्था में प्रजनन और बीज उत्पादन प्रोटोकॉल को मानकीकृत किए गए, जिनमें *ग्नथानोडोन स्पेकिओसस* और *कैरेंक्स इग्नोबिलिस* की प्रग्रहण अवस्था में प्रजनन के लिए उल्लेखनीय सफलताएँ हासिल की गई हैं। आठ अलंकारी प्रजातियों को प्रग्रहण अवस्था में अंडजनन के लिए सफलतापूर्वक प्रेरित किया गया, जिनमें *पिक्टिक्रोमिस पैकाग्रेलोरम, इस्टिगोबियस ऑर्नेटस* और *गोबियोडॉन सिट्रिनस* के लिए बीज उत्पादन पूरा किया गया। वर्ष 2024 में तमिलनाडु के पाक खाड़ी और मन्नार की खाड़ी में कुल 19.6 मिलियन *पीनियस सेमीसलकैटस* पश्च डिम्भक को समुद्र में विमोचन किया गया। इसके अलावा केरल के अष्टमुडी झील में 3.0 मिलियन पीली गर्दन वाली सीपी को (*पाफिया मालाबारिका*) विमोचित किए गए, साथ ही महाराष्ट्र में सीपी और शुक्ति के बीजों का बड़े पैमाने पर वितरण किया गया।

एकेंथोपाग्रस बर्डा का पालन परीक्षण पेल्लेट खाद्य के साथ किया गया जब कि *सिगनस वर्मीकुलैटस-ट्रेकिनोटस ब्लोची* पॉलीकल्चर के लिए अनुकूलित किया गया। 180 दिनों में *नातनोडन स्पीशियोसस* का 285 ग्रा. तक की वृद्धि हुई और छह महीनों में *लुटजानस आरजेंटीमाकुलेटस* का 243 मि. मी. तक की वृद्धि हुई। जॉन स्नाप्पर मछली 20 पीपीटी लवणता पर 16% की बेहतर वृद्धि दिखाई, साथ ही छिपाने वाले स्थानों ने अतिजीवितता में मदद की। शंबु पालन ने प्रभव घनत्व को परिष्कृत किया, और मंडपम में *ग्रेसिलेरिया एडुलिस* को पिंजरे में पालन की गयी कोबिया मछलियों के साथ एकीकृत किया गया। खुले समुद्र में *कप्पाफाइकस अल्वारेज़ी* के ट्यूब नेट पालन ने 3.52% की दैनिक वृद्धि हासिल की। भा कृ अनु प- सी एम एफ आर आइ ने एफ एफ पी ओ के गठन का समर्थन किया।

समुद्री संवर्धन पर अखिल भारतीय नेटवर्क परियोजना के अंतर्गत सी एम एफ आर आइ ने 12 केन्द्रों में पालन प्रौद्योगिकियों और बीज उत्पादन पर अनुसंधान का समन्वयन किया। समुद्री पिंजरों में मिश्रित आहार के साथ जॉन स्नाप्पर मछली का वजन 615±50 ग्राम तक बढ़ गया, जबकि तालाब के कम घनत्व में 670 ग्राम तक की वृद्धि हुई। पाक खाड़ी में 90% अतिजीवितता के साथ पिंजरों में पालन की गयी कोबिया मछली का वज़न सात महीनों में 2.4 किलोग्राम तक की वृद्धि हुई। सिल्वर पोम्पानो, जाइंट ट्रेवली और मेज़ रैबिट मछली के पालन परीक्षणों ने आशाजनक वृद्धि दिखाई। 15 मीटर व्यास वाले समुद्री पिंजरे के व्यवहार्यता अध्ययन ने पिंजरों की सुदृढ़ीकरण के साथ संरचनात्मक स्थिरता पर बल दिया।

भा कृ अनु प- सी एम एफ आर आइ के मंडपम क्षेत्रीय केंद्र को मत्स्य पालन विभाग, मत्स्य पालन, पशुपालन और डेयरी मंत्रालय, भारत सरकार द्वारा दिनांक 03 सितंबर 2024 को 'समुद्री शैवाल पैदावार के लिए उत्कृष्टता केंद्र (सी ओ ई)' घोषित किया गया। मत्स्य पालन विभाग, मत्स्य पालन, पशुपालन और डेयरी मंत्रालय, भारत सरकार ने दिनांक 9 दिसंबर 2024 को भा कृ अनु प- सी एम एफ आर आइ, मंडपम के मंडपम क्षेत्रीय केंद्र को 'समुद्री मछली प्रजातियों के लिए न्यूक्लियस प्रजनन केंद्र' के रूप में अधिसूचित किया है।

पर्यावरणीय कारकों को शामिल करके भारत के पश्चिमी तट पर स्काड के स्थानिक वितरण को मापित करने के लिए प्रजाति वितरण मॉडल (एस डी एम) का उपयोग किया गया और वैधित समूह मॉडल ने विभिन्न जलवायु परिवर्तन परिदृश्यों के तहत स्काड के आवासों में संभावित बदलावों का खुलासा किया, जिससे उनके स्थानिक वितरण पर जलवायु के सशक्त प्रभाव पर प्रकाश डाला गया। जी ए एम विश्लेषण (1998-2023) से पता चला कि समुद्र सतह का तापमान (एस एस टी), समुद्र सतह की लवणता (एस एस एस), और क्लोरोफिल ने केरल तट पर भारतीय तारली के पकड प्रति यूनिट प्रयास को महत्वपूर्ण रूप से प्रभावित किया, भविष्य के एसएसपी अनुमानों में गिरावट का संकेत है। तापीय अध्ययनों ने सिल्वर और इंडियन पोम्पानो को जलवायु-लचीले समुद्री संवर्धन के लिए उपयुक्त माना गया। उच्च तापमान ने डिम्भक के अस्तित्व को प्रभावित किए बिना *ओरिज़ियास डांसेना* के विकास और प्रारंभिक परिपक्वता को तेज़ कर दिया। उच्च तापमान ने *ग्रेसिलेरिया कॉर्टिकाटा* की वृद्धि और प्रजनन में बाधा उत्पन्न की।

भा कृ अनु प- सी एम एफ आर आइ ने कडलमिन™ सिल्वरग्रो एक्वाफीड का उपयोग करके सिल्वर पोम्पानो मछली का पिंजरे में पालन करने के लिए ए बी आई एस एक्सपोर्ट्स इंडिया प्राइवेट लिमिटेड के साथ भागीदारी की। समुद्री पख मछली डिम्भक के लिए नए माइक्रो-फीड, कडलमिन™ सिल्वरग्रो और कडलमिन™ माइक्रोफिन को प्रारम्भ किया गया। शून्य अपशिष्ट प्रसंस्करण के लिए एक काली सिपाही मक्खी डिम्भक - आधारित जैव परिवर्तन इकाई का उद्घाटन किया गया, साथ ही कीट प्रोटीन-आधारित मछली फ़ीड प्रौद्योगिकी के लिए एक समझौता ज्ञापन पर हस्ताक्षर किए गए। इसके अतिरिक्त, मछली अपशिष्ट अपघटन के लिए एक माइक्रोबियल संघ विकसित किया गया, जो पौधों के लिए उर्वरक के रूप में उपयुक्त खाद का उत्पादन करता है।

पख मछली के रोगजनक प्रोफाइलिंग ने दो नई मैक्सोपोरियन प्रजातियाँ, जो कि *मैक्सोबोलस राकेरी* एवं *मैक्सोबोलस माली* की पहचान की गयीं साथ ही साथ स्फुटनशाला और पिंजरे में पालन की गयी प्रजातियों में परजीवी और जीवाणु संक्रमण की पहचान की गयीं। पांच *विब्रियो* प्रजातियों का पता लगाने के लिए एक मल्टीप्लेक्स पी सी आर को अनुकूलित किया गया, और नैनोकण-आधारित वैक्सीन संरूपण विकसित किए गए। प्राकृतिक और पालन की गयी द्विकपाटियों में *पेरकिनसस* संक्रमण पायी गयी। *ट्रकिनोटस ब्लोची* पर किए गए प्रतिरक्षा अनुसंधान ने जीवाणु रक्षा में टी एन एफ-α जीन की भागीदारी का खुलासा किया, जबकि जैव-पूर्वेक्षण ने समुद्री-व्युत्पन्न जैवसक्रिय पदार्थों सहित सूजनरोधी, थक्कारोधी और उच्चरक्तचापरोधी गुणों की पहचान की।

पेर्ना विरिडिस के गुणसूत्र-स्तर के पूरे जीनोम ने कैंसर अनुसंधान और जलजीव पालन के लिए अंतर्दृष्टि प्रदान की, जबकि *उरोटेउथिस डुवाउसेली* ट्रांसक्रिप्टोम ने शीर्षपाद जीनोमिक्स को समृद्ध किया। *नेमिप्टेरस रैंडली* के आनुवंशिक विश्लेषण में तटीय विभेदन पाया गया, और *डेकैप्टेरस रसेली* के ओटोलिथ रसायन ने परिरक्षण के लिए स्थानिक संरचना की पुष्टि की। *पैनुलीरस पॉलीफैगस* के पहले माइटोजेनोमिक अध्ययन ने गहरी सहविशिष्ट वंशावली का खुलासा किया। इसी तरह, *पीनियस सेमीसुलकैटस* के पूरे सूत्रकणिकीय जीनोम को अनुक्रमित किया गया। *नेमिप्टेरस* मांसपेशी कोशिकाओं के साथ कोशिकीय समुद्री संवर्धन परीक्षणों ने स्कैफोल्ड-समर्थित प्रसार हासिल किया।

समुद्री जैव विविधता अनुसंधान सर्वेक्षणों ने 509 समुद्री स्तनियों, 682 पख मछलियों और 314 मोलस्क प्रजातियों का दस्तावेजीकरण किया, जिनमें 41 संकटग्रस्त प्रजातियों की पहचान की गई। *चिरोनेक्स इंद्रसाकसाजिया* सहित 20 जेलीफ़िश प्रजातियों का रिकोर्ड किया गया और सी एम एफ आर आइ द्वारा जेलीफ़िश डंक के इलाज के लिए जेलीस्प्रे (JellySpray) सफलतापूर्वक विकसित किया गया।

विब्रियो पैराहेमोलिटिकस को लक्षित करने वाले एक नए बैक्टीरियोफेज, PhPV1.2 का जीनोम-अनुक्रमण किया गया और GenBank में संग्रहीत किया गया।

लक्षद्वीप समुद्र में प्रवाल भित्तियों पर समुद्री उष्णता लहर का अभिलेख किया गया और चक्रवात के कारण 70 मत्स्यन रोध दिनों का दस्तावेजीकरण किया गया। वेब-आधारित कूड़ा मानचित्र से पता चला है कि केरल और कर्नाटक के तटों पर प्लास्टिक का अत्यधिक संचय है, जबकि कर्नाटक में माइक्रोप्लास्टिक की मात्रा लक्षद्वीप की तुलना में अधिक है।

सर्वेक्षणों ने भारत के 24.27% तटीय आर्द्रभूमि में आवश्यक मछली आवासों का मानचित्रण किया। लक्षद्वीप, टूटिकोरिन और एरणाकुलम में मैंग्रोव पुनरुद्धार प्रयासों में सफलता मिली। ऑप्टिकल समुद्र विज्ञान अध्ययनों ने सी डी ओ एम की गतिशीलता पर प्रकाश डाला, जिसमें कोच्ची के पास *ट्राइकोडेसमियम* के प्रमुख प्रस्फुटन की पुष्टि सेन्टिनल-2 इमेजरी के माध्यम से की गई।

भा कृ अनु प- सी एम एफ आर आइ के समुद्री जैवविविधता संग्रहालय में 70 नए नमूनों को जोड़ा गया, जिनमें 47 मछलियों की प्रजातियाँ, एक व्हेल का कंकाल (*बलेनोप्टेरा एडेनी एडेनी*), और *माग्नोफस्कस मारियानस* gen. nov. sp. nov. का होलोटाइप शामिल हैं । वर्ष 2024 में संग्रहालय में लगभग 8,966 दर्शकों ने दौरा किया, जिनमें से 80% छात्र थे, जो इसे एक महत्वपूर्ण शैक्षणिक संसाधन के रूप में दर्शाता है।

भा कृ अनु प- सी एम एफ आर आइ ने कई क्षेत्रों में पिंजरा मछली पालन इकाइयाँ, बायोफ्लोक और पेन कल्चर प्रणालियाँ स्थापित करके जनजातीय उप-योजना और अनुसूचित जाति उप-योजना के तहत आजीविका संवर्धन को बढ़ावा दिया। प्रमुख उपलब्धियों में *एट्रोप्लस सुराटेन्सिस*, सीबास, पोम्पानो, मसल, स्पाइनी लॉबस्टर के पालन से जनजातीय आय में वृद्धि तथा पुदुकुडी में बड़े पैमाने पर समुद्री शैवाल का पैदावार, जो अब समुद्री शैवाल बीज गाँव के रूप में मान्यता प्राप्त है, शामिल हैं।

के वी के एरणाकुलम ने गन्ने की खेती, मशीनीकृत लेमनग्रास कटाई आदि को पुनर्जीवित किया और 82 पंचायतों में विकसित भारत संकल्प यात्रा का विस्तार किया। ये कडप्पुरम फ्रेश फिश वितरण संघम एस एच जी को एक प्रमुख ब्रांड में बदल दिया, जिससे दैनिक बिक्री 100 किलोग्राम से बढ़कर 700 किलोग्राम हो गई और 20 शैक्षणिक संस्थानों में फलों के बागान स्थापित किए गए। के वी के लक्षद्वीप ने समुद्री शैवाल संवर्धन, समुद्री अलंकारी मछली स्फुटनशाला विकास और नारियल आधारित उद्यमों को बढ़ावा दिया, जबकि 10 द्वीपों में मृदा रहित माध्यम और सब्जी की खेती को बढ़ावा दिया गया। एक आधारभूत सर्वेक्षण में समुद्री शैवाल पैदावार की शक्यता की पहचान की गयी और कोको फेस्ट-2024 में 8,000 हितधारकों को शामिल किया गया।

उत्तरदायी मात्स्यिकी प्रबंधन, समुद्री संवर्धन, स्फुटनशाला तकनीकों और आनुवंशिक उपकरण सहित क्षेत्रो में संस्थान द्वारा मछुआरों, उद्यमियों, अनुसंधानकारों और छात्रों सहित मात्स्यिकी के हितधारकों के लिए कई प्रशिक्षण और क्षमता निर्माण कार्यक्रम आयोजित किए गए। वर्ष के दौरान 20 कार्यक्रमों से 700 से अधिक प्रतिभागियाँ लाभान्वित हुए। 125 कर्मचारियों को कौशल विकास के लिए वार्षिक प्रशिक्षण योजना (ए टी पी) के माध्यम से कर्मचारी प्रशिक्षण दिया गया। समुद्री शैवाल से उच्च मूल्य वाले यौगिक विकास पर 21 दिवसीय शीतकालीन पाठशाला का आयोजन किया गया, साथ ही कई अल्पकालिक पाठ्यक्रम भी आयोजित किए गए।

संस्थान ने तीन ट्रेडमार्क, एक डिज़ाइन और चार पेटेंट प्राप्त किए, जबकि चार प्रौद्योगिकियों का वाणिज्यीकरण किया। टिकाऊ जलजीव पालन का समर्थन करते हुए मेसर्स अमला इकोक्लीन प्राइवेट लिमिटेड को कीट प्रोटीन आधारित मछली फ़ीड प्रौद्योगिकी का हस्तान्तरण करना एक महत्वपूर्ण उपलब्धि है। संस्थान ने एमिनोटेक प्राइवेट लिमिटेड के सहयोग से यकृत के स्वास्थ्य के लिए समुद्री शैवाल आधारित न्यूट्रास्युटिकल *GreenRex* ™ का शुभारंभ किया। बारह प्रौद्योगिकियों को भा कृ अनु प प्रमाणीकरण प्राप्त हुआ।

संस्थान के पुस्तकालय और प्रलेखन केंद्र ने विस्तारित डिजिटल और भौतिक संसाधनों के साथ समुद्री मात्स्यिकी अनुसंधान को बढ़ाया। *eprints@ CMFRI* ने 5.4 मिलियन डाउनलोड के साथ 18,500 प्रकाशनों को पार कर लिया, जबकि *DSpace@ CMFRI* ने 6,000 दुर्लभ दस्तावेजों को संग्रहीत किया। J-Gate, Indiastatagri, ASFA और CeRA तक पहुँच ने अनुसंधान सहायता को मज़बूत किया। iThenticate, प्रकाशन समन्वय और एक नई ग्राफिक डिज़ाइन इकाई के माध्यम से साहित्यिक चोरी की जाँच ने विद्वानों के आउटपुट को बेहतर बनाया।

संस्थान ने चेन्नई में आयोजित 28वीं भा कृ अनु प क्षेत्रीय समिति-VIII बैठक का समन्वय किया, जिसमें भा कृ अनु प के अधिकारियों, एस ए यु नेताओं और राज्य लाइन विभाग के प्रतिनिधियों सहित 272 प्रतिभागियों ने भाग लिया। सचिव डेयर और महानिदेशक भा कृ अनु प की अध्यक्षता में हुई इस बैठक में 26 प्रमुख कृषि मुद्दों को प्राथमिकता दी गई, कार्ययोजना तैयार की गई और समय पर समाधान के लिए भा कृ अनु प संस्थानों और एस ए यू को जिम्मेदारियाँ सौंपी गईं।

संस्थान में 28वीं आर ए सी (अप्रैल 2024), 31वीं आई आर सी (जुलाई 2024) और 90वीं और 91वीं आई एम सी (सितंबर और नवंबर 2024) बैठकों के आयोजन किए गए। मुख्य चर्चाओं में अनुसंधान प्रगति, नीति संक्षिप्त विवरण, परिरक्षण रणनीतियाँ, अपतटीय जलजीव पालन, प्रौद्योगिकीय स्केलिंग और भविष्य की अनुसंधान दिशाएँ शामिल थीं।

भा कृ अनु प- सी एम एफ आर आइ के वैज्ञानिकों को वर्ष 2024 में कई पुरस्कार प्राप्त हुए। डॉ. काजल चक्रवर्ती को एन ए एस आई फेलो चुना गया। डॉ. ग्रिन्सण जॉर्ज को प्रो. एच. पी. सी. शेट्टी पुरस्कार और डॉ. संध्या सुकुमारन को यूके-ब्रिटिश काउंसिल एलुमनी पुरस्कार मिला। डॉ. रेश्मा गिल्स को आइ एन वै ए एस – आइ एन एस ए में शामिल किया गया और उनको सी एम एस डी-युवा वैज्ञानिक का पुरस्कार मिला। डॉ. सुबल कुमार राउल को आई एफ एस आई डॉ. बी. सी. झा और ए एफ एस आई बी युवा वैज्ञानिक पुरस्कार मिल गए। सी एम एफ आर आइ को 13 आई एफ ए एफ में सर्वश्रेष्ठ स्टॉल के लिए प्रथम स्थान की प्राप्ति हुई।

संस्थान को वर्ष 2023-24 के लिए गृह मंत्रालय के राजभाषा विभाग से *क्षेत्रीय राजभाषा पुरस्कार* प्राप्त हुआ, तथा वर्ष 2022-23 के लिए कोच्ची में स्थित केंद्र सरकार के संगठनों के बीच राजभाषा कार्यान्वयन में उत्कृष्टता और हिंदी गृह पत्रिका मत्स्यगंधा केलिए रोलिंग ट्रोफियाँ - प्रथम स्थान भी प्राप्त हुए।

संस्थान ने वर्ष 2024 में मुख्यालय, क्षेत्रीय केंद्रों और के वी के में विभिन्न अभियानों (स्वच्छता ही सेवा, विशेष अभियान 4.0 और स्वच्छता पखवाड़ा) के आयोजन से *स्वच्छ भारत अभियान* में सक्रिय रूप से भाग लिया। इनमें स्वच्छता अभियान, जागरूकता कार्यक्रम, तटीय सफाई और अपशिष्ट प्रबंधन प्रशिक्षण शामिल थे। संस्थान ने 'भा कृ अनु प- सी एम एफ आर आइ में दशक भर की स्वच्छ भारत गतिविधियाँ' नामक रिपोर्ट का विमोचन किया।

संस्थान के महिला सेल ने विभिन्न केंद्रों पर नेतृत्व विकास और स्वास्थ्य जागरूकता अभियानों पर केंद्रित पहलों के माध्यम से वर्ष 2024 में लिंग समावेशिता और सशक्तिकरण को बढ़ावा दिया। संस्थान ने प्रेरक अतिथि वक्ताओं के साथ अंतर्राष्ट्रीय महिला दिवस मनाया और महिला उद्यमियों को उनके योगदान के लिए सम्मानित किया गया

Photo: Gillnet-caught Indian mackerel landed at Kollam Port, Kerala

Fishery Resource Monitoring

Geo-referenced marine fisheries resources information system for Indian EEZ based on enhanced survey protocols and methodological platforms for stock assessment, modelling anWd forecasting

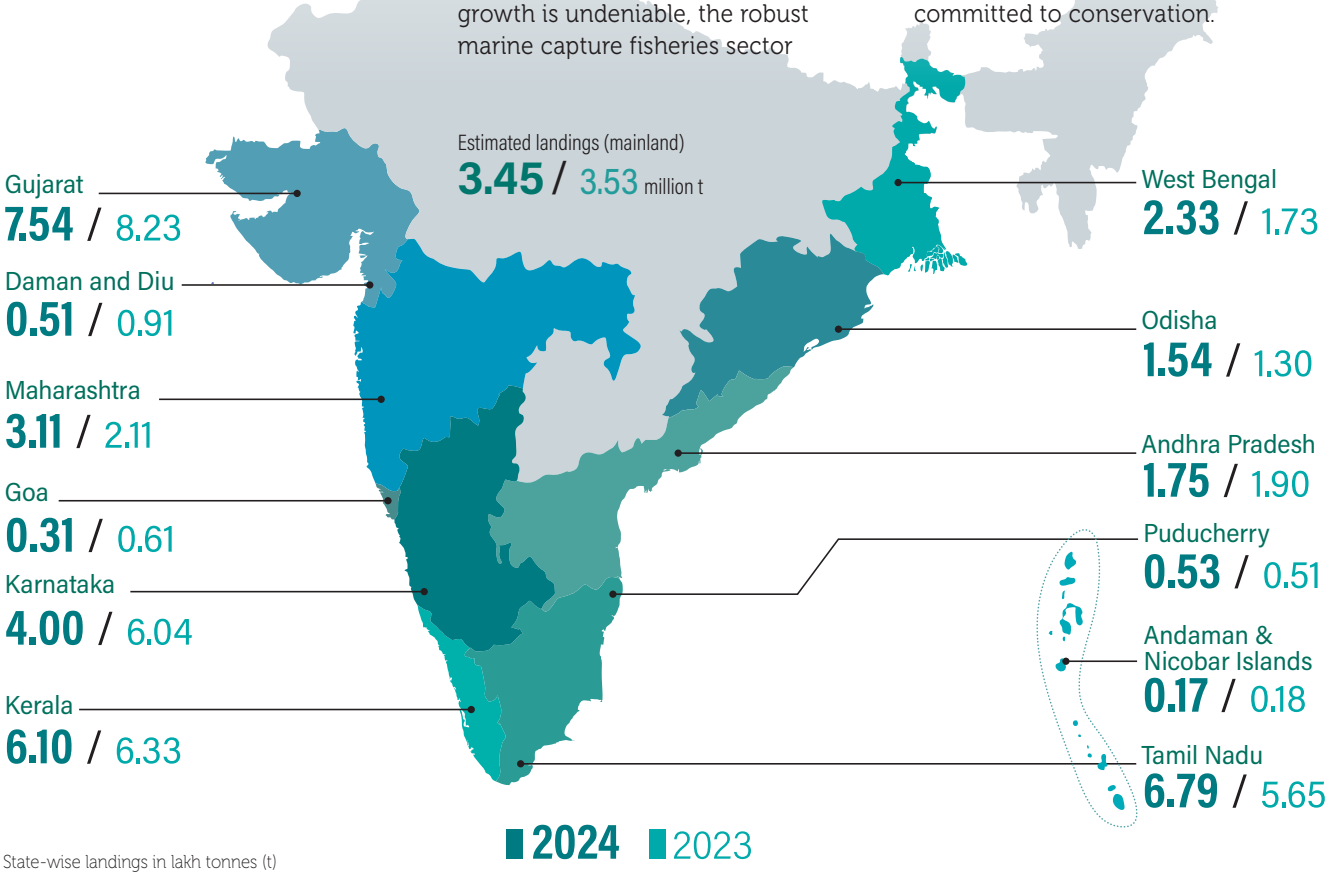
Project: FRAEED/GIS/01

India's marine fish landings–2024

India, a titan in the global fisheries arena, commands an impressive eight percent of the world's catch, securing its position as the second-largest producer. While aquaculture's vibrant growth is undeniable, the robust marine capture fisheries sector continues to anchor the nation's economic and social fabric, sustaining millions of livelihoods.

The government's Pradhan Mantri Matsya Sampada Yojana, a flagship programme of the newly formed ministry, has injected fresh impetus into this vital sector. Guided by the scientific rigor of institutions like ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), a sustainable approach permeates research and development, ensuring the long-term health of these precious resources.

ICAR-CMFRI, the nation's marine fisheries sentinel, employs a time-tested survey methodology, a beacon amidst proposed alternatives. This unique, self-evolving system, relying on trained, neutral data collectors, stands as a testament to robust scientific inquiry, a gold standard recognised by nations committed to conservation.



State-wise landings in lakh tonnes (t)

The "two-stage stratified random sampling" method, a marvel of statistical precision, allows for rapid, economical, and comprehensive data collection across 1190 landing centres on the peninsula and 70 in Andaman & Nicobar Islands. This meticulously executed scheme, spearheaded by ICAR-CMFRI, captures the intricate portrait of fishing activities, reflecting the true pulse of the ocean's bounty. Around 150 dedicated technicians (harbour-based observers) with species identification expertise visit landing centres according to work schedules generated under the sampling scheme, documenting various aspects of the fishery from sampled boats. To enhance their species identification skills in the field, these observers receive regular training in taxonomy.

This system, a confluence of scientific resplendence and statistical robustness, boasts efficiency, economy, and continuous evolution. The digital leap, embodied by the Fish Catch Survey and Analysis (FCSA) 2.0 app, has revolutionised data collection, providing near real-time insights into landing centre dynamics, fish quality, and the impact of natural calamities on fishermen's livelihoods. Crucially, the app now maps estimated fishing ground geolocations, enabling the calculation of catch per unit effort and biomass across spatial grids, enriching the National Marine Fisheries Data Centre (NMFDC). Approximately 70,000 boat trips were observed out of 2.5 lakh trips that landed marine resources in 2024.

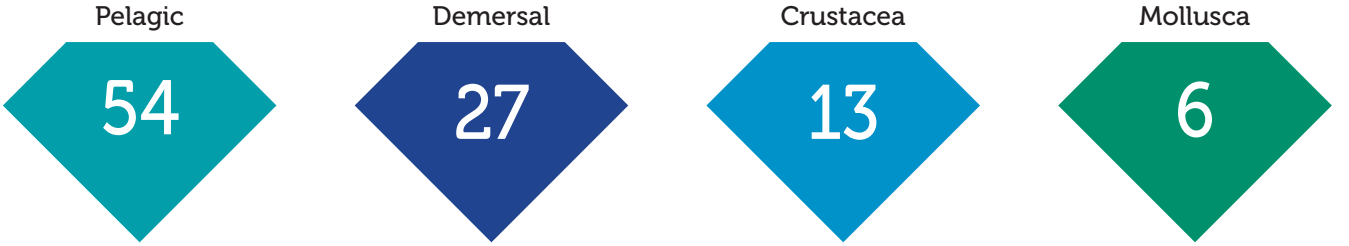
Region-wise landings (%)

In 2024, the tides have shifted slightly. Mainland marine fish landings experienced a marginal 2% decline, from 3.53 million t in 2023 to 3.45 million t. This ebb and flow, within acceptable deviations, reveals a nuanced regional pattern: a general decline along the westcoast, countered by growth on the eastcoast, with notable exceptions like Maharashtra and Andhra Pradesh. The westcoast's dominance means this overall decline, roughly 80,000 t, is marginal.

The marine fish landings of the Andaman & Nicobar Islands (ANI) totalled 16,990 t in 2024, reflecting an 8% decline. This contributed to the country's total estimated marine fish landings of 3.47 million t. To maintain consistency in sequential comparison, the figures are being discussed without including ANI estimates.

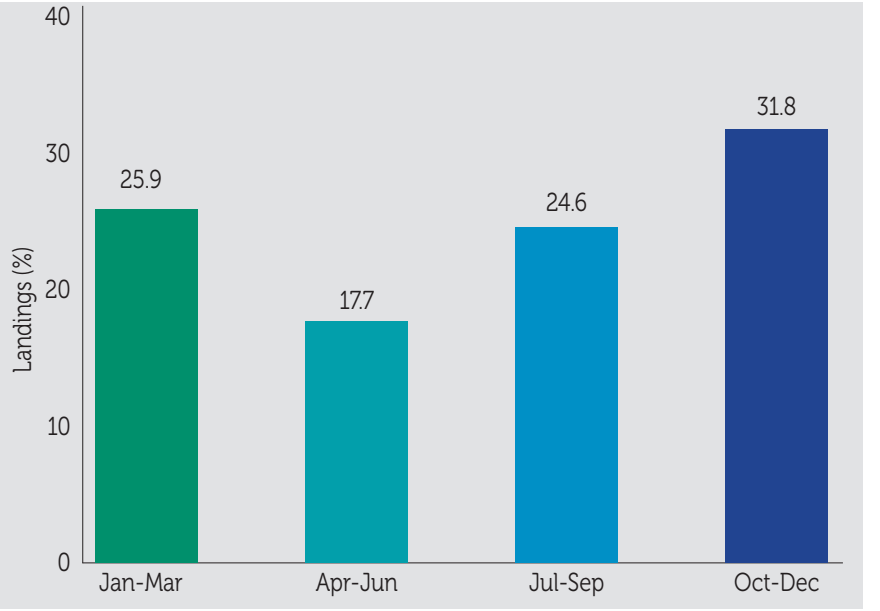
Karnataka witnessed a striking 34% fall, while Goa and Daman and Diu experienced precipitous drops of 50% and 44% respectively, highlighting the inherent volatility of regional fisheries. Conversely, Puducherry maintained its landings, while the northeastern states of West Bengal and Odisha surged by 35% and 18% respectively. Tamil Nadu, a major eastcoast contributor, saw a substantial 20% increase.

Regionally, the northwest has slightly surpassed the southwest in contributions, largely due to Karnataka's decline and Maharashtra's surge. Pelagic fishes dominated the catch, accounting for 54%, followed by demersal fishes, crustaceans and molluscs, nearly mirroring the previous year's proportions. The top five contributors to the pelagic fish assemblage retained their 2023 performance with a slight change in order. In the case of demersal resources, the deep-dwelling threadfin breams and croakers maintained their robust performance. Penaeid shrimps saw a slight increase, while non-penaeid shrimps declined. Squid and cuttlefish remained the top molluscan contributors.

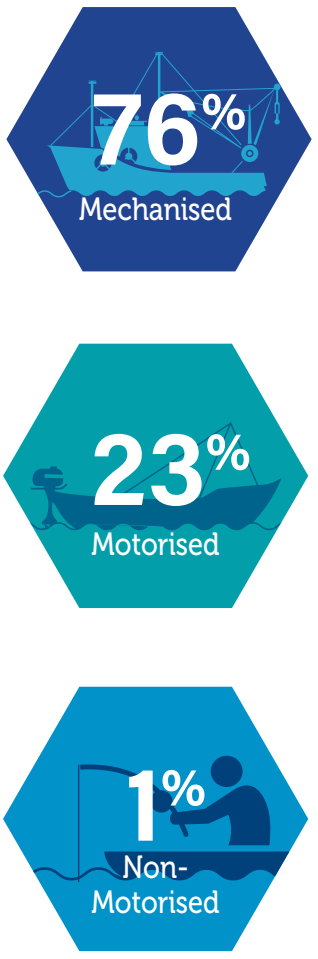


Assemblage (%)

The motorised sector experienced a significant increase of around 1 lakh t, particularly in Tamil Nadu and the eastcoast, while the mechanised sector saw a decline of about 1.7 lakh t, making the contributions to 76% and 23% for the mechanised and motorised sector respectively. Non-motorised contributions dwindled further to 1%. A gear-wise comparison gives out the following interesting facts: in the motorised sector, outboard gillnet units recorded an increase of nearly 15,000 t in landings, while their estimated boat trips decreased by about 2 lakh units; bagnet landings have nearly doubled with a 20% increase in unit operations; in the case of the outboard ring seines the landings showed a jump of roughly 30,000 t despite a marginal decline in units estimated. The overall catch rate estimates for 2024 indicate that mechanised fishing crafts recorded 2,959 kg/trip, motorised fishing crafts reported 174 kg/trip, while non-motorised fishing crafts registered 41 kg/trip.



Quarter-wise landings (%)



Sector-wise landings

Seasonally, the fourth quarter contributed 31.8% of the annual landings, followed by the first and third quarters. The second quarter, impacted by fishing regulations and the southwest monsoon, contributed the least, though slightly more than the previous year. A diverse array of 1147 taxa were landed, showcasing the rich biodiversity of India's marine ecosystems.

This chronicle of India's marine harvest is a testament to the nation's commitment to sustainable fisheries management, a delicate dance between economic prosperity and ecological preservation. The data, meticulously collected and analysed, paints a vivid picture of the shifting tides, guiding policy decisions and ensuring the enduring health of these vital resources.

Automated system for marine fishery resources landing data collection *via* computer vision and AI-driven deep learning algorithms for species identification and quantification from visual images

Project: FRAEED/CV/02

In most countries, landing centre-based surveys are commonly practiced to assess marine resources, as exploratory fishery resource surveys are often time-consuming and expensive. These surveys rely on trained personnel to identify various marine species from landings. However, the operation of numerous boats in most landing centres and the high diversity of species make it challenging to collect comprehensive data on all resources from every vessel. Limited manpower across all sectors has necessitated the adoption

Releasing the MARLIN@CMFRI mobile app by Dr S. Ayyappan, recipient of the Padma Shri and former Secretary, DARE & Director General, ICAR

of automated techniques for more efficient data collection.

A potential solution to these challenges is the use of photographs taken by cameras mounted on boats or at landing centres. Leveraging deep learning algorithms and computer vision for marine resource identification can significantly enhance data accuracy, efficiency, and accessibility. This technological advancement allows for a more streamlined approach to resource assessment, reducing manual efforts while improving precision in species identification.

Recognising the potential of citizen science in addressing these challenges, an innovative mobile application, 'MARLIN@CMFRI (comprehensive media sharebase for MARine fishery machine Learning routines of INdian EEZ),' has been developed to engage the public in marine fisheries research. This app serves as a comprehensive media-sharing platform, revolutionising marine fishery research, species identification, and assessment efforts within India's Exclusive Economic Zone (EEZ). Through 'MARLIN@CMFRI,' users can seamlessly upload photographs of marine fish species encountered in Indian waters, contributing to the creation of an extensive visual repository of marine fishery resources.

Mobile app: MARLIN@CMFRI

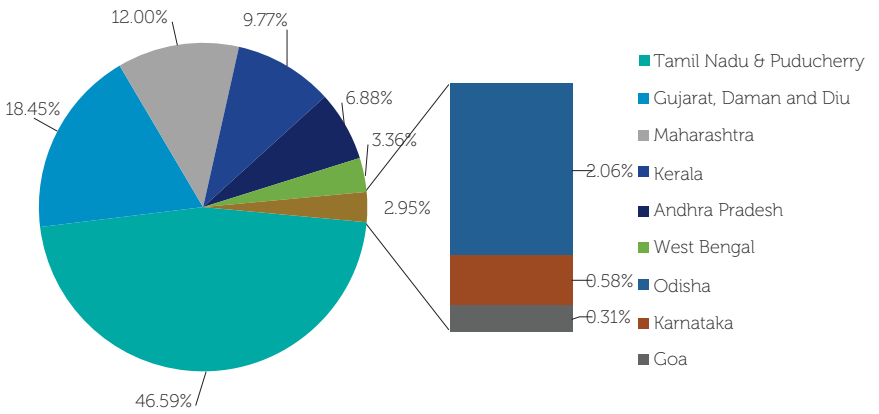
The collected data will support the development of an advanced AI-powered system for automated marine species identification, enhancing the accuracy of marine resource databases. This initiative provides crucial insights for researchers and conservationists studying species distribution patterns within the Indian EEZ, thereby supporting sustainable fisheries management and conservation efforts.

The app was officially released by Dr S. Ayyappan, recipient of the Padma Shri and former Secretary, DARE & Director General, ICAR, marking a significant milestone in the integration of AI and citizen science in marine fisheries research.

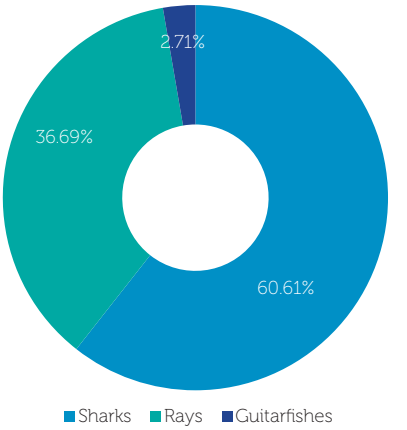
Decoding the interplay of fisheries-dependent and fisheries-independent factors on elasmobranchs of India to improve conservation, sustainability, livelihood security and management

Project: FFD/ELM/07

Elasmobranchs, comprising sharks, rays, guitarfishes and skates, were landed to the tune of 0.39 lakh t in 2024, an increase from 0.32 lakh t in 2023. The increase from 2020 has been ~50%. Tamil Nadu and



Contribution of states to elasmobranch landings in India in 2024



Contribution of sharks, rays and guitarfishes to elasmobranch landings in India in 2024

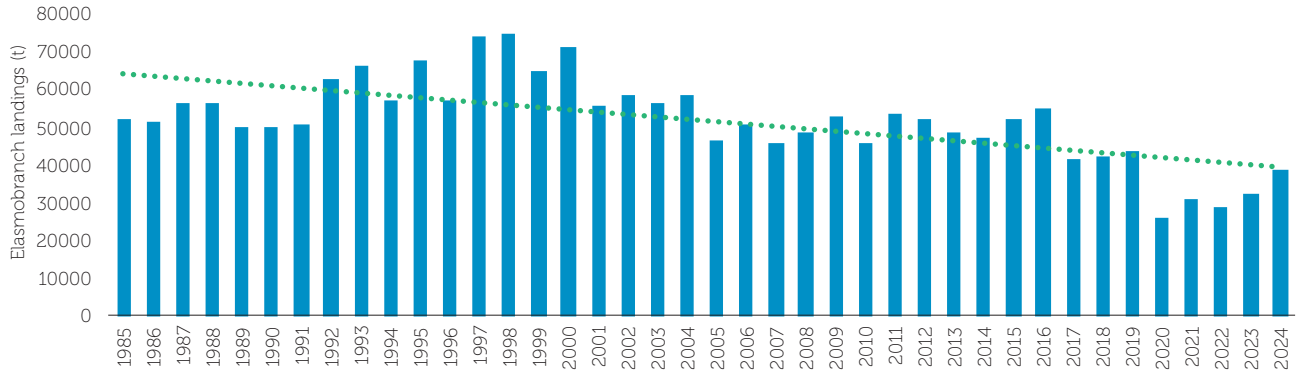
Puducherry accounted for ~47%, Gujarat, Daman and Diu, ~18% and Maharashtra, ~12%.

Composition of the landings

Sharks contributed to ~60% of the elasmobranch landings, rays ~37% and guitarfishes just under 3%. There was a very meagre contribution from skates and chimaeras. Tamil Nadu and Puducherry contributed to ~42% of the shark landings, followed by Gujarat, Daman and Diu (~24%), Maharashtra (~17%) and Kerala (~11%). Maximum landing of rays was observed in Tamil Nadu and Puducherry (~55%), Andhra Pradesh (~14%), Gujarat, Daman and Diu (9%) and Kerala (~8.7%). Guitarfish landings were also maximum in Tamil Nadu and Puducherry (~50%), followed by Gujarat, Daman and Diu (~24%) and West Bengal (20%).

Composition of elasmobranch landings in India in 2024

Sharks	% in shark landings	Rays	% in ray landings	Guitarfishes	% in guitarfish landings
Scoliodon sp.	35.0552	*Himantura* sp.	32.0195	*Glaucostegus* sp.	48.485
Carcharhinus sp.	33.2481	*Mobula* sp.	18.2424	*Rhinobatos* sp.	34.515
Alopias sp.	19.2332	*Dasyatis* sp.	11.4925	*Rhynchobatus* sp.	9.396
Chiloscyllium sp.	4.4705	*Telatrygon* sp.	7.3805	*Rhina* sp.	7.604
Rhizoprionodon sp.	2.6382	*Maculabatis* sp.	6.5208		
Sphyrna sp.	1.5068	*Pateobatis* sp.	5.2869		
Galeocerdo sp.	1.0639	*Gymnura* sp.	4.5228		
Isurus sp.	0.9279	*Aetobatus* sp.	4.1175		
Lamiopsis sp.	0.7099	*Neotrygon* sp.	2.9256		
Echinorhinus sp.	0.3456	*Taeniurops* sp.	2.0997		
Iago sp.	0.2872	*Pastinachus* sp.	1.7875		
Nebrius sp.	0.2403	*Rhinoptera* sp.	1.1504		
Stegostoma sp.	0.1912	Other rays	1.1328		
Pseudocarcharias sp.	0.0315	*Aetomylaeus* sp.	0.7350		
Centrophorus sp.	0.0256	*Manta* sp.	0.2517		
Mustelus sp.	0.0127	*Urogymnus* sp.	0.2124		
Loxodon sp.	0.0051	*Torpedo* sp.	0.0435		
Halaelurus sp.	0.0040	*Pteroplatytrygon* sp.	0.0395		
Triaenodon sp.	0.0013	*Plesiobatis* sp.	0.0228		
Prionace sp.	0.0010	*Narcine* sp.	0.0161		
Squalus sp.	0.0007				



Annual elasmobranch landings in India (1985-2024)

Twenty-one genera of sharks contributed to the shark landings in the country in 2024. The maximum contribution was by sharks of the family Carcharhinidae, with *Scoliodon* spp., *Carcharhinius* spp. and *Rhizoprionodon* spp. forming >70% of the total shark landings. Nineteen genera of rays constituted the total landings of rays, with maximum landings of *Himantura* spp., followed by *Mobula* spp. and *Dasyatis* spp. Guitarfish landings comprised four genera – *Glaucostegus, Rhinobatos, Rhynchobatus* and *Rhina.*

Pregnant female *Acroteriobatus variegatus* landed in Neendakara, with five embryos recovered from it

Rare occurrences and accidental landings of protected species

Accidental landing of four protected species, whale shark *Rhincodon typus*, bowmouth guitarfish *Rhina ancylostoma*, spine-tail mobula, *Mobula mobular,* and giant freshwater stingray *Urogymnus polylepis* were recorded along the Odisha coast in 2024. The accidental landing of the porcupine ray, *Urogymnus asperrimus*, another species protected under Schedule I of the Wild Life (Protection) Amendment Act, 2022, was observed at Pamban, Tamil Nadu, in June 2024.

Female whale shark accidentally caught in fishing operations off Paradeep, Odisha

Porcupine ray landed at Pamban

The landings of tiger sharks *Galeocerdo cuvier* were monitored along the east coast. A female tiger shark landed at Visakhapatnam Fishing Harbour on 5 July 2024 measured 356 cm TL and weighed nearly 200 kg; it is one of the largest specimens landed at the harbour in recent history.

A pregnant female stripenose guitarfish *Acroteriobatus variegatus* was observed among the landings at Neendakara fishing harbour. Five embryos were recovered from the specimen.

Live release of protected elasmobranchs

The live release of the widenose guitarfish *Glaucostegus obtusus,* which is protected under Schedule I of the Wildlife (Protection) Act, 1972, through the Amendment Act, 2022, was done at Gokarna and Aligadda landing centres in Karnataka under the guidance of ICAR-CMFRI. The fish were accidentally entangled in gillnets.

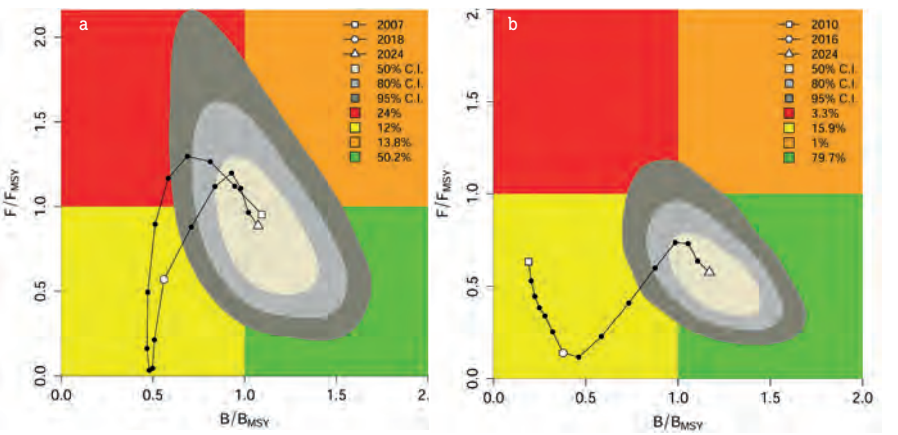
A neonate of the same species was successfully released back into the sea after being accidentally caught in a bottom-set gillnet at Vypin, Kochi, in November 2024. The neonate guitarfish, measuring 23 cm, was entangled in the net and landed ashore. Upon confirming that the neonate was alive, the technical personnel of ICAR-CMFRI oversaw its careful release back to the sea.

Release of live widenose guitarfish back to the sea in Karwar, Karnataka

Live neonate widenose guitarfish that was released back to the sea at Vypin, Kochi

Stock assessment

Stock status assessments indicated that spadenose shark *Scoliodon laticaudus,* bigeye hound shark *Iago omanensis*, and scaly whipray *Brevitrygon imbricata* are healthy



Stock status assessment of (a) *Scoliodon laticaudus* and (b) *Brivitrygon imbricata* along northeast coast of India

Adult *Brevitrygon imbricata* with pups and juveniles

along the northwest coast, while milk shark *Rhizoprionodon acutus*, grey sharpnose shark *Rhizoprionodon oligolinx*, Annandale's guitarfish *Rhinobatos annandalei*, and spotted guitarfish *Rhinobatos punctifer* are overfished in the region, indicating the need for region-specific management measures for these species. Along the northeast coast, the stock status of both *S. laticaudus* and *B. imbricata* is healthy.

India-Oman interactive workshop for capacity building on elasmobranch taxonomy, fisheries management and conservation

Shark and ray researchers from India and Oman got together at the ICAR-CMFRI, Kochi, in May 2024 for an interactive workshop to support sustainable elasmobranch fisheries and management in the northern Indian Ocean. Researchers from the Marine Science & Fisheries Centre and the Aquaculture Centre under the Directorate General of Fisheries Research, Sultanate of Oman, and Scientists from ICAR-CMFRI, India attended the programme and shared scientific knowledge on marine fisheries practices in the region, with particular emphasis on elasmobranch fisheries, species diversity, molecular taxonomy methods, conservation and trade.

International Whale Shark Day and International Sawfish Day

All Centres and Stations of ICAR-CMFRI, celebrated International Whale Shark Day on 30 August 2024, through awareness campaigns for various stakeholders, from school students to enforcement wings. Leaflets prepared in all the vernacular languages were distributed among the participants.

International Sawfish Day was celebrated on 17 October 2024 through awareness campaigns at Kochi, Karwar, Mumbai, Puri, and Digha. Sawfish Information Bulletins in local languages were distributed to the stakeholders.

Participants of the India-Oman interactive workshop at Kochi in May 2024

Stakeholder meetings and awareness campaigns on international whale shark day

A Student-Scientist Interface held at ICAR-CMFRI was inaugurated by Shri Hibi Eden, Honourable MP of Ernakulam Lok Sabha. He highlighted the importance of conservation of sawfish in a situation when climate change is posing threats to the marine ecosystem.

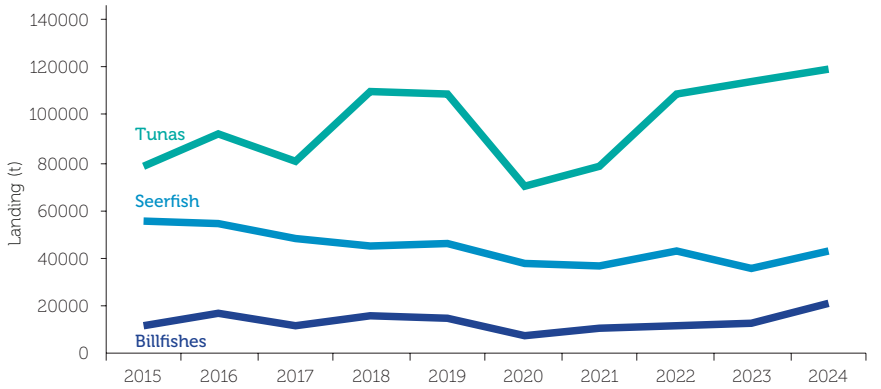
Development of integrated scientific fishery management approaches for biological and livelihood sustainability of tuna and tuna-like fishes along the Indian coast

Project: FFD/LPF/08

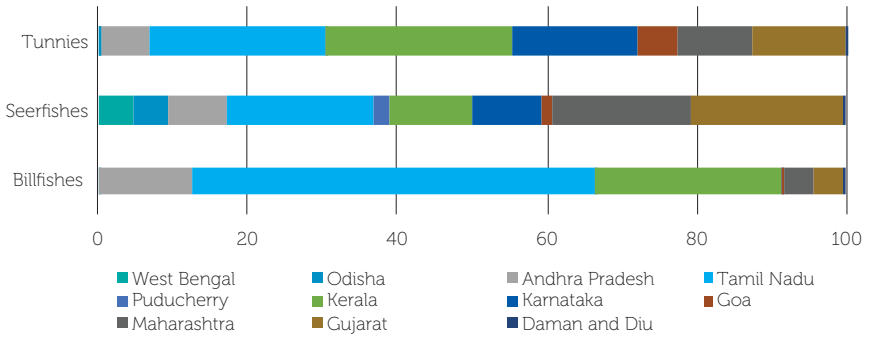
Large pelagics, such as tuna, billfish, and seerfish, are among the most traded fish globally and are under international monitoring and management.
The project aimed to update information on their fishery and stock health.
Landings of all three resources registered an uptrend in 2024. They were landed mainly by long lines, gillnets, trawls, hand lines, purse seines, and ring seines.

About 1,19,069 t tuna, 42,897 t seer fish and 21,321 t billfishes were landed along the mainland coast in 2024. Their landings improved respectively by 17%, 4% and 68% over 2023. The improvement in landing was due to an improved abundance of resources, as indicated by the increased catch rate of all species.

Shri Hibi Eden, honourable MP of Ernakulam Lok Sabha constituency at the student-scientist interface organised on International Sawfish Day, holding a sawfish model



Landing trend of tuna and tuna-like fishes



State-wise contribution

Tuna fishery

Tunas were landed all along the mainland coast of India, with nearly 50% of the landings by Kerala and Karnataka. Fishery was supported by eight species, six at commercial level and two as incidental catch. Coastal tunas dominated the catch by representing 63.0% of the total tuna landings and were represented mainly by *Euthynnus affinis* (35.1%), *Auxis thazard* (15%) and *Auxis rochei* (9.6%). Other neritic tunas in the fishery were *Thunnus tonggol* and *Sarda orientalis*. Oceanic tunas in the landing were dominated by yellowfin tuna, 21.5%, followed by skipjack tuna, *Katsuwonus pelamis,* along with nominal quantities of *Thunnus obesus* and *Gymnosarda unicolor.*

Seerfish fishery

Seven species supported the fishery, dominated by narrow-barred Spanish mackerel, *Scomberomorus commesrson* (60.4%). Spotted seerfish represented by three species 37% and wahoo 2.7% also added to their landings. Landing by other species was only very nominal.

Billfish fishery

Fishery was dominated by lone species of sailfish, contributing nearly 44% of the billfish landing. Swordfish were represented by a single species and contributed 7.8% to the group landing. Marlins, represented by four species, constituted the rest of the landing.

Biology

Landings were mostly supported by adults, indicating their healthy and sustainable fishery along the region. However, in species like narrow-barred Spanish mackerel, sailfishes, swordfish, and common dolphinfish, young ones predominated during certain seasons in gears like trawls and gillnets when fishing occurs along their nursery areas. Considering their seasonality, non-targeted nature of fishery and proportion in the total landings, the fishery may not be detrimental to the resource.

Biological reference points show that the size at capture is higher than the

Length range (cm) of major species and composition of immature fishes (< MLS in cm) in landings

				Immature fish (%)		
No	Species	Size range in the landing	MLS	Hooks & line	Gillnet	Trawl/RS
1.	*Thunnus albacares*	35-152	50.0	0	2.9	0.4
2.	*Katsuwonus pelamis*	27-72	35.0	0	6.5	1.1
3.	*Euthynnus affinis*	28-84	31.0	0	3.8	0.7
4.	*Auxis thazard*	24-52	25.0	0	2.7	2.3
5.	*Gymnosarda unicolor*	46-112	50.0	2.3	0	0
6.	*Scomberomorus commerson*	17-138	50.0	1.3	8.6	17.4

size at maturity but lower than the optimum size (L_{opt}) for exploitation. The exploitation rate shows that the stock is under moderate fishing pressure necessitating regulation of the fishery either to reduce the effort or to expand the fishing to distant waters.

Peak period of spawning of large pelagic species

Species	Peak spawning period
Scomberomorus commerson	May, Auguest and October-November
Scomberomorus guttatus	September-November
Euthynnus affinis	January-February and October-November
Auxis thazard	July-September
Auxis rochei	May-October

Length (cm) characteristics of major species in the landing

Species	L_r	L_{max}	L_{mat}	L_{opt}	L_c
Euthynnus affinis	18	78.0	37.7	40.1	39.7*
Auxis thazard	18	51.0	27.5	28.8	28.4*
Auxis rochei	16	39.0	23.6	24.5	24.2*
Thunnus tonggol	32	92	53	57.4	52.3*
Sarda orientalis	32	58	34	36	37.4**
Thunnus albacares	23	182	53	61.1	39.7*
Katsuwonus pelamis	12	89	34	45	28.4*
Gymnosarda unicolor			62	67.7	

Geo spatial map of pole and line fishing in Lakshadweep

Geospatial mapping of fishing grounds

Mapping of the pole and line fishing grounds of Lakshadweep on geospatial platform has been initiated, to aid effective fishery management programmes.

Livelihood sustainability metrics and indicators

A total of 82 indicators were identified under the five capitals framework (human, social, natural, physical, and financial) for constructing a Livelihood Index, specific to large pelagic fisheries in the Indian context based on the


Tuna landed at Kochi fishing harbour


Seerfish landing at Thresspuram landing centre, Thoothukkudi

sustainable livelihood approach. A standardised data collection protocol was designed , which needs to undergo validity and reliability check before the data collection.

Assessment and management of small-scale bivalve and gastropod fisheries for sustainable exploitation in India

Project: SFD/BGF/17

The annual landings of clams, oysters, and mussels across the coastal states of Kerala, Karnataka, Goa, Maharashtra, Tamil Nadu, Andhra Pradesh, and Odisha were estimated at 1,05,361 t in 2024. Compared to 2023, the production recorded a decrease of 14.37% from the previous year's landings of 123,047 t due to the decreased landings (-57%) of green mussels.

Increased bivalve landings were recorded in Maharashtra, Kerala and Odisha compared to 2023. Clams dominated the bivalve landings, followed by oysters and mussels. *Villorita cyprinoides* was the dominant bivalve species.

Intense spat fall of *Paphia malabarica* was observed in the Bhatye Creek in Ratnagiri during November-December, where a self-imposed fishing ban was imposed by clam handpickers during the spat fall season. The fishers designed different mesh-sized semicircular nets to avoid the harvest of small-sized clams. In Kerala, *P. malabarica* spat fall commenced in October and intensified in November in Thejaswini Estuary, Kuppam Estuary and Ashtamudi Lake. *V. cyprinoides* spat fall was observed in February and July in the Vembanad Lake and Madakkara, in Kerala. *Meretrix casta* spat fall was observed in estuaries *viz.* Chettuva, Chamaravattom, Korapuzha, Kuttiyadi, Valapattanam and Thejaswini in Kerala.

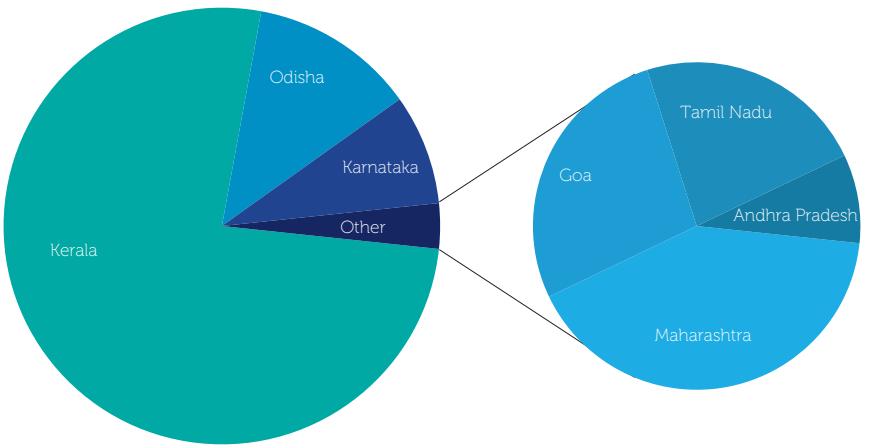
Intense spat fall of green mussel, *Perna viridis* was observed in Azhikal, Chellanam, Puthuponnani, Calicut and Kannur coastal areas in Kerala during the post-monsoon period of 2024. Self-regulatory quota in mussel fishery was observed in north Kerala. *Crassostrea madrasensis* spat fall was observed in Ashtamudi Lake and Chaliyar Estuary.

Gastropod catch

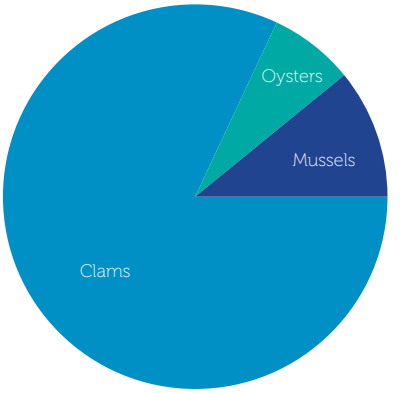
In 2024, the total gastropod landings in India was 6280 t. Tamil Nadu contributed the maximum of 79.4% of the total gastropod catch followed by Kerala (10.3%), Andhra Pradesh (9.6%) and other states. Karnataka, Maharashtra and Gujarat contributed less than 1% to the fishery. Among different gears, the major catch was from the gillnet (28.9%) followed by the trawl net (26.9%); by bag net (23.7%), diving and handpicking (13.4%), the remaining 7.2% catch was from other gears.

Gastropod species composition

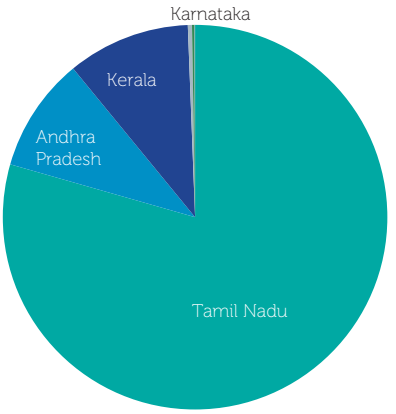
In the overall gastropod fishery of India, *Turbinella pyrum* was the major species (32.2%) followed by *Babylonia zeylanica* (18.3%), *Chicoreus ramosus* (12.9%), *Laevistrombus canarium* (7.4%), *Babylonia spirata* (6.5%), *Cerithidea* sp., (5.8%), *Lambis lambis* (4.6%), *Umbonium vestiarium* (3.9%), *Chicoreus virgineus* (2.6%) and other species contributed 5.8% to the fishery. In Tamil Nadu, *T. pyrum, C. ramosus, B. zeylanica, L. canarium* and *L. lambis* were the dominant species. In Kerala, the gastropod catch was dominated by *B. spirata* and *B. zeylanica*. In Andhra Pradesh,



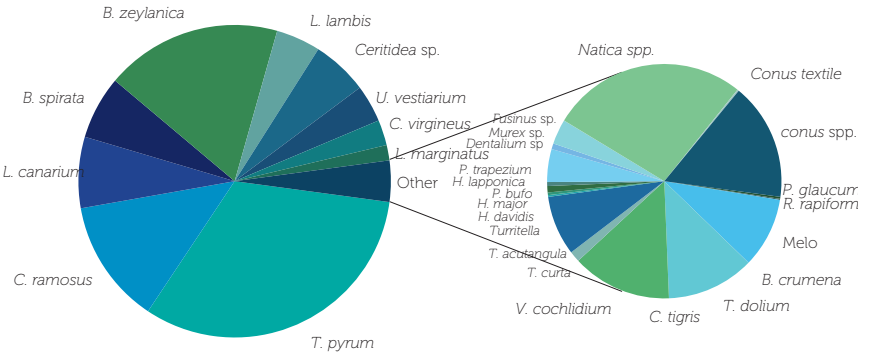
Contribution of bivalve production by state in India



Contribution of clams, oysters and mussels to all India bivalve production



Gastropod catch composition of India–2024



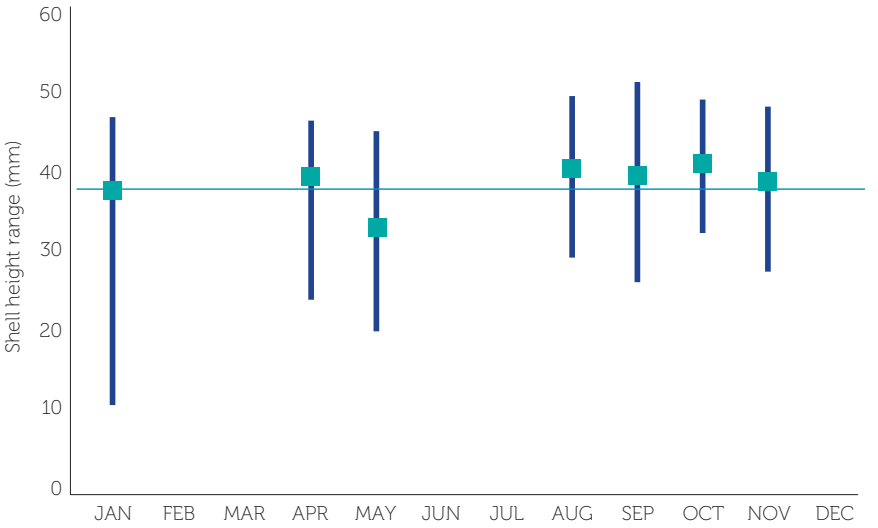
Gastropod species composition of India

the maximum catch was from *Cerithidea* sp. and *U. vestiarium* species. In Karnataka, the *Turritella* species was dominant in the catch.

Biology of major gastropods

In Kerala, the annual mean shell height of *B. spirata* was 37.5 mm in the fishery. Fishery was seasonal with the peak in April-May. The sex ratio was skewed with a dominance of females in the fishery.

In Gulf of Mannar, the size ranges of *T. pyrum* and *C. ramosus* from the two-exploitation method show high mean length in the skin diving method for both the species.

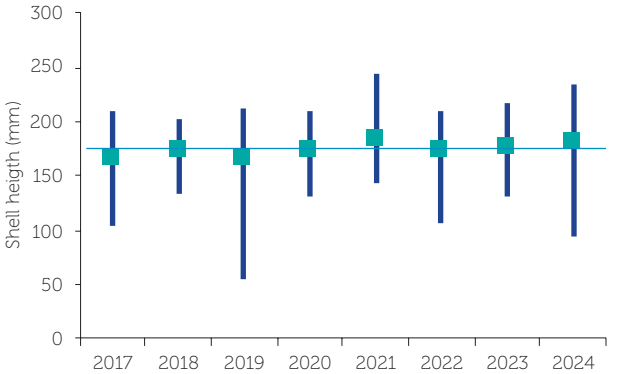


Monthly shell height range with mean height (square) of *Babylonia spirata* in the fishery with annual mean height (horizontal line)

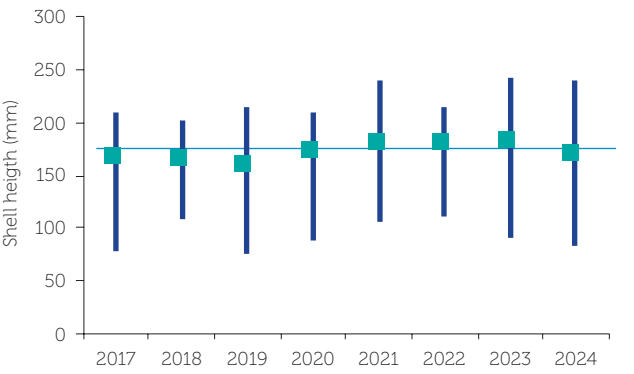
Investigations on the juvenile/subadult penaeid shrimps from nursery habitats

Project: SFD/PSF/16

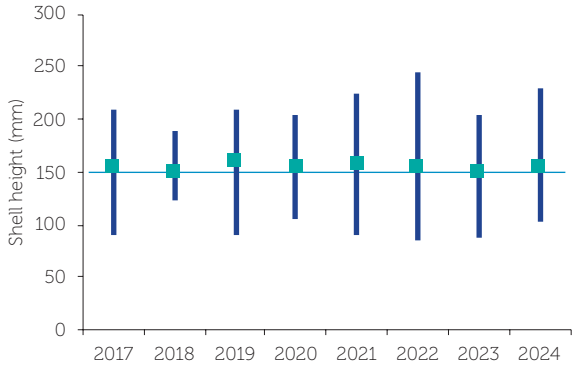
The project aims to derive baseline observations for relating juvenile/ subadult penaeid shrimp



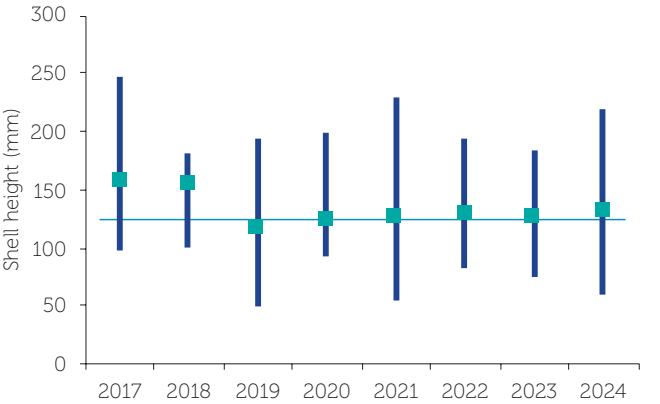
Monthly shell height range with mean height (square) of *Chicoreus ramosus* collected by diving, with annual mean height (horizontal line)



Monthly shell height range with mean height (square) of *Chicoreus ramosus* collected from gillnet, with annual mean height (horizontal line)



Monthly shell height range with mean height (square) of *Turbinella pyrum* collected by diving, with annual mean height (horizontal line)



Monthly shell height range with mean height (square) of *Turbinella pyrum* collected from gillnet, with annual mean height (horizontal line)

Size ranges of major Gastropods in Palk Bay

Species	sex	size range (mm)	mean
Volegalea cochlidium	M	62-85	67.9
	F	56-98	79.2
Chicoreus virgineus	M	79-110	82.4
	F	61-103	81.7
Laevistrombus canarium	M	53-67	57.9
	F	55-65	59.2
Margistrombus marginatus	Unsexed	41-78	60.1

Size ranges of *T. pyrum* and *C. ramosus* from diving and gillnet

Exploitation	*T. pyrum* (mm)	*C. ramosus* (mm)
Diving and hand picking	102 – 228	95 – 234
Gillnet	61 – 218	84 – 218

Processed *Turbinella pyrum* from Thoothukudi, Tamil Nadu

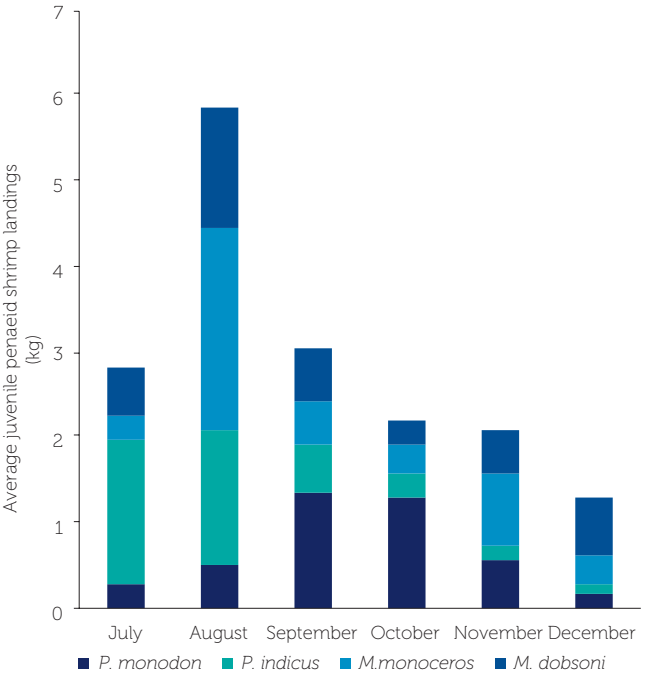
Size range (mm) of specimens of penaeid shrimps recorded

Species	Cochin	Chilika	Bheemili
P. monodon	80-98	54-127	
P. indicus	48-137	51-123	32-95
Metapenaeus monoceros	42-88	52-117	
Metapenaeus dobsoni	14-70	34-68	35-62

abundance in their nursery grounds with recruitment in the sea using suitable models. Collection of data on juvenile/subadult penaeid shrimp species started in Cochin backwaters (Kerala), Surajbari (Gujarat), Chilika Lagoon (Odisha), Bheemili (Andhra Pradesh), Palk Bay (Tamil Nadu) during the year.

In Cochin Backwaters, the juvenile/sub-adult penaeid shrimps were studied from stake net and Chinese dip net landings from July 2024. Besides, fishing using a mini trawl net was initiated in December 2024. *Metapenaeus dobsoni*, *Penaeus indicus*, *Penaeus monodon*, *Metapenaeus monoceros* were recorded. In Surajbari, the study was based on pre-adult *Metapenaeus kutchensis* caught in fixed bag nets. The total length of these ranged from 51 to 105 mm with females dominating the catch. In Chilika Lagoon, the penaeid shrimps were caught in trap nets (*Khanda Jal*). *Penaeus monodon*,

Bag nets – Surajbari, Gujarat



Average juvenile penaeid shrimp from trap net (n=10) in Chilika Lagoon, Odisha

Trap net – Chilika Lagoon, Odisha

Penaeus indicus, Metapenaeus monoceros and *Metapenaeus dobsoni* were recorded from July 2024. In Bheemili, the species recorded were *Penaeus monodon, Penaeus indicus* and *Metapenaeus dobsoni* caught in cast nets from September 2024. While in Palk Bay, the juvenile fishery of *Penaeus semisulcatus* in the inshore waters off Devipattinam coast was recorded. Mini trawl nets were used to catch the resource.

Shrimps caught from Chilika Lagoon, Odisha

Chinese dip net, Kerala

Huge landings of *Odonus niger* at Muttom harbor, Tamil Nadu

Stomatopods from Neendakara Fisheries Harbour, Kerala

Exploring non-conventional fisheries resources: assessing their fishery, stock status and potential for commercial exploitation

Project: FFD/ENCFR/33

The marine capture fisheries sector of India has witnessed wide fluctuations in the catches of major resources, driven by various factors. The emphasis is now changing from expanding the harvest of conventional resources to exploring the potential of non-conventional fisheries resources. There is an urgent need for resource diversity, and the search for non-conventional resources can help with this diversification. However, there is a large knowledge gap in the understanding of the life history traits, utilisation, value chain, and nutritional value of these resources. These resources may be of substantial use and application as they move from emerging to target species in the fishery. Hence, there is a need to focus on the non-conventional marine fisheries resources, not only to understand their eco-biological dynamics but to also evaluate their potential to support livelihoods and food security of the country in the coming years.

Non-conventional fisheries resources include species that are unassessed, underutilised, seasonally available, and region-specific in availability or catch, often with significant ecological or trophic role and currently have limited but emerging demand. Additionally, some species hold significant nutritional value or bioactive compounds, enhancing their potential for commercial utilisation in food, pharmaceuticals, and nutraceutical industries.

To initiate work in their assessment, an inception workshop was held as a brainstorming session on 14 August 2024 at ICAR-CMFRI, Kochi, in a hybrid mode to finalise key aspects of the study. The session focused on defining 'Non-Conventional Fisheries Resources', identifying target species for the study, and standardising methodologies for species-specific data collection.
The session concluded with a refined definition, emphasising their potential contribution to fisheries sustainability, economic development, and nutritional security. Initiated the monitoring and identification of key non-conventional fisheries resources along the Indian coast. Additionally, data analysis on length composition and fishery parameters, including gear type, spatial distribution, and depth range, has commenced. Structured questionnaires have been developed to systematically collect fishers' perspectives, along with preliminary insights into trade dynamics and economic aspects.

Marine Fisheries Census

On the occasion of World Fisheries Day, 21 November 2024, the conceptual launch of the 5th Marine Fisheries Census 2025 was formally officiated by the Honourable Union Minister of Fisheries, Animal Husbandry and Dairying, Shri Rajiv Ranjan Singh, at Sushma Swaraj Bhawan, New Delhi. Concurrently, administrative approval was accorded under the Pradhan Mantri Matsya Sampada Yojana (PMMSY), entrusting the ICAR-CMFRI with the vital responsibility of undertaking the census.

Photo: Multi-day trawlers at Vanakbara landing centre of Diu

Sustainable Fisheries Management

Gujarat, Daman and Diu

Developing an Integrated Assessment Framework to inform management decisions for marine fisheries in Gujarat, Daman and Diu

Project: SFD/IAF/14

Gujarat

Marine fish landings

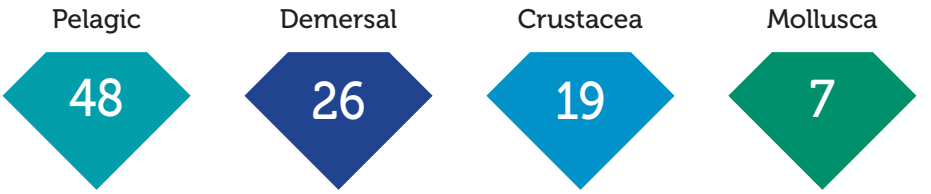
Marine fish landings in Gujarat were estimated at 7.54 lakh t in 2024, reflecting an 8% decline, yet the state remained the leading contributor among India's maritime states in landings.

Cyclone Asna brought severe weather in late August and early September, significantly disrupted fishing, damaged boats and caused loss of many fishing days.

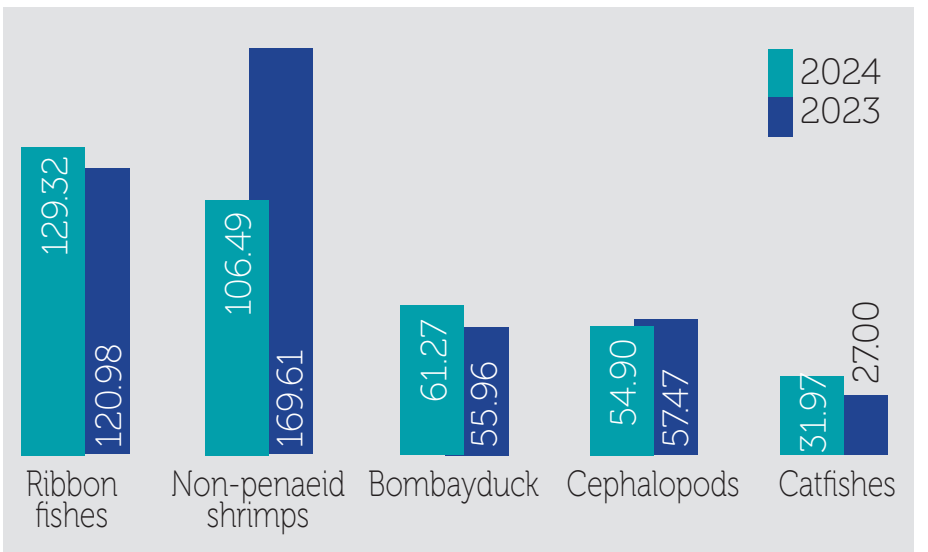
Ribbonfishes were the most landed resource in 2024, registering a 7% increase, with its landings being the highest in the past ten years.

Non-penaeid shrimp landings saw 37% decline compared to 2023, likely due to reduced fishing effort and catch rates in dol nets, thereby contributing to a 31% decrease in crustacean landings from the previous year.

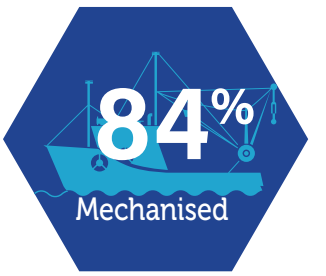
Majority of the landings came from Gir Somnath (43%), followed by Porbandar (17%) and Junagadh (13%) districts.

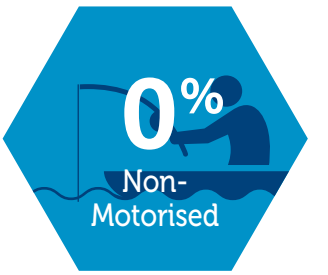


Assemblage (%)

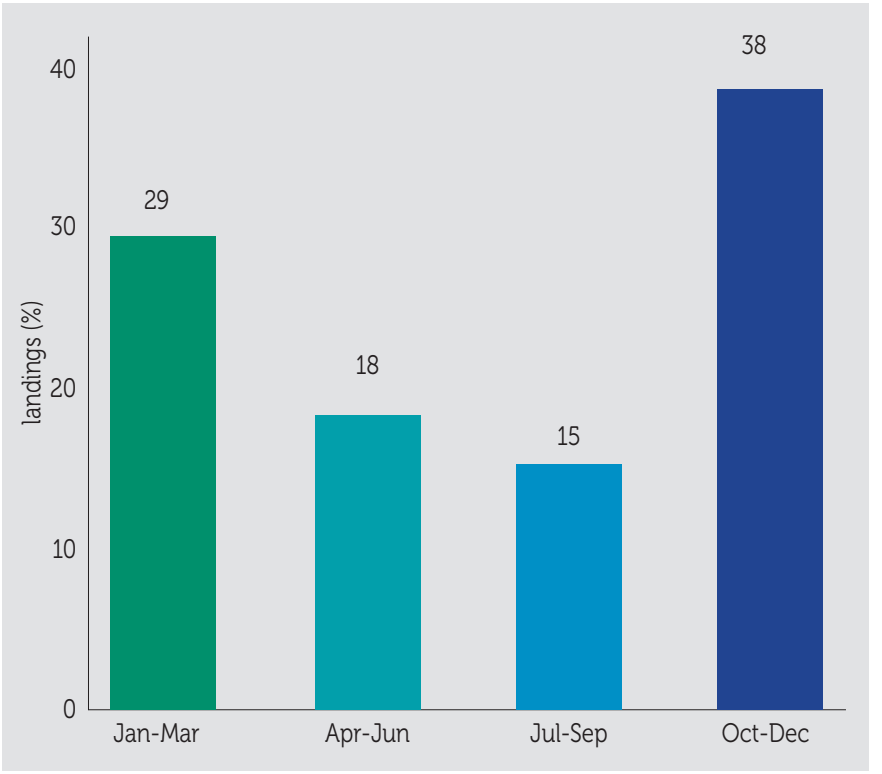


Major landings (in '000 tonnes)





Sector-wise landings



Quarter-wise landings (%)

Finfish resources

In 2024, pelagic and demersal fishery resources contributed 48% and 26%, respectively, to the total marine fish landings in Gujarat. Among the pelagic resources, ribbonfishes accounted for the highest landings (1.29 lakh t), followed by bombay duck (0.61 lakh t), Indian mackerel (0.26 lakh t), and anchovies (0.25 lakh t).

Among demersal resources, catfishes were the most dominant, with landings of 0.32 lakh t, followed by croakers (0.27 lakh t), threadfin breams (0.24 lakh t), and rock cods (0.23 lakh t).

Shellfish resources

In 2024, crustacean and molluscan fishery resources contributed 19% and 7.7%, respectively, to the total marine fish landings in Gujarat. Non-penaeid shrimps constituted the majority of

Priacanthus sp. landed at Mangrol LC of Gujarat

Landings of *Pristipomoides* sp. at Porbandar LC of Gujarat

shellfish landings, totalling 1.06 lakh t, while penaeid shrimp landings were recorded at 0.27 lakh t. Crab and lobster landings during the year amounted to 5,527 t and 934 t, respectively. Among cephalopods, cuttlefish accounted for 0.34 lakh t, whereas squid landings were recorded at 0.19 lakh t.

Biology and stock assessment

A length-based assessment of 30 major fishery resources was conducted. The length-frequency distribution recorded in 2024 was used as the primary input. Stocks with sufficient biomass (B/B0 > 0.30 and B/BMSY > 0.8) were classified as healthy, while those with lower observed biomass (B/B0 < 0.30 and B/BMSY < 0.8) were considered overfished. The analysis revealed that approximately 63% (19 stocks) were in a healthy state, whereas the remaining 11 stocks were overfished. These estimates should be regarded as preliminary, and a more comprehensive assessment incorporating length observations from adjacent maritime states and catch trends would provide a more holistic and robust estimate of stock status.

To establish a repository of region-specific life history traits of marine fishery resources, information available in published literature spanning the past five decades was compiled. Data on growth parameters (Linf, K, t_0), mortality parameters (F, M, Z), and stock status indicators (E, F/FMSY, B/BMSY) were digitised. Additionally, other biological attributes, including the allometric coefficient (b), peak

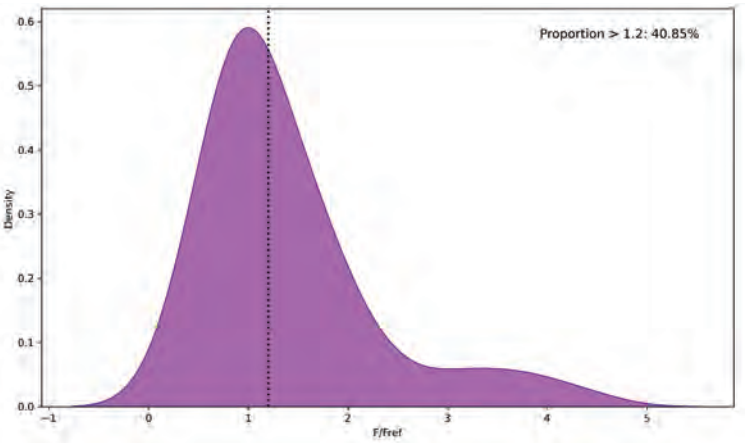
Octopus landed at Bhidia LC of Veraval, Gujarat

Stock status of major fishery resources of Gujarat

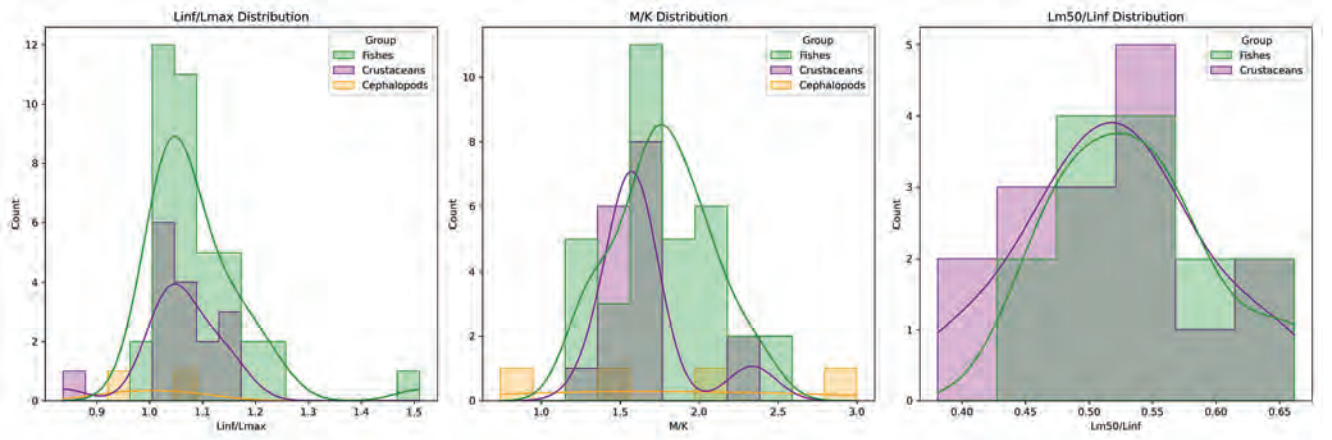
Species	Length Range (mm)	B/B_0	B/B_{MSY}	F/M	Status
Epinephelus diacanthus	86-513	0.29	0.75	1.44	Overfished
Nemipterus japonicus	102-345	0.33	0.83	1.1	Healthy
Priacanthus prolixus	110-415	0.36	0.88	0.95	Healthy
Johnius glaucus	104-312	0.29	0.77	2.23	Overfished
Johnius borneensis	115-305	0.37	0.91	1.05	Healthy
Johnius dussumieri	95-236	0.41	1.01	0.95	Healthy
Otolithes cuvieri	145-354	0.24	0.72	1.13	Overfished
Sardinella albella	55-1.7	0.55	1.24	0.87	Healthy
Thryssa dussumieri	45-105	0.44	1.15	0.85	Healthy
Acanthopagrus arabicus	133-413	0.51	1.04	0.98	Healthy
Saurida tumbil	145-610	0.41	1.1	0.89	Healthy
Saurida undosquamis	91-346	0.34	0.95	1.04	Healthy
Pampus candidus	59-239	0.22	0.68	1.56	Overfished
Parastromateus niger	97-515	0.28	0.74	1.63	Overfished
Plicofollis layardi	158-560	0.29	0.78	1.87	Overfished
Parapenaeopsis stylifera	72-159	0.32	0.83	1.05	Healthy
Solenocera crassicornis	51-139	0.34	0.95	1.1	Healthy
Metapenaeus monoceros	103-254	0.27	0.73	1.3	Overfished
Metapenaeus affinis	71-193	0.35	0.85	1.2	Healthy
Portunus sanguinolentus (CW)	57-165	0.37	0.91	0.95	Healthy
Thenus unimaculatus	76-252	0.22	0.63	1.56	Overfished
Panulirus polyphagus	145-350	0.19	0.57	0.61	Overfished
Rastrelliger kanagurta	111-276	0.41	1.11	0.95	Healthy
Harpadon nehereus	144-311	0.31	0.81	1.32	Healthy
Coilia dussumeiri	95-177	0.24	0.68	2.01	Overfished
Megalaspis cordyla	140-411	0.36	0.81	1.05	Healthy
Trichiurus lepturus	245-1122	0.29	0.78	1.35	Overfished
Coryphaena hippurus	175-1335	0.37	0.97	1.23	Healthy
Chirocentrus nudus	344-673	0.36	0.84	1.05	Healthy
Uroteuthis duvaucelii (DML)	35-265	0.31	0.82	2.42	Healthy

spawning months, fecundity, size at maturity (Lm50), size at capture (Lc50), and major prey species, were documented.

A meta-analysis was conducted on key life history constants, such as Linf/Lmax, Lm50/Linf, and M/K. Furthermore, an assessment of fishing pressure on fishery resources (F/Fref) indicated that in approximately 41% of cases, the value exceeded the threshold of 1.2.



Distribution of fishing pressure on the marine fishery resources of Gujarat

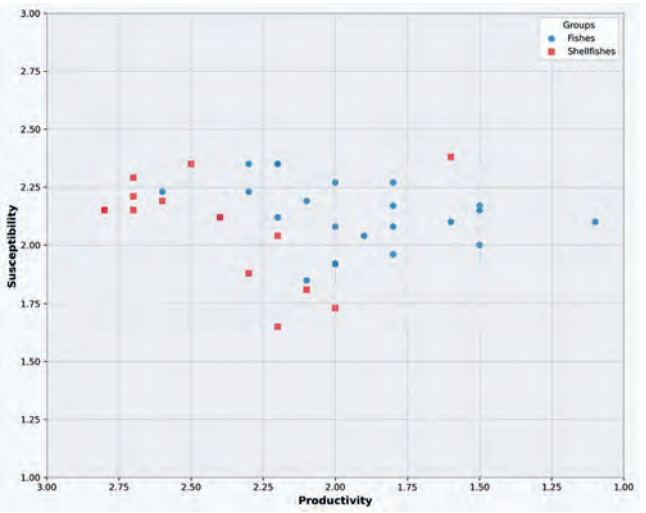


Distribution of life history constants of the fishery resources of Gujarat

A Productivity and Susceptibility Analysis (PSA) was conducted for 37 major fishery resources in Gujarat, comprising 23 fish species and 14 shellfish species. The analysis incorporated 10 productivity attributes and 13 susceptibility attributes, with certain modifications to the original PSA framework to better align with the characteristics of tropical fishery resources. The study revealed a broad range of vulnerability scores, ranging from 1.03 to 2.2. In general, fast-growing shellfish species exhibited lower vulnerability scores, whereas long-lived, low-fecundity fish species demonstrated higher vulnerability scores.

Stakeholder consultation

A three-day inception workshop was conducted at the Veraval Regional Station of ICAR-CMFRI. The workshop commenced with a stakeholder meeting, where members of the boat owner associations from Veraval and Mangrol agreed to share geospatial data on selected fishery resources through a citizen science approach. All stakeholders emphasised the necessity of implementing the proposed Minimum Legal Size (MLS) by ICAR-CMFRI for Gujarat. However, they urged ICAR-CMFRI to initiate a large-scale awareness programme on the importance and necessity of MLS before its official notification by the state authorities. Additionally, fishers and processors requested that studies be conducted on the effectiveness of the existing fishing ban period, the major market forces influencing the region's fisheries, and the economic viability of different fishing practices within the state. The next two days were dedicated to intensive brainstorming sessions among the research team to finalise the methodological approaches for the project.



Scatterplot of productivity and susceptibility scores of major fishery resources of Gujarat

Stakeholder consultation conducted at Veraval RS of ICAR-CMFRI on 08 November 2024

Daman and Diu

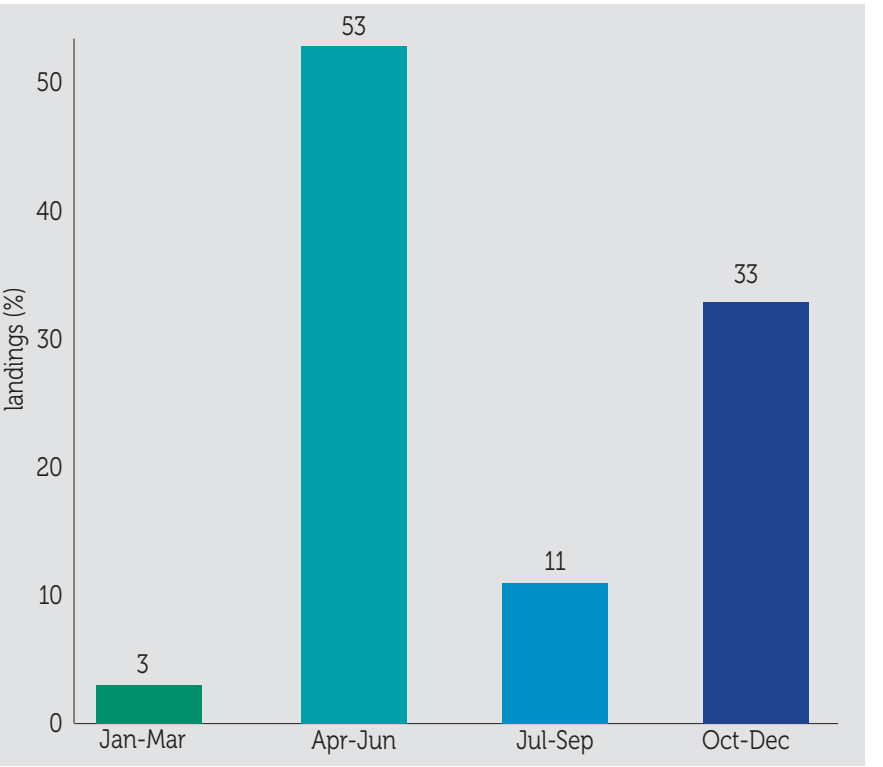
Marine fish landings

Marine fish landings in Daman and Diu declined by 44% in 2024, reaching 0.51 lakh t, primarily due to a significant reduction in unit operations of multi-day trawl nets and mechanised gillnets.

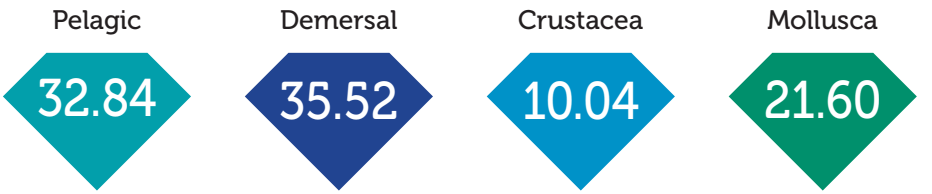
Ribbonfish landings dropped by 49% but remained the top resource in 2024, while non-penaeid shrimps saw a nearly threefold increase, reaching their highest landings in a decade.

The mechanised sector experienced a 45% decline, while the motorised sector saw a threefold increase.

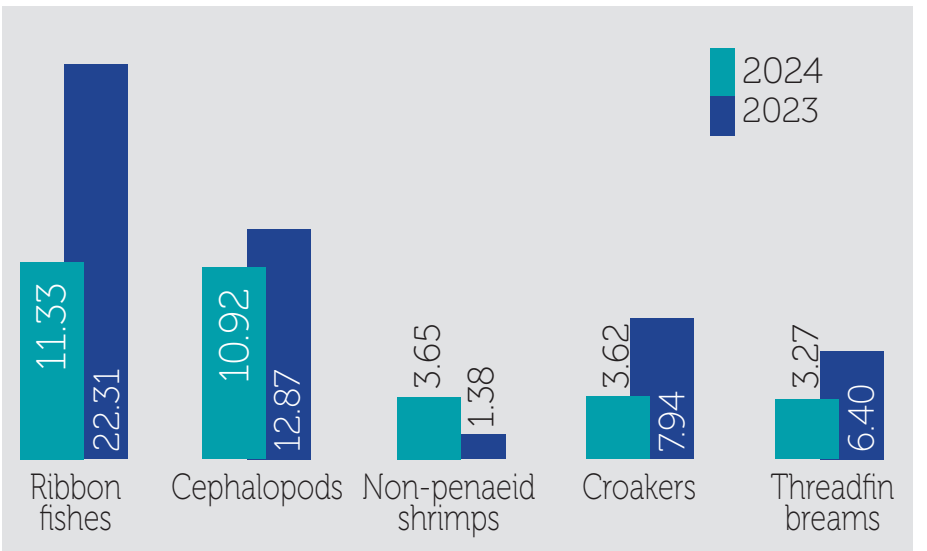
Cyclone Asna brought severe weather in late August and early September, resulting in the loss of many fishing days.



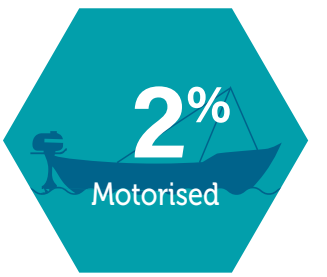
Quarter-wise landings (%)

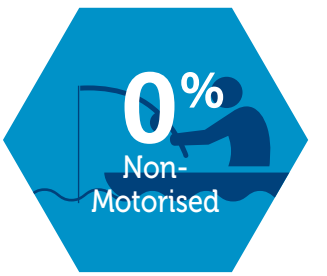


Assemblage (%)



Major landings (in '000 tonnes)





Sector-wise landings

Photo: Night landings at Naigaon, Palghar district, Maharashtra

Sustainable Fisheries Management **Maharashtra**

Developing an Integrated Assessment Framework to support management decisions for marine fisheries in Maharashtra

Project: SFD/IAF/15

Marine fish landings

Maharashtra recorded 3.11 lakh t of landings in 2024, marking a 47% increase compared to 2023.

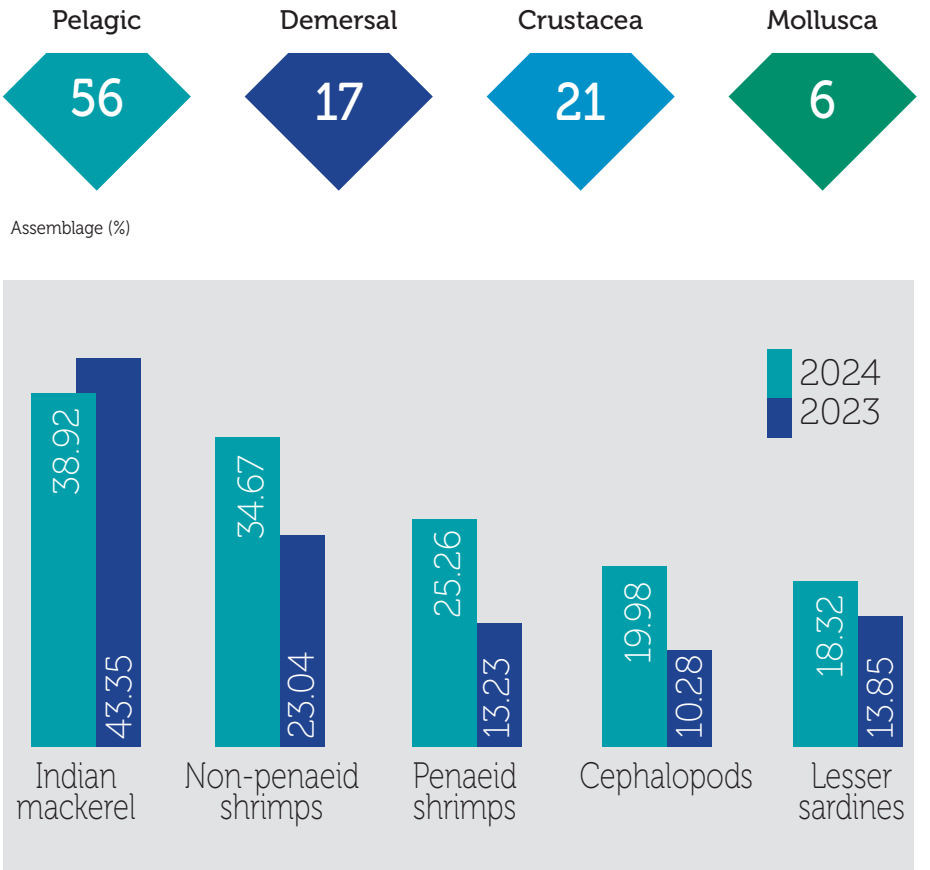
Indian mackerel was the most landed resource in the state, though its landings decreased by 10% compared to 2023.

The landings of shrimps and cephalopods in 2024 witnessed a twofold increase.

In 2024, the major landings came from mechanised purse seine (32%), multi-day trawl net (29%), and mechanised dol net (19%).

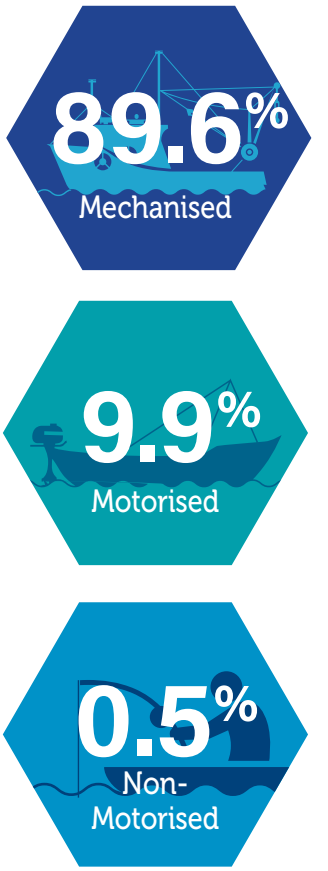
Mumbai city district accounted for 33% of the landings, which accommodates two major harbours, while Ratnagiri district contributed 25%.

Among the major harbours in Maharashtra, Sassoon Dock New (16%) recorded the highest landings in 2024.

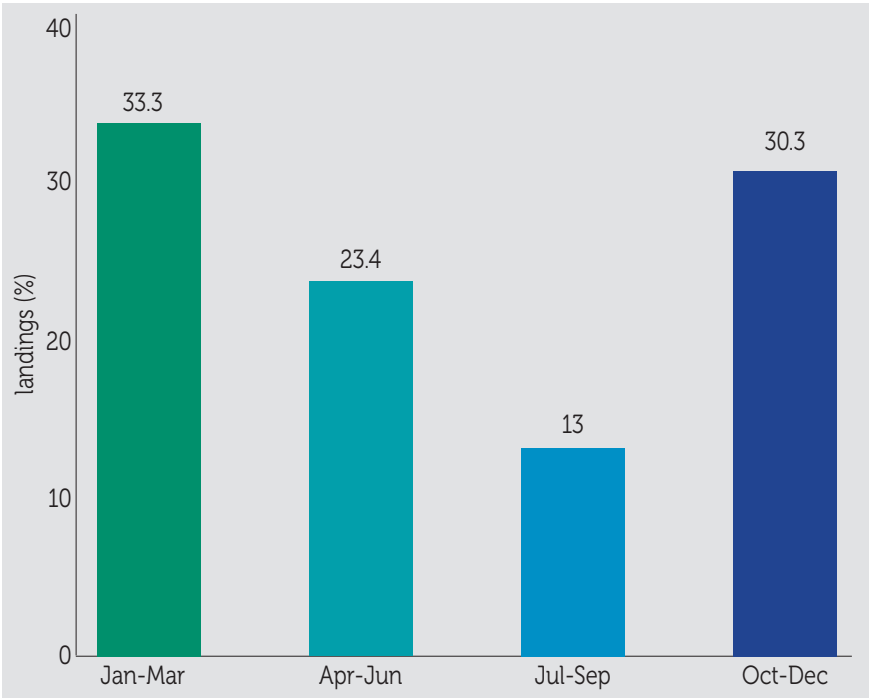


Assemblage (%)

Major landings (in '000 t)



Sector-wise landings



Quarter-wise landings (%)

Fish landing at New Ferry Wharf, Mumbai

Pelagic resources

The estimated landings of pelagic fish in 2024 was 1,73,359 t. Among the pelagic catch, Indian mackerel contributed 22%, followed by lesser sardine at 11%. In the carangid category, horse mackerel was the primary contributor with 10,803 t, while scads contributed 2,532 t. The clupeid species collectively accounted for 11% of the overall pelagic landings. Among the clupeids, the species with the highest contribution was the lesser sardine (18,332 t), followed by the oil sardine, (11,351 t). The seerfish fishery in the region primarily consisted of two species, namely *Scomberomorus commerson* (4,820 t) and *Scomberomorus guttatus* (3,072 t). The pelagic fishery was found to have a minor contribution of 7.4% from tunnies, primarily dominated by *Auxis* spp. which accounted for 49% of the total catch.

Compared to 2023, a significant increase was observed in several key resources, including hilsa shad (270%), other shads (149%), golden anchovy (139%), Bombay duck (94%), and scads (89%). A reduction was recorded in Indian mackerel (10%), flying fish (67%) and unicorn cod (90%). The fourth quarter (October-December) contributed 37% of pelagic fish caught due to the good landings of Indian mackerel (15,651 t). Around 53% of the total pelagic catch was contributed by mechanised purse seiners, followed by multiday trawl netters (16%), dol netters (16%), gillnetters (11%) and ring seiners (4%).

Demersal resources

Demersal fish landings for 2024 are estimated at 53,432 t, compared to 34,627 t in 2023, which is a notable increase of approximately 54%. The demersal fish species were found to have made a significant

Ribbon fish landing at New Ferry Wharf, Mumbai

contribution of 17% towards the overall fish landings estimated in Maharashtra. The fishery was primarily sustained by croakers (30%), silver pomfret (11%), sharks (7.5%), catfish (7%) and threadfin bream (6%). Significant reductions were noted in the fishery of silverbellies (38.9%) and skates (76%). At the same time, a major increase was noticed in threadfin bream (96%), goatfish (93%), Chinese pomfret (89%), sharks (66%) and silver pomfret (63%). The first quarter contributed 32% of total demersal resources, followed by the fourth quarter 29%, the third quarter 26% and the second quarter 12%.
A major chunk of demersal resources was landed by trawlers (64%), followed by dol netters (14%), gillnetters (14%) and purse seiners (7%).

Crustacean resources

The total crustacean landings in Maharashtra during the year 2024 reached 63,803 t, contributing 21% to the total marine fishery landings in the state. This marks a significant augmentation of 71% compared to the crustacean landings recorded in 2023. Non-penaeid shrimps emerged as the major contributors to 54.3% of the crustacean landings followed by penaeid shrimps at 39.6%, crabs at 4.1%, stomatopods at 1.4% and lobsters at 0.6%. Penaeid shrimp resources recorded increased landings by 91%, non-penaeid shrimp resources increased by 50%, lobster landings increased by 232%, crab resources increased by 284% and stomatopod resources landings increased by 214%.
These trends indicate shifts in species composition and fishing patterns in Maharashtra. Penaeid shrimps were

Crustaceans landing at New Ferry Wharf, Mumbai

the largest contributors among crustaceans landed by trawlers, making up 76% of the total landings, whereas non-penaeid shrimps formed the major portion at 78.5% of crustaceans landed by dol netters, followed by penaeid shrimps at 20.4%.

The total annual catch of crustaceans by trawlers in Maharashtra was 21,605 t, with a catch rate of 10.43 kg/hr, forming 22.26% of the total trawl net fish landings. Among them, penaeid shrimps contributed 16,441 t (76%), non-penaeid shrimps (11%), crabs (9.2%), stomatopods (2.3%), and lobsters (1.5%). The total catch of crustaceans by dol netters in Maharashtra was recorded at 41,129 t, with a catch rate of 18.95 kg/hr and 56.85 kg/haul, accounting for 52.27% of the total dol net fish landings. The major contributors among dol netters included non-penaeid shrimps at 78.5%, penaeid shrimps at 20.4%, stomatopods at 0.7%, crabs at 0.3%, and lobsters at 0.02%.

Molluscan resources

The total mollusc landings in Maharashtra during the year 2024 reached 20,184 t, contributing 6.5% to the total marine fishery landings in the state. This marks a substantial augmentation of 96% compared to mollusc landings in 2023. Squids were the major contributors, accounting for 76% (15,290 t) of the total mollusc landings, followed by cuttlefish at 23%, and octopus at 1%. Squid landings increased by 91.5%, while cuttlefish landings surged by 118.5%. However, octopus landings experienced a decline of 8.45%. Among molluscs landed by trawlers, squids were the dominant species, contributing 75% of the total mollusc landings. In contrast, cuttlefish dominated molluscs landed by dol netters, forming 94.0% of the total dol net mollusc landings. The annual landings of molluscs by trawlers in Maharashtra amounted to 9,729 t, with a catch rate of 4.69 kg/hr, forming 10.02% of the total trawl net fish landings in the state. The major contributors were squids (75%), followed by cuttlefish (23%) and octopus (2%). The total catch of molluscs by dol netters in Maharashtra was recorded at 1,299 t, with a catch rate of 0.59 kg/hr and 1.8 kg/haul, accounting for 1.65% of the total dol net fish landings. Among them, cuttlefish were a major contributor (94%), followed by squids (4%), and octopus (2%).

Cephalopods landing at New Ferry Wharf, Mumbai

The year 2024 saw a notable shift in shellfish landings in Maharashtra, with an overall positive trend in resource availability. The increase in non-penaeid shrimps, cephalopods, lobsters, and crabs indicates a promising outlook for the marine fishery sector in the state.

Biology and stock assessment

The length range, sex ratio, food and feeding, mature percentage and peak spawning were recorded for commercially important species landed along the Maharashtra coast. A length-based assessment of major fishery resources was conducted. The length-frequency distribution recorded in 2024 was used as the primary input. Stocks with sufficient biomass (B/B_0 > 0.30 and B/BMSY > 0.8) were classified as healthy, while those with lower observed biomass (B/B_0 < 0.30 and B/BMSY < 0.8) were considered overfished. The analysis revealed that approximately 75% stock were in a healthy state.

Assessing the biological parameters of silver pomfret

Size range, sex ratio, maturity and spawning season of commercial species landed in Maharashtra

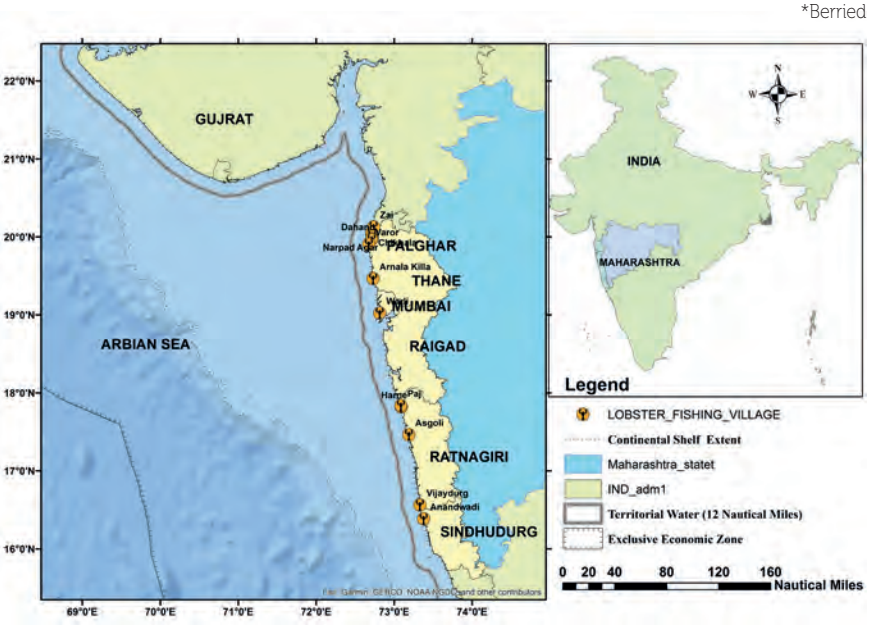
Sr. No.	Sp. Name	Length Range (mm)	Sex Ratio (M:F)	% Mature	Peak Spawning
1	*Harpadon nehereus*	55-367	1:0.79	50.31	Oct-Dec
2	*Coilia dussumieri*	37-214	1:0.625	71	Oct-Dec Mar-Apr
3	*Trichiurus lepturus*	478-928	1:2.66	55	Oct-Dec Feb-Mar
4	*Rastrelliger kanagurta*	94-303	1:0.57	65	Nov-Mar
5	*Ilisha filigera*	125-394	1:2.22	70	Nov-Apr
6	*Chirocentrus nudus*	264-782	1:0.49	71	Oct-Dec
7	*N.japonicus*	74.5–274.5	1 : 2.9	32	Aug-Nov
8	*P. candidus*	34.5–274.5	1 : 0.6	33	Oct-Jan
9	*X.gladius*	1305–2601	1 : 1	30	Jan-Mar
10	*P. stylifera*	67-124	1:1.55	43.2	Feb-Apr
11	*S. crassicornis*	57-115	1:2.95	48.18	Nov-Dec
12	*M. affinis*	89-169	1:1.14	52.2	Jan-Mar
13	*M. monoceros*	80-189	1:0.90	49.6	Sept-Oct
14	*P. merguiensis*	98-253	1:0.98	50	Jan-Mar
15	*N. tenuipes*	28-68	1:1.27	17*	Jan-March
16	*C. feriata*	60-154	1:0.74	58*	Sept-Oct
17	*P. sanguinolentus*	73-169	1:1.02	6*	Jan-Feb
18	*P. pelagicus*	89-249	1:2.52		
19	*P. polyphagus*	140-296	1:1.28	24*	Sep & Apr
20	*U. duvaucelii*	22-252	1:1.17	674	Aug-Oct

Sr. No.	Sp. Name	Length Range (mm)	Sex Ratio (M:F)	% Mature	Peak Spawning
21	*S. inermis*	20-94	1:0.96	80.7	Sept-Oct
22	*S. elliptica*	34-155	1:1.04	77	Feb-Apr
23	*C. indicus*	40-168	1:0.50	52.4	Mar-Apr

*Berried

Artisanal small scale lobster gillnet fishery in Maharashtra

Maharashtra coast particularly northern coast is rich in lobster resources and is a major contributor in lobster landings of India (~12%). Artisanal fishing with monofilament polyamide bottom set gillnets (locally named "Shevandi jal") in rocky area to capture the mud spiny lobster, *Panulirus polyphagus* is a common in coastal region of Maharashtra. It supports artisanal small scale fishers. The study aims to understand the extent of lobster fishing grounds along coastal region, mapping of habitual lobster fishing ground on GIS platform, gillnet landings assessment of *Panulirus polyphagus* and organised market chain in lobster fisheries. The targeted mud spiny lobster fishery is carried out in rocky area near coastal fishing villages. Most of the fishing grounds were located at distance of 8-12 km from fishing villages at depths 6-10 m. The single cylinder boats of OAL 8-12 feet carry 20-25 gillnet pieces for lobster fishing. The fishing season for mud spiny lobster start during mid October-November and last up to May.



Artisanal lobster gillnet fishing villages along Maharashtra coast

Stakeholder consultation

The Mumbai Regional Station of ICAR-CMFRI held a stakeholder consultation at Satpati village, Palghar District, bringing together scientists, fishers, cooperative society members, and officials of the Fisheries Department to discuss marine fisheries sustainability. Key issues included juvenile fishing, enforcing Minimum Legal Size (MLS) norms, and extending the fishing ban in Maharashtra from 60 to 90 days. Stakeholders urged ICAR-CMFRI to enhance awareness campaigns and provide scientific data on fish spawning seasons. Concerns over erratic weather and its impact on fishing were raised, with calls for climate-resilient policies. The workshop highlighted the need for participatory governance and evidence-based policymaking to sustain marine fisheries in the region.

Stakeholder consultation held at Satpati village, Palghar District

Photo: Shore seine landing at Karwar

Sustainable Fisheries Management

Karnataka & Goa

Developing an Integrated Assessment Framework to support management decisions for marine fisheries in Karnataka & Goa

Project: FFD/IAF/10

Karnataka

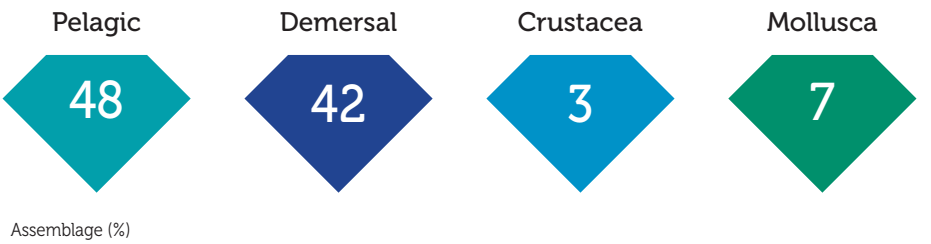
Marine fish landings

Karnataka secured the fourth position with an annual landings of 4 lakh t, a 16% decrease compared to the previous year. The number of units operating this year reduced by over 50% for trawl, more than 60% for mechanised gillnet, and 16% for purse seine, contributing to the decline in landings. Extreme weather conditions also resulted in reduced fishing days, further adding to the decrease in landings.

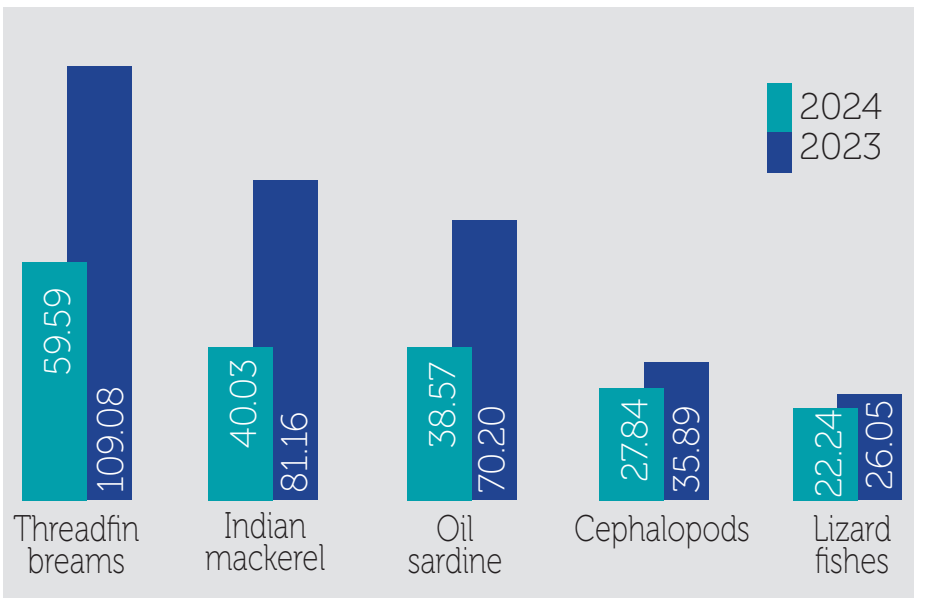
The mechanised sector contributed to over 80% of the landings during 2024, with trawlers accounting for about 70% of the total landings in Karnataka. Purse seines were the other major contributor, responsible for about 24% of the total landings.

All major resources exhibited fluctuations in the landings, with more than 40% decrease observed for threadfin breams, mackerel, and oil sardine, leading to an overall decrease in the state's total landings.

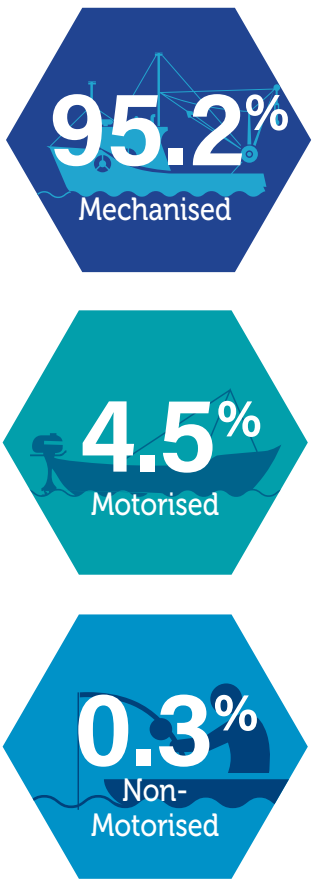
Estimated fish landings in Goa were 3.1 lakh t, reflecting a 50% decrease compared to the previous year.



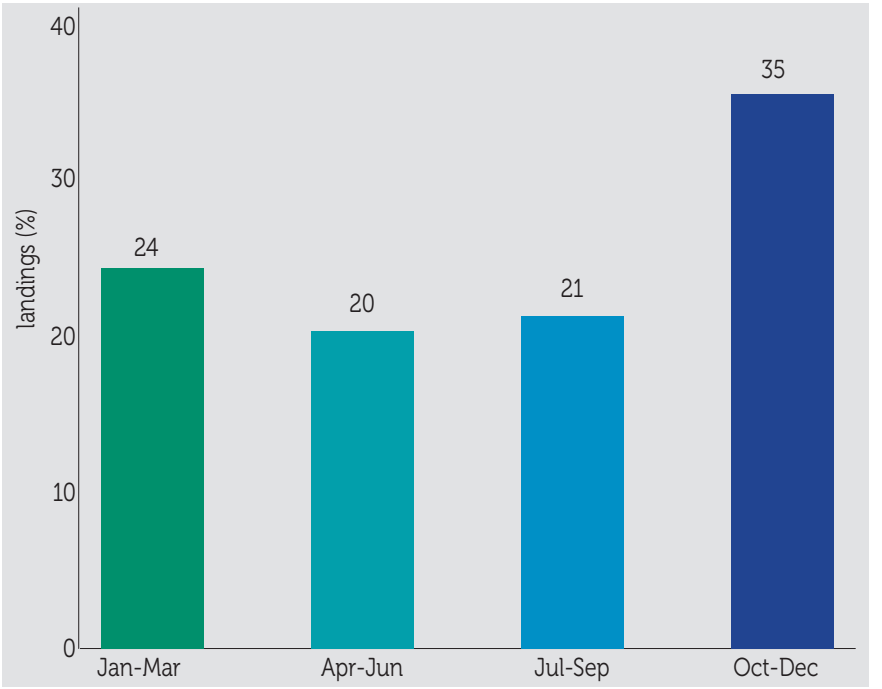
Assemblage (%)



Major landings (in '000 tonnes)



Sector-wise landings



Quarter-wise landings (%)

Within this total, outboard gillnets and purse seines accounted for 68% and 15% of the region's fishery, respectively. The decline in both the number of fishing days and operational units contributed to the reduced landings this year.

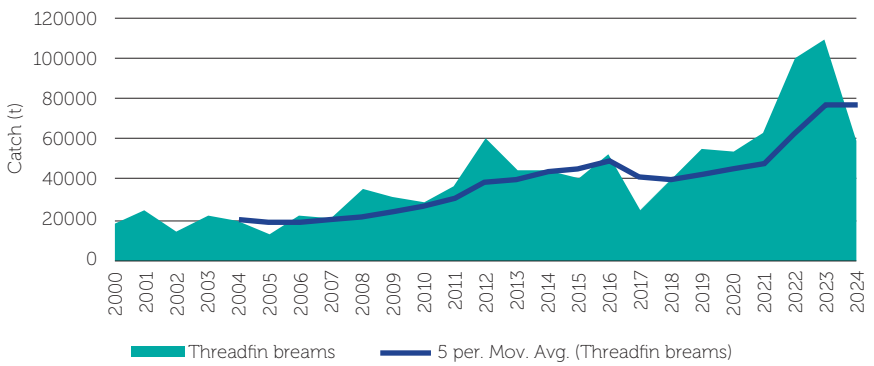
A significant portion of the total landings was from the major harbours *viz.,* Mangalore (48%) and Malpe (35%).

Dakshina Kannada district contributed 49% of total landings, followed by Udupi (39%), and Uttara Kannada (12%).

Threadfin breams, mackerel, and oil sardine declined in landings, reflecting broader fluctuations in major resources and contributing to an overall reduction in the state's total catch.

Outboard fishing crafts at the Gokarna landing centre

Mackerel landings from outboard gillnet fishing operations



Trend in landings of threadfin breams 2000-2024 along Karnataka coast

Finfish resources

The finfish resources recorded an estimated landings of 3.94 lakh t which formed about 97% of the total landings in Karnataka state. The largest landings was recorded for threadfin breams, contributing 15% to the total landings, followed by mackerel (10%), oil sardine (9.6%), and perches other than threadfin breams (7%).

Mangalore fishing harbour, Karnataka

Fish landing in Karnataka

The trend in the fishery of threadfin breams was analysed from 2000 to 2024. The resource which forms the major fishery along coastal Karnataka fluctuated over the years, with an average landings of 41,377 t, with peak landings in 2023 (1,09,080 t) and a minimum in 2005 (13,222 t).

Shellfish resources

Shellfish resources, comprising crustaceans and molluscs, contributed approximately 0.42 lakh t (10.4%) to Karnataka's marine fish landings in 2024. The total crustacean landings along the Karnataka coast stood at 13,766 t, accounting for 3.4% of the total landings—a 40% decline compared to 2023. Among crustaceans, penaeid shrimps made up 64%, crabs 20%, and stomatopods 16%.

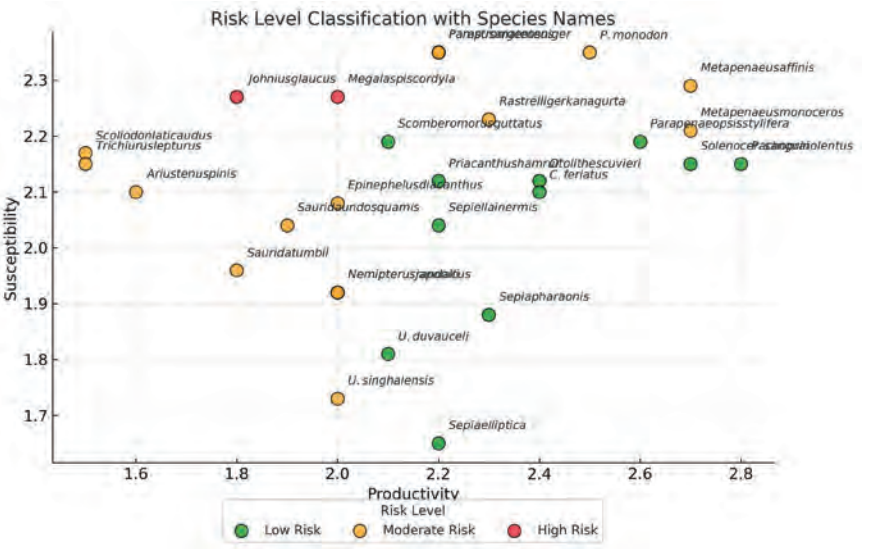
During the monsoon season, landings were dominated by *Fenneropenaeus indicus* and *Metapenaeus dobsoni*, primarily caught by outboard ring seiners. Stomatopod landings, contributed by single-day trawlers, saw a 40% reduction from 2023.

Cephalopod landings in Karnataka totalled 27,836 t, with squids constituting 53% and cuttlefishes 42%. Notably, cuttlefish landings increased by 25% in 2024. Multi-day trawlers (MDTN) accounted for 76% of the state's total shellfish landings, with penaeid shrimps contributing 1.5% and cephalopods 9.5% of MDTN landings.

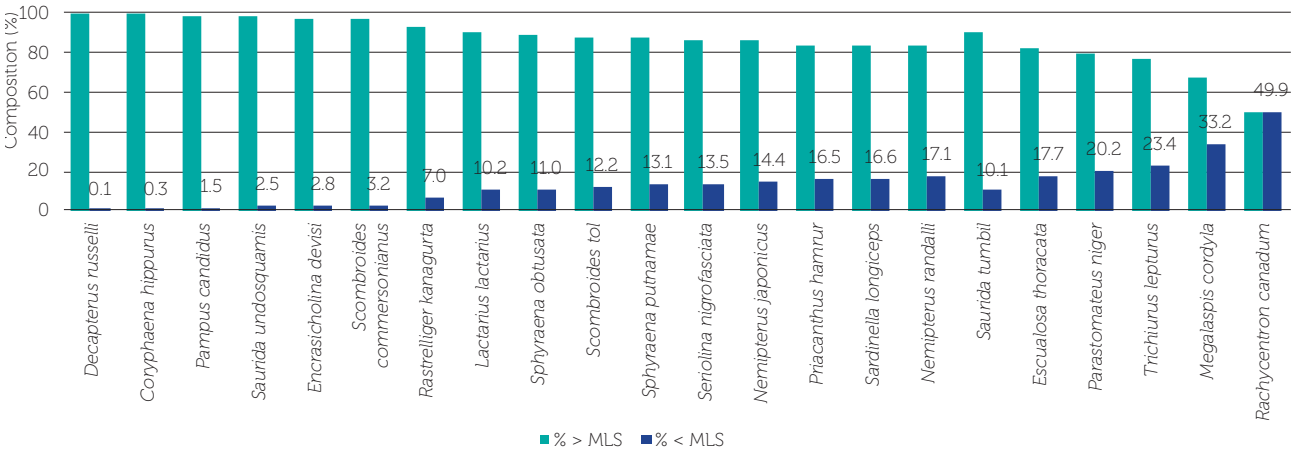
The relative abundance of penaeid shrimps and cephalopods in multi-day trawler (MDTN) catches was 1.7 kg/hr and 10.9 kg/hr, respectively. Meanwhile, stomatopod landings by single-day trawlers (MTN) had a catch rate of 10 kg/hr. Penaeid shrimps made up 4.7% of the outboard ring seine (OBRS) landings, with an estimated catch rate of 59 kg/hr.

Biology and stock assessment

A study was conducted to evaluate the vulnerability of major commercial species in the trawl fishery using Productivity Susceptibility Assessment (PSA). Productivity scores were derived from biological parameters such as growth rate, lifespan, and fecundity. Susceptibility attributes considered fisheries interactions, gear selectivity, and management measures. Twenty-eight major species representing a significant portion of the fishery's catch were considered for analysis. The analysis showed that 11 species were in the low-risk category as these species had high productivity and low susceptibility, meaning they are resilient to fishing and can sustain fishing pressure but still need sustainable practices.



Productivity susceptibility assessment of major resources in Karnataka

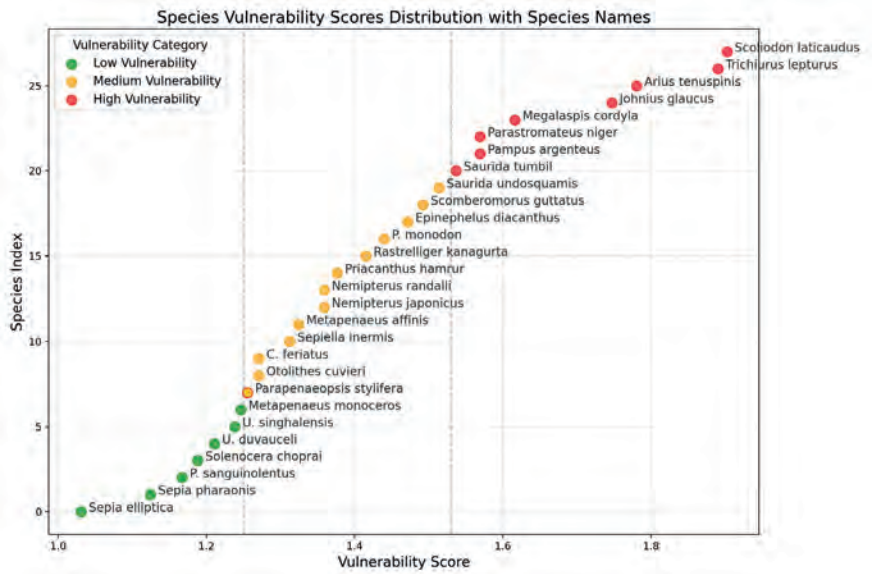


Catch composition in relation to the Minimum Legal Size of major resources along the Karnataka coast

About fifteen species with high productivity and low susceptibility (*E.diacanthus*, *M. affinis*) were in the medium risk category, meaning they are resilient to fishing and can sustain fishing pressure but still need sustainable practices. However, two species (*Johnius glaucus* and *M. cordyla*) were in high-risk category having low productivity and high susceptibility, making them most vulnerable.

Biological studies

A comprehensive study was conducted along the Karnataka coast focusing on the life history traits of 26 finfish species, 7 crustacean species, and 7 cephalopod species. This study encompassed their growth patterns, reproductive traits, and trophodynamics. To assess the stock dynamics, population modelling and fishing impact analysis were used.



Vulnerability scores of major resources along the Karnataka Coast

Juvenile composition

The size composition of major finfish resources landed along the Karnataka coast, evaluated with reference to the Minimum Legal Size, indicated that individuals below MLS constituted less than 25% in most species.

Length range and mean size of finfishes

The length range and mean size of the major finfish and shellfish resources landed along the Karnataka coast were studied.

Trophic level of major resources

The trophic level analysis showed that medium carnivores have more diverse feeding strategies within their category, while large carnivores, despite being more numerous in species count, have more consistent feeding patterns at higher trophic levels. This distribution is typical of many commercial fisheries where large predatory fish often form a significant component of the catch, both in terms of species diversity and commercial importance. Clear trophic level stratification exists

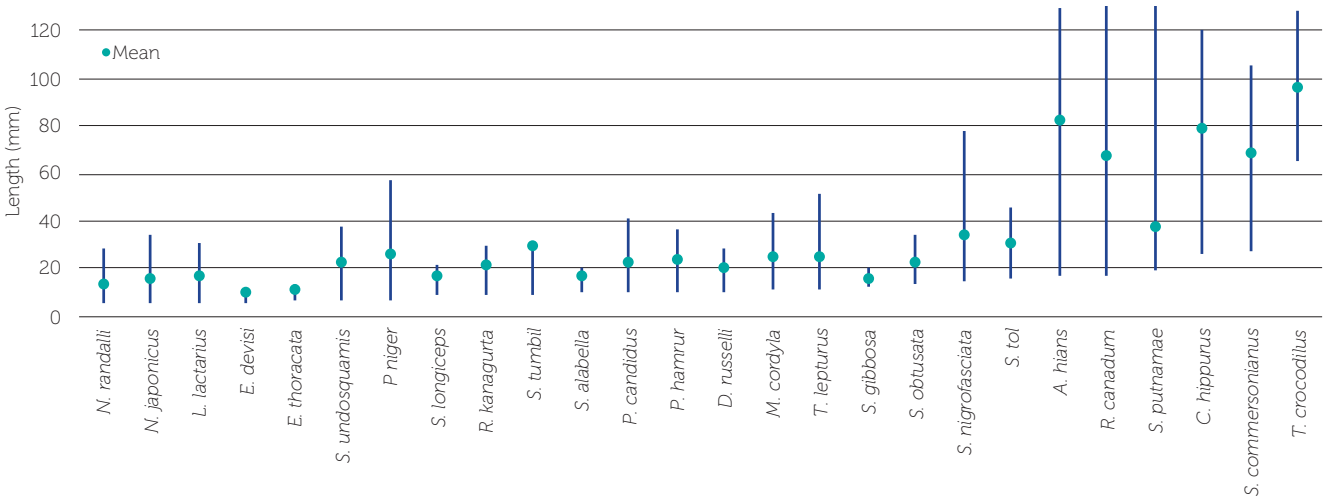
among feeding categories. Large carnivores maintain a consistently high trophic position (narrow range: 4.0-4.5). Medium carnivores show the most diverse feeding patterns, suggesting adaptable feeding strategies. Omnivores, despite their varied diet, maintain a surprisingly consistent trophic level. Planktivorous occupy an intermediate position with moderate variability. This pattern reflects the classic marine food web structure, where larger predators occupy higher trophic levels with specialised feeding behaviours, while lower trophic levels show more dietary flexibility.

Spawning season of major finfish fishery resources

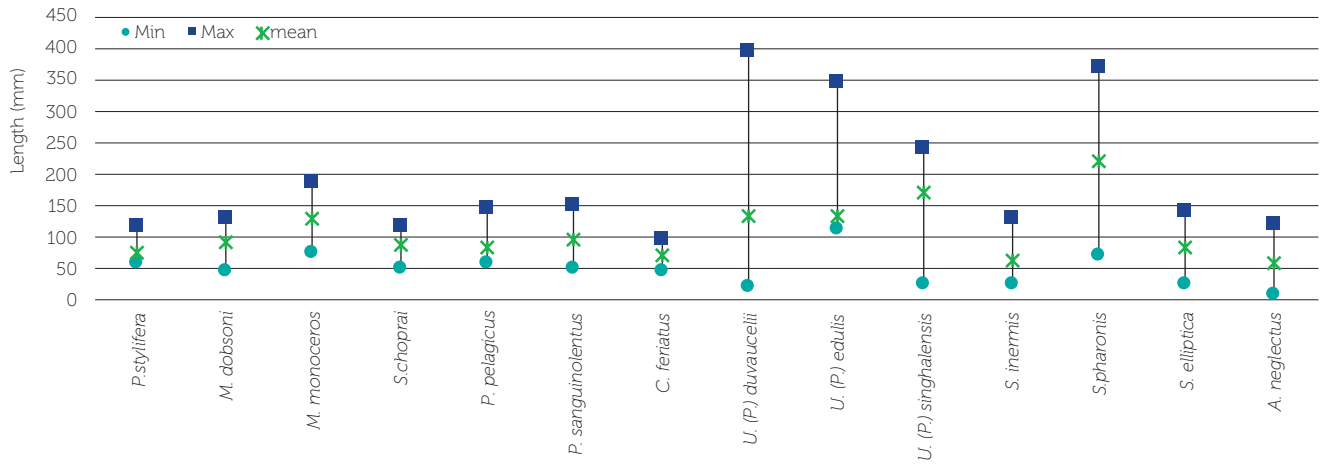
The spawning season of major commercial species was determined through biological analysis. While most species spawn throughout the year, peak spawning activity was primarily observed during the post-monsoon season.

Stock status

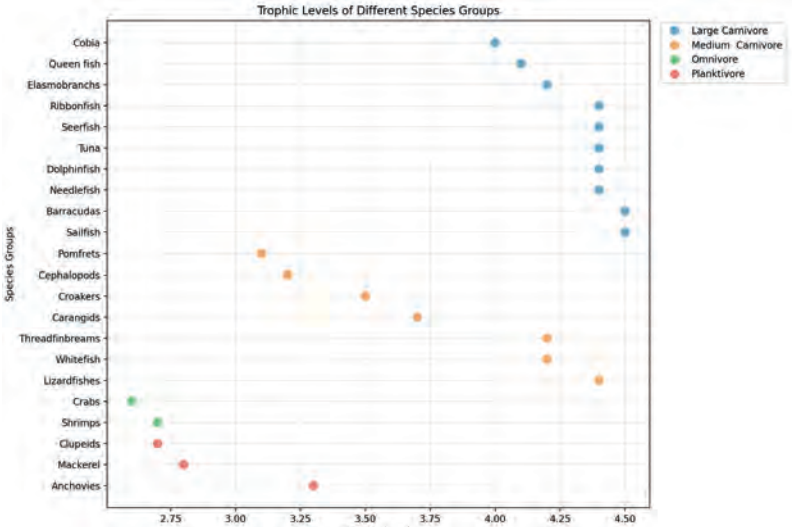
The CMSY (Catch-Maximum Sustainable Yield) analysis was conducted for major commercial species to assess stock status using catch data from 2020 to 2024. Species resilience estimates were used alongside the data to estimate Maximum Sustainable Yield (MSY), carrying capacity (K), relative biomass (B/BMSY), and fishing pressure (F/FMSY) trends. The graph illustrates the relationship between biomass ratio (B/BMSY) and fishing pressure ratio (F/FMSY), where points in the top-left quadrant indicate overfished stocks (low biomass, high fishing pressure), while those in the bottom-right quadrant suggest underfished stocks (high biomass, low fishing pressure). The analysis, performed using CMSY software in R, revealed



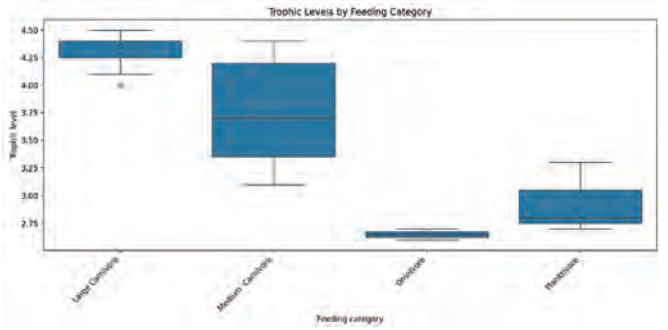
Length range and mean length of major finfish resources in Karnataka



Length range and mean length of major shellfish resources in Karnataka



Trophic levels of major resources in Karnataka



Box plot depicting feeding strategies within the different categories

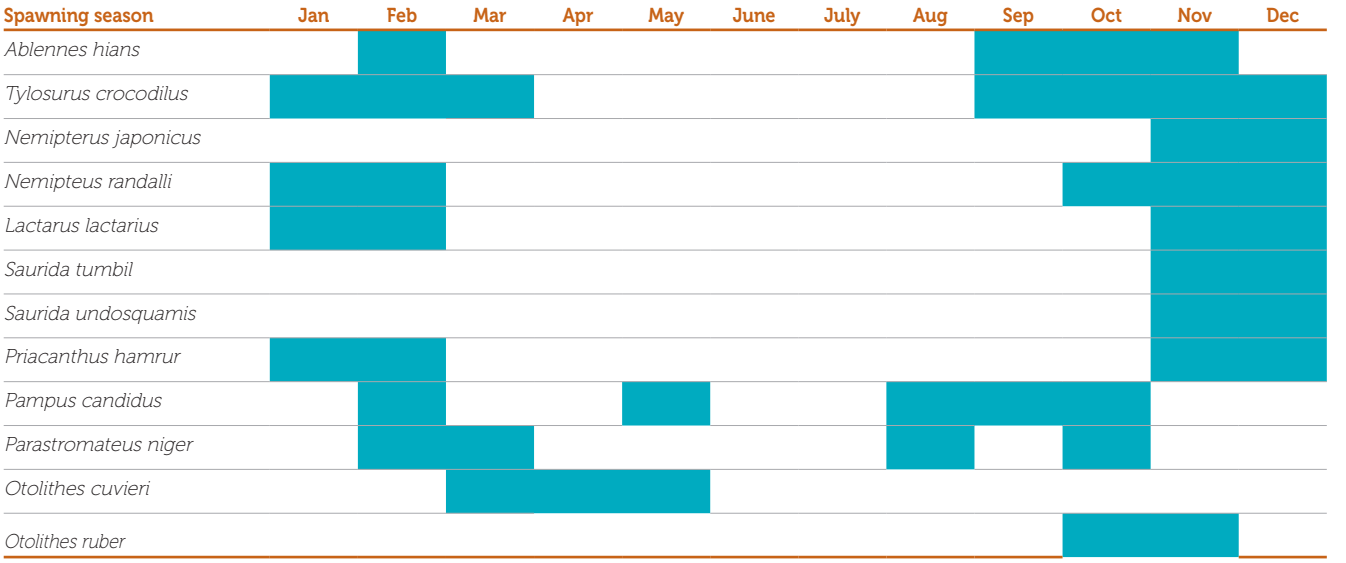
that approximately 52% of the stocks are sustainable, while the rest are either overfished or experiencing overfishing.

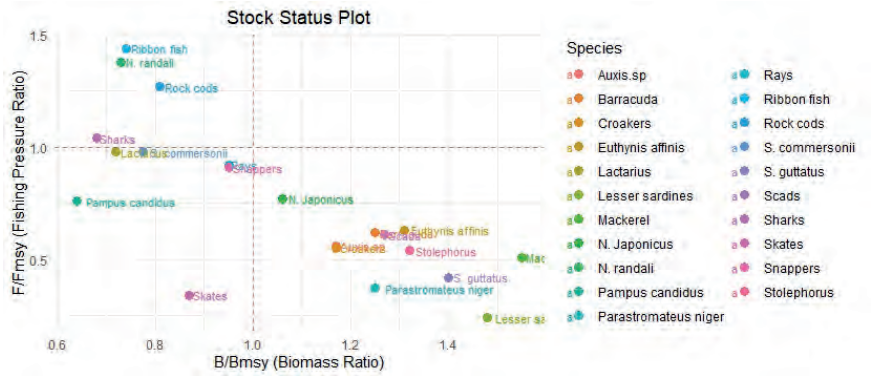
Real-time data collection using a participatory approach

A participatory approach was employed for real-time sampling and data collection from trawl, purse seine, and gillnet operations along the coast. This method involved active collaboration with fishers to gather crucial information, including GPS coordinates of fishing locations, species composition, and biological samples from each site. The collected samples were analysed for biological studies, providing valuable insights into species distribution and population dynamics. The data obtained through this initiative will contribute to resource mapping, aiding in the sustainable management and conservation of marine resources.

Spawning season of major commercial species of Karnataka determined through biological analysis

Spawning season	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Sardinella longiceps						■	■	■				
Rastrelliger kanagurta			■	■	■	■			■	■		
Decapterus russelli				■	■			■	■	■		
Megalaspis cordyla		■	■	■				■				
Seriolina nigrofasciata			■	■	■					■	■	■
Trichiurus lepturus		■	■								■	■
Encrasicholina devisi	■	■									■	■
Escualosa thoracata		■	■	■	■				■	■	■	
Rachycentron canadum					■				■	■	■	
Sphyraena obtusata				■	■						■	■
Sphyraena putnamae				■	■				■	■		
Scobroides commersonianus											■	■
Scombroides tol			■	■	■							
Coryphaena hippurus			■	■	■		■	■	■	■		





Stock Status of major resources along Karnataka Coast

Socioeconomics

The provisional value of marine fish landings in 2024 was ₹ 6914 crores at the landing centre (LC) level and ₹ 9875 crores at the retail centre (RC) level, both showing a significant decrease from 2023. Threadfin breams had the highest share, followed by Indian Mackerel, in both landings and value terms. Marketing efficiency is measured as the fishers' share of the consumers' rupee (FSCR) across the major species. The marine fish marketing efficiency of Karnataka state for the year 2024 was estimated to be 68.76%.

Primary data collection on costs, earnings, and other economic indicators of various fishing units from Mangalore and Malpe fish landing centres was conducted weekly using a multi-stage stratified random sampling procedure. The data was analysed to estimate key economic indicators and provide policy inputs on the profitability and efficiency of different fishing methods.

Stakeholder consultation

A series of stakeholder consultations were conducted across the state, involving key participants such as traditional fishers, fish meal plant owners, and fish farmers. These meetings provided a platform to

Stakeholders consultation in Malpe, Karnataka

National workshop on exploring mesopelagic resources

discuss various concerns related to fisheries management, sustainability, and environmental challenges.

Goa

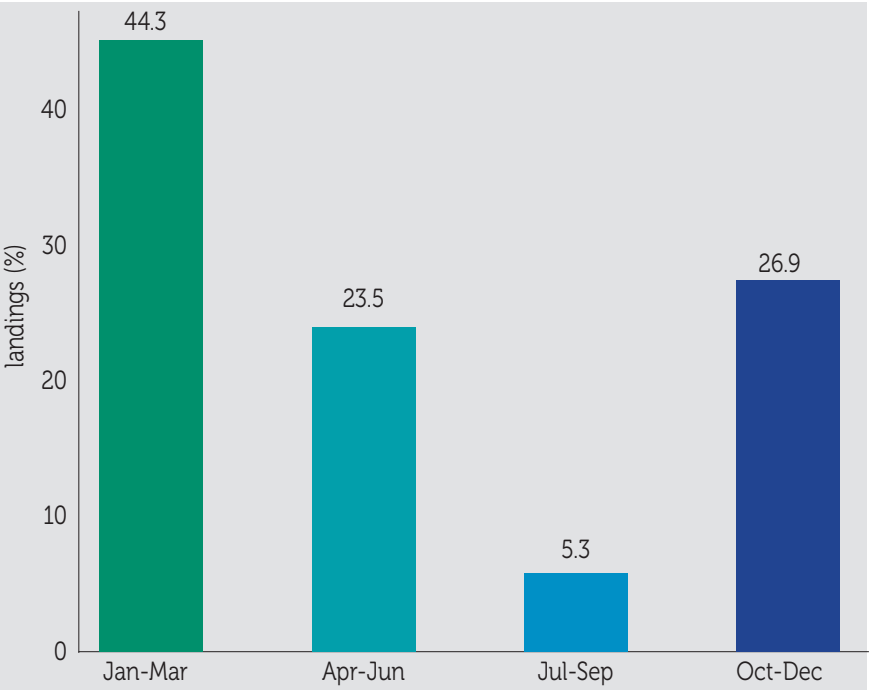
Marine fish landings

The marine fish landings from Goa showed a drop of 50% in 2024 compared with 2023.

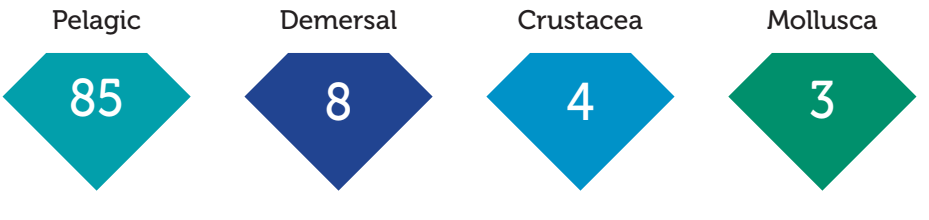
The landings of Indian mackerel and Oil sardine saw a decline of approximately 70% each, whereas Tuna landings witnessed a two fold increase.

Compared to 2023, there was a 35% decline in mechanised trawling operations.

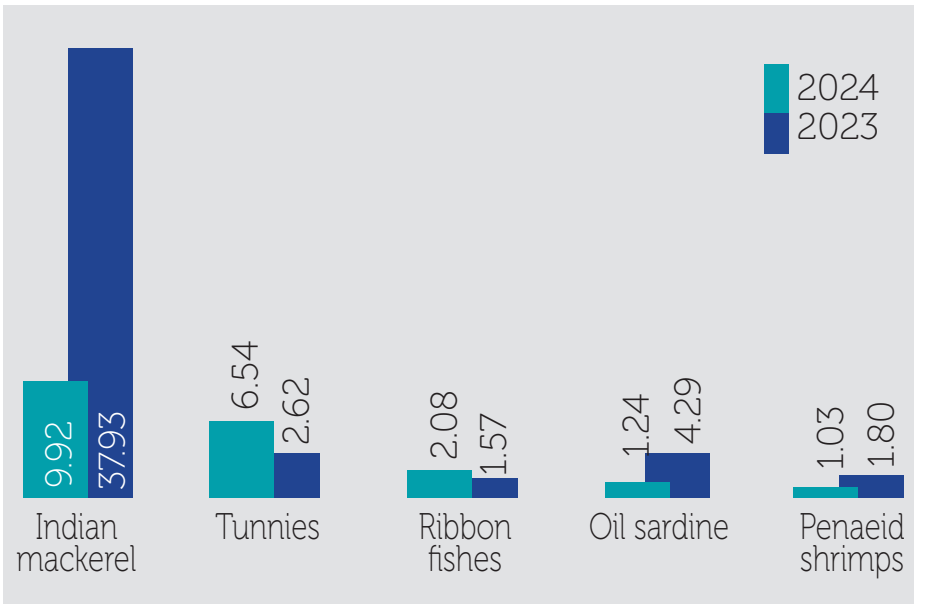
Landings in the purse seine sector



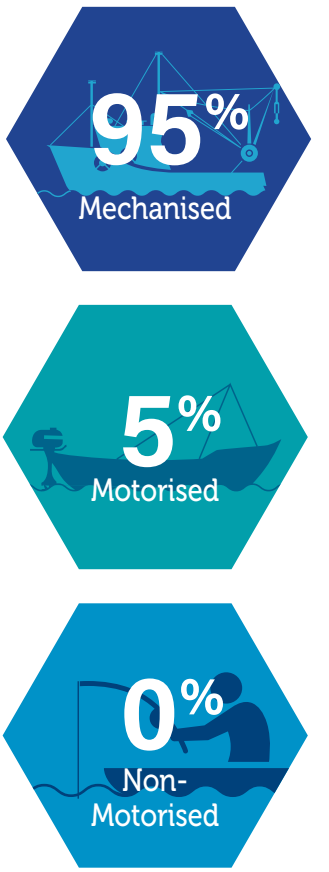
Quarter-wise landings (%)



Assemblage (%)



Major landings (in '000 t)



Sector-wise landings

Purse seine boat - Goa

declined by 49%, with an 81% reduction in the catch per hour.

Landings during the third quarter witnessed a steep decline of 87% compared to the corresponding period in the previous year. This significant drop was primarily attributed to the loss of nearly 25 active fishing calendar days during August and September. Adverse weather conditions, including continuous heavy rainfall and frequent weather warnings, severely hampered fishing operations along the coast. The data underscores the vulnerability of marine fisheries to climatic variability and operational disruptions.

In Goa, the fishery during this period was largely supported by pelagic resources. Among these, Indian mackerel (Rastrelliger kanagurta) was the most dominant species, accounting for 32% of the total catch. Tuna species, particularly Kawakawa (*Euthynnus affinis*), also contributed significantly, forming 19% of the overall landings.

Vasco Fisheries Harbour Goa

Photo: Threadfin bream landings at Munambam fisheries harbour, Kerala

Sustainable Fisheries Management

Kerala & Lakshadweep

Developing an Integrated Assessment Framework to support management decisions for marine fisheries in Kerala & Lakshadweep

Project code: FFD/IAF/09

Kerala

Marine fish landings

Studies revealed that a minor decrease of 4% was recorded in the total landings of Kerala when compared to the previous year.

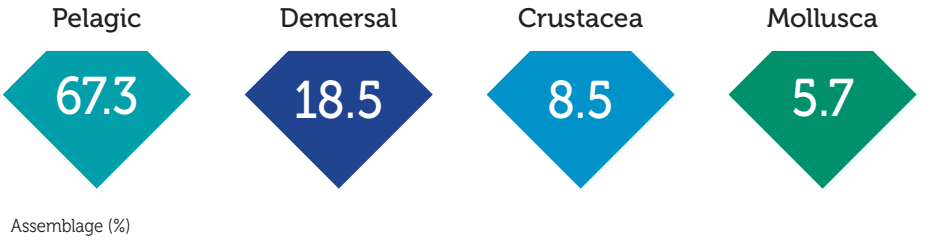
The first half of the year witnessed very low landings with a total of less than 2 lakh t during when oil sardine were scarce.

From September onwards, oil sardine landings surged, exceeding one lakh t in the last quarter (October-December).

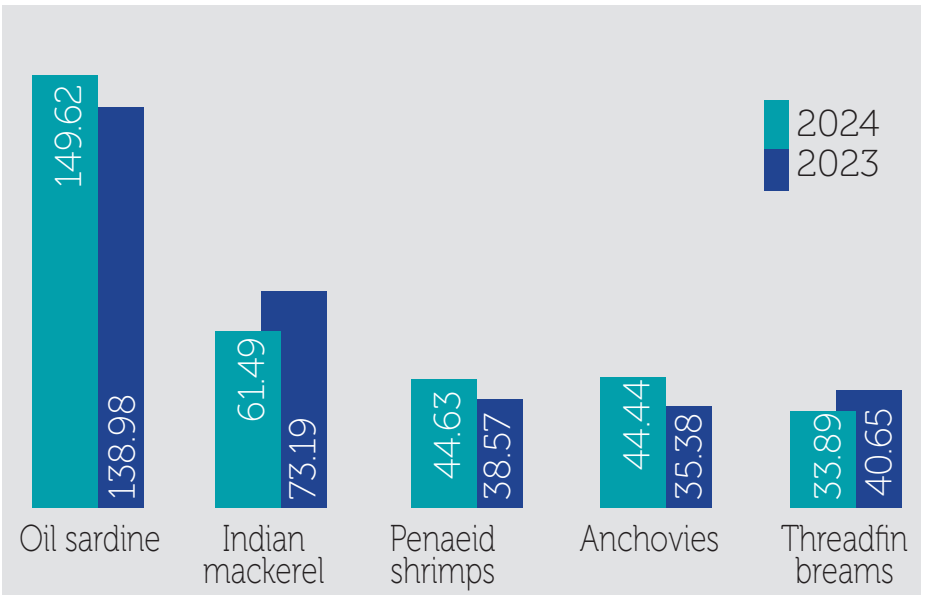
Compared to 2023, southern districts (Thiruvananthapuram to Ernakulam) saw a decline in landings, whereas northern districts (Malappuram to Kasaragod) had an increase, and Thrissur district's landings remained almost the same.

Pelagic resources

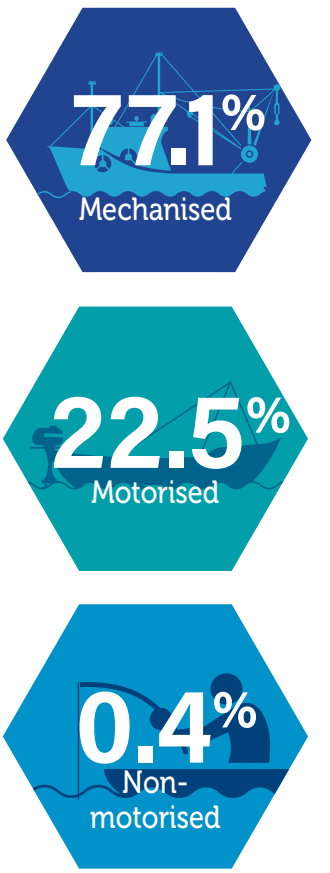
Oil sardine in Kerala indicated a sustained increase with landings of 1.50 lakh t in 2024, which was 8% higher than that of the previous year, owing to good recruitment in 2024. Mechanised ring seines accounted for 68%, and outboard ring seines 21% of the landings. Size ranges of 10-14 mm dominated in the fishery from August



Assemblage (%)

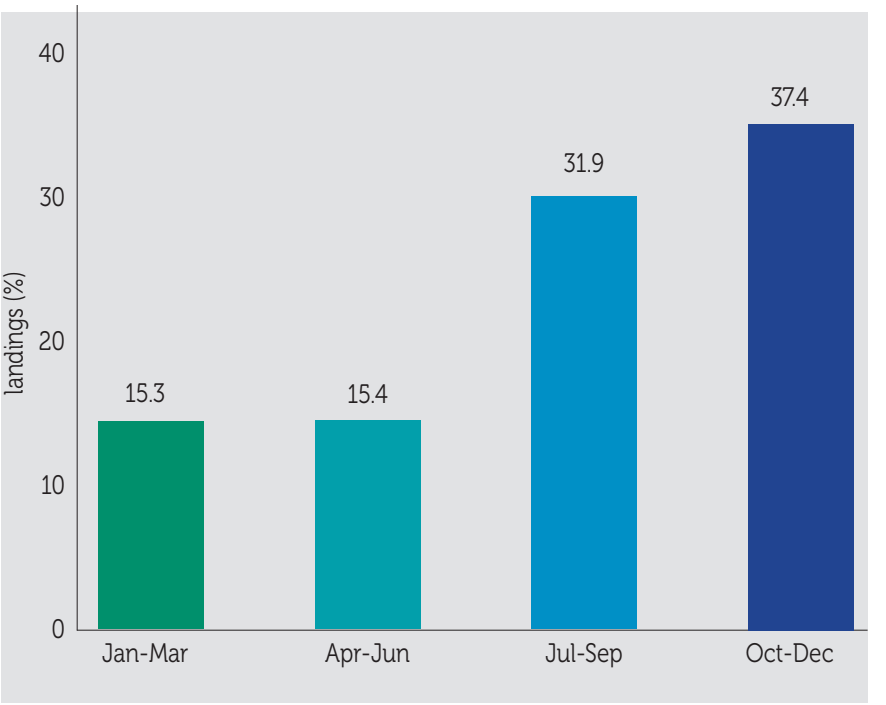


Major landings (in '000 t)

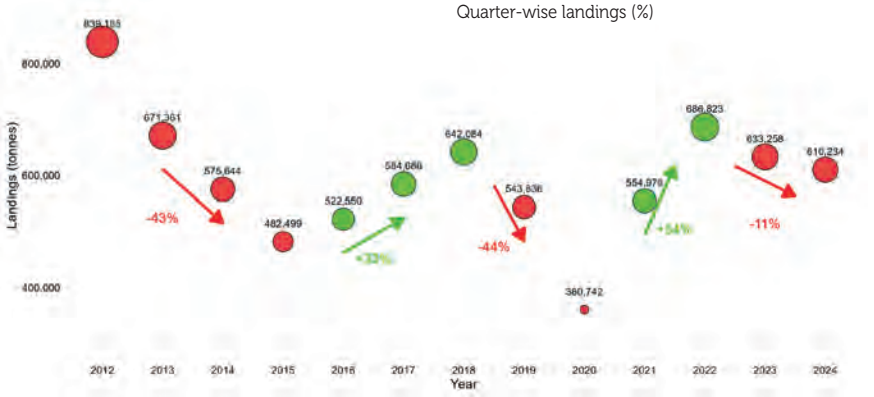


Sector-wise landings

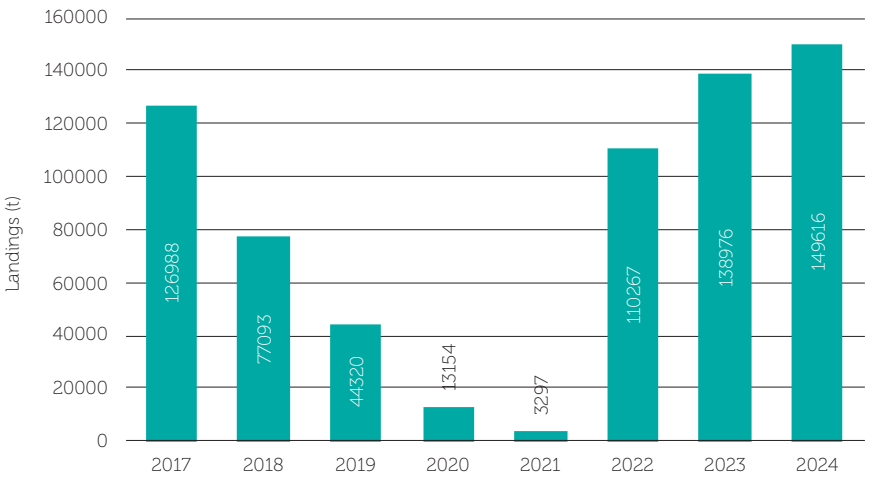
onwards. Unlike previous years, there was a stagnation in mean size due to the continuous entry of recruits, which replaced the existing size classes that were simultaneously exploited by ring seines. Continuous beaching of oil sardine shoals along the Calicut area was observed from August onwards, especially in October-November. Major fishing grounds along Calicut were within 10 m depth. Mackerel landings were estimated at 61,494 t, which was 16% less than that of the previous year, and a continuous decrease in landings was observed during the last three years. There was a significant increase in the landings of *Stolephorus* sp. (27%) and lesser sardines (36%) and a decrease in the landings of scads (-30%) and



Quarter-wise landings (%)



Marine fish landings of Kerala during 2012–2024



Landings of oil sardines in Kerala from 2017 to 2024

ribbonfishes (-38%) compared to the year 2023.

During September–November 2024, coastal aggregations of *Sardinella longiceps* were regularly reported from Kerala. On 20th October 2024, from 10:30 am to 12:30 pm, beaching event was observed at Konad Beach, followed by at least 10 similar beaching events from Malappuram to Kasaragod. The size range was 113-152 mm TL. Approximately 40–50 fishing vessels were operating in the vicinity, with most catches being landed at the adjacent Vellayi harbour. The diet consisted of a mixture of copepods and phytoplankton. Immature and developing fishes dominated in the sample collected from Calicut. No blooms were observed along the fishing grounds.

Demersal resources

The landings of threadfin breams, which was the dominant demersal finfish resource, decreased in 2024

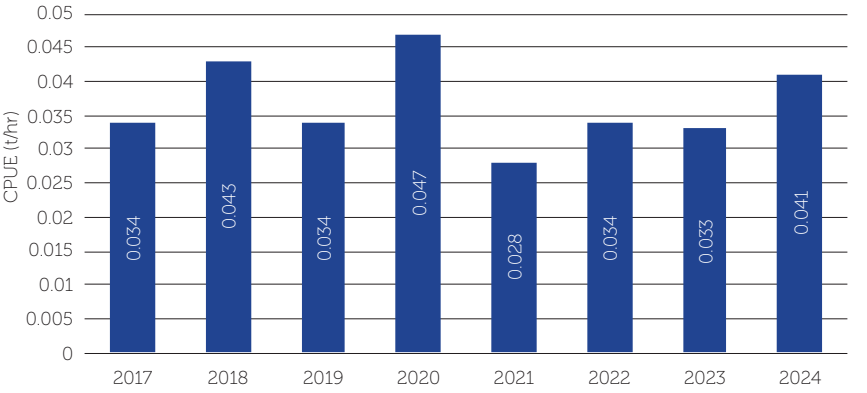
Anchovy landings at Chettuva fisheries harbour

Beaching of oil sardine recorded during 2024 along the Malabar region

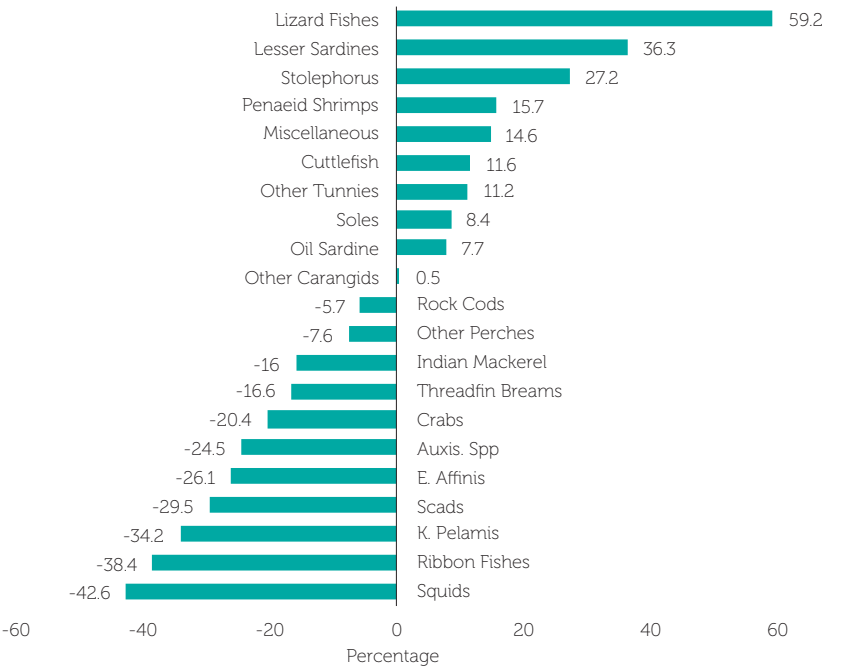
(-17%) with a landings of 33,893 t and formed 30% of the total demersal finfish landings of the state. This was followed by lizardfishes (12.0%), flat fishes (8%), rock cods (5%) and bullseyes (5%). There was a significant increase in landings of lizardfishes (59%), and except for this group and croakers, all other major demersal finfish resources recorded a significant decline during 2024 compared to the preceding year. The declined resources were snappers (-28%), pigface breams (-42%), threadfin breams (-17%), rock cods (-8%), silver bellies (-45%) and catfishes (-26%). The total elasmobranch landings in Kerala during 2024 was estimated at 4,863 t, which was 17% higher than that of last year's estimates, of which sharks contributed 67%, followed by rays (33%) and the rest by guitarfishes. Twenty species of sharks were recorded in the landings of which, *Carcharhinus falciformis* (46%) was the dominant one. The annual mean length in their landings was 140 cm.

Crustacean resources

Crustaceans contributed 8.5% of the total marine fish landings of Kerala with estimated landings of 52,012 t, which was 7% higher than the previous year's estimates. About 86% was



CPUE of oil sardines in Kerala from 2017 to 2024

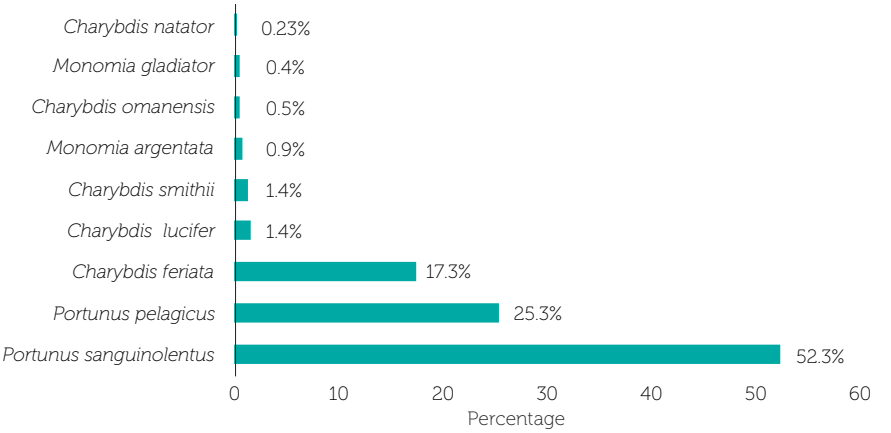


Changes observed in landings of the fishery resources in Kerala in 2024 compared with 2023.

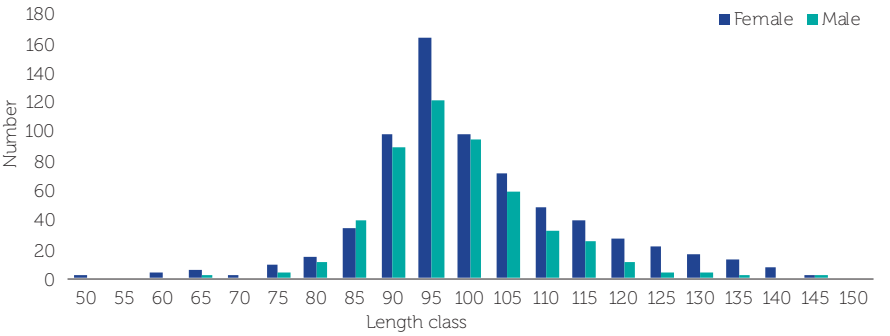
contributed by penaeid shrimps, followed by crabs (9.5%) and non-penaeid shrimps (4.2%). There was a 16% increase in the landings of penaeid shrimps and 20% decrease in the landings of crabs from that of the previous year. The length range of *Metapenaeus dobsoni* landed in 2024 was 56-120 mm, *Parapenaeopsis stylifera* 61-115 mm, *Penaeus indicus* 86-205 mm, and *Metapenaeus monoceros* 86-190 mm. Deep-sea shrimp landings were constituted by *Aristeus alcocki, M. andamanensis* and *Penaeopsis jerryi* among the penaeids while *Heterocarpus chani, H. woodmasoni, Plesionika quasigrandis* and *P. semilaevis* species formed the non-penaeid deep-sea shrimp catch of Kerala. Biological studies were carried out for all the major species. Crab landings were contributed by three major species *P. sanguinolentus, P. pelagicus* and *Charybdis feriata*. Sizes of *P. sanguinolentus* in the fishery ranged between 41-165 & 51-165 mm CW (male & female respectively), *P. pelagicus* between 51-170 & 66-175 mm CW (male & female respectively) and *C. feriata* between 51-175 & 46-140 mm CW (male & female respectively). The fecundity of *P. sanguinolentus* ranged between 80960 and 2357004 (81 to 170 mm CW).

Molluscan resources

Molluscs contributed 5.6% (34,268 t), which was 28% lower than the previous year's estimate. Squids dominated (31%) the landings, followed by cuttlefishes (26%) and octopuses (8%).

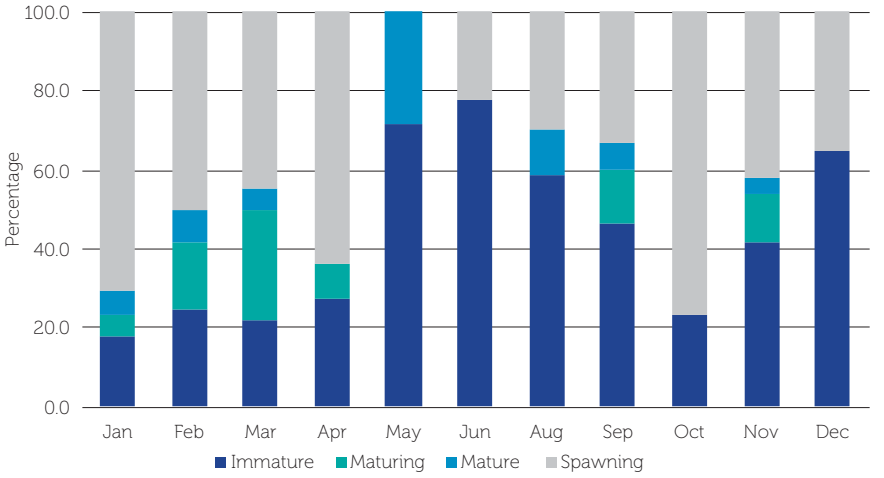


Species composition in the marine crab landings in Kerala during 2024

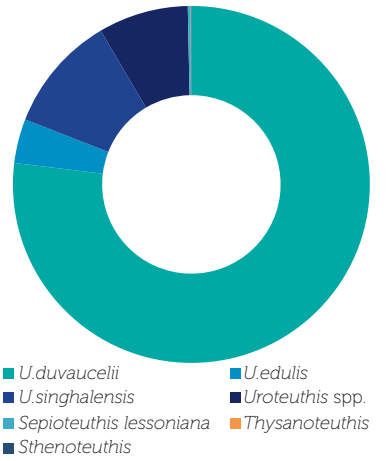


Length composition of the deepsea shrimp *Heterocarpus chani* from Kerala

Landings of coastal penaeid shrimps along the coast of Kerala



Maturity stages of *Sepia pharaonis* during pre-monsoon and post-monsoon period



Species composition of squids landed in Kerala during 2024

There was a significant decline in the landings of squid in 2024 (-43%). Among cuttlefishes, *Sepia pharaonis* was the major species, contributing 81.8% of the landings, followed by *Sepiella inermis* (10.5%) and *S. elliptica* (6%).

Biology and stock assessment

The enforcement of Minimum Legal Size regulations in the marine fishery of Kerala continued in 2024. The size, composition and annual mean length of the major finfish and shellfish species in the samples were monitored, which indicated that almost all the major species of finfishes landed in Kerala were above their notified MLS. In the case of shellfish resources, the annual mean length of more than 90% of the exploited species was above the MLS.

Mean length (round shapes), length range and MLS (diamond shapes) of the finfish species landed in Kerala during 2024

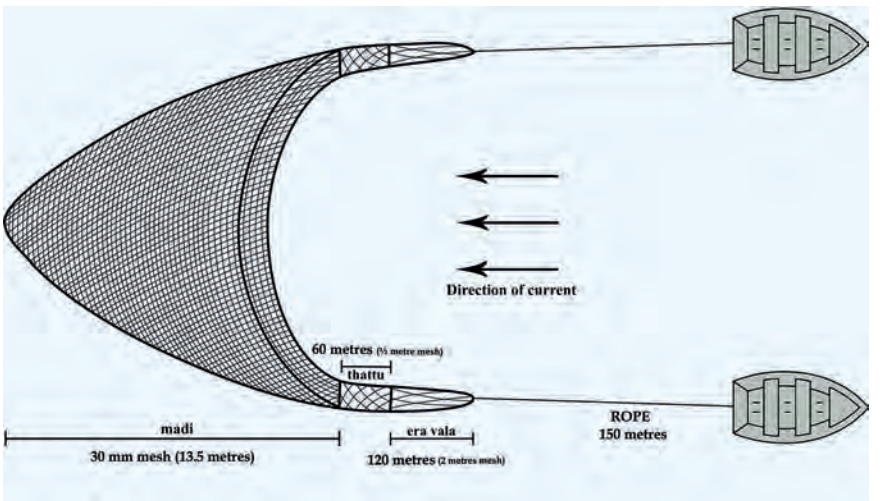
Mean length (round shapes), length ranges and MLS (diamond shapes) of the shellfish species landed in Kerala during 2024

Sardinella longiceps landed at Chellanam landing centre

Cuttlefish landings at Neendakara fisheries harbour

Reproductive biology as well as food and feeding habits of 35 species of finfishes and 25 species of shellfishes were studied to strengthen the life history traits of commercially important fishery resources and to decipher their role in community ecology.

An appraisal of the boat seine fisheries along the Kerala coast indicated that it is a profitable fishing activity along the Trivandrum coast. Of late, boat seines are being operated using 5 to 7 boats targeting fish around traditionally fabricated fish aggregating materials. The major species caught were *Decapterus macrosomia, Thunnus albacares, Katsuwonus pelamis, Elagatis bipinnulata, and Euthynnus affinis.*



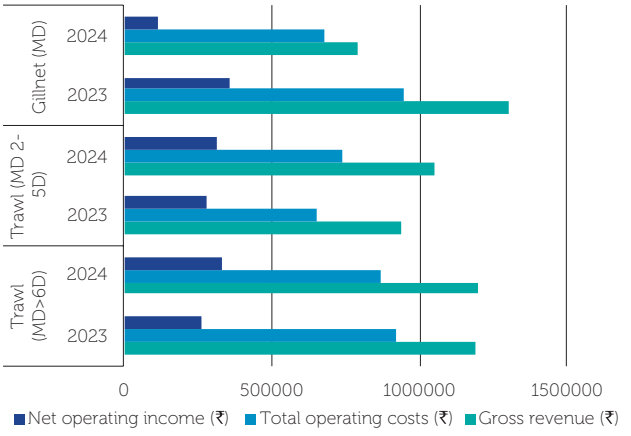
Design of boat seine operating along the southern region of Kerala

Socioeconomics

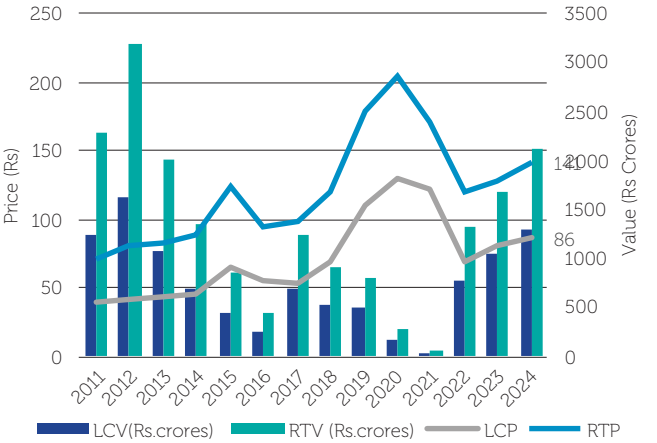
Comparative economic performance of marine fishing units in Kerala for the year 2024 showed that multiday trawlers (2-5 days) were more economically efficient during 2024 compared to the previous year and compared to other fishing units with better operating income. The gross revenue and net operating income of multiday gillnetters significantly decreased in 2024 compared to 2023. With the reduction in catch, the gross revenue and net operating income of inboard (IBRS) and outboard ring seiners (OBRS) considerably reduced in 2024 compared to 2023.

Stakeholder consultation

Stakeholder consultations were organised at Kochi, Vizhinjam and Kasaragod. The major issues discussed were the concern on mandatory implementation of TED in



Economic efficiency of mechanised fishing units in Kerala during 2023 and 2024 (MD denotes multiday)



Landing centre price (LCP), retail price (RTP) and gross value of oil sardines in Kerala (2011-2024)

the fishing vessels, the need for reduction of Overall Length (OAL) as well as number of vessels, and the recent price dip in wild-caught shrimps in Kerala. Traditional fishermen demanded the extension of the trawl ban period. The other issues cited were exploitations of India's marine resources by foreign vessels, pollution in the river Periyar and subsequent mass fish mortalities, light fishing along south and north parts of Kerala, implementation of MLS regulations across the value chain for effective regulation, jellyfish menace during fishing and request for venom studies, issue of abandoned fibreglass fishing boats and demand to study the small-scale fisheries component in all states.

Lakshadweep

Live bait fisheries

Live bait fisheries are an integral part of tuna fisheries in Lakshadweep, particularly for skipjack pole-and-line tuna fishery and yellowfin handline fishery. For skipjack pole-and-line tuna fishery, live baits are primarily

Presentation of salient findings of the study and subsequent deliberations at the stakeholder consultation held at ICAR-CMFRI, Kochi in July 2024

Stakeholder consultation held at Vizhinjam RS of ICAR-CMFRI, in July 2024

Stakeholder consultation organised at Kasaragod by Calicut RS of ICAR-CMFRI, in August 2024

sourced from lagoon shallow areas, contributing 55.1% of the total live bait used. The blue sprat (42%) is the most commonly targeted species, followed by silver sprat and *Ceasio* spp. The outer reef area provides a significant portion of silver sprat. The blue sprat exhibits a length range of 2.60 to 5.0 cm and dominates the live bait fishery.

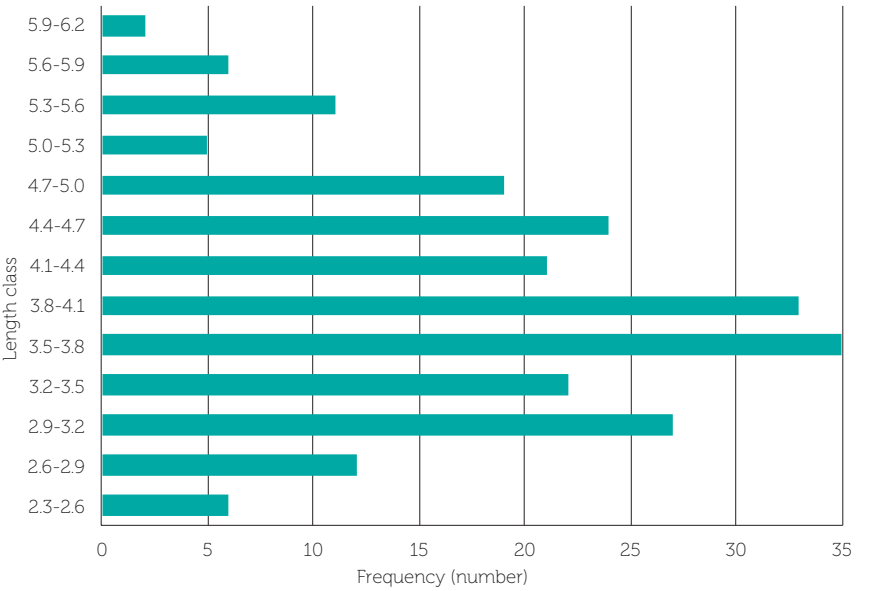
In contrast, yellowfin handline fishery relies more on live bait from the outer reef region, which contributes 67.5% of the total bait used. The primary bait species for this fishery is triggerfish (*Odonus niger*), contributing 47%, followed by *Ceasio* spp., *Pteroceasio* spp., and *Chromis caeruleus*.

Tuna fisheries

Tuna accounts for approximately 80% of the total fish landings in Lakshadweep. Skipjack tuna is the dominant species, contributing 64% of total tuna production in 2024, followed by yellowfin tuna (31%) and other tunas (5%). The pole-and-line fishery remains the primary method for tuna fishing, accounting for 82% of skipjack tuna, 14% of yellowfin tuna, and 4% of other tunas. Meanwhile, the handline fishery is responsible for 92% of

Percentage composition in bait fishery for skipjack pole and line fishing

Species/group	Lagoon (%)	Outer reef (%)	Fate
Blue sprat	37	5	used up
Silver sprat	5	12	used up
Ceasio spp.	1.3	11	used up
Pteroceasio spp.	1.2	7	used up
Green chromis	3	0.5	used up
Lepidozygous tapeinosoma	3	1.4	used up
Fusliers (others)	0.5	2.5	used up
Cardinal fishes	1.15	2.7	used up
Others	2.95	2.8	discarded live
TOTAL	55.1	44.9	–



Length frequency of *Spratelloides delicatulus* in the live bait fishery in Lakshadweep

Percentage composition in bait fishery for yellowfin tuna handline

Species/group	Lagoon (%)	Outer reef (%)	Fate
Ceasio spp.	5	11	Used up
Pteroceasio spp.	5	7	Used up
Chromis caeruleus	6.1	0	Used up
Lepidozygous tapeinosoma	5	0	Used up
Fusliers (others)	3	3	Used up
Trigger fishes	4.2	42.7	Used up
Cardinal fishes	0	0.9	Discarded live
Anthias	0	1.1	Discarded live
Wrasses	3	0	Consumed
Half beak	0.5	0.7	Consumed
Others	0.7	1.1	Discarded live
Total	32.5	67.5	–

A fisher holding the catch of reef fish from spearfishing

yellowfin tuna landings.

Skipjack tuna is primarily targeted near anchored fish aggregating devices (aFADs) or in free-school shoals. Length measurements from fishery samples indicate that skipjack caught near aFADs ranges between 35 and 49 cm, whereas those from free-school shoals range from 40 to 59 cm. Moreover, small-sized yellowfin tuna are frequently observed in aFAD catches, with lengths ranging from 21.5 to 68.9 cm, predominantly in the 45–49 cm size group.

Reef fisheries

In 2024, snappers dominated the reef fishery, contributing 42% of total landings, followed by groupers (21%), emperors (20%), and other reef-associated fish. The primary fishing methods in the reef fishery include handlining (45%), gillnetting (37%), and spearfishing (18%). The increasing demand from collector vessels from the mainland has driven up reef fishery catches in recent years. Fish prices vary between ₹80 and ₹250 per kg, depending on species and size. Spearfishing has gained popularity in the islands due to the higher market value of targeted species, such as large groupers, wrasses, and parrotfish. Skin diving with snorkels is commonly used for spearfishing at depths of 10–15 metres. However, SCUBA diving for spearfishing has not been observed so far.

Stakeholder consultation

A stakeholder consultation was conducted on World Fisheries Day, bringing together representatives from the traditional pole-and-line fishery, yellowfin handline fishery, spear fishers, and seaweed farmers

Catch of reef fishes from handline fishery

to discuss key challenges and the way forward for Lakshadweep fisheries. During the meeting, fishers highlighted concerns such as the low price of tuna catch and the need for additional aFADs as their numbers have decreased since the initial deployment. Meanwhile, seaweed farmers emphasised the need for advanced training in seaweed farming techniques and financial support to develop essential infrastructure, including HDPE rafts, anchors, and seed materials. In response, ICAR-CMFRI assured its continued support for the fisheries sector in Lakshadweep through various extension programs, including the TSP (Tribal Sub Plan) programme, to provide necessary assistance and technical guidance in tuna fishery, seaweed farming and marine ornamental fish farming.

Stakeholder consultation conducted in Kavaratti, Lakshadweep

Photo: *Caranx heberi* landed at Dhanushkodi, Tamil Nadu

Sustainable Fisheries Management

Tamil Nadu & Puducherry

Developing an Integrated Assessment Framework to inform management decisions for marine fisheries in Tamil Nadu & Puducherry

Project: SFD/IAF/13

Tamil Nadu

Marine fish landings

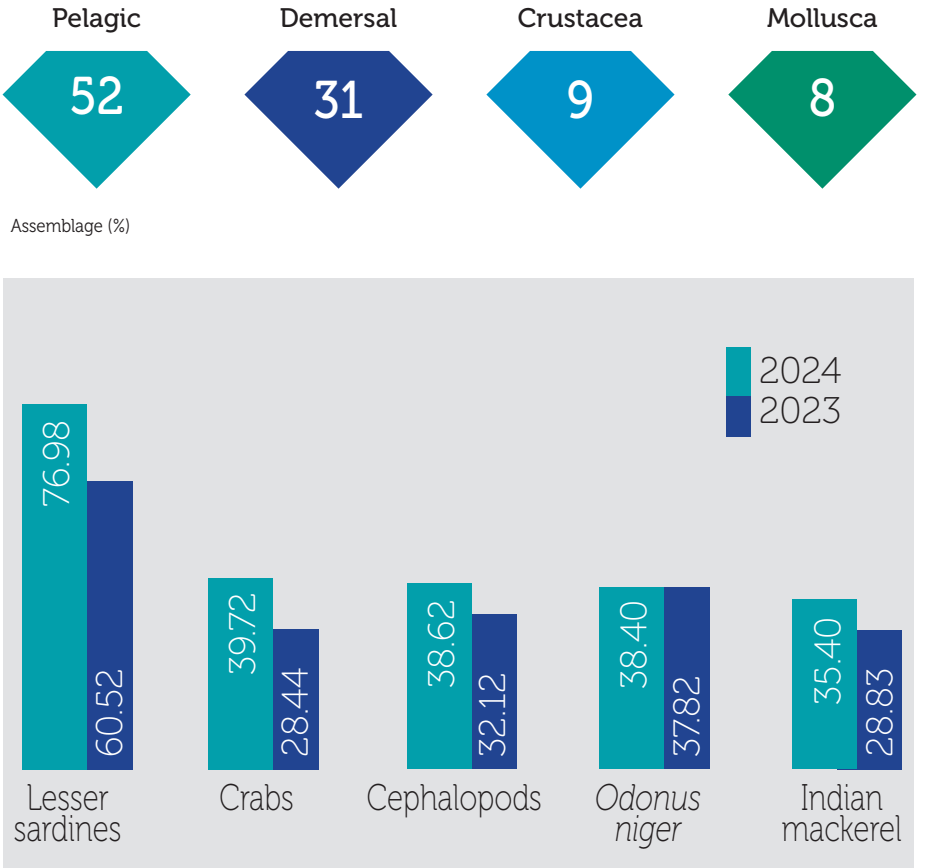
In 2024, the state harvested 6.79 lakh t, a 20% increase from 2023, ranking second among maritime states, driven by a 29% rise in multi-day trawl net landings.

Fourth quarter saw a nearly 15% decline in landings compared to 2023, primarily due to the impact of cyclone Fengal and its aftermath in November and December.

Lesser sardines remained the most abundant landings, with a 27% increase reaching 0.77 lakh t, while *Odonus niger* entered the top five with a 2% rise in landings.

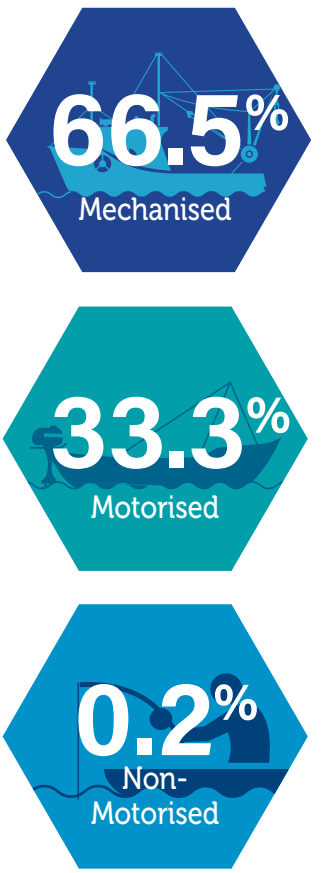
Madras Fisheries Harbour recorded its highest-ever catch in 2024, contributing 13% of total fish landings.

The number of unit operations by outboard crafts increased by nearly 2 lakhs, with outboard crafts using ring seines witnessing an almost two-fold increase in landings.

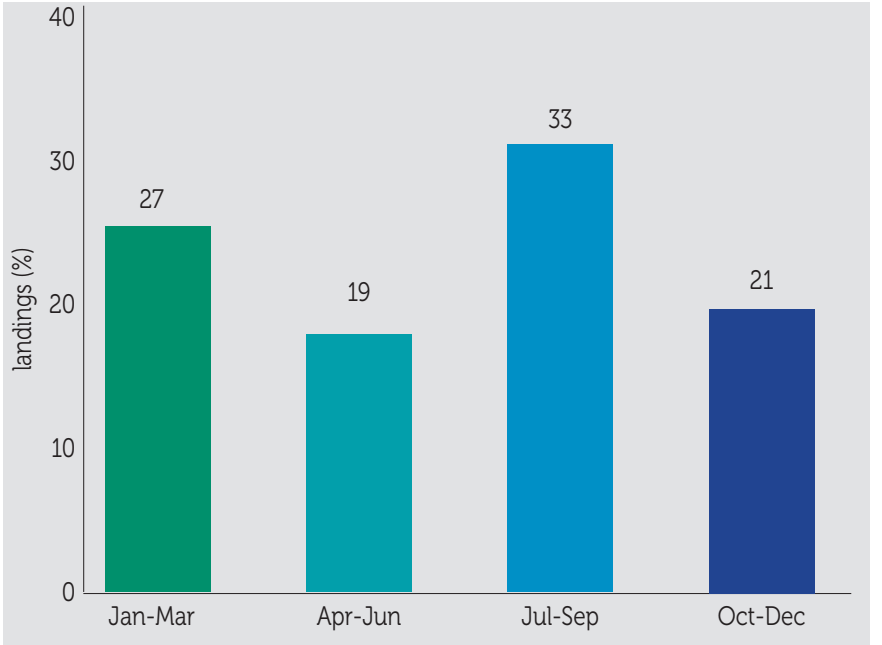


Assemblage (%)

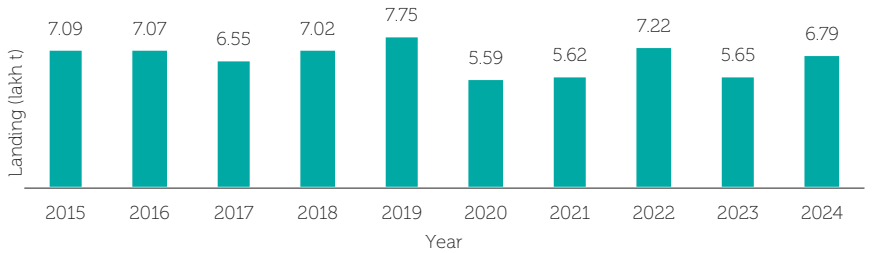
Major landings (in '000 t)



Sector-wise landings



Quarter-wise landings (%)



Total marine fish landing (finfish, shellfish) trend in Tamil Nadu

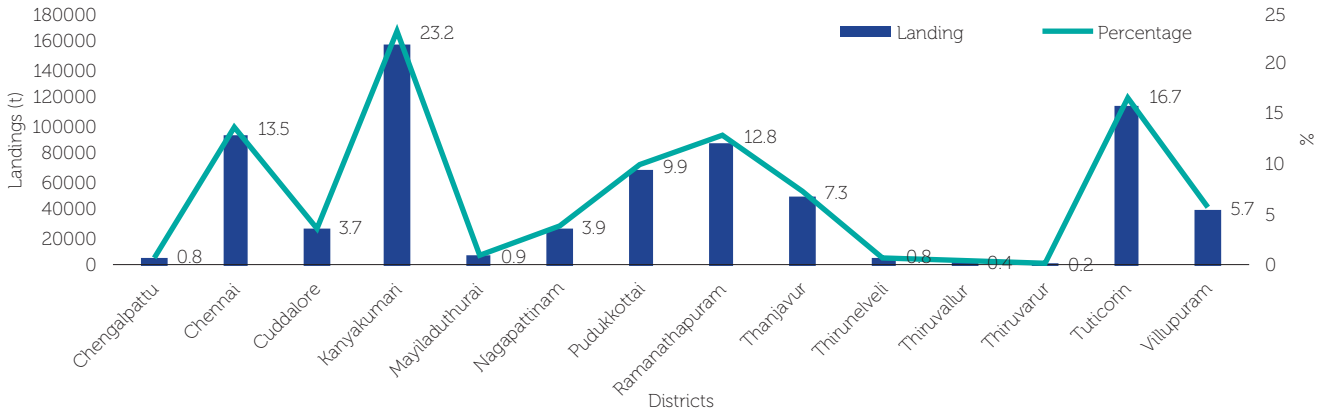
District-wise estimated landings

Among the 14 maritime districts of Tamil Nadu, Kanyakumari recorded the highest landings of 1,57,280 t (23.2%), followed by Tuticorin at 1,13,356 t (16.7%), Chennai with landings of 91,927 t (13.5%) and Ramanathapuram 87,140 t (12.8%). The percentage contribution of Pudukottai, Thanjavur, Villupuram, Nagapattinam and Cuddalore districts were 9.9, 7.3, 5.7, 3.9 and 3.7% respectively to the total landings of Tamil Nadu.

Finfish resources

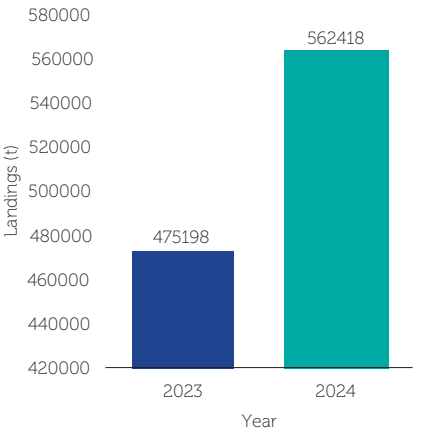
The total estimated finfish landings was 5,62,418 t, accounting for 83% of the overall marine landings of 6,78,521 t. These figures highlight that finfish constitute a substantial portion of the total marine landings.
The finfish landings increased from 4,75,198 t in 2023 to 5,62,418 t in 2024, reflecting a positive trend with a 18% growth.

Tuna landing at Tharuvaikulam



District-wise landings–Tamil Nadu

A view of fish catches at Pamban South fish landing centre



Finfish landings–Tamil Nadu

Mobula birostris

Hemiramphus far landed at Kalimankundu, Gulf of Mannar

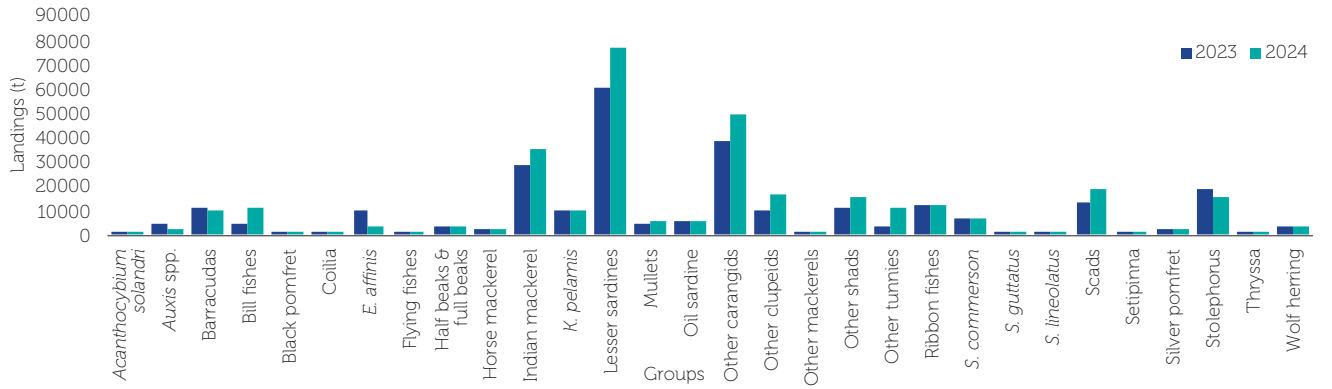
Platybelone argalus landing in Kalimankundu, Gulf of Mannar

Caranx melampygus landed at Threspuram

Bumper catch of *Caranx heberi* in shore seine at Dhanushkodi

Pelagic resources

The total landings of pelagic resources increased from 2,86,919 t in 2023 to 3,51,053 t in 2024, indicating a positive growth of 22% over one year. The lesser sardines recorded the highest landings in both 2023 and 2024, with a significant increase from 60,521 t in 2023 to 76,975 t in 2024. Scads also saw a notable increase in the landings from 13,519 t in 2023 to 18,644 t in 2024; showing an increase of 5,125 t.



Landing of pelagic resources in Tamil Nadu

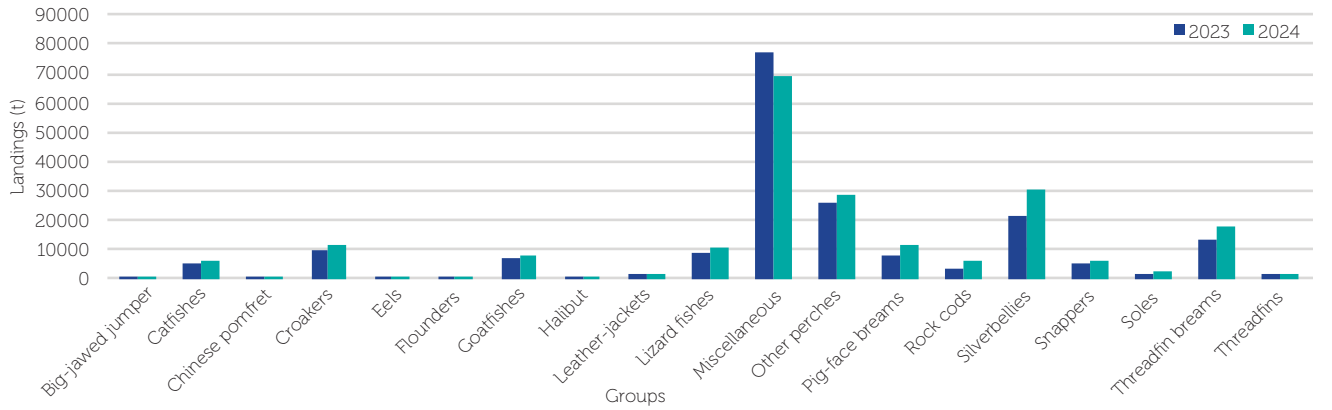
A view of fish drying at Pamban

Demersal resources

The demersal fish landings increased from 1,88,279 t in 2023 to 2,11,365 t in 2024, reflecting a growth of 12%. The silverbellies showed significant growth, increasing from 21,656 t in 2023 to 30,828 t, besides other perches which also increased in the landings from 25,694 t in 2023 to 29,037 t in 2024.

Crustacean resources

In 2024, the total landings of crustaceans in Tamil Nadu were 61,463 t. The penaeid shrimps formed 31% of the crustacean landings, crabs 65%, stomatopods 1.0%, and lobsters 2.0%. The landings of non-penaeid shrimps were only 1.0%.

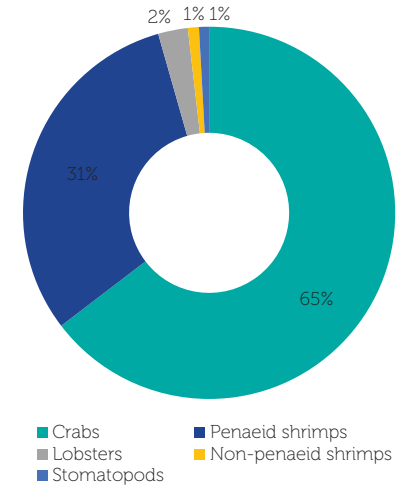


Landing of demersal resources in Tamil Nadu

Removal of harvest from bottom set gill net-Dhanushkodi

Shrimps landed at Mandapam

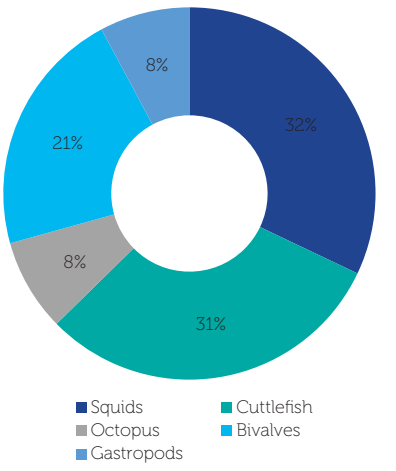
Portunus pelagicus landed at Pamban



Composition of crustacean landing in Tamil Nadu

Molluscan landings

The total landings of molluscs in Tamil Nadu was 54,640 t, showing an increase of 23.6% compared to 2023 (44,177 t). The cephalopods constituted 71% followed by bivalves (21%) and gastropods (8%). Among cephalopods, squids and cuttlefish were dominant, forming 32 and 31% respectively of the total molluscan landings, and octopus contributed 8%. The multi-day trawl landed the majority of the molluscan resources in Tamil Nadu (31%).



Composition of molluscan landing in Tamil Nadu

Puducherry

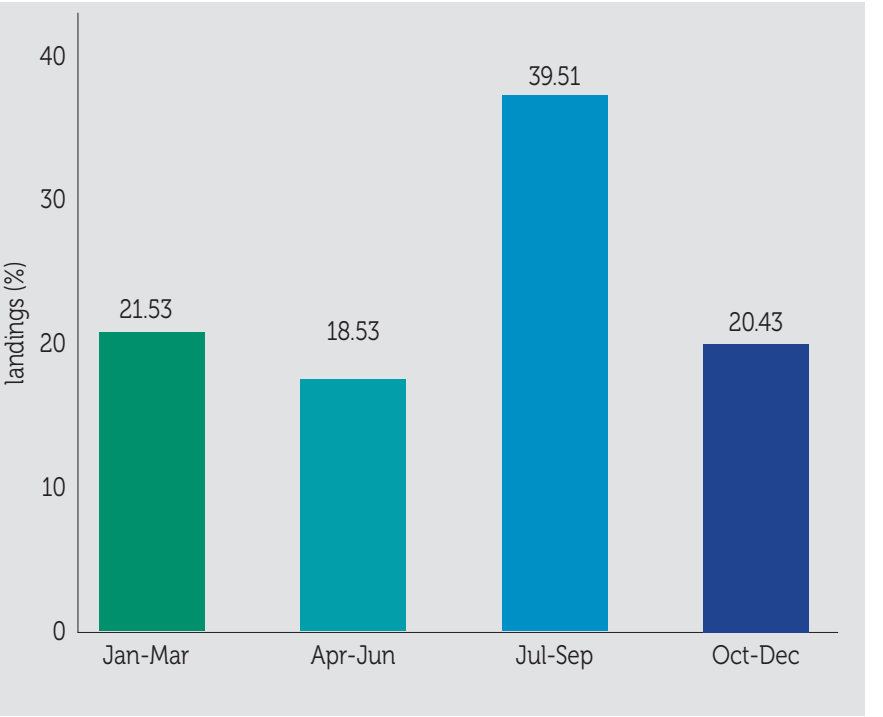
Marine fish landings

Puducherry's marine fish landings increased by 4% in 2024, reaching 0.53 lakh t compared to 2023, driven primarily by a 62% increase from multi-day trawl net catch.

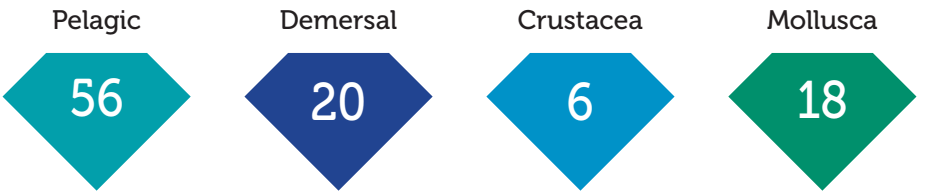
Fourth quarter saw a significant decline in catch due to the landfall of cyclone Fengal in Puducherry, though this was effectively offset by higher landings in the third quarter.

Indian mackerel emerged as the most landed species in Puducherry in 2024, marking a decade-high record with a 38% increase from 2023.

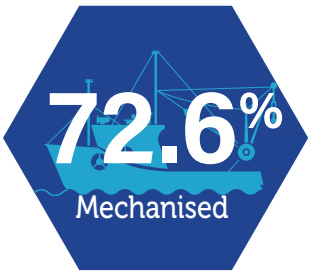
Cephalopod landings surged by 73%, showing remarkable growth

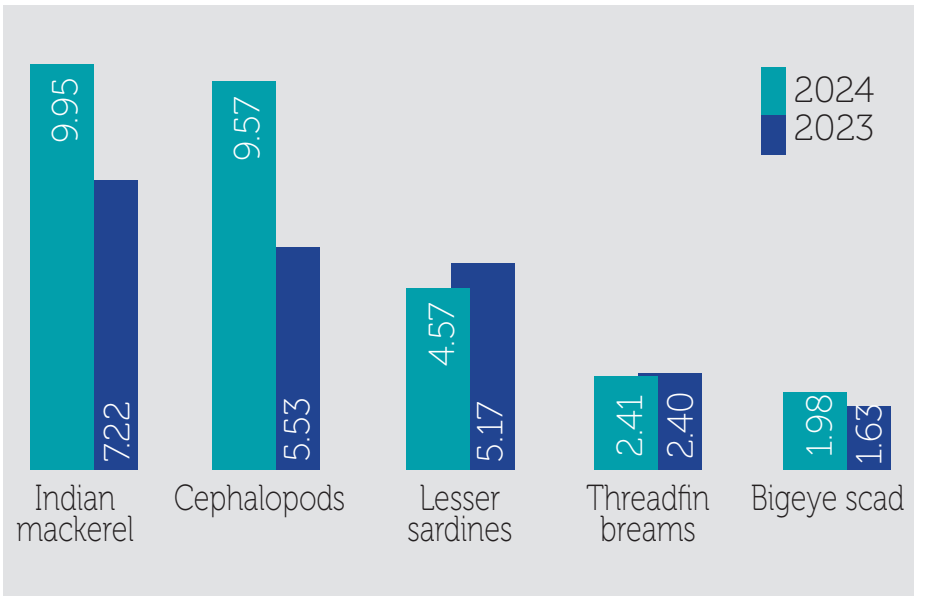


Quarter-wise landings (%)

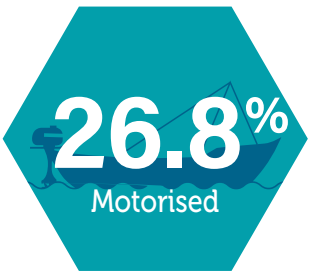


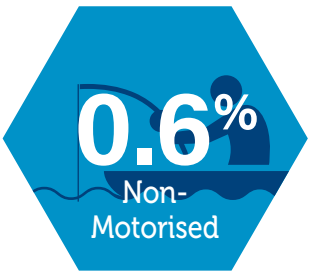
Assemblage (%)



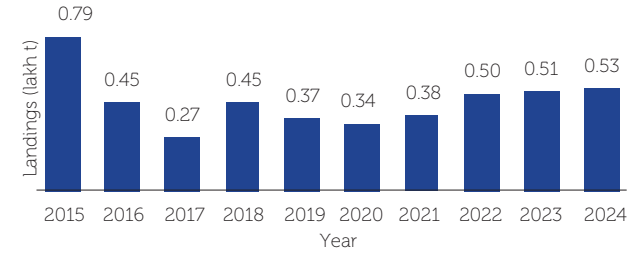


Major landings (in '000 t)





Sector-wise landings



Landing trend in Puducherry (lakh t)

Mackerel landing (t) trend in Puducherry

compared to the previous year.

Multi-day trawl nets contributed the largest share (40%), followed by motorised gillnets (25%).

Puducherry Fisheries Harbour accounted for 42% of the total catch, making it the leading contributor.

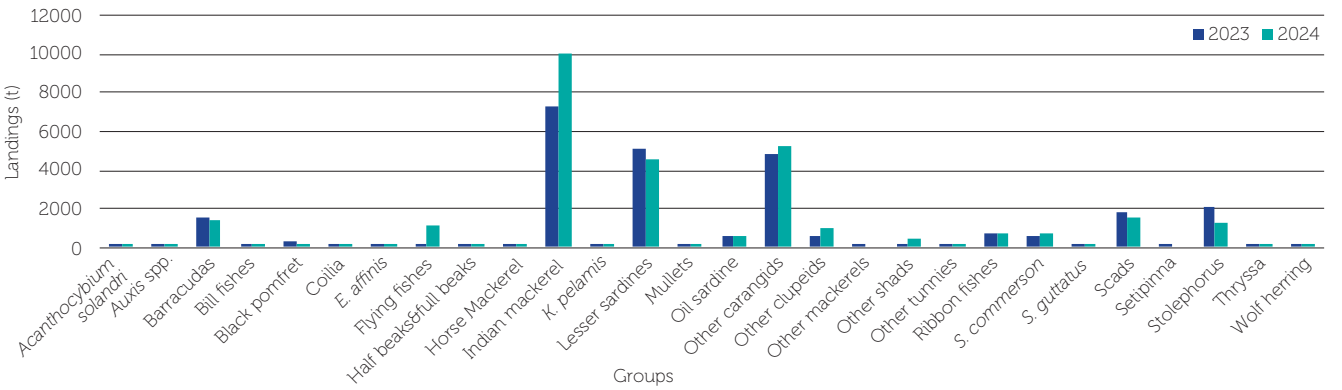
Pelagic resource landings

In 2023, the total estimated landings of pelagic resources were 26,757 t, which increased significantly to 29,681 t in 2024, reflecting an increase of 2,924 t. In 2023, the most dominant resource was other carangids, with landings of 4,843 t, which increased to 5,267 t in 2024. The Indian mackerel became the most landed resource, marking a decade-high record with a 38% increase from the previous year. The Indian mackerel experienced the least reduction, increasing from 7,536.0 t in 2023 to 9,953.4 t in 2024, reflecting a positive trend.

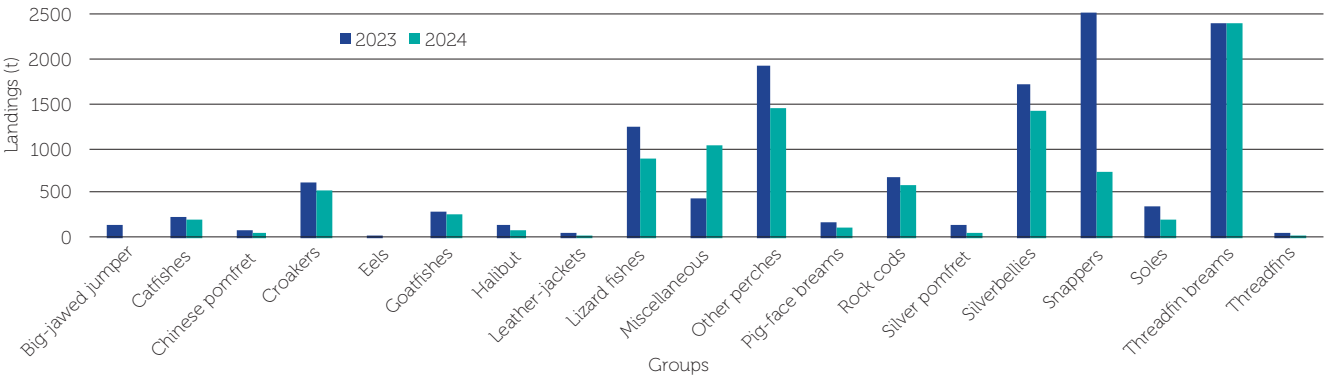
Demersal resource landings

In 2023, the total landings of demersal resources was 13,583 t, but this drastically declined to 10,452 t in 2024, representing a significant reduction of 3,131 t. In 2023, snappers recorded the highest landings at 2,510 t, but this dropped significantly to 743 t in 2024.

Crustacean resources



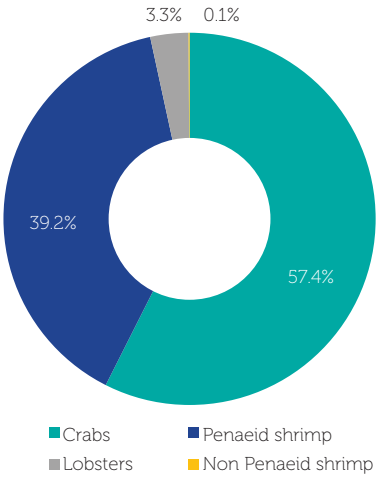
Landings of pelagic resources in Puducherry



Landings of demersal resources in Puducherry

Scomberomorus commerson landed at Pamban

Landing of *Otolithes ruber* at Mandapam

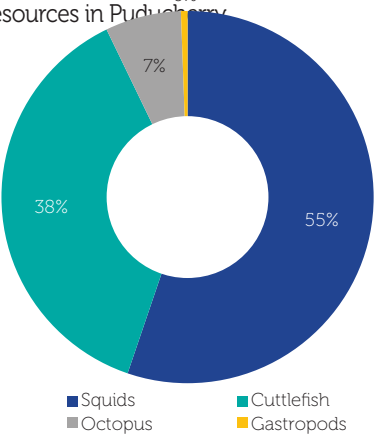


Composition of crustacean landings in Puducherry

The total landings of crustaceans in Puducherry in 2024 were 3,259 t. The penaeid shrimps formed 39.2% of the crustacean landings, crabs 57.4%, lobsters 3.3%, and non-penaeid shrimps were 0.1%.

Molluscan landings

In 2024, the total landings of molluscs in Puducherry was 9,625 t; an increase of 72% compared to 2023 (5,590 t). The cephalopods dominated the catch (99% of landings) while gastropods contributed little to no to the total landings. Among cephalopods, the share of squid was maximum (55%), followed by cuttlefish (38%) and octopus (7%). The multi-day trawl nets contributed the maximum to the landings of molluscan resources in Puducherry.



Composition of molluscan landings in Puducherry

Photo: Gillnet fishing in Andhra Pradesh coast

Sustainable Fisheries Management

Andhra Pradesh

Developing an Integrated Assessment Framework to inform management decisions for marine fisheries in Andhra Pradesh

Project: FFD/IAF/11

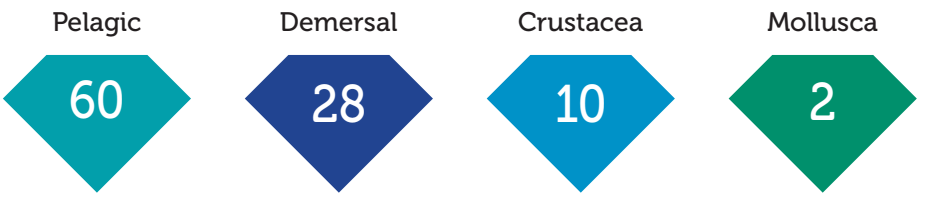
Marine fish landings

In 2024, Andhra Pradesh recorded marine fish landings of 1.75 lakh t, reflecting an 8% decline from 2023 and a 19% drop from 2022. Indian mackerel was the most landed species at 0.32 lakh t—a 76% surge and the highest in the past decade—while lesser sardines rose by 3%, rebounding from a 72% fall in 2023.

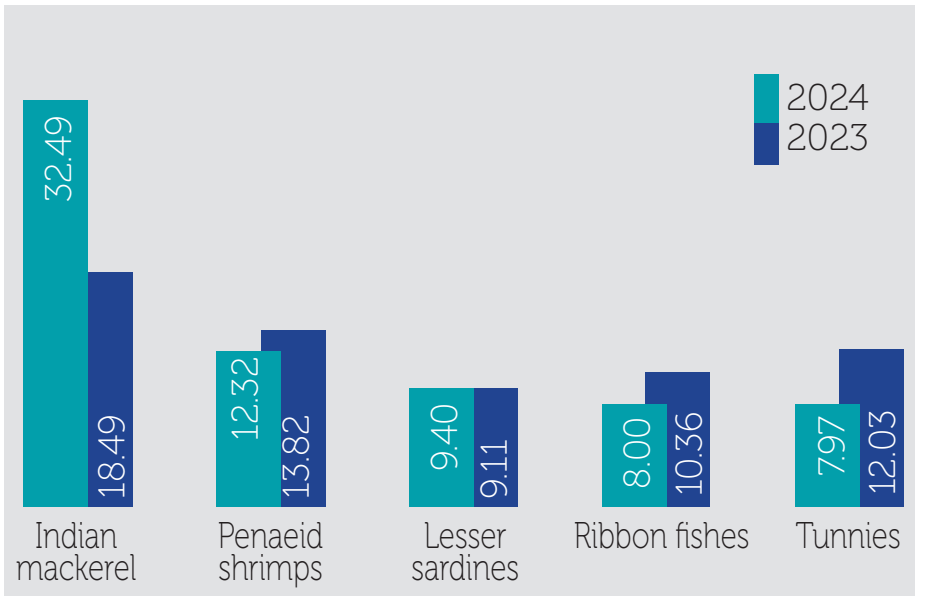
Kakinada district led in landings with 40% of the total landings, followed by Visakhapatnam with a 22% share.

The Juvvaladinne fishing harbour in Nellore district became operational in June 2024, contributing 3% of the state's major fishing harbour landings.

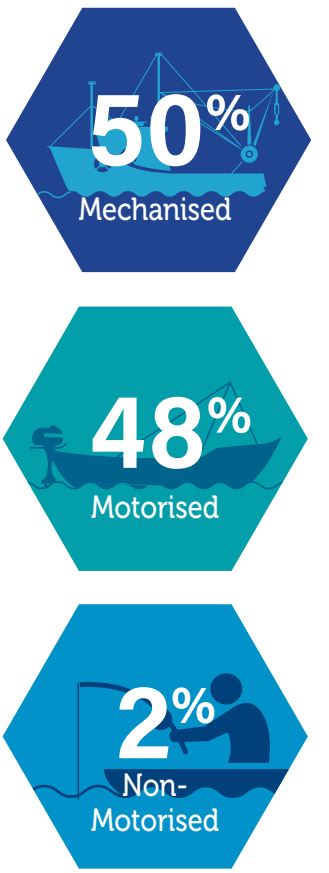
The state experienced more heatwave days in 2024, along with frequent cyclones, including Dana in October and Fengal in November, which contributed to a decline in the fourth-quarter landings.



Assemblage (%)

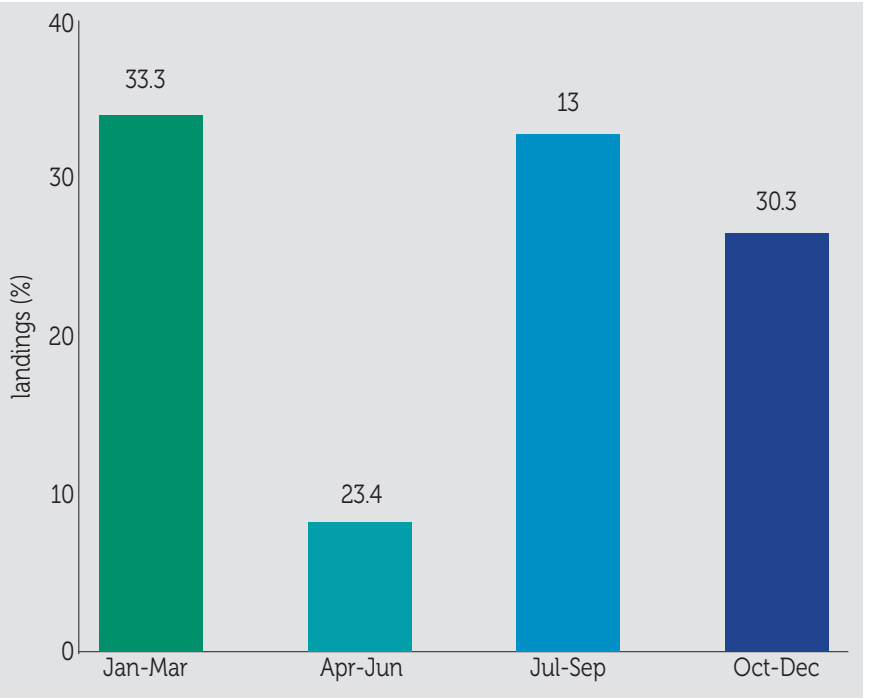


Major landings (in '000 t)



Sector-wise landings

Within the pelagic resources, the highest contribution was by Indian mackerel (31.4%), lesser sardines (9.1%), other carangids (7.9%), ribbonfish (7.7%) and other clupeids (4.4%). The landings of Indian mackerel showed a significant increase of 76% from the previous year and recorded the highest landings in the past decade. Among demersal resources the major groups landed were other perches (15.9%), croakers (14.3%), silverbellies (11.2%), threadfin breams (9.4%) and catfish (5.6%). Penaeid shrimps contributed the highest (70.8%) to crustacean landings of the state, followed by crabs (26.9%) and non-penaeid shrimps (1.5%). Cuttlefishes contributed 56.0%, squids 35.4% and octopuses 8.6% to the molluscan landings of the state.



Quarter-wise landings (%)

Eels being taken for packing at Antharvedipallipalem

The major contribution to the estimated landings was recorded from multiday trawlers (47%) followed by motorised gillnetters (20.2%) and motorised ring seiners (19.9%). Other major fishing gears contributing to marine landings in the state were motorised hook and lines and non-motorised gears. Catch rates in single-day trawls was 83 kg/h which was a significant increase from the previous year. The catch rate in multiday trawls was 43 kg/h which also was higher than that seen in the previous year. The highest catch per unit effort was observed in ring seines (886 kg/unit), followed by motorised hook and lines (380 kg/unit) and motorised gillnets at 156 kg/unit. Artisanal (non-motorised) fishing gears had a catch rate of 91 kg/unit.

Biology and stock assessment

Studies on the reproductive biology and diet of major finfish and shellfish

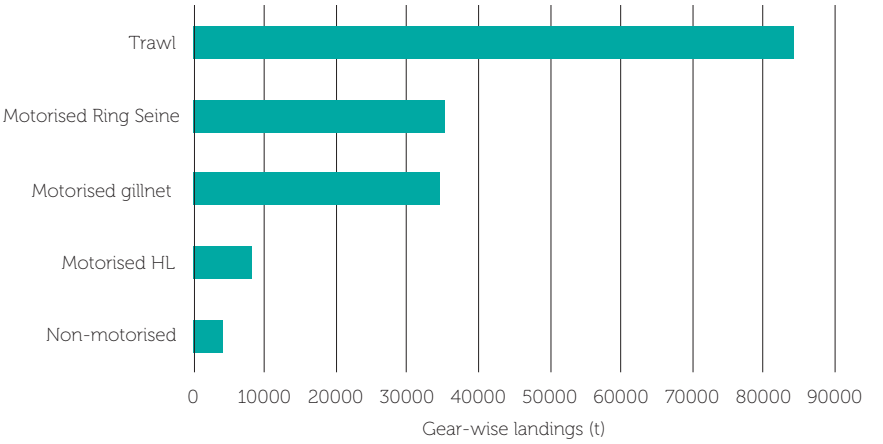
resources landed in Andhra Pradesh were continued in 2024.

Marine environment off Visakhapatnam

Detailed water quality parameters such as salinity, water temperature, pH, Dissolved oxygen, nutrient content and chlorophyll were analysed and recorded at three sites off Visakhapatnam. The chlorophyll content of sea surface water was recorded minimum (0.4531 mg/m^3) in December at Kailashgiri and a maximum (2.2584 mg/m^3) at cage sites (R B Beach) in November. For bottom water, chlorophyll content was recorded as highest (1.932 mg/m3) and lowest (0.3678 mg/m^3) at Yarada for November and December 2024 respectively. Both surface and bottom water salinity was 22 ppt for November whereas for December it varied from 28-29 ppt. The pH of seawater varied from 8-8.2 for surface and bottom water with a mean was 8.1 for both months. The average dissolved oxygen for surface water for November and December 2024 was 5.58 mg/l and 5.54 mg/l respectively whereas for subsurface water it was less than 5 mg/l for both months. The highest ortho-phosphate was recorded in surface water at Kailashgiri (0.04 mg/l) and lowest at Yarada (0.002 mg/l) in December.

Socioeconomics

Economic analysis of mechanised multiday trawlers was carried out for Kakinada and Visakhapatnam in Andhra Pradesh. For the year 2024, the average operating cost of a mechanised multi-day trawl net in the Kakinada fishing harbour worked out to be ₹ 1,67,005 with an average gross revenue of ₹ 1,91,117. Similarly, for Visakhapatnam fishing harbour, the operating cost was ₹ 2,12,968 with an average gross revenue of ₹ 2,31,669. The average operating cost of



Gear-wise contribution to marine landings of Andhra Pradesh (2024)

Size range of major finfish species landed in Andhra Pradesh

Species	Length range (mm)	Mean length (mm)	Sex ratio (F:M)
Chirocentrus dorab	318-683	454.0	-
Ariomma indicum	139-228	179.4	-
Rastrelliger kanagurta	179-243	181.7	-
Hilsa kelee	181-258	219.5	-
Tylosurus crocodilus	328-1205	497.9	-
Selar crumenophthalmus	143-238	185.7	-
Stolephorus commersonii	43-153	87.8	-
Scomberoides lysan	206-695	424.3	-
S. tala	205-682	399.9	-
S. tol	240-585	335.4	-
S. commersonnianus	187-885	351.9	-
Strongylura leiura	358-737	529.4	-
Lutjanus indicus	188-360	271.0	0.3
Pricanthus hamrur	150-300	225.0	1.2
Pricanthus tayenus	165-194	183.7	2.5
Polydactylus sextarius	115-203	151.0	-
Psettodes erumei	175-470	293.5	-
Pomadasys kaakkan	180-535	263.0	-
Nemipterus japonicus	163-290	204.0	-
Nemipterus randalli	110-200	150.6	-
Upeneus supravittatus	120-175	138.0	-

The size range of major shellfish species landed in Andhra Pradesh

Species	Length range (mm)	Mean length (mm)	Sex ratio (F:M)
Penaeus indicus	111-198	153.1	1.27
Metapenaeus monoceros	70-200	130.2	0.95
Metapenaeus affinis	104-170	121.5	1.13
Metapenaeus dobsoni	53-132	93.1	0.35
Solenocera crossicornis	66-115	88.4	0.47
Solenocera melantho	53-119	85.4	0.85

Species	Length range (mm)	Mean length (mm)	Sex ratio (F:M)
Trachypenaeus aspara	49-112	80.6	0.44
Parapenaeopsis stylifera	65-128	98.7	0.81
Parapenaeopsis maxillipedo	58-114	83.6	0.87
Metapenaeopsis barbata	52-107	83.4	0.61
Metapenaeopsis stridulans	57-114	78.0	0.75
Portunus sanguinolentus	70-163	112.3	0.83
P. pelagicus	98-177	138.7	1.17
Charybdis feriatus	62-143	89.7	0.80
Panulirus homarus	131-224	179.1	2.17
Panulirus polyphagus	149-210	170.8	0.64
Sepia brevimana	48-104*	69.4	0.99
Sepia vecchioni	40-116*	84.6	0.91
S aculeata	48-198*	111.8	1.05
S pharaonis	98-284*	197.0	1.05
Sepiella inermis	42-92*	59.0	0.76
Sepioteuthis lessoniana	132-332*	216.2	0.59
Uroteuthis (Photololigo) duvaucellii	35-172*	83.9	1.36
Amphioctopus marginatus	60-102*	86.1	1.63

*: Dorsal mantle length (mm)

motorised single-day trammel net and ring seine in the Srikakulam district of Andhra Pradesh worked out to ₹ 30,675 and ₹ 24,946 per unit respectively with an average gross revenue of ₹ 59,242 and ₹ 45,658 respectively. The average operating cost of a non- motorised single-day gillnet in the Vizianagaram district of Andhra Pradesh worked out to ₹ 4631 with an average gross revenue of ₹ 9165. It is seen that capital productivity of the single-day fishing of non-motorised gillnet was efficient with a lower operating ratio of 0.51 compared to other craft-gear combinations. The capital productivity ranged from 0.51 for non-motorised gillnets (single-day fishing) in Bavanapadu landing centre of Srikakulam district to 0.88. Gross Value Added (GVA) was higher for non-motorised gillnets operating in Srikakulam district of Andhra Pradesh, reaching 99%.

Assorted fishes ready to be sold at Visakhapatnam fishing harbor

Caranx heberi landed at Visakhapatnam fishing harbour

Crabs landed at Visakhapatnam

Dried ribbonfish for trading at Visakhapatnam

Ring seine landings at Iduvanipalem

Stakeholder consultation

A stakeholder consultation was held to discuss marine fishery highlights of Andhra Pradesh and to discuss various challenges faced by marine fishermen of the state. Fishermen agreed that marine landings have been decreasing in the region. They indicated the resource groups which have increased in landings over the years and which have reduced. The meeting brought forth several suggestions for improving marine fishery health in the region.

Stakeholder consultation held at Visakhapatnam RC on 28 February 2025

Photo: Threespot swimming crab landings at Paradip fishing harbour

Sustainable Fisheries Management

Odisha & West Bengal

Developing an Integrated Assessment Framework to inform management decisions for marine fisheries in Odisha & West Bengal

Project: SFD/IAF/12

Odisha

Marine fish landings

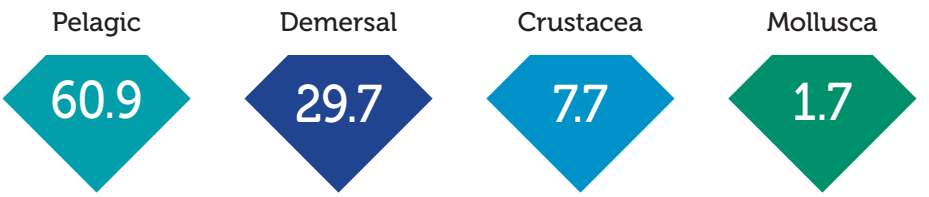
Odisha's marine fish landings reached 1.54 lakh t in 2024, an 18% increase from 1.3 lakh t in 2023.

Croakers, lesser sardines, anchovies and white sardines, the top four marine fish resources in Odisha, showed an increase in landings compared to 2023, accounting for 26% of the total landings in the state. Croaker landings made up 9% of the total landings.

Lesser sardine landings experienced the most significant change among the top five resources, with a sharp increase of 7,753 t. This surge is primarily attributed to higher catches using outboard ring seine and gillnet in the districts of Puri and Ganjam. Conversely, penaeid shrimp landings declined by 23%, totalling 8,093 t.

Finfish resources

Total finfish landings were 1.39 lakh t, which increased by 25% compared to 2023. Pelagic resources contributed the maximum (60.9%) to the total finfish landings of Odisha with an



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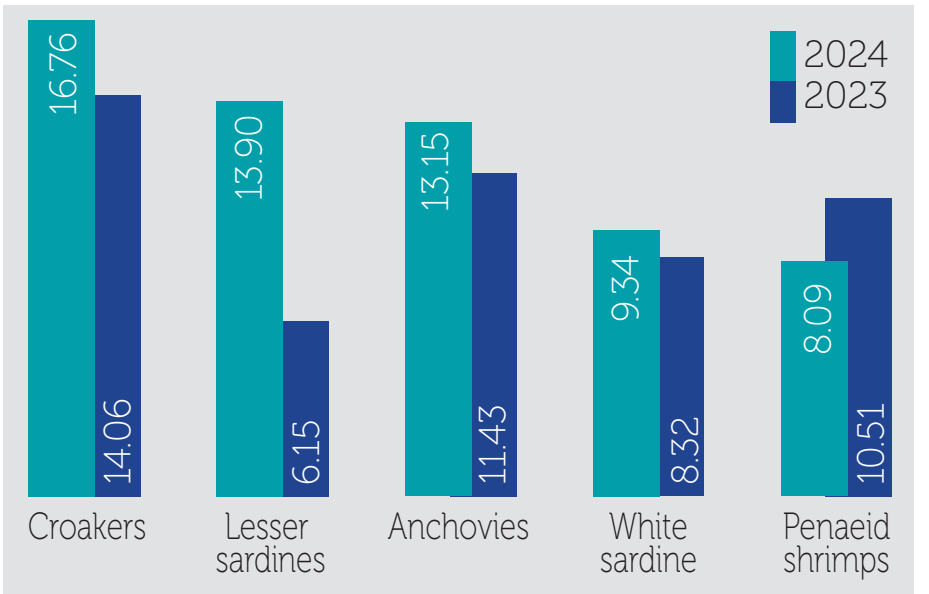
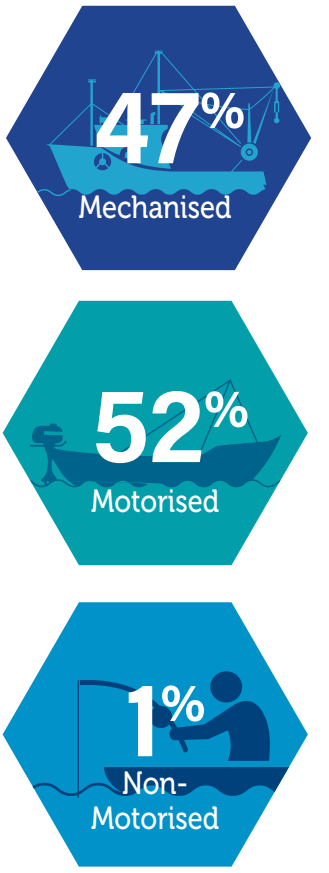


Major landings (in '000 t)

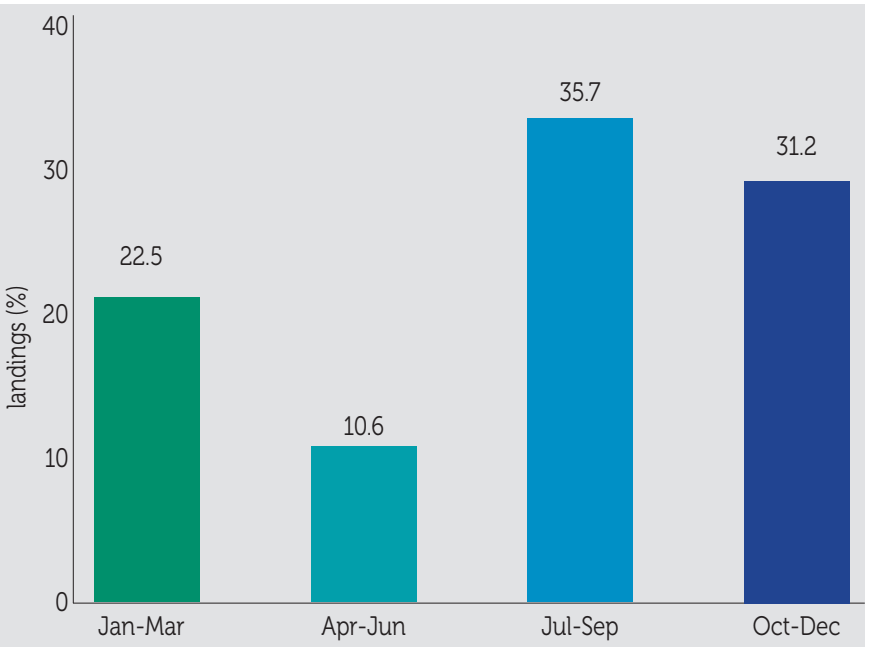


Sector-wise landings

increase of 23% compared to the previous year. Pelagic landings were mainly composed of clupeids (69.1%), carangids (9.1%), ribbonfishes (7.4%), Bombay ducks (6.9%), mackerels (4.1%) and seerfishes (2.2%). The demersal resources contributed 29.7% to the total marine finfish landings of Odisha during 2024 and also registered an increase of 29%. Croakers were the most dominant demersal group contributing nearly 37% to the total demersal landings followed by catfishes (16%), silverbellies (12%), pomfrets (10%) and flatfishes (6%).

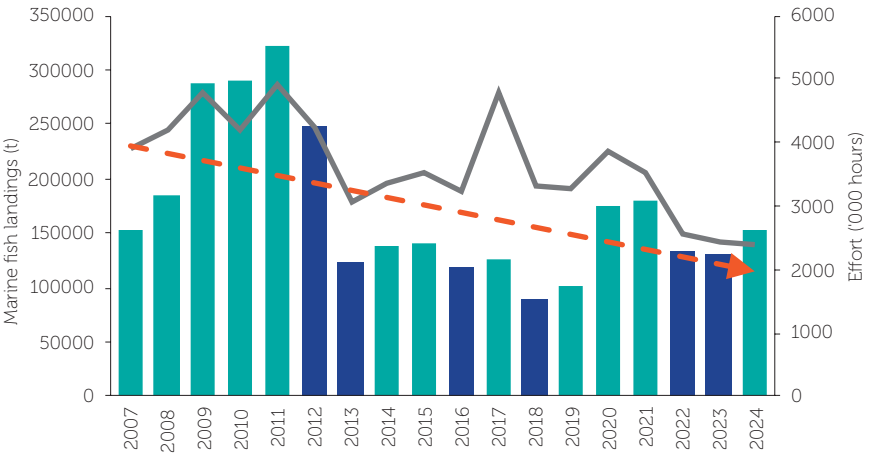
Shellfish resources

Total shellfish landings were 0.14 lakh t, which decreased by 20% compared to 2023. Crustacean resources with landings of about 0.12 lakh t contributed the maximum (82.2%) to the total shellfish landings of Odisha with a decrease of 15% compared to the previous year. Crustacean resources were predominantly represented by penaeid shrimps (68%), followed by crabs (31.9%), non-penaeid shrimps (0.08%), and lobsters (0.05%). The shrimp landings were mainly *Parapenaeopsis* spp., followed by *Metapenaeus* spp., *Solenocera crassicornis*, and *Penaeus* spp. Among crabs, the major landings came from *Portunus sanguinolentus*, followed by *Charybdis feriata* and *P. pelagicus*. Lobster resources were prominently represented by *Panulirus polyphagus*. Cephalopods, the major group of molluscs, with an annual landings of 0.02 lakh t contributed 17.8% to the total marine shellfish landings of the state. Among the cephalopods, cuttlefishes contributed the maximum (75.4%), followed by squids (19.9%), and octopus (4.78%). The total cephalopod landings in Odisha comprised *Sepiella inermis*, *Sepia aculeata*,



Quarter-wise landings (%)

Ribbonfish landings at Paradip, Odisha



Decadal trends in marine fish landings of Odisha

Bombay duck landings at Paradip, Odisha

Rays landing at Paradip, Odisha

Uroteuthis (Photololigo) duvaucelii, *Sepia pharaonis*, and *Sepia elliptica*.

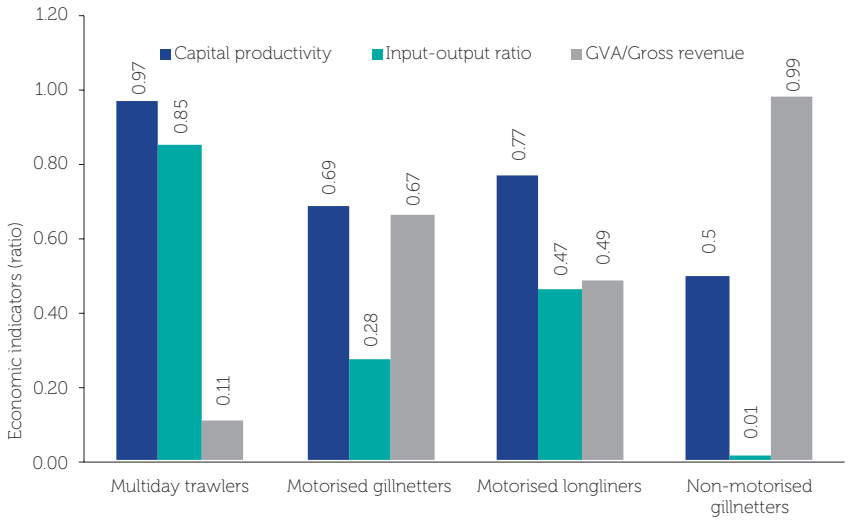
Biology and stock assessment

Regular length-based data collection and biological investigations have been carried out to assess the life history and exploitation parameters, reproductive biology, food, and feeding habits of prioritised commercially important marine finfish (10 species) and shellfish

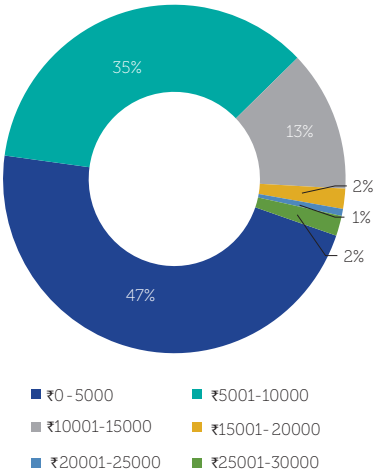
Cuttlefish landings at Paradip, Odisha

Biological information for the commercially important species in Odisha during 2024

Sl. No.	Species	Length range (cm)	Mean length (cm)	Sex ratio F: M	LM_{50} (cm)	Mature (%)
1	*Nemipterus japonicus*	10.3-24.56	14.96	1:1.1	15.6	36.8
2	*Pomadassys kaakan*	27.8-66.7	32.41	1:1.2	31.7	63.5
3	*Otolithes ruber*	20.0-51.9	35.02	1:1.06	27.2	55.5
4	*Plicofollis dussumieri*	27.0-108	59.65	1:2.5	38.4	41.3
5	*Pampus griseus*	6.2-23.6	12.45	1:0.15	20.3	36.7
6	*Muraenosox bagio*	54.0-164.0	102.5	1:0.78	95.2	59
7	*Strophiodon sathate*	52.2-158.2	86.05	1:0.25	98	50
8	*Scoliodon laticaudus*	25.0-51.1	35.43	1:0.4	35.6	71.3
9	*Ilisha megaloptera*	17.4-26.0	23.04	1:0.25	23.5	77.2
10	*Trichurus lepturus*	49.3-76.3	59.46	1:0.59	53.2	53.7
11	*Charybdis feriata*	5.4-16.6	11.2	1:0.86	10.8	85.6
12	*Portunus pelagicus*	5.7-17.2	11.8	1:0.92	11.3	82.3
13	*Portunus sanguinolentus*	5.3-17.9	11.4	1:0.95	11.1	89.2
14	*Metapenaeus dobsoni*	3.7-12.1	7.9	1:0.73	6.4	72.7
15	*Parapenaeopsis stylifera*	4.6-13.5	8.6	1:0.41	8.3	79.4
16	*Solenocera crassicornis*	4.5-12.8	8.4	1:0.57	7.9	81.2
17	*Penaeus monodon*	7.9-29.2	18.4	1:0.70	17.5	78.9
18	*Uroteuthis (Photololigo) duvaucelii*	4.5-13.8	8.91	1:0.60	10	51
19	*Sepiella inermis*	2.9-7.1	5.1	1:0.66	6.1	48
20	*Sepia pharaonis*	10.5-33.7	21.65	1:0.30	12.2	76
21	*Sepia aculeata*	6.9-17.8	13.26	1:0.64	8.6	62



Economic performance of various fishing methods in Odisha



Monthly household income profile in the motorised fishing sector of Odisha

(11 species) of Odisha. The fisheries biology parameters are currently being used to derive various biological target and limit reference points for the sustainable exploitation of the commercially important finfish species of Odisha. Apart from this, an apparent sign of fatigue and decline in 34% of the assessed stocks (14 out of 41 species) has been observed using catch-based method BSM. Critical species under stress are hilsa, Bombay duck, threadfin breams, Indian mackerel and some high-valued shrimps.

Socioeconomics

A study on migration behaviour, community structure and socio-economic status of fishers from the motorised sector revealed that most of the families live below the poverty line (BPL) largely (96%) in a nuclear family setup. Among the fishers from the motorised sector, the average indebtedness was observed to be about ₹ 56000. The monthly income of most of the households (47%) was observed to be below ₹ 5000 followed by 35% of households earning a monthly income between ₹ 5000 to 10000. About 2% of the interviewed households also reported

Crab landings at Paradip, Odisha

a monthly earning between ₹ 25,000 to 30,000. Neither seasonal nor permanent migration to overseas was recorded for any of the interviewed fishers.

The economic performance of various fishing methods such as multi-day trawlers from the mechanised sector, longliners and gillnetters both from the motorised and non-motorised sectors have been studied from the selected fish landing centres in Odisha. The economic indicators such as capital productivity, input-output ratio and Gross value added (GVA) as a percentage of gross revenue were calculated.

Stakeholder consultation

A stakeholder consultation was organised by the Puri Field Centre of ICAR-CMFRI to discuss key developments in Odisha's marine fisheries sector and address the challenges faced by marine fishing communities. Participants acknowledged noticeable fluctuations in marine fish landings, while also identifying specific resource groups with increasing or declining trends. The meeting generated several constructive suggestions and recommendations to promote the sustainability of marine fisheries.

Stakeholders meeting conducted at Puri FC of ICAR-CMFRI

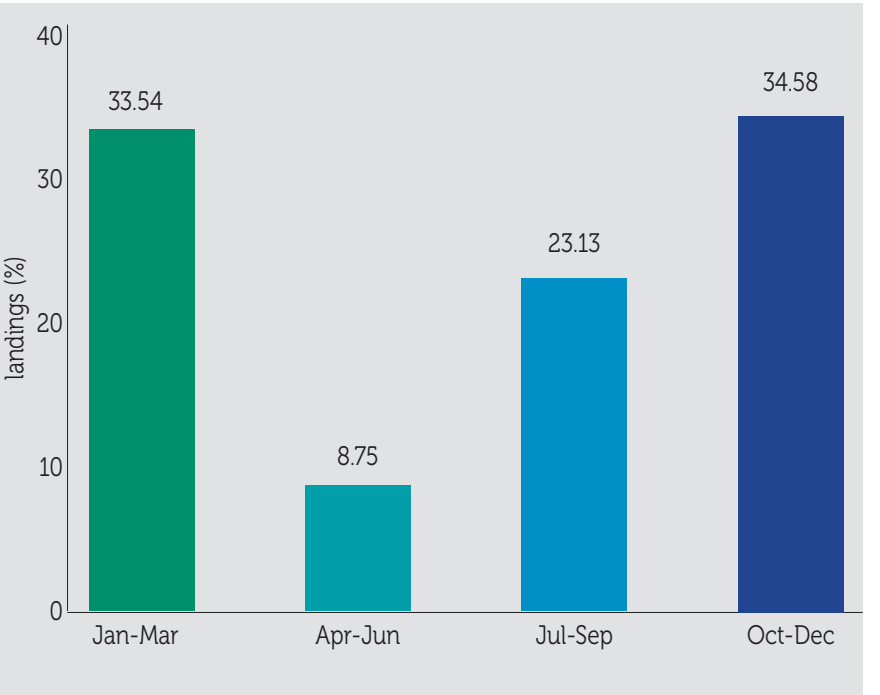
West Bengal

Marine fish landings

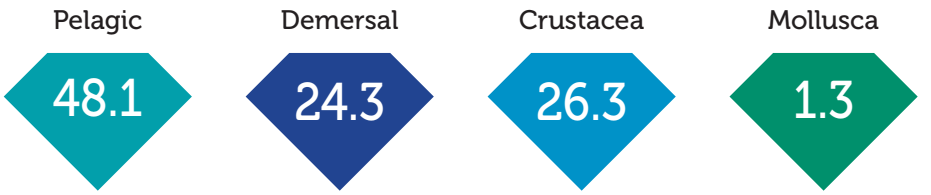
The total marine fish landings along the West Bengal coast were estimated at 2.33 lakh t, registering a significant increase of 35% compared to the previous year's landings in 2023.

Non-penaeid shrimps (*Acetes* spp.) landings in the state reached a record high, nearly tripling the previous year's total. About 85% of this landing occurred in the last quarter (Oct-Dec) and was caught by motorised bagnet operations.

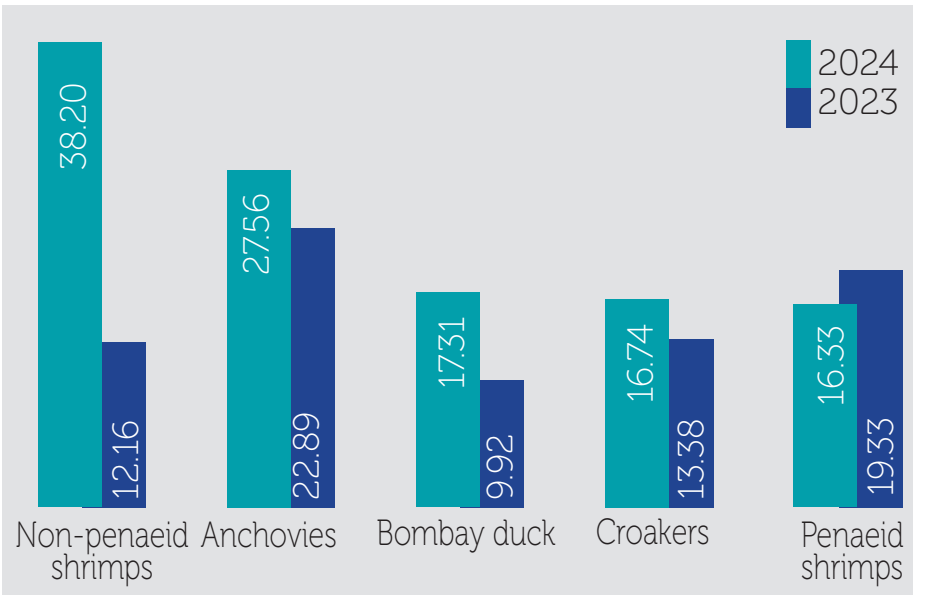
State experienced the impact of two cyclones during the year but fishery was not much affected as the first cyclone *Remal* occurred during the



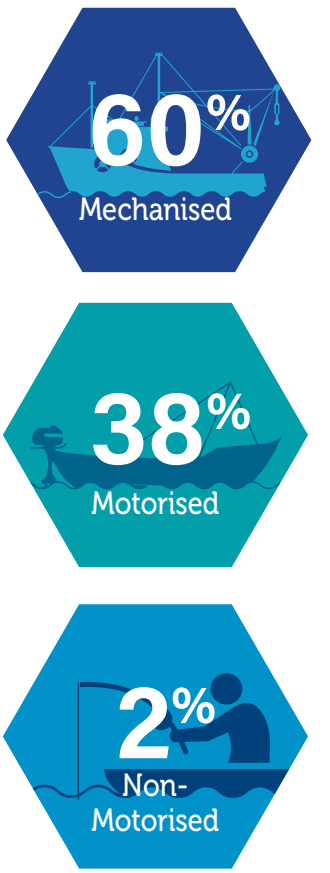
Quarter-wise landings (%)



Assemblage (%)



Major landings (in '000 t)



Sector-wise landings

fishing ban period of May. The second cyclone *Dana* occurred in October which caused the loss of some fishing days.

While South 24 Parganas district accounted for the majority of total landings (61%), motorised crafts in Purba Medinipur district landed the bulk of *Acetes* during the last quarter, primarily at medium and minor landing centres.

Finfish resources

The total finfish landings were estimated to be 1,68,905 t, accounting for approximately 72% of the state's total marine fish catch. This represents a 28% increase compared to the previous year's landings of 1,31,549 t.

In 2024, pelagic fish landings were 1,12,162 t, reflecting a 33% increase from the previous year's figure of 84,580 t and accounting for 48% of the state's total marine fish landings. Among the key pelagic resources, clupeids were the most dominant, contributing around 37% of the total pelagic landings, followed by anchovies (25%), Bombay duck (15%), ribbonfishes (10%), carangids (7%), mackerels (3%), seerfishes (2%), and other species.

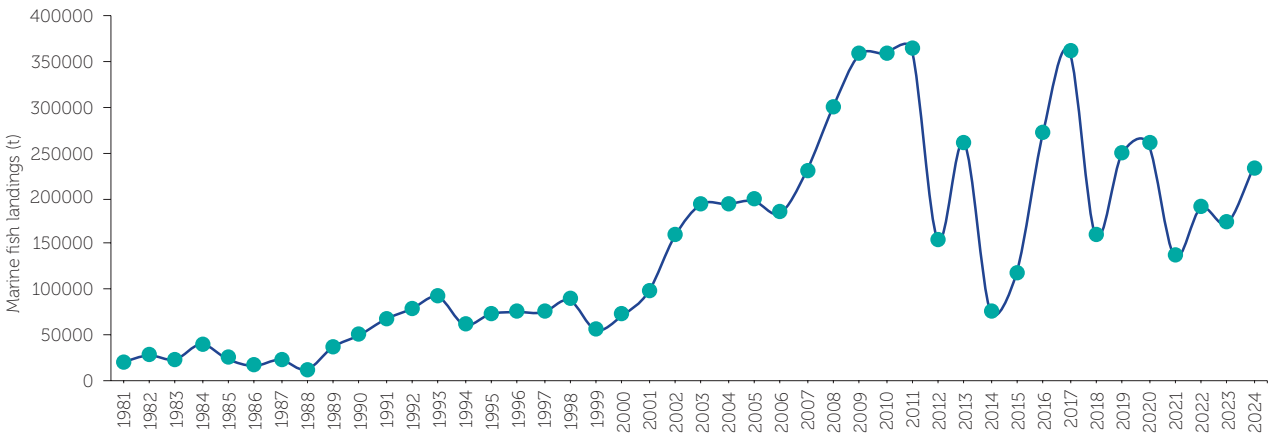
In 2024, demersal fish landings reached 56,743 t, reflecting a 21% increase from the previous year's total of 46,969 t and accounting for 24% of the state's total marine fish landings. Among the demersal resources, croakers were the most dominant, contributing approximately 30% of the total demersal landings, followed by pomfrets (24%), catfish (22%), perches (9%), threadfins (7%) and flatfish (6%).

Shellfish resources

The total shellfish landings were estimated to be 64,244 t, accounting for approximately 28% of the state's total marine fish landings. This represents a 55% increase compared to the previous year's landings of 41,393 t.

In 2024, crustaceans accounted for a total annual landings of 61,313 t,

Threespot swimming crab landings at Digha Mohana, West Bengal.



Multi-decadal trends in marine fish landings in West Bengal

Eleutheronema tetradactylum landing at Digha Mohana, West Bengal

Otolithes ruber landing at Digha Mohana, West Bengal

Epinephelus coioides landing at Digha Mohana, West Bengal

marking a 61% increase from the previous year's total of 37,968 t and comprising 95% of the state's total marine shellfish landings. The dominant resource within this group was non-penaeid shrimps (62%), followed by penaeid shrimps (27%) and crabs (11%), while stomatopods and lobsters made the smallest contributions, each at less than 1%.

In 2024, cephalopods landed along the West Bengal coast, with an annual catch of 2,931 t, accounting for 5% of the state's total marine shellfish landings. This represented a notable decline of approximately 14% from the previous year's total of 3,425 t. Among the cephalopod groups, cuttlefish contributed 78%, followed by squids at 21%, while

Penaeus monodon landing at Digha Mohana, West Bengal

Socioeconomics of marine fisheries of West Bengal during 2024

		Mechanised		Motorised		Non-motorised
Sl.no.	Indicators	Trawlnet	Gillnet	Gillnet	Bagnet	Shore seine
1	Net operating income ₹	67298	55196	874	4997	4744
2	Capital productivity	0.22	0.72	0.88	0.67	0.59
3	Labour productivity	174.7	57.8	16.14	50	9.48
4	Input-output ratio	0.47	0.36	0.54	0.25	0.07
5	Gross value added (GVA)	1,47,187	1,17,337	2674	10795	10100
6	GVA as % of gross revenue	48.45	60.44	33.85	69.62	87.63

Size range of commercially landed species in West Bengal during 2024

Sl.No.	Species	Length range (cm)	Mean length (cm)
1	*Tenualosa ilisha (TL)*	4.2-58.5	29.9
2	*Coilia dussumieri (TL)*	7.7-17	13.6
3	*Coilia ramcarati (TL)*	6.8-21.8	17
4	*Sardinella longiceps (TL)*	15.4-22.5	20.1
5	*Harpadon nehereus (TL)*	5.7-34	21.3
6	*Scomberomorus guttatus (FL)*	10.3-74.3	30.1
7	*Auxis thazard (FL)*	20.1-42	31.7
8	*Euthynnus affinis (FL)*	20.3-59.3	44.5
9	*Rastrelliger kanagurta (TL)*	13.7-27.1	21.1
10	*Lepturacanthus savala (TL)*	20.7-78	49.9
11	*Trichiurus lepturus (TL)*	34.3-96.8	64.3
12	*Rachycentron canadum (FL)*	11.7-173	68.3
13	*Tylosurus crocodilus (FL)*	57-125	88.7
14	*Polynemus paradiseus (TL)*	7.1-27.1	15.2
15	*Chrysochir aureus (TL)*	12.3-40	23.8
16	*Pterotolithus maculatus (TL)*	16.4-60.2	35.6
17	*Osteogeneiosus militaris (TL)*	7-47.5	25.6
18	*Pomadasys maculatus (TL)*	8.9-21.1	13.4
19	*Sillago indica (TL)*	5.6-26.5	16.8
20	*Sillaginopsis domina (TL)*	15-42	27.2
21	*Penaeus japonicus (TL)*	11.5-25.4	17.8
22	*Parapenaeopsis hardwickii (TL)*	3.8-14.1	9.6
23	*Portunus pelagicus (CW)*	8.9-18.5	14.5
24	*Charybdis feriata (CW)*	3.2-14.3	9.5
25	*Portunus sanguinolentus(CW)*	3.3-22.2	12.9
26	*Panulirus polyphagus (TL)*	10-36.3	20.2
27	*Sepia aculeata (ML)*	5.7-21.8	13.5
28	*Sepia brevimana (ML)*	2.1-10	7.2
29	*Sepiella inermis (ML)*	1.6-9	5.1
30	*Uroteuthis (Photololigo) duvaucelii(ML)*	3.5-15.2	8.5
31	*Sepia pharaonis (ML)*	13.6-31.0	20.3

octopus had the lowest contribution at just 1%. The primary species contributing to the landings included *Sepiella inermis, Uroteuthis (Photololigo) duvaucelii, Sepia aculeata, Sepia pharaonis* and *Sepia brevimana*.

Biology and stock assessment

Regular data collection on length frequency and biological investigations were carried out to evaluate the life history, exploitation parameters, reproductive biology, and feeding habits of 26 finfish and shellfish species that landed along the West Bengal coast.

Socioeconomics

The economic performance of various fishing methods has been analysed across different sectors in West Bengal. This includes trawlers and gillnetters from the mechanised sector, gillnetters and bagnetters from the motorised sector, and shore seiners from the non-motorised sector. The study was conducted at selected fish landing centres, evaluating key economic indicators such as net operating income, capital productivity, labour productivity, input-output ratio, Gross value added (GVA) and GVA as a percentage of gross revenue.

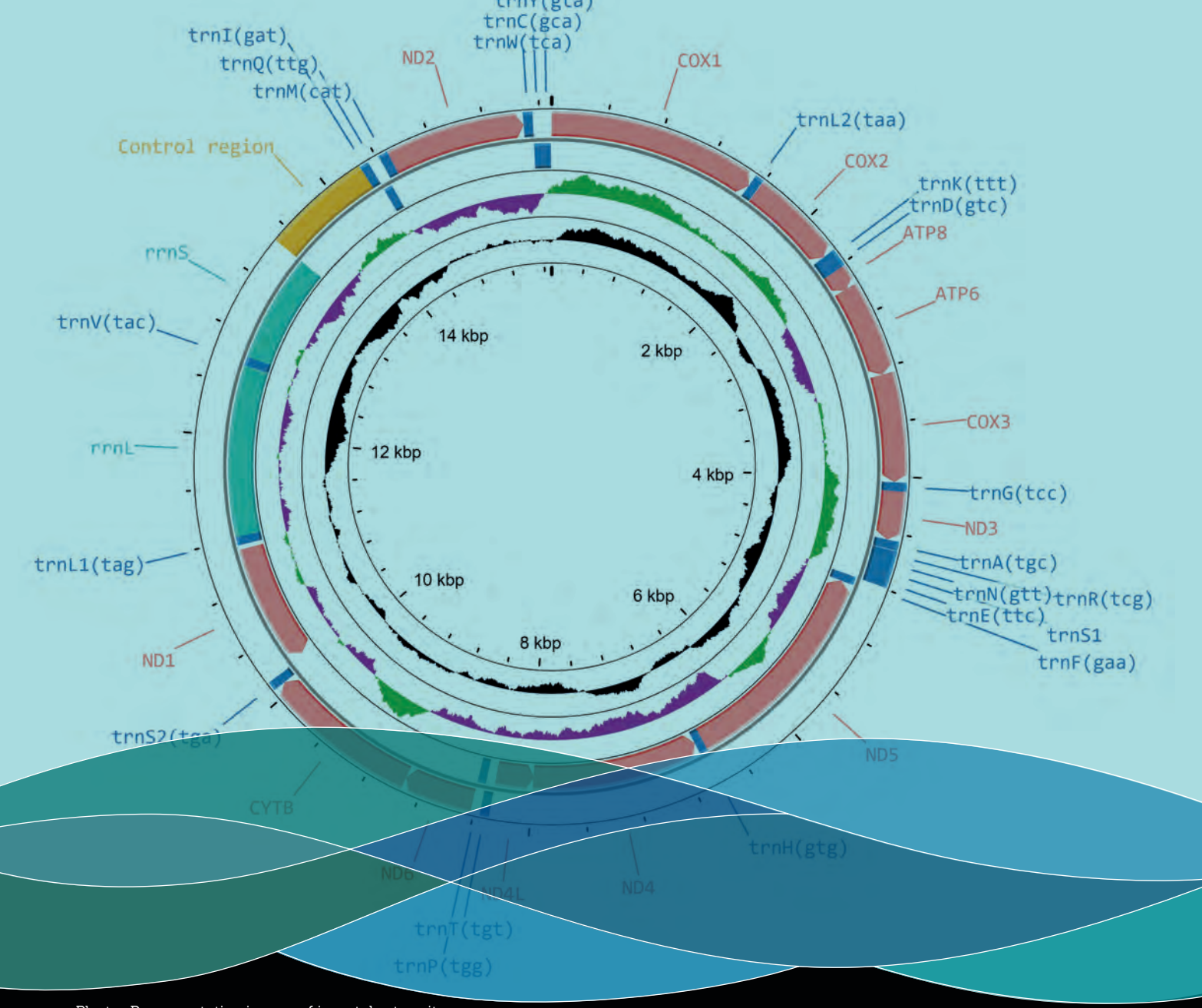


Photo: Representative image of invertebrate mitogenome

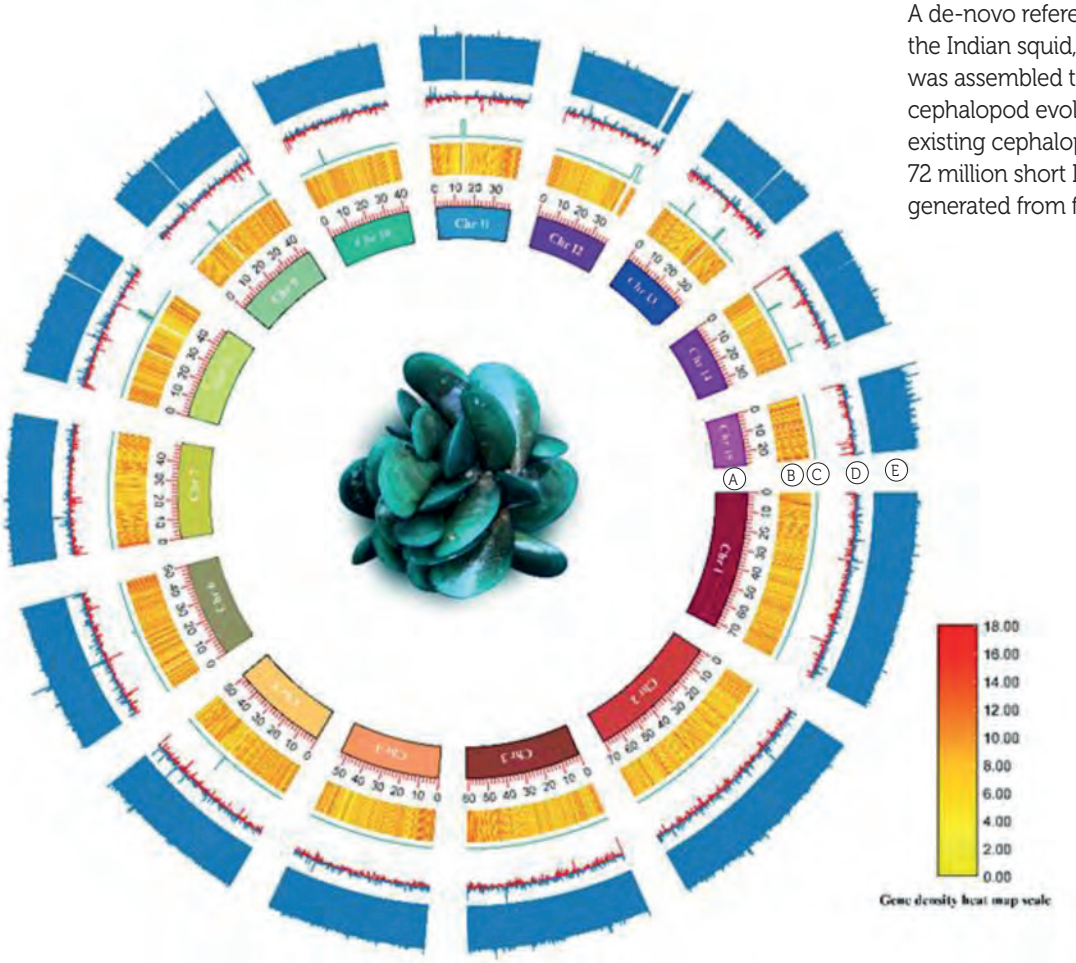
Genetics and Genomics

Genome assembly of the Asian green mussel, *Perna viridis*

Project: DBT

A high-quality, chromosome-level assembly of the Asian green mussel, *Perna viridis* was generated by combining PacBio single molecule sequencing technique (SMRT), Illumina paired-end sequencing, high-throughput chromosome conformation capture technique (Hi-C) and Bionano mapping. The final assembly resulted in a genome of 723.49 Mb with a scaffold N50 of 49.74 Mb with 99% anchored into 15 chromosomes. A total of 49654 protein-coding genes were predicted from the genome. The presence of 634 genes associated with the cancer pathway and 408 genes associated with viral carcinogenesis indicated the potential of this species to be used as a model for cancer studies.

The chromosome-level assembly of this species is also a valuable resource for further genomic selection and selective breeding to improve economically important aquaculture traits and augment aquaculture productivity.



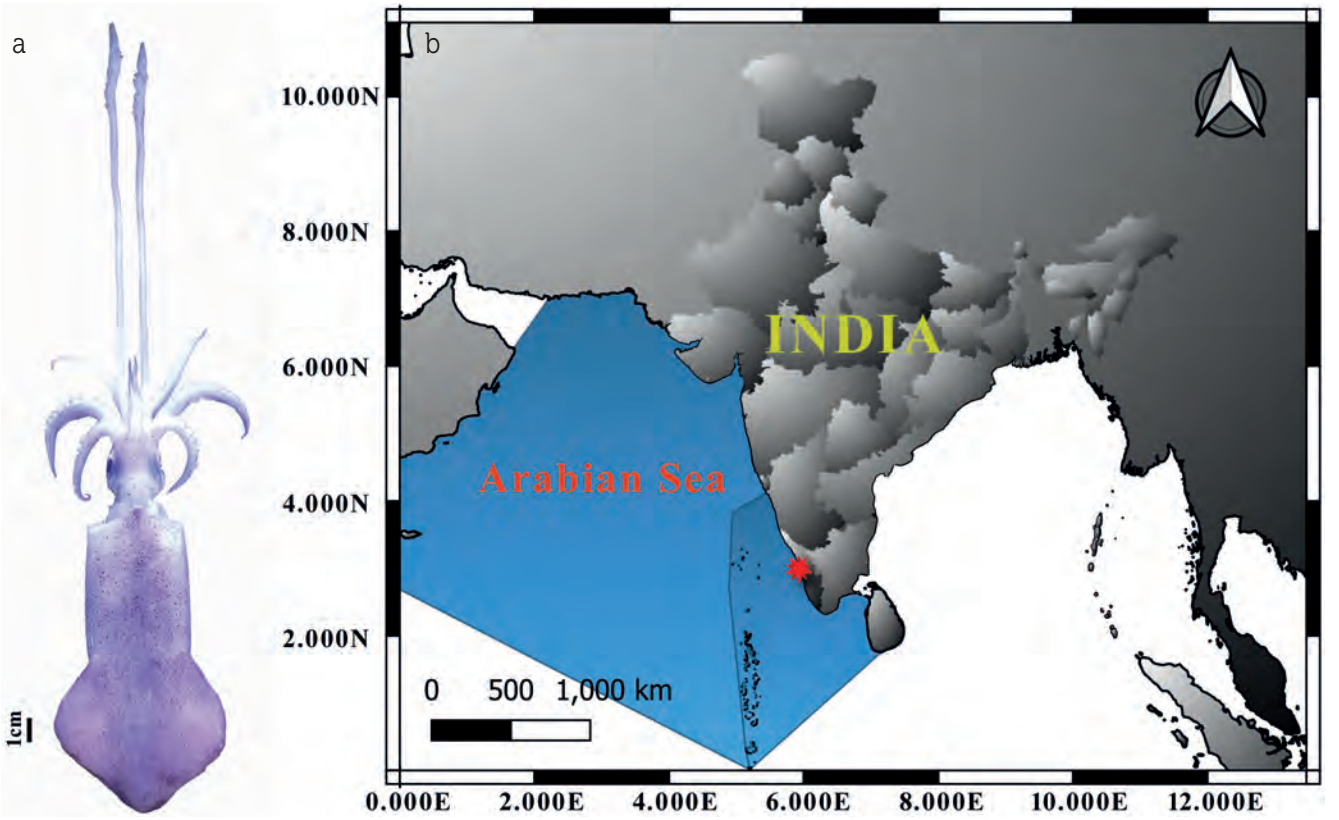
Circos plot of the *P. viridis* genome assembly: A) 15 chromosomes; B) Gene density heat map; C) N -ratio; D) GC skew; E) the distribution of GC content.

Genetic and genomic tools for fisheries, mariculture and conservation

Project: MBT/GNM/25

De Novo reference transcriptome assembly of Indian squid

A de-novo reference transcriptome of the Indian squid, *Uroteuthis duvaucelii* was assembled to gain insights into the cephalopod evolution and enrich the existing cephalopod database. Around 72 million short Illumina reads were generated from five different tissues,

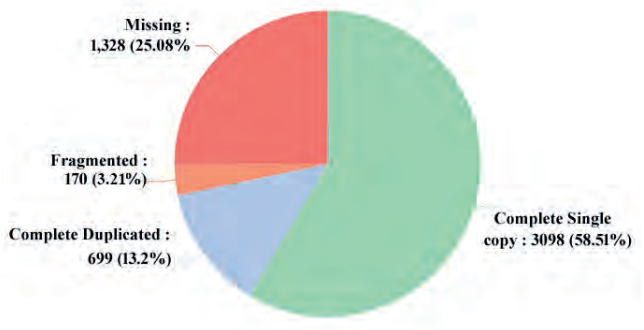


The squid, *Uroteuthis duvaucelii*, used for transcriptome sequencing (a) and sample collection site (b)

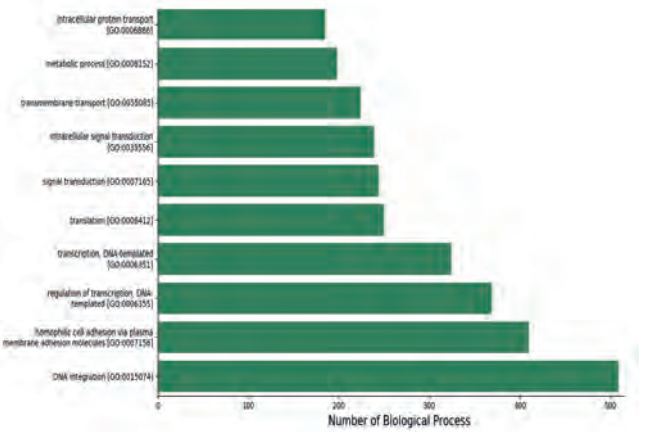
including the brain, eye, gill, heart and gonads, and assembled using the Trinity assembler. Around 26230 protein-coding sequences were annotated from the assembled transcripts. The BUSCO completeness of the assembly was 71.71% compared to the Mollusca_ Odb10 gene set. KEGG and REACTOME pathway analyses revealed that *U. duvaucelii* shares many genes and pathways with higher vertebrates.

Population genetic analyses on randall's threadfin bream

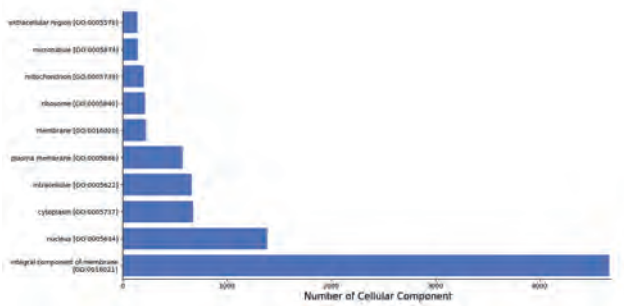
Population genetic analyses of Randall's threadfin bream, *Nemipterus randalli* were conducted using mitochondrial cytochrome b and nuclear ribosomal protein gene intron RpS7 sequences. Significant genetic differentiation was detected between the east and west coasts of India.



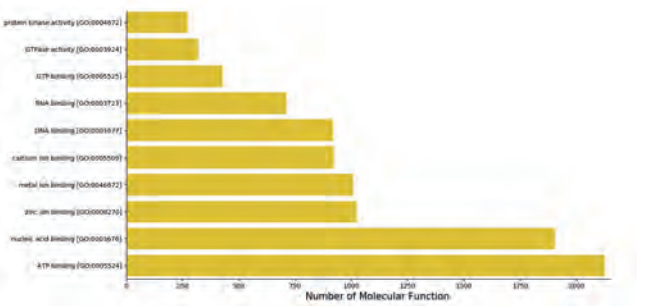
Assembled transcriptome quality. BUSCO score of C:71.71%, F:3.21% and M:25.08%-mollusca database.



The top 10 GO annotated terms corresponding to 'Biological Process (BP)'



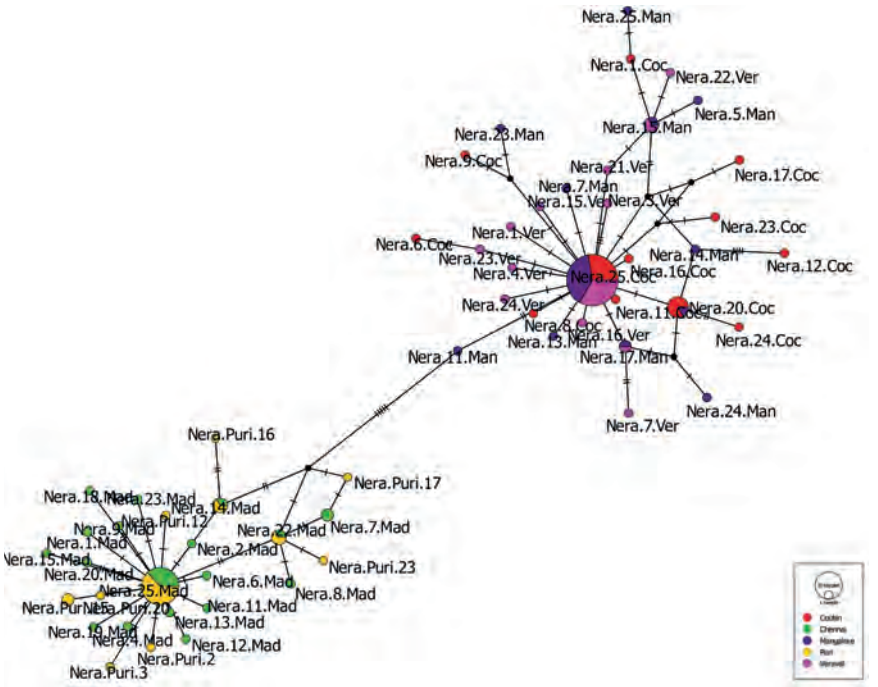
The top 10 GO annotated terms corresponding to 'Cellular Component (CC)'



The top 10 GO annotated terms corresponding to 'Molecular Function (MF)'

Spatial structuring of Indian scad populations

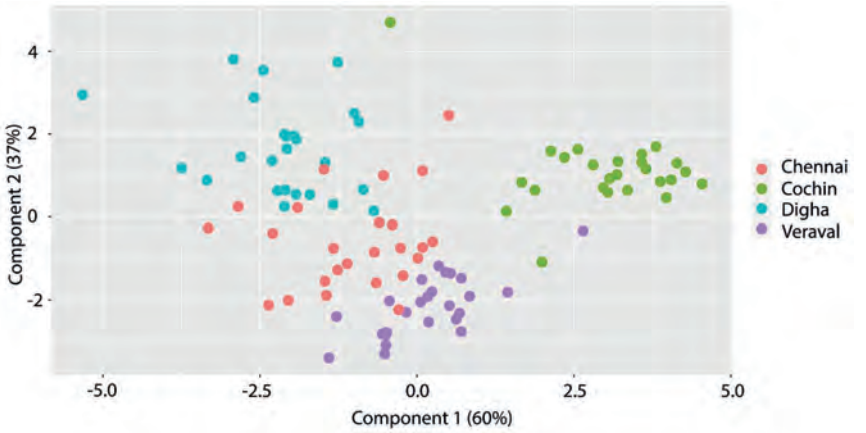
The spatial structuring of the Indian scad (*Decapterus russelli*) was assessed using otolith chemistry patterns. The whole sagittal otolith composition was analysed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) to assess the spatial distribution of *D. russelli* collected from 4 sites along the Indian coast. Elemental ratios (Ba/Ca, Fe/Ca, K/Ca, Mg/Ca, Na/Ca, Sr/Ca and Zn/Ca) were analysed using univariate and multivariate statistics to determine whether this chemical signature can provide insights into the adaptive patterns. All element/Ca ratios were found to be significantly different between the four sampling locations (ANOVA, $p < 0.05$; MANOVA, $p < 0.05$). Five of the element/Ca ratios were found to be significantly different when the data was analysed coastwise (ANOVA, $p < 0.05$; MANOVA, $p < 0.05$). The LDA plot also showed the spatial heterogeneity of element/Ca ratios between the four sampling sites, but some overlaps were also observed, reflecting the migratory ability of the species. The basic information on spatial ecology is essential for formulating effective management and conservation strategies for the species.



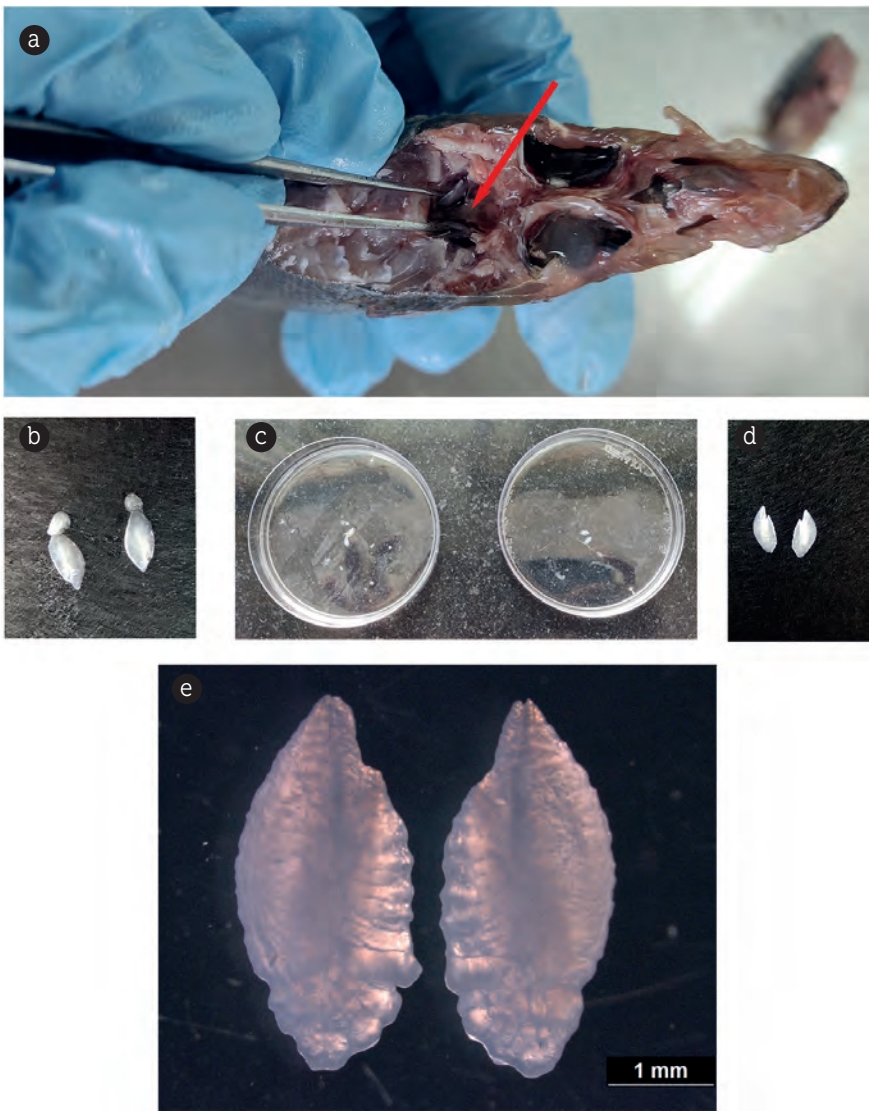
Median joining network for *N. randalli* based on Cytb sequences: haplotypes are represented in circles and colours indicate geographical locations. Vertical lines indicate mutational steps. Black dots indicate lost or not sampled haplotypes

Population genetic structure and mitogenomic recognition (*Panulirus polyphagus*)

The study provided the first report of three deep conspecific lineages in *Panulirus polyphagus* from the Indian Ocean, filling the gap in genetic research. Comparative mitogenomics data at the species and family levels, evolutionary relationships and heterogeneity of sequence divergence within decapoda, and divergence time were estimated. The mitogenomes were 15685 to 15705 bp in size followed the typical pan-crustacean pattern. Among the three lineages, L1 dominated the Bay of Bengal, L2 dominated the Arabian Sea, and L2.a, genetically closer to L2, was restricted to the Arabian Sea. The coral triangle region containing Indonesia appeared to have another lineage L1.a more closely related to L1. The mitogenome-based K2P divergence between the major lineages, L1 and L2 was ~8.0%. The largest genetic distance was between L1.a and L2.a (9%). The phylogenetic tree showed a clear pattern of lineage diversification in *P. polyphagus*. The species appears to have diverged during the Miocene, with further diversification events during the Pliocene. The lineages from the central Indo-Pacific and the Arabian Sea identified in this study



Linear discriminant analysis of otolith elemental composition: Plot of individual fish labelled by site using variates derived from linear discriminant analysis of elemental ratios. Coloured circles represent different locations.

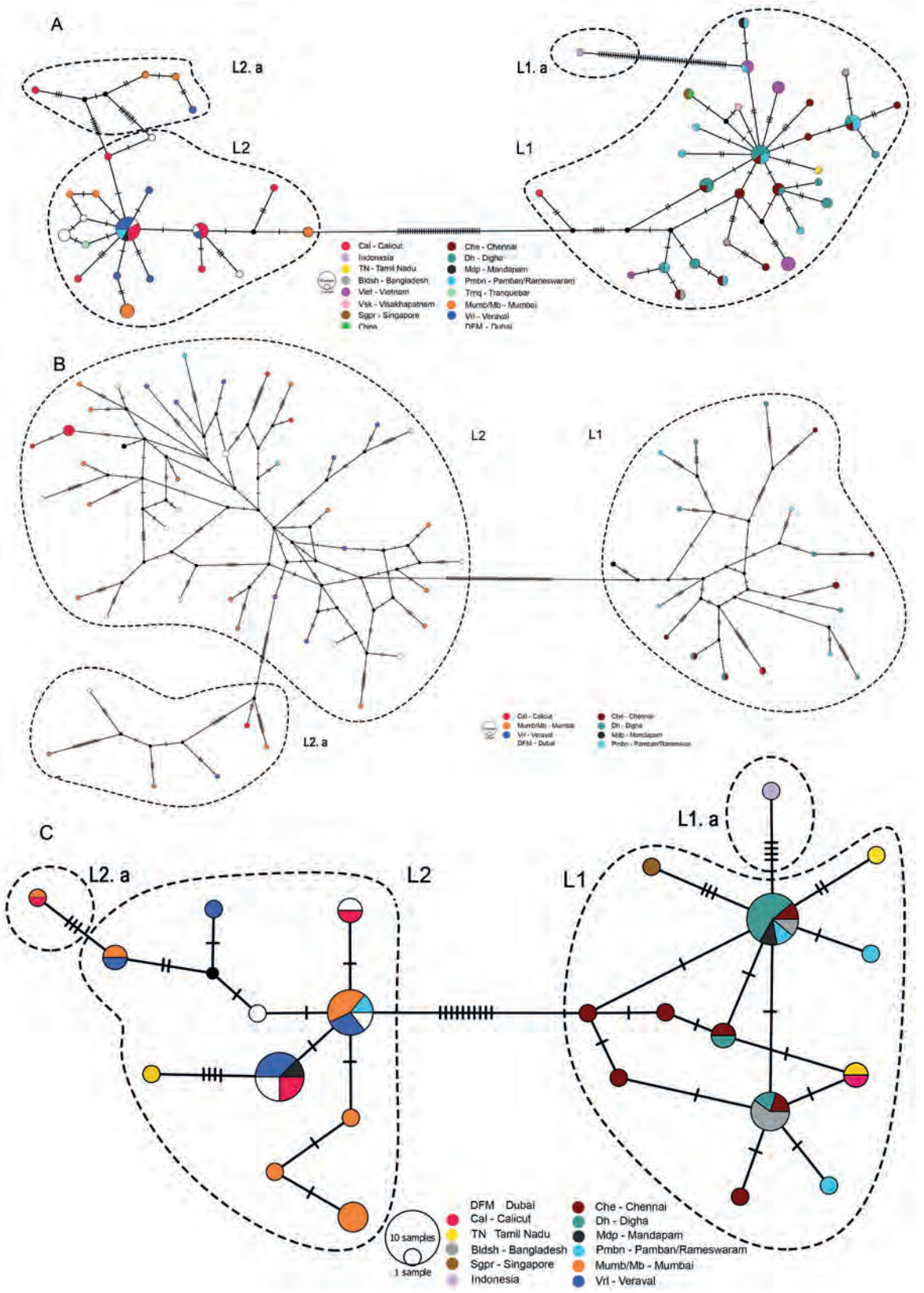


Removal and preparation of otolith for elemental analysis: (a) Removal of otolith by open the hatch method. Red arrow indicates the location of otolith; (b) all the three pairs of otolith and adherent tissue; (c) Washing and; (d) Cleaning of sagittal otolith; (e) Stereo zoom image of a pair of sagittal otoliths from *D. russelli.*

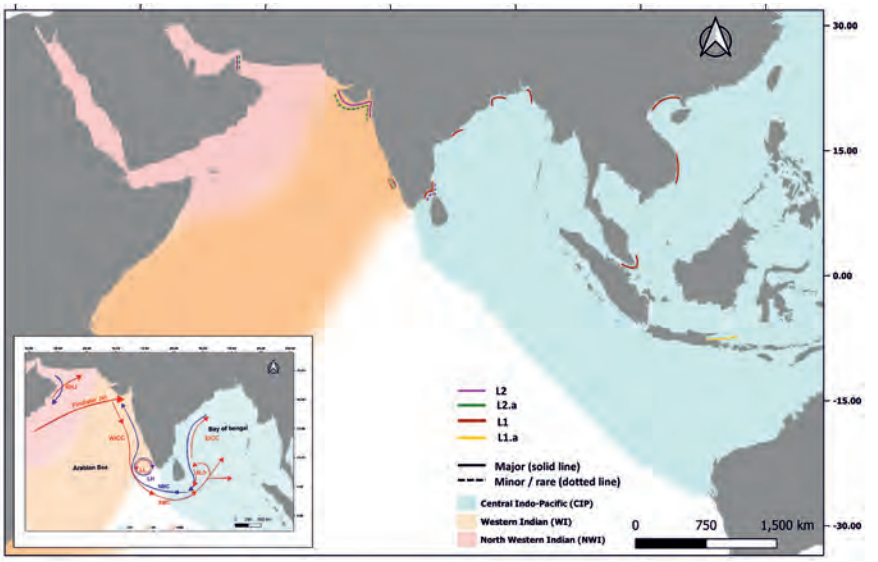
can be broadly categorised as two distinct genetic stocks that require separate management.

Transcriptome profiling of the metamorphosing Indian halibut, *Psettodes erumei*

The transcriptome profiling of the metamorphosing flat fish, Indian Halibut, *Psettodes erumei* was completed to better understand their cellular, biological and functional modifications concerning their efficient and successful production. The total number of reads generated from all the tissues together amounted to 236 million with an average read length ranging from 151-159 bp. After effective filtering and ribosomal removal, high-quality reads (average 13.11 million reads with read length ranging between 149–153 bp, average GC content of 46.72%, and an average Q30 (%) score of 93.75) alone were taken for assembly. The N50 length of assembly was 2477 indicating that the sum of all contigs of this length or longer covers at least 50% of the total assembly length. The BUSCO genes of Actinopterygii lineage were used to check the completeness of the transcriptome assembly, which resulted in 3339 complete genes out of 3640 total BUSCO genes in Actinopterygii lineage, accounting for 91.7 % completeness. A total of 243784 coding transcripts were identified and CD-HIT was used for clustering highly similar sequences to produce the final set of non-redundant representative sequences resulting in 87018 clusters. Protein domain-based annotation was done using the interproscan module of OmicsBox v3.3.2 resulting in 87,017 hits. The results revealed Protein Kinase as the dominant domain. EggNOG mapper was used for orthology-based annotation resulting in 42796 hits. Gene ontology and functional annotation were obtained

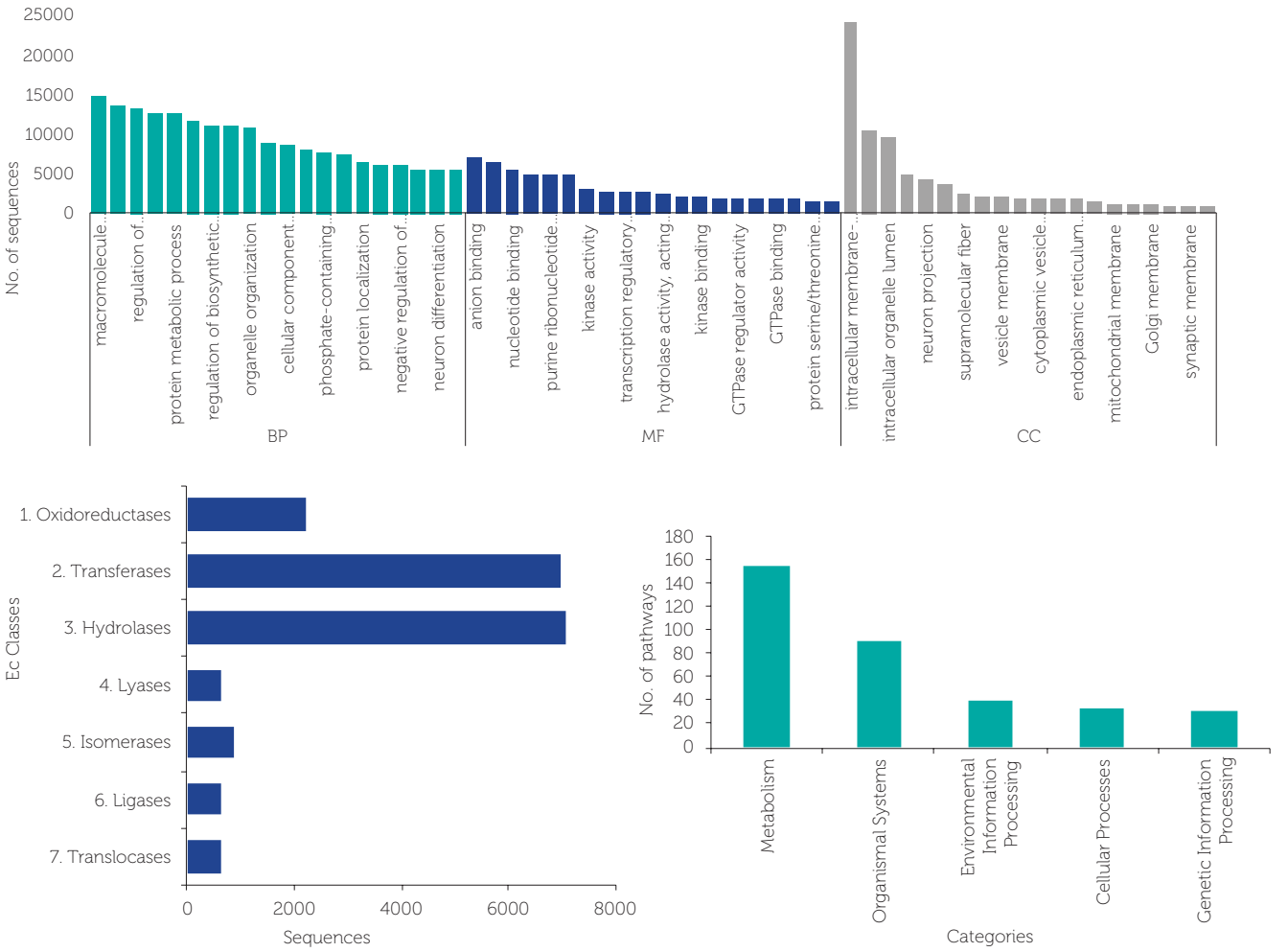


Haplotype network of *P. polyphagu*: A) COX1; B) Control Region and; C) 16S rRNA. The colours in the legend correspond to those of the haplotype network. Dashed circles indicate the different lineages.



Status map depicting the distribution of *P. polyphagus* lineages along the sampling sites: insight map shows the schematic illustration of the major currents along the Indian coastline

by combining terms from blastx, interpro and EggNOG summing to a total of 39,852 transcripts. Hydrolases, transferases and oxidoreductases were the most dominant enzyme classes expressed. Gene ontology revealed that the most expressed GO categories were macromolecule biosynthetic process, Anion Binding and intracellular membrane-bounded organelle. KEGG pathway analysis indicated that 21,155 sequences were involved in 351 pathways. Most dominant pathways were relative to metabolism followed by organismal systems, environmental information processing, cellular process and genetic information processing.

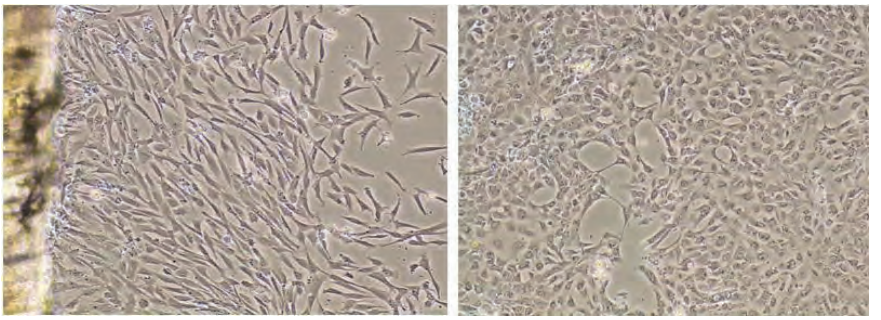


Transcriptome analysis of the Indian Halibut, *Psettodes erumei*

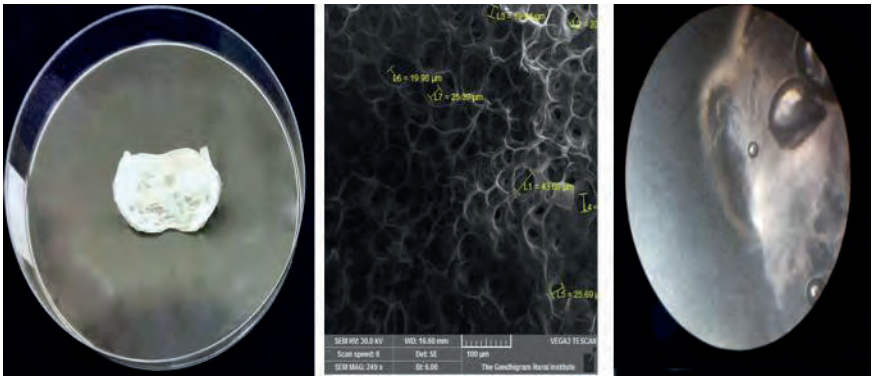
Cellular mariculture and refinement of *in-vitro* pearl formation

Project: MBT/CA/26

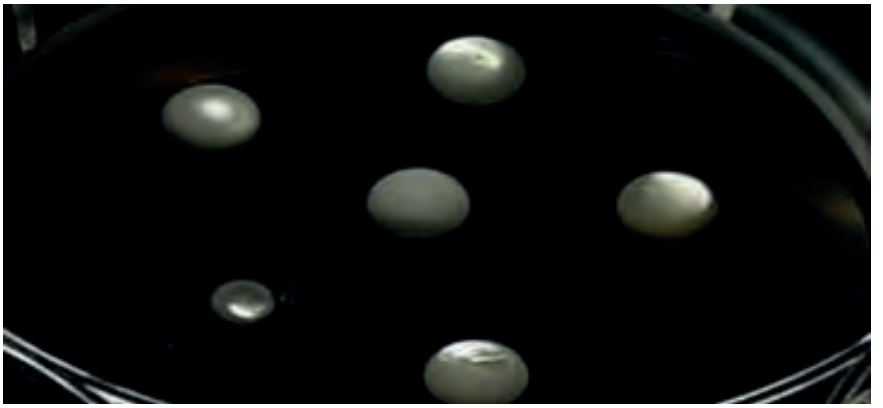
Live healthy Nemipterus fishes (average weight 90 ± 15 Gms) collected from the coastal waters of Chennai were used for the initiation of primary cultures. Leibovitz's L15 and Minimal Essential Medium supplemented with 10- 20% foetal bovine serum were used for the development of primary cell cultures from the muscle explants. Proliferation and emergence of cells from the attached muscle explants and subsequent monolayer formation were observed within 10 to 15 days post-incubation. The fibroblast-like cells started spreading rapidly, forming a network and cells were found attaching to the substrate of the culture flask from the second day. Trials were conducted for the standardisation and preparation of tissue-engineered biocompatible scaffolds using Chitosan and Carrageenan for the growth of muscle cells onto scaffolds. The average pore size of the scaffold was found to range from 19µm-44µm. The fabricated Chitosan and Carrageenan scaffold sustained the growth of muscle cells for 10 days post-incubation. The refinement of the *in-vitro* pearl formation process resulted in the development of 22 lustrous prototypes of marine pearls on different size nuclei with bright reflections around the circumference of the nucleus.



Liberation of cells from muscle explants and formation of monolayer of cells



SEM image of scaffold and growth of cells on the scaffold



Development of prototype of marine pearl *in-vitro*

Stock structure investigations on yellowfin tuna

Project: DoF-PMMSY

Yellowfin tuna (*Thunnus albacares*), a key oceanic resource, lacks clear stock structure data in the Indian Ocean, essential for its scientific management. To address this, a project funded under the Department of Fisheries – PMMSY initiative was undertaken to identify stock structuring using advanced genomic tools. High-quality DNA from 338 samples underwent ddRAD sequencing on the Illumina Novaseq 6000 platform. Samples were digested with MspI and EcoRI enzymes, barcoded, size-selected using BluePippin, PCR-amplified, and sequenced with a 100 bp approach. Preliminary findings reveal significant genetic differentiation, indicating distinct stock structures between Lakshadweep, mainland India, and international waters. These insights are crucial for informed management and conservation of Yellowfin tuna in the region.

Photo: Fish feeds developed by ICAR-CMFRI

Fish Nutrition

Nutrition and nutrigenomics for mariculture and fisheries

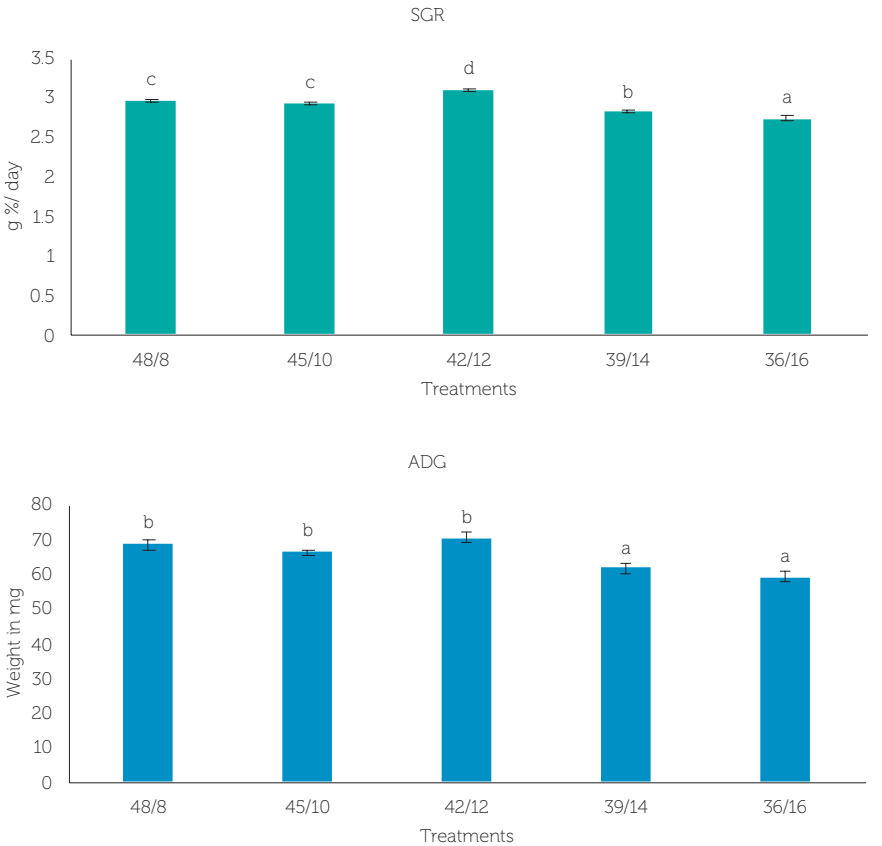
Project: MBT/NGM/24

Demonstration of Cadalmin™ SilverGrow feed for silver pompano

ICAR-Central Marine Fisheries Research Institute partnered with ABIS Exports India Pvt Ltd (IB Group) to execute the demonstration of cage farming of silver pompano using the Cadalmin™ SilverGrow aquafeed, developed by ICAR-CMFRI. The harvest was done on the National Fish Farmers Day. During the event, progressive farmers from Uttara Kannada district were honoured for their excellence in marine and coastal cage farming. Assessment of the growth performance and production efficiency commenced in December 2023 and spanned seven months. The results indicated optimal growth and efficient feed utilisation, underscoring the feed's suitability for sustainable marine cage farming systems. The trial demonstrated the potential of Cadalmin™ SilverGrow feed to enhance the sustainability and productivity of cage aquaculture of silver pompano. Cadalmin™ SilverGrow, contains a minimum of 38% protein and 8% fat, featuring a high-quality blend of marine proteins along with soy flour, wheat flour, fish oil, vitamins, minerals, antioxidants and antifungal agents.

Harvest of silver pompano (*Trachinotus blochii*) fed with Cadalmin™ SilverGrow feed

Release of Cadalmin™ SilverGrow by Honourable Minister of State, Prof. S. P. Singh Baghel



The average daily growth (ADG) and specific growth rate (SGR) of fish obtained after the trial. The mean values in the same colour bar with different superscripts differ significantly (P<0.05). The data expressed mean ±SE; n=3.

Release of Cadalmin™ SilverGrow

Honourable Minister of State for Fisheries, Animal Husbandry & Dairying and Panchayati Raj, Government of India, Prof. S. P. Singh Baghel released the Cadalmin™ SilverGrow- a novel grow-out feed for silver pompano (*Trachinotus blochii*), developed by the ICAR-CMFRI.

Energy requirement in picnic seabream, *Acanthopagrus berda*

Dietary energy requirement in Picnic seabream, *A. berda* was studied with varying levels of DP/DL (%) with the DP: DE content (mg/kJ): 48/8 (28.8), 45/10 (26.5), 42/12 (24.0), 39/14 (21.7) and 36/16 (19.5). The experimental fishes with an initial body weight of 1.2±0.15 g were stocked in five treatments each in triplicates. Five isonitrogenous diets with varying levels of dietary energy content were prepared for the experiment. The diets were either higher protein/lower lipid/ higher DP: DE or lower protein/higher lipid/lower DP: DE contents. The experiments were conducted for 120 days. The fish reached the average final size of 16.8 ±0.37 g. The study revealed that better weight gain percentage (WGP), specific growth rate (SGR) and average daily growth (ADG) were witnessed in 42/12 (24.0 mg/kJ) group.

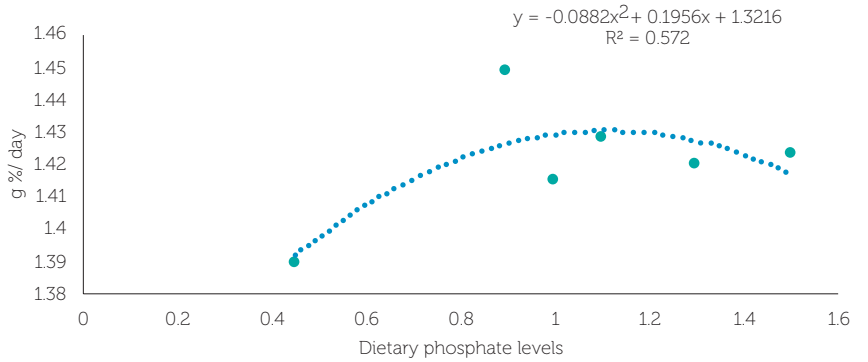
Dietary phosphate requirement of snubnose pompano, *Trachinotus blochii*

The dietary phosphate requirement of snubnose pompano, *Trachinotus blochii* was studied with varying levels of phosphate (%) 0.45, 0.90, 1.0, 1.1, 1.30 and 1.5%. The experiment was conducted for 90 days. Six isonitrogenous (38% CP) and isocaloric (6% CF) experimental feeds were prepared with varying levels of

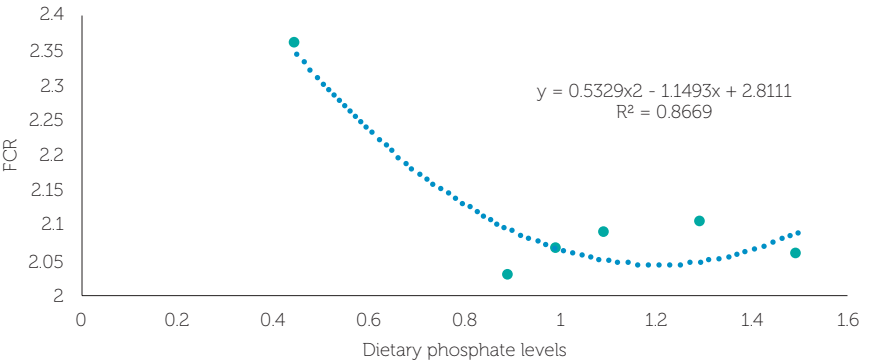
phosphate content. The growth and biochemical parameters were studied from the different treatments. The results of the study revealed that better body gain percentage (BGP), specific growth rate (SGR) and feed conversion ratio (FCR) were observed in fish fed with 0.90% phosphate content in the diet.

Black soldier fly larvae-based bioconversion

Honourable Minister of State for Fisheries, Animal Husbandry & Dairying and Minority Affairs, Government of India, Shri George Kurian inaugurated the black soldier fly larvae-based bioconversion unit, designed and developed by the Marine Biotechnology Fish Nutrition and Health Division of ICAR-CMFRI. The unit is designed to process vegetable and fishery-related biological wastes of the institute, adhering to the principles of zero waste and circular economy. This unit can process 60-70 kg of organic waste daily. 'Cadalmin™ BSF ZW- A



The specific growth rate (SGR) of fish fed with different levels of phosphate: X-axis represents dietary phosphate levels and Y-axis represents SGR.



The feed conversion ratio (FCR) of fish fed with different levels of phosphate. X-axis represents dietary phosphate levels and Y-axis represents FCR.

Honourable Minister of State for Fisheries, Animal Husbandry & Dairying and Minority Affairs, Government of India, Shri George Kurian inaugurating the black soldier fly larvae-based bioconversion unit

Release of brochure, on black soldier fly larvae-based fish feed by Honourable Minister of State Shri George Kurian

Zero-Waste bioconversion system' brochure was also released by the hon'ble minister in an event held at the ICAR-CMFRI on 26 September 2024 as part of the *Swachhata Hi Seva* campaign led by ICAR-CMFRI.

Innovative insect protein-based fish feed technology

ICAR-CMFRI has signed a memorandum of understanding (MoU) with M/s Amala Ecoclean Pvt. Ltd. for transfer of technology to produce fish feed using Black Soldier Fly Larvae (BSFL). This collaboration focuses on promoting eco-friendly and cost-effective methods for fish feed production, harnessing the nutritional potential of BSFL, which is rich in protein and other essential nutrients for aquaculture. The partnership underscores CMFRI's dedication to advancing sustainable practices in aquaculture.

Nutritional properties of commercially important cephalopods

Among six edible species, *Cistopus indicus, Amphioctopus marginatus, Amphioctopus aegina, Sepia pharaonis, Sepia elliptica* and *Sepia aculeata,* studied from the Malabar

Signing of MoU with M/s Amala Ecoclean Pvt. Ltd

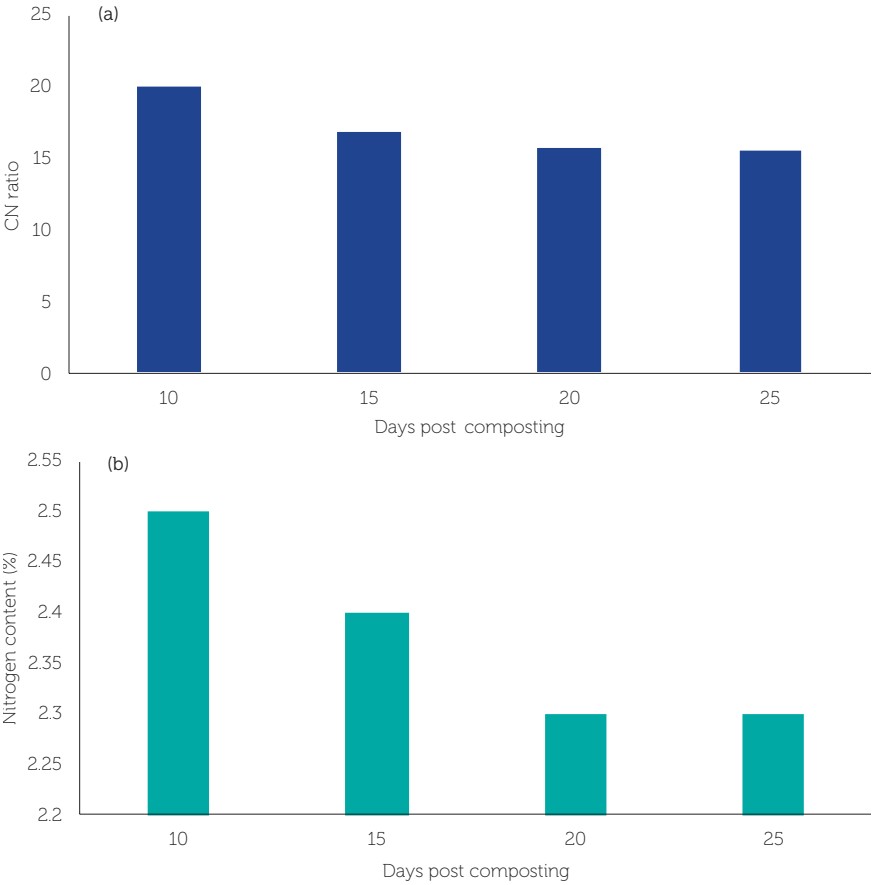
coast, *A. marginatus* exhibited the highest PUFA content (36.85%), while *A. aegina* stood out for its vitamin D3 (96.23 µg/100 g), supporting bone health. Octopus species exhibited a significantly greater Σn-3/Σn-6 ratio than cuttlefish species. The ideal atherogenicity/ thrombogenicity indices (<1.0) in the edible tissues of the studied cephalopods qualify these species as potentially healthy food. The amino acid profile demonstrated a balanced ratio of essential to non-essential amino acids (0.93-1.63) with a higher concentration of essential amino acids, attributing enhanced biological value of proteins in these cephalopods. S. pharaonis recorded the highest arginine- to-lysine ratio (~1.77), indicating excellent cholesterolemic index.

Biochemical and nutritional profiling of selected tropical green seaweeds

The nutritional composition and anti-inflammatory properties of six tropical green seaweed*s viz., Ulva lactuca, Ulva linza, Halimeda macroloba, Halimeda gracilis, Chaetomorpha antennina* and *Chaetomorpha linum* were evaluated. *Ulva lactuca* showed the highest carbohydrate content (66.1%). *Chaetomorpha linum* exhibited the strongest anti-inflammatory activity (IC_{50} 1.60 mg ml/1), with bioactivity correlating to the favourable n-3/n-6 fatty acid ratio, positioning these seaweeds as promising candidates for dietary supplements and functional foods.

Biochemical analysis and nutritional profile of deep-sea shrimp

With low thrombogenicity and atherogenicity indices, high potassium and iron content, and a balanced amino acid profile, *Plesionika semilaevis* emerges as a nutritious and healthful dietary option.



The C:N ratio (a) and nitrogen content of the compost (b) on different days

Fish waste degrading microbial consortium

Identified a reliable method for producing axenic cultures of ammonia and nitrite-oxidizing bacteria, which can be used for purifying the cultures of fish waste degrading consortium. Phytotoxicity evaluation of the final compost (at 25 days of composting) indicated that it is matured by 20-25 days of composting. Further, nutrient evaluation of the final compost (at 25 days of composting) indicated that the final products qualified the requirements for its use as a plant fertilizer.

Release of Cadalmin™ Microfin

Project: DBT Dr E G Silas CoE

Dr J. K. Jena, DDG (Fisheries Science) released Cadalmin™ Microfin- a novel micro-feed for altricial marine fin fish larvae, developed by the ICAR-CMFRI in an event held at the ICAR-CMFRI, Kochi. Cadalmin™ Microfin is an innovative micro-feed developed using advanced fluidised bed processing.The developed feed is precisely engineered to address the nutritional needs of delicate marine fish larvae during their initial growth phases. The feed features optimal particle sizes, superior water stability, and enriched nutrient content (crude protein: 50%, lipid: 15% minimum), ensuring improved survival and growth rates while reducing feed

Release of Cadalmin™ Microfin

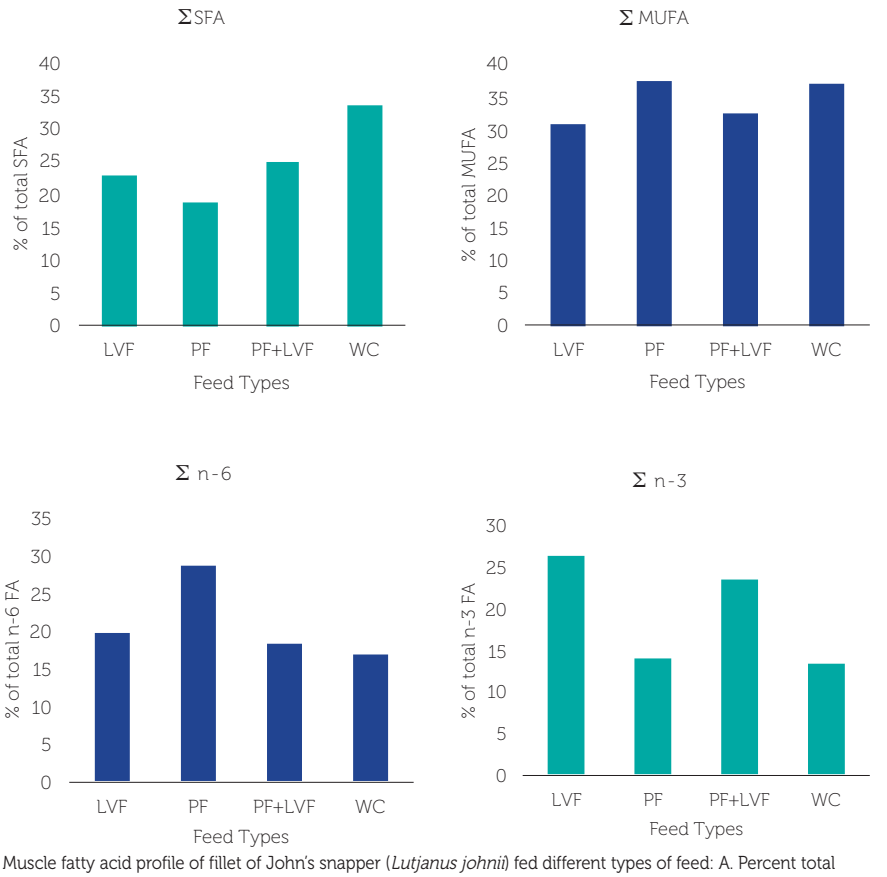
waste. Successfully trialled in the larvae of cobia and pompano, it outperforms commercially available feeds in key parameters such as water stability, nutrient retention, buoyancy, and digestibility, establishing it as a premium choice for sustainable aquaculture practices.

Nutritional value of John's snapper (*Lutjanus johnii*) fed on different feeds in sea cages

Project: MDN/SMP/19

In this trial, the fish were fed trash fish (TF), pellet feed (PF), and a combination of both pelleted feed and trash fish (PF+TF). The fish were fed three times a day at 5% of their body weight. At the end of the trial, fish muscle samples were collected for nutritional analysis. Fish that received a combination of pelleted feed and trash fish showed high protein content (85.22±2.3) and lower lipid content (8.72±1.2). In contrast, fish that received TF alone had higher lipid accumulation (15±0.98) compared to the PF group (11.85±1.3). There was no significant difference in the amino acid profile of the fish.

The fish that received commercial pelleted feed exhibited significantly lower total saturated fatty acid (SFA)



Muscle fatty acid profile of fillet of John's snapper (*Lutjanus johnii*) fed different types of feed: A. Percent total Saturated Fatty Acids; B. Percent total Monounsaturated Fatty Acids; C. Percent total n-6 Fatty acids; D. Percent total n-6 Fatty acids. Data are shown as mean values with their standard errors (n = 3). Statistical significance analysed through one-way ANOVA and Tukey's multiple comparisons.

Fatty acid profile of fillet of John's snapper for each rearing system (% of total FA methyl esters)

Fatty acids	Trash fish	Pelleted feed	Pelleted feed and Trash fish	Wild caught
C14:0 (Myristic)	0.01	0.01	0.05	0.01
C15:0 (Pentadecanoic)	0.08	0.02	0.6	2.62
C16:0 (Palmitic)	18.4	15.68	20.41	18.76
C17:0 (Heptadecanoic)	0.73	0.15	0.13	0.39
C18:0 (Stearic)	1.17	1.11	2.15	8.24
C20:0 (Arachidic)	0.37	1.07	1.06	2.1
C21:0 (Henicosanoic)	0.76	0.16	0.13	0.44
C22:0 (Behenic)	1.34	0.28	0.21	0.66
∑SFA	23.03	18.65	24.86	33.57
C16:1 (Palmitoleic)	0.81	0.16	0.1	0.46
C17:1 (cis-10-Heptadecenoic)	0.63	0.12	0.2	0.16
C18:1n9c (Oleic)	26.34	34.7	30.14	22.27
C20:1n9 (cis-11-Eicosenoic)	2.05	1.81	1.14	4.66
C22:1n9 (Erucic)	0.57	0.16	0.15	8.44
C24:1n9 (Nervonic)	0.2	0.59	0.51	0.75
∑MUFA	31.06	37.59	32.66	37.02
C18:2n6t (Linolelaidic)	0.95	0.14	0.2	0.17
C18:2n6c (Linoleic)	3.75	23.62	4.74	5.32
C18:3n6 (g-Linolenic)	0.38	0.13	0.13	0.11
C20:3n6 (cis-8,11,14-Eicosatrienoic)	2.1	2.24	3.15	3.58
C20:4n6 (Arachidonic)	12.53	2.68	10.16	7.78
∑n-6	19.7	28.82	18.38	16.95
C18:3n3 (a-Linolenic)	3.04	3.73	3.7	1.71
C20:3n3 (cis-11,14,17-Eicosatrienoic)	0.03	0.04	0.09	0.09
C20:5n3 (cis-5,8,11,14,17-Eicosapentaenoic)	3.14	2.06	2.01	1.77
C22:6n3 (cis-4,7,10,13,16,19-Docosahexaenoic)	20.45	8.15	18.02	8.81
∑n-3	26.67	13.98	23.82	12.38
∑PUFA	46.37	42.8	42.2	29.33
n-3/n-6	1.35	0.49	1.3	0.73

contents (∑SFA; 18.65±1.3%) compared to fish fed trash fish alone (23.03±2.1%) and those fed a combination of trash fish and pelleted feed. Wild-caught fish showed significantly higher ∑SFA levels (33.57±3.4%) than fish in all other feeding groups, including those fed pelleted feed, trash fish, or a combination of both. Conversely, pelleted feed-fed fish recorded the highest monounsaturated fatty acids (MUFA) (∑MUFA; 37.59±4.8%), highlighting the influence of feed composition. Wild-caught fish exhibited comparable ∑MUFA levels (37.02±3.4%), which could be attributed to their naturally MUFA-rich diet.

Trash fish-fed fish revealed the highest total omega-3 fatty acid content (∑n-3; 26.67±4.5%) and overall polyunsaturated fatty acid (∑PUFA; 46.37%), indicative of the nutrient-rich profile of trash fish. In contrast, pelleted feed-fed fish had elevated omega-6 fatty acid levels (∑n-6; 28.82%) but reduced ∑n-3 (13.98±2.1%), resulting in a lower n-3/n-6 ratio (0.49).

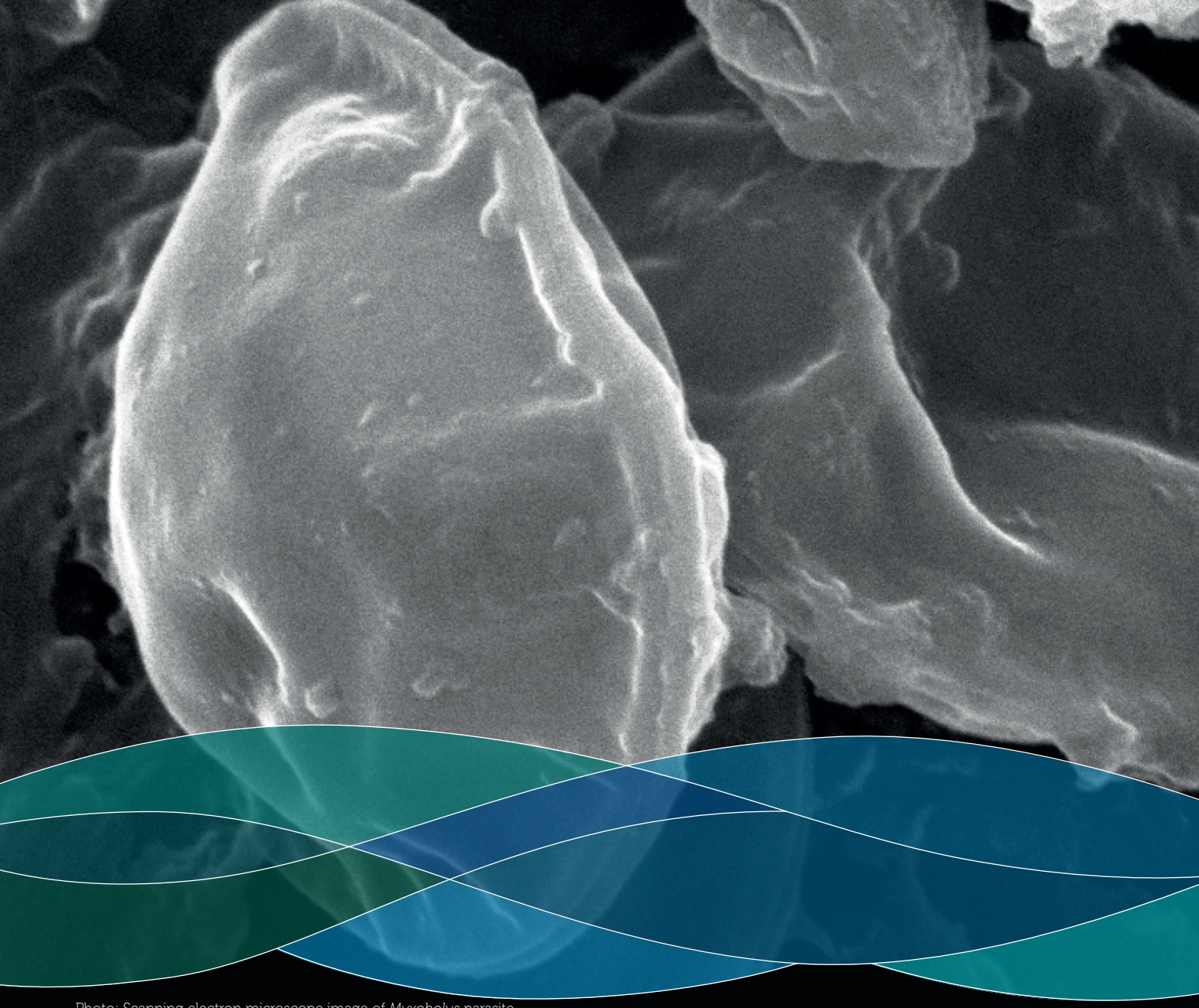


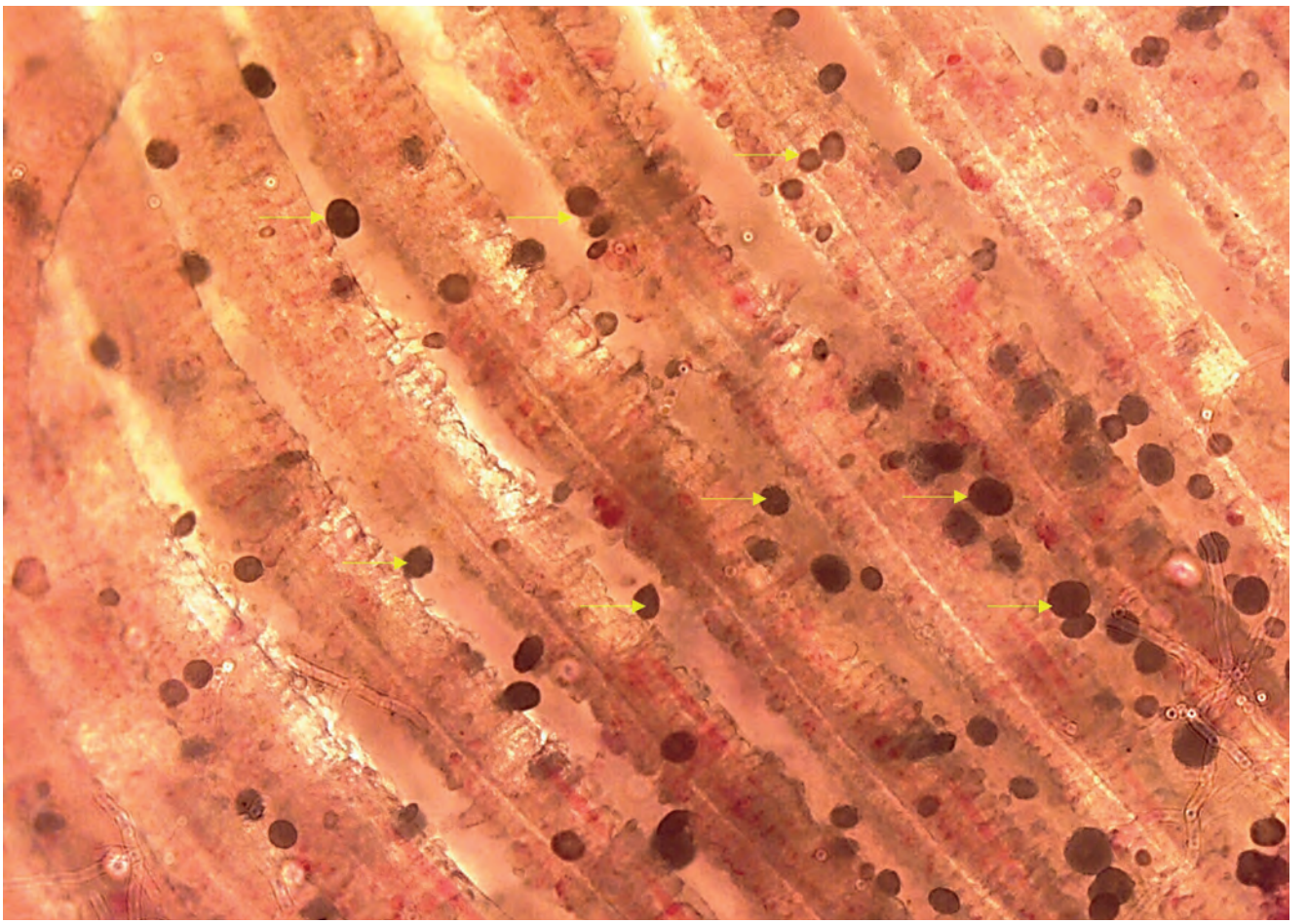
Photo: Scanning electron microscope image of *Myxobolus* parasite

Fish Health Management and Bioprospecting

Health management in marine finfish and shellfish

Project: MBT/HLT/23

Pathogen profiling of various fin fishes revealed two new parasitic myxosporean species, viz. *Myxobolus rakeri* n. sp. infecting the gill rakers, and *Myxobolus mali* n. sp. infects the mullet's gill arch (*Planiliza macrolepis*). The two new species were unique based on variations in morphology and morphometry, phylogenetic analysis, and host and site of infection. Infestations and infections by parasites, bacteria and fungus, including epizootic ulcerative syndrome (EUS) were documented in various fish species, including broodstocks of Indian pompano, maroon clownfish (*Premnas biaculeatus*), Asian seabass (*Lates calcarifer*), seer fish (*Scomberomorus commersoni*), mangrove red snapper from the marine finfish hatchery at Visakhapatnam, Mandapam and Karwar, and cage farms in Kerala. The Indian pompano broodstocks in cages were infested with the monogenean flatworm, *Neobenedenia girellae*. In maroon clownfish, parasitic infections by *Amyloodinium ocellatum* were treated using formalin baths at 150 ppm for 45 min, demonstrating an effective method to control the infestation. In cage-farmed Asian seabass, sea lice (*Argulus quadristriatus*), marine leeches and developmental stages of helminth parasites were identified, highlighting the prevalence of parasites in



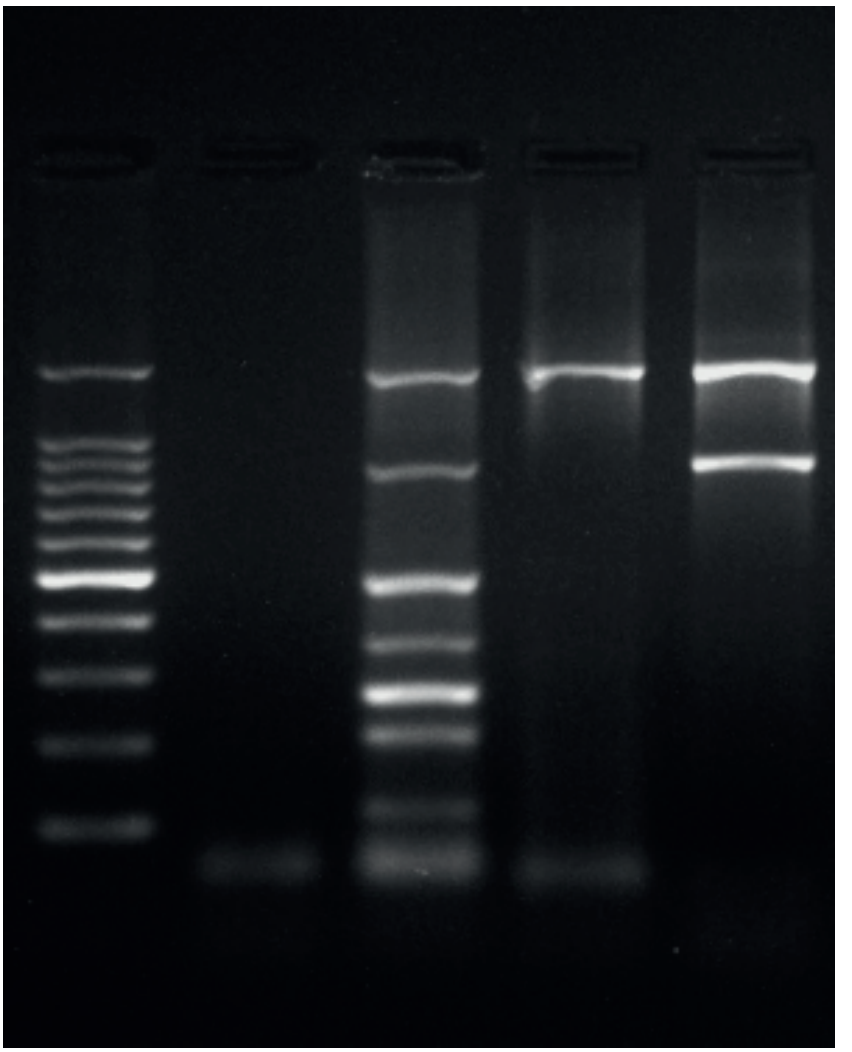
Trophonts (arrows) on the gills of maroon clown fish infected with *Amyloodinium ocellatum*

Skin lesions with deep ulcer (arrow) in mangrove red snapper with epizootic ulcerative syndrome

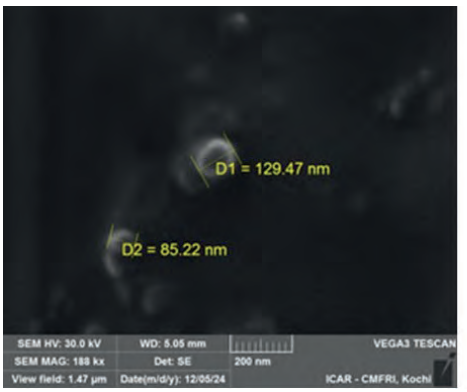
aquaculture settings. Additionally, *Microcotyle* spp. was observed in wild juvenile seer fish collected from Karwar and Majali landing centres of Karnataka. Pinkish discolouration of larval tank bottom leading to sluggish larval movement, black colouration, reduction in feed consumption and 70 to 100% larval mortality have been observed in pompano larval rearing facilities.

Treatment protocols, vaccines and diagnostics

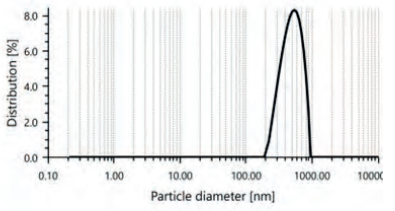
A multiplex PCR for simultaneous detection of five pathogenic vibrios, namely *Vibrio parahemolyticus*, *Vibrio vulnificus*, *Vibrio cholerae*, *Vibrio fluvialis* and *Vibrio mimicus* in a single reaction, along with one internal amplification control, was optimised. The optimised multiplex PCR assay successfully detected all targeted genes with high reproducibility. Evaluation of the sensitivity and specificity showed a reliable, efficient, and specific method for identifying five *Vibrio* species in a single reaction without the chance of false negative results. The optimised assay represents a significant advancement in pathogen detection, offering a



Multiplex PCR assay for simultaneous detection of several *Vibrio* pathogens



Size determination of polymeric nanoparticles



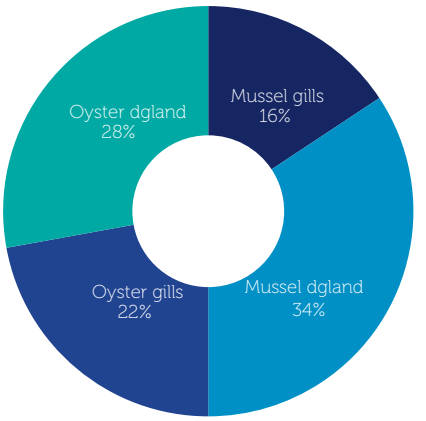
Characterisation of nanoparticles by scanning electron microscopy and dynamic light scattering

reliable, efficient, sensitive, and specific method for identifying five *Vibrio* species in a single reaction.

The virulence of various *Vibrio* strains was assessed through PCR-based amplification of key functional genes, including those involved in transcriptional regulation, quorum sensing, bioluminescence initiation, and chitinase activity, for developing an oral encapsulated vaccine. These strains were subsequently inactivated using formalin. A stable nanoparticle emulsion composed of polymeric nanoparticles was developed, and the formulation process was standardised. The particle size was analysed and the morphology was examined through scanning electron microscopy. This polymeric nanoparticle emulsion is intended for use in vaccine delivery.

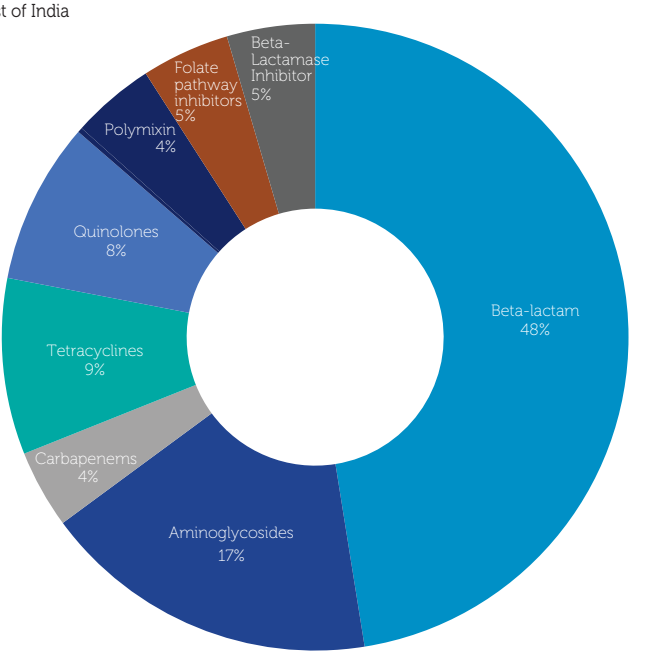
Abundance, enzyme profiling and antimicrobial resistance patterns of marine bacteria

A prevalence of *Escherichia coli* in *Perna viridis* (23.3%) and *Magallana bilineata* (35%) was recorded in 350 bivalves sampled from three sites on the southwest coast of India. Digestive glands exhibited a higher frequency of *E. coli* than gills, with 69% and 56% of *E. coli* recovered from the digestive gland in *Perna viridis* and *Magallana bilineata*, respectively. The highest prevalence of *E. coli* was found in Ashtamudi Lake in Dalavapuram (53%), followed by Vembanad Lake in Sathar Island (33.75%) and Kayamkulam Lake (14.7%). Among the enzymes studied, 82.8% of the *E. coli* isolates showed caseinase production, with four (3.8%) isolates producing exceptionally high activity with a zonal diameter >5mm. Moderate caseinase activity was exhibited by 69.5% of isolates. One of the isolates (KLK8) displayed lecithinase and gelatinase activity.

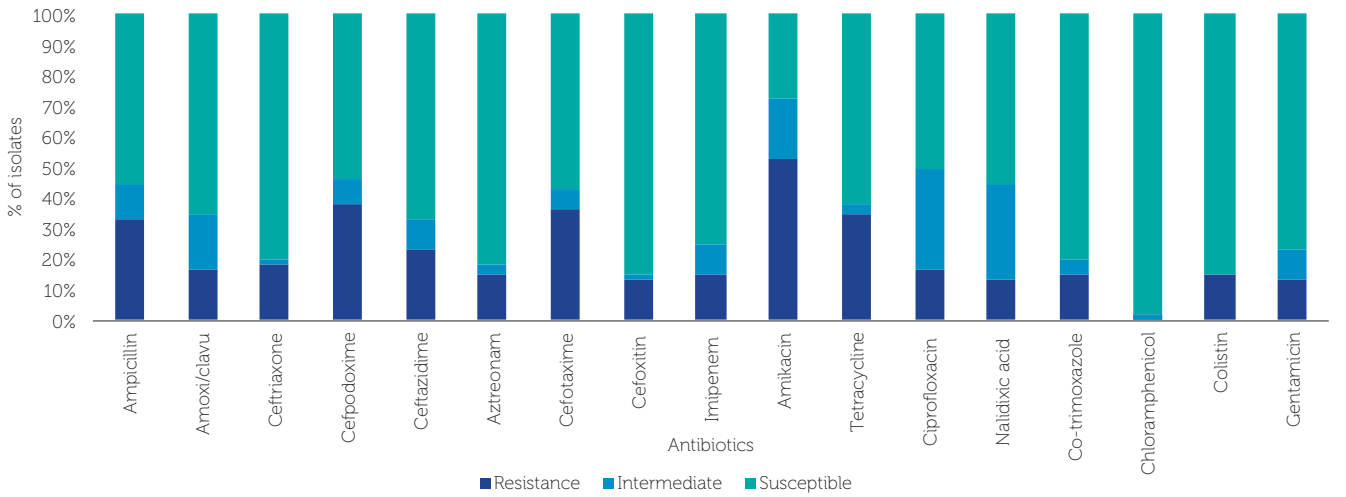


Prevalence (%) of *Escherichia coli* in the digestive gland and gills of oysters and mussels from the southwest coast of India

Escherichia coli isolates from all the sampling sites were screened for phenotypic antibiotic resistance. The highest resistance was found against the β-lactams (48%) class of antibiotics followed by aminoglycosides (17%), tetracycline (9%), and quinolones (8%). Fifty-five (52.38%) isolates were resistant to Amikacin, 40 (38%) isolates were resistant to Cefpodoxime, 38 (36%) were resistant to Cefotaxime, and 35 (33%) isolates were resistant to ampicillin.

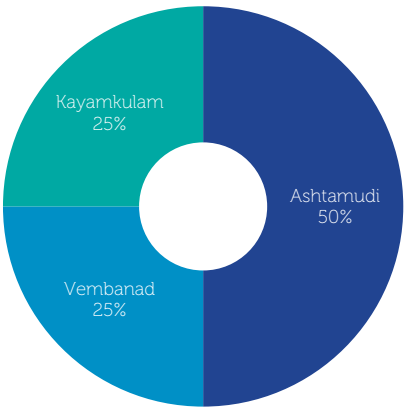


Resistance pattern in *Escherichia coli* isolated from bivalves to different classes of antibiotics



AMR pattern in *E. coli* isolated from bivalves

Except for one isolate, all other isolates were susceptible to chloramphenicol. With a MAR index value greater than 0.2, 41.9% of isolates were resistant to at least four different antibiotics examined. Twenty-two (81.48%) isolates from Ashtamudi Lake, 71.4% from Vembanad Lake and 44% from Kayamkulam Lake had a MAR index value >0.2. However, none of the multi-drug-resistant *Escherichia coli* isolates were resistant to all 17 antimicrobial drugs tested. One of the isolates from Ashtamudi Lake was resistant to 13 antibiotics examined, with the MAR pattern AMP/ AMC/ CTR/ CPD/ CAZ /AZ /CTX / CX/AK/TE/CIP/ COT/COL and a MAR index of 0.76.



Multiple drug resistance in *Escherichia coli* isolates with MAR index values >2

About 58% of the isolates under aerobic conditions had considerable biofilm-forming ability, with four isolates being very powerful biofilm makers. Under anaerobic conditions, 52.4% of the isolates showed strong biofilm-producing potential. The positive control exhibited high biofilm-forming capabilities under both aerobic and anaerobic conditions. There was no significant difference in biofilm biomass under aerobic and anaerobic conditions.

All India network project on fish health

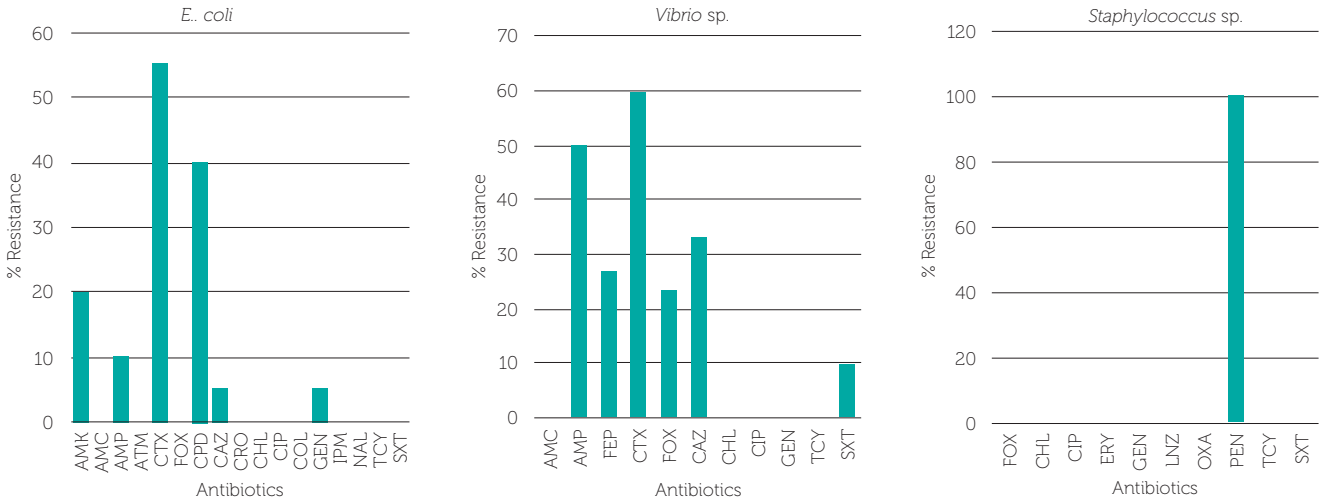
Project: ICAR-Network

Comparative *in vitro* efficacy evaluation of commonly used aquaculture disinfectants (chloramine-T, benzalkonium chloride, iodophor, formalin, Clorox, 50% glutaraldehyde, 30% hydrogen peroxide, and potassium permanganate) against *Streptococcus agalactiae* isolates revealed iodophor and chloramine-T as the most effective disinfectants against *S. agalactiae*. Pharmacokinetic profiles of oxytetracycline in *T. blochii* revealed that apart from the blood, concentrations of the drug in the intestine, plasma, gill, liver, muscle and kidney at 11 sampling points of drug administration were studied. The generated data can be applied to formulating efficient therapeutic protocols.

All India network project on antimicrobial resistance

Project: ICAR-Network

Staphylococcus aureus, CONS, *Escherichia coli*, *Vibrio parahemolyticus* and other green Vibrios were isolated from the gills and intestines of cage-reared marine fishes and subjected to phenotypic antimicrobial susceptibility tests and genetic determinants of resistance. The highest resistance was observed in *Escherichia coli* against Cefotaxime (55%) followed by Cefpodoxime (40%). In *Vibrio* spp. the highest resistance was observed against Ceftazidime (36.4%) followed by Ampicillin (27.3%) and Cefepime & Cefoxitin (18.2%). In the case of *Staphylococcus* spp. (n=1), the highest resistance was seen against Penicillin G (100%).



Antimicrobial resistance pattern in bacteria isolated from cage-farmed marine fish

National surveillance programme for aquatic animal diseases

Project: PMMSY

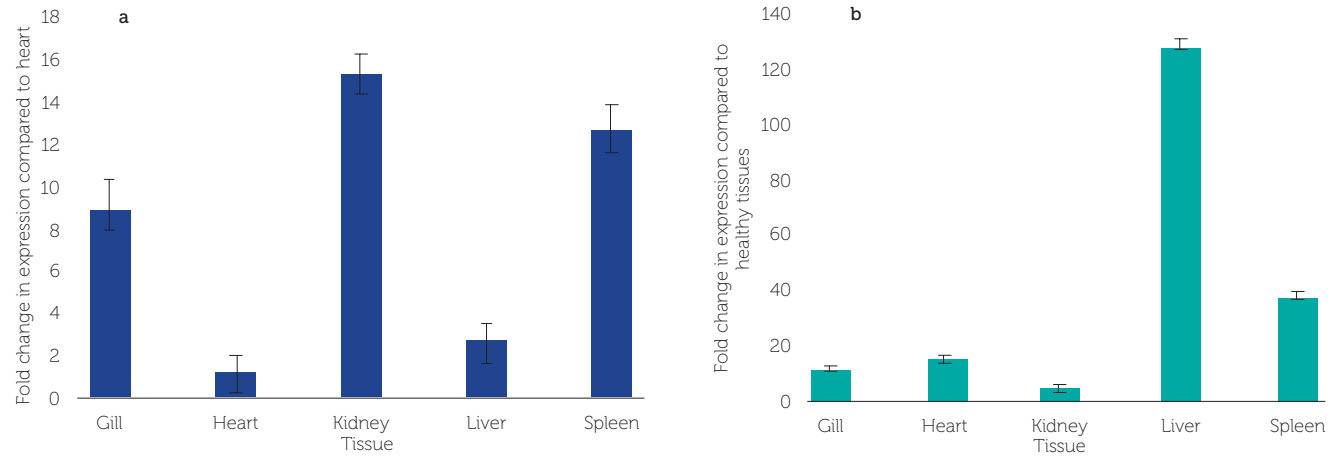
A total of 2233 bivalves, consisting of 1736 farmed and 497 wild bivalves sampled from Kerala, Karnataka and Goa, revealed infection with *Perkinsus olseni* and *Perkinsus beihaiensis*. Concurrent infection with the presence of both species was also observed.

Dr E. G. Silas centre of excellence and innovations in marine fish microbiome

Project: DBT

Identified the complete coding sequence of a novel homologue of the TNF-α gene from *Trachinotus blochii*. The comparative phylogenetics identified the isoform of the TbTNF-α as type 1. The molecular features of the gene and predicted protein, structural details of the protein, genomic organisation, and functional validation in both healthy and post-bacterial challenge were studied in detail. Since the in-silico analysis predicted the biological function of the gene as the regulator in the defence response to bacterial infection, functional validation was done through the expression analysis following *Vibrio harveyi* challenge. The results showed that the expressions of tbtnfα-1 were

Bivalves	No. of bivalves sampled	% +ve for *P. olseni*	% +ve for *P. beihaiensis*	Concurrent infection
Wild	497	9.34	25.82	8.79
Farmed	1736	11.70	44.63	5.42



Expression of TNAz gene in healthy(a) and infection-challenged (b) snubnose pompano

significantly up-regulated in the liver, spleen, heart, gill and kidney of challenged fish, depicting the functional significance in the immune response of silver pompano against bacterial infection. For *in vitro* expression analysis of immune genes and optimising concentrations of immune modifiers in *Trachinotus blochii* larvae, fin and kidney tissue explants were obtained from healthy *Trachinotus blochii* and grown in optimised conditions up to 22 passages and cryopreserved.

Development of small molecular weight bioactives and polysaccharides from marine and coastal bivalves

Project: NASF

A sulphated glycosaminoglycan from *Perna viridis* demonstrated significant anti-inflammatory properties by suppressing nitric oxide secretion in LPS-induced RAW 264.7 cells and reducing carrageenan- and formalin-induced paw oedema in a dose- and time-dependent manner. A sulphated glycosaminoglycan (MBP-3) isolated from the slipper oyster, *Magallana bilineata* demonstrated strong anti-inflammatory effects by inhibiting 5-lipoxygenase and cyclooxygenase-2 enzymes.

Evaluation of immune-enhancing polysaccharides of edible chlorophytan seaweed, *Ulva lactuca*

Project: SERB

The anti-inflammatory potential of UFP-2, isolated from *Ulva fasciata* was demonstrated through the regulation of key cytokines involved in inflammatory responses, with a downregulation of IFN-α and IL-1β, reduction in expression of TNF-α in lipopolysaccharide-induced CALU-1 cells. A (1→3)/ (1→4)-linked galactofucopyranose, isolated from a brown marine macroalga, exhibited anticoagulant effects by interfering with multiple steps in the blood coagulation cascade.

Development of polyketide and oligosaccharide analogues from economically important seaweeds

Project: DBT

A polygalacto-fucopyranose isolated from a marine alga, *Sargassum wightii* exhibited potential antihypertensive activity. Upon treatment with studied polygalactofucan, serum hypertension biomarkers troponin-T, troponin-I and angiotensin-II converting enzymes were significantly recovered in hypertensive rats. Sulphated polysaccharides like URP-2 from *Ulva reticulata*, exhibited strong anti-inflammatory effects by increasing interferon-α expression and reducing levels of inflammatory cytokines in LPS-induced CALU-1 cells.

Development of high-value pharmacophores and nutraceutical products from marine macroalgae

Project: ICAR Norman Borlaug Award Challenge Research

A sulfated rhamnoglycan (ULP-2), extracted from the seaweed *Ulva lactuca,* exhibited significant immunomodulatory effects by downregulating inflammatory cytokines like IFN-γ, TNF-α, and IL-1β in LPS-induced CALU-1 cells, while upregulating IFN-α.Sulfated polysaccharides, like URP-2 from *Ulva reticulata*, exhibit strong anti-inflammatory effects by increasing interferon (IFN)-α expression and reducing levels of inflammatory cytokines such as IL-1β and TNF-α in LPS-induced CALU-1 cells.

Photo: Hatchery-produced juveniles of giant trevally

Broodstock and Seed Production

Captive breeding and seed production of important finfishes, shellfishes, other invertebrates and seaweeds

Project: MD/CBR/18

Broodstock development of the big eye trevally (*Caranx sexfasciatus*), white-spotted spine foot (*Siganus canaliculatus*), streaked spine foot (*Siganus javus*), yellowfin surgeonfish (*Acanthurus xanthopterus*) and small spotted dart (*Trachinotus baillonii*) is progressing in captivity, besides 11 ornamental finfishes, three invertebrates (sea urchin, bivalve and sponge).

Captive breeding and seed production of food fishes, *viz.* the gold silk seabream (*Acanthopagrus berda*), vermiculated spine foot (*Siganus vermiculatus*), green snapper (*Lethrinus nebulosus*), pink-ear emperor (*Lethrinus lentjan*), banded grunt (*Pomadasys furcatus*) are under various stages of standardisation and breakthrough achieved in the case of golden trevally (*Gnathanodon speciosus*) and giant trevally (*Caranx ignobilis*). Captive spawning was successful for eight species of ornamental value, of this, initial success was achieved for seed production of royal dotty back (*Pictichromis paccagnellorum*), while seed production standardised for three species (lemon damsel-*Pomacentrus moluccensis,* azure

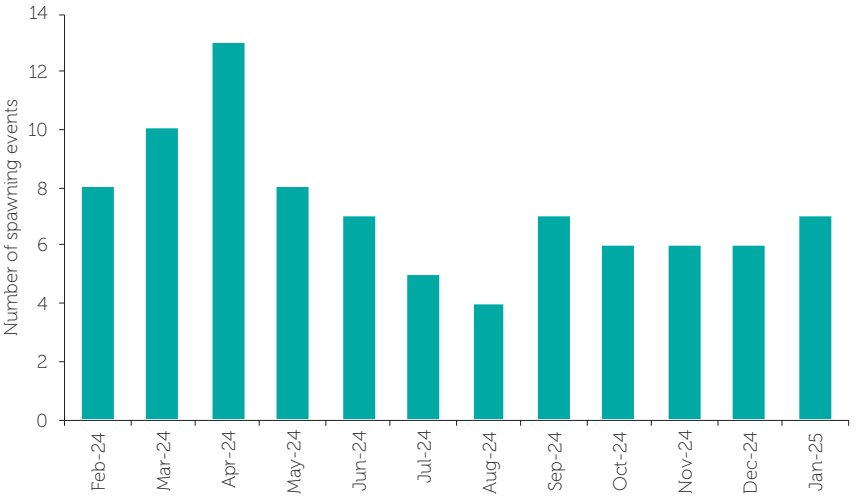
Hatchery-produced juveniles of golden trevally *(Gnathanodon speciosus)*

damsel- *Chrysiptera hemicyanea,* ornate goby- *Istigobius ornatus*).

Golden trevally

Captive breeding protocol for golden trevally (*Gnathanodon speciosus*) standardised. Mature males and females of the species, at a sex ratio of 1:2 (female: male), were maintained in a 40 t concrete tank (5 m diameter) connected to a recirculating aquaculture system (RAS). Feed management was optimised using various combinations, with squid, clam and crab meat (2:1:1 ratio), fortified with squid oil has been identified as the most effective feed. Spawning occurred year-round with 87 spawning recorded in the year from two females and four males. The average number of fertilised eggs per spawning was 77,000. Fertilisation and hatching rates were 79 ± 1.55% and 83.67 ± 0.81%, respectively. Subsequent spawning intervals ranged from 2 to 8 days in the RAS. The size of the fertilised eggs ranged from 820-870 µm. The eggs were hatch out after 12-14 hours of incubation at a temperature range of 28-30 °C and salinity of 30 ppt with mild aeration. Newly hatched larvae were free-floating on the water surface.

Newly hatched larvae (38–44 h post-hatch) were collected from the water surface of hatching tanks and stocked in larval rearing tanks at a density of 10 larvae/ml with a minimum water depth of 80 cm. The green water technology was used for rearing. Rotifers (6–8 nos./ml) and copepod nauplii (3–4 nos./ml) were introduced from the 2nd DPH, followed by Artemia nauplii from the 11th DPH. Weaning to an inert diet began on the 18th DPH. Metamorphosis occurred between the 22nd and 33rd days, yielding fry 19–21 mm in size. Juveniles were harvested after 45–50 days and shifted for nursery rearing. By the 51st day, fry averaged 2.98 cm and 0.46 g with a 2.71% survival rate. Artificial light (1000 lux) was used for 2–8 days, followed by natural light. A total of 22,000 seeds were produced during the reporting period.

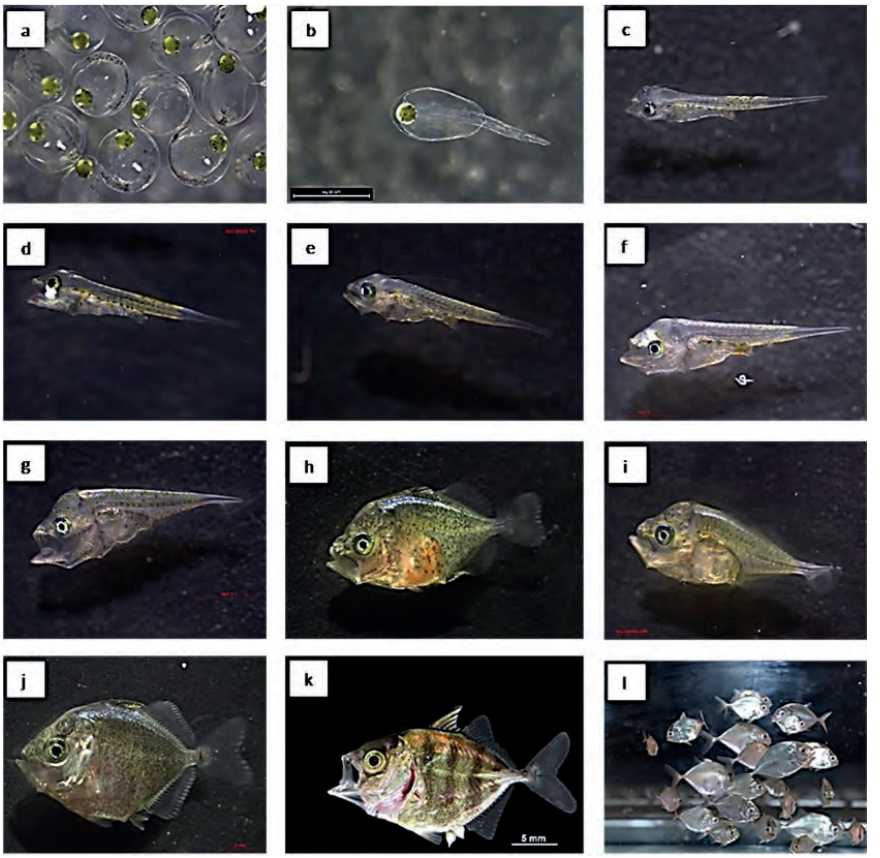


Spawning events in each month of the experimental period

Adult giant trevally *(Caranx ignobilis)*

Giant trevally

Juveniles of *Caranx ignobilis* of 11–18 cm total length (TL), 0.012–0.058 kg weight, were collected from the wild and reared in floating cages for broodstock development. Each fish was tagged and monitored individually for gonad maturation by periodic biopsy through cannulation. Upon reaching 46.5–56 cm TL and 1.7–2.8 kg weight, the oocytes of the females grew upto 300 µm in diameter. Mature broodstocks (1 female: 2 males) were transferred to a 10 t capacity recirculating aquaculture system for spawning. The commercial-grade GnRH analogue with dosage modifications tailored to oocyte maturity could induce spawning. Spawning occurred by 24–36 hours of hormone inducement, yielding 0.2–0.5 million eggs with a fertilisation rate of 94%. The eggs were spherical, averaging



Larval rearing period of Giant trevally (a. eggs, b. hatchling, c. 3dph stage, d. 5 dph stage, e. 7 dph stage, f. 9 dph stage, g. 11 dph stage, h. 15 dph stage, i. 17 dph stage, j. 19 dph stage, k. 26 dph stage, l. juveniles at 50 dph)

726 µm in diameter, and hatched after 14–18 hours of incubation with a hatching rate of 91%. Hatchlings measured 1780–1864 µm and began external feeding 63–66 hours post-hatch, concurrent with yolk absorption and mouth opening. During the first five days, larvae were fed on nauplii of calanoid copepods, with successful feeding confirmed via gut content analysis.

Hatchery produced juveniles of *Caranx ignobilis*

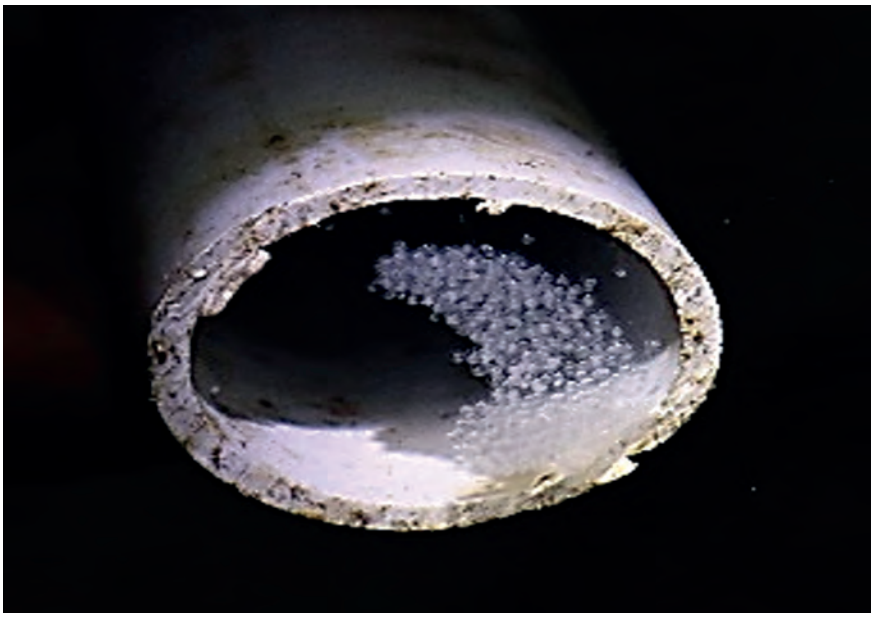
Under refinement of breeding and seed production, the use of a one-time LHRH implant facilitated continuous spawning in Indian pompano. In John's snapper, improvements in water quality and feed management improved seed production by 15%. In *Siganus vermiculatus*, management of salinity (25 ppt) and temperature (28 °C) resulted in 95% egg hatchability within 20 hours post-spawning. Additionally, short-term enrichment of *Parvocalanus crassirostris* nauplii (2–3 stage) using probiotics, enhanced larval survival by 4.7% at 19 days post-hatch (dph) highlighting the importance of targeted interventions in environmental and feed manipulation strategies to optimise seed production. In John's snapper, marginally lowering salinity and providing refuges increased nursery survival to 95% and improved growth by 16%.

For *Gnathanodon speciosus*, combining artificial and natural feeds promoted significant growth from 1 g to 15 g in 90 days. Mixed feeding of copepods and rotifers enhanced the survival of *Caranx ignobilis*. The nursery survival of *Acanthopagrus berda* could be raised to 97%, and that of *Siganus vermiculatus* up to 90%.

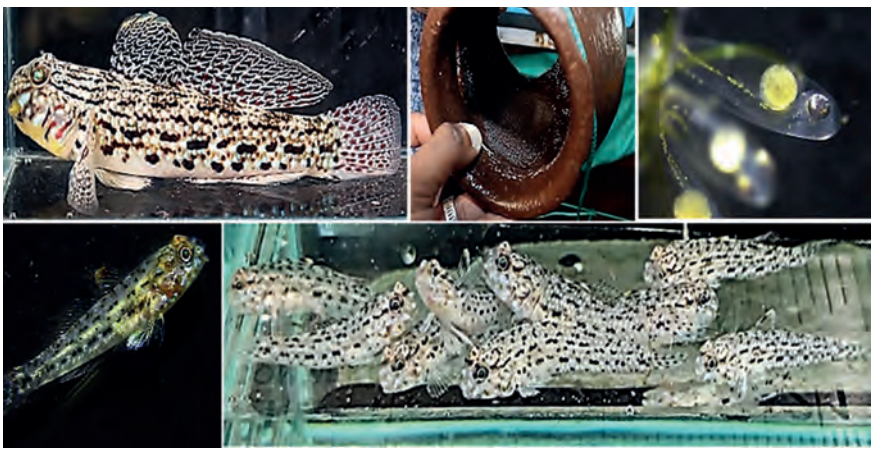
Ornamental fishes

Among ornamental species, the Royal dotty back (*Pictichromis paccagnellorum*), a tropical reef-associated fish, native to the Western Pacific Ocean (0–15 m depth), acclaimed in the Global marine aquarium industry fetching around US $ 24 per individual, was procured as subadults (3.5–4.2 cm, 0.7–1.2 g) from an international ornamental fish importer. The fish underwent quarantine and were subsequently stocked in three biofiltered, 500 l HDPE tanks (350 l filtered, ozone-treated

Pictichromis paccagnellorum



Spawned egg mass of *Pictichromis paccagnellorum* in PVC pipe shelter



Broodstock, eggs, fry and seeds of ornate goby (*Istiogobius ornatus*)

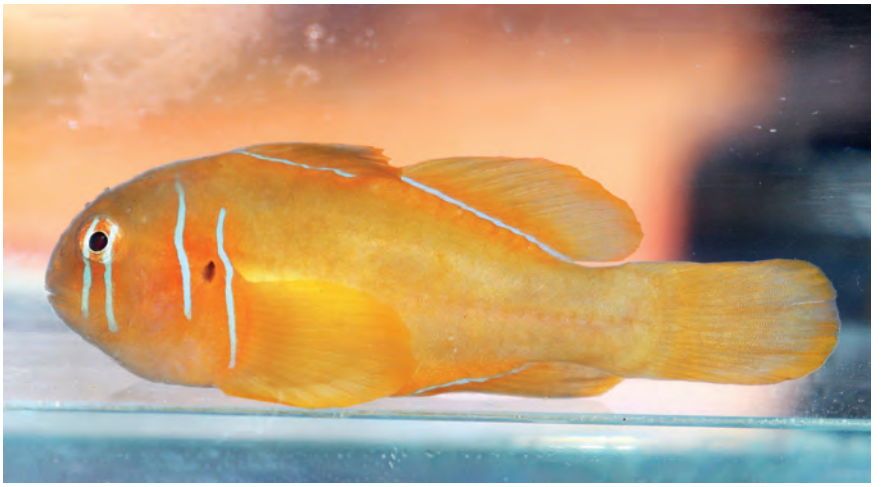
seawater; 34±1 ppt salinity; pH 7.86–8.23; 28±0.05 °C) and fed thrice daily with mussel and squid meat. After six months of aggressive behaviour, healthy individuals formed breeding pairs. PVC pipes (1-inch diameter, half-foot length) served as spawning shelters. Spawning occurred on 17 October 2024, with eggs attached to the PVC pipe. The entangled, thread-like egg masses contained globular, transparent eggs measuring 990–1090 µm in diameter. Further work in larval rearing is in progress.

Broodstock of ornate goby (*Istiogobius ornatus*) maintained for seven months could be spawned in captivity. After spawning in the early morning, the males guarded the elliptical, demersal eggs (1214±347 µm diameter). Fecundity averaged 3516 ±365 eggs, with 90% hatching in 72 hours at 30–31°C. Hatchlings (2.1 mm TL) had a mouth opening (280 µm) at 1 dph, and yolk absorption was complete within 24 hours. The larvae were reared using *Isochrysis galbana*, *Nannochloropsis oculata*, *Parvocalanus* sp., *Artemia* nauplii, and formulated feed (300–400 µm pellet size). Flexion occurred at seven dph, settlement at 25 dph, and metamorphosis by 75–80 dph, with ~10% survival.

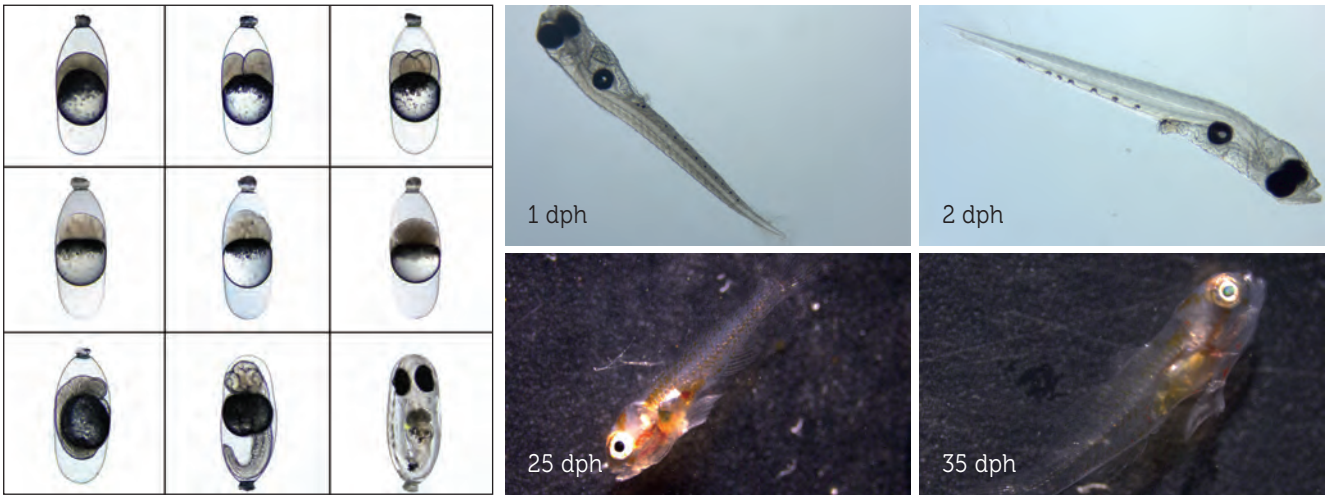
Broodstock of the lemon coral goby (*Gobiodon citrinus*) maintained under laboratory conditions could be spawned in early in the morning, producing demersal, elliptical eggs (965 × 449 µm) attached in a single layer with filaments. Fecundity was 510 ± 76 eggs, with 95% hatching in 108 ± 5.4 hours at 30–31 °C. Larvae (2.3–2.4 mm) had mouth opening (332 µm) at 36 hours, and yolk absorption was complete by 48 hours. Larvae were reared on *Parvocalanus* sp. nauplii and *Isochrysis* sp. as live feed. Flexion occurred by 11 dph, settlement occurred by 23–25 dph, and survival up to 80 dph was 3–5%.

Live feed development

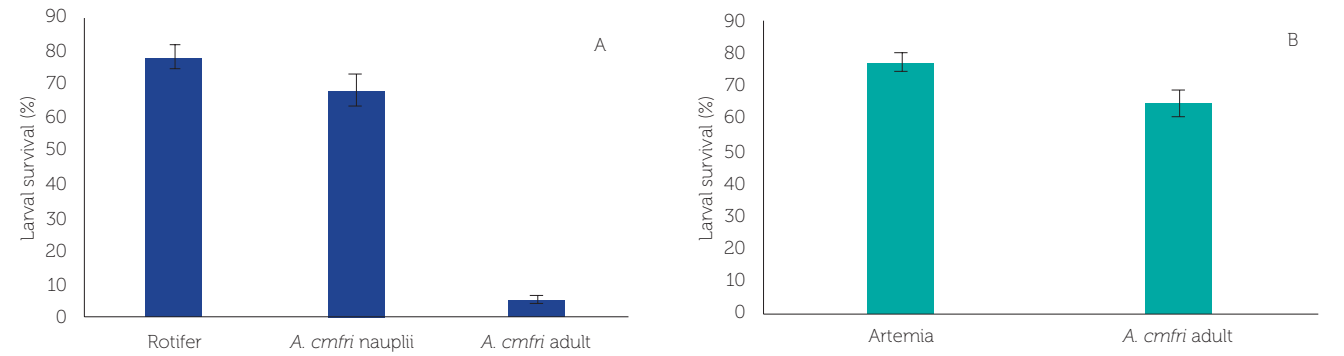
The copepod *Apocyclops cmfri* shows promise as live feed for marine finfish and shellfish larvae. Trials with *Siganus vermiculatus* revealed that at 20 DPH, survival was similar for larvae fed on *A. cmfri* nauplii and rotifers (*Brachionus plicatilis*), but significantly lower for those offered adult copepods, indicating non-ingestion. By 30 DPH, survival was comparable for larvae fed on *A. cmfri* adults and *Artemia*, with gut content analysis confirming ingestion of adult copepods.



Lemon coral goby (*Gobiodon citrinus*) broodstock



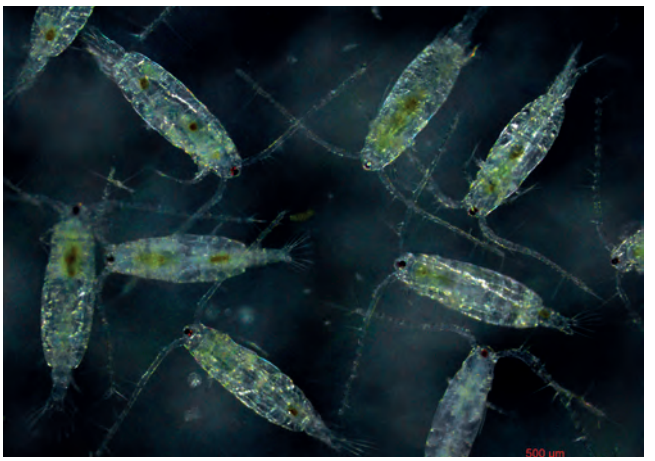
Different life stages of *Gobiodon citrinus* (egg development and larval stages)



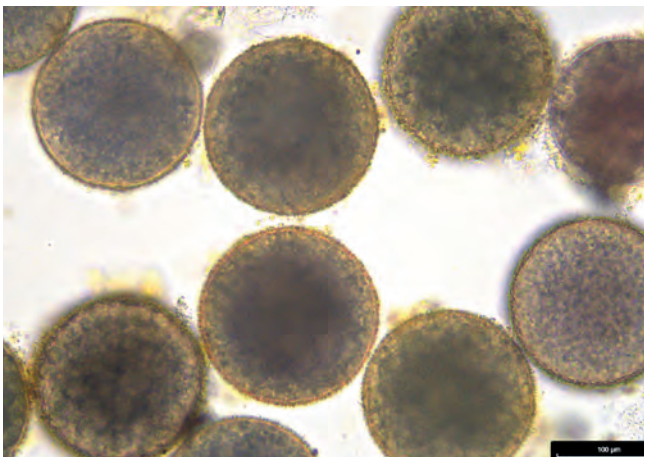
Larval survival of *Siganus vermiculatus* in feeding trials at 20 dph (A) and 30 dph (B) with *Apocyclops cmfri*

Protocol developed for storage of eggs of *Acartia sarojus* as a potential substitute for Artemia cyst in fish larval rearing. Further work to extend the shelf life is progressing.

Salinity tolerance trials on *Bestiolina similis* exhibited the highest egg hatching success at 30 ppt (95.33 ± 3.05%) and 35 ppt (90 ± 4%), with no hatching at 0 ppt. Hatching success at 30 and 35 ppt showed no significant difference but was significantly higher than other salinities. Live feeds are being supplied to stakeholders and hatcheries.



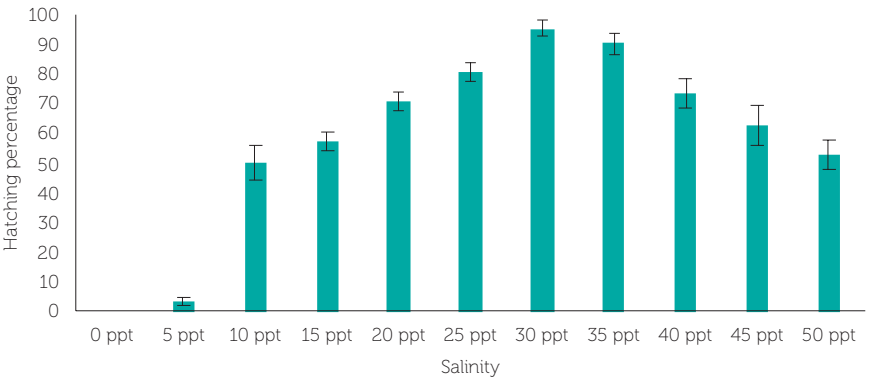
The copepod, *A. sarojus*



Eggs of *A. sarojus* produced in the hatchery

Sea ranching of green tiger shrimp in Palk Bay and the Gulf of Mannar

Project: PMMSY



Hatching success of *B. similis* in different salinities

Sea ranching of green tiger shrimp (*Penaeus semisulcatus*) postlarvae (PL) in Palk Bay and Gulf of Mannar, Tamil Nadu, for sustainable shrimp production has been continued. During 2024, a total of 19.6 million PL were sea ranched. A total of 115.14 million green tiger shrimp seeds have been sea ranched in Palk Bay and the Gulf of Mannar since the inception of the Project. Studies on the application of molecular genetic markers are being carried out to ascertain the impact of sea ranching on the landings of the shrimp. The mitogenome of the species' banded antenna morphotype was characterised for the first time in Indian waters. This morphotype harbours Indian and Pacific lineages with 6.5% divergence, offering insights into its genetic diversity and evolution and potentially aiding stock differentiation once sufficient maternal lineage data are generated.

Union Minister of State for Ministry of Fisheries, Animal Husbandry & Dairying, Government of India, Sri George Kurien reviewing the progress of the project

Sea ranching of green tiger shrimp by ICAR-CMFRI in Palk Bay

Mussel seed distribution


Ranching of clam seeds in estuaries

Development of open-sea eco-mussel farm

Project: NFDB -PMMSY

Mussel hatchery facilities were upgraded, including an expanded photobioreactor system to establish pilot-scale open-sea eco-mussel farms in India. The official inauguration on 17 December 2024, marked the distribution of Indian peacock mussel (*Perna viridis*) seeds to farmers and the release of 3.0 million yellow-foot clam (*Paphia malabarica*) seeds into estuaries, promoting aquaculture and replenishing natural stocks. The project is progressing with efforts to foster India's blue economy through sustainable bivalve aquaculture.

Nucleus Breeding Centre

The Department of Fisheries; Ministry of Fisheries, Animal Husbandry & Dairying, Government of India, has notified the Mandapam Regional Centre of ICAR-CMFRI, as a 'Nucleus Breeding Centre' (NBC) for marine fish species on 9 December 2024, to enhance the development and management of high-quality broodstock to support hatcheries in seed production for mariculture. The Centre will serve as a hub for advancing research & development, training and capacity building in the field of genetic improvement of marine fish species with the goal of addressing current challenges in broodstock and quality seed production in the mariculture sector.

Photo: Fish farming in floating cages in coastal marine waters

Grow-out Technologies

Development of sustainable mariculture practices

Project: MDN/SMP/19

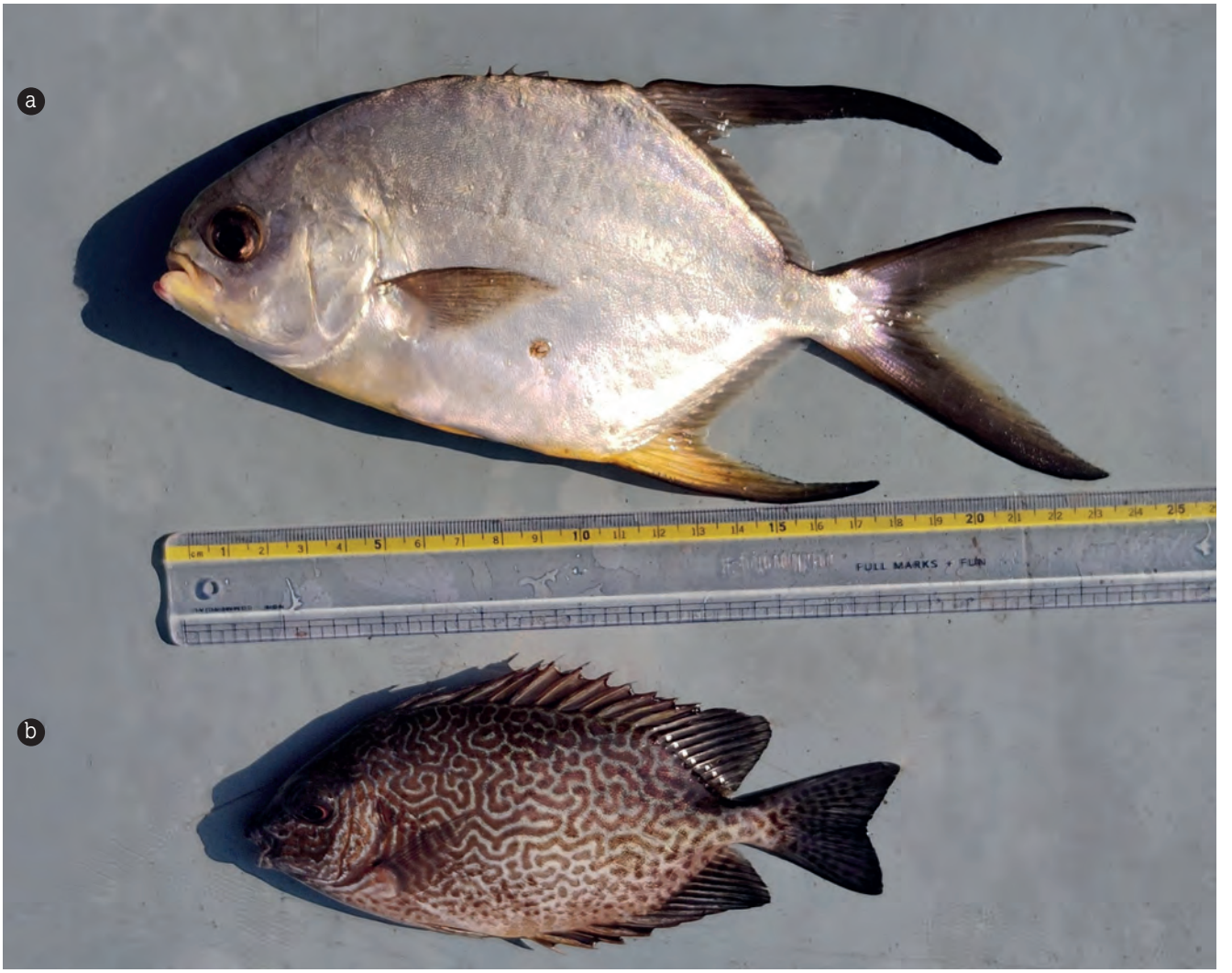
Culture of *Acanthopagrus berda*

Hatchery-produced *Acanthopagrus berda* fingerlings (3.5 ± 0.2 mm) were transported from the Karwar Research Centre and stocked in two systems at Muchukunnu, Kozhikode. A total of 500 fish were stocked in earthen ponds, and 1,000 were stocked in 4×4 m Galvanized Iron (GI) cages.

Fingerlings are being fed floating pellet feed, with trials ongoing.

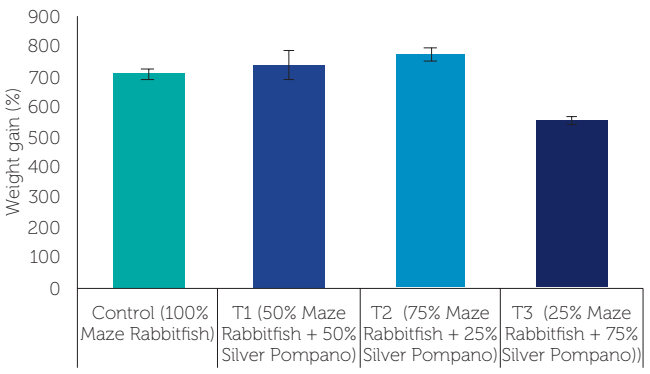
Polyculture of maze rabbitfish and silver pompano

A study at Karwar Regional Station (ICAR-CMFRI) evaluated the polyculture of Maze rabbitfish (*Siganus vermiculatus*) and silver pompano (*Trichinotus blochii*) at different stocking ratios in sea cages over five months. The best growth performance was recorded with a 50:50 ratio. The 25:75 ratio (rabbitfish to pompano) negatively affected rabbitfish growth due to pompano's aggressive feeding.

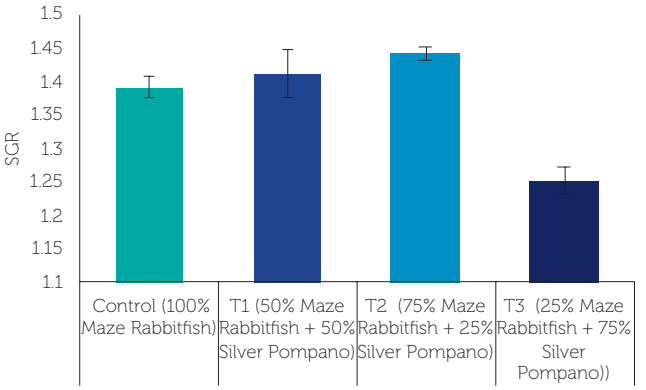


Polycultured *Trichinotus blochii* (a) and *Siganus vermiculatus* (b)

Polyculture harvest of *Trichinotus blochii* and *Siganus vermiculatus*



Weight gain of maze rabbit fish and silver pompano in polyculture at different combinations



Specific growth rate of maze rabbit fish and silver pompano in polyculture at different combinations

Golden trevally grow-out trials in sea cages

Golden trevally fry was nursery-reared in cement tanks at a density of 3–4 fish/l. Fingerlings reached 15.5 g in 90 days and were stocked in sea cages at 10 fish/m³. After 180 days, they grew to 285 g on a diet of pellet feed (45% crude protein, 10% fat) and low-value fish.

Nursery-reared fingerlings of golden trevally

Capture-based mariculture

Wild seed collection in marine habitats, using nets, showed a

Cage-farmed golden trevally after 180 days

Farmed red snapper *Lutjanus argentimaculatus*

Hideouts used for John's snapper nursery rearing

dominance of glassfish and *Caranx* sp. Cage farming of *Lutjanus argentimaculatus* was initiated at Kovalam, Chennai, using wild collected seeds. Fish stocked at 96 mm reached 243 mm in six months at a stocking density of 5 fish/m³.

Enhanced nursery rearing for John's snapper

Two strategies, 1. reducing salinity to 20 ppt and 2. using hideouts (PVC/HDPE pipes) improved the growth and survival rates of John's snapper. Salinity reduction increased growth by 16%, and hideouts reduced congregation-related mortality, boosting survival by 6%.

Raft culture experiment of brown mussel at Vizhinjam

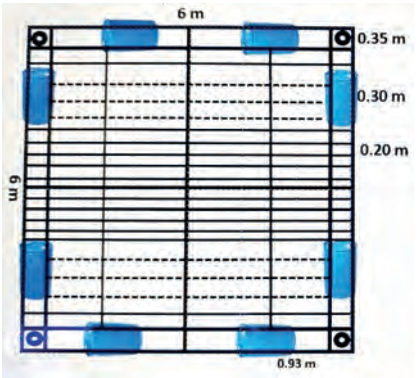
Raft made for culture of brown mussel

Mussel farming

Experiments were conducted at Kureepuzha (rack culture for green mussels) and Vizhinjam Bay (raft culture for brown mussels) to optimise stocking densities. Stocking densities of 400, 600, and 1,000 mussels/metre were tested for green mussels, and 500, 700, and 1,000 mussels/metre for brown mussels.

Improved farming of edible oyster

Traditional wooden poles and bamboo have been replaced with 18 mm Polypropylene ropes in GI rafts, enhancing the durability and efficiency of the system.



Improved oyster raft design

Mussel rope for raft culture of brown mussel at Vizhinjam

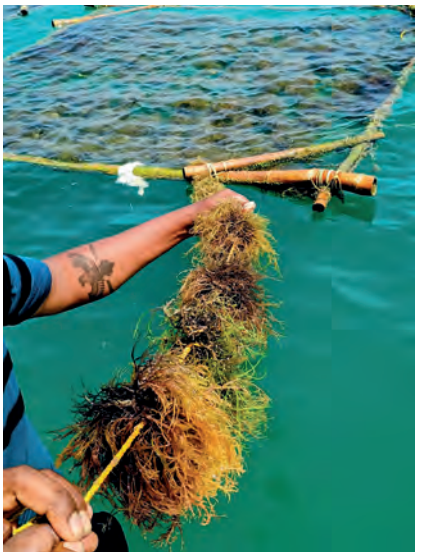
Mussel seeds embedded on rope

Integrated Multi-Trophic Aquaculture (IMTA)

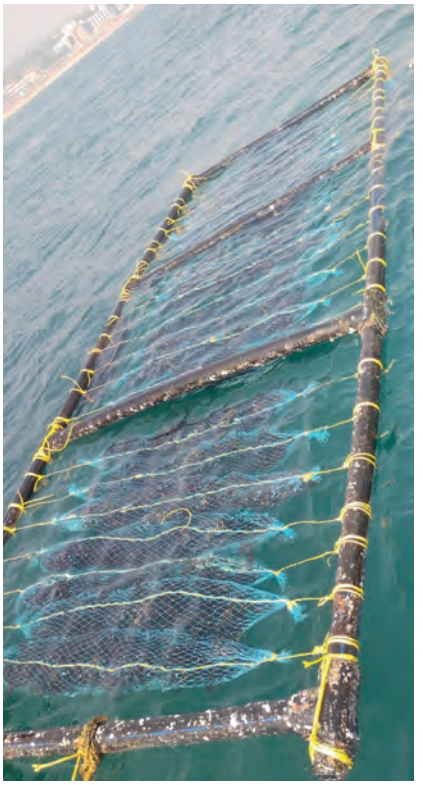
IMTA of silver pompano with seaweed

Twelve seaweed rafts with 60 kg of *Gracilaria edulis* per raft were integrated with cobia cages to enhance nutrient recycling at Mandapam.

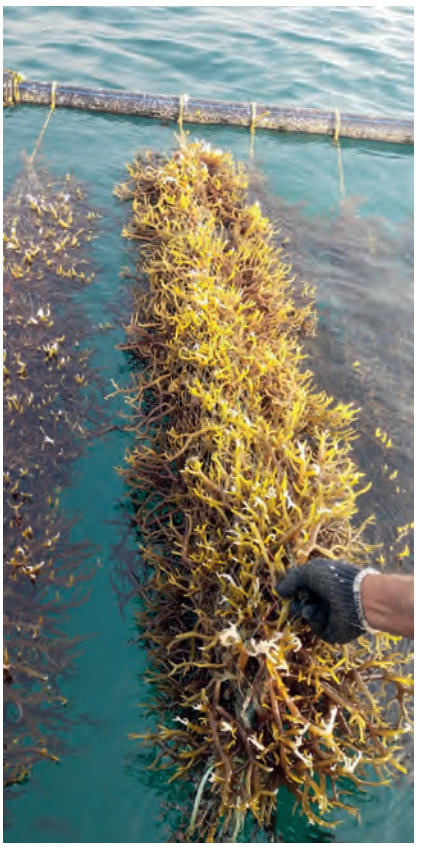
IMTA of *G. edulis* with cobia in cage



IMTA farmed *G. edulis*



Kappaphycus alvarezii in net tubes



HDPE-based raft culture of *Kappaphycus alvarezii*

Seaweed culture in indoor systems

Ulva lactuca and *Ulva fasciata* were cultured in a multilayer running water system, achieving 4-fold and 3-fold weight increases, respectively, over 60 days in 2,000 l FRP tanks.

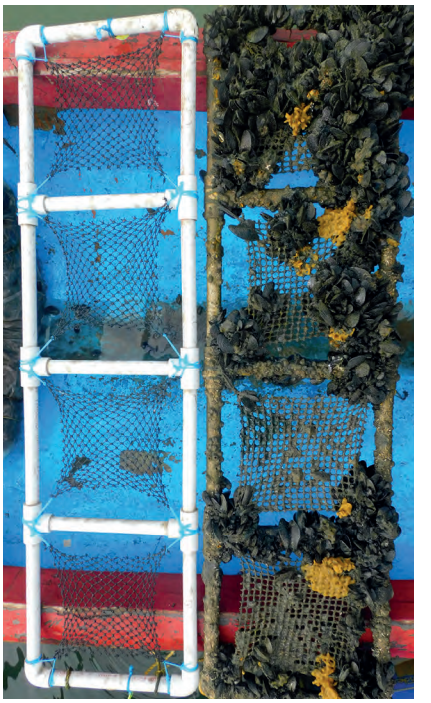
Tube net culture

High-Density Polyethene (HDPE) based tube net culture of *Kappaphycus alvarezii* was initiated in exposed seas (15 m depth), achieving a 3.52% daily growth rate. *Gracilaria edulis* culture using tube nets was also initiated.

Management of biofouling on cage nets

A study in Ashtamudi (Kollam) assessed the biofouling patterns in four stations (East Kallada, Ashtamudi, Chavara and Prakkulam). Mussels, sponges, barnacles, and polychaetas were dominant biofoulers. *Mytella strigata* was the most abundant species. Salinity influenced biomass and fouling density.

Indoor culture of *Ulva lactuca*



Experimental net panel before and after six months of anti-fouling trial

Improved mooring system for cages

The mooring chain diameter was increased to 18 mm (80-grade short-linked alloy steel) to enhance cage mooring durability. This modification extended the mooring life to over two years.

Technology demonstration

Technical support was provided to fisher Self-Help Groups in North Kerala, facilitating the operation of 150 cages, 10 pens, and 2 ponds.

In Olavaippu (Alappuzha), a 1-acre coastal pen was established for mixed shrimp and pearl spot farming. However, suboptimal harvest outcomes were attributed to feeding challenges and the unavailability of certified organic feed.

At Gothuruth (Ernakulam), a model cage farm was set up, featuring two 6 m HDPE cages (fabricated in 2008) and multiple 4×4 m GI cages, serving purposes of research, student training, and production enhancement. Additionally, one HDPE cage was relocated from Chittattukara to Gothuruth.

In Kozhikode estuaries, two farmer-participatory IMTA systems were deployed at Korapuzha and Kuttiadi, each consisting of a 15×10 m pen stocked with 8,000 seabass and 200 mussel spat ropes.

At Pinarayi (Kannur) and Kottappuram (Thrissur), five farmers adopted IMTA systems integrating green mussel farming with fish cages, promoting sustainable and diversified aquaculture practices.

IMTA as alternate livelihood in coastal Karnataka

Project: NFDB-PMMSY

IMTA units comprising two fish cages (6×3×2 m), two mussel rafts (20×10 ft), and two seaweed rafts (10×10 ft) were installed at four estuarine sites in Udupi district. Each cage was stocked with 1,000 silver pompano and 1,000 Indian pompano. Mussel rafts held 150 seeded ropes each, while seaweed rafts cultivated *Kappaphycus alvarezii*, *Gelidiella acerosa*, and *Gracilaria salicornia*.

Pompano and Mussels harvested from IMTA site at Kundapura

Mussels harvested from IMTA site at Uppunda

After five months, harvests yielded 700–800 kg of silver pompano and 600–650 kg of Indian pompano per site, sold at ₹400–450/kg. Mussels, harvested in phases, weighed 2.0–3.0 kg per rope and fetched ₹145–150/kg, with better growth observed at IMTA sites. Similar demonstrations are ongoing in 2024–25 across estuaries in Dakshina Kannada and Udupi districts.

Strategic seaweed cultivation in Kutch border areas, Gujarat

Project: NFDB-PMMSY

ICAR-CMFRI has made significant strides in seaweed cultivation along the Kori and Padala marine creeks, in the Kutch district of Gujarat. The initiative, besides demonstrating seaweed farming, has also trained 320 stakeholders and hundreds of villagers from 22 border villages in innovative seaweed farming, yielding 38 t harvest of farmed seaweeds from 180 rafts in seven locations. Advanced systems like HDPE raft grids and mooring solutions along with people's participation enabled the production. The project aims to involve local farmers in large-scale seaweed production, thereby generating employment and income opportunities.

Socioeconomic impact evaluation of mariculture

Project: MD/MTI/31

A survey of 40 farmers in Ernakulam district revealed key insights into cage farming demographics, education levels, farming preferences, and challenges. Cage ownership is predominantly male (75.9%) and regarding age the largest proportion (53.3%) was in the age group of 35–50 years, while younger farmers (20–35 years) represent 25.5%, indicating youth participation. Education played a crucial role, with 98.6% having formal education. Nearly 93.6% have received training in cage farming. Institutional support was the major reason cited for starting cage farming. The Seabass + Pearl Spot combination is the most preferred farming option (91%) among farmers. Farmers are looking for diversification to other species as sometimes due to glut farmers face issues in marketing. The 4x4x3 m^3 cage (72.3%) remains the most popular due to its ease of handling and economic feasibility. Major constraints to cage culture adoption include high operational costs, lack of credit facilities, and coastal water pollution. An economic analysis of a standard 48 m^3 (4 x 4 x 3 m) cage with seabass and pearl spot composite culture indicated a Benefit-Cost Ratio of 1.87.

Dr P. K. Mishra, Principal Secretary to Prime Minister, visiting the Kori Creek seaweed farming site

Formation of FFPOs

Facilitated the formation of a Fish Farmer Producer Organisation (FFPO), Aquarise Ltd. at Gothuruth (Ernakulam), which received approval from NABARD, and an all-women lead FFPO, Shree Bhimrao Matsyaudyog Seva Sahkari Mandali Ltd. at Gujarat with ICAR-CMFRI as the supporting institution.

Establishment of Centre of Excellence on Seaweed Farming

Based on the works on seaweeds and promotion of seaweed farming in the country being carried through the Mandapam Regional Centre of ICAR-CMFRI, the Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, New Delhi, has approved the establishment of a 'Centre of Excellence (CoE) for Seaweed Cultivation' at the Mandapam Regional Centre of ICAR-CMFRI on 03 September 2024.

Photo: Fabrication of cages for coastal cage farming

All India Network Project on Mariculture

Activities under the AINP-Mariculture

The AINP–Mariculture is coordinating research in mariculture across 12 participating centres under two major themes: (1) Grow-out technologies and (2) Seed production, with ICAR-CMFRI as the lead institute.

Grow-out culture

John's snapper

John's snapper was cultured in sea cages for 10 months using three feeding strategies. Fishes fed with a combination of formulated feed and low-value fish meat achieved the highest weight (615±50g). Ongoing nutritional and physiological studies aim to assess overall fish health and optimise feeding strategies for improved growth performance.

John's snapper was cultured in coastal ponds with different stocking densities. Fish reared at lower density (≤0.5 fish/m^2) grew to 670g, while those at higher density (1.0 fish/m^2) reached 425g in seven months. The study highlights the impact of stocking density on growth performance in John's snapper aquaculture.

Indian salmon

Indian salmon, collected from the wild at approximately 20-25 days

Harvest of cage-farmed *Siganus vermiculatus*

Seed distribution of hatchery-produced giant trevally seeds to cage farmer at Ashtamudi Lake, Kerala

post-hatching, was grown out in coastal ponds for a period of nine months. The fish were fed a high-nutrient formulated feed containing 40-45% crude protein and 10% crude fat. By the end of the culture period, the Indian salmon reached an average size of 390g. The study observed that the optimum salinity range for successful grow-out farming of Indian salmon is 20-30 ppt.

Feasibility study of larger diameter cages

A feasibility study assessed a 15m inner diameter sea cage with a four-point mooring system. The 618 m^3 cage, with a 3.5 m depth, used a frame similar to a 6 m cage but added base pipe supports for buoyancy. Stability was observed for seven months, but base pipes and handrails need reinforcement with larger pipes to withstand dynamic water forces. A 3.5 m net depth was suitable, requiring 10 personnel for manual net exchange. Two ballast pipes controlled net folding. However, buoyancy improvements are needed by increasing the base pipe diameter to enhance stability and operational efficiency.

Grow-out farming in a larger cage was demonstrated using a 10 m dia. HDPE cage in the Gulf of Mannar by growing cobia advanced juveniles. The fishes were fed with low-value fishes @ 3-5 % of the biomass once in a day. Periodically growth assessment is carried out. The grow-out farming is in progress.

Farming demonstrations

Farming demonstrations were initiated to disseminate the developed technology for the cultivation of various marine finfish across multiple locations in the country. These demonstrations provided valuable insights into the performance of the species, contributing to the promotion of sustainable aquaculture practices.

The details of the demonstrations for Indian pompano conducted in Andhra Pradesh

Farming method	Place	Estimated production	Stocking density	Number of units
Sea cage	Pedda Lararipertai, Visakhapatnam,	1.45 t/cage	25/m^3	2 Acre
Coastal ponds	Losari, West Godavari District	1.5-2.0 t/acre	3000/m^2	4 Acre
	Gurginapalli, Kakinada		3000/m^2	6 Acre
	Urlakondadibba, Krishna District		2500/m^2	2 Acre
	Nali, Nagayalanka, Krishna District		2500/m^2	8 Acre
	Komaragiripatnam, Konaseema District		2500/m^2	2 Acre

Indian pompano farming in sea cages

Caranx ignobilis

The farming trials of *Caranx ignobilis* (giant trevally) were conducted in open water cages (3m x 3m x 2.5m) under controlled conditions with salinity (12-25 ppt), temperature (26-28 °C), pH (7.2-8.6), and dissolved oxygen (5.5-6.3 mg/l). The fish were initially fed 1-1.8mm sized pellets, with the pellet size adjusted as they grew. Growth assessments were conducted weekly, and over three months, total length increased from 4.68 cm to 17.3 cm, while weight grew from 4.94 g to 79.4 g.

Silver pompano reared in cage

Indian pompano

Farming of Indian pompano in the farmer's field was conducted at various locations in Andhra Pradesh, both in cage culture system and pond culture system to demonstrate the economic viability of the technology. These demonstrations have created awareness among fish farmers for the adoption of this species for farming.

Silver pompano

For silver pompano farming, trials in Ashtamudi Lake involved stocking

Coastal cage culture site at Tank Village, Sindhudurg district

Cobia harvested from a cage in Palk Bay at Munaikadu, Mandapam

2-inch-sized seeds in 3 x 3 x 2.5 m cages. The fish were fed a mix of trash fish and pelleted feed at 5% of their body weight. In six months, they achieved an average weight of 340 g, demonstrating promising growth.

Siganus vermiculatus

A farming demonstration of *Siganus vermiculatus* in Sindhudurg, Maharashtra, stocked 1,000 hatchery-produced juveniles in 4x4x2 m cages. After 210 days of rearing using commercial feed, fish reached 24.33 cm and 235 g, with 80% survival. The successful harvest of fishes encouraged the local fisherfolk to adopt farming of siganus in cages.

Cobia

Participatory sea cage farming demonstration of cobia was conducted in Palk Bay at Munaikadu, Mandapam. A 6 m diameter HDPE cage was stocked with 350 cobia fingerlings (~50 g each). Initially fed with pellet feed, they were later switched to chopped low-value fish at 10% of biomass daily. After seven months, the fish reached an average weight of 2.4 kg, yielding a total harvest

Seaweed rafts at Andaman Waters

Farmed seaweeds at Andaman

of 700 kg with a 90% survival rate. The Mandapam RC of ICAR-CMFRI supplied the seed and provided technical support.

Seaweed farming

Seaweed farming with native species of seaweeds were experimented to study its growth and farming potential in the Andaman and Nicobar Islands. Seaweed farming trials used a 1×1m raft system with tube net cultivation. Species like *Gracilaria edulis* and *Acanthophora spicifera* were cultivated, with biomass increasing 4-5 times in 60 days. Over 100 rafts have been deployed, though challenges like grazing fish and weather damage persist. A proposal for *Kappaphycus* commercial farming has been submitted.

Improvements in cage systems

Traditional mooring systems using MS/GI iron chains face corrosion and operational challenges. To address this, trials in Prabhas Patan, Gujarat, tested advanced, non-corrosive, high-strength mooring designs using Dyneema ropes. A single-point mooring (SPM) system was implemented, showing promising results in stability and efficiency.

Seed production of marine finfish

Through the continuous refinement of seed production technology, significant improvements were achieved in the production of juveniles of Indian pompano and John's snapper. The enhanced production capacity enabled the consistent supply of high-quality juveniles to farmers and also for various research and demonstration programmes conducted by the institute. The institute's efforts in optimising seed production not only support the growth of the aquaculture sector but also foster collaboration with stakeholders in applied research and capacity-building initiatives.

Indian pompano

Indian pompano broodstock management was further improved for natural spawning using a single LHRH implant. Over the reporting period, 67 spawnings were recorded from three females and six males, resulting in 1.10 lakh stockable-sized seeds.

John's snapper

John's snapper broodstock management was refined to facilitate year-round natural spawning. Larval rearing of John's snapper was carried out and produced 24,000 stockable size seeds.

Seed support to farmers

Seed support was provided to multiple farmers and hatcheries on a payment basis, and individual farmers across Andhra Pradesh, Tamil Nadu, Kerala,

Supply of yolk-sac larvae to various centres of ICAR-CMFRI

Karnataka and Gujarat. Fertilised eggs of Indian pompano were also supplied to private hatcheries for seed production. Yolk sac larvae of Giant trevally were distributed to ICAR-CMFRI centres in Karwar, Mandapam, and Njarakkal.

Broodstock development of carangids

Broodstock development of *Caranx melampygus* is progressing using fish collected from the Ashtamudi estuary, Kerala. Juveniles (40–50 g) were stocked in cages and fed trash fish and pellets at 5–6% of their body weight daily.

Subadult of Bluefin trevally (*Caranx melampygus*)

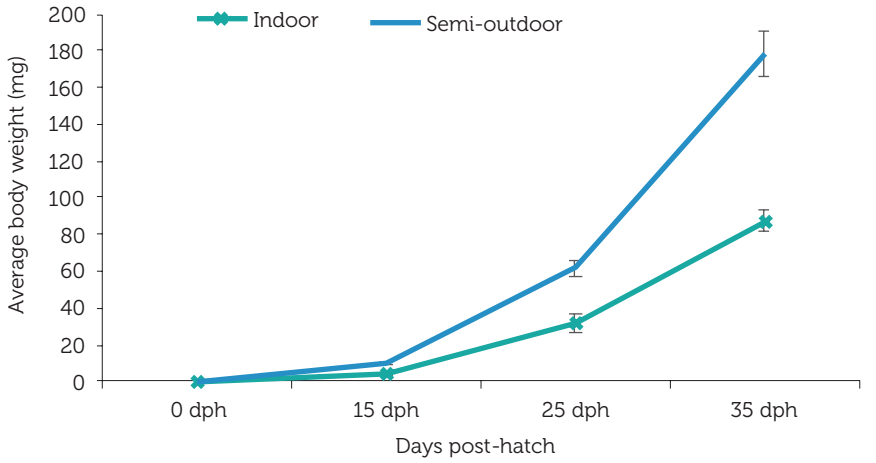
Broodstock development of *Siganus canaliculatus*

Broodstock development of white spotted spinefoot (*Siganus canaliculatus*) is under progress in a Recirculating Aquaculture System (RAS) in Vizhinjam. Fish were fed a specialised maturation diet with supplemental squid meat. Female broodstock above 230 g exhibited maturing eggs, and males above 215 g showed thick running milt, indicating reproductive readiness.

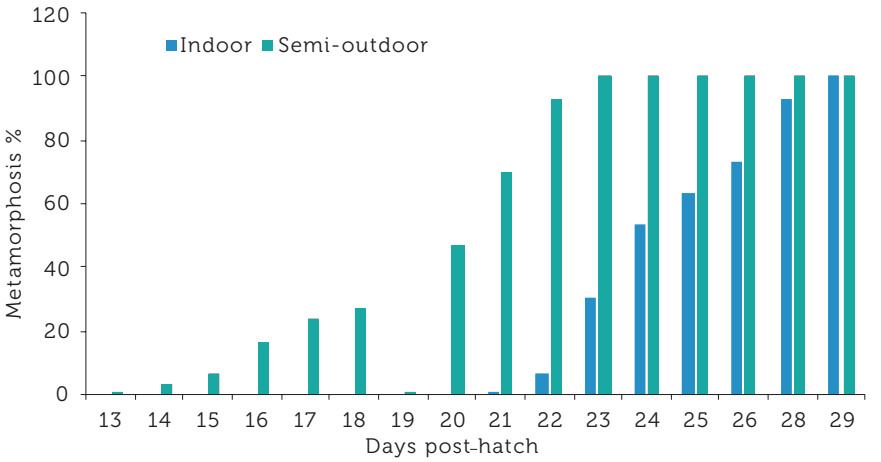
Broodstock of white spotted spinefoot (*Siganus canaliculatus*)

Growth and development of silver pompano larvae

A study compared silver pompano growth in indoor and semi-outdoor rearing systems. Semi-outdoor tanks had faster embryonic development, shorter incubation (19–23 h), and higher growth rates, with final body weight (178.2 mg vs. 87.4 mg) and length (18.68 mm vs. 12.01 mm). Metamorphosis occurred five days earlier, improving larval development.



Growth of silver pompano larvae in Indoor and semi outdoor rearing systems



Metamorphosis (%) in Indoor and semi outdoor systems

Newly isolated rotifer species

A newly isolated rotifer species, identified as *Colurella* sp., was cultured as a live feed. SEM analysis revealed unique trophii measurements and molecular analysis indicated 8.81% evolutionary divergence, suggesting a potentially new species within the *Colurella* genus.

Training programmes

To enhance public awareness and develop human resources, stakeholder training sessions and awareness programmes were conducted at various locations on different aspects of mariculture. These included training on advances in marine finfish farming practices, breeding and seed production of cultivable marine finfishes, and microbial interventions in health management of marine finfish and shellfish aquaculture, all held at the Visakhapatnam Regional Centre (VRC) of ICAR-CMFRI. Additionally, a three-day training and awareness programme on cage farming for farmers and stakeholders was organised by the Faculty of Fisheries, West Bengal University of Animal & Fishery Sciences, at three locations in South 24 Parganas, Kolkata.

SEM image of rophii of *Colurella* sp.

Colurella sp.

Photo: Spotted dolphins breaching from the sea off Lakshadweep

Marine Biodiversity

Assessment and evaluation of the marine biodiversity with emphasis on bycatch from an ecosystem perspective

Project: MBEMD/BYC/30

Bycatch associated with major fishing gears across various landing centres along the Indian coast was observed from July to December. The rare congrid eel (*Bathycongrus nasicus*) and monocanthids (*Thamnaconus modestoides* and *Thamnaconus* sp.) were reported and confirmed from the Neendakara Fisheries Harbour.

A seasonal bycatch survey at Sakthikulangara Fishing Harbour, Kerala, recorded 187 species across 111 families during pre-monsoon, with two species listed as 'Vulnerable' (*Cynoglossus macrostomus* and *Torpedo marmorata*) and one species as 'Near Threatened' (*Anguilla bicolor*). In the post-monsoon, juveniles of *Johnius macrorhynus* and *Erythrocles schlegelii* dominated, with most species falling under the 'Least Concern' category of the IUCN.

At Calicut, gillnet bycatch predominantly comprised *Thryssa* sp., while trawls targeting squid and mackerel in October recorded higher proportions of *Sardinella* spp. (15%), *Sphyraena* spp. (11%), and *Caranx hippos* (9%). In November, trawls

Pampus candidus from a multiday dol net at Arnala, Maharashtra

Bycatch at Sakthikulangara Fishing Harbour, Kerala


Bycatch at Vishakapatnam

targeting anchovies and *Rastrelliger kanagurta* yielded more *Sepia* sp. (8%) and *Trichurus auriga* (13%). The most dominant species in the mixed bycatch were *Sardinella fimbriata* (56.06%) and *Rastrelliger kanagurta* (18.69%), in October, shifting to *Nemipterus japonicus* (29.62%) and *Rastrelliger kanagurta* (28.75%), in November, with a predominance in both months. The presence of the gorgonian *Verrucella* sp., *Jenceella juncea* (Family Ellisellidae) and *Dendronephthya* sp. (Family Nephtheidae) was recorded in multiday trawl bycatch at Mangalore. *Pampus candidus* were recorded as bycatch in multiday dol net operations at Arnala, Maharashtra.

Between September and December 2024, shrimp trawlers from Thoothukudi targeted 14 species, while their bycatch included 240 species from 66 families, dominated by 217 bony fishes, followed by chondrichthyans (14), molluscs (29), echinoderms (15), jellyfish (2), and other crustaceans (11). Conservation status of bycatch species included 'Least Concern' (64%), 'Not Evaluated' (24%), and small percentages of other categories, including 'Critically Endangered' (1%). In northern Andhra Pradesh, multiday trawlers operating from Gopalpur to Kakinada during the post-monsoon period were studied, with marine megafauna bycatch—mainly turtles—recorded through onboard surveys on trawlers and gillnetters.

Jellyfish bloom dynamics in coastal and marine ecosystems of India

Project: MBD/JBD/32

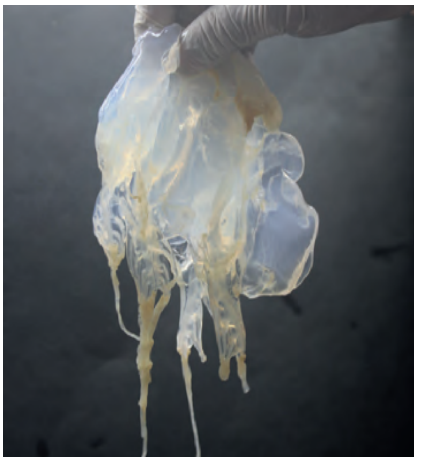
Sixteen species of scyphozoan jellyfish from 10 families and 15 genera, along with four species of cubozoan jellyfish, were recorded from India's coastal and marine ecosystems. The dominant species included *Crambionella annandalei, Crambionella orsini, Chrysaora* spp., *Catostylus townsendi, Acromitus flagellatus, Cyanea* sp., *Lychnorhiza malayensis, Netrostoma coerulescens, Rhopilema hispidum, Marivagia stellata, Cephea* sp., *Lobonemoides robustus, Cassiopea xamachana, Pelagia noctiluca, Chiropsoides buitendijki* and *Alatina alata*. Three distinct colour morphs of *Crambionella orsini* were identified along the Indian coast (tan and cyan on the east coast and maroon on the west coast), primarily attributed to metal-binding proteins.

Jellyfish fisheries targeting *Crambionella annandalei* were

Three colour morphs of *Crambionella orsini*


Beached jellyfish bloom


Processing of the oral arms of *Crambionella annandalei* at Uppada, Kakinada


Deadly box jellyfish *Chironex indrasaksajiae* recorded from Palk Bay

observed for 25 days during July–August at Uppada, Kakinada District and for 15 days in October at Odalarevu, West Godavari district. Fishermen operated gillnets and scoop nets at depths of 10–25 m, landing the catch at nearby centres. The oral arms were processed on-site in cement or polythene tanks into semi-dried products, following a stepwise salt treatment procedure.

Promotion of jellyfish-sting first-aid spray

The first recorded sighting of the deadly box jellyfish *Chironex indrasaksajiae* along the Indian coast in Palk Bay was published, with multiple stinging incidents reported near the Pamban (North) coast of Tamil Nadu during September-October 2024.

An evaluative formulation of "JellySpray" for managing jellyfish stings was successfully used on 16 July 2024 to treat a severely envenomated individual from Mandapam after a four-tentacled box

jellyfish sting. The treatment significantly reduced Irukandji-like syndrome, facilitating a swift recovery at the primary health centre.

A unique acrylic Kreisel tank design was developed for the captive rearing of jellyfish. This design creates a gentle circular flow that keeps jellyfish suspended in the water column while eliminating sharp edges, providing optimal support for their delicate physiology.

Marine microbial diversity in relation to ecosystem functioning and environmental changes

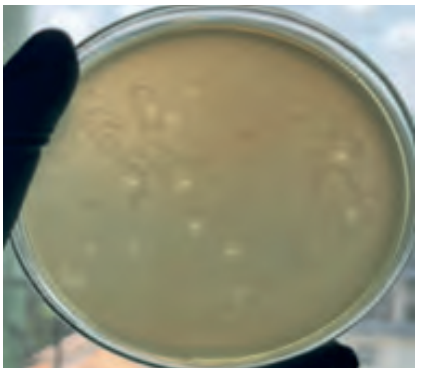
Project: MBEMD/MMD/39

Investigations on bacterial communities on four seagrass species (*Halodule pinifolia, Thalassia hemprichii, Cymodocea serrulata,* and *Syringodium isoetifolium*), from the Thoothukudi coast, yielded 36 isolates, including 21 endophytes and 15 epiphytes. Bacteria from *H. pinifolia* and *T. hemprichii* exhibited strong antibacterial activity against biofilm-forming bacteria, followed by those from *C. serrulata* and *S. isoetifolium*.

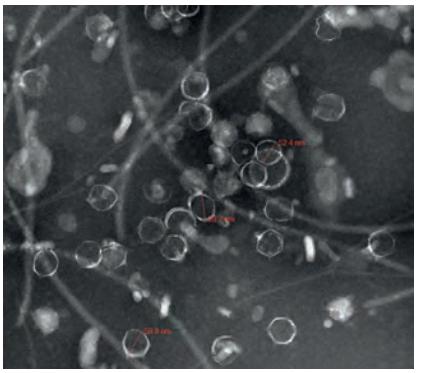
Studies on the bacterial community of the upside-down jellyfish *Cassiopea xamachana* identified 13 species, including *Exiguobacterium mexicanum, Salinivibrio costicola, Cytobacillus firmus, Achromobacter* sp., *Halomonas* sp., *E. profundum, Shewanella algae, E. aestuarii, Bordetella* sp., *Marinobacter hydrocarbonoclasticus, Bacillus cereus, Robbsia andropogonis* and *Priestia flexa*. *C. firmus* exhibited high amylase and lipase production, while *Achromobacter* sp. showed high protease production. Preliminary screening highlighted *Achromobacter* sp., *Halomonas* sp., *Shewanella algae, Bordetella* sp., *Robbsia andropogonis,* and *Priestia flexa* as promising biosurfactant producers.

Sixteen extremely halophilic bacterial species were identified from solar salterns along the southeast coast of India, including *Pontibacillus salipaludis, Halobacillus kuroshimensis, Halobacillus trueperi, Arhodomonas recens, Arhodomonas aquaeolei, Halobacillus alkaliphilus, Halomonas smyrnensis, Halovibrio variabilis, Oceanobacillus kimchi, Fodinibius saliphilus, Chromohalobacter israelensis, Halobacillus mangrovi, Halomonas organivorans, Halobacillus dabanensis, Pontibacillus yanchengensis, Marinobacter persicus* and *Halobacillus halophilus*.

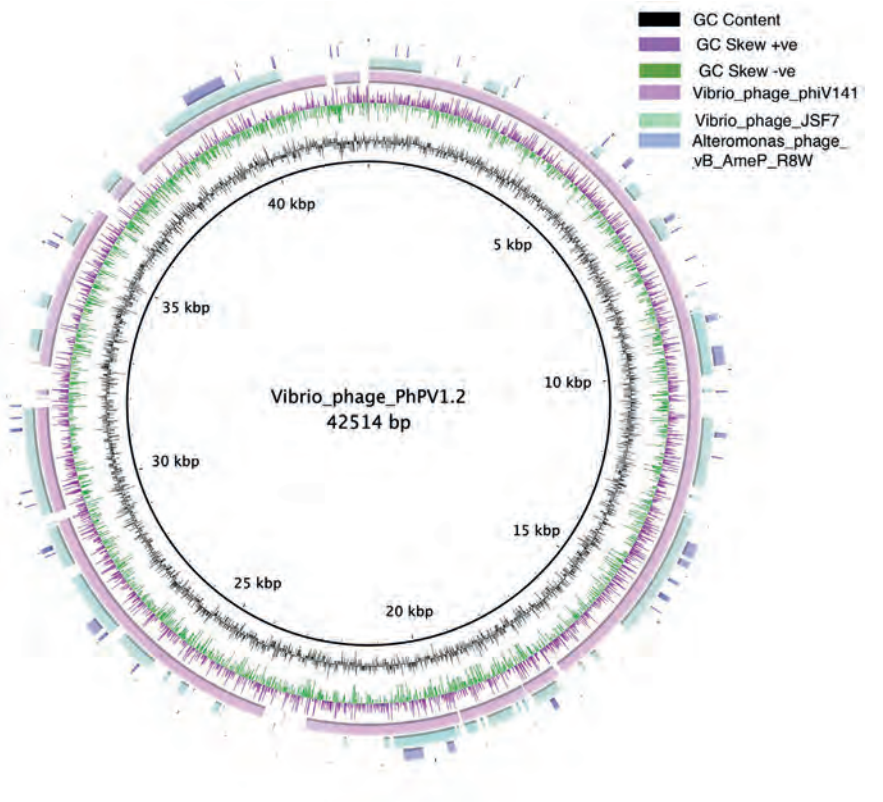
Investigations on archaeal diversity from solar salterns identified eight species, including *Haloferax larsenii* (3 strains), *Haloferax mucosum* (3



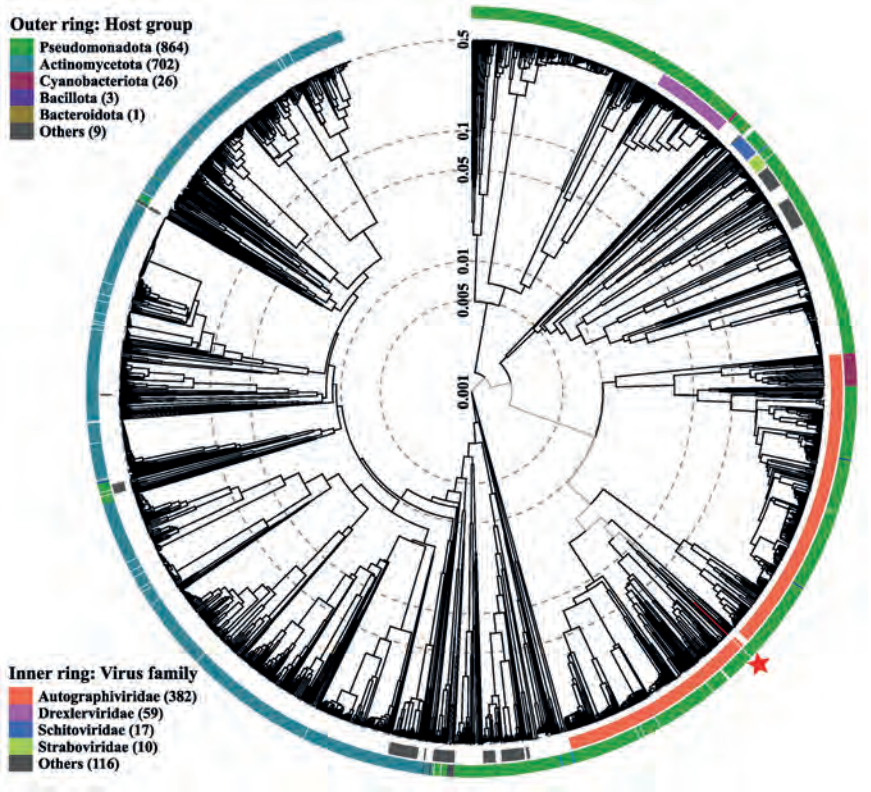
Haloed plaques of PhPV1.2



TEM image of PhPV1.2



Comparative genome analysis of PhPV1.2 using BRIG



Viral proteomic tree of PhPV1.2 generated using ViPTree

strains), *Haloferax denitrificans, Halorubrum salinarum, Haloferax massiliensis*, *Haloferax alexandrines, Haloferax volcanii* and *Haloferax profundi*.

Studies on marine plastisphere-associated bacterial diversity from various locations off Kochi identified 12 species comprising *Qipengyuania intermedia, Kandeliimicrobium roseum, Bacillus paranthracis, Vibrio owensii, Vibrio neocaledonicus, Vibrio parahaemolyticus, Vibrio alginolyticus, Priestia aryabhattai, Priestia koreensis, Priestia megaterium, Pseudoalteromonas spongiae* and *Pseudoalteromonas xiamenensis*. These strains are being screened for their potential to degrade various types of plastics.

Exploring marine bacteriophage diversity, a novel bacteriophage, PhPV1.2, specifically lysing a multidrug-resistant, biofilm-forming *Vibrio parahaemolyticus* strain PV1.2, was characterised by transmission electron microscopy (TEM) and whole genome sequencing. The TEM analysis revealed an icosahedral head having 53±5 nm dia. *De novo* whole-genome sequencing identified a 38.5 kbp dsDNA genome with 47.79% G+C content and 49 putative ORFs. Viral proteomic tree generated using VipTree and phylogenetic analysis of DNA polymerase and the large terminase subunit sequences confirmed PhPV1.2 as a novel *Tawavirus* within the *Autographiviridae* family. The complete genome sequence is available in GenBank (Accession No. PQ511476).

Two immortal cell lines (CA1F3Ex, GenBank Accession No. OM131589) and CA1F4Tr, GenBank Accession No. OM131590) were developed from the humpback grouper (*Cromileptes altivelis*), along with a novel brain cell line, PB1BrTr (GenBank Accession No. OR290980), from the maroon clownfish (*Premnas biaculeatus*), and have been published.

Developing a national roadmap for integrated coastal conservation and fisheries enhancement along the Indian coast through artificial reefs

Project: MCD/AR/21

Over five years, ten artificial reef (AR) sites along north Tamil Nadu were studied for fishery trends, fisher feedback, field trials, and fish movement, leading to performance indices for AR productivity. Each site, with 225–250 concrete modules covering 1500–1700 m², forms a pelagic impact zone (PIZ) of 30–32 ha and a bottom impact zone (BIZ) of ~5 ha after one year, shaped by local hydrodynamics. Modules last 10–12 years, with an effective life (AREL) of 6–8 years. The Area of Influence (AI) spans 200–300 m for pelagic and up to 100 m for demersal species. Effective Boundaries (PEB/SEB) range estimated is 200–600 m (surface) and 40–400 m (bottom). The Biological Influence Range (BIR) is 40–60 m. Operationally, ARs reduce fuel use by 30% and scouting time by 50%. Economically, hook and line fishing in 5 ha yields ₹ 25,000–66,500/year, while drift gillnets in 32 ha yield ₹ 8.4–12.24 lakhs, with catches averaging 0.5–1.5 kg/ha/year and 4.5–7.1 kg/year, respectively, demonstrating strong fishery enhancement potential.

A fish seed release and ranching device for sea ranching on artificial reefs has been developed and is currently being tested off Visakhapatnam, Andhra Pradesh and Tharuvaikulam, Tamil Nadu. A new

Snappers aggregating over the Artificial reef module deployed off Tuticorin

Prototype of fish seed release and ranching device

coral restoration reef module design is also under trial in the Gulf of Mannar, Tamil Nadu.

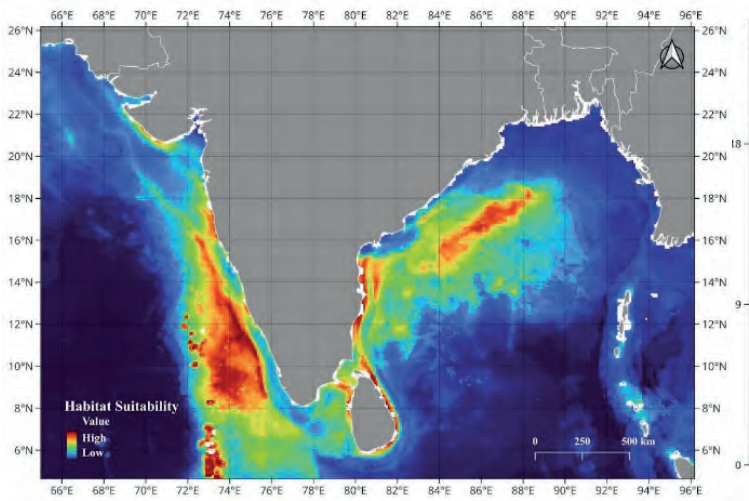
Marine mammal stock assessment in India

Project: DoF-PMMSY

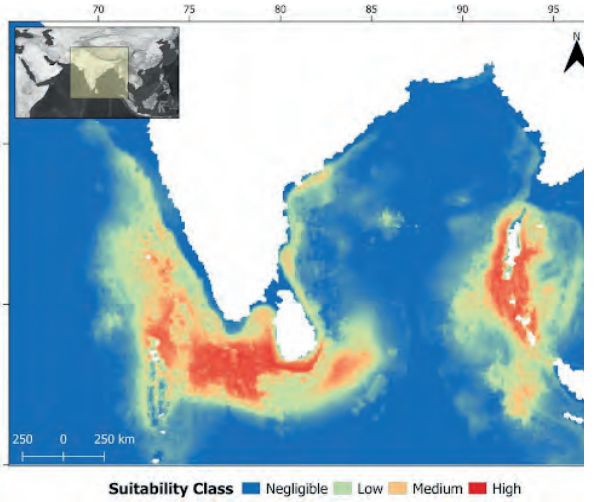
In 2024, marine mammal exploratory surveys across five Indian states and Lakshadweep documented 509 individuals from ten species, with *Sousa plumbea* (Indian ocean humpback dolphin) being the most common (355 sightings), frequently displaying leaping and fluke-slapping behaviors. Additionally, 171 strandings were recorded, highest in Goa (88), followed by Kerala (29) and Tamil Nadu (14). Stranded mammals belonged to seven families—Delphinidae (69), Phocaenoidae (54), Balaenopteridae (14), Dugongidae,

Killer whale feeding on a sunfish, sighted in Lakshadweep waters

Fluke slapping/lobtailing of *Sousa plumbea*



Model-based prediction of *Stenella longirostris* habitat suitability in the Indian Ocean



Habitat suitability predictions of *P. macrocephalus* in the Indian Ocean

Sousa plumbea leaping out of water, displaying a terminally smoothened fluke

Onboard catch and fish diversity at Antervedipalipalem landing centre

Kogiidae, and Ziphiidae (2–3 each), with 25 unidentified cases. Habitat suitability predictions of the sperm whale, Physeter macrocephalus, and spinner dolphin, Stenella longirostris, were attempted in the Indian Ocean.

Bio-inventorying and documentation of marine species in coastal and marine ecosystems of Andhra Pradesh

Project: APSBB

Sargassum sp. on rocks exposed during low tide at Rushikonda

The conservation status of 682 finfish species recorded along the Andhra coast was assessed, with 41 species classified as threatened (Critically Endangered, Endangered, or Vulnerable) as per the IUCN classification. Thirty-six of these threatened species (87.80%) are elasmobranchs.

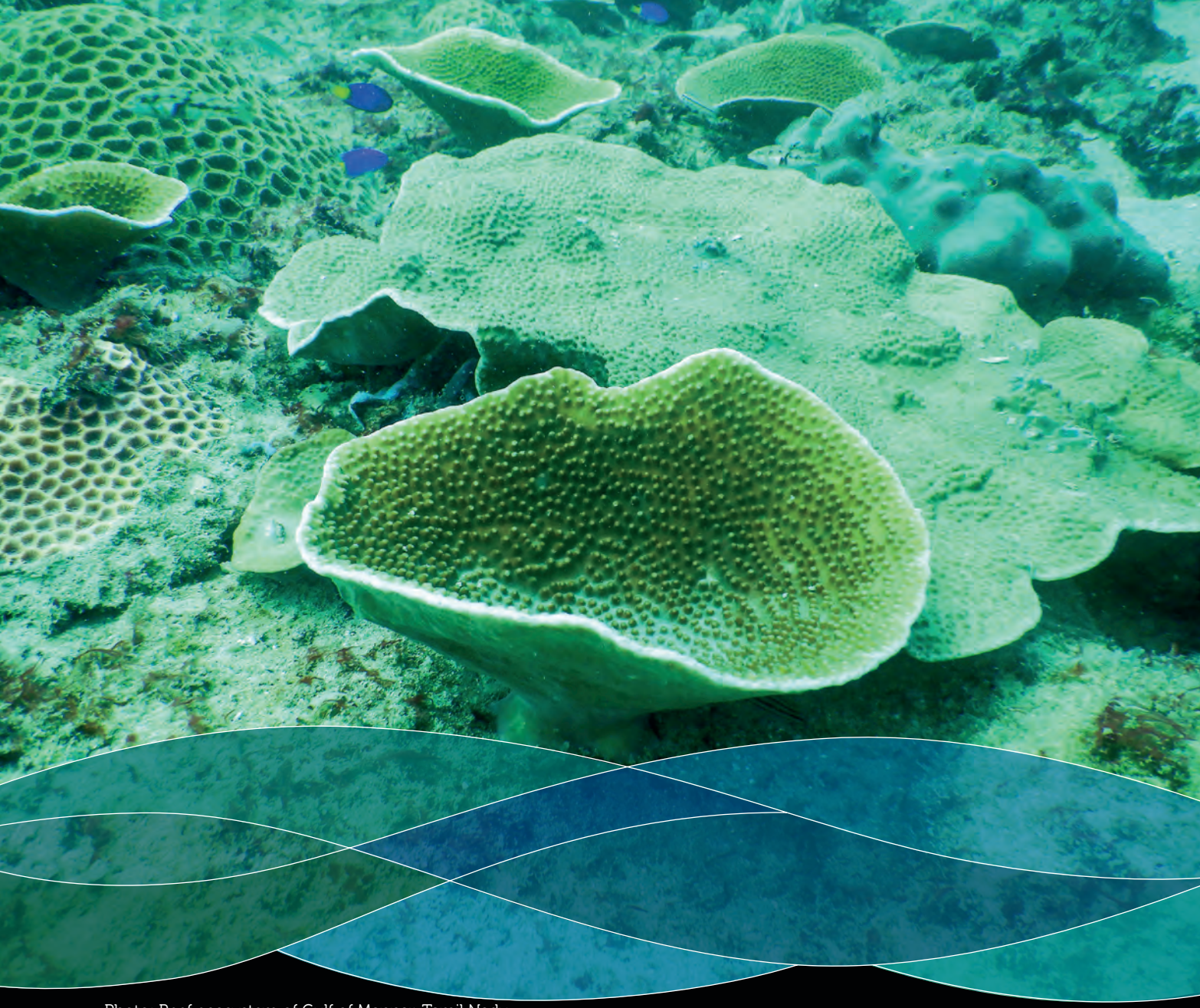


Photo: Reef ecosystem of Gulf of Mannar, Tamil Nadu

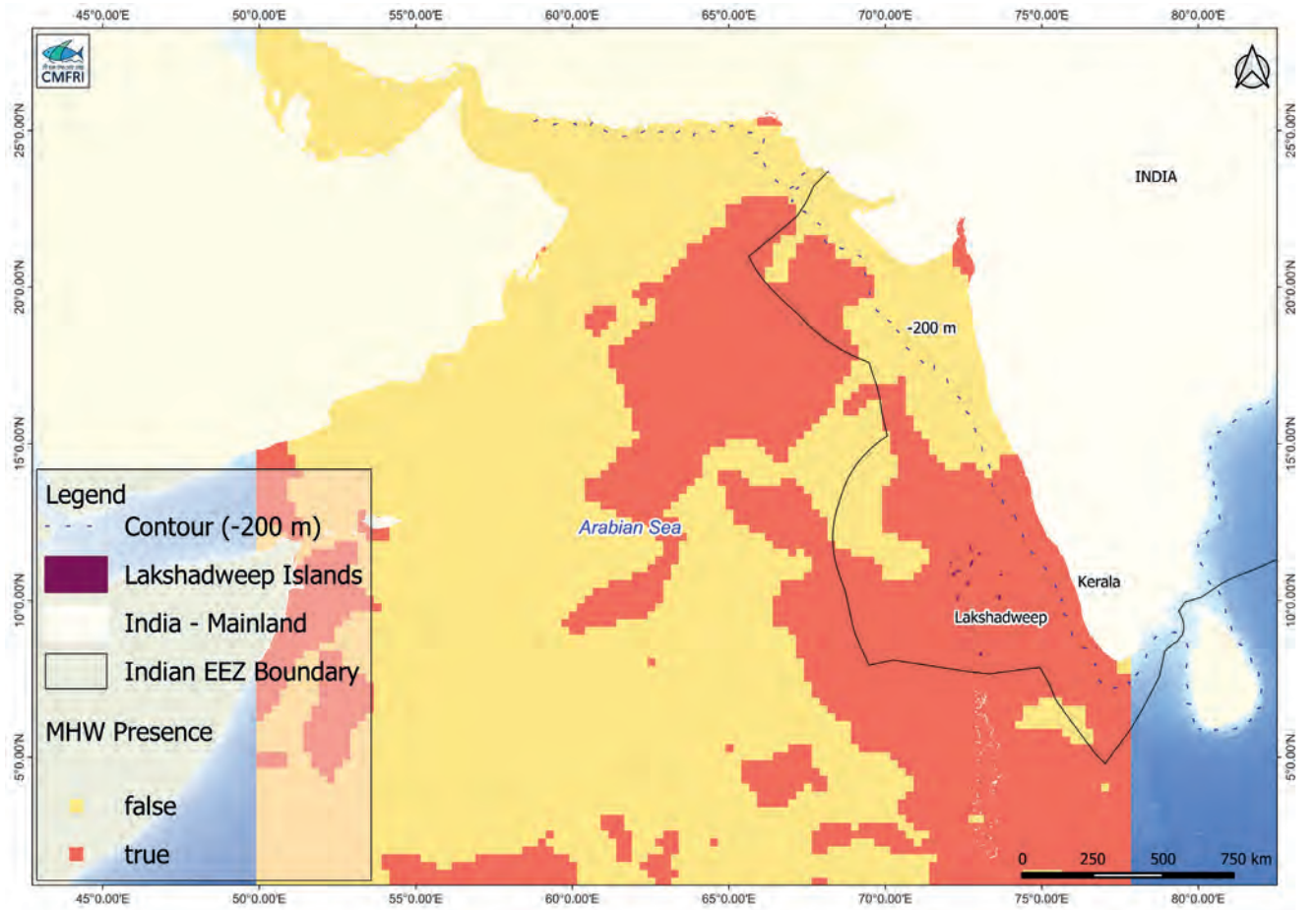
Marine Habitats

Impacts of extreme weather events on marine fisheries in selected ecosystems of northern Indian Ocean

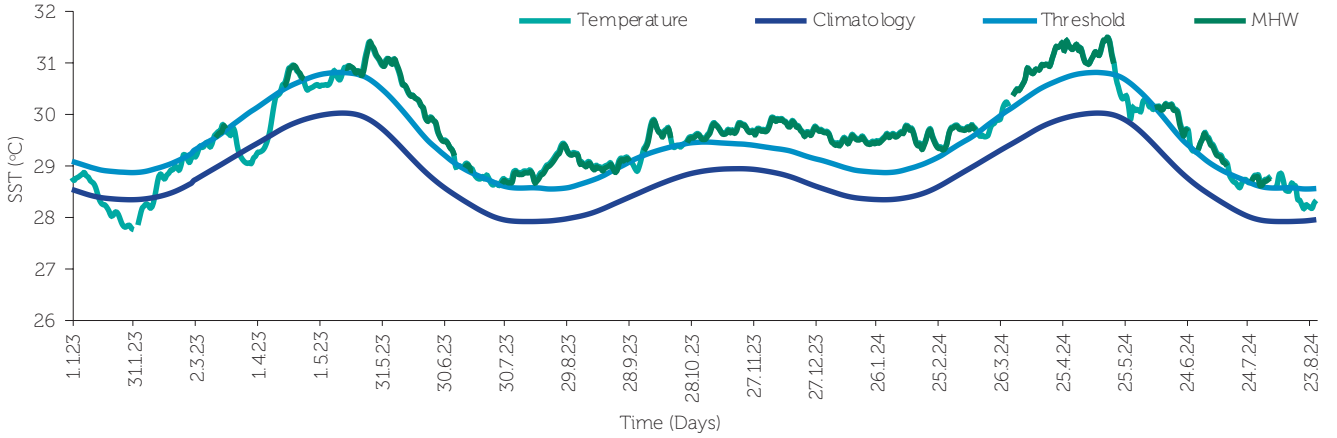
Project: FEM/GIS/38

Monitored the evolution of marine heatwaves in the Lakshadweep Sea. An unprecedented incidence of marine heatwaves occurred from 27 October 2023 to 15 March 2024. This was followed by a brief respite from 16 to 31 March 2024.
A subsequent marine heatwave event occurred from 1 April to 20 May 2024, with an intensity exceeding 1°C, leading to prolonged thermal stress on coral reefs. Compared to Degree Heating Weeks (DHW), marine heatwaves serve as a more precise indicator of heat stress for coral alert systems.

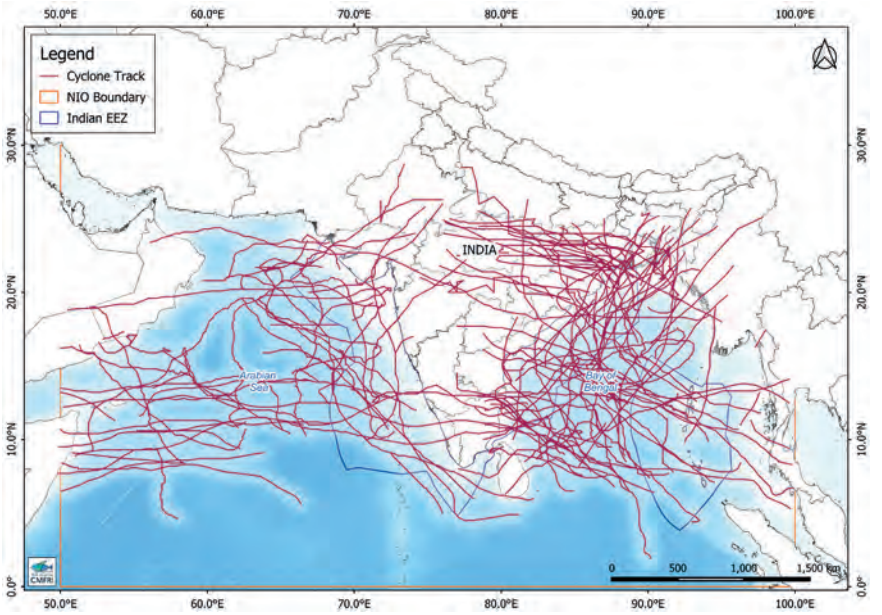
Between 2011 and 2024, a total of 147 cyclonic disturbances formed in the North Indian Ocean (NIO) region, with 90 originating in the Bay of Bengal, 41 in the Arabian Sea, and 16 over land. In 2024 alone, the NIO witnessed 11 depressions, 7 deep depressions, 4 cyclonic storms and 2 severe cyclonic storms. As a result, fishing activities were suspended for a total of 70 days. Odisha State experienced the highest loss, with 18 fishing days affected, followed by West Bengal with 17 days.



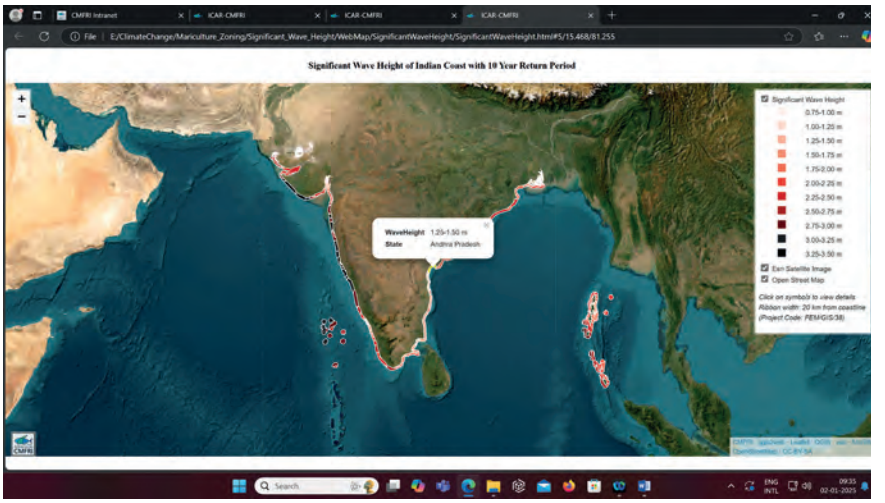
Area under marine heatwave incidence in the Arabian Sea as on 15 April 2024



Marie heatwave progression in Lakshadweep (08° to 12° N; 71° to 75° E)



Track of cyclonic disturbances in the NIO region (2011 to 2024)



Screenshot of the interactive map of significant wave height with a 10-year return period

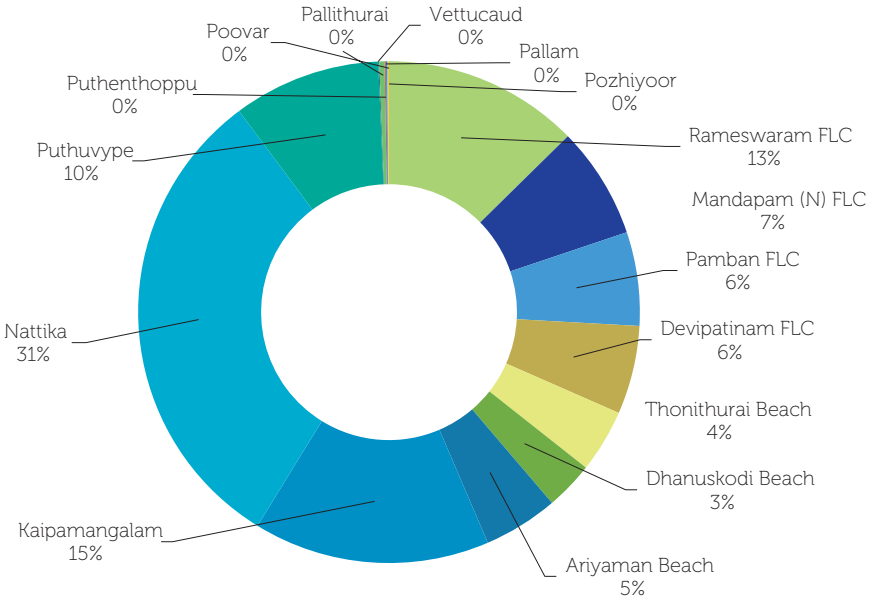
Interactive web maps of the ocean current fields, wind velocity and significant wave height along the coast of India within a 20 km buffer from the coastline were developed, to help design mariculture cage structures.

Impact of coastal marine pollution on the ecosystem's health, biodiversity and mitigation measures

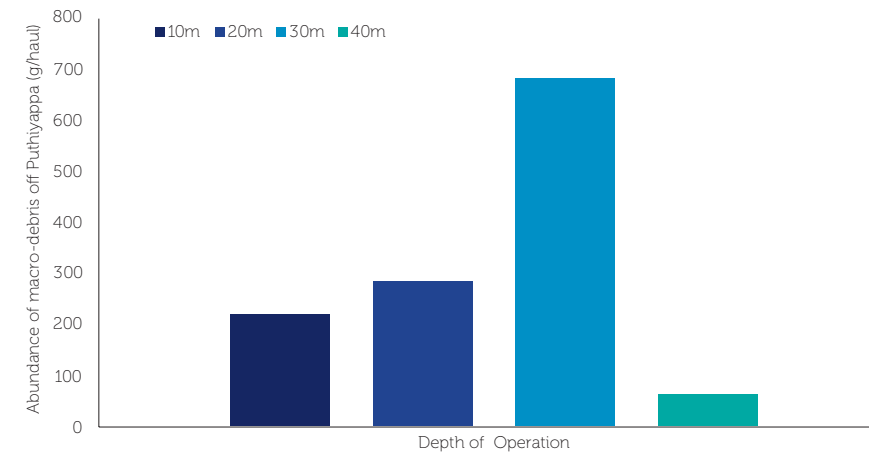
Project: MBEMD/MPC/28

Marine debris

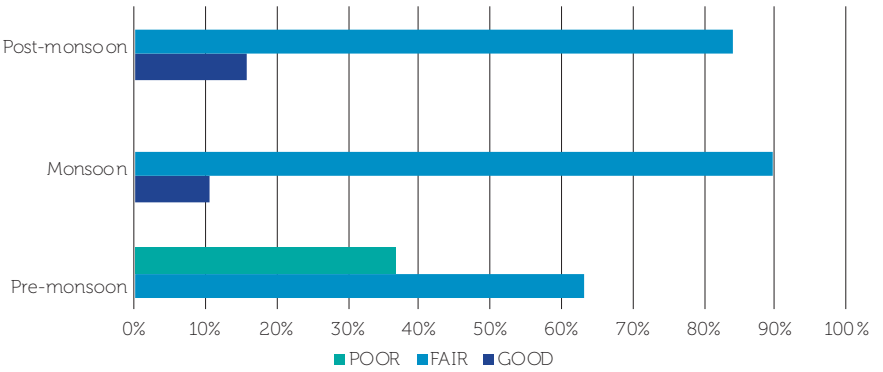
An interactive web map was developed to assess beach litter along the Indian coast, incorporating beach-wise and state-wise litter data. Off Puthiyappa, Kerala, marine litter analysis showed the highest accumulation at 30 m depth (2.5 kg per haul, dominated by plastics) and the lowest at 40 m (0.2 kg per haul). In Karnataka fishing grounds, an average of 3.8 litter items per kg of marine organisms was recorded (14.3 g, 1–190 cm size range), with litter mainly of terrestrial and fishing-related origin.



Litter abundance along selected beaches of south India (g/m²)



Depth-wise variation in sea-bed macroplastics abundance in Puthiyappa fishing ground



Seasonal water quality grading of Vembanad coastal ecosystem

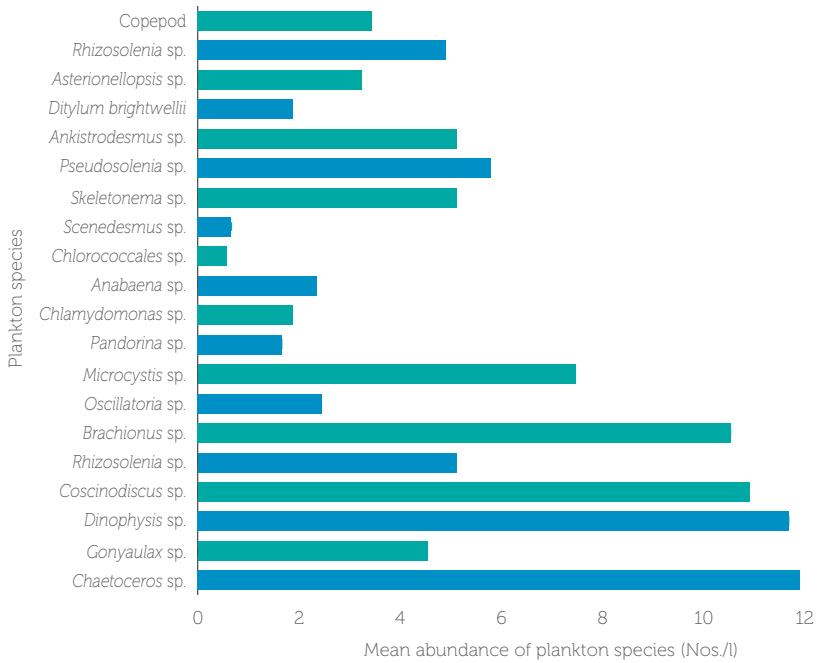
Investigations on microplastics in Lakshadweep and Karnataka coasts revealed significant variations. Lakshadweep had lower levels (2–21 pieces per transect), dominated by beads, while Karnataka recorded higher concentrations (48–328 pieces per transect), with fragments as the dominant type.

Coastal marine pollution

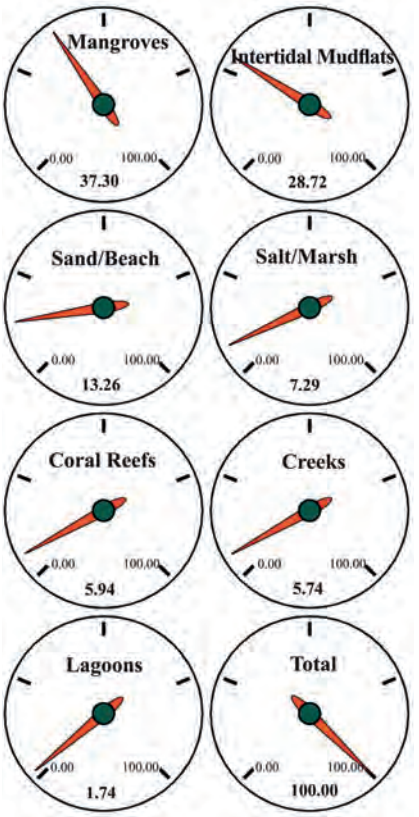
Water quality analysis off Kochi showed a fair to good Water Quality Index (WQI) in Vembanad Lake and Kalamukku Fishing Harbour. Molar ratios of DIN/DIP, DIN/DISi, and DISi/DIP indicated nitrogen (N) limitation in inshore and marine zones and phosphorus (P) limitation in estuarine and coastal zones. Sediment oxidation-reduction potential (ORP) and total organic carbon (TOC) assessments in Vembanad Lake estuarine hotspots revealed reduced conditions with high organic load.

An assessment of marine pollution and its impact on the coastal health of Chennai revealed the highest impact at Marina Beach. The concentration of heavy metals (Pb, Cu, Mn, Ba, As, and Hg) in seawater off Chennai during the monsoon and summer seasons was found to be within permissible limits. Similarly, heavy metal analysis of sediment samples along the Dakshina Kannada coast indicated that the mean concentrations of Cr, Cd, Cu, Pb, Ni, and Zn remained within the Probable Effect Level (PEL) threshold.

Analysis of plankton community structure and dynamics in selected coastal areas of Puthiyappa and Konad Beach, Kozhikode, revealed the presence of potentially harmful algal bloom (HAB) species, including *Dinophysis* and *Microcystis*, which are known to produce toxins harmful to both humans and marine life.



Mean abundance of phytoplankton off Puthiyappa, Kerala



Percentage composition of coastal habitats in India (Nos.)

Understanding the essential fish habitats for sustainable management of coastal and marine ecosystems

Project: MBEMD/EFH/29

Habitats of Particular Concern (HPCs) were delineated along India's east and west coasts to identify Essential Fish Habitats (EFHs). A rapid assessment and meta-analysis revealed that Indian coastal habitats cover 24.27% (37.1 lakh ha; 10,204 sites) of the total wetland area (152.6 lakh ha). Intertidal mudflats dominate (24.1 lakh ha; 65.16%; 2,931 sites), followed by mangroves (12.73%; 3,806), lagoons (6.64%; 178), creeks (5.58%; 586), salt marshes (4.35%; 744), coral reefs (3.83%; 606) and sandy beaches (1.7%; 1,353).

HPC sites identified based on rapid surveys include Punnakayal estuary in Thoothukudi, Pantry estuary in Kanyakumari, Keelakarai in Gulf of Mannar (GoM), Poovar in Thiruvananthapuram, Thottappally and Pallana in Alappuzha, Thirumullavaram in Kollam, Puthuvypu and Mangalavanam mangroves and adjoining Vembanad wetlands in Ernakulam, Korapuzha-Elathur, Kolavipalam, and Velliyamkallu rock island in Kozhikode, Netrani reef in Dakshina Kannada and Lakshadweep islands. These sites are ecologically significant due to their rich biodiversity, critical role in faunal life cycles, and vulnerability to environmental threats. Surveys documented the biodiversity of seaweed beds, mangrove stands, coral reefs, and other coastal ecosystems.

Mangroves

Egg and larval analyses identified fish aggregation sites in Thoothukudi and Kanyakumari mangroves. Surveys of Elathur-Korapuzha Kolavipalam mangroves, revealed rich biodiversity. Poovar bar-built mangrove estuary hosts rare and vulnerable mangrove species. Anthropogenic threats faced by these ecosystems, including tourism, sand mining, shrimp farming and waste dumping, were also assessed.

The mangrove nursery established at Muttiyar Beach, in Lakshadweep comprising *Rhizophora mucronata, R. apiculata, Avicennia marina, A. officinalis, Bruguiera cylindrica* and *B. gymnorrhiza,* and a similar effort in the farm area of ICAR-CMFRI, Thoothukudi, planting 78 saplings of *R. mucronata, A. marina* and *Bruguiera* spp., have shown establishment of the saplings with robust stilt roots, healthy foliage. To optimise spacing and growth, smaller saplings have been relocated to nearby areas. Ongoing monitoring and management with active involvement of the local community

Mangrove patches in Kanyakumari

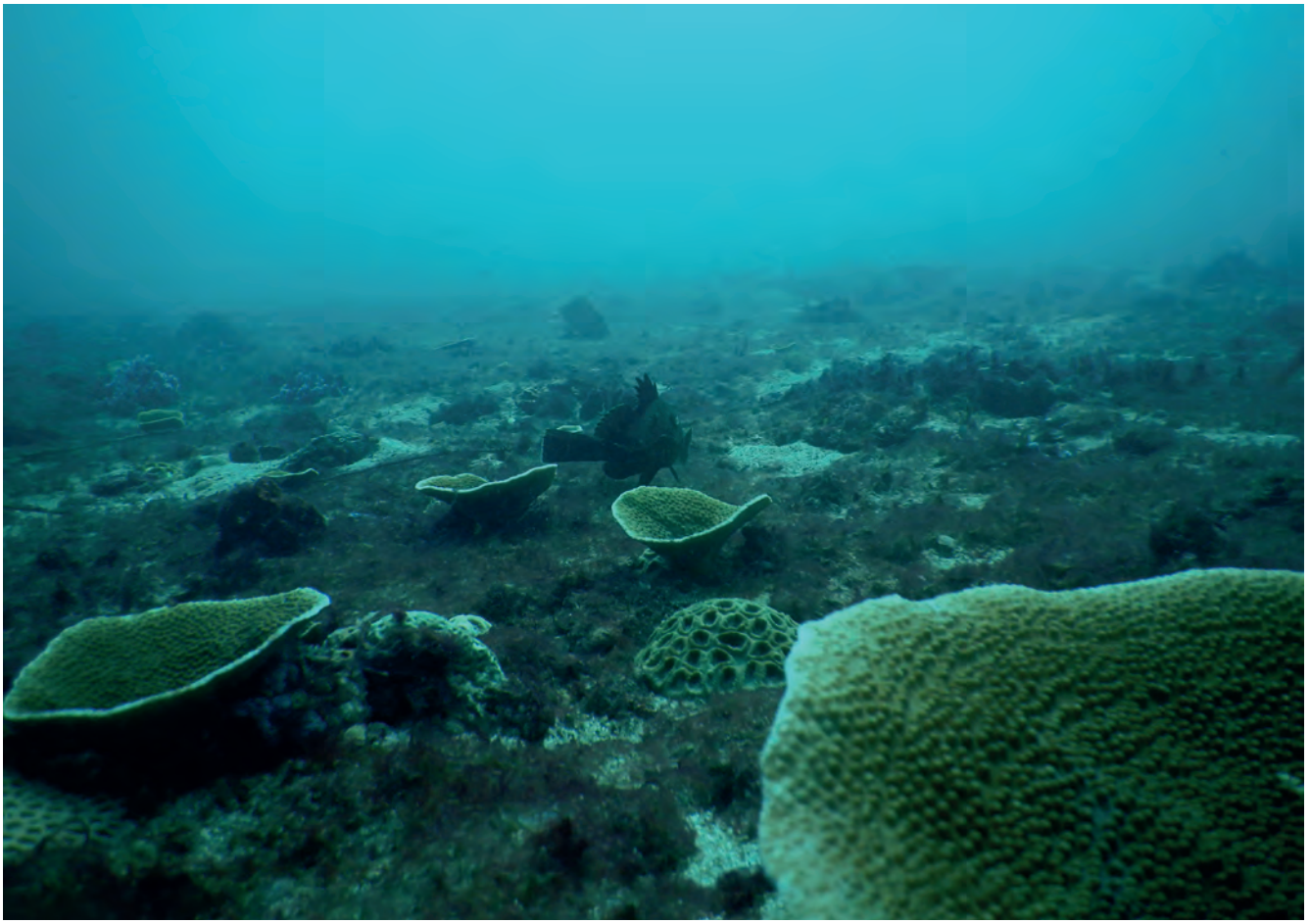
Mangrove nursery at Muttiyar beach, Kavaratti

Relocating smaller mangrove saplings from the nursery to nearby areas in Muttiyar beach

are being implemented to support their long-term establishment to enhance ecosystem benefits. Restoration efforts were also made by planting 200 saplings of *R. mucronata* and 100 saplings of *B. cylindrica* in the backwater area of the KVK, Ernakulam.

Coral reefs

Fish trap catches from four coral islands (Appa, Vala, Thalayari, and Manauli) and the Keelakarai region of the Gulf of Mannar revealed dominance of parrotfishes and rabbitfishes. Underwater surveys at Netrani Reef and Bhatkal Wreck highlighted the ecological significance of *Reticulammina novazealandica* in deepsea ecosystems and documented the impact of the 2024 global mass coral bleaching event on Netrani reefs. A survey at Velliyamkallu Rock Island revealed diverse rocky reef habitats with marine ornamental fishes, sea urchins, corals, and sponges. Exploration of fish diversity in Lakshadweep resulted in a

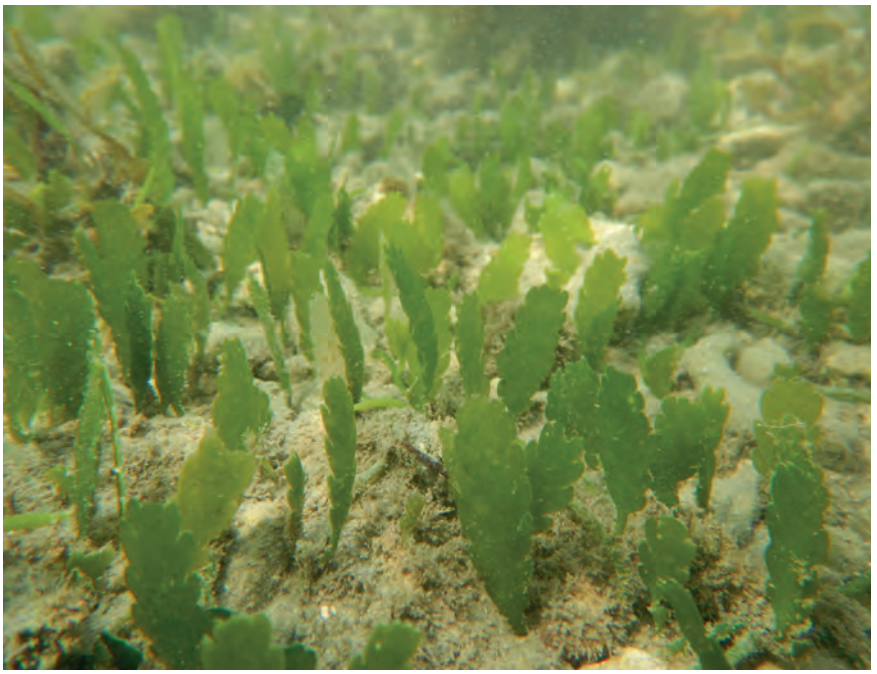


Reef ecosystem of Gulf of Mannar, Tamil Nadu

checklist of 883 species, including 15 new reef fish records. The survey in Thirumullavaram, featuring a unique rocky shoreline supporting encrusting corals, revealed a rich diversity of macroalgae and 24 species of coral reef fishes.

Seaweed beds

Studies in seaweed beds in Thoothukudi and Kanyakumari revealed the dominance of red algae *Gracilaria* spp. along with brown (*Sargassum, Padina, Stoechospermum*) and green algae (*Caulerpa, Ulva*). *Gracilaria edulis* and *G. corticata* cystocarps were recorded in summer and post-monsoon seasons. Macroalgal survey in Thirumullavaram documented 45 species from



Seaweed bed in Thoothukudi

Seaweed beds along with mussels in Kanyakumari

Seaweed beds in Thirumullavaram

Chlorophyceae, Rhodophyceae, and Phaeophyceae, including reproductive stages of *G. corticata* and *Asparagopsis taxiformis*.

Other ecosystems

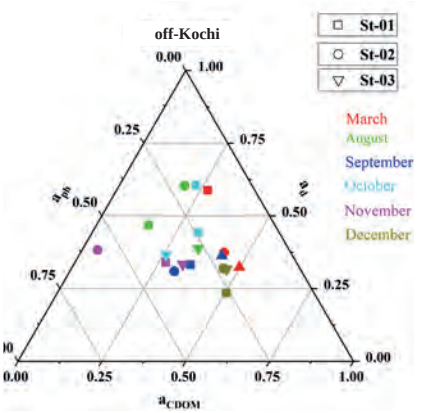
Thottapally and Pallana beaches in Alappuzha, key staging grounds for shore and seabirds, saw a sharp decline in winter migrants in 2024, with only 9 of 22 species arriving by December. Habitat loss due to placer mining and altered circulation patterns likely contributed to this decline.

CO_2 assimilation off Kochi and Mandapam coasts

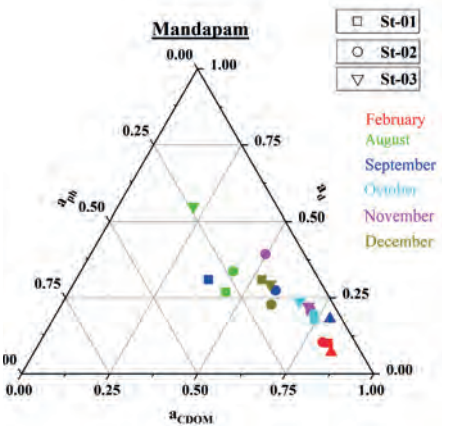
Project: PME/ERPRC/NRSC-1/2015

Absorption budget off Kochi and Mandapam

In coastal waters off Kochi, absorption by coloured dissolved organic matter (aCDOM), phytoplankton (aph), and detritus (ad) contributed equally to the absorption budget. In Mandapam, CDOM was



Absorption budget off Kochi



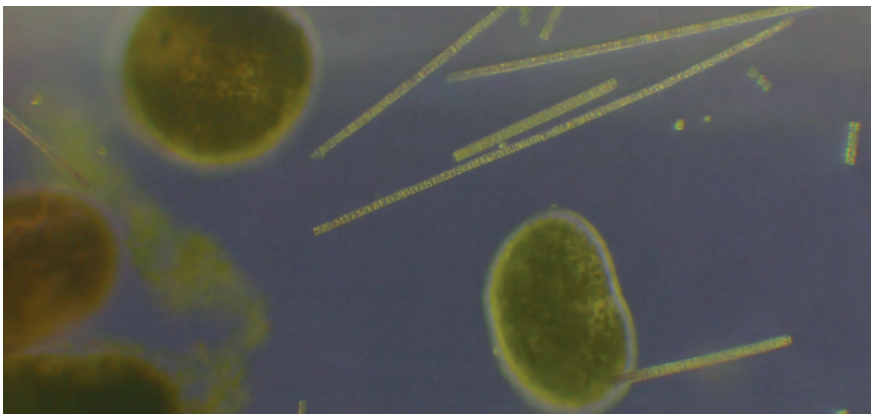
Absorption budget off Mandapam

the dominant contributor, followed by aph, likely influenced by cage aquaculture activities enhancing CDOM concentrations in the sampling area.

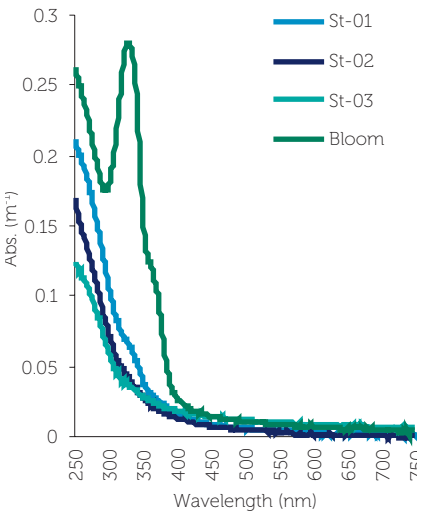
Algal blooms

A *Trichodesmium* bloom (15.22 lakh cells/l) was observed off Kochi in March 2024, leading to elevated total ammonia-N, increased chlorophyll-a, and higher aCDOM. The bloom was likely triggered by elevated SST, nutrient enrichment, low phosphate levels, and favourable environmental conditions. CDOM absorption at 440 nm was significantly higher (0.277/m) at the *Trichodesmium* bloom station compared to non-bloom stations (0.16–0.20/m). False color composite (FCC) and Normalized Difference Chlorophyll Index (NDCI) imageries from Sentinel-2 data (08 March 2024) identified the bloom patch off Kochi. An NDCI value of 0.3 indicated a moderately high chlorophyll-a level.

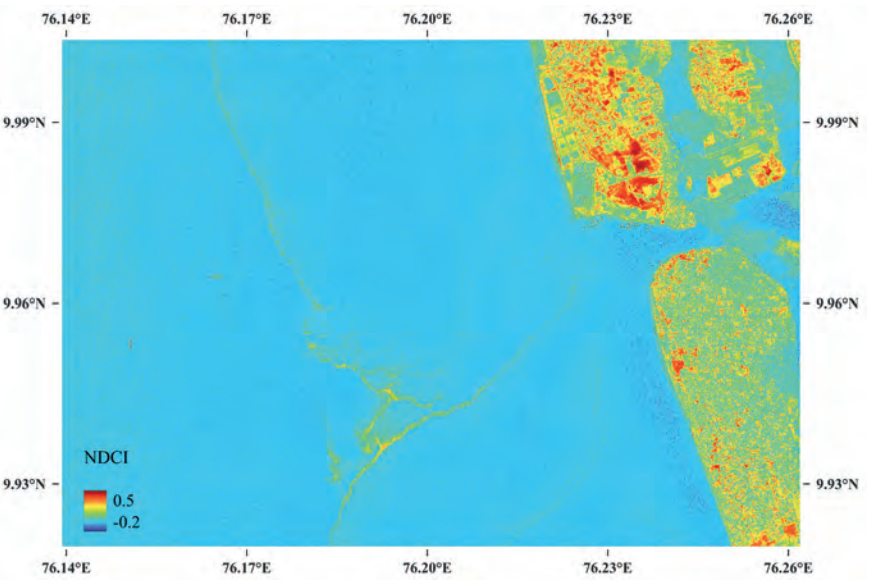
Algal bloom recorded off Kochi



Trichodesmium sp. in the bloom



CDOM Absorbance spectra



Normalised difference chlorophyll index (NDCI) image developed from Sentinel 2 dataset showing the algal bloom trail

Photo: Indian oil sardine (*Sardinella longiceps*)

Climate Change

Climate change risk assessment on marine resources

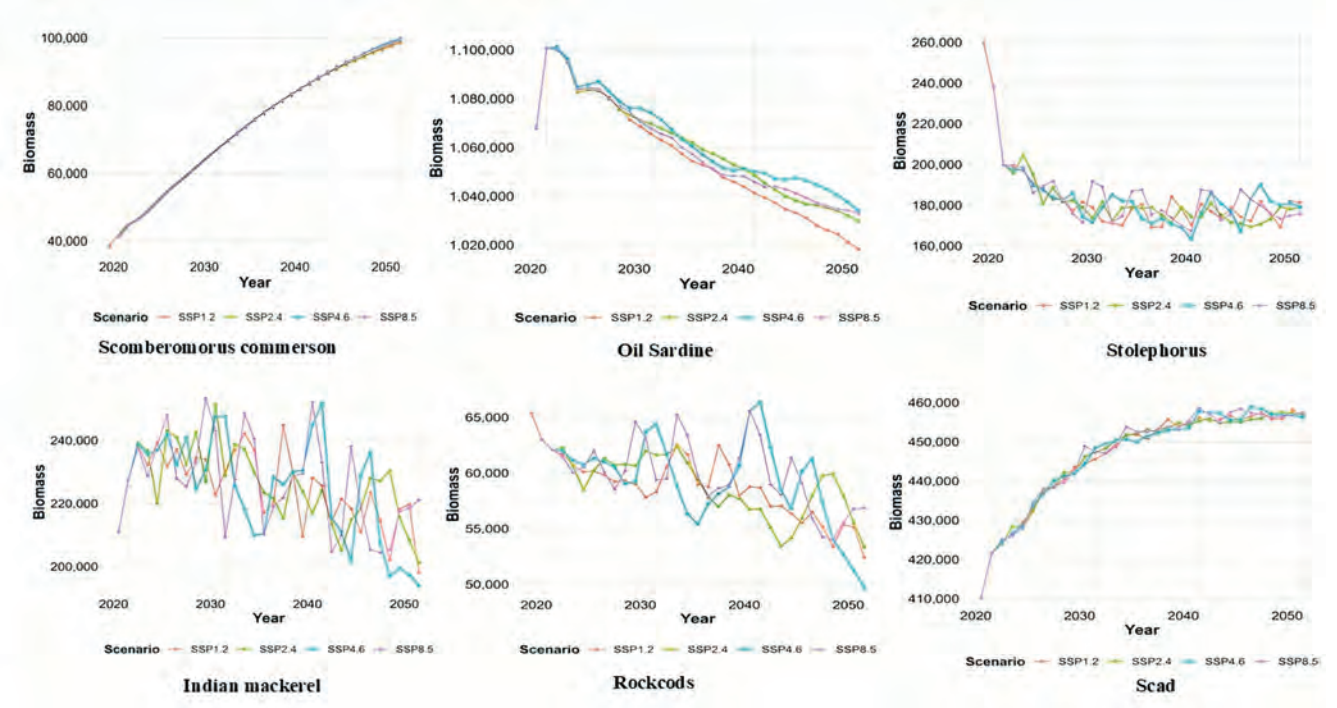
Project: NICRA

Impact of environmental variables on the catch per unit effort of Indian oil sardine along the Kerala coast

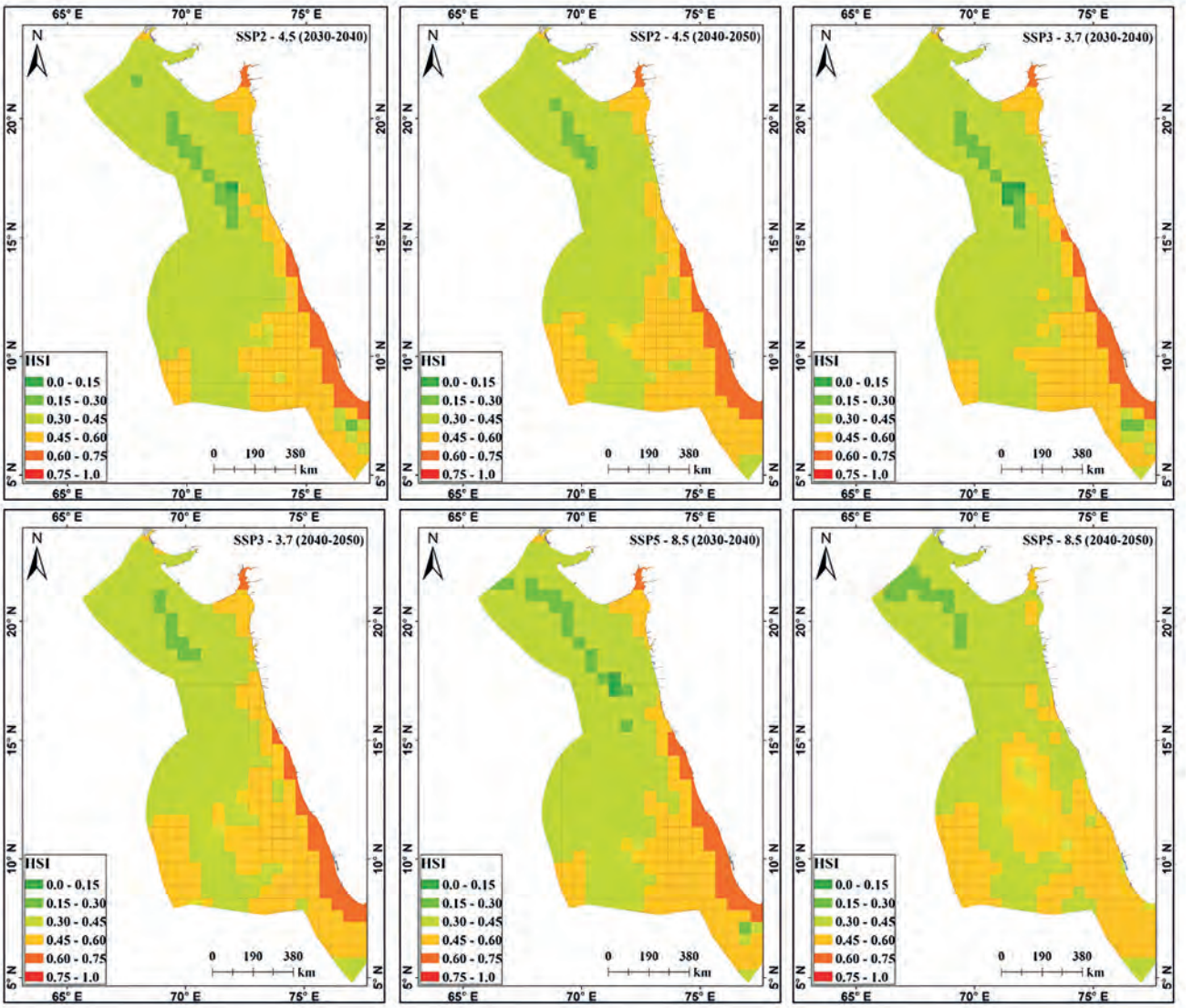
Impact of Environmental Variables on the Catch per Unit Effort (CPUE) of Indian oil sardine (*Sardinella longiceps*) along the Kerala coast (1998-2023) was assessed using a Generalised Additive Model (GAM). The input data included the time series of total landing data, oil sardine landings, and fishing hours expended by various fishing gears to capture the respective species. Monthly average data of oceanographic variables, Sea Surface Temperature (SST), Sea Surface Salinity (SSS), Mixed Layer Depth (MLD), chlorophyll (Chl-a), Dissolved Oxygen (DO), Phytoplankton Carbon (phyC), and Precipitation along the Kerala coast were averaged to obtain the yearly values. The analysis revealed that a combination of SST, Chl-a, and SSS significantly impacted the oil sardine CPUE, showing a strong fit with an adjusted R-squared value of 0.52 and explaining 59.4% of the deviance. Future predictions made using these variables under various shared socio-economic pathway (SSP) scenarios indicated a declining trend in oil sardine CPUE across all SSP scenarios.

Multispecies predator-prey climate model

A multispecies predator-prey climate model was developed to evaluate the combined effects of rising SST and predation pressure on the predator-prey dynamics of *Scomberomorus commerson* (predator) and oil sardine, Indian mackerel, *Stolephorus,* rock cods, and scads (prey species). Projections under future various SSP scenarios indicated a steady increase in scad's biomass and a decline in other prey species, illustrating species-specific responses to warming temperatures and ecological interactions.



Prediction of biomass of predator and prey in various SSP scenarios



Potential distribution of scads under different SSP scenarios

Species distribution modelling of scads

Species Distribution Modelling (SDM) of scads was done to predict their potential habitats along India's west coast, integrating key environmental variables. The Exclusive Economic Zone was divided into 446 grids (0.5° x 0.5°) and a comprehensive spatial database was constructed using species occurrence data and oceanographic factors, SST, SSS, Chl-a, DO, pH, and bathymetry. The study indicated Chl-a and SSS have a crucial role in determining scad distribution.

The models predict a significant loss of suitable habitats for scads in future due to changing environmental conditions under various SSP scenarios (SSP2, SSP3, and SSP5)

Trophic plasticity to combat climate-induced change in prey abundance of bombay duck

Trophic plasticity in bombay duck was assessed in response to changing environmental conditions, particularly prey abundance (anchovies and *Acetes*).

Two modelling approaches, weighted predator abundance (surplus production model) and time-varying model (CPUE-based) were used to analyse the effects of prey availability. Both models confirm that the bombay duck is adapting its diet to changes in prey abundance, supporting the hypothesis of trophic plasticity driven by climate change.

Impact of cyclone *Tauktae* on fishers' livelihood in Karnataka

The impact of cyclone *Tauktae* on the coastal districts and the fishing

communities of Karnataka, exploring the cyclone's hazard characteristics, socio-economic losses, infrastructure damage, and community preparedness were evaluated. The cyclone's hazards were identified as strong winds, storm surges, and violent rains, with varying intensity across districts. Dakshina Kannada experienced the most severe storm surges, while Udupi and Uttara Kannada faced significant wind damage. Socio-economic losses were severe, with fatalities reported in each district, and injuries affecting over a thousand people. Fishing households experienced substantial losses, with Dakshina Kannada, Udupi, and Uttara Kannada reporting average economic losses. Fishing boats and nets were heavily impacted across all three districts, significantly affecting the livelihood of the fishing communities. Social security challenges were evident, with transportation, power, and fuel shortages being the primary concerns, while food insecurity was less severe due to relief efforts. The study also examined the preparedness of communities, revealing that while 80% received climate-related warnings, 81.5% could not relocate valuable assets before the cyclone. Evacuation efforts were insufficient, with only 34.3% of respondents moving to shelters. Despite these challenges, communities have adapted through various strategies, although there is a need for greater preparedness, improved disaster mitigation, and enhanced relief efforts to bolster resilience against future cyclones.

Thermal adaptability of silver pompano

Temperature is a vital environmental factor influencing the physiology and aquaculture potential of fish species. To evaluate the heat tolerance of silver pompano (*Trachinotus blochii*), it's Critical Thermal Maxima (CT_{max}) and Critical Thermal Minima (CT_{min}) were examined across six acclimation temperatures (T_{acc}), ranging from 18 °C to 36 °C. Analysis using a Generalised Additive Model (GAM) revealed that the CT_{max} and CT_{min} for *T. blochii* were 41.1 $\pm$ 0.047 °C and 12.0 $\pm$ 0.075 °C, respectively. The study found that silver pompano acclimated to higher temperatures exhibited increased thermal tolerance, which could be further enhanced through acclimation, facilitating adaptation to elevated temperatures. These findings position silver pompano as a climate-resilient finfish, capable of contributing significantly to climate-smart marine aquaculture systems.

Thermal and environmental adaptability of Indian pompano for mariculture

Mariculture, a low-carbon aquaculture sub-sector, is a crucial and rapidly expanding global food production industry. However, its growth is highly vulnerable to climate change, primarily due to temperature fluctuations in existing environments. Ensuring the sector's long-term sustainability requires effective mitigation and adaptation strategies to address these temperature variations and their impacts on production. A key adaptive approach involves identifying new marine fish species with robust thermal tolerance to establish climate-resilient mariculture systems. Understanding the upper and lower thermal tolerance limits of these species is vital for evaluating their suitability for mariculture diversification beyond their natural habitats. In this context, the thermal adaptability of Indian pompano (*Trachinotus mookalee*) was conducted at six acclimation temperatures (T_{acc}), which revealed that the Critical Thermal Maxima (CT_{max}) ranging from 37.02 °C to 43.22 °C, while the Critical Thermal Minima (CT_{min}) ranging from 12.66 °C to 19.22 °C. The Acclimation Response Ratio (ARR) also was calculated, highlighting its resilience and adaptability to varying thermal conditions within the tested range. The results project Indian pompano as a promising candidate for mariculture development in tropical regions where their robust thermal adaptability provides a practical solution for adaptation and mitigation, particularly in areas where extreme climate conditions hinder traditional species farming practices.

Impact of elevated temperature on growth and spore formation of *Gracilaria corticata*

Temperature influence on the growth and spore formation of the sea weed, *Gracilaria corticata* were tested at two temperatures, 30 °C (normal) and 32 °C (higher) under controlled conditions. After 60 days, seaweeds at 30 °C showed a 30% weight increase, indicating favourable growth, while those at 32 °C experienced 50% bleaching, indicating thermal stress. Spore formation occurred only at 30 °C, with no reproduction at 32 °C. The results highlight that elevated temperatures significantly hinder both growth and reproduction, making *Gracilaria corticata* vulnerable to stress.

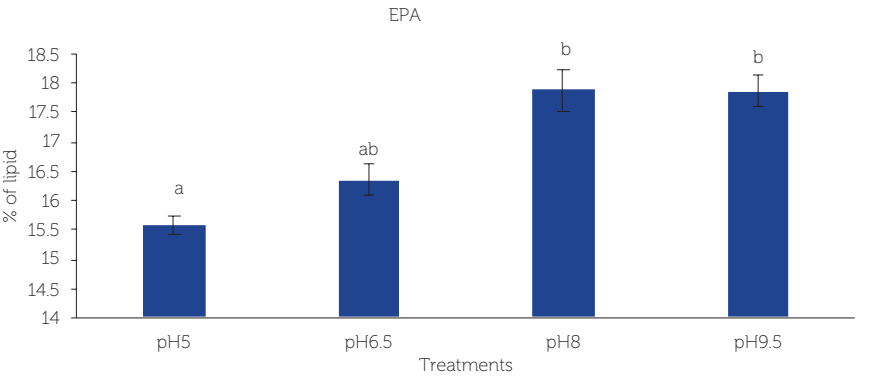
Growth and nutritive profile of the phytoplankton, *Chaetoceros calcitrans*

The growth and nutritive profile of *Chaetoceros calcitrans* was assessed under different pH conditions (5, 6.5, 8, and 9.5) at 28 °C. CO_2 was added cyclically to maintain pH 5, 6.5, and 8, while pH 9.5 was maintained without CO_2. The results showed that pH 8.0 was optimal for higher cell density, biomass, and growth rate. The Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) content increased with pH from 5.0 to 8.0 and

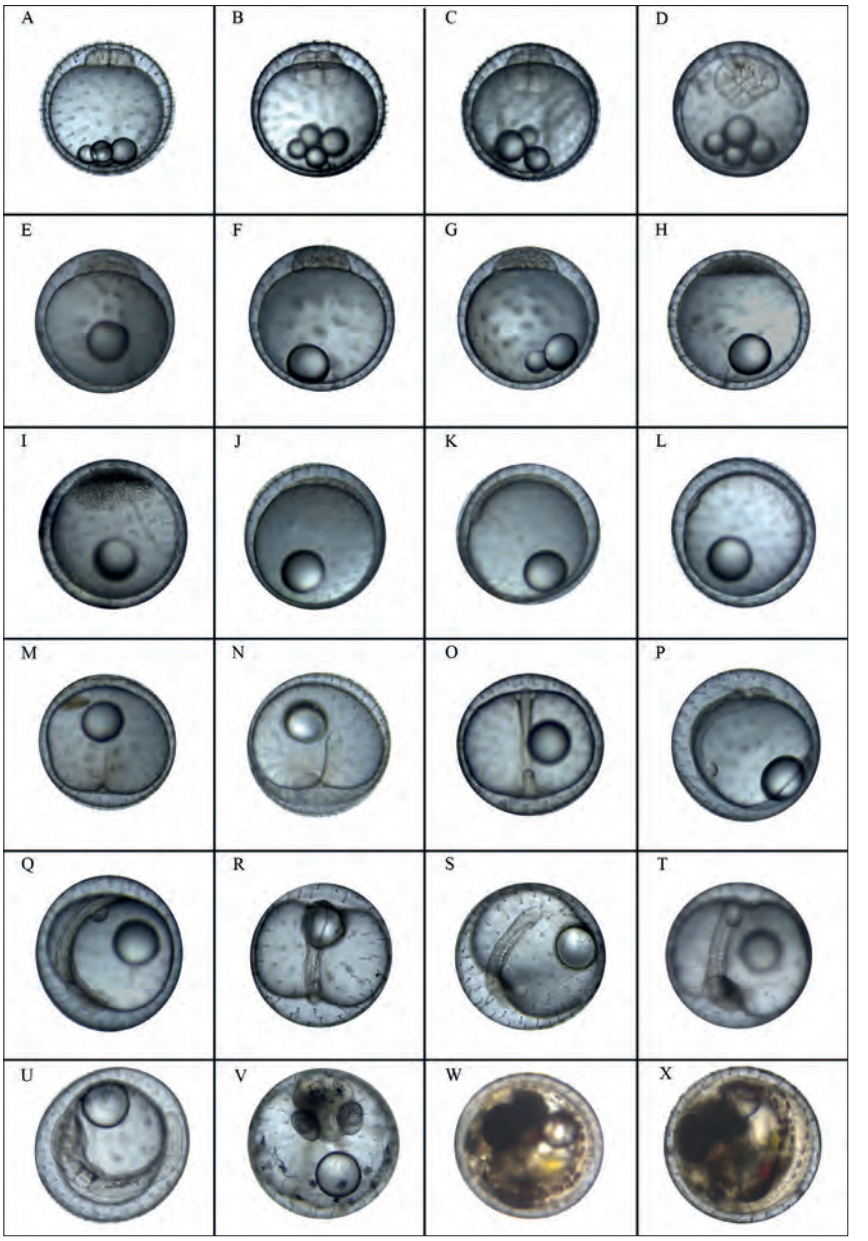
5.0 to 9.5. Crude protein content was highest at pH 8.0, while lipid content was highest at pH 9.5.

Influence of temperature on the early life history stages of Indian rice fish (*Oryzias dancena*)

The study examined the effects of different temperatures on the early life stages of *Oryzias dancena*. Temperatures of 24 °C (control), 27 °C, 30 °C, and 33 °C were analysed to determine their influence on embryonic development, larval growth, survival, and reproductive maturity. The study revealed that temperature significantly influenced the duration of the embryonic period in *Oryzias dancena* but did not affect the chronology of ontogenetic events. Embryonic development duration was reduced by 11% at 27 °C (492 ± 9 hours), 40% at 30 °C (331 ± 34 hours), and 60% at 33 °C (221 ± 40 hours) when compared to the control at 24 °C (552 ± 19 hours). Larval growth, measured as total length at 10, 20, and 30 days post-hatch (DPH), displayed significant differences across all temperature treatments, with the highest growth recorded at 33 °C, followed by 30 °C, 27 °C, and 24 °C. Despite these variations in growth, larval survival percentages remained consistent among treatments. Additionally, the earliest reproductive maturity and spawning were observed in 66% of rice fish pairs reared at 33 °C. These findings underscore the critical role of temperature in accelerating developmental stages and promoting growth rates in *Oryzias dancena*. While larval survival was unaffected by temperature, elevated temperatures such as 33 °C facilitated earlier reproductive maturity, demonstrating their potential benefits for achieving rapid production cycles.



The protein, lipid, EPA and DHA content of *Chaetoceros calcitrans* at various pH



Embryonic developmental phases and subsequent larval development of *Oryzias dancena*

Photo: Fishing crafts in Chellanam landing centre

Economics, Sustainability and Trade

Economics, trade, and stakeholders in the marine fisheries sector: a policy outlook

Project: FRAEED/ETS/05

Valuation of fish landings

In 2024, the value of marine fish landings was estimated at ₹ 62,702 crores at the landing centre (LC) level (up 4.22 % from 2023) and ₹ 90,104 crores at the retail centre (RC) level (up 8.46 %). The unit price per kilogram was ₹ 182.59 at LC (up 6.98 % from 2023) and ₹ 262.38 at RC (up 11.33% from 2023). Marketing efficiency improved to 69.59 % as compared to 2023.

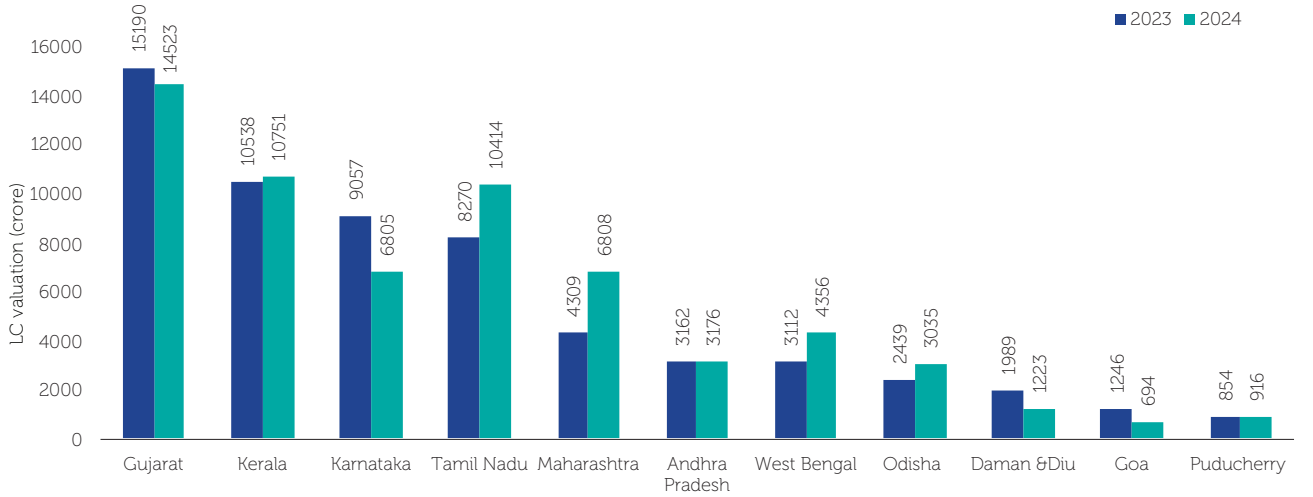
Valuation of fish landings across states

Gujarat recorded the highest price realisation at LC (23.16%) and RC (23.20%) levels, followed by Kerala at LC (17.14%) and RC (16.66%), with all percentages reflecting increases over 2023.

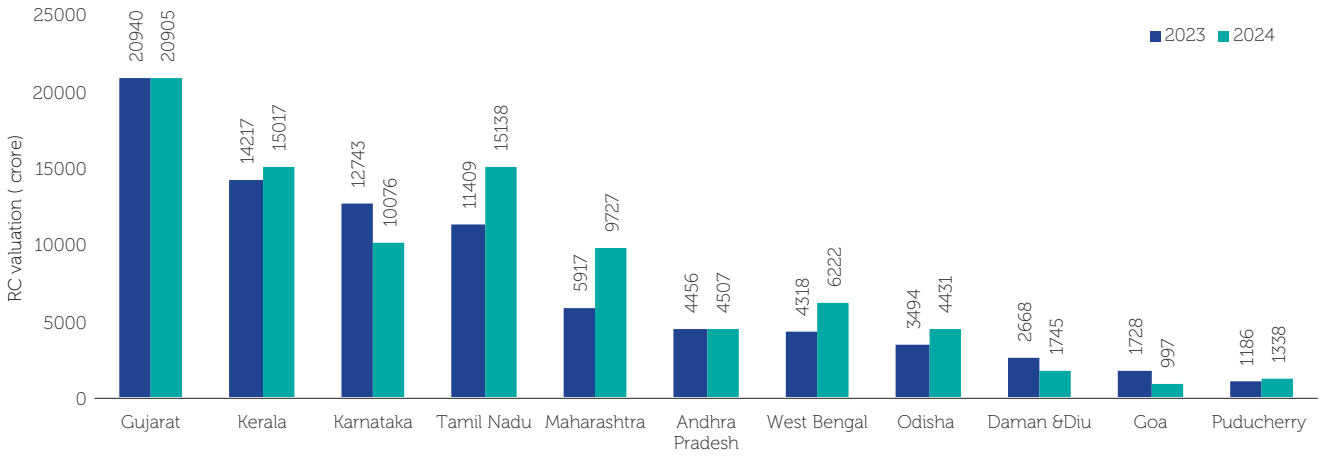
Species-wise valuation of marine fisheries in India

Indian mackerel had the highest share in total marine fish landings (9.71%), while penaeid shrimps led in value terms with 10.04% at LC and 9.70% at RC levels.

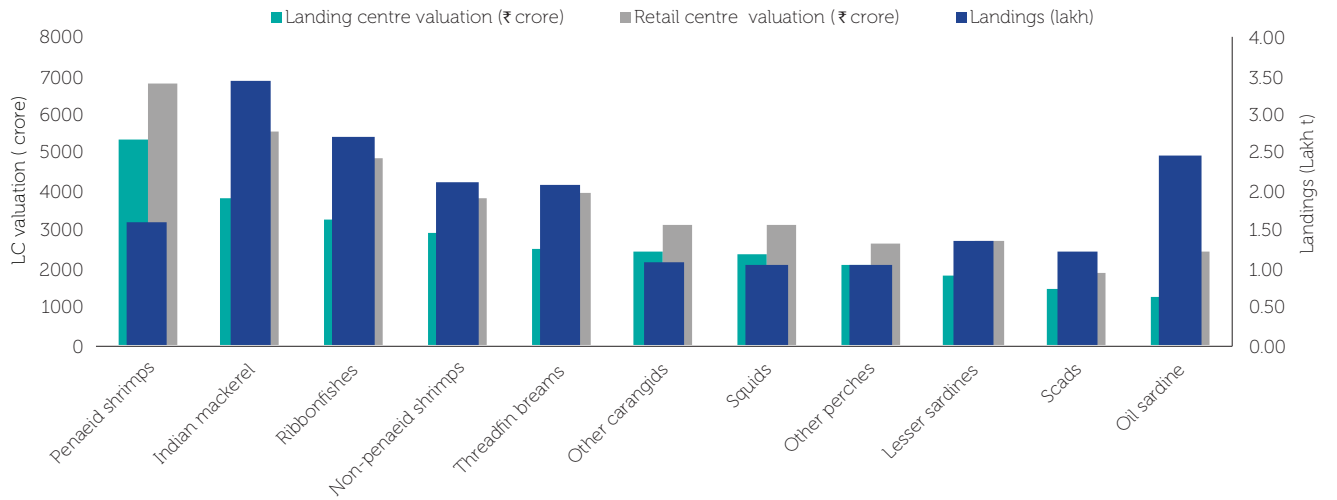
View from Karoor landing centre, Alappuzha



State-wise LC valuation 2023 & 2024 (₹ crores)



State-wise RC valuation 2023 & 2024 (₹ crores)



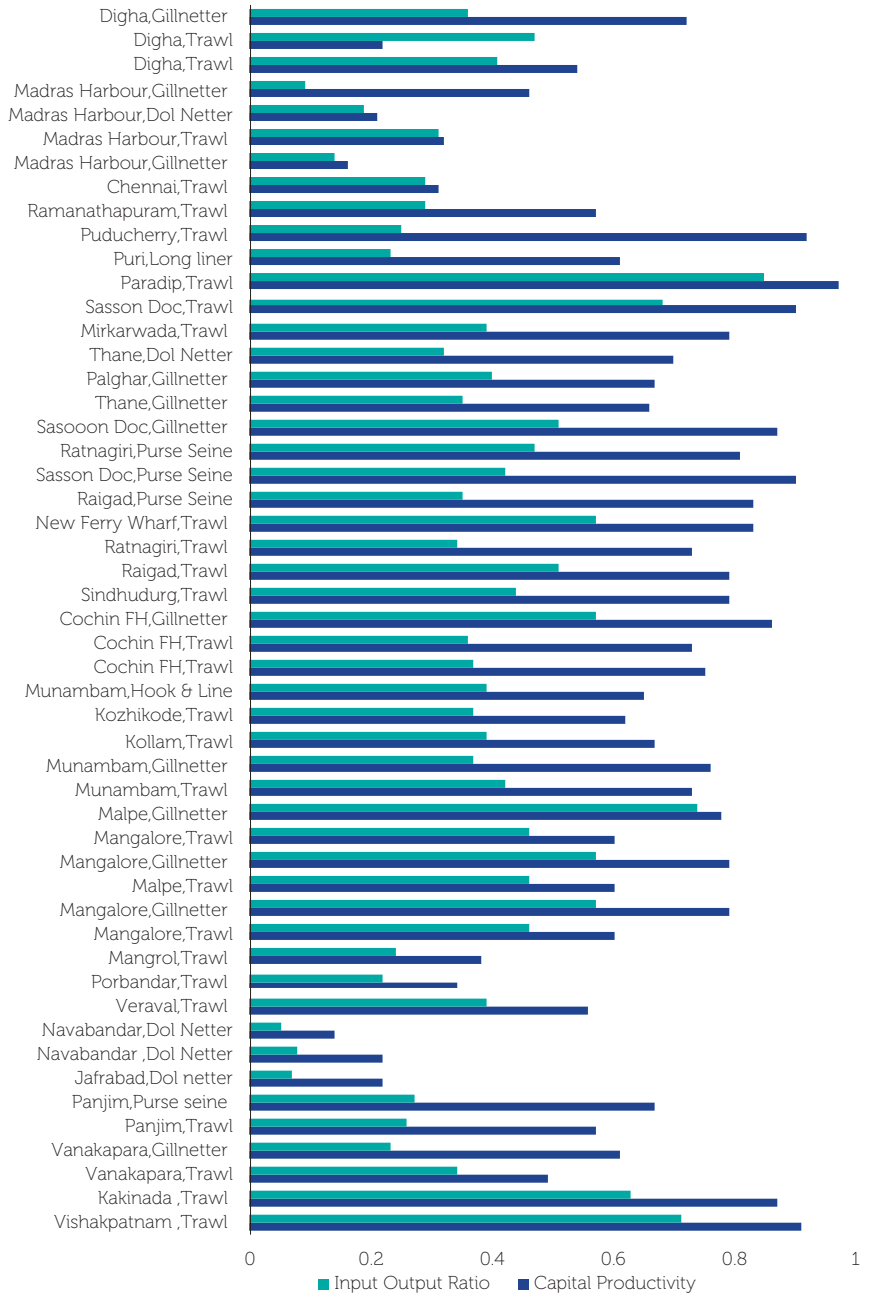
Species-wise landings and valuation of major marine fish species, 2024

Macroeconomic indicators of the marine fisheries sector

The marine fisheries sector contributed a gross value added (GVA) of ₹ 43,252 crores, accounting for 68.98% of the gross revenue.

Marine fisheries in Indian economy: Macroeconomic indicators 2024

Indicators	Value
Value at LC level (in ₹ Crores)	62702
Total operating cost (in ₹ Crores)	35113
Net operating income (in ₹ Crores)	27589
Average capital productivity	0.56
Gross value added (GVA) (in ₹ Crores)	43252
GVA as a percentage of gross revenue (in%)	68.98



Economic performance of marine fishing methods – mechanised sector, 2024 – multiday

Economic performance of marine fishing methods

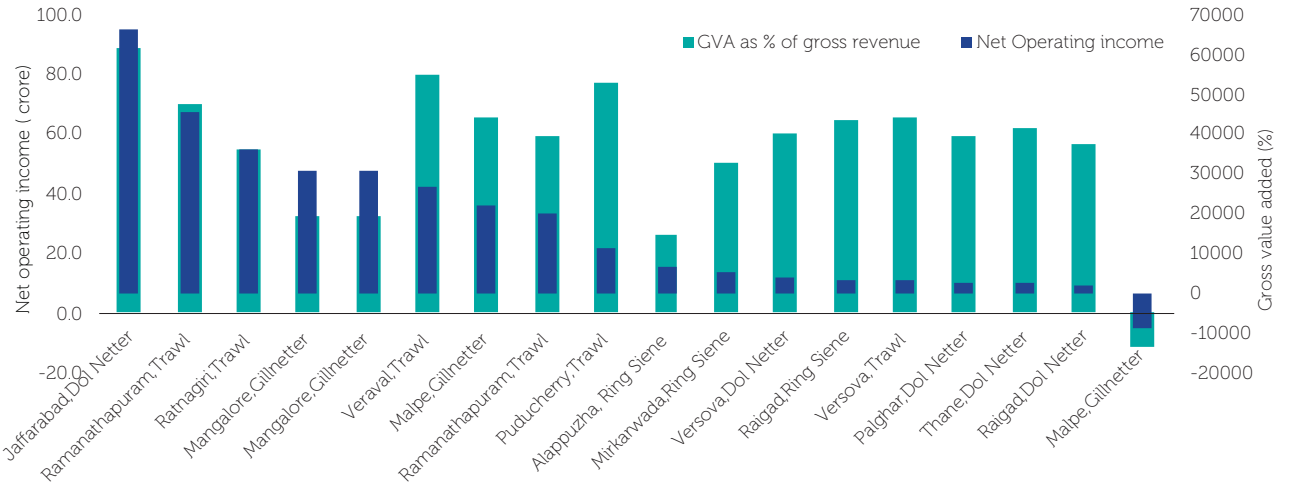
The economic performance of various fishing methods across selected centres in India was evaluated using key indicators, including capital productivity, input-output ratio, net operating income and gross value added (GVA).

Price behaviour of marine fish varieties

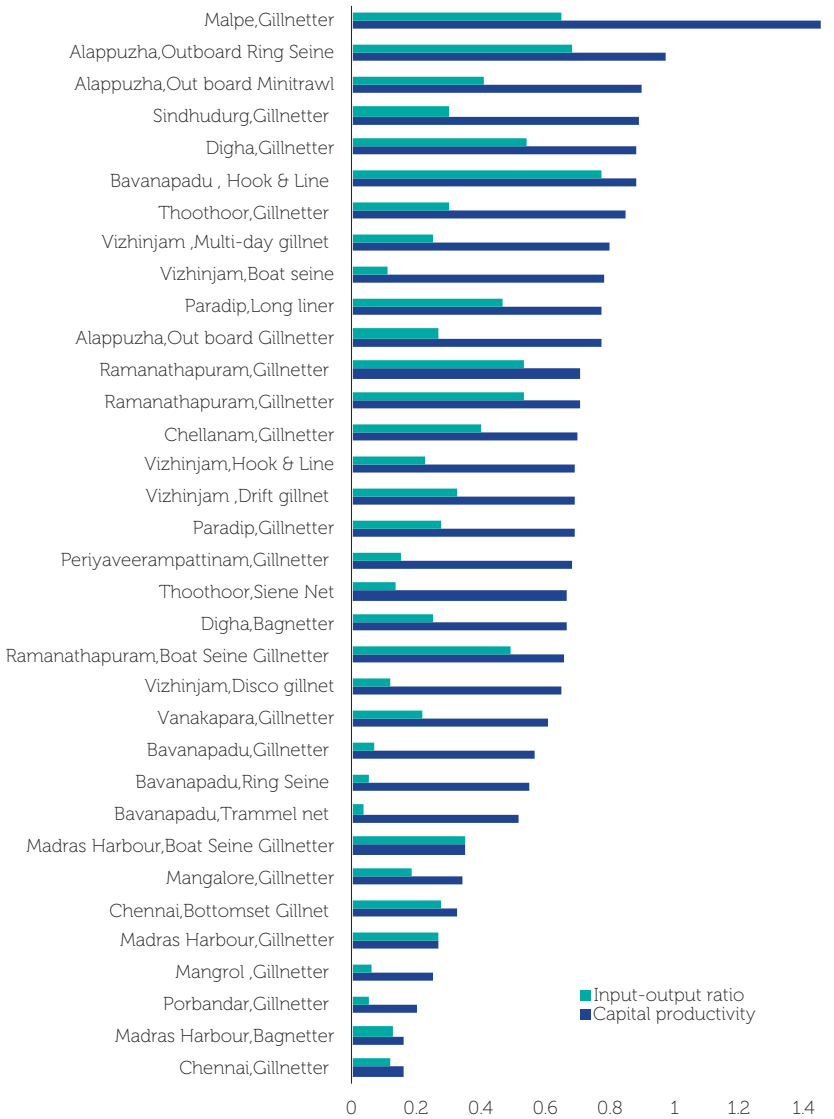
The analysis of landing price behaviour for major species revealed significant price variations across species and between States.

The analysis of average RC prices for major species in India shows that lobster realised the highest retail price at ₹919, followed by silver pomfret at ₹578.

Fish auction in Vizhinjam harbour, Kerala coast



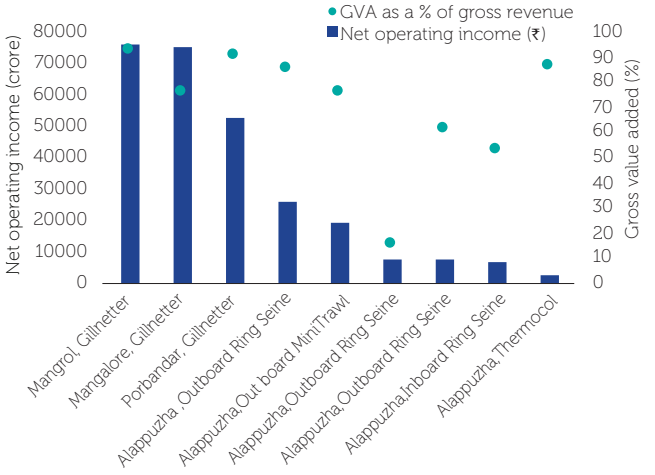
Economic performance of marine fishing methods – mechanised sector, 2024 – single day



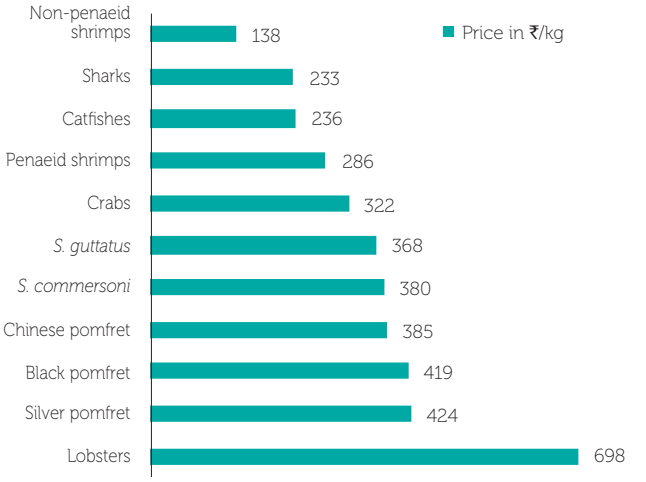
Economic performance of marine fishing methods – motorised sector, 2024 – multiday

Mechanised fishing boats in Kannur fisheries harbour

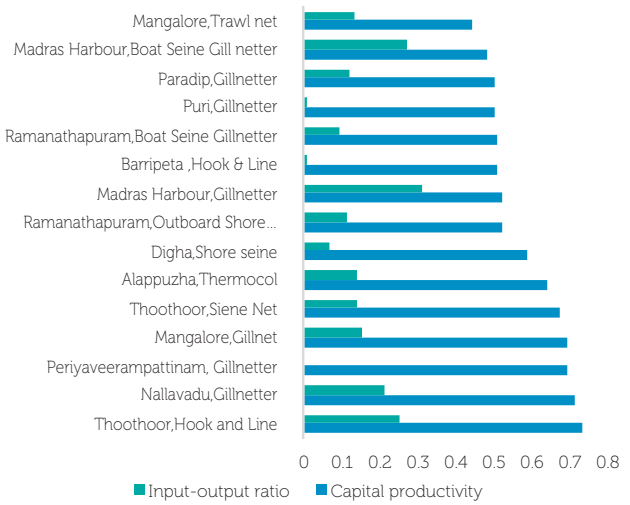
Single day trawlers in Kannur fishing harbour



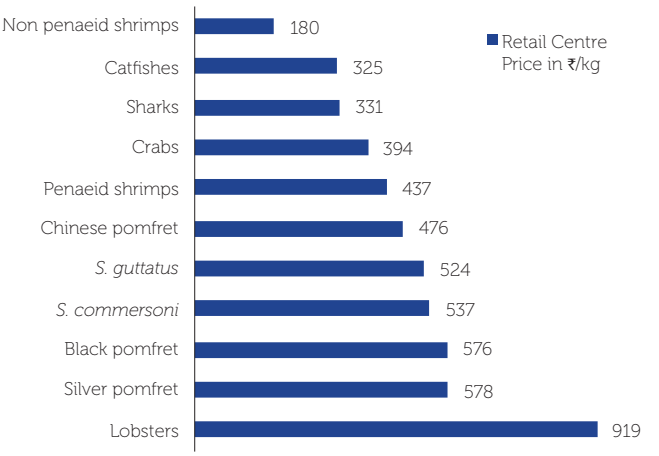
Economic performance of marine fishing methods – motorised sector, 2024



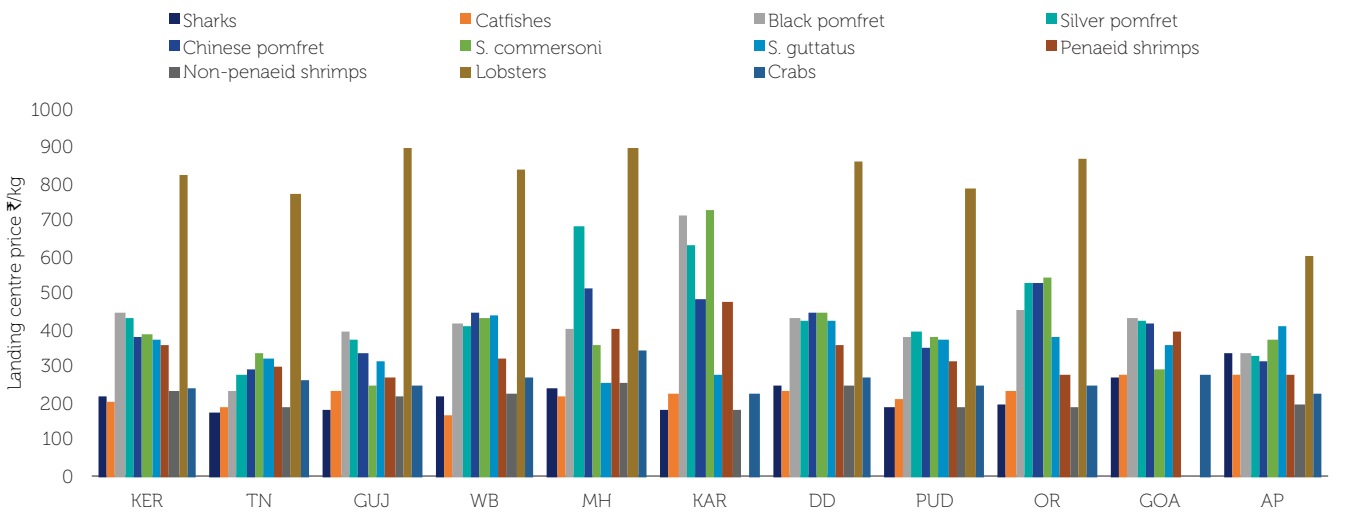
Average LC Price realization – all India (` /kg)



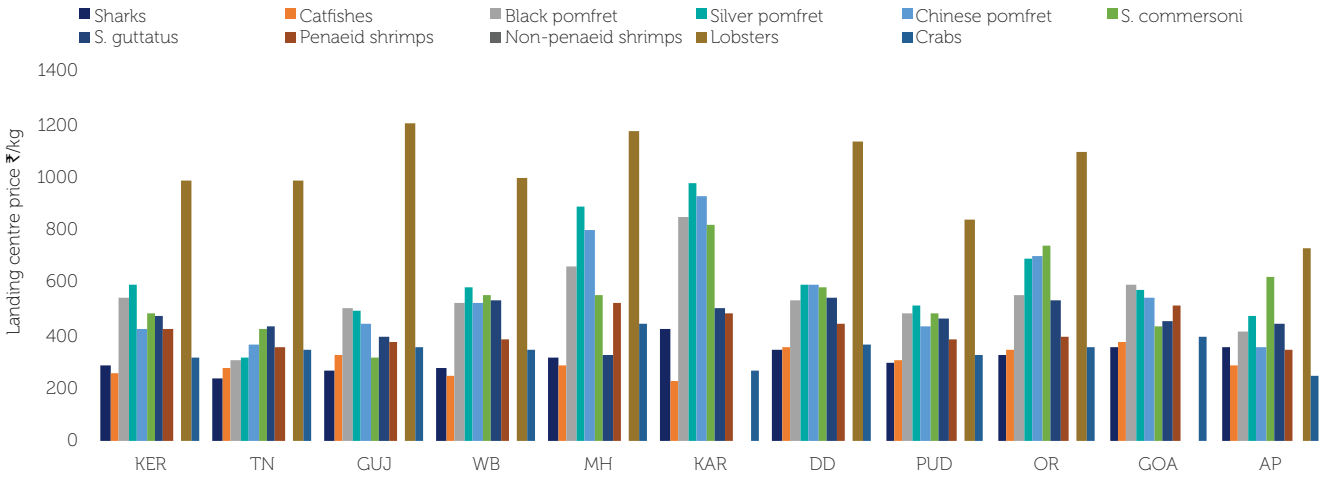
Economic performance of marine fishing methods – non motorised sector, 2024



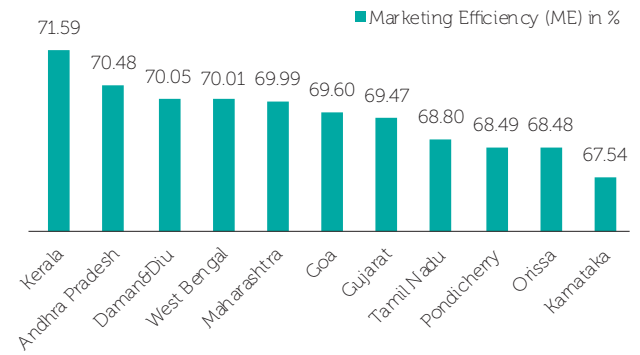
Average RC Price realization – All India (₹/kg)



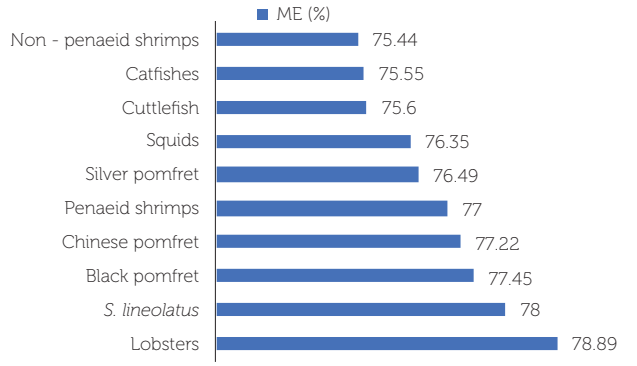
State-wise landing price behaviour (₹/kg) of major species, 2024 (KER- Kerala, TN- Tamil Nadu, GUJ- Gujarat, WB- West Bengal, MH- Maharashtra, KAR- Karnataka, DD- Daman and Diu, OR- Odisha, PUD- Puducherry, GOA- Goa, AP- Andhra Pradesh)



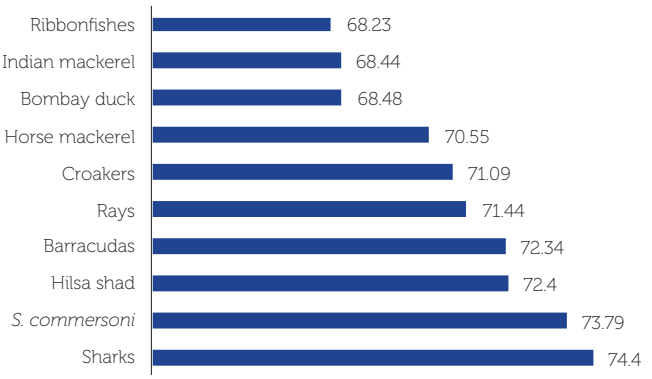
State-wise retail price behaviour (₹/kg) of major species, 2024 (KER- Kerala, TN- Tamil Nadu, GUJ- Gujarat, WB- West Bengal, MH- Maharashtra, KAR- Karnataka, DD- Daman and Diu, OR- Orissa, PUD- Puducherry, GOA- Goa, AP- Andhra Pradesh)



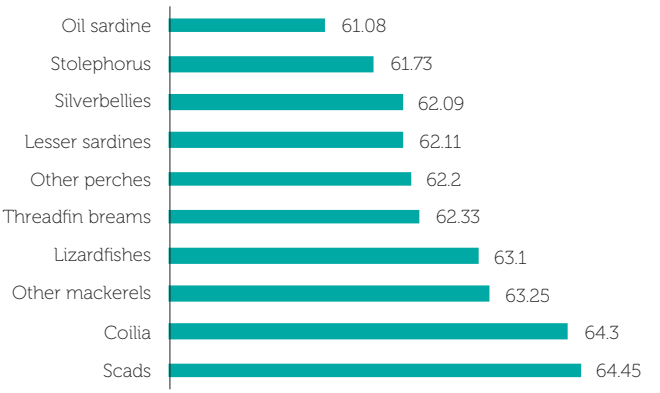
State-wise average marine fish marketing efficiency in India, 2024



Species with high marketing efficiency



Species with medium marketing efficiency (%)



Species with Low marketing efficiency (%)

Summary of Difference-in-Differences (DID) Analysis

Variables	Outcome Variable: Marine Fish Landings	Outcome Variable: Box-Cox Transformed Marine Fish Landings
ATT (post intervention x time)	210,790* (91,363)	0.89* (0.39)
Post intervention	-24,309,915** (9,323,623)	-101.43** (38.65)

Statistical significance: *10%, **5% ; values in parentheses indicate robust standard errors

Factors Affecting Resilience Capacity of Boat Owners

	Outcome variable – Square Root of Resilience Capacity Score	
Variables	`Multiple Linear Regression	Standard Errors
Number of working family members	1.824e-01 ***	1.088e-02
Boat value	-4.247e-08*	1.947e-08
Source of Credit _ Family and friends (Yes=1, 0 otherwise)	5.408e-02**	1.831e-02
Adjusted R-squared	0.8346	

The model includes other relevant variables; only statistically significant variables are presented here. Statistical significance: *10%, **5%, ***1%

Marketing efficiency across states

The marketing efficiency, measured as the fishers' share of the consumer's rupee (FSCR), varied across states for major species. Kerala recorded the highest marketing efficiency at 71.59 %, followed by Andhra Pradesh at 70.48 % and Daman and Diu at 70.05 %.

Species-wise marketing efficiency

Marketing efficiencies assessed by the fishers share of the consumers rupee in 2024 were categorised as high (>75%), medium (65-75%), and low (<65%), with species grouped accordingly.

High-value species like lobsters (78.89 %) and *Scomberomorus lineolatus* (78.00%) exhibited higher marketing efficiencies, while species like sharks (74.40%) and *Stolephorus commersonii* (73.79 %) showed medium marketing efficiencies. Low marketing efficiencies were observed for scads (64.45 %), coilia (64.30%), and oil sardine (61.08%).

COVID pandemic and marine fisheries sector in india: impacts, externalities and stakeholders reflection on adaptation and mitigation

Project: ICSSR

A DID framework was uniquely adapted to assess the impact of COVID-19 on India's marine fish landings. The results revealed significant decline in fish landings, with notable regional and sectoral variations.

Though the model included other relevant variables, only the estimated coefficients of Average Treatment Effect on the Treated (ATT) and 'Post intervention' are presented in summary table.

A comprehensive evaluation of resilience across key nodes in Kerala's marine fisheries value chain, including boat owners, labourers, traders, market functionaries, and women in fishing-related activities, revealed distinct resilience scores for each group. Factors influencing resilience of boat owners showed that higher boat values reduce resilience, while more working family members and informal credit networks, like support from family and friends, enhance it through income diversification and financial flexibility.

Adaptation and resilience strategies in kerala's marine fisheries during COVID-19: based on 480 respondents from Alappuzha and Ernakulam, the study analysed adaptation measures across key stakeholders. Strategies included utilizing savings, seeking informal support, transitioning to online platforms, and exploring alternative livelihoods. Boat owners, traders, and exporters adopted online tools and value additions to address logistics, while labourers diversified skills and sought new livelihoods. Familial bonds, community relief, and adherence to safety protocols played a crucial role in mitigating pandemic-induced stress.

Adaptation and Resilience Strategies by Stakeholders

Stakeholder	Coping Strategies	Primary Sources of Support
Labourers	Improved fishing efforts (57.5), new fishing avenues (23.33)	Employer (76.67), Self (86.67)
Boat Owners	Direct marketing (76.6), enhanced fishing efforts (55.56)	Community (74.4), Friends/Self (48.89)
Traders & Market Functionaries	Online marketing (70), alternative livelihoods (67.5)	Employer (90), Self (70)
Women	Alternative livelihoods (51.72), skill development (25.26)	Self (53.45), Govt (39.66)
Exporters	Skill development and technology adoption (50)	Self (50), Govt (20)
Consumers	Used savings (56.3), availed credit (47.9)	Self (98.3), Relatives/Friends (60.18)

Values in parentheses indicate percentages

Photo: Trans-inclusive gender mainstreaming through ATIC

Fisheries Governance, Livelihood and Gender Welfare

Responsible marine fisheries governance: compliance analysis and peripatetic capacity development

Project: SEE/GOV/34

Responsible marine fisheries governance

The study in Maharashtra's coastal districts, Raigad and Ratnagiri, assessed fishers' compliance with fisheries regulations. While 57.1% always followed Maharashtra Marine Fisheries Regulation Act (MMFRA) rules, only 35.4% believed their crew did the same. A concerning 61.3% admitted to violating fishing bans, and an equal percentage used fish aggregating devices without adherence to guidelines. Reporting violations was low (18.8%), but compliance with safety measures like life jackets was high (76.3%). However, only 2.1% consistently carried original fishing licences, indicating non-compliance. Hazardous practices, such as chemical use for fish tranquillization, were reported by 70% of respondents. Despite some positive compliance trends, major gaps remain in adherence to restricted zone, time violations, and reporting mechanisms, underscoring the need for stricter monitoring and awareness efforts. ANOVA analysis was conducted for the total score of compliance, revealing that there was a statistically significant difference in compliance levels across various zones. The computed F-statistic valued at 5.025, strongly surpassed typical thresholds for statistical

Women retailers in the Porbandar retail fish market

significance, with a p-value of <0.00.

Factors influencing compliance behaviour

Spearman's rho correlation analysis identified key factors influencing fishers' compliance behaviour. Significant positive correlations were found between compliance and education, family size, family type, total family income, fishing income, crew size, vessel tonnage, awareness, and knowledge, with coefficients ranging from 0.191 to 0.755 ($p < 0.01$). Among these, total knowledge ($r = 0.755$) and total awareness ($r = 0.549$) had the strongest correlations, emphasising their crucial role in compliance. Higher education levels ($r = 0.191$) likely enhance understanding of regulations and sustainable practices. Joint family structures ($r = 0.210$) exhibited better compliance than nuclear families. Income levels, both total ($r = 0.364$) and fishing-related ($r = 0.348$), were positively linked to compliance, suggesting financial stability supports adherence to regulations. Crew size also showed a positive correlation. These findings underscore the complex interplay of socio-economic, operational, and cognitive factors in shaping compliance behaviour. Similarly, the effectiveness of Maharashtra's marine fisheries regulatory system was assessed across zones, including Mora Karanja, Alibag, Revdanda, Murud, Shrivardhan, Ratnagiri, and Sassoon Dock. A Friedman test revealed significant differences in perceived effectiveness ($\chi^2 = 459.354$, $df = 10$, $p < .000$). The highest mean rank (7.19) was for ensuring fair access and equitable fishing opportunities, highlighting MMFRA's strong control over mechanised fishing. The lowest mean rank (3.83) was for addressing illegal, unreported, and unregulated (IUU) fishing, citing issues like insufficient staffing, limited funding, and delays in procuring essential resources. While officers demonstrated efficiency, managing multiple zones with high fishing activity strained enforcement efforts. These findings emphasised the need for additional enforcement personnel and fisheries staff to enhance regulatory effectiveness and ensure better compliance.

Decision-making process in sustainable marine fisheries stewardship: applications of behavioural approaches

Project: FRAEED/ABA/06

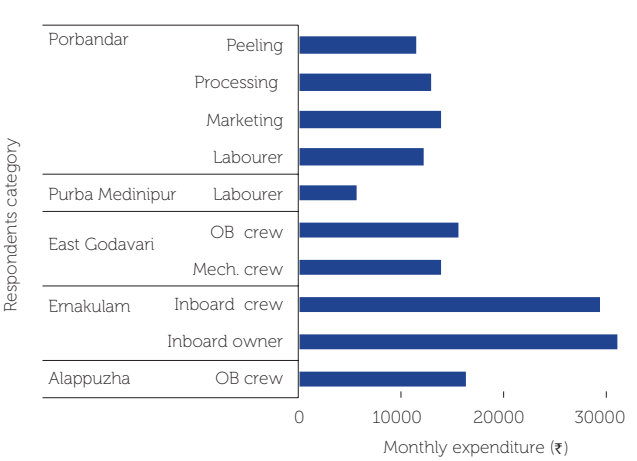
A thorough literature search was conducted to finalise the different factors included in the measurement of drivers of decision-making among the fishers. These factors include cognitive drivers like stakeholders' knowledge, awareness, and understanding of fisheries governance, sustainability practices, risk perception, and the socio-ecological dynamics of marine ecosystems; Normative drivers stem from social norms, cultural values, and peer influence, which dictate acceptable behaviours within fishing communities and cooperative groups and the economic drivers are stakeholders' financial priorities, such as maximising income, reducing costs, and ensuring livelihood security, often balancing short-term needs with long-term resource sustainability, etc. Based on these identified variables, a structured data collection tool was meticulously designed to capture relevant information. This tool has been prepared for pilot testing to validate its reliability and effectiveness in measuring the drivers of decision-making among the target population.

Assessing the livelihood status of marine fisherfolk in India: a sustainable livelihoods approach

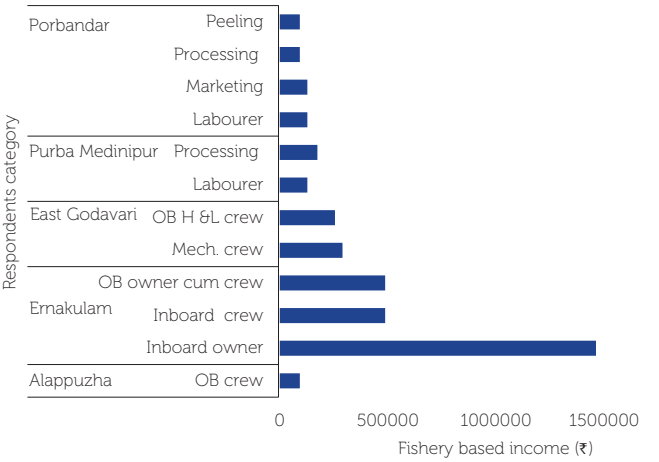
Project: FRAEED/LIV/03

Data collection schedules were developed for the livelihood assessment of active fisher and allied worker households in the marine fisheries sector. Sample size and methodology were finalised to collect data from 24 coastal districts covering 5200 households. Information on socio-demographic particulars, livelihood strategies, household income, employment, expenditure, food security, savings, indebtedness, natural and physical assets, social capital, and livelihood challenges were collected

Smallscale oyster farming at St.Sebastian Island, Chavara



Annual income from fishery-based livelihoods in selected coastal districts



Monthly household expenditure for various categories of fisher households

from various categories of fisher households. The livelihood diversification index, dependency ratios, and education index of the households were calculated. The livelihood capital index was calculated as a weighted index of 41 sub-indicators under natural, physical, human, social and financial capital. The weights for the sub-indicators were calculated using the entropy method based on district-level data. A preliminary assessment of the income status of fishers in selected coastal districts indicated that among the small-scale fisherfolk, the highest annual household income was reported for inboard ring seine owners in Ernakulam district. The annual household income for workers in the inboard ring seine units in Ernakulam district was ₹ 5,95,896 and fishery income formed 81% of the household income. In the East Godavari district of Andhra Pradesh, the annual fishery income for the workers in the motorised sector was ₹ 2,54,982. For the workers in the motorised category in Alappuzha district, fishery income formed 15% of the total household income and 73% of the household income was contributed by salaried jobs in the private sector.

The highest monthly consumption expenditure was reported for inboard ring seine owners in Ernakulam district at ₹ 31,449, whereas the lowest consumption expenditure was observed in the case of fishing labourers in the Purba Medinipur district of West Bengal (₹ 5,782/ month).

A comprehensive praxis on trans-inclusive gender mainstreaming through the paradigm of sustainable livelihoods in the Indian fisheries sector

Project: FRAEED/GEN/04

The gender project successfully executed a series of impactful activities, including establishing a comprehensive database of transgender stakeholders, encompassing 145 individuals (71 transwomen, 62 transmen, and 12 who chose not to disclose their gender identity). The initiative identified their preferences for participation in fishery-based microenterprises and organised sensitisation programmes alongside entrepreneurial capacity-building training conclaves tailored to the LGBTQIA+/transgender community. Among the fishery-based ventures, fish value addition emerged as the most preferred entrepreneurial activity, closely followed by ornamental fish culture, aqua tourism, and fish vending. Success stories of transgender beneficiaries were documented with highlights of their achievements and presented indicative economic benefits.
A detailed analysis of the challenges faced by transgender stakeholders, conducted using Friedman's test, revealed social isolation as the most severe constraint, followed by financial liabilities and gender marginalisation. This comprehensive approach underscores the potential of fisheries as a platform for inclusive and sustainable livelihood opportunities. A study in Kharakuwa village, Gir Somnath district, examined women's involvement in small-scale fisheries. Most participants were over 45 years old, with 50% having medium occupational experience. Risk orientation varied, with 37% high, 36% medium, and 27% low. Decision-making was strong, with 60% playing a high role in family matters. Awareness of fisheries programmes was evenly distributed (37% high, 30% medium, 33% low). Participation in fisheries programmes was moderate for 40% of respondents. The findings

highlight the significant yet varied roles women play in fisheries, emphasising the need for targeted support and awareness initiatives.

Science, technology & innovation hub in fisheries sector

Project: DST

Under the DST-funded STI-Hub project, 84 fishery-based microenterprises have been successfully launched across eight districts of Kerala: Ernakulam, Thrissur, Kottayam, Alappuzha, Kozhikode, Kannur, Pathanamthitta, and Kollam. Building on the foundation of 57 microenterprises established in the first two years, an additional 25 interventions were implemented across various regions of the state. These enterprises span a diverse array of activities, including cage culture, pearl spot seed production, fish vending, fish culture, ornamental fish culture, integrated fish farming, fish fertilizer production, value-added fish products, mussel culture, oyster culture, clam processing, and dry fish units. Collectively, the project has positively impacted 490 beneficiaries, comprising 241 men, 242 women, and 6 transgender individuals, fostering inclusive growth and sustainable livelihoods in the fisheries sector.

Allied livelihood option through dry fish marketing in Veraval, Gujarat

Agricultural Technology Information Centre (ATIC)

The ATIC generated a total revenue of ₹21,52,706 through product sales

Ornamental fish culture training at Cheppad

Fish fertiliser SHG leader with DST expert at Munambam

(₹19,37,827), diagnostic services (₹81,802), and visitors' fees (₹1,01,180). Additionally, ATIC hosted 14,090 visitors, including students, faculty members, entrepreneurs, farmers, and the general public.

Expert committee assessment on the sustainability of purse seine fishing in India

A study on the impact of purse seine fishery on marine resource sustainability in Indian waters was conducted for the expert committee on purse seine fishing under the Department of Fisheries, Government of India with Director ICAR-CMFRI as its chairman. The study found that most targeted species, including Indian oil sardine, anchovy, pomfret, and mackerel were healthy with some exceptions in stock status. Stakeholder consultation in Tamil Nadu revealed mixed opinions. Critics raised concerns about bulk landings, and price drops, while supporters highlighted its efficiency, minimal environmental impact, and better fish quality. The Tamil Nadu government was cautious about potential law and order issues if the ban on purse seine fishing were lifted.


Stakeholder workshop on purse seine fishing held on 9-10 January 2024 in Chennai, Tamil Nadu

Photo: Seaweed farming and harvest by beneficiaries

Tribal Sub-Plan and Scheduled Caste Sub-Plan

Tribal Sub-Plan

Under the Tribal Sub-Plan (TSP), GI cages were launched for farming of *Etroplus suratensis* for the benefit of various women groups in Kochi and in Idukki districts. Biofloc units were also established. Farmers embraced these technologies, earning additional annual incomes ranging from ₹. 1,00,000 to ₹ 1,50,000. Training programmes were also conducted in cage farming, pen culture, ornamental fish keeping, biofloc, and mussel culture for tribal officials and ST promoters in Ernakulam District.

Animal Health Camp was conducted at Kavaratti Island by KVK Lakshadweep and treated 5021 animals, including dairy cows, goats, cats, ducks, poultry birds, and other pets, for 781 farmers and stakeholders. Through the Calicut Centre of ICAR-CMFRI, selected tribal beneficiaries received GI cages, modular cages, a pen culture system, pond construction materials, hapa nets, weighing scales, and coracles. Seabass and pearl spot seeds were distributed for cage and pen culture. Training and demonstrations on 'pond construction and fish farming practices' were conducted for these tribal beneficiaries. The harvest of pearl spot resulted in an income of ₹ 2,20,000 this year. At Veraval, the open sea cage culture of spiny

Seaweed, *Kappaphycus alvarezii,* harvested from monoline plots

Training conducted for ST promoters in Ernakulam district

lobster (*Panulirus polyphagus*) was initiated and is currently underway. In Mumbai, inputs such as crab culture trays, crab traps, and nets were provided for fattening mud crabs (*Scylla serrata*). Training and on-farm demonstrations on fattening mud crabs and oyster farming were also conducted in Maharashtra. In 2024, about 2.75 t of Asian seabass were harvested from cage culture, generating an income of ₹. 9,80,500 in Chennai, while Indian pompano and Asian seabass in coastal cages were cultured by the Yenadi community in Visakhapatnam and generated ₹. 9.1 lakhs and ₹. 2.4 lakhs, respectively.

At Puri, the Bhumija and Santal tribes were involved in a polyculture of mullets with prawns, mud crab rearing and fattening, and integrated backyard poultry farming. Inputs such as solar power facilities, deep freezers, salinometers, HDPE crab boxes, water pump sets, weighing scales, feed, fertilizer, and veterinary medicines were provided for the successful implementation of the scheme.

Harvest of open sea reared Asian seabass from cages by TSP beneficiary at Chennai

TSP-backyard poultry unit at Odisha.

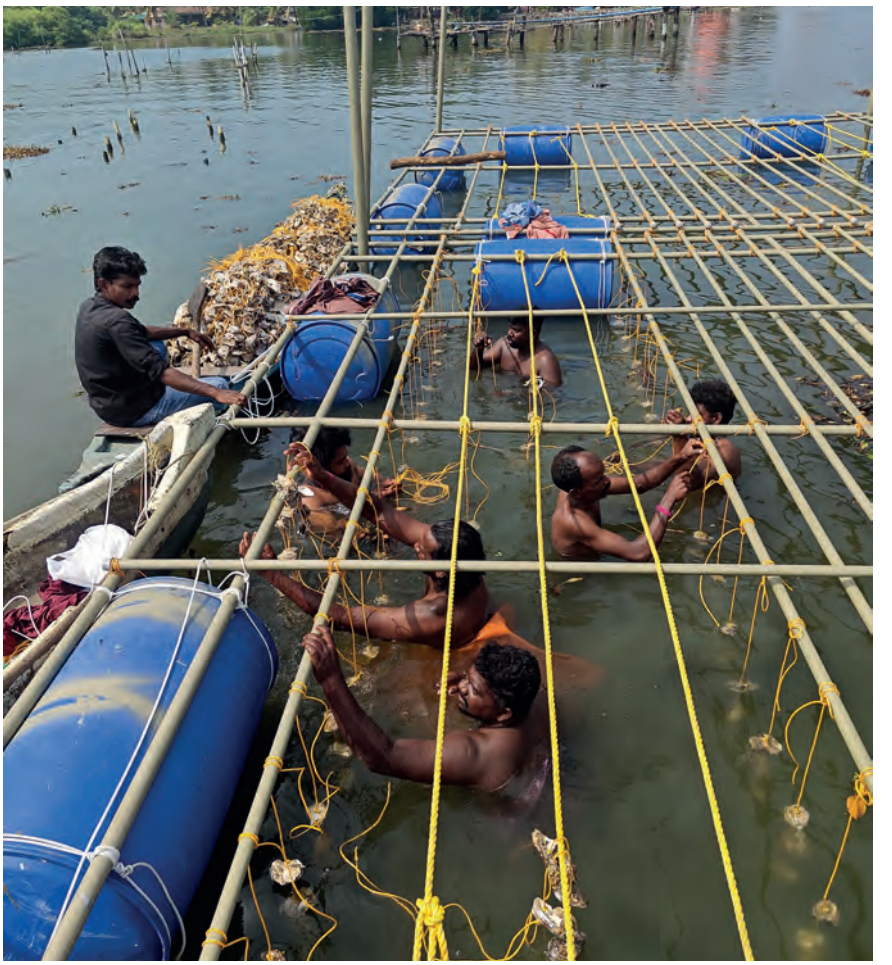
Scheduled Caste Sub-Plan

Under the Scheduled Caste Sub-Plan (SCSP), a total of 139 cages, 20 biofloc units, four pen culture units, and 11 pond culture systems were established. In addition, support was extended to approximately 6,350 SC beneficiaries through the provision of 2,800 crab boxes, 2,700 seaweed culture units, 17 marine ornamental fish culture units, eight RAS units, 14 mussel/oyster farming units, and one fish vending/live fish stall.hhh

At the Kochi and Calicut centres, 24 GI cages and four modular cages were installed, along with the establishment of three biofloc units, five oyster rafts, and one mussel

farming unit. Approximately 20,000 pearl spot seeds, 17,900 sea bass, 8,000 Channa sp., 2,500 Anabas sp., and 1,500 rens were distributed to farmers. Additionally, an outboard motor and a 38-foot fishing canoe were provided

Essential materials such as feed, hapa nets, cage nets, self-start generators, weighing balances, biofloc unit sheds, pH metres, water testing kits, and solar light units were distributed to SC farmers. An awareness programme on 'Biofloc fish farming, cage culture, and oyster farming' were conducted. Clam relaying activities at two sites in Vembanad Lake were also conducted for the benefit of 100 SC beneficiaries. Training and on-field demonstrations covered IMTA, pond farming, pond construction, mussel farming, and cage farming. Income generated from culture activities included ₹4,44,500 from seabass, ₹17,500 from pearl spot, and ₹1,22,612 from oyster and mussel farming. Additionally, seabass culture in Mangalore yielded an income of ₹3,25,080. Spiny lobster (*Panulirus polyphagus*) culture in Veraval, seaweed farming for women



SCSP-oyster farming

Handing over of 38 foot canoe to SC beneficiary in Kerala

Distribution of outboard motor to SC beneficiary in Kerala.

beneficiaries, and backyard marine ornamental fish rearing in Mumbai were conducted.

Farming of silver pompano, Asian seabass, and green mussels were cultured in IMTA mode at Karwar and generated an income of ₹ 1,83,850. Pearl spot, red snapper, and *Tilapia* sp. were cultured and generated ₹ 6.08 lakhs by the beneficiaries, and also six dinghies and two portable generators were provided in Vizhinjam. ₹ 3,85,000 (marine ornamental fish), ₹ 74,400 (seaweed farming), and ₹ 70,200 (crab fattening) were generated in Tuticorin. In 14 villages of Tamil Nadu, 155.10 t of dry seaweed (*Kappaphycus alvarezii*) were produced, generating an income of ₹155.10 lakhs. Out of these, the Puthukudi village is now recognized as a Seaweed Seed Village.

A revenue of ₹ 8,89,471 has been generated from Asian seabass farming on the Chennai coast, and ₹ 12.26 lakhs generated from Indian pompano farming in coastal cages in Visakhapatnam.

Lobster fattening activity at Veraval under SCSP

Polyculture with mullets, prawns, and mud crab; indoor vertical mud crab farming; and backyard poultry integration were conducted and generated a revenue of ₹ 6,58,000 in Odisha. In West Bengal, polyculture involving *Mugil cephalus*, *Penaeus monodon*, *Lates calcarifer*, and *Oreochromis mossambicus* is progressing. Inputs such as circulating pumps, sand filters, UV filters, salinometers, FRP tanks, weighing balances, dissolved oxygen metres, feed, seeds, medicines, and fertilizers were provided for polyculture operations. Two hands-on training sessions, three field days, one demonstration programme, and two farmers' fairs were organised for the beneficiaries.

Photo: Children exploring the marine biodiversity museum

Marine Biodiversity Museum

Activities of the marine biodiversity museum

The Marine Biodiversity Museum at ICAR-CMFRI hosted 8430 visitors, which included 2448 students from 44 schools, 5396 students from different colleges along with general public from across India in 2024, including organised visits from different organisations. In 2024, 70 new specimens were added to the collections. The additions included 47 species of fish, one reptile, two species of molluscs, eight species of crustaceans, and one species of sea horse. Of the fish specimens added, one was a holotype for *Magnafuscus marianus* gen. nov. sp. nov.. The additions also included the skeleton of a whale species, *Balaenoptera edeni edeni*, weighing approximately 35 t, which is undergoing curation for exhibition.

Ranina ranina (Linnaeus, 1758)

A whale skeleton on display in the museum

Visit of the NPOL *Swatch Bharat* Team to ICAR-CMFRI Museum

Species added to the museum collection with accession number

Specimens added to the collection	Accession number
Reptilia	
Hydrophis curtus (Shaw, 1802)	LA.1.1.1.1
Mollusca	
Sepia pharaonis (Ehrenberg, 1831)	DE.1.1.1.2.1
Geloina coaxans (Gmelin, 1791)	DC.15.2.2
Crustacea	
Kishinouyepenaeopsis maxillipedo (Alcock, 1905)	ED.1.3.4.4.1
Charybdis (Archias) omanensis Leene, 1938	ED.5.5.1.10.2
Charybdis (Archias) longicollis Leene, 1938	ED.5.5.3.6.1
Dorippoides facchino (Herbst, 1785)	ED 5.2.2.1
Alpheus samudra De Grave, Krishnan, Kumar K.P. & Christodoulou, 2020	ED.2.5.1.3
Parapenaeopsis maxillipedo Alcock, 1905	ED.1.3.4.4.1
Bathynomus giganteus A. Milne-Edwards, 1879	EE.1.1.1.1
Ranina ranina (Linnaeus, 1758)	ED.4.6.1.1
Fishes	
Lamnostoma orientale (McClelland, 1844)	GB.4.13.24.58
Ophichthus erabo (Jordan & Snyder, 1901)	GB.4.13.25.57
Hyporhamphus sindensis (Regan, 1905)	GB.10.4.7.28
Rexea bengalensis (Alcock, 1894)	GB.31.62.10.7
Uranoscopus marmoratus Cuvier, 1829	GB.31.155.5.9
Muraenesox bagio (Hamilton, 1822)	GB.4.8.3.1
Obliquogobius cometes (Alcock, 1890)	GB.31.66.93.4
Lophiomus setigerus (Vahl, 1797)	GB.25.12.1.3
Magnafuscus marianus gen. nov. sp. nov.	GB.10.4.1.1
Bathycongrus nasicus (Alcock, 1894)	GB.4.4.5.3
Hyporhamphus quoyi (Valenciennes, 1847)	GB.10.4.7.26.1
Hyporhamphus xanthopterus (Valenciennes, 1847)	GB.10.4.7.27
Strongylura incisa (Valenciennes,1846)	10.2.8.6.1
Strongylura leiura (Bleeker, 1850)	GB.10.2.8.7.1
Strongylura strongylura (van Hasselt, 1823)	GB.10.2.8.8.1
Tylosurus crocodilus (Péron & Lesueur, 1821)	GB.10.2.9.2.3
Tylosurus melanotus (Bleeker, 1850)	GB.10.2.9.1.1
Xenentodon cancila (Hamilton, 1822)	GB.10.3.1.1
Brotula multibarbata Temminck & Schlegel, 1847	GB.28.4.17.3
Neobythites fasciatus Smith & Radcliffe, 1913	GB.28.4.17.12
Ophidion smithi (Fowler, 1934)	GB.28.5.1.1
Neobythites steatiticus Alcock, 1894	GB.28.4.17.14.1

Specimens added to the collection	Accession number
Neobythites multistriatus Nielsen & Quéro, 1991	GB.28.4.17.10.1
Monomitopus nigripinnis (Alcock, 1889)	GB.28.4.16.3.1
Lamprogrammus niger Alcock, 1891	GB.28.4.5.6.1
Lamprogrammus fragilis Alcock, 1892	GB.28.4.5.5
Hypopleuron caninum Smith & Radcliffe, 1913	GB.28.1.18.1
Glyptophidium oceanium Smith & Radcliffe, 1913	GB.28.2.18.3
Dicrolene nigricaudis (Alcock, 1891)	GB.28.4.18.6
Brotula multibarbata Temminck & Schlegel,1846	GB.28.4.5.3.1
Glyptophidium argenteum Alcock, 1889	GB.28.2.18.1
Glyptophidium macropus Alcock, 1894	GB.28.2.18.2
Dicrolene tristis Smith & Radcliffe, 1913	GB.28.4..18.7
Dicrolene introniger Goode & Bean, 1883	GB.28.4.18.8
Pycnocraspedum squamipinne Alcock, 1889	GB.28.6.1.1
Histiopterus typus Temminck & Schlegel, 1844	GB.31.109.2.3.2
Pterois russelii Bennett, 1831	GB.38.24.38.7.1
Snyderina guentheri (Boulenger, 1889)	GB.38.24.45.1.2
Arothron stellatus (Anonymous, 1798)	GB.43.6.2.3.1
Scarus rubroviolaceus Bleeker, 1847	GB.31.131.9.40.1
Halieutaea stellata (Vahl, 1797)	GB .25.15.4.6.1
Grammonus robustus Smith & Radcliffe, 1913	GB.28.2.1.2
Saccogaster maculata Alcock, 1889	GB.28.3.1.1
Cnidarians	
Myxobolus GF n.sp.	CG.3.2.1.48
Myxobolus GBK n.sp.	CG.3.2.1.49
Myxobolus GO n.sp.	CG.3.2.1.50
Myxobolus ST n.sp.	CG.3.2.1.51
Myxobolus DFI n.sp.	CG.3.2.1.52
Myxobolus CM n.sp.	CG.3.2.1.53
Myxobolus IMD n.sp.	CG.3.2.1.54
Myxobolus IME n.sp.	CG.3.2.1.55
Myxobolus PFI n.sp.	CG.3.2.1.56
Myxobolus SCMI n.sp.	CG.3.2.1.57
Ellipsomyxa GA n.sp.	CG.3.1.1.2
Ceratomyxa A n.sp.	CG.3.2.1.45
Ceratomyxa B n.sp.	CG.3.2.1.46
Ceratomyxa C n.sp.	CG.3.2.1.47

Photo: Nutraceuticals developed by ICAR-CMFRI

Institute Technology Management Unit

Activities of Institute Technology Management Unit

The Institute Technology Management Unit (ITMU) of ICAR-CMFRI serves as the backbone of intellectual property (IP) management and technology transfer at the institute. Its core activities include promoting IPR awareness among researchers and stakeholders, facilitating the filing and maintenance of intellectual property (IP), including patents, trademarks and copyrights, driving technology licensing to bridge the gap between innovation and industry, regularly updating and maintaining patent informatics to keep abreast of the latest developments in the field and ensure accurate and comprehensive data compilation, compilation of data related to patent database, and compiling relevant data on the institute's patent database, enabling efficient access and utilisation of patent information for research and commercial purposes.

Over the years the ITMU has accomplished several milestones, the significant among these are as follows.

Intellectual Property achievements: Grant of 25 patents, over 60 patents filed, and grant of three trademarks, two designs, and one copyright over the years.

Collaborative engagements: Successfully executed more than 50 consultancy projects, over 50 MoUs, and one contract research project.

Market launch of ICAR-CMFRI's seaweed-based product GreenRexfor for liver health

Commercialisation and training: Facilitating the commercialisation of over 25 technologies, along with conducting extensive IPR awareness programmes, training sessions, and business meets.

Entrepreneurship development: Empowering small-scale entrepreneurs in fisheries and mariculture and fostering sustainable livelihoods.

Scholarly contributions: Published over 10 peer-reviewed IPR-related articles, abstracts, and chapters, and authored a comprehensive book entitled Intellectual Property Rights: A Perspective in Marine Fisheries and Mariculture, ICAR-CMFRI Special Publication No. 108.

Through these initiatives, ITMU continues to catalyse innovation, knowledge transfer, and sustainable development in marine fisheries and aquaculture.

Insect protein-based fish feed technology

ICAR-CMFRI has signed a memorandum of understanding (MoU) with M/s Amala Ecoclean Pvt. Ltd. for transfer of technology to produce fish feed using Black

Management of IP portfolio: patents, designs, and trademarks granted during 2024

IPRs	Name of Institute	Application/ Registration No.	Name of Innovation/ Technology/ Product/ Variety	Application Granted/ Registered
Trademarks				
Trademark applied	ICAR-CMFRI	2811624 18/09/2024	Trademark Registration No. 2811624 Mark: CMFRI Class: 31	Granted and in-force
Trademark applied	ICAR-CMFRI	2811623 18-09-2024	Application Number 2811623 CMFRI Class 05	Granted and in-force
Trademark applied	ICAR-CMFRI	2811625 18-09-2024	Application Number 2811625 CMFRI Class 35	Granted and in-force
Designs				
	ICAR-CMFRI	Design No. 421026-001 in class 10-05	A copepod nauplii accumulating and harvesting device	Registered and in-force
Patents				
Patent granted	ICAR-CMFRI	Indian patent grant No. 558580	A process and formulation to prepare vibrio antagonistic micro feed for finfish and shellfish larvae using marine bacteria and a product thereof	Granted and in-force
Patent granted	ICAR-CMFRI	Indian patent grant number 498920	An antioxidant composition of seaweeds	Granted and in-force
Patent granted	ICAR-CMFRI	Indian patent grant number 434347	Growout pellet feed for silver pompano *Trachinotus blotchii* (lacepede) and a process therefore to incorporate essential nutritional elements in fish	Granted and in-force
Patent granted	ICAR-CMFRI	Indian patent grant number 513214	A process to prepare antihypertensive concentrate from seaweed and a product thereof	Granted and in-force

List of technologies commercialised by the ITMU during 2024

Name of Technology/ Know-how	Name of Institute	Name of contracting party	Mode of partnership	Revenue Earned (Rs.)
Cadalmin™ BSF-FFF Insect Protein-Based Fish Feed Technology	ICAR-CMFRI	M/s Amala Ecoclean Pvt. Ltd., Kerala	MoU/licensing and Royalty	MoU (for 5 years) @ ₹ 1,00,000/- licence fee and 5% royalty
Cadalmin™ BSF Pro aquafeed technology	ICAR-CMFRI	M/s Bhairav Renderers, Coimbatore	MoU/licensing and Royalty	MoU (for 5 years) @ ₹ 1,00,000/- licence fee and 5% royalty
Cadalmin™ Livcure extract	ICAR-CMFRI	M/s Emineotech, Kerala	MoU/licensing and Royalty	MoU (for 5 years) @ ₹ 5,25,000/- licence fee and 6% royalty

ICAR-CMFRI transfers innovative insect protein-based fish feed technology to Amala Ecoclean Pvt. Ltd.

Soldier Fly Larvae (BSFL). The transfer of CMFRI's insect protein-based fish feed technology to M/s Amala Ecoclean Pvt. Ltd. marks a significant step toward sustainable aquaculture in India.

Seaweed-based product for liver health

Shri P. Rajeev, Minister for Industries, Law and Coir, Govt. of Kerala, launched the market debut of ICAR- CMFRI's seaweed-based nutraceutical product for liver health. The product, named GreenRex™, is the commercial brand of ICAR-CMFRI technology, which is produced and marketed by Emineotech Private Limited. A unique blend of 100% natural bioactive ingredients extracted from select seaweeds, the product is made using eco-friendly green technology to improve liver health.

Training/workshop/ seminar

Organised a webinar on the occasion of World IP Day on "IP and the SDGs: Building our Common Future with Innovation and Creativity" for the scientists, technical officers, staff, and research scholars of ICAR-CMFRI on 30/04/2024.

The institute remains committed to advancing its IP endeavours by fostering innovation, securing IP rights, and translating research into impactful solutions. These efforts contribute significantly to national priorities, including sustainable fisheries management, aquaculture development, and the growth of blue economy.

GreenRex™

Technologies/ products/ methodologies certified by ICAR

In 2024, the Institute could secure ICAR certification for 12 technologies/ products developed by various research divisions. The details of these certified technologies are as follows.

Technologies/ products/ methodologies certified by ICAR

Sl. No.	Name of the technology/ product/ methodology	ICAR Code	Lead developer	Co-developer (s)
1	Coastal pond farming of Indian pompano	ICAR-FS-CMFRI-Technology-2024-020	Sekar Megarajan	R. Rajan, B. Xavier, S. Ghosh, B. Ignatius, A. Gopalakrishnan
2	Sea cage farming of Indian pompano	ICAR-FS-CMFRI-Technology-2024-021	Sekar Megarajan	R. Rajan, B. Xavier, S. Ghosh, B. Ignatius, A. Gopalakrishnan
3	Production of designer clown fishes through captive breeding	ICAR-FS-CMFRI-Technology-2024-022	K. K. Anikuttan	Rameshkumar, A.K. Nazar, R. Jayakumar, G. Tamilmani, M. Sakthivel, M. Sankar, R. Bavithra, B. Johnson, I Joseph, B. Ignatius, K Madhu, K. Vinod, A. Gopalakrishnan
4	ArcGIS Web Application-An interactive seaweed farming sites along Indian Coast	ICAR-FS-CMFRI-Product-2024-023	B. Johnson	D. Divu, R. Jayasankar, L. Ranjith, P.P. Suresh Babu, M. Koya, S. Ghosh, P. Rohit, B. Ignatius, A. Gopalakrishnan Gyanaranjan Dash, Sekar Megarajan, L. Loveson Edward, Ritesh Ranjan, M. Muktha, Biji Xavier, N. Rajesh, R. Ratheesh Kumar, A. Anuraj, S. Ramkumar, A. Chellappan, Nakhawa Ajay Dayaram, Jayasree Loka, R. Jayakumar, A. K. Abdul Nazar, P. K., Asokan, P. Kaladharan, S. K. Mojjada, V. V. Singh.
5	Integrated Multi-Trophic Aquaculture (IMTA) of seaweed and fish farming in cages	ICAR-FS-CMFRI-Technology-2024-024	B. Johnson	G. Tamilmani, M. Sakthivel, P. Ramesh Kumar, K.K. Anikuttan, M. Sankar, Divu D., S.K. Mojjada, S. Ghosh, Sekar M., P. Shinoj, R. Jayakumar, A.K. Nazar, George G., B. Ignatius, A. Gopalakrishnan
6	A framework for assessing the level of sustainability associated with mariculture	ICAR-FS-CMFRI-Methodology-2024-025	Shinoj P.	M. Muktha, B, Johnson, Charles Jeeva, Anuraj A., P.S. Swathi Lekshmi, S. Ghosh, D. Divu, Sekar M., A.P. Gop, R. Geetha, S.V. Vinuja, B. Ignatius, V.V.R. Suresh, B. Santhosh, R. Narayanakumar, Prem Chand and A. Gopalakrishnan
7	Environmental Performance Index (EPI): A practical metric for evaluating the health of marine fisheries	ICAR-FS-CMFRI-Methodology-2024-026	J. Jayasankar	Eldho Varghese, S. Ghosh, Muktha M., P. Rohit, E.M. Abdussamad, A.P. Dineshbabu, P. Laxmilatha, C. Ramachandran, Shinoj P., M. Kavitha, E. Vivekanandan, Sreepriya V., A. Gopalakrishnan
8	Cadalmin™ Immunalgin extract (Cadalmin™ IMe): A nutraceutical from seaweed for improving immunity and antiviral activities against delta variant of SARS CoV-2 virus	ICAR-FS-CMFRI-Product-2024-027	Kajal Chakraborty	A. Gopalakrishnan
9	Cadalmin™ LivCure extract (Cadalmin™ LCe): A novel seaweed-based nutraceutical for use against non-alcoholic fatty liver disease	ICAR-FS-CMFRI-Product-2024-028	Kajal Chakraborty	A. Gopalakrishnan
10	Cadalmin™ Silvergrow- A Novel Grow-out feed for Silver Pompano	ICAR-FS-CMFRI-Product-2024-029	D. Linga Prabu	S. Chandrasekar, S. Ebeneezar, Sayooj P., P. Vijayagopal, K. Chakraborty, A. Gopalakrishnan
11	A framework using biological reference points for assessing the health status of marine fish stocks	ICAR-FS-CMFRI-Methodology-2024-030	A. Gopalakrishnan	G. Sasikumar, U. Ganga, Shoba J.K., G. Dash, Anulekshmi C., Muktha M., S. Bhendekar, Rajan K., S. Sukumaran, Sujitha T, S. Ghosh, E.M. Abdussamad, Prathibha Rohit, Swatipriyanka Sen, Akhilesh K. V., Remya L., Shikha Rahangdale, K. M. Rajesh, Rekha J. Nair, T. M. Najmudeen, G. B. Purushottama, Mohamed Koya, Subal Kumar Roul, V. Mahesh, Livi Wilson, P. Abdul Azeez, S. Surya, H. M. Manas, D. Ajay Nakhawa, R. Vinothkumar, A. Margaret Muthu Rathinam, P. Laxmilatha, Josileen Jose, A.P. Dineshbabu, Lakshmi Pillai, P. T. Sarada, Rekha Devi Chakraborty, V. Venkatesan, Indira Divipala, R. Vidya, F. Jasmine, M. Kavitha, Rajesh Kumar Pradhan, M. Rajkumar, P. Gomathi, Sunil Kumar Ail, J. Jayasankar, Somy Kuriakose, Mini K.G., Eldho Varghese, Vinay Kumar Vase
12	Mass production of marine Copepods	ICAR-FS-CMFRI-Technology-2024-031	B. Santhosh	R Ranjan, C. Kalidas, B. Ignatius, J. Loka, A.P. Gop, G. Gopakumar, A. Gopalakrishnan, Muhammed Anzeer F., Aneesh K.S., M. K. Anil, A. Anuraj, P.P. Suresh Babu, K.K. Anikuttan, Shoji Joseph, Imelda Joseph, V.V.R. Suresh, Mijo V. Abraham, Darsana, S., Ritty Mariya Thomas, Jess Wilson, Balakrishna, C., S. Sonali, H. Jose Kingsly, V. A. Leslie, Greever Yoyak and Akhil, A. R.

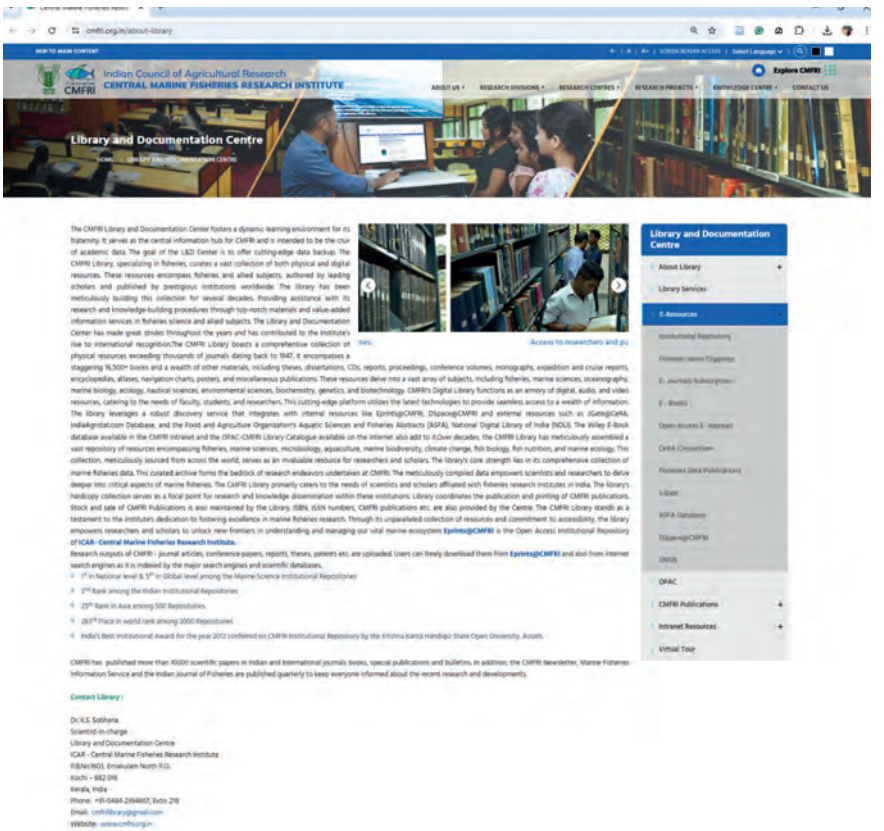
Photo: View of the library of ICAR-CMFRI

Library and Documentation Centre

Activities of Library and Documentation Centre

The Library and Documentation (L&D) Centre of ICAR-CMFRI continued its service through its state-of-the-art facilities empowering the research and academic community to achieve their research goals. The L& D Centre stands as an information hub providing cutting-edge information backup and support to the knowledge creation processes of the institute through its incomparable resources and tailored user services in marine fisheries and related subjects.

As a referral library in fisheries, it curates a vast collection of both physical and digital resources. These resources encompass fisheries and allied subjects, authored by leading scholars and published by prestigious institutions worldwide. It has evolved in such a manner building this collection for several decades. It houses thousands of journals since 1947, more than 16500 books, more than 200 theses, dissertations, CDs, reports, proceedings, conference volumes, monographs, expedition and cruise reports, encyclopaedias, atlases, navigation charts, posters, miscellaneous publications etc. which covers vast subjects such as fisheries, marine sciences, oceanography, marine biology, ecology, nautical sciences, environmental sciences, biochemistry, genetics, biotechnology, etc.



Online homepage of ICAR-CMFRI library

ICAR-CMFRI Digital Library is content-rich with a diverse collection of digital, audio, and video materials. It is complemented by a suite of essential research tools, including two institutional repositories, a comprehensive library catalogue, a dedicated journal platform (J-Gate), a statistical database (Indiastatagri), and consortia abstract services (ASFA). Access to NDLI resources and a virtual tour of the library further enrich this comprehensive offering. The Wiley E-Book database available in the ICAR-CMFRI Intranet also add to it. The Library and Documentation Centre of ICAR-CMFRI provides user awareness sessions on the effective utilisation of electronic information resources and research support tools to its users against request from the scholars. Library also provide internship and hands on training to Library Science graduates as per ICAR rules.

eprints@CMFRI

The eprints@CMFRI is an institutional repository, renowned for its open access nature and comprehensiveness of the information contained. Institutional repository has a total collection of more than 18500 publications now and includes the ICAR-CMFRI publications published from its beginning to present

and the papers/articles/conference proceedings/videos/posters/brochures/ theses etc. authored by all our staff and scholars in peer-reviewed/reviewed/ popular/science journals and books etc. This scientifically organised information repository is easily accessible and indexed by Google, Google Scholar, J-Gate, ASFA, OAIster, etc. Its popularity and utility are evident in the 5,98,598 downloads it received in 2024. More than 1,365 new items have been added to the repository this year. By supporting open access to the institution's scholarly outputs, the library helps increase the impact and reach of scientific information. Open-access articles draw more citations, more readers, and more academic social media attention, leading to greater public engagement, faster impact, wider collaboration, and increased interdisciplinary conversation. The eprints@CMFRI has completed 15 years of successful information dissemination with a total of 18,794 items uploaded and 5,436,579 downloads across the globe.

Homepage of Eprints@CMFRI

DSpace@CMFRI

Another Institutional Repository, the DSpace@CMFRI, is a digital archive of ICAR-CMFRI developed for archiving rare and old publications procured at ICAR-CMFRI library. Six thousand old and rare documents like memoirs, catalogues, reports and expedition reports are archived in "DSpace@ CMFRI". Full text of the documents can be freely accessed at HQ and RCs of ICAR-CMFRI as it is an Intranet resource.

Online Public Access Catalogue

The ICAR-CMFRI Library digital catalogue (OPAC) is also available online and accessible from anywhere. The portal is an integrated network of information sources. Besides serving as a web-based interface to the in-house resources, the portal also provides links to strategic sources of information.

JGate@CMFRI

ICAR's Consortium for e-Resources in Agriculture (CeRA) subscribed to e-journals and are made available through JGate@CMFRI platform. Access to 1,174 e-books on agriculture and allied subjects and more than 15,500 e-journals are available through CeRA. 80 e-books on fish and fisheries, 17 e-book series and e-journals on fish and fisheries published by Elsevier, Wiley, Springer, Taylor & Francis are accessible at HQ and RCs. JGate is one of the largest discovery services in the world itself and it caters to agriculture researchers across the nation to find their relevant content. The platform is designed with a user-friendly interface, making it easy for users to search, browse, and access the desired content. Advanced search functionalities enable users to refine their searches based on various criteria such as keywords, authors, publication dates, and journals.

Indiastatagri

The Indiastatagri is a statistical database subscribed for the ICAR-CMFRI academia, which is a comprehensive online resource that provides a wealth of statistical information about agriculture in India.

FAO- Aquatic Sciences and Fisheries Abstracts

Aquatic Sciences and Fisheries Abstracts (ASFA) published by the Food and Agriculture Organisation (FAO) is accessible on the CMFRI Intranet. Access to these databases is limited to the ICAR-CMFRI users within the CMFRI campuses at Headquarters and RCs.

ICAR-CMFRI in media

News clippings on fisheries, aquaculture and related subjects published in various newspapers were collected and compiled every month as news clippings magazine for reference. News related to ICAR-CMFRI are archived and uploaded to the website under the menu 'ICAR-CMFRI in Media'. Fisheries-related news clippings are also archived and made available for future reference. More than 660 news clippings were added in 'CMFRI in Media' during 2024.

Plagiarism/ Similarity check service

The library has made arrangements for checking plagiarism/ similarity for scientific articles of the institute staff for publishing in various journals. The 'Ithenticate' software is subscribed for anti-plagiarism service. Manuscripts submitted for the in-house journals 'Indian Journal of Fisheries' and 'Marine Fisheries Information Service' are also checked with this similarity checking software to ensure the originality of content.

Publication control and printing co-ordination of ICAR-CMFRI publications

The library is entrusted with arrangements for printing, stock maintenance, distribution and sale of Institute publications. Printing arrangements were made for Institute publications during the period and ISBN, ISSN and Series Nos. were allotted. The digital versions of Institute publications are uploaded to the Institute website.

Graphic designing unit

A dedicated graphic designing unit is proposed for the pre-press works including layout and graphic design of all ICAR-CMFRI publications such as Annual Reports, Books, Serials and other miscellaneous printables. Rooms are furnished and equipment is procured for the proposed design unit.

Indian Journal of Fisheries

Indian Journal of Fisheries (IJF) is a peer-reviewed quarterly published by ICAR-CMFRI. In 2024, 4 issues of IJF, Vol. 71 were published. Worldwide usage statistics of IJF for the year show a total of more than 8000 users. Indian Journal of Fisheries got a NAAS rating of 6.5 and an International Impact Factor of 0.5.

Marine Fisheries Information Service

The Marine Fisheries Information Service, Technical & Extension Series (MFIS) is a quarterly publication. Research-based technical articles, reporting significant new information, knowledge and understanding of marine fisheries and ecosystems as well as new concepts/ technologies in marine fish nutrition, hatchery and larval rearing, fish pathology, fish health management, application of genetics in fish conservation and farming, sea farming technologies, seafood trade and fisheries governance are published. In 2023, four issues of MFIS were published and printed. visit: *http://eprints.cmfri.org.in/ view/subjects/MFIS.html*

Cover design and layout of institute publications

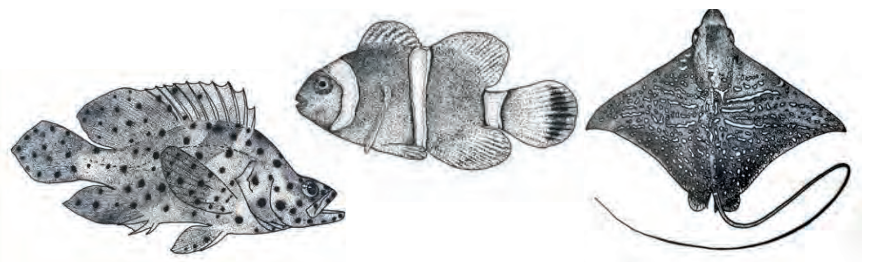
Our creative in-house design team delivered impactful visual communication through beautifully designed covers and layouts for diverse publications such as ICAR-CMFRI Special Publications, training manuals, booklets, posters and pamphlets. The documentation wing further enhanced internal communication with professional photography and videography of events. With meticulous attention to detail, the artist created scientific sketches of 146 marine species, which are valuable assets to both ICAR-CMFRI and the broader scientific community.

Online library information service

Release of new publications from the institute, activation of online databases and journals, new books purchased etc. are intimated regularly to scientists & researchers in HQ and RCs by email.

Online document delivery service

Resource sharing and document delivery services extend the library's ability to support faculty and student research by obtaining materials not available in the local collection from other institutions across the world. Users can make requests for the electronic copy of journal articles available at the ICAR-CMFRI Library through the DDR platform and they are delivered within days to them. Access to special collections and archives material is supported through memberships in various Library



Scientific drawings of marine specimen

consortia which helps to deliver documents against user needs. Students and scholars from universities and research institutions recognised by ICAR are the users of this service.

Internship programme

The library is providing internship facility to Library Science students as part of their academic programme.

ICAR-CMFRI publications 2024

1. CMFRI Annual Report 2023
2. Indian Journal of Fisheries Vol. 71 (1-4)
3. CMFRI Newsletter Cadalmin No.180,181,182
4. Marine Fisheries Information Service No.259,260,261
5. Marine Fish Landings in India 2023
6. CMFRI Marine Fisheries Policy Series No.23/2024: Guidelines for Green Certification of Marine Ornamental Species
7. Proceedings of the National Workshop on Exploring the Possibilities for Harvest and Utilisation of Mesopelagic Fishes in the Indian EEZ

ICAR-CMFRI Special publications

1. CMFRI Special Publication No.151: கடற்பாசி வளர்ப்பில் சிறந்த மேலாண்மை நடைமுறைகள் (Good Management Practices in Seaweed Farming-Tamil).
2. CMFRI Special Publication No.152: समुद्री शैवाल पैदावार में अच्छी प्रबंधन प्रथाएँ (Good Management Practices in Seaweed Farming-Hindi).
3. CMFRI Special Publication No.154: One decade of Swachh Bharat Abhiyan at ICAR-CMFRI.

Local news paper clippings on various activities of CMFRI

A few covers designed for CMFRI publications in 2024

Posters

1. Protected Elasmobranch Species of India: The Wild Life (Protection) Amendment Act 2022, Schedule-1
2. Protected Elasmobranch Species of India: The Wild Life (Protection) Amendment Act 2022, Schedule-2
3. Reconnoitring Annual Landings and Biochemical Profiling of Deep-Sea Driftfishes (Cubiceps: Nomeidae): A Promising Food Source

Brochures

1. Cadalmin™ Cardioalginol Extract CAe: A green solution from the wonder herbs of the ocean to protect cardiac health
2. Cadalmin™ Immunoboost extract (Cadalmin™ IBe)
3. National workshop on 'exploring possibilities for the sustainable harvest and utilisation of mesopelagic fishes of the Indian EEZ'
4. Fish feeds and feed technologies of ICAR-CMFRI
5. Cadalmin BSF ZW: a Zero-Waste Bio-Conservation System
6. Farmed marine finfish species in brief
7. Glimpse of Madras Regional Station ICAR-CMFRI
8. ICAR-CMFRI (ICAR-Central Marine Fisheries Research Institute)
9. Ornamental fish culture
10. Sawfish Information Bulletin
11. International whale shark day 30 August
12. അന്താരാഷ്ട്ര തിമിംഗല സ്രാവ് ദിനം 30 ആഗസ്റ്റ്
13. பொரிப்பகங்களில் வளர்க்கப்படும் பாறை மீன்களில் ஏற்படும் நோய்களும் அதன் தடுப்பு முறைகளும்
14. मात्स्यकी में वज्ञिान, प्रौद्योगकिी और नवाचार हब एक झलक
15. आंध्र प्रदेश की समुद्री मात्स्यिकी की टिकाऊपन के लिए नीति मार्गदर्शन (Policy guidance for sustainable marine fisheries of Andhra Pradesh-Hindi)
16. आंध्र प्रदेश की समुद्री मात्स्यिकी का निर्धारण (Assessment of Marine Fisheries of Andhra Pradesh-Hindi)

Training manuals

1. Course Manual: ICAR winter school on harnessing recent advances in high-value compound development and seaweed biomass utilisation for human well-being: propelling atmanirbhar swastha bharat and empowering farmers 15th february to 06th march 2024
2. Training manual on microbial interventions in health management of marine finfish and shellfish aquaculture
3. Training manual on "know your Marine Biodiversity and Environment (MarBiE 1)"
4. Training manual on "know your Marine Biodiversity and Environment (MarBiE 2)"
5. Training manual on marine microalgae culture techniques
6. Study of shark and ray non-fin commodities in India
7. Training manual on advances in marine finfish farming practices
8. Draft Indian Standard: good aquaculture practices for sea cage farming
9. Training manual on fisheries management practices and techniques
10. Course Manual on "Know your Marine Biodiversity & Environment MarBiE 3" water and sediment analytical techniques with special reference to marine life
11. Working manual: High Performance Computing Facility (Fish@CMFRI)
12. శిక్షణా పుస్తకం భారతదేశపు సముద్ర మత్స్య సంపదను మెరుగుపరిచే కృత్రిమ దిబ్బల యొక్క ప్రాథమిక అంశాలు (Telugu version of Course Manual on Fundamentals of Artificial Reefs for Improving Marine Fisheries in India).

Videos

1. From conventional to innovation: Abla Bhai's seaweed farming success story
2. Sea Cage Farming
3. Monoline method of seaweed farming
4. Bamboo raft method of farming
5. Seaweed Mentors: shaping success in Indo-Pak Border marine waters along Gujarat coast
6. Lobster fattening in sea cages
7. SCSP activities, ICAR-CMFRI, Mandapam Regional Centre
8. Door-to-door awareness programme: an initiative by ICAR-CMFRI to expand seaweed farming along Indo-Pak border regions
9. Advanced custom-designed HDPE Seaweed Rafts redefining seaweed farming with rafts engineered for challenging marine sites
10. "Seaweed farming revolution": a voyage towards sustainable seas, propelled by advanced HDPE rafts and region-specific adaptation
11. Novel decision-support system for improved resource efficiency and lobster production through technological refinements in mariculture systems
12. विचार विमर्श - कृत्रिम चट्टान और मछली पालन

Photo: International Women's Day celebration at Vizhinjam RC of ICAR-CMFRI

Women's Cell

Activities of Women's Cell

The Women's Cell of ICAR-CMFRI Headquarters and Regional Centres/ Stations actively engaged in promoting gender inclusivity and empowering women through various initiatives and activities throughout 2024. The Cell has consistently worked towards encouraging greater participation of women in both professional and personal development activities, ensuring a supportive and inclusive environment.

Women participation in key initiatives and activities

Women participation in ICAR-CMFRI in areas such as livelihood enhancement programmes, health and wellness, technical and professional development, leadership and representation, awareness and advocacy, national and international celebrations, cultural activities and institutional responsibilities were in alignment with other programmes like Swachh Bharath Abhiyan, SCSP/ TSP outreach, NICRA. etc. From initiatives in livelihood support to professional development and leadership roles, the Women Cell has actively worked towards creating an enabling environment for women employees reflecting ICAR-CMFRI's dedication to fostering a culture of equality and empowerment, making it a vital part of its mission and vision for the future.

Women Cell involvement in SCSP empowerment at Visakhapatnam

Programmes concerning women employees of ICAR-CMFRI

Scientists and staff of Regional Centres and Stations of the Institute participated virtually in an awareness talk delivered by Adv. Mrs Sujatha Varma, High Court of Kerala on the 'Prevention of sexual harassment of women in the workplace' as part of the observance of the 'Sexual Harassment of Women at Workplace Prevention Week', on 10th December 2024. Women employees of Regional Centres and Stations of ICAR-CMFRI also participated in an awareness programme organised by ICAR-CMFRI, Kochi on 1st March 2024 for popularising menstrual cups as an eco-friendly and hygienic alternative to sanitary napkins, which goes a long way into increasing comfort for women, decreasing expenditure and providing viable solutions for minimising non-biodegradable waste. A follow-up of the same with menstrual cups being presented to the women contractual staff of ICAR-CMFRI, Kochi in consonance with the Swachh Bharath campaign was also organised at ICAR-CMFRI, Kochi on 1st October 2024. Regular quarterly meetings of the Women Cell of the Institute were held during 2024.

International Women's Day 2024 on the theme "Invest in Women: Accelerate Progress" on 8th March 2024

At ICAR-CMFRI, Kochi, the International Women's Day (IWD) was held with the presence of Ms Chitra Arun, a famous playback singer as the Chief Guest. Two women entrepreneurs, Ms Ivy Jose, who was inspired by CMFRI's training, established Ivy's Agro-hub near Munambam Harbour, transforming fish waste into organic fertilizer that enhances soil quality and supports sustainable agriculture and Ms K.G. Rethikumari, who turned her passion for ornamental fish farming into a thriving business, creating employment opportunities for women and generating significant family income, aided by training from ICAR-CMFRI and NFDB, were honoured. At Vizhinjam Centre of ICAR-CMFRI, the IWD was celebrated with an interactive session on the theme 'Prioritizing Women's Health and Wellness', which was graced by the renowned gynaecologist Dr Maya Devi as the Chief Guest and included cultural performances. At its Mangalore Centre, the IWD was celebrated recognising and appreciating the achievements of women in our lives and society. The Centre honoured Ms Tabassum, known by the sobriquet Mother Teresa of Karavali, who manages Snehadeep, a centre for HIV positive children, especially girls. She was accompanied by some of the children from Snehadeep who were studying in various schools in the city. In the Veraval Centre, the IWD was observed with Dr Smita Chag, Principal, Government Science College, gracing the occasion, who highlighted the need to sensitise women on their rights and legal aids available to counter harassment at the workplace. She also urged all the employees of the station to practice sensitisation to their children at home. Smt. Shikha Rahangdale, Scientist, also highlighted the need to educate female children at home so that they grow into strong independent women in the future. At Karwar Centre, the IWD was celebrated by arranging a motivational talk by Chief Guest, Dr Bhagyashree Naik, Lecturer, Shivaji Composite College, Sadashivagad, Karwar, who is a resource person for history forum, a writer and poet.

International Women's Day celebration at ICAR-CMFRI, Kochi

At Mandapam Centre, Ms Raji Krishnan, Principal, Kendriya Vidhyalaya Mandapam, was the chief guest. At Tuticorin, the IWD was celebrated with the wholehearted participation of all the staff. The Madras Research Station of ICAR-CMFRI organised the IWD. Smt. K. Priya, Branch Manager, SBI, MRC Nagar, Chennai, as chief guest. She delivered a lecture on the role and achievements of women in society. She also spoke about the role of banks in supporting fisheries entrepreneurs.

International Women's Day celebration at Mangalore RC of ICAR-CMFRI

International Women's Day celebration at Mandapam RC of ICAR-CMFRI

International Women's Day celebration at Veraval RS of ICAR-CMFRI

International Women's Day celebration at Karwar RS of ICAR-CMFRI

International Women's Day celebration at Tuticorin RS of ICAR-CMFRI

International Women's Day celebration at Madras RS of ICAR-CMFRI

Personnel

Scientists (Headquarters and Centres)

ICAR-CMFRI HEADQUARTERS, KOCHI

No.	Name of Employee and Designation
1	Dr Grinson George Director
2	Dr V. V. R. Suresh Principal Scientist & Head, Mariculture Division
3	Dr A. P. Dineshbabu Principal Scientist & Head, SFD
4	Dr J. Jayasankar Principal Scientist & Head, FRAEED
5	Dr Kajal Chakraborty Principal Scientist & Head, MBFNHD
6	Dr Shoba Joe Kizhakudan Principal Scientist & Head, FFD
7	Dr Imelda Joseph Principal Scientist
8	Dr Abdussamad E. M. Principal Scientist
9	Dr Josileen Jose Principal Scientist
10	Dr K. S. Sobhana Principal Scientist
11	Dr Madhu K. Principal Scientist
12	Dr D. Prema Principal Scientist
13	Dr Rema Madhu Principal Scientist
14	Dr Shoji Joseph Principal Scientist
15	Dr Boby Ignatius Principal Scientist
16	Dr Ramachandran C. Principal Scientist
17	Dr Somy Kuriakose Principal Scientist
18	Dr Geetha Sasikumar Principal Scientist
19	Dr Vipinkumar V. P. Principal Scientist
20	Dr S. R. Krupesha Sharma Principal Scientist
21	Dr U. Ganga Principal Scientist
22	Dr S. Lakshmi Pillai Principal Scientist
23	Dr Shyam S Salim Principal Scientist
24	Dr Rekha J. Nair Principal Scientist
25	Dr K. G. Mini Principal Scientist
26	Dr Saju George Principal Scientist
27	Dr T. M. Najmudeen Principal Scientist
28	Dr Miriam Paul Sreeram Principal Scientist
29	Dr Rekhadevi Chakraborty Principal Scientist
30	Dr Sandhya Sukumaran Principal Scientist
31	Dr Aswathy N. Principal Scientist
32	Dr Shinoj P. Principal Scientist
33	Dr Suresh Babu P. P. Principal Scientist
34	Dr M. A. Pradeep Senior Scientist
35	Dr Eldho Varghese Senior Scientist

No.	Name of Employee and Designation
36	Dr Sreenath K. R. Senior Scientist
37	Dr Shelton Padua Senior Scientist
38	Dr K. Mohammed Koya Senior Scientist
39	Dr Jeena N. S. Senior Scientist
40	Dr Vidya R. Senior Scientist
41	Dr Rajesh N. Scientist
42	Smt. Reshma K. J. Scientist
43	Dr Ratheesh Kumar R. Scientist
44	Dr Chandrasekar S. Scientist
45	Dr Sanal Ebeneezar Scientist
46	Dr Remya L. Scientist
47	Dr Sumithra T. G. Scientist
48	Dr (Smt.) Reshma Gills Scientist
49	Dr Livi Wilson Scientist
50	Dr Adnan Hussain Gora Scientist
51	Dr Abdul Azeez P. Scientist
52	Dr Saima Rehman Scientist
53	Dr Anuja A. R. Scientist
MANDAPAM RC	
54	Dr K Vinod Principal Scientist & Head
55	Dr G. Tamilmani Principal Scientist
56	Dr M. Sakthivel Principal Scientist
57	Dr P. Rameshkumar Senior Scientist
58	Dr Johnson B. Senior Scientist
59	Dr R. Saravanan Senior Scientist
60	Dr Anikuttan K. K. Senior Scientist
61	Shri S. Thirumalaiselvan Scientist
62	Shri Rajkumar M. Scientist
63	Shri Sankar M. Scientist
64	Miss. Bavithra R. Scientist
VISAKHAPATNAM RC	
65	Dr Joe K. Kizhakudan Principal Scientist & Head
66	Dr S. S. Raju , Principal Scientist
67	Dr Jayasree Loka Principal Scientist
68	Dr Ritesh Ranjan Principal Scientist
69	Dr Biji Xavier Senior Scientist
70	Dr Muktha M. Senior Scientist
71	Dr Pralaya Ranjan Behera Senior Scientist
72	Dr Sekar Megarajan Senior Scientist
73	Dr Indira Divipala Senior Scientist
74	Dr Manas H. M. Senior Scientist
75	Dr Jasmine F. Scientist
MANGALORE RC	
76	Dr Sujitha Thomas Principal Scientist & Head
77	Dr Rajesh K. M. Principal Scientist
78	Dr Bindu Sulochanan Principal Scientist
79	Dr Divya Viswambharan Scientist
80	Dr Sunil Kumar S Ail Scientist
CALICUT RS	
81	Dr Anulekshmi Chellappan Senior Scientist
82	Dr Akhilesh K. V., Senior Scientist
83	Dr Shilta M. T. Scientist
84	Smt. Ramya Abhijith Scientist
85	Dr Vaisakh G. Scientist
KARWAR RS	
86	Dr C. Kalidas Principal Scientist
87	Dr Purushottama G. B. Senior Scientist
88	Dr Mahesh V. Scientist
89	Dr Kurva Raghu Ramudu Scientist
90	Shri Tanveer Hussain Scientist
MADRAS RS	
91	Dr R. Narayana Kumar Principal Scientist
92	Dr A. Margaret Muthu Rathinam Principal Scientist
93	Dr A. K. Abdul Nazar Principal Scientist
94	Dr J. Charles Jeeva Principal Scientist
95	Dr R. Jeyabaskaran Senior Scientist
96	Dr Srinivasa Raghavan V. Senior Scientist
MUMBAI RS	
97	Dr Venkatesan V. Principal Scientist
98	Dr S. Ramkumar Senior Scientist
99	Shri Nakhawa Ajay Dayaram Scientist
100	Dr Bhendekar Santosh Nagnath Scientist
TUTICORIN RS	
101	Dr Loveson L. Edward Senior Scientist
102	Dr L. Ranjith Senior Scientist
103	Dr D. Linga Prabu Scientist
104	Smt. M. Kavitha Scientist
105	Shri Vinothkumar R. Scientist
106	Smt. Vidhya V. Scientist
VERAVAL RS	
107	Dr Swathilekshmi P. S. Principal Scientist
108	Dr Divu D. Senior Scientist
109	Dr Vinaya Kumar Vase Senior Scientist
110	Dr Rajan Kumar Scientist
111	Smt. Shikha Rahangdale Scientist
VIZHINJAM RC	
112	Dr B. Santhosh Principal Scientist & Head
113	Dr M. K Anil Principal Scientist

No.	Name of Employee and Designation
114	Dr Asha P. S. Principal Scientist
115	Dr Krishna Sukumaran Principal Scientist
116	Dr Anuraj A. Scientist
117	Dr Surya S. Scientist
118	Dr Rathi Bhuvaneswari G. Scientist

No.	Name of Employee and Designation
119	Smt. P. Gomathi Scientist
120	Shri Ambarish P. Gop Scientist
PURI FC	
121	Dr Gyanaranjan Dash Senior Scientist
122	Dr Swatipriyanka Sen Dash Senior Scientist
123	Shri Rajesh Kumar Pradhan Scientist

No.	Name of Employee and Designation
DIGHA RS	
124	Dr Subal Kumar Roul Scientist
KVK of ICAR-CMFRI NARAKKAL	
125	Dr Shinoj Subramannian Principal Scientist & Head
KVK of ICAR-CMFRI LAKSHADWEEP	
126	Dr P. Natarajan Ananth Principal Scientist & Head

Technical Staff (Headquarters and Centres)

No.	Name of Employee and Designation
ICAR-CMFRI HEADQUARTERS, KOCHI	
1	Shri N. Viswanathan Chief Technical Officer(Civil)
2	Shri P. S. Anilkumar Assistant Chief Technical Officer
3	Dr G. Shylaja Assistant Chief Technical Officer
4	Dr Jenni B. Assistant Chief Technical Officer
5	Shri Sijo Paul Assistant Chief Technical Officer
6	Smt. K. P. Salini Assistant Chief Technical Officer
7	Smt. Seetha P. K. Assistant Chief Technical Officer
8	Dr M. P. Paulton Assistant Chief Technical Officer
9	Smt. Sindhu K. Augustine Senior Technical Officer
10	Shri V. K. Manu Senior Technical Officer (Computer)
11	Smt. N. R. Dhanutha Technical Officer
12	Shri Arun Surendran P. S. Technical Officer
13	Smt. Lavanya Ratheesh Technical Officer
14	Shri P. S. Alloycious Technical Officer
15	Shri T. Retheesh Technical Officer
16	Shri A. Padmanabha Technical Officer
17	Shri K. G. Radhakrishnan Nair Technical Officer (Motor Driver)
18	Shri P. K. Baby Technical Officer

No.	Name of Employee and Designation
19	Smt. Vandana V. Senior Technical Assistant (Hindi Translator)
20	Smt. Priya K. M. Senior Technical Assistant (Hindi Translator)
21	Shri Aju K. Raju Senior Technical Assistant
22	Shri K. M. David Senior Technical Assistant (Artist)
23	Shri Vijayakarthikeyan Senior Technical Assistant (Electrician)
24	Shri C. V. Jayakumar Senior Technical Assistant
25	Dr Anusree V. Nair Senior Technical Assistant
26	Shri Binoy Bhaskaran Senior Technical Assistant
27	Dr Ragesh N. Senior Technical Assistant
28	Shri Sayooj P. Senior Technical Assistant
29	Dr Sajeela K. A. Senior Technical Assistant
30	Dr Sajikumar K. K. Senior Technical Assistant
31	Shri Retheesh T. B. Senior Technical Assistant
32	Shri Manjeesh R. Senior Technical Assistant (Computer appln.)
33	Shri M. N. Sathyan Senior Technical Assistant (Motor Driver)
34	Shri Abhilash P. R. Senior Technical Assistant (Exhibition Assistant)
35	Smt. Reena V. Joseph Technical Assistant
36	Smt. Dhanya G. Technical Assistant
37	Shri V. H. Venu Senior Technician

No.	Name of Employee and Designation
38	Smt. J. Sudhadevi Senior Technician
39	Smt. Shyamala M. P. Senior Technician
40	Shri P. V. Sunil Senior Technician
41	Shri Shaji A. K. Senior Technician
42	Smt. Sheela P. P. Senior Technician
43	Shri Jestin Joy K. M. Senior Technician
44	Shri Sreekumar K. M. Senior Technician
45	Shri Vijayan M. T. Senior Technician
46	Shri Kishor T. G. Senior Technician
47	Shri Sreesanth L. Senior Technician
48	Shri Sunil K. T. S. Senior Technician
49	Shri Jishnudev M. A. Senior Technician
50	Shri Paulose Jacob Peter Senior Technician
51	Shri Abbas .A. Muhammed Senior Technician
52	Shri Anoob P. Anassery Senior Technician
53	Shri Jerin V. Jose Technician
54	Smt. Sini M. B. Technician
55	Smt. Usha P. K. Technician
56	Shri Rajesh P. A. Technician

No.	Name of Employee and Designation
57	Shri Jithesh P. T. Technician
58	Smt. Keerthi Krishna Technician
59	Shri Akhil Babu V. Technician
60	Shri Pakkri Muthu S. Technician
61	Smt. Sethulakshmi M. Technician
62	Shri Joby P. J. Technician
63	Shri Prashanth P. K. Technician
64	Smt. Jesli Disilva Technician
65	Shri Ullas Shankar Technician
66	Shri Koushik T. R. Technician

MANDAPAM RC

1	Shri I. Mendonza Xavier ACTO
2	Shri M. Asokan Technical Officer (Painter cum Polisher)
3	Shri G. Hanumantha Rao Technical Officer
4	Shri M. Palanichamy Technical Assistant (Electrician)
5	Shri K. Shanmughanathan Senior Technician
6	Shri M. Jayasingh Senior Technician
7	Shri I. Syed Sadiq Senior Technician
8	Shri V. Muniasamy Senior Technician
9	Shri B. Kathiresan Senior Technician
10	Shri K. Muniyasamy Senior Technician
11	Shri M. Ganesan Senior Technician
12	Shri M. Thayalan Senior Technician
13	Shri K. Senthil Kumar Senior Technician
14	Shri Tinto Thomas Senior Technician
15	Shri A. Ramesh Senior Technician
16	Shri S. M. Sikkender Batcha Senior Technician
17	Shri M. Mahalingam Technician
18	Shri R. Suresh Technician
19	Shri K. Narayanan Technician
20	Shri Midhun Muthayan Technician
21	Shri Aneesh U. Technician
22	Shri Deepak Kumar Technical Trainee

VISAKHAPATNAM RC

1	Dr Phalguni Pattnaik ACTO
2	Shri K. Gauri Sankara Rao STO (Computer)
3	Shri P. Venkataramana Technical Officer
4	Shri Narasimhulu Sadhu Technical Officer
5	Dr Mamidi Satish Kumar Technical Officer
6	Shri V. Ashok Maharshi Technical Officer
7	Shri Kodi srinivasa Rao Technical Officer
8	Shri Ravi kumar Avadhanula Senior Technical Assistant
9	Shri Balla Vamsi Senior Technical Assistant
10	Shri Chinni Babu Bathina Senior Technical Assistant
11	Shri Suresh kumar Pilli Senior Technical Assistant
12	Shri R. P. Venkatesh Technical Assistant (Fitter)
13	Shri Sangaru Padmaja Rani Senior Technician
14	Shri Durga Suresh Relangi Senior Technician
15	Shri Rachakonda Shivaraju Senior Technician
16	Shri D. Bhaskara Rao Senior Technician
17	Shri Panchakarla Nagaraju Senior Technician
18	Shri C. H. Moshe Senior Technician
19	Shri D. Jaganna Senior Technician
20	Shri D. Lingaraju Technician
21	Shri Oggu China Venkateswarlu Technician
22	Shri Damodara Rao Padumu Technician
23	Smt. Jincy Cherian Technician
24	Shri Siddhartha Hazra Technical Trainee
25	Shri Ranjan Kumar Technical Trainee

PURI FC

1	Dr Biswajit Dash ACTO
2	Dr Madhumita Das ACTO
3	Ms Menaka Das Technician
4	Shri Prakash Chandra Das Technician
5	Shri Avinash Kumar Lal Technical Trainee

VIZHIJAM RC

1	Dr Jose Kingsly ACTO
2	Dr V. A. Leslie ACTO
3	Shri K. K. Suresh ACTO
4	Smt. Dipti N. V. Technical Officer
5	Shri Albert Idu Senior Technical Assistant
6	Smt. Sharanya M. P. Technician
7	Ms Sruthi N. S. Technician

MANGALORE RC

1	Shri P. Harshakumar Technical Officer(Motor Driver)
2	Shri Lingappa Technical Officer
3	Dr Veena Shettigar Technical Officer
4	Shri M. Chaniappa Technical Officer
5	Shri G. D. Nataraja Technical Officer
6	Shri Karamathulla Sahib P. Technical Assistant
7	Ms Renuka K. Technician
8	Shri Sabyasachi Ghosh Technical Trainee
9	Shri Banoth Sunil Technical Trainee

MUMBAI RS

1	Dr Nilesh Anil Pawar ACTO
2	Shri Punam Ashok Khandagale Technical Officer
3	Shri Shashikanth R. Yadav Technical Officer (Motor Driver)
4	Shri Vaibhav Dinkar Mhatre Technical Officer

No.	Name of Employee and Designation
5	Shri Thakurdas Technical Officer
6	Shri Jayadev S. Hotagi Technical Officer
7	Shri Umesh Hari Rane Senior Technical Assistant
8	Shri Bhangare Sunil Ramachandra Senior Technician
9	Shri Shrikrishna Pandurang Hotekar Senior Technician
10	Shri Suresh Technician
11	Shri Digambhar Suresh Kumbar Technician
12	Shri Mahendra Pandit Sonawane Technician
13	Shri Jay Prakash Ray Technical Trainee

MADRAS RS

1	Shri K. Diwakar CTO
2	Shri D. Pugazhendi CTO
3	Smt. S. Gomathy ACTO
4	Shri N. Rudramurthy ACTO
5	Shri S. Selvanidhi Technical Officer
6	Shri P. Jaiganesh Technical Officer
7	Shri M. Anbarasu Technical Officer
8	Dr K. S. Shiak Mohamed Yousuf Technical Officer
9	Shri S. V. Subba Rao Technical Officer
10	Shri G. Sudhakar Technical Officer
11	Shri S. Pradeep Technical Assistant
12	Shri I. Santhoshi Technical Assistant
13	Shri J. Balaji Senior Technician
14	Shri V. Sitaramacharyalu Senior Technician
15	Shri Bareen Mohammed Senior Technician
16	Smt. Remya Unnikrishnan Technician
17	Smt. R. Eswari Technician
18	Smt. P. Prasannakumari Technician
19	Shri Vishnu P. G. Technician
20	Shri Pankaj Kumar Technical Trainee

TUTICORIN RS

1	Shri U. Jeyaram Senior Technical Officer
2	Shri S. Mohamed Sathakathullah Technical Officer
3	Shri K. Ramaswami Senior Technical Assistant (Motor Driver)
4	Dr P. Rajendran Technical Assistant
5	Shri S. Willington Senior Technician
6	Shri N. Ramaswami Senior Technician
7	Shri C. S. Santhana Kumar Technician
8	Smt. A. Usha Rani Technician
9	Shri Soumen Bar Technical Trainee

VERAVAL RS

1	Dr Suresh Kumar Mojjada ACTO
2	Dr Fofandi Mahendra Kumar D. ACTO
3	Shri Chudasama Ramji Raja Technical Officer
4	Shri Bhatt Bhargav Hareshbhai Senior Technician
5	Shri Solanki Vipulkumar Mulajibhai Senior Technician
6	Ms. Gohel Jayshree Khimji Senior Technician
7	Shri Chudasama Karsan Punja Senior Technician
8	Shri Sonara Yogesh Zinabhai Technician
9	Shri Dinesh Kumar Yadav Technical Trainee

CALICUT RS

1	Shri N. P. Ramachandran Technical Officer
2	Smt. P. Renuka Senior Technician
3	Shri Ansar Pokkarakath Senior Technician
4	Smt. Silpa P. G. Senior Technician
5	Shri T. Rajesh Babu Senior Technician
6	Shri Shiju P. Senior Technician
7	Smt. Vijisha M. Technician
8	Smt. Vijayalakshmi V. V. Technician

KARWAR RS

1	Shri YVS Suryanarayana Technical Officer
2	Dr Sonali S. Mhaddolkar Technical Officer
3	Dr Praveen Narayan Dube Senior Technical Assistant
4	Shri N. Selvakumar Senior Technician
5	Smt. Pramila Harish Borkar Senior Technician

DIGHA RS

1	Shri Indranil Mukherjee Senior Technician
2	Shri Milan Jana Technical Trainee
3	Shri Kalpataru Maji Technical Trainee

KVK Narakkal

1	Shri Shoji Joy Edison ACTO (SMS-horticulture)
2	Shri F. Pushparaj Anjalo ACTO (SMS-Agri.Extn.)
3	Dr Karikkathil Smitha Sivadasan ACTO (SMS-Animal Husbandry)
4	Dr Vikas P. A. ACTO (SMS-Fisheries)
5	Shri Robin Bilam STO (SMS-Soil Sciences)
6	Shri Thirumoorthy P. STO (SMS-Home Science)
7	Shri Sineesh Ambi Technician(Motor Driver)
8	Shri Binoop C. S. Technician(Motor Driver)

KVK, LAKSHADWEEP

1	Dr Abdul Gaffor V. M. STO (SMS-Poultry & Animal Sciece)
2	Shri Sagar Vitthal Shinde STO (SMS-Aquaculture)
3	Dr Ansul STO (SMS-Vegetable Science)
4	Dr Abhishek Das STO (SMS-Soil Sciences)
5	Shri Raju C. A. STO (SMS-Home Science)
6	Dr Marepally Udaya Sindhu STO (SMS-Agricultural Extension)

Administrative Staff (Headquarters and Centres)

ICAR-CMFRI HEADQUARTERS, KOCHI

No.	Name of Employee and Designation
1	Shri Hareesh Nair Chief Administrative Officer (Senior Grade)
2	Shri Prashant Kumar Comptroller
3	Smt. Meera K. N. Administrative Officer
4	Smt. V. K. Sobha Administrative Officer
5	Shri Sreekumaran K. S. Senior Finance & Accounts Officer
6	Smt. Febeena P. A. Assistant Finance & Accounts Officer
7	Smt. G. Hemlata Assistant Finance & Accounts Officer
8	Shri Arjun Murali Assistant Finance & Accounts Officer
9	Shri Roshin Pushpan Assistant Finance & Accounts Officer
10	Smt. Deepa P. N. Assistant Finance & Accounts Officer
11	Shri C. Jayakanthan AAO
12	Smt. M. Safiyabi AAO
13	Shri Joseph Mathew AAO
14	Shri Sunil A. T. AAO
15	Smt. G. Ambika AAO
16	Smt. Manjusha G. Menon AAO
17	Smt. Radhika Krishnan G. AAO
18	Smt. Soumya Surendran AAO
19	Smt. Sumeena N. K. Assistant
20	Smt. N. G. Supriya Assistant
21	Smt. Binny Cherian Assistant
22	Smt. T. C. Chandrika Assistant
23	Smt Annies Mary Paulose Assistant
24	Shri K. S. Sunil Raj Assistant
25	Shri T. K. Sumesh Assistant
26	Shri E. A. Roopesh Assistant
27	Smt. Manju Jose Assistant
28	Shri B. James Assistant
29	Smt. Sujatha K. K. Assistant
30	Ms. Tintu P. X. Assistant
31	Mr. Vimal Ganesh R. Assistant
32	Smt. P. Vineetha Private Secretary
33	Smt. P. K. Anitha Private Secretary
34	Smt. Bindu Sanjeev Private Secretary
35	Smt. K. Smitha Private Secretary
36	Smt. Shirley Kuriakose Private Secretary
37	Shri S. Sreekumar Upper Division Clerk
38	Smt. Remya T. R. Upper Division Clerk
39	Smt. Sreeja N. P. Upper Division Clerk
40	Shri M. Saravanan Upper Division Clerk
41	Smt. Sandhya C. K. Upper Division Clerk
42	Smt. Zulekha Personal Assistant
43	Smt. Dhanya M. B. Personal Assistant
44	Shri. Rajesh T. K. Lower Division Clerk
45	Shri Biju George Lower Division Clerk
46	Shri Greever Yoyak Lower Division Clerk
47	Shri Eldhose Benny Lower Division Clerk
48	Smt. Emy K Baby Lower Division Clerk
49	Shri Seban John Lower Division Clerk
50	Shri T Jothi Manikandan Lower Division Clerk
51	Shri Ebrahim K. P. Lower Division Clerk
52	Shri S. Sarath Chandran Lower Division Clerk

MADRAS RC

No.	Name of Employee and Designation
1	Shri S. Yuvarajan Assistant
2	Smt. Suriya Varshini P. Assistant
3	Smt. S. Anjalidevi Upper Division Clerk
4	Shri R. Kumaran Lower Division Clerk

MANDAPAM RC

No.	Name of Employee and Designation
1	Shri D. Augustus Julin Raj AAO
2	Shri M. Shahul Hameed Assistant
3	Shri B. Palanivelmurugan Upper Division Clerk
4	Smt. M. Valarmathi Upper Division Clerk
5	Smt. K. Madhavi Lower Division Clerk

CALICUT RS

No.	Name of Employee and Designation
1	Shri Rishikesh Aandi AAO
2	Shri R. Saravanan Upper Division Clerk

MUMBAI RS

No.	Name of Employee and Designation
1	Shri Santosh Kumar AAO
2	Shri Vinod P. Bhagayatkar Assistant
3	Shri Bhomesh Meena Assistant

TUTICORIN RS

No.	Name of Employee and Designation
1	Smt. T. Mahalakshmi Assistant
2	Shri J. Vinoth Prabhu Vaz Assistant
3	Shri K. Jerald Raja Assistant
4	Smt. R. Anantharani Upper Division Clerk

MANGALORE RC

No.	Name of Employee and Designation
1	Shri Upendar Kumar AAO
2	Shri Vineeth T. Lower Division Clerk

VERAVAL RS

No.	Name of Employee and Designation
1	Shri Rohit A. Chowda Upper Division Clerk
2	Shri Pandya Jatin Kumar Upper Division Clerk

KARWAR RS

No.	Name of Employee and Designation
1	Shri Ratan P. Naik Upper Division Clerk

VISAKHAPATNAM RC

No.	Name of Employee and Designation
1	Smt. D. Madhavi Latha Assistant
2	Shri L. Pydi Raju Upper Division Clerk
3	Shri S Srinivasulu Lower Division Clerk

No.	Name of Employee and Designation
VIZHINJAM RC	
1	Smt. K. Latha AAO

No.	Name of Employee and Designation
2	Smt. Vinny George Assistant
3	Smt. M. P. Kaladevi Upper Division Clerk

No.	Name of Employee and Designation
DIGHA RS	
1	Shri A. Yesudhas Assistant

Multi Tasking Staff (Headquarters and Centres)

No.	Name of Employee and Designation
ICAR-CMFRI HEADQUARTERS, KOCHI	
1	Shri K. G. Jayaprasad Multi Tasking Staff
2	Smt. K. T. Prakasini Multi Tasking Staff
3	Shri M. D. Suresh Multi Tasking Staff
4	Smt. Usha S. Multi Tasking Staff
5	Smt. P. K. Sujatha Multi Tasking Staff
6	Shri M. J. Joseph Multi Tasking Staff
7	Smt. Subaida K. S. Multi Tasking Staff
8	Smt. K. S. Jeeji Multi Tasking Staff
9	Shri P. M. Gireesh Multi Tasking Staff
10	Shri M. K. Anil Kumar Multi Tasking Staff
11	Smt. Unniresmi C. U. Multi Tasking Staff
12	Smt. Rinku Joseph Multi Tasking Staff
13	Smt. Deepa R. Multi Tasking Staff
14	Shri Sibin P. Babu Multi Tasking Staff
15	Shri Ratheesh M. Multi Tasking Staff
16	Smt. Anaswara K. B. Multi Tasking Staff
17	Smt. Sruthy S. Multi Tasking Staff
18	Shri Akhildev S. Multi Tasking Staff
19	Smt. Binitha Babu Multi Tasking Staff
20	Smt. Remya E. A. Multi Tasking Staff
21	Smt. Jinimol K. P. Multi Tasking Staff

No.	Name of Employee and Designation
22	Smt. Hima P. H. Multi Tasking Staff
23	Smt. Divya K. A. Multi Tasking Staff
24	Shri Thobias P. Antony Multi Tasking Staff
25	Shri Vysakhan P. Multi Tasking Staff
26	Shri Sujith R. Multi Tasking Staff
27	Smt. Reshma K. S. Multi Tasking Staff
28	Ms. Athira T. G. Multi Tasking Staff
29	Smt. Preethy Udayabhanu Multi Tasking Staff
30	Shri Vipinkumar K. K. Multi Tasking Staff
31	Shri Augustine Sipson N. A. Multi Tasking Staff
32	Shri Ancil Parera Multi Tasking Staff
33	Smt. Nandana P. R. Multi Tasking Staff
CALICUT RS	
1	Smt. Nishida P. Multi Tasking Staff
2	Shri M. K. Chandran Multi Tasking Staff
3	Shri P. V. Gopalan Multi Tasking Staff
4	Shri P. B. Jeevaraj Multi Tasking Staff
5	Shri Anoop K. G. Multi Tasking Staff
6	Shri V. Rajendran Multi Tasking Staff
7	Shri Anirudh K. Multi Tasking Staff
8	Shri Ajith Mettappadan Multi Tasking Staff
9	Shri Abdul Hakeem M. M. Multi Tasking Staff

No.	Name of Employee and Designation
KARWAR RS	
1	Shri Ramakant Shankar Harikantra Multi Tasking Staff
2	Ms. Pooja Mahabaleswar Gajinkar Multi Tasking Staff
3	Ms. Veena Ulhas Kamble Multi Tasking Staff
4	Shri Ravichandra Angadi Multi Tasking Staff
5	Shri Manoj Rajendra Hulaswar Multi Tasking Staff
6	Smt. Bebutai Laxman Korabu Multi Tasking Staff
7	Shi Nagaraj Mohan Durgekar Multi Tasking Staff
8	Shri Suraj Surendra Kalgutkar Multi Tasking Staff
9	Shri Nagaraj Somayya Gond Multi Tasking Staff
KVK, LAKSHADWEEP	
1	Smt. Shajala Banu P. M. Multi Tasking Staff
KVK, NARAKKAL	
1	Shri Jimosh Mohan C M Multi Tasking Staff
2	Shri Midhun Kumar P. H. Multi Tasking Staff
MADRAS RS	
1	Smt. R. Kalaiselvi Multi Tasking Staff
2	Shri T. Balaraman Multi Tasking Staff
3	Shri K. Prabhakaran Multi Tasking Staff
4	Shri Raja Sekar R. Multi Tasking Staff
5	Shri R. Yuvaraj Multi Tasking Staff
6	Smt. Niranjana A. Multi Tasking Staff
7	Shri J. Ramachandran Multi Tasking Staff

No.	Name of Employee and Designation
MANDAPAM RC	
1	Shri M. Saravana Kumar Multi Tasking Staff
2	Shri K. Ganesan Multi Tasking Staff
3	Smt. M. Saraswathi Multi Tasking Staff
4	Shri N. Thirupathi Multi Tasking Staff
5	Smt. M. Muthuvelu Multi Tasking Staff
6	Shri A. Mohammed Kaleem Multi Tasking Staff
7	Smt. M. Afrin Rani Multi Tasking Staff
8	Shri Ravikumar T. T. Multi Tasking Staff
9	Shri B. Sravanakumar Multi Tasking Staff
10	Shri R. Rajkumar Multi Tasking Staff
11	Shri S. Joseph Jegan Multi Tasking Staff
12	Shri K. Jeevanantham Multi Tasking Staff
13	Ms. Divya Bharathy S. Multi Tasking Staff
14	Smt. S. Sabiya Begum Multi Tasking Staff
15	Shri K Chandran Multi Tasking Staff
16	Shri Harivenkateshwaran .C. Multi Tasking Staff
17	Shri K. Krishnan Multi Tasking Staff
18	Shri A. Dharunkumar Multi Tasking Staff
MANGALORE RC	
1	Shri S. Mahalinga Naik Multi Tasking Staff
2	Smt, Thanujakshi Multi Tasking Staff
3	Shri Shrinath B. Multi Tasking Staff
4	Smt. Sathyavathi Multi Tasking Staff
5	Ms. Pushpa K. Multi Tasking Staff
6	Shri Dharmaraju L. B. Multi Tasking Staff
7	Shri Naveen Raju K. G. Naik Multi Tasking Staff
MUMBAI RS	
1	Smt. Urmila S. Balmiki Multi Tasking Staff
2	Shri Ashish C. S. Chaturvedi Multi Tasking Staff
3	Shri Vaibhav Milan Tawde Multi Tasking Staff
4	Shri Vaibhav Jayant Gharat Multi Tasking Staff
5	Shri Deepak Ramesh Rao Multi Tasking Staff
TUTICORIN RS	
1	Shri Santhakumar A. Multi Tasking Staff
2	Shri I. Ravindran Multi Tasking Staff
3	Shri S. Mariappan Multi Tasking Staff
4	Shri M. Kalimuthu Multi Tasking Staff
5	Shri K. Subramanian Multi Tasking Staff
VERAVAL RS	
1	Smt. Santok A. Bharada Multi Tasking Staff
2	Shri Bhint Mitesh Hiralal Multi Tasking Staff
3	Shri Chorvadi Kamlesh Kalidas Multi Tasking Staff
4	Shri Thakar Milan Rajnikant Multi Tasking Staff
5	Shri Mushagra Rajit Hasam Multi Tasking Staff
6	Shri Gadhiya Noormamad Alibhai Multi Tasking Staff
7	Shri R. Pydi Raju Multi Tasking Staff
VISAKHAPATNAM RC	
1	Shri P. Venkatesh Multi Tasking Staff
2	Shri Siram Nookaraju Multi Tasking Staff
3	Shri Seera Harish Multi Tasking Staff
4	Shri Potala Bhaskara Rao Multi Tasking Staff
5	Shri Venkateswarulu Vuyyala Multi Tasking Staff
6	Shri Yenni Prasad Babu Multi Tasking Staff
7	Shri P. Shanmukh Deekshit Kumar Multi Tasking Staff
8	Shri Palli Kalidasu Multi Tasking Staff
9	Shri Vasamsetti Ravikant Multi Tasking Staff
10	Shri C H Ramarao Multi Tasking Staff
VIZHINJAM RC	
1	Shri S. Satheesh Kumar Multi Tasking Staff
2	Ms. Krishna Priya P. M. Multi Tasking Staff
3	Smt. Shalini O. Multi Tasking Staff
4	Smt. Nisha S. Multi Tasking Staff
5	Shri V. Anand Multi Tasking Staff
6	Smt. Sreelakshmi S. Multi Tasking Staff
DIGHA RS	
1	Shri Vishal Dayanand Jangam Multi Tasking Staff
2	Shri Ganesh Suryakant Tandal Multi Tasking Staff

In-house Projects

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
Fishery Resources Assessment, Economics & Extension Division					
1	FRAEED/GIS/01	Geo-referenced Marine Fisheries Resources Information System for Indian EEZ based on Enhanced Survey Protocols and Methodological Platforms for Stock Assessment, Modelling and Forecasting	2024-2029	Dr. J. Jayasankar	Dr. Somy Kuriakose - Co-PI Dr. Mini K.G. - Co-PI Dr. Eldho Varghese - Co-PI Dr. Vinaya Kumar Vase - Co-PI Dr. R. Narayana Kumar - Co-PI Dr. Reshma Gills - Co-PI
2	FRAEED/CV/02	Automated System for Marine Fishery Resources Landing Data Collection via Computer Vision and AI-Driven Deep Learning Algorithms for Species Identification and Quantification from Visual Images	2024-2029	Dr. Eldho Varghese	Dr. J. Jayasankar - Co-PI Dr. Somy Kuriakose - Co-PI Dr. K.G. Mini - Co-PI Dr. Vinaya Kumar Vase - Co-PI Dr. Rekha J. Nair - Co-PI Dr. Muktha M. - Co-PI Dr. Biplab Banerjee (IIT, Mumbai) - Co-PI
3	FRAEED/LIV/03	Assessing the livelihood status of marine fisherfolk in India: A sustainable livelihoods approach	2024-2027	Dr. N. Aswathy	Dr. J. Jayasankar - Co-PI Dr. P.S. Swathilekshmi- Co-PI Dr. J. Charles Jeeva- Co-PI Dr. S. S. Raju- Co-PI Dr. Shinoj P- Co-PI Dr. Anuja A.R- Co-PI Dr. R. Narayanakumar- PA Dr. P.N. Ananth - PA

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
4	FRAEED/GEN/04	A comprehensive praxis on trans-inclusive gender mainstreaming through the paradigm of sustainable livelihoods in Indian fisheries sector	2024-2027	Dr. Vipin Kumar V.P.	Dr. J. Jayasankar - Co-PI Dr. R. Narayana Kumar - Co-PI Dr. C. Ramachandran - Co-PI Dr. Shyam S. Salim - Co-PI Dr. P.S. Swathilekshmi - Co-PI Dr. S. S. Raju - Co-PI Dr. J. Charles Jeeva - Co-PI Dr. B. Johnson - Co-PI Dr. P. Shinoj - Co-PI Dr. Reshma Gills - Co-PI Dr. Anuja A.R. - Co-PI
5	FRAEED/ETS/05	Economics, Trade and Stakeholders in Indian Marine Fisheries sector: A Policy Outlook (ETS-PO)	2024-2029	Dr. Shyam S. Salim	Dr. R. Narayana Kumar - Co-PI Dr. J. Jayasankar- Co-PI Dr. S.S.Raju- Co-PI Dr. P.S. Swathilekshmi- Co-PI Dr. Somy Kuriakose- Co-PI Dr. Vipinkumar V.P.- Co-PI Dr. Aswathy N.- Co-PI Dr. Shinoj P.- Co-PI Dr. Anuja A.R.- Co-PI Dr. Saju George- Co-PI Dr. J. Charles Jeeva- Co-PI Dr. B. Johnson- Co-PI Dr. Sujitha Thomas- Co-PI Dr. Swathipriyanka Sen Dash- Co-PI Shri Nakhawa Ajay Dayaram - PA Dr. Subal Kumar Roul - PA
6	FRAEED/ABA/06	Decision-making Process in Sustainable Marine Fisheries Stewardship: Applications of Behavioural Approaches	2024-2027	Dr. C. Ramachandran	Dr. J. Jayasankar - CO-PI Dr. Vipinkumar V.P.- CO-PI Dr. Shinoj P.- CO-PI Dr. Reshma Gills- CO-PI Dr. Swathilekshmi P.S.- CO-PI Dr. J. Charles Jeeva- CO-PI Dr. B. Johnson- CO-PI Dr. K. Mohammed Koya- CO-PI
Finfish Fisheries Division					
1	FFD/ELM/07	Decoding the interplay of fisheries-dependent and fisheries-independent factors on elasmobranchs of India to improve conservation, sustainability, livelihood security and management	2024-2029	Dr. Shoba Joe Kizhakudan	Dr. Sujitha Thomas - Co-PI (DPI) Smt. Shikha Rahangdale - Co-PI Shri Nakhawa Ajay Dayaram - Co-PI Dr. Purushottama G.B. - Co-PI Dr. Mahesh V. - Co-PI Dr. Rajesh K.M. - Co-PI Dr. Akhilesh K.V. - Co-PI Dr. U. Ganga - Co-PI Dr. T.M. Najmudeen - Co-PI Dr. Livi Wilson - Co-PI Dr. Surya S. - Co-PI Dr. Anulekshmi Chellappan - Co-PI Dr. Vinothkumar R. - Co-PI Dr. Muktha M. - Co-PI Dr. Swatipriyanka Sen Dash - Co-PI

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
					Dr. Subal Kumar Roul - Co-PI
					Dr. Sandhya Sukumaran - Co-PI
					Dr. Abdul Azeez - Co-PI
					Dr. Mini K.G.- PA
					Dr. Shinoj P. - PA
					Dr. Remya L - - Co-PI
					Smt. Vidhya V- Co-PI
2	FFD/LPF/08	Development of Integrated Scientific Fishery Management Approaches for Biological and Livelihood Sustainability of tuna and tuna-like fishes along the Indian coast	2024-2029	Dr. E.M. Abdusammad	Dr. Abdul Azeez P.- Co-PI
					Smt. Shikha Rahangdale- Co-PI
					Shri Nakhawa Ajay Dayaram- Co-PI
					Dr. Purushottama G.B.- Co-PI
					Dr. Mahesh V.- Co-PI
					Dr. Rajesh K.M.- Co-PI
					Dr. Anulekshmi Chellappan- Co-PI
					Dr. T.M. Najmudeen- Co-PI
					Dr. Surya S.- Co-PI
					Dr. Vinothkumar R.- Co-PI
					Dr. Maragaret Muthu Rathinam A.- Co-PI
					Dr. Manas H.M.- Co-PI
					Dr. Swatipriyanka Sen Dash- Co-PI
					Dr. Subal Kumar Roul- Co-PI
					Dr. Mini K.G.- Co-PI
					Dr. Ramachandran C.- Co-PI
					Dr. Reshma Gills- Co-PI
3	FFD/IAF/09	Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to support management decisions for marine fisheries of Kerala & Lakshadweep	2024-2029	Dr. T.M. Najmudeen	Dr. Shoba Joe Kizhakudan - CO-PI
					Dr. E.M. Abdussamad- CO-PI
					Dr. U. Ganga- CO-PI
					Dr. Livi Wilson- CO-PI
					Dr. Dineshbabu A.P.- CO-PI
					Dr. Josileen Jose- CO-PI
					Dr. Geetha Sasikumar- CO-PI
					Dr. Lakshmi Pillai S.- CO-PI
					Dr. Rekha Devi Chakrabory- CO-PI
					Dr. K.V. Akhilesh- CO-PI
					Anulekshmi Chellappan- CO-PI
					Dr. Surya S.- CO-PI
					Dr. R. Vidya- CO-PI
					Smt. Gomathi P.- CO-PI
					Dr. C. Ramachandran- CO-PI
					Dr. Remya L.- CO-PI
					Dr. Abdul Azeez P.- CO-PI
					Dr. Somy Kuriakose- CO-PI
					Dr. N. Aswathy- CO-PI
					Dr. Shelton Padua - PA

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
4	FFD/IAF/10	Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to support management decisions for marine fisheries in Karnataka & Goa	2024-2029	Dr. Sujitha Thomas	Dr. Rajesh K.M.- DPI/CO-PI Dr. Purushottama G.B.- CO-PI Dr. Mahesh V.- CO-PI Dr. Sunil Kumar S. Ail- CO-PI Dr. Bindu Sulochanan- CO-PI Dr. Somy Kuriakose- CO-PI Dr. Vipinkumar V.P.- CO-PI Dr. Shyam S. Salim- CO-PI Dr. P. Shinoj- CO-PI Dr. Divya Viswambharan - PA
5	FFD/IAF/11	Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to inform management decisions for marine fisheries of Andhra Pradesh	2024-2029	Dr. Muktha M.	Dr. Manas H.M.- CO-PI Dr. Indira Divipala- CO-PI Dr. Jasmin F.- CO-PI Dr. S. S. Raju- CO-PI Dr. Eldho Varghese- CO-PI Dr. B. Johnson- CO-PI Dr. Pralaya Ranjan Behera - Co-PI Dr. Joe K. Kizhakudan - PA
6	FFD/ENCFR/33	Exploring Non-Conventional Fisheries Resources: Assessing their Fishery, Stock Status and Potential for commercial exploitation	2024-2029	Dr. Livi Wilson	Dr. Shoba Joe Kizhakudan - CO-PI Dr. Sujitha Thomas- CO-PI Dr. Abdussamad E.M.- CO-PI Dr. U. Ganga- CO-PI Dr. T.M. Najmudeen- CO-PI Dr. Anulekshmi Chellappan- CO-PI Dr. Muktha M. - PA Dr. Swatipriyanka Sen Dash - PA Dr. Manas H.- CO-PI Dr. Akhilesh K.V.- CO-PI Dr. Surya S.- CO-PI Dr. Subal Kumar Roul- CO-PI Dr. Remya L.- CO-PI Dr. Mahesh V.- CO-PI Shri Nakhawa Ajay Dayaram- CO-PI Smt. Shikha Rahangdale- CO-PI Dr. Abdul Azeez P. - PA Dr. Vinothkumar R. - PA Smt. Vidhya V.- CO-PI Dr. Josileen Jose- CO-PI Dr. Geetha Sasikumar - PA Dr. S. Lakshmi Pillai- CO-PI Dr. Rekhadevi Chakraborty- CO-PI Dr. Gyanaranjan Dash- CO-PI Dr. Vidya R. - PA Dr. Indira Divipala- CO-PI Dr. Jasmin F.- CO-PI Smt. M. Kavitha- CO-PI Dr. Rajesh Kumar Pradhan- CO-PI Dr. Sunil Kumar S. Ail- CO-PI Dr. Rajkumar M. - PA Smt. P. Gomathi- PA

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
					Dr. Rajan Kumar- CO-PI
					Dr. Bhendekar Santosh Nagnath- CO-PI
					Dr. Shelton Padua - PA
					Dr. Ratheesh Kumar R. - PA
					Dr. Somy Kuriakose - PA
					Dr. Shyam S. Salim - PA
					Dr. Anuja A. R. -PA
7	FFD/MES/34	Exploring the harvest and utilization potential of mesopelagic resources from the Indian EEZ	Sept 2024-Mar 2025	Dr. Sujitha Thomas	Dr. Rajesh K.M.- DPI/Co-PI
					Dr. Sunil Kumar S. Ail- Co-PI
					Dr. Bindu Sulochanan- Co-PI
					Dr. P. Shinoj- Co-PI
					Dr. Rekha Devi Chakraborty- Co-PI
					Dr. Akhilesh K.V.- Co-PI
					Dr. Abdussamad E.M.- Co-PI
					Dr. Shoba Joe Kizhakudan- Co-PI
					Dr. Ganga U.- Co-PI
					Dr. Livi Wilson- Co-PI
					Dr. Remya L.- Co-PI
					Dr. Divya Viswambharan- PA
					Dr. T.M. Najmudeen - PA
8	PEL/EL/40	Marine eggs and larval studies along the Indian Coast	2020-2025	Dr. R. Ratheesh Kumar	Dr. Josileen Jose - Co-PI
					Dr. Manas H.M. - Co-PI
					Dr. Rajesh K.M. - PA
					Dr. Jasmin F. -Co-PI
					Shri R. Vinothkumar -PA
					Dr. Anulekshmi Chellappan-Co-PI
					Shri Nakhawa Ajay Dayaram-PA
					Shri Bhendekar Santosh Nagnath-PA
					Dr. Sujitha Thomas-Co-PI
					Dr. Abdul Azeez - PA
					Dr. Rekha J. Nair-Co-PI
					Smt. Shikha Rahangdale-Co-PI
					Dr. Dineshbabu A.P.-PA
					Shri Rajan Kumar-Co-PI
					Dr. Miriam Paul Sreeram - PA
					Dr. Shoba Joe Kizhakudan - PA
					Dr. Najmudeen T.M. - Co-PI
					Dr. K. Mohammed Koya - PA
					Dr. Sandhya Sukumaran - PA
					Dr. Rajesh Kumar Pradhan - PA
					Dr. Muktha M. -PA
					Dr. Remya L. - PA
					Shri S. Thirumalaiselvan - PA
					Ms. Surya S.- PA
					Shri M. Rajkumar - Co-PI
					Dr. Asha P.S. - PA
					Smt. Ramya Abhijith - PA
					Dr. Bindu Sulochanan - PA
					Dr. Indira Divipala - Co-PI
					Dr. Sunil Kumar S. Ail - CO-PI
					Dr. Ramkumar S. - PA

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
Shellfish Fisheries Division					
1	SFD/IAF/12	Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to inform management decisions for marine fisheries of Odisha & West Bengal	2024-2029	Dr. Gyanaranjan Dash	Dr. Swatipriyanka Sen Dash - CO-PI Dr. Rajesh Kumar Pradhan - CO-PI Dr. Subal Kumar Roul - CO-PI Dr. Mini K.G. -PA Dr. S.S.Raju-PA Dr. J. Charles Jeeva-PA Dr. Pralaya Ranjan Behera-PA
2	SFD/IAF/13	Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to inform management decisions for marine fisheries of Tamil Nadu & Puducherry	2024-2029	Dr. K. Vinod	Dr. A. Margaret Muthu Rathinam- CO-PI Dr. Eldho Varghese- CO-PI Smt. M. Kavitha- CO-PI Dr. M. Rajkumar- CO-PI Dr. Vinothkumar R.- CO-PI Dr. R. Narayana Kumar - PA Dr. B. Johnson - PA Dr. S. Thirumalaiselvan - PA Mrs. Vidhya V. - CO-PI
3	SFD/IAF/14	Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to inform management decisions for marine fisheries Gujarat, Daman & Diu	2024-2029	Dr. Rajan Kumar	Dr. Swathilekshmi P.S. - PA Dr. Vinaya Kumar Vase - CO-PI Dr. Ratheesh Kumar R.-PA Smt. Shikha Rahangdale- CO-PI Dr. Anuja A.R.- CO-PI
4	SFD/IAF/15	Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to support management decisions for marine fisheries of Maharashtra	2024-2029	Dr. V. Venkatesan	Dr. J. Jayasankar- CO-PI Shri Nakhawa Ajay Dayaram- CO-PI Dr. Bhendekar Santosh Nagnath- CO-PI Dr. Ramkumar S. - CO-PI Dr. Reshma Gills - PA Dr. Anuja A.R. - PA
5	SFD/PSF/16	Investigations on the recruitment of juvenile/ subadult penaeid shrimps from nursery habitats to derive management insights for the coastal penaeid shrimp fishery	2024-2028	Dr. Lakshmi S. Pillai	Dr. A. P. Dineshbabu - CO-PI Dr. Josileen Jose - CO-PI Dr. Gyanaranjan Dash - CO-PI Dr. F. Jasmin - CO-PI Dr. Indira divipala - CO-PI Dr. Rajan Kumar - CO-PI Shri M. Rajkumar - CO-PI
6	SFD/BGF/17	Assessment and management of small-scale bivalve and gastropod fisheries for sustainable exploitation in India	2024-2029	Dr. Geetha Sasikumar	Dr. R. Vidya - CO-PI Smt. M. Kavitha - CO-PI Dr. V. Venkatesan - CO-PI Dr. F. Jasmin - CO-PI Smt. P. Gomathi - CO-PI Dr. Bhendekar Santosh Nagnath - CO-PI Dr. Rajesh Kumar Pradhan - CO-PI Shri M. Rajkumar - CO-PI Dr. Sunil Kumar S. Ail - CO-PI Dr. Saju George - CO-PI Dr. Shyam S. Salim - PA Dr. G. Vaisakh - PA

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
Mariculture Division					
1	MD/CBR/18	Captive breeding and seed production of important finfishes, shellfishes and other invertebrates for sustainable mariculture, fisheries enhancement, and conservation	2024-2029	Dr. V.V.R. Suresh	Dr. Imelda Joseph- CO-PI Dr. K. Madhu- CO-PI Dr. Rema Madhu- CO-PI Dr. Boby Ignatius- CO-PI Dr. Shoji Joseph- CO-PI Dr. N. Rajesh- CO-PI Dr. G. Tamilmani- CO-PI Dr. M. Sakthivel- CO-PI Dr. K. K. Anikuttan- CO-PI Ms. Bavithra R.- CO-PI Dr. P. Rameshkumar- CO-PI Shri M. Sankar- CO-PI Dr. Suresh Babu P.P.- CO-PI Dr. Anuraj A.- CO-PI Dr. Jayasree Loka- CO-PI Dr. Ritesh Ranjan- CO-PI Dr. Biji Xavier- CO-PI Dr. Sekar Megarajan- CO-PI Dr. Joe K. Kizhakudan- CO-PI Dr. A.K. Abdul Nazar- CO-PI Dr. D. Divu- CO-PI Dr. C. Kalidas- CO-PI Smt. M. Kavitha- CO-PI Dr. B. Santhosh- CO-PI Dr. M.K. Anil- CO-PI Smt. P. Gomathi- CO-PI Mr. Ambarish P. Gop- CO-PI Dr. Shilta M.T.- CO-PI Dr. Saju george- CO-PI Dr. Krishna Sukumaran- CO-PI Dr. Rathi Bhuvaneswari- CO-PI Shri Tanveer Hussain- CO-PI Dr. Jeena N.S.- CO-PI Dr. Sanal Ebeneezar- CO-PI Dr. S. Chandrasekhar- CO-PI Dr. Krupesha Sharma- CO-PI Dr. T.G. Sumithra- CO-PI Dr. K. Vinod -- CO-PI Dr. Adnan H. Gora - Co-PI Dr. Saima Rehman - Co-PI
2	MD/CTS/20	Evaluation of crowding and transportation stress in selected mariculture species and development of stress management strategies	2024-2028	Dr. Suresh Babu P.P.	Mr. Tanveer Hussain - Co-PI Dr. Shilta M.T. - Co-PI Dr. Anikuttan K.K. - Co-PI Dr. G. Tamilmani - Co-PI Dr. Sakthivel M. - Co-PI Dr. Ramesh Kumar P. - Co-PI Dr. Rajesh N. - Co-PI Dr. Krishna Sukumaran - Co-PI Dr. Anuraj A. - Co-PI Dr. Rathi Bhuvaneswari - Co-PI Smt. Bhavithra R. - Co-PI Shri Ambarish P. Gop - PA

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
					Dr. Joe K. Kizhakudan-- PA Dr. Ritesh Ranjan- PA Dr. Divu D. - PA Dr. Jeena N.S.- PA Dr. Sanal Ebeneezar - PA Dr. D. Linga Prabu- PA
3	MD/AR/21	Developing a National Roadmap for Integrated Coastal Conservation and Fisheries Enhancement along the Indian coast through Artificial reefs	2024-2029	Dr. Joe K. Kizhakudan	Dr. Shoba Joe Kizhakudan- Co-PI Dr. Bindu Sulochanan- Co-PI Dr. Anulekshmi C. - PA Dr. Manas H.M.- Co-PI Dr. Indira Divipala- Co-PI Dr. Abdul Azeez P.- Co-PI Dr. L. Remya- Co-PI Dr. Grinson George - PA Dr. Sunil Kumar S. Ail - PA Smt. Shikha Rahangdale - PA Dr. Vinod K. - PA Dr. Ritesh Ranjan - PA Dr. R. Saravanan - PA Dr. Loveson Edward L. - PA Dr. Sreenath K.R. - PA Dr. Shelton Padua - PA Dr. Gyanaranjan dash - PA Dr. Muktha Menon - PA Dr. Pralaya Ranjan Behera - PA Dr. L. Ranjith - PA Dr. Anikuttan K.K. - PA Dr. Ratheesh Kumar R. - PA Dr. Divya Viswambharan - PA Dr. Vaisakh G. - PA Mr. S. Thirumalaiselvan - PA Dr. Bhendekar Santosh Nagnath -PA
4	MD/LQI/22	Development of larval quality indices for farmed marine finfishes	2024-2029	Dr. Ritesh Ranjan	Dr. Joe K. Kizhakudan- Co-PI Dr. Jayasree Loka- Co-PI Dr. Biji Xavier- Co-PI Dr. Sekar Megarajan- Co-PI Dr. G. Tamilmani- Co-PI Dr. M. Sakthivel- Co-PI Dr. Anikuttan K.K.- Co-PI Dr. P. Rameshkumar- Co-PI Ms. Bavithra R.- Co-PI Dr. B. Santhosh- Co-PI Shri Ambarish P. Gop- Co-PI Dr. Anuraj A.- Co-PI Dr. Rathi Bhuvaneswari- Co-PI Dr. Suresh Babu P.P.- Co-PI Mr. Tanveer Hussain- Co-PI Dr. Imelda Joseph- Co-PI Dr. Rema Madhu- Co-PI Dr. S.R. Krupesha Sharma- Co-PI Dr. Chandrasekar S.- Co-PI Dr. Sumithra T.G.- Co-PI Dr. C. Kalidas - Co-PI

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
5	MD/MTI/31	Socio Economic Impact Evaluation of Mariculture Technology Interventions	2024-2027	Dr. Saju George	Dr. Imelda Joseph- CO-PI Dr. V. V. R. Suresh- CO-PI Dr. K. Madhu- CO-PI Dr. Boby Ignatius- CO-PI Dr. Shoji Joseph- CO-PI Dr. N. Rajesh- CO-PI Dr. Shyam S. Salim- CO-PI Dr. G. Tamilmani- CO-PI Dr. Joe K. Kizhakudan- CO-PI Dr. A. K. Abdul Nazar- CO-PI Dr. C. Kalidas- CO-PI Shri Ambarish P. Gop - CO-PI Dr. Shilta M.T.- CO-PI Dr. A.P. Dineshbabu- CO-PI Dr. Geetha Sasikumar- CO-PI Dr. Vidya R.- CO-PI Dr. Somy Kuriakose- CO-PI Dr. A. Anuraj - CO-PI Dr. D. Divu CO-PI Dr. Johnson B. - PA Dr. Subal Kumar Roul - PA Shri Tanveer Hussain - PA Dr. Sunil Kumar S. Ail - PA
6	MDN/SMP/19	Development of sustainable mariculture practices through technological innovations in cage and coastal farming	2020-2025	Dr. Imelda Joseph	Dr. V. V. R. Suresh - CO-PI Dr. K. Madhu- CO-PI Dr. Boby Ignatius- CO-PI Dr. Shoji Joseph- CO-PI Dr. Rajesh N.- CO-PI Dr. Rema Madhu- CO-PI Dr. Jayasree Loka- CO-PI Dr. Suresh babu P.P.- CO-PI Dr. Kurva Raghu Ramudu- CO-PI Dr. Anuraj A.- CO-PI Dr. Tamilmani G.- CO-PI Dr. P. Rameshkumar- CO-PI Dr. M. Saktivel- CO-PI Dr. B. Johnson- CO-PI Dr. K.K. Anikuttan- CO-PI Shri M. Sankar- CO-PI Dr. Ritesh Ranjan- CO-PI Dr. Biji Xavier- CO-PI Dr. Sekar Megarajan- CO-PI Dr. Joe K . Kizhakudan- CO-PI Dr. A.K. Abdul Nazar- CO-PI Dr. Divu D.- CO-PI Dr. Shilta M.T.- CO-PI Dr. Kalidas C.- CO-PI Dr. Santhosh B.- CO-PI Shri Ambarish P. Gop- CO-PI Dr. Krishna Sukumaran - CO-PI Shri Tanveer Hussain- CO-PI Smt. R. Bavithra - CO-PI

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
Marine Biotechnology, Fish Nutrition and Health Division					
1	MBFNHD/DNA/27	eDNA Metabarcoding for a Comprehensive Analysis of Species Diversity in Various Ecosystems	2024-2026	Dr. Pradeep M.A.	Dr. Mini K.G.- CO-PI Dr. Vinod K..- CO-PI Dr. Shelton Padua - CO-PI Dr. Vinod K. - PA Dr. Mohammed Koya K. - PA
2	MBT/HM/23	Health management in selected finfish and shellfish	2020-2025	Dr. N.K. Sanil/ Dr. Krupesha Sharma S.R.	Dr. Sanal Ebeneezar - CO-PI Dr. M.A. Pradeep -CO-PI Dr. Anil M. K. -CO-PI Dr. Joe K. Kizhakudan - PA Dr. Ritesh Rajan -CO-PI Dr. P. Rameshkumar -CO-PI Dr. T. G. Sumithra -CO-PI Dr. Kurva Raghu Ramudu -CO-PI Dr. Divu D. -CO-PI Shri S. Chandrasekar -CO-PI
3	MBT/NGM/24	Nutrition and nutri-genomics research in mariculture and marine fisheries	2020-2025	Dr. D. Linga Prabu	Dr. Boby Ignatius -Co-PI Dr. Joe K. Kizhakudan-Co-PI Dr. Kalidas C. Co-PI Dr. Sanal Ebeneezar-Co-PI Smt. Reshma K.J. Co-PI Dr. Sumithra T.G.-Co-PI Dr. S. Chandrasekar Co-PI Dr. Kajal Chakraborty-Co-PI Dr. Saima Rehman Co-PI Dr. Adnain H Gora-Co-PI Shri Tanveer Hussain Co-PI Dr. Jeena N.S.-Co-PI
4	MBT/GNM/25	Genetic and genomic tools for sustainable marine fisheries, mariculture and conservation	2020- 2025	Dr. Sandhya Sukumaran	Dr. Jeena N.S.-Co-PI Dr. Sekar Megarajan-Co-PI Dr. Srinivasa Raghavan V.-Co-PI Shri M. Sankar-Co-PI
5	MBT/CA/26	Cellular aquaculture and the refinement of in-vitro pearl formation	2020- 2025	Dr. Srinivasa Raghavan V.	Dr. Linga Prabu - Co-PI
Marine Biodiversity and Environment Management Division					
1	MBEMD/EFH/29	Understanding the Essential Fish Habitats (EFHs) for sustainable management of coastal and marine ecosystem	2024-2029	Dr. L. Ranjith	Dr. P.S. Asha- CO-PI Dr. K.S. Sobhana- CO-PI Dr. Miriam Paul Sreeram- CO-PI Dr. Rekha J. Nair- CO-PI Dr. K.R. Sreenath- CO-PI Dr. Shelton Padua- CO-PI Dr. Ratheesh Kumar R. - PA Smt. Ramya Abhijith- CO-PI Dr. Vaisakh G.- CO-PI Dr. Bindu Sulochanan- CO-PI Dr. Divya Viswambharan- CO-PI Dr. S. Ramkumar- CO-PI Dr. Loveson Edward L. - PA Dr. Pralaya Ranjan Behera - CO-PI Dr. Vinod K.- CO-PI

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
					Dr. R. Saravanan - CO-PI Shri S. Thirumalaiselvan - CO-PI Dr. R. Vinothkumar - PA Dr. Vinaya Kumar Vase -PA Dr. Subal Kumar Roul - PA Dr. Abdul Azeez P - PA Dr. Rajesh Kumar Pradhan- CO-PI
2	MBEMD/BYC/30	Assessment and evaluation of the marine biodiversity with emphasis on bycatch from an ecosystem perspective	2024-2029	Dr. Rekha J. Nair	Dr. Grinson George- CO-PI Dr. Miriam Paul Sreeram - PA Dr. Sreenath K.R.- CO-PI Dr. Ratheesh Kumar R.- CO-PI Mr. Vaisakh G.- CO-PI Dr. Divya Viswambharan- CO-PI Dr. S. Ramkumar- CO-PI Dr. Pralaya Ranjan Behera- CO-PI Dr. Vinod K. - PA Dr. L. Ranjith- CO-PI Dr. Shinoj P.- CO-PI Dr. R. Narayana Kumar- CO-PI Dr. Swathilekshmi P.S. - PA
3	MBEMD/MMD/39	Marine microbial diversity in relation to ecosystem functioning and environmental changes	2023-2027	Dr.(Mrs.) K.S.Sobhana	Dr. Ratheesh Kumar R.- CO-PI Smt. Ramya Abhijith- CO-PI Dr. Anil M.K. - PA Dr. L. Ranjith- CO-PI Dr. Loveson Edward L.- CO-PI Dr. Pralaya Ranjan Behera- CO-PI
4	MBEMD/MPC/28	Impact of coastal marine pollution on the ecosystem's health, biodiversity and mitigation measures	2023-2027	Dr. P.S. Asha	Dr. Grinson George - CO-PI Dr. Sobhana K.S. -CO-PI Dr. Rekha J. Nair - CO-PI Dr. Jeyabaskaran R. - CO-PI Dr.Pralaya Ranjan Behera - CO-PI Dr. Miriam Paul Sreeram -CO-PI Dr. D. Prema- CO-PI Dr. Bindu Sulochanan- CO-PI Dr. Loveson Edward L.- CO-PI Dr. Shelton Padua- CO-PI Dr. R. Ratheesh Kumar- CO-PI Shri S. Thirumalaiselvan- CO-PI Smt. Ramya Abhijith- CO-PI Dr. S. Ramkumar - PA Dr. V. Srinivasa Raghavan - PA Dr. Adnan H Gora - CO-PI Dr. R. Saravanan - CO-PI Dr. L. Ranjith - CO-PI Dr. G. Vaisakh- PA Dr. T. G. Sumithra- PA Dr. S. R. Krupesha Sharma- PA

Sl.No.	Project code	Project title	Duration	Name of PI	Name of CO-PI/ PA
5	MBD/JBD/32	Jelly Fish bloom dynamics in coastal and marine ecosystems of India	2020-2025	Dr. Saravanan R.	Dr. K.S. Sobhana - Co-PI Dr. K. Vinod- Co-PI Dr. Miriam Paul Sreeram- Co-PI Dr. K.R. Sreenath- Co-PI Dr. L. Ranjith- Co-PI Dr. Divya Viswambaharan- Co-PI Dr. Pralaya Ranjan Behera- Co-PI Dr. S. Ramkumar- Co-PI Dr. Subal Kumar Roul - PA Dr. Gyanaranjan Dash - Co-PI Shri S. Thirumalaiselvan - Co-PI Dr. S. Surya -PA Dr. G. Vaisakh - Co-PI Dr. Abdul Azeez P. - PA Dr. Rajan Kumar - PA Dr. C. Kalidas - PA Dr. R. Jeyabaskaran - Co-PI
6	FEM/GIS/38	Impacts of extreme weather events on marine fisheries in selected ecosystems of Northern Indian Ocean - A geoinformatics approach	2020-2025	Dr. Shelton Padua	Dr. Prema D - Co-PI Dr. Asha P.S.- Co-PI Dr. Ratheesh Kumar R.- Co-PI Dr. Reshma Gills- Co-PI Dr. Bindu Sulochanan- Co-PI Dr. Loveson Edward L- Co-PI Dr. Vaisakh G- Co-PI Shri Nakhawa Ajay Dayaram - PA Dr. Abdul Azeez P. - PA

Externally Funded Projects

Sl. No	Title	Name of PI	Funding Agency	Starting year	Ending year
1	Stock structure investigations on yellowfin tuna, *Thunnus albacares* from the EEZ of India and the adjacent high seas using genomic tools	Dr. A. Gopalakrishnan / Dr. Sandhya Sukumaran	DoF (PMMSY)	2023	2024
2	E G Silas Centre of Excellence and Innovation (EGS-CoEI) in marine fish microbiome and nutrigenomics	Dr. A. Gopalakrishnan / Dr. Krupesha Sharma S R (Project Coordinator) Dr. Sumithra T G Dr. Sanal Ebeneezar	DBT	2020	2025
3	De Novo whole genome and transcriptome sequencing of Asian green mussel, *Perna viridis*	Dr. A. Gopalakrishnan (Project Coordinator) Dr. Sandhya Sukumaran	DBT	2021	2025
4	CO_2 Assimilation off Cochin and Mandapam Coast	Dr. Shelton Padua / Dr. Grinson George	NRSC	2018	2026
5	Evaluation of immune-enhancing polysaccharides of edible chlorophytan seaweed *Ulva lactuca* (sea-lettuce) and development of functional polysaccharide nanoparticle	Dr. Kajal Chakraborty	DST-SERB	2022	2025
6	Development of small molecular weight bioactives and polysaccharides from marine and costal bivalves to develop prospective nutraceutical products	Dr. Kajal Chakraborty	NASF	2022	2025
7	Establishment of marine ornamental fish aquaculture enterprises in Lakshadweep as a technology demonstration project in operationalization of ornamental fishery	Dr. Anikttan K K / Dr. Mohammed Koya K.	NCDC	2022	2025

Sl. No	Title	Name of PI	Funding Agency	Starting year	Ending year
8	Development of seed production technology for the high value marine food fish, the Giant trevally *Caranx ignobilis* to enhance the seafood production and nutritional security	Dr. Sakthivel M.	DBT	2023	2026
9	Covid pandemic and marine fisheries sector in India: Impacts, externalities and stakeholders reflection on adaptation and mitigation	Dr. Shyam S. Salim	ICSSR	2022	2024
10	Sea ranching of green tiger shrimp (*Penaeus semisulcatus*) Postlarvae (PL) in Palk Bay and Gulf of Mannar, Tamil Nadu for sustainable production	Dr. Tamilmani G.	DoF-AH&D	2022	2025
11	Science, Technology and Innovation Hub in fisheries sector, Kochi corporation, Ernakulam District, Kerala State.	Dr. Vipinkumar V P	DST-SEED	2022	2025
12	Joint study on seaweed cultivation potential and ecological safeguards in the Gulf of Mannar, Tamil Nadu	Dr. Johnson B.	DoF - PMMSY	2023	2024
13	The changing dynamics of labour migration on employment, livelihoods and resource productivity patterns in Indian marine fisheries sector	Dr. Shyam S. Salim	NASF	2023	2026
14	Phytoplankton diversity in Indian ocean using OCM-3: collection and analysis of *In-situ* datasets for studing phytoplankton diversity	Ms. Shikha Rahangdale	ISRO-SAC	2023	2025
15	Algal blooms estimation and associated bio-optical properties in Indian ocean region using OCM-3 and sea-truth measurements	Dr. Vinaya Kumar Vase	ISRO-SAC	2023	2025
16	Computer vision based monitoring of fishes in marine cage farming	Dr. V V R Suresh	iHub Drishti Foundation	2023	2025
17	Marine mammal stock assessments in India	Dr. Grinson George (Project Coordinator) Dr. Ratheesh Kumar	DoF- PMMSY	2023	2025
18	Development of Polyketide and Oligosaccharide analogues from economically important seaweeds as prospective angiotensin converting enzyme inhibitors	Dr. Kajal Chakraborty	DBT	2023	2026
19	Bio-inventoring and documentation of marine species in coastal and marine ecosystems of Andhra Pradesh	Dr. Pralaya Ranjan Behera	APSBB (Andhra Pradesh State Biodiversity Board)	2023	2025
20	Integrated Multi-Trophic Aquaculture for the alternate livelihood of fishers and augmenting fish production of coastal waters in Karnataka	Dr. Rajesh K M	NFDB- PMMSY	2023	2025
21	Environmental sustainability through Integrated Multi-Trophic Aquaculture (IMTA): A participatory approach for the socio-economic upliftment of coastal fishers of Thoothukudi District, Tamil Nadu	Dr. L Ranjith	NABARD-FSPF	2023	2025
22	Seaweed farming feasibility assessment and exploration of promotional activities along Kori, Padala and other selected locations along Kutch Coast, Gujarat	Dr. Divu D	NFDB -PMMSY	2023	2025
23	Standardization of mass production and evaluation of resting egg production in tropical marine copepods for the use as live feed for fish larval rearing	Dr. B. Santhosh	DBT	2023	2026
24	Development of breeding and supply centre for damsel fishes	Dr. Ambarish P. Gop	DBT-BIRAC	2024	2025
25	Integrating risk assessment and future projections for sustainable coastal resilience	Dr. Shinoj P./ Dr. Grinson George	MoEF&CC	2024	2027
26	Development of pilot scale open sea eco mussel farms in India–A blue growth project	Dr. Anil M K	NFDB -PMMSY	2024	2025

Sl. No	Title	Name of PI	Funding Agency	Starting year	Ending year
27	Establishment of STI Hub for primitive "Sidi" Adivasi Tribes of Gujarat for socio-economic upliftment through mariculture entrepreneurship	Dr. Divu D.	DST- SEED	2024	2027
28	Omics approaches in the Indian pompano, *Trachinotus mookalee* and the Indian edible oyster, *Crassostrea bilineata (Magallana bilineata)* to develop genomic resources for ensuring sustainable aquaculture	Dr. Sandhya Sukumaran (Poject Coordinator) Dr. Sekar Megarajan	DBT	2024	2027
29	Development of a sustainable aquafeed with docosahexaenoic acid-rich *Aurantiochytrium* sp., as an alternative to fish oil for enhancing Silver pompano nutrition	Dr. Adnan Gora	DBT	2024	2027
30	Deep-sea metagenomics for enhanced next generation bioethanol production	Dr. Sumithra T G	Deep Ocean Mission scheme of MoES	2024	2026
31	Impact assessment on the use of water jet pumps for chank exploitation on marine fisheries and its ecosystem for sustainable fishing	Ms. Kavitha M.	DoF & FW, TN	2025	2025
32	National surveillance programme for aquatic animal diseases	Dr. Sanil N K	PMMSY-NBFGR	2022	2025
33	Eco-systems, Agribusiness and Institutions Component 1: Impact assessment of agricultural technology	Dr. Shinoj P	NIAP Network project	2021	2026
34	Development of high-value pharmacophores and nutraceutical products from marine macroalgae for human health management and combating lifestyle diseases	Dr. Kajal Chakraborty	ICAR- Norman Borlaug Award 2020	2023	2028
35	Genomic approaches in the Golden trevally, *Gnathanodon speciosus* and Silver pompano *Trachinotus blochii* to augment aquaculture productivity	Dr. Sandhya Sukumaran	ICAR- CRP Genomics	2024	2025
36	National Innovations in Climate Resilient Agriculture (NICRA)	Dr. Grinson George	ICAR	2012	2026
37	AINP on Mariculture	Dr. Boby Ignatius	ICAR	2017	2025
38	Network programme on Assessment of Antimicrobial Resistance (AMR) in microorganisms associated with fisheries and aquaculture in India	Dr. Krupesha Sharma S. R.	ICAR	2018	2025
39	AINP on Fish Health	Dr. Krupesha Sharma S. R.	ICAR	2017	2024
40	Network project on ornamental fish breeding and culture	Dr. Madhu K	ICAR	2018	2026

Consultancy Projects

Sl. No.	Project	Client	Amount (Lakh)
1	Artificial fish habitat based marine ecosystem restoration in the inshore areas off Bhadreshswar, Kutch District, Gujarat.	Commissioner of Fy. Commissionerate of Fy. Third Floor, Block No.10, Jivraj Mehta Bhavan, Gandhi Nagar, Gujarat	359.37
2	Setting up of Modern Aquarium at Dept. of Fisheries, UT of Lakshadweep, Kavaratti.	Chief Executive Officer, Dept. of Fisheries, UT of Lakshadweep, Kavaratti- 682 555	54.7
3	Identification of sites for deployment of Artificial Reefs in Gaja Cyclone affected Cuddalore district of Tamil Nadu	Director of Fisheries, Govt. of TN	29.37
4	Identification of sites for deployment of Artificial Reefs in Gaja Cyclone affected districts of Nagapattinam, Thanjavur and Thiruvarur of Tamil Nadu	Director of Fisheries, Govt. of TN	42.54
5	Identification of sites for deployment of Artificial Reefs in Gaja Cyclone affected Ramanathapuram and Pudhukottai districts of Tamil Nadu	Director of Fisheries, Govt. of TN	37.82
6	Large scale impact examination of the construction of Thane Creek Bridge-III on fish stock and fishing activities in the nearby areas	Joint MD, Maharashtra State Road Development Corporation, Near Lilavati Hospital, Opp. Bandra Reclaimation Bus Depo, K.C. Marg, Bandra West, Mumbai – 400 050	49.87
7	Technical services for preoperational activities of a proposed multi species fish hatchery at Benaulim, Goa	Director of Fisheries, Govt of Goa	7.58
8	Technical backstopping for strengthening sustainable harvest of shrimp and cephalopod trawl fishery of Kerala	The Seafood Exporters Association of India, Kochi	49.74
9	Impact assessment of proposed sand mining on the marine fisheries and fishermen community of Daman (Union Territory)	Jawaharlal Nehru Port Authority (JNPA), Navi Mumbai – 400 707	188.36
10	Bivalve seed supply for mangrove conservation and livelihood generation	The Executive Director, Mangrove & Marine Biodiversity Conservation of Maharashtra,	8.21
11	Fishery and stock assessment of small pelagics (Indian mackerel, Oil sardine, lesser sardines, and other small pelagics) in purse seines along Karnataka coast	Yashaswi Fish meal & Oil Company, Udupi, Karnataka	35.51
12	Marine water quality monitoring at SPM.	M/s Mangalore Refinery & Petrochemical Ltd. (MRPL)	5.76
13	Restoration and conservation of mangrove stands of the coastal areas of Vypin along Pallipuram, Kuzhippilly, Njarakkal and Kadamkkudi Grama Panchayats	Planatearth, Aluva	17.81
14	Monitoring, Evaluation, and Impact Assessment of Deployed Artificial Reefs in 49 Villages (200 sites) in Coastal Tamil Nadu Phase I under PMMSY/DOF.	Director of Fisheries, Govt of TN	49.0
15	Seawater monitoring study at marine outfall discharge point of MSEZ	Mangalore SEZ Ltd., Mangalore	20.65
TOTAL			956.29

Research Management

Research Advisory Committee

The 28th Research Advisory Committee (RAC) meeting of the ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), Kochi, was held on 11th April 2024. Dr Dilip Kumar (Former Director/ Vice Chancellor, ICAR-Central Institute of Fisheries Education (deemed to be university), Mumbai Chaired the meeting. The RAC members who attended the meeting were Dr H. Shivananda Murthy, former Dean, College of Fisheries, Mangalore; Dr Sushanta Kumar Chakraborty, former Head, ICAR-Central Institute of Fisheries Education, Mumbai; Dr M. Krishnan, former Head, ICAR-Central Institute of Fisheries Education, Mumbai; Dr P. Ravichandran, former Member Secretary, Coastal Aquaculture Authority, Chennai, Dr Shubhadeep Ghosh , Assistant Director General, (Marine Fisheries), ICAR, New Delhi and Dr. A. Gopalakrishnan, Director, ICAR-CMFRI, Kochi. The Heads of Divisions, Heads of Research Centres, and Research Stations of ICAR-CMFRI were also attended the meeting.

The meeting commenced with the welcome address proposed by Dr P. Laxmilatha, Member Secretary, RAC followed by the presentation of the Action Taken Report on the 27th RAC's action points, which received final approval from the committee.

During the session, Heads of various research Divisions, Research Centres, and Scientists-

in-Charge of Research Stations showcased research achievements and progress.

Recommendations of 28th RAC

1. Accelerate the integration of automation and AI frameworks into key research areas, leveraging their capabilities for purposes including fish landing estimation, stock assessment, precision mariculture techniques, and the development of automatic feeding and monitoring systems.

2. The RAC wholeheartedly appreciated ICAR-CMFRI for bringing out MFSS 2022, opined that the exercise has to be continued regularly and suggested that, (1) the extended list of commercially important marine species to be included in the subsequent MFSS documents have to be brought out by CMFRI at the earliest; (2) a consolidated spawning calendar document of important marine species also has to be brought out by the Institute to aid in biology-based stock assessment studies and (3) a real-time reassessment of fishery potential is also to be undertaken.

3. Better focus should be given to scaling up cage culture operations to industrial levels, involving larger, sturdier cages, including their economic viability, environment sustainability and potential conflicts with other marine resource users through pilot projects, including imparting necessary training and skills for farmers and entrepreneurs in operating such systems.

4. Accelerate the ongoing development of cost-effective diet supplements and feed attractants for mariculture species, focusing on sustainable and affordable ingredient options, including live feeds that enhance acceptability, digestibility, growth rates, and overall health of farmed species and reduce environmental impacts of feed ingredients.

5. With the anticipated large-scale growth of mariculture driven by Government impetus, it is crucial to enhance the focus and facilities for mariculture research at key centres of CMFRI. Specifically, the Narakkal Mariculture Facility of CMFRI should be upgraded with state-of-the-art mariculture amenities, leveraging its proximity to seawater to maximise research potential.

6. Efforts may be made to identify suitable sites along the Indian coasts for (1) bivalve (mussels, edible and pearl oysters) farming and determining the carrying capacity of different sites, as done for sea cage and seaweed farming areas; (2) deployment of artificial reefs and (3) sea ranching for replenishment of shell- and finfish resources.

7. To revitalise India's pearl farming sector and attract global markets, efforts are to be made with the necessary infrastructure and resources, to initiate focused research on producing triploid edible oysters with more meat content and pearl oysters for producing larger marine pearls in a variety of colours.

Meeting of the 28th RAC

8. Give impetus to human resource development for scientists by prioritising foreign exposure and training opportunities, including visits to countries with robust end-to-end fisheries value chains.

9. The focus of climate research, which has been primarily on impact assessment, needs to be more towards devising effective mitigation measures aiming to enhance resilience, particularly of ecosystems, fisheries and coastal communities. Ecosystem-based studies on vulnerable and important fish habitats and fishery bycatch, changes in plankton dynamics, marine eggs and larval distribution and new ventures such as research in marine microbiology, sediment biology and marine birds-fishery interactions to be given impetus. Pertinent tasks such as economic valuation of coastal and marine areas harbouring resources are to be undertaken.

10. Prioritise genome editing and genomics as thrust areas for formulating projects, including genetic improvement of *Trachinotus mookalee* and advanced studies on myostatin characteristics of *T. mookalee* and *T. blochii*, alongside complete genome sequencing of seaweed *Gracilaria* edulis and emphasising research in cellular meat production.

11. Along with the marine fish landing data collection, it is essential to collect mariculture production data as well. This includes data from both cage farming and seaweed farming, involving collaboration between fisheries resource management scientists and mariculture scientists.

12. CMFRI should have more inter-institutional collaborative projects, especially with ICAR-CIFT; both CMFRI and CIFT must explore the possibility of (1) estimating the potential of the mesopelagic resources; (2) mapping the accurate location of these resources in the EEZ; (3) develop efficient and economical way of harvesting these resources; (4) to use these resources in the fish meal industry and (5) use of wax esters from these species in the cosmetic products.

13. Strengthening of oceanography work as a crucial support specialty within the MBEM and FRAEE Divisions to enhance understanding and management of marine ecosystems and environmental processes.

14. CMFRI's research on marine products/ bioactive compounds primarily focuses on developing nutraceuticals for human health, but there should also be a concerted effort to explore their application in mariculture and fish health.

15. The Socio-economic and Extension Scientists of CMFRI should assess the national and international impact of CMFRI's outputs, technologies, and recommendations by evaluating their effectiveness in enhancing sustainability, productivity, visibility, as well as scientific and socio-economic outcomes.

16. CMFRI may develop science-based practices to expand marine fisheries and mariculture beyond the Indian EEZ and collaborate with neighbouring countries on sustainable management of shared resources (e.g., hilsa, tuna, seer fish, pomfrets, elasmobranchs, green tiger shrimp, etc.).

Institute Research Council

The 31st Institute Research Council (IRC) of ICAR-CMFRI was conducted during 24-25 July 2024.
Dr A. Gopalakrishnan, Director, ICAR-CMFRI chaired the IRC meeting. Dr Shoba Joe Kizhakudan, Head, FFD & Member Secretary, IRC, all the Heads of Research Divisions, the Heads of Regional Centres and Scientists-in-charge of Regional Stations, Scientists-in-Charge of KVKs, PME Cell, HRD Cell, AKMU, and Library & Documentation Unit at HQ, and all the Scientists from HQ and outstations attended the meeting. In the opening remarks,
Dr. A. Gopalakrishnan, Chairman, IRC greeted all members of IRC and enlisted the achievements of ICAR-CMFRI 2023 and the vision for the future. After the opening remarks, the Annual Report for the year 2023 was released by the Director, ICAR-CMFRI. The Action Taken Report of the 30th IRC was presented before the members by the Secretary, IRC for approval and the reports were approved. Following this, the presentations by the Heads of the Divisions and PIs of the completed In-house projects were made. Presentation of revised objectives & technical programme of projects approved/as decided in mid-term IRC were done by the respective PIs.

In his concluding remarks, the Chairman of IRC emphasised the importance of project evaluation. He encouraged all PIs to prepare a protocol for retrieving marine fish landing centre data; to update the policy brief for Tamil Nadu fisheries management and to prepare a fisheries management plan for Puducherry; regional assessment of

The 31st Institute Research Council Meeting

conservation status and mapping of critical habitats for elasmobranchs, to strengthen bivalve data collection from Odisha, West Bengal, Maharashtra and Andhra Pradesh; to establish ecological informatics lab and microbial diversity lab; to focus on offshore aquaculture and scaling up existing technologies and to develop advisories for fishing methods on artificial reefs. Chairman also said that national-level MLS should be finalised taking into consideration the resources in the Northwest and Northeast regions. He also highlighted the need for assessments of *Mytella strigata*, turtle stocks, jellyfish, and the development of ornamental jellyfish.

Institute Management Committee

90th Institute Management Committee

The 90th and the 91st meetings of the Institute Management Committee (IMC) of CMFRI were held on 6th September 2024 and 6th November 2024 through virtual mode.
The Director and the Chairman of IMC presented a brief about the mandate of the institute and the research achievements made by the institute in the past. Actions taken during the points that emerged in the previous meeting were reviewed. The members of IMC expressed satisfaction with the research achievements of the institute. IMC has recommended all the agenda points be placed before the committee for approval.

15th Institute Joint Staff Council Meeting

The constitution of the Institute Staff Council of CMFRI is the following.

The Director, CMFRI: Chairman

Official side

1. The Chief Administrative Officer (Sr. Grade), CMFRI: Member
2. The Comptroller, CMFRI: Member
3. Dr Sreenath K. R., Scientist, CMFRI: Member
4. Shri N. Viswanathan, CTO, CMFRI: Member
5. Smt. V. K. Sobha, Administrative Officer, CMFRI: Member
6. Assistant Administrative Officer (Coordination), CMFRI- Member Secretary

Staff side

1. Shri Jayakumar C. V., Senior Technical Assistant, CMFRI, Kochi.
2. Smt. Priya K. M., Senior Technical Assistant, Mandapam RC of CMFRI, Mandapam.
3. Shri Vaibhav Dinkar Mhatre, Senior Technical Assistant, Mumbai RS of CMFRI, Mumbai.
4. Shri Joseph Mathew, Assistant Administrative Officer, CMFRI, Kochi.
5. Shri S. Yuvarajan, Assistant, Madras RS of CMFRI, Chennai.
6. Shri Thobias P. Antony, Skilled Support, staff, CMFRI, Kochi.
7. Shri Vipinkumar K. K., Skilled Support Staff, CMFRI, Kochi.

Shri Joseph Mathew, Assistant Administrative Officer has been elected as the Secretary (Staff Side), 15th IJSC of CMFRI and Shri Jayakumar C. V., Senior Technical Assistant has been elected as Member from CMFRI to the CJSC of ICAR.

Human Resource Development

Training and capacity building

ICAR-CMFRI takes a keen interest in developing the skills and capacity of various stakeholders associated with fisheries and allied sectors. Accordingly, the Institute conducts regular training and capacity-building activities for fishermen, fish farmers, entrepreneurs, professionals, in-house staff, research scholars, and students. This mainly includes short-term training programmes, winter/summer schools in specialised areas, post-graduate dissertation programmes, post-doctoral programmes, etc. The main areas of skill development under regular in-house programmes include 'Responsible Fisheries Management', 'Ecosystem Approach to Fisheries

ICAR Winter school participants with Director and staff of ICAR-CMFRI

Regular in-house training programmes organised by ICAR-CMFRI in 2024

Sl. No.	Subject of Training	Place
1	Elasmobranch taxonomy, fisheries management and conservation	ICAR-CMFRI, Kochi
2	Know your biodiversity	ICAR-CMFRI, Kochi
3	Fisheries management practices and techniques	ICAR-CMFRI, Kochi
4	Familiarizing with the activities of the institute and acquiring knowledge in the field of fisheries	ICAR-CMFRI, Kochi
5	Climate change in coastal livelihood and sustainable fisheries under SCSP	Chellanam and Kuzhupulli, Kochi
6	Sea cage farming, marine fish hatchery management, live feed culture, and marine fish identification	ICAR-CMFRI, Karwar RS
7	One-day orientation programme for *Kudumbasree* personal	ICAR-CMFRI, Kochi
8	Experiential agri. analytics: field to lab knowledge pathways	ICAR-CMFRI, Kochi
9	Refresher training on administrative and financial matters	ICAR-CMFRI, Kochi
10	Refresher training on administrative and financial matters	ICAR-CMFRI, Kochi
11	Survey methodology for field data collection, fcs app, and taxonomy for species identification	ICAR-CMFRI, Kochi
12	Advanced molecular and biochemistry techniques in fish nutrition	ICAR-CMFRI, Kochi
13	Stock health assessments of shellfishes of Indian coast through fishery biology methods'	ICAR-CMFRI Puri FC
14	Training and exposure visit	ICAR-CMFRI, Mandapam RC
15	Collection, analysis, and application of citizen science data for marine fisheries management	ICAR-CMFRI, Mangalore RC
16	Seaweed cultivation and entrepreneurship development	ICAR-CMFRI, Mandapam RC
17	Preparation of PPT in advanced version of Microsoft Office suite	ICAR-CMFRI, Visakhapatnam RC
18	Stock assessment continuum tool	ICAR-CMFRI, Kochi
19	Microalgae culture techniques	ICAR-CMFRI, Visakhapatnam RC
20	MARBIE III: short term training programme on 'water and sediment analytical techniques with special reference to marine life'	ICAR-CMFRI, Kochi

Management', Marine Biodiversity and Conservation, 'Genetics and Genomic Techniques in Fisheries', 'Mariculture Technologies,' 'Hatchery Techniques', 'Aquarium Setting and Feed Production,' 'Live feed production,' and so on. In 2024, a total of 20 training programmes were conducted, which benefitted over 700 participants.

Capacity building programmes for employees

Capacity building for the various categories of ICAR-CMFRI employees was facilitated based on the annual training plan (ATP) prepared after assessing the training needs of individual employees. ATP was prepared such that 20-25% of the institute's employees get the opportunity to attend training programmes in a year. In 2024, 25 scientists, 30 technical staff, 40 administrative and finance personnel, and 30 multi-tasking staff underwent

Training programme on 'Marine Maicroalgae Culture Techniques' held during 25-29 November 2024 at Vishakhapatnam RC of ICAR-CMFRI

various training programmes organised by ICAR-CMFRI and other Institutes.

Winter school/ short-term training

ICAR-CMFRI provides the opportunity to attend winter schools and short-term training programmes for interested individuals and students following ICAR guidelines. One winter school entitled 'Harnessing Recent Advances in High-Value Compound Development and Seaweed and Biomass Utilisation for Human Well-being: Propelling *Atmanirbhar Swastha Bharat* and Empowering Farmers' was organised for 21 days (15/02/2024 to 06/03/2024) with Dr Kajal Chakraborty, Head, MBFNHD, ICAR-CMFRI, Kochi as the Course Director. Short-term training programmes have benefited 25 participants and generated a revenue of ₹ 2,10,000 in 2024.

Doctoral and post-doctoral programmes

Scientists of ICAR-CMFRI are recognised guides under various reputed universities like Kerala University of Fisheries and Ocean Studies (KUFOS), Cochin University of Science and Technology (CUSAT), Mangalore University, Mahatma Gandhi University, Andhra University, Madras University, and Kerala University. Presently, 119 research scholars are pursuing their doctoral degree programmes at ICAR-CMFRI, Kochi, and its centres under various universities. Seven scholars received

ICAR sponsored Winter School on 'Harnessing recent advances in high-value compound development and seaweed and biomass utilisation for human well-being' organised from 15/02/2024 to 06/03/2024 at ICAR-CMFRI HQ, Kochi

Training programme on 'Power point skills' held during 11-12 November 2024 at Vishakhapatnam RC of ICAR-CMFRI

List of scholars who submitted PhD thesis / awarded PhD in 2024

Name	University	Submitted /Awarded	Supervisor
Azar Shahansha	Mangalore	Submitted	Dr Pradeep M A
Vineetha Valsalan K C	CUSAT	Submitted	Dr V Kripa PS (Rtd.)
Aswathy Joshy	Mangalore	Submitted	Dr S R Krupesha Sharma
Summaya Rahuman	Mangalore	Submitted	Dr P. Vijayagopal (Rtd.)
Priyanka Paulose	CUSAT	Submitted	Dr Sobhana K S
Dr. Linga Prabhu	Mangalore	Awarded	Dr P. Vijayagopal (Rtd.)
Dr. Silpa K P	Mangalore	Awarded	Dr Kajal Chakraborty

Interaction with seaweed farmers held on 11 August 2024 at Mandapam RC of ICAR-CMFRI

their PhD degrees and four new scholars joined the PhD programme in 2024.

One post-doctoral fellow pursued research in ICAR-CMFRI in 2024. Eleven fellows were permitted to apply for various post-doctoral fellowships such as DBT-RA, DST-WISE post-doctoral fellowship, KSCSTE Back-to-lab post-doctoral fellowship 2024, and DBT-BIOCARE post-doctoral fellowship, with ICAR-CMFRI as the host.

M.Sc. dissertation programme

Opportunities were provided to final-year students pursuing Master's degrees in various universities and colleges to undertake their project work at various Divisions of ICAR-CMFRI. Students can apply for three or six-month programmes on various subjects listed on the online application portal for completing their dissertation at ICAR-CMFRI HQ, Kochi, and its various Centres. A total of 32 students completed their dissertation work at the Institute in 2024. Through this, a revenue of Rs. 7 lakhs was generated in fees.

Field survey staff of ICAR-CMFRI during their skill enhancement training at Mandapam RC of ICAR-CMFRI

Hands-on training and cage installation under the Tribal Sub-Plan scheme at Veraval RS of ICAR-CMFRI

Photo: Director ICAR-CMFRI, Dr Gopalakrishnan welcoming the DG ICAR Dr Himanshu Pathak at RCM for Zone VIII

Major Events

The 28th meeting of the ICAR Regional Committee-VIII

The 28th meeting of the ICAR Regional Committee-VIII comprising the States of Karnataka, Kerala, Tamil Nadu and UTs of Puducherry and Lakshadweep was held at Chennai, Tamil Nadu, in the N K Panikkar Hall, National Institute of Ocean Technology, Chennai. The meeting was coordinated and jointly organised by the ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), Kochi and the ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA), Chennai. The meeting was convened in physical and online mode (hybrid mode). About 272 delegates and participants attended the programme (187 physically and 85 online).

The Secretary, DARE & DG, ICAR Dr Himanshu Pathak Chaired the meeting. The Deputy Directors General and Assistant Directors General of ICAR; Vice-Chancellors and other senior officers of the State Agricultural Universities (SAUs) in the region, Agricultural Production Commissioners, Governing Body Members of ICAR, Directors of ICAR Institutes & ATARIs in the region; Directors and representatives of State and UTs in the region, Officers-in-charge of Regional Centres and Stations of ICAR Institutes located in the region, and Scientists and Staff of ICAR-CMFRI and ICAR-CIBA attended the meeting.

Member Secretary, RCM for Zone VIII and Director ICAR-CMFRI, Dr Gopalakrishnan welcoming the DG ICAR Dr Himanshu Pathak

Representatives from the concerned States and UTs raised their issues regarding agricultural research, education, and extension within the region, and their challenges in executing approved programmes or addressing emerging issues were discussed threadbare. Identified issues were prioritised, gaps were identified and action plans were finalised for 26 issues. The action plans were then assigned to related ICAR Institutes and State Agricultural Universities to address and come out with solutions within an assigned timeframe.

Shri Suman Bery, Vice Chairman of NITI Aayog, speaking on the occasion

National workshop on harnessing the potential of fisheries in the marine states

On 5 January 2024, the ICAR-CMFRI, in collaboration with NITI Aayog and the Department of Fisheries, Government of Kerala, hosted a high-level workshop to deliberate on strategic initiatives for sustainable marine fisheries. Inaugurated by Shri Suman Bery, Vice Chairman of NITI Aayog, the event focused on integrating advanced technologies such as artificial intelligence into fisheries management. Prof. Ramesh Chand, Member of NITI Aayog, highlighted the sector's growing export potential and called for value addition and innovation. Dr J.K. Jena, DDG (Fisheries Science), ICAR, stressed the untapped potential of deep-sea fisheries. The workshop laid the groundwork for policy reforms and encouraged collaboration among marine states to unlock economic and ecological value from India's coastal waters.


Shri George Kurian, Minister of State for Fisheries, Animal Husbandry & Dairying and Minority Affairs,, inaugurating the programme

National workshop on drone applications in fisheries

On 8 November 2024, Shri George Kurian, Minister of State for Fisheries, Animal Husbandry & Dairying and Minority Affairs, Government of India, inaugurated a workshop on drone technologies in fisheries at ICAR-CMFRI. The workshop showcased potential drone applications in monitoring, stock assessment, aquaculture management, and disaster response. Over 700 farmers and stakeholders attended the programme.

Exchange of MoU with Neat Meatt Biotech Pvt. Ltd. on collaboration on lab-grown marine fish meat

Visit of Ms. Neetu Kumari Prasad, Joint Secretary, Department of Fisheries, Government of India

Inauguration of Winter School on development of high value compounds

Release of ICAR-CMFRI brochure by Dr S. Ayyappan, former Secretary, DARE & Director General, ICAR

Celebration of International Women's Day at ICAR-CMFRI

28th meeting of the ICAR-CMFRI Research Advisory Committee

Presentation of Shri Nandakumar Rao Memorial Award


India-Oman workshop at ICAR-CMFRI


Visit of Dr Abhilaksh Likhi, Secretary, Fisheries, Government of India to ICAR-CMFRI


Hindi orentation programme

Felicitation of Ali manikfan, recipient of Padma Shri


Signing of MoU with Plan@Earth NGO

Honourable Minister of State Shri George Kurian releasing the book on One Decade of Swachh Bharat Abhyan at ICAR-CMFRI

DDG, Fisheries Science, ICAR releasing the field Guide on fish production data management


Honourable Minister of State Shri George Kurian releasing ICAR-CMFRI products

Photo: ICAR-CMFRI KVK's drive drone technology for efficient farming

Krishi Vigyan Kendras

Krishi Vigyan Kendra, Ernakulam

Krishi Vigyan Kendra (KVK) Ernakulam plays a pivotal role in disseminating advanced agricultural technologies and best practices to farmers, fostering sustainable farming and livelihood enhancement in the region. Through its training programmes, on-farm demonstrations, and advisory services, KVK Ernakulam bridges the gap between scientific research and field-level implementation, empowering farmers with innovative solutions for productivity and resilience. Major activities taken up by the KVK in 2024 are summarised below.

Alangadan Jaggery production unit inaugurated

The Alangadan Jaggery has made a remarkable comeback after four decades due to the dedicated efforts of KVK-Ernakulam. As part of its initiative to revive sugarcane farming and jaggery production in the region, KVK Ernakulam established a jaggery production unit at the Alangad Cooperative Bank campus. The unit was inaugurated by Shri P. Rajeev, Minister for Law, Industries, and Coir, on September 22, 2024. Since its launch, the unit has successfully produced around 1,000 kg of high-quality, chemical-free jaggery under the brand name *Alangadan Sharkara*. This initiative aims to rejuvenate

Inauguration of jaggery production unit by Honourable Minister for Law, Industries and Coir, Government of Kerala, Shri P. Rajeev

Drone demonstration in farmer's fields during VBSY programme

sugarcane farming in the Periyar river basin and expand cultivation to 50 acres in the coming years. The KVK has implemented a series of initiatives, including a demonstration of sugarcane farming, hands-on training for SC farmers under the SCSP project, and a seminar on the prospects of sugarcane cultivation in Alangad. This mission became a reality through the collaboration of KVK, local farmers, Alangad Service Cooperative Bank, and Alangad Grama Panchayat.

Viksit Bharat Sankalp Yatra

KVK Ernakulam actively participated in the *Viksit Bharat Sankalp Yatra* (VBSY), a nationwide campaign held from 1st December 2023, to 24 January 2024, aimed at increasing awareness and ensuring the effective implementation of Government of India schemes. The Yatra, flagged off by Shri Suresh Gopi, Member of Parliament, covered 82 Grama Panchayats in Ernakulam district. KVK played a crucial role by identifying agricultural fields for drone demonstrations, selecting partner farmers, and conducting awareness programmes on soil health, government schemes, and KVK services. Drone demonstrations were carried out by experts from FACT. The campaign witnessed active participation from Panchayat members, Lead Bank Managers, NABARD officials, and central government representatives.

Successful mechanisation of lemongrass harvesting

The KVK-Ernakulam has introduced a mechanised reaper for efficient harvesting of lemongrass effectively addressing the labour shortage in the district. A successful field trial of the reaper was conducted on 17 July 2024, at the Aromatic and Medicinal Plants Research Station in Odakkali.
The KAMCO KR120H model reaper proved highly efficient, and capable of harvesting an acre per hour.
This development aligns with KVK's broader efforts to revive lemongrass farming in the district, which was once the epicentre of lemongrass cultivation and the oil trade in the state.

Street fish vendor to a successful brand

In 2011, Shri Sabu, a small fish vendor from Thammanam, Ernakulam, operated a modest street-side fish vending unit on Stadium Link Road. Committed to selling safe, high-quality fish, he sourced his stock only from small boats returning daily after fishing, avoiding fish stored for extended periods. However, his focus on quality meant higher prices, limiting his business growth to a daily turnover of ₹ 25,000 by selling around 100 kg of fish. Recognizing his potential, the KVK Ernakulam advised him to form a self-help group (SHG) and obtain the necessary licences to formalise his venture. With KVK's support, he established the 'Kadappuram Fresh Fish Vitharana Sangham SHG', enabling structured growth. The KVK provided training in responsible fish vending, sourcing fresh fish from local farmers, adulteration detection, handling, storage, and waste management. With enhanced credibility, 'Kadappuram Fresh Fish Vitharana Sangham SHG' gained community trust, attracting customers willing to pay a premium for fresh and safe fish. During the COVID-19 lockdown, when movements were restricted impacted his business. The KVK intervened with a strategic solution.

Demonstration of mechanised harvesting of lemongrass

Fish vending stall of Kadappuram Fresh Fish Vitharana Sangham SHG

By issuing movement certificates, KVK enabled the SHG to adopt a door-delivery model, ensuring continued operations. KVK also promoted the initiative through newspapers, radio, and WhatsApp groups, which significantly boosted their customer base. Post-lockdown, Kadappuram expanded its services by hiring dedicated delivery staff, improving the vending unit with better lighting and a billing system, and modernising operations. These efforts resulted in a remarkable transformation, with daily fish sales growing from 100 kg to 700 kg and turnover increasing to ₹ 4.0 lakh a day. Encouraged by this success, the SHG launched an additional outlet featuring grilled fish and seafood delicacies, further strengthening its brand presence. Through expert guidance, technological support, and strategic interventions, of KVK Ernakulam, the Kadappuram Fresh Fish Vitharana Sangham has grown from a small street-side operation into a thriving local brand, demonstrating the power of scientific methodology, innovation, quality, and brand building.

Fruit gardens established in schools and colleges

KVK Ernakulam, in collaboration with Prof. K.V. Thomas Vidyadhanam Trust, launched an initiative to establish fruit gardens in 20 schools and colleges across Ernakulam District. As part of the programme, each institution received 10 fruit trees—Mango, Jackfruit, Lime, Guava, and Neem—along with organic manures, liming materials, tree guards, and maintenance guidelines to ensure successful establishment and growth. The initiative was officially launched on September 30, 2024, at Sacred Heart College, Thevara, where Shri P. Prasad, Minister for Agriculture, emphasised the health benefits of incorporating local fruits into daily diets.
By integrating fruit gardens into educational institutions, this initiative aims to create eco-friendly learning spaces, enhance biodiversity, and instil environmental responsibility among students.

Launching of the initiative to establish fruit gardens in schools

Krishi Vigyan Kendra, Lakshadweep

The KVK worked on the mandatory activities On Farm Trail (OFT), Frontline Demonstrations (FLD) and training. Along with the mandatory works, an action plan for the KVK was envisaged with extension activities, demonstrations, providing extension advisory services and promoting rural entrepreneurship in value addition and processing of coconut and fish. The development initiatives like technology assessment, promotion of best practices, key baseline surveys and joint works through convergence with ICAR-CPCRI, ICAR-IIHR, ICAR-NBAGR, NCDC, Coconut Development Board and other agencies under the UT administration of Lakshadweep were also undertaken. The works on seaweed culture and the establishment of a marine ornamental hatchery were also performed jointly with the host institute, the ICAR-CMFRI. During 2024, the KVK implemented the activities as detailed below.

The OFT on integrated feeding practices for goats with compounded feed with green grass was found to be

FLD on fodder grass as intercrop in coconut gardens

Activities implemented by KVK Lakshadweep in 2024

No	Activity	No.	Beneficiaries
1.	On Farm Trail (OFT)	2	16
2.	Front Line Demonstration	3	13
3.	Training	45	1142

OFT on integrated feeding of goats with compounded feed and green grass

Training on soilless media at the demonstration plot, Kavaratti

effective as compared with the goats fed only with green grass. The other OFT on feeding with the larvae of black soldier fly was found to be effective in backyard poultry as a supplementary feed. The frontline demonstration was conducted with densified feed blocks for goats, improved backyard poultry strains and others.

Soilless media

The KVK and ICAR-IIHR jointly organised a demonstration of soilless media for the farmers in Kavaratti Island. The technology of ICAR-IIHR in the preparation of soilless media was demonstrated. The technology of using coir pith, a decomposer and microbial consortium of IIHR was the base for this demonstration. The technology demonstration was attended by more than 60 farmers.
A demonstration plot was established in Kavaratti.

Promotion of vegetable cultivation

Since 2021, KVK has been promoting vegetable cultivation on the island with ICAR-IIHR by using TSP funds of ICAR-CMFRI. During 2024, the vegetable seeds were distributed to 2063 farmers across 10 islands of Lakshadweep. The Department of Agriculture supported KVK in distributing the seeds to all the islands. In some islands, a nursery was established, and seedlings were provided, and in other cases, seeds were directly provided (10 types of vegetable seeds were provided under this initiative).

Study on coconut enterprises

The KVK and ICAR-CPCRI are jointly working on a project funded by the Coconut Development Board, Kochi, on mapping out the coconut enterprises in Lakshadweep islands.

The project has mapped 132 enterprises working on value addition and processing of coconut across different islands. There are about 21 food and non-food enterprises working on the coconut, which are found to be small-scale enterprises characterised by low production capacity. Most of the enterprises need technological up gradation and have to work on improving the efficiency.

Baseline survey on potentials of seaweed cultivation

KVK- Lakshadweep organised a baseline survey on seaweed assemblages along the coastline of Kavaratti Island, Lakshadweep. This survey aimed to work on development interventions on seaweeds fitting into the mandates of KVK. The KVK will develop a repository of the works performed on seaweeds towards identifying

Consultation meeting and distribution of vegetable seeds to farmers and farm women

Sampling of various species of seaweed through transit survey

potential areas for further development works.

Non-descript animal genetic resources of Lakshadweep

The KVK hosted an interface on "Characterisation and Documentation of Animal Genetic Resources of Lakshadweep Island" by ICAR-NBAGR. Further, field visits and sample collection were led by KVK. The purpose is mainly to identify the indigenous germplasm in the island and register it. During the field visit a breed of goat, duck and poultry were found to be non-descript and the team started working on studying and registering following the protocols with extensive data collection work.

Coco Fest-2024

The Coco Fest-2024 (Coconut Festival) of Lakshadweep islands was organised by the KVK along with the partners from 20-22 November 2024 at Kavaratti. The event aimed to

Stakeholders meeting on documentation of goats of Lakshadweep

Inauguration of the exhibition during Coco Fest-2024 at Kavaratti

Data collection for characterisation of goats, Kavaratti

Women farmer awarded during Coco Fest-2024

strengthen the role of coconut as a cornerstone of the islanders' livelihoods and traditions.

The festival had 54 exhibitors showcasing their activities and technological innovations related to coconut. Additionally, 72 experts from the mainland participated with their exhibits and took part in the other events. Oil mill expeller units, SHGs and other coconut enterprises from Lakshadweep attended the festival. The festival was attended by more than 8000 stakeholders.

Photo: ICAR-CMFRI Receiving Kshetriya Rajbhasha Puraskar, 2023-24

Official Language

Activities of the Official Language Section

Awards and recognitions received

Government of India Regional Rajbhasha Award

ICAR-Central Marine Fisheries Research Institute bagged the *Kshetriya Rajbhasha Puraskar* of the Department of Official Language, Ministry of Home Affairs for the period 2023-24 among the Central Government organisations in the South–West Region of India. Dr Grinson George, Director & Shri Hareesh Nair, CAO (S.G.) received the Rajbhasha Shield and Certificate from the Honourable Governor of Bihar Shri Aarif Muhammed Khan and Honourable Minister of State for Home Affairs of India Shri Nityananda Rai in the function held at Karnataka State Open University, Convocation Bhavan, Mysuru on 4th January 2025.

TOLIC Awards

ICAR-Central Marine Fisheries Research Institute bagged the Rolling Trophy – First position for excellent implementation of the official language and First position for Hindi Magazine '*Matsyagandha*' among the Central Government Organisations in Kochi for the period 2022-23. Smt. Preeti Garg IRS, Principal Chief Commissioner of Income Tax distributed trophies in the meeting of Kochi TOLIC held at Income Tax Office, Kochi on 23rd October 2024. Shri Hareesh Nair, CAO (S.G.) and officials of the Official Language Section, ICAR-CMFRI received the trophies on behalf of the Institute.

Receiving TOLIC Award 2022-23

Prize in Official Language Seminar

Directorate of Cashewnut and Cocoa Development, Kochi conducted Official Language Seminar on the subjects '*Vasudhaiv Kutumbakam*' and '*Narishakti*' on 25th June 2024 at Kera Bhavan, Kochi. Smt. Bindu Sanjeev, Private Secretary, ICAR-CMFRI awarded 3rd Prize in Official Language Seminar for her presentation on the topic '*Vasudhaiv Kutumbakam*' in Hindi. Dr Femina, Director, Directorate of Cashewnut and Cocoa Development, Kochi distributed awards.

Smt. Bindu Sanjeev, Private Secretary receiving trophy from Dr Femina, Director, Directorate of Cashewnut and Cocoa Development

Extension activities

Hindi fortnight observance

Hindi Fortnight was observed from 14 to 28 September 2024. Various programmes like Hindi Memory Test and Hindi Antakshari competitions were held offline and Hindi Noting and Drafting, Hindi Quiz, Hindi Speech and Hindi Typing competitions were held in hybrid mode. The competitions were attended by the Officials from ICAR-CMFRI Headquarters and all the Regional Centres / Stations. The Valedictory function of Hindi Fortnight was held in Conference Hall 201 on 18th October 2024. Prof. K. Vanaja, Head (Retd.), Department of Hindi, Cochin University was the chief guest of the function. Dr Grinson George, Director, ICAR-CMFRI delivered the presidential address. Shri Hareesh Nair, Chief Administrative Officer (S.G.) and

Hindi fortnight valedictory function 2024

Official Language orientation programme for officers

Official Language orientation programme for staff

Hindi workshop

Officer-in-Charge (OL), Shri Prashant Kumar, Comptroller, ICAR-CMFRI were also present in the occasion. The chief guest distributed prizes to the winners. The Co-ordination Section received the Rajbhasha Rolling Trophy for securing more points in Hindi competitions. Smt. Meera K. N, Administrative Officer, Shri A.T.Sunil, AAO, Co-ordination Section and officials of the section received the trophy from the chief guest. Hindi Week / Fortnight was observed in all Regional Centres / Stations of ICAR-CMFRI with various programmes.

Official language orientation programme

As per the decisions taken during the OLIC meeting held on 03.05.2024 at the Institution, an Official Language Orientation Programme was organised for the officers and staff of ICAR-CMFRI on 26th June 2024. Dr Madhusheel Ayillyatth, Manager and In-Charge (Rajbhasha), RBI, Kochi conducted a class for the staff members. The first session was conducted for 20 staff members on the topic of 'Official

Official language inspection at ICAR- CMFRI headquarters

Language Policy' and the e-tools used in Hindi. The second session of the programme was organised for the Officers. The Comptroller of ICAR-CMFRI and newly appointed Divisional Heads of ICAR-CMFRI have participated in the programme. Information related to the role of Senior Officers in the successful implementation of the Official Language Policy and the e-tools used in Hindi were provided.

Hindi workshops

Hindi Workshops were conducted on 10.01.2024, 26.06.2024, 30.09.2024 & 13.12.2024 respectively at Headquarters, Kochi. Hindi Workshops were also organised at Regional Centres / Stations of ICAR-CMFRI.

Official language Implementation committee meetings

Official Language Implementation Committee Meetings were conducted on 22.03.2024, 03.05.2024, 09.08.2024 and 09.12.2024.

Official language inspections

Shri Anirban Kumar Biswas, DD(OL) (Implementation), Regional Implementation Office (South), Bengaluru, D/o Official Language inspected OL activities of Mangalore Regional Centre of ICAR-CMFRI on 19th June 2024 & CMFRI Headquarters on 21st October 2024.

Participation in seminar / workshop / Conference

Dr Joe K. Kizhakudan, Principal Scientist and Head, Visakhapatnam Regional Centre of ICAR-CMFRI participated in the National Scientific Hindi Seminar conducted by NBFGR, Lucknow on 25th September 2024. Dr Indira Divipala, Senior Scientist and Dr Phalguni Pattnaik, ACTO, Visakhapatnam Regional Centre of ICAR-CMFRI participated in the Hindi Seminar conducted by FSI, Visakhapatnam on 22nd October 2024. Smt. Priya K. M., STA and Smt. Remya T. R., UDC participated in the Official Language Seminar conducted by Cochin Shipyard Limited on 22nd November 2024.

Other activities

A word a day in Hindi with an equivalent was displayed on the electronic display board every day. All the documents under Section 3(3) of the Official Language Act 1963 were issued bilingually. All letters received in Hindi were replied in Hindi.

Publications in Hindi

The publications in Hindi included the *Matsyagandha* Hindi magazine volumes 12 & 13; Fisheries Glossary, Special Publication on '*Samudri Shaival Paidavar mem Achi Prabandhan Prathayem*'.


Release of fisheries glossary in Hindi

Photo: Green drive at Vizhinjam Regional Centre of ICAR-CMFRI

Swachh Bharat Abhiyan

Swachh Bharat Abhiyan

The ICAR-CMFRI made significant contributions to accelerating the 'Clean India' campaign by effectively implementing the *Swachh Bharat Abhiyan* at its headquarters and regional centres spread across the coastal states of the country, including its two KVKs. To document the significant achievements of the institute towards the *Swachh Bharat* Mission in the past decade, a special publication on 'One Decade of Swachh Bharat Abhiyan at ICAR-CMFRI' was published. ICAR-CMFRI organised three major campaigns in 2024: the *Swachhta Hi Seva* from 17th September to 2nd October 2024; the Special Campaign 4.0 from 2nd to 31st October 2024 and the *Swachhta Pakhwada* from 16th to 31st December 2024. The staff of the institute took the *Swacchta* pledge during the

Cleanliness drive at Tuticorin

Coastal clean-up drive at Lakshadweep by KVK, Lakshadweep

Coastal clean-up drive by Mandapam RC of ICAR-CMFRI

Honouring Safai mitras at ICAR-CMFRI, Kochi

Kisan Diwas celebrations by Madras RS of ICAR-CMFRI

campaign to express their commitment towards making the workplace, villages and localities clean and to encourage citizens to actively participate in the 'Clean India' campaign.

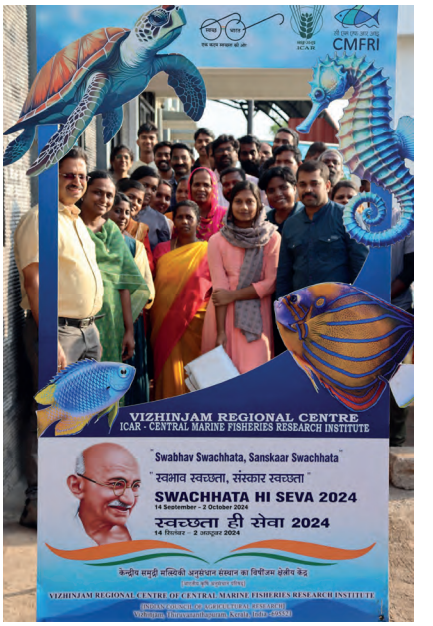
The *Swachhta Hi Seva* 2024 campaign commenced with the online *Swachhata* Pledge organised by the DG, ICAR on 17th September 2024. The campaign was celebrated under the theme *Swabhav Swachhta Sanskar Swachhta*. The major programmes in the campaign included cleanliness drives at difficult and dirty spots (Cleanliness Target Units), public awareness programmes involving local leaders and citizens, waste-to-art competitions, cleanliness drives at public places, competitions for students, *swachhta* awareness talks, walkathons, human chains, tree planting drives, and installation of selfie points at strategic locations. Under the *Safai Mitra Samman* programme, honouring and supporting the sanitation workers was done through awareness classes, preventive health check-ups, and presenting safety gear and mementos to selected sanitary workers.
The Institute made commendable efforts to promote clean and healthy oceans by organising coastal clean-up drives with the active involvement of local bodies, fishers, students and various organisations across the coastal states.

The visit of the Honourable Minister of State of Fisheries, Animal Husbandry and Dairying Shri George Kurian to ICAR-CMFRI, Kochi on 26th September 2024 gave extra momentum to the *Swachhta Hi Seva* campaign. The Minister inaugurated the Black Soldier Fly Larvae (BSFL) based bio-waste processing unit and released the book 'One Decade of Swachh Bharat Abhiyan at ICAR-CMFRI'. *Swachh Bharat Diwas* was celebrated on 2nd October 2024 at

Ms. Jini Gopal, Miss Kerala Women's Fitness title winner, inaugurating the Swachhta Pakhwada cleanliness campaign at Kochi

Green drive at Vizhinjam RC

Plant 4-Mother campaign at Tuticorin RS of ICAR-CMFRI



Swachhta themed Selfie point installed at Vizhinjam RC of ICAR-CMFRI

ICAR-CMFRI HQ and its research centres and KVKs with great enthusiasm for celebrating the transformation of Cleanliness Target Units (CTUs).

ICAR-CMFRI actively participated in the *Swachhta* Special Campaign 4.0 which intended to institutionalise cleanliness *(Swachhta)* and minimise pendency in government offices. Accordingly, the campaign was set to run from 2nd to 31st October 2024, with the primary focus on enhancing workplace cleanliness, promoting sustainable practices, disposal of office scrap and redundant items, effective space utilisation and beautification of workspaces and office premises.

The *Swachhta Pakhwada* 2024 campaign was celebrated from 16th to 31st December 2024 at ICAR-CMFRI HQ, its regional centres, research stations and KVKs. Cleanliness drives were undertaken at workspaces, office premises and public utility areas. Public awareness campaigns were organised through door-to-door sanitation awareness programmes in coastal villages, distribution of waste bins, public signing campaigns, walkathons, green drives to promote tree plantation and workshops and demonstrations on waste management. Public awareness programmes on plastic pollution with the active involvement of local bodies, NGOs, women self-help groups and educational institutions are commendable contributions by the Institute during the *Swachhta* campaigns. Training and awareness programmes on sustainable management of marine litter, recycling of wastes through the preparation of compost and vermicompost, and awareness classes to stop the burning of crop residues were also conducted for the benefit of the local people and farmers.

ICAR-CMFRI has developed and promoted several novel technologies for the conversion of waste to wealth. The CADALMIN™ BSF ZW -A Zero waste bio-conversion system established at ICAR-CMFRI, Kochi using the novel technology for valorisation of organic waste using black soldier fly larvae (BSFL) ensures bio-conversion of organic wastes at ICAR-CMFRI HQ campus. The Institute is also actively involved in promoting the commercial production of fish fertilizer from fish wastes as a viable option for income

Swachhta awareness to school children by Mumbai RS of ICAR-CMFRI

Waste to art competition conducted by Mangalore RC of ICAR-CMFRI

Swachhta walkathon by Visakhapatnam RC of ICAR-CMFRI

Walkathon conducted by Mangalore RC of ICAR-CMFRI

generation to women entrepreneurs and rural youth. A workshop on advanced technologies for waste management and a demonstration class on waste management using a BSFL-based bioconversion unit for the women self-help group members in coastal villages of Ernakulam were also conducted during the *Swachhta Pakhwada* 2024 Campaign.

Kisan Diwas (Farmer's Day) was celebrated on 23rd December 2024 as part of the *Swachhta Pakhwada* Campaign during which the significance of Swachh Bharat mission was briefed to the fishers and fish farmers. Progressive farmers and other stakeholders were felicitated. Celebrities, VIPs, students, farmers and entrepreneurs were invited to participate in the *Swachhta Pakhwada* campaign to create awareness and encourage the citizens to be involved in *Swachhta* programmes. Wide publicity for the *Swachh Bharat* initiatives of the Institute was achieved through print and electronic media, social media platforms, reels, videos etc. to propagate the *swachhta* message.

Workshop on waste management for women self-help group members during the Swachhta Pakhwada at CMFRI, Kochi

Budget

Budget 2024-2025

Name of the Head		(Rs. In lakhs) R.E 2024-25	Expenditure up to 31.03.2025	% of Utilisation
	Grants for creation of Capital Assets (CAPITAL)			
1	Works			
	(A) Land	0.00	0.00	0.00
	(B) Building			
	i Office Building	121.35	121.35	100.00
	ii Residential Building	0.00	0.00	0.00
	iii Minor Works	0.00	0.00	0.00
2	Equipments	244.41	244.41	100.00
3	Information Technology	54.36	54.36	100.00
4	Library Books and Journals	0.00	0.00	0.00
5	Vehicle & Vessels	2.70	2.70	100.00
6	Livestock	0.00	0.00	0.00
7	Furniture & Fixtures	5.18	5.18	100.00
8	Others	0.00	0.00	0.00
	Total – CAPITAL (Grants for creation of Capital Assets)	**428.00**	**428.00**	**100.00**

Grants in Aid–Salaries (REVENUE)				
1	**Establishment Expenses**			
	Salaries			
	i. Establishment Charges	7950.00	7950.00	100.00
	ii. Wages	0.00	0.00	0.00
	iii. Overtime Allowance	0.00	0.00	0.00
	Total – Establishment Expenses (Grant in Aid–Salaries)	7950.00	7950.00	100.00

Grants in Aid–General (REVENUE)

1	**Pension & Other Retirement Benefits**	**9450.00**	**9450.00**	**100.00**
2	**Travelling Allowance**			
	(A) Domestic TA/Transfer TA	175.00	175.00	100.00
	(B) Foreign TA	0.00	0.00	0.00
	Total – Traveling Allowance	175.00	175.00	100.00
3	**Research & Operational Expenses**			
	(A) Research Expenses	178.85	178.85	100.00
	(B) Operational Expenses	316.15	316.15	100.00
	Total–Research & Operational Expenses	495.00	495.00	100.00
4	**Administrative Expenses**			
	(A) Infrastructure	722.65	722.65	100.00
	(B) Communication	19.37	19.37	100.00
	(C) Repairs & Maintenance			
	i Equipments, Vehicles & Others	92.06	92.06	100.00
	ii Office Building	74.24	74.24	100.00
	iii Residential Building	10.43	10.43	100.00
	iv Minor Works	0.00	0.00	0.00
	(D) Others (excluding TA)	336.25	336.25	100.00
	Total–Administrative Expenses	1255.00	1255.00	100.00
5	**Miscellaneous Expenses**			
	A HRD	12.57	12.57	100.00
	B Other items (Fellowships, Scholorship etc.)	0.00	0.00	0.00
	C Publicity & Exhibition	17.50	17.50	100.00
	D Guest House–Maintenance	4.93	4.93	100.00
	E Other Miscellaneous	0.00	0.00	0.00
	Total–Miscellaneous Expenses	35.00	35.00	100.00
	Total Grants in Aid–General (incl. Pension)	11410.00	11410.00	100.00
	Grand Total	**19788.00**	**19788.00**	**100.00**
	TSP–Capital	10.00	10.00	100.00
	TSP–General	110.00	110.00	100.00
	Total TSP	**120.00**	**120.00**	**100.00**
	SCSP-Capital	30.00	30.00	100.00
	SCSP-General	230.00	230.00	100.00
	Total SCSP	**260.00**	**260.00**	**100.00**
	RE-Total	**20168.00**	**20168.00**	**100.00**
	Loans & Advances	3.00	3.00	100.00
	Institute Corpus Fund	73.73	73.73	100.00

(Rs. In Lakhs)

Revenue 2024-25		Target	Achieved
Income from Sales/services			34.57
Fee/Subscription		72.00	12.01
Income from Royalty, publication etc.			1.02
	Total	**72.00**	**47.60**
Other Receipts			
Other Income			199.71
STD Interest			11.23
Sale of Asset			14.93
Recoveries on Loans & Advances			10.07
CPWD/Grants Refund			14.17
TOTAL			**250.11**
GRAND TOTAL			**297.71**

(Rs. In lakhs)

Other Heads	Opening Balance	Receipts	Expenditure	Refund	Closing Balance
AINP-M	0.00	222.00	222.00	0.00	0.00
AINP-OFBC	0.00	335.00	335.00	0.00	0.00
NICRA	0.31	153.50	153.50	0.31	0.00
Winter/Summer School	0.93	5.25	5.38	0.08	0.72
Emeritus	5.84	0.00	0.00	5.84	0.00
Other Schemes	39.70	145.70	148.68	30.60	6.12
KVK, Narakkal	6.17	219.96	219.92	6.17	0.04
KVK, Lakshadweep	14.83	143.45	142.61	14.83	0.84
Deposit Schemes (Externally funded)	161.50	717.88	744.88	22.95	111.55
Consultancies	604.43	124.38	102.34	0.00	626.47

Publications

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Abdul Azeez, P., Abdussamad, E. M., Rajesh, K. M., Anulekshmi Chellappan, Ajay D. Nakhawa, Surya, S., Mohammed Koya, K., Shubhadeep Ghosh, Manas, H. M. and Prathibha Rohit 2024. Fishery, biology and population characteristics of frigate tuna *Auxis thazard* (Lacepede, 1800) from Indian waters. *Indian J. Fish.*, 71(1): 64-69.

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Participations

Conferences/Meetings/Workshops/Symposia/Trainings/Deputations

Gopalakrishnan, A., Director (January to July 2024)

- Workshop on "Harnessing Potential of Fisheries in Marine States" jointly organised by the NITI Aayog, DoF, MoFAH&D, New Delhi and ICAR CMFRI, Kochi, 05 January 2024.
- Consultation to discuss the Draft National Marine Fisheries Management Plan and State-specific Management Plans for purse seine fisheries, Chennai, 10 January 2024.
- Meeting with the C6 Energy team at ICAR-CMFRI, Kochi, to explore possibilities for offshore farming of seaweeds along the Indian coasts, 11 January 2024.
- Inaugural programme of the Cochin Shipyard's new facilities 17 January 2024.
- Online meeting on the Impact of purse seine fisheries along Maharashtra coastal waters, Chaired by the Commissioner of Fisheries, Maharashtra, 18 January 2024.
- The 8th Interactive Meeting of the Heads of Finance and Administration of ICAR Institutes with AS&FA, DARE, ICAR at CMFRI, Kochi, 19 January 2024.
- The 30th meeting of the Scientific Panel of FSSAI on genetically modified organisms and foods, 30 January 2024.
- The 28th Meeting of the ICAR Regional Committee for Zone-VIII at Chennai, as Member Secretary, 16 February 2024
- Meeting on the National Plan of Action on Elasmobranchs convened by the BOBLME and the Government of India, 19 February 2024.
- Meeting with the Joint Secretary, Marine Fisheries, Department of Fisheries, Government of India, Ms Neetu Kumari Prasad at ICAR-CMFRI 19 February 2024.
- Assessment Committee Meeting at ASRB, New Delhi, 27 February 2024
- FAO Workshop organised by the BOBP IGO on fish stock assessment (Area 51) at Kochi on 15-16 March 2024.
- Online meeting on Viksit Bharat convened by the Director General, ICAR 16 April 2024.
- The Scientific Advisory Committee Meeting of KVK Ernakulam at ICAR-CMFRI, Kochi, 23 April 2024.
- Online meeting on the Impact of purse seine fisheries in India, convened by the Department of Fisheries, Government of India, on 29 April 2024.
- Meeting with Dr Abhilaksh Likhi, Secretary (Fisheries), Department of Fisheries, Government of India, at CMFRI, 15 May 2024.
- Meeting with the Norwegian Delegation on their visit to ICAR-CMFRI along with Shri Hibi George Eden, Member of Parliament, Ernakulam, 21 May 2024.
- National Workshop on Exploring the Possibilities for Harvest and Utilisation of Mesopelagic Fishes in the Indian EEZ, Mangalore, 24 May 2024.
- NAAS Annual General Body Meeting, New Delhi, 3-6 June 2024
- Discussion with the Director & Team of Scientists of INCOIS & NRSC, Hyderabad on joint research programmes with ICAR-CMFRI and signing MoU with INCOIS, 12-13 June 2024

- Meeting with women entrepreneurs in seaweed farming along the Odisha Coast, 14-15 June 2024
- Meeting with the Joint Secretary, Inland Fisheries, Department of Fisheries, Government of India, Regional Centre of CMFRI, Mandapam, 29 June 2024.
- ICAR Foundation Day and Directors' Meeting, New Delhi, 15-16 July 2024
- Online review meeting on the 14 AFAF, Chaired by DDG (Fisheries Science), ICAR, 29 July 2024.
- Brainstorming on Cellular Fish Meat Production: Prospects and Challenges, NAAS, New Delhi, 20 September 2024.

Grinson George, Director

- Workshop on "Harnessing Potential of Fisheries in Marine States" jointly organised by the NITI Aayog, DoF, MoFAH&D, New Delhi and ICAR-CMFRI, Kochi, 05 January 2024
- First Regional Consultation Meeting on the Updation of National Biodiversity Strategy and Action Plan (NBSAP) and Adoption of National Biodiversity Targets (NBTs) in alignment with the Kunming-Montreal Global Biodiversity Framework (KMGBF), Hyderabad, 09-10 January 2024
- Meeting with Shri Nelson Vadassery, Co-founder and Chief Technology Officer, Sea6 Energy regarding collaboration in Rough Water Seaweed Farming, at ICAR-CMFRI, Kochi, 11 January 2024
- Meeting with Shri Tanmay Kumar, Additional Secretary, MoEFCC, ICAR-CMFRI, Kochi, 11 January 2024
- International Fisheries Congress and Expo 2024, organised by Kerala University of Fisheries and Ocean Studies (KUFOS) and the College of Fisheries Panangad Alumni Association (COFPAA). Delivered invited talk on the topic "Sustainable Fisheries in a Warming World: Adapting to the New Normal" under the Theme 3.2: Strategies for Resilience: Innovations and Interventions for Sustainable Production, at KUFOS, Kochi, 12-14 January 2024
- Awareness class on Citizen Science with the demonstration of Mini Secchi Disk and TurbAqua App; On-site training for students on the operation of Mini Secchi Disk in Lake Vembanad and Student-scientist interaction, ICAR-CMFRI, Kochi, 21 January 2024
- 13th Indian Fisheries and Aquaculture Forum (IFAF): Fostering Indian Fisheries and Aquaculture for Attaining Sustainable Development Goals. Delivered a lead lecture in the Technical Session on Climate Research in Fisheries and Aquaculture (Theme VII) and received the Prof. HPC Shetty Award for overall achievement in fisheries research, from Hon'ble Minister for Fisheries, Government of India. ICAR-CIFRI, Barrackpore, Kolkata, 23-25 February 2024
- 28th Regional Committee Meeting, Zone VIII, NIOT Campus, Chennai, 13-17 February 2024.
- World Ocean Science Congress 2024. Delivered a lead talk on the topic "Marine Biodiversity and Ocean Ecosystem" in Chennai, 27-29 February 2024
- Interactive meeting with Padma Sri Dr. S. Ayyappan, former DG, ICAR and Secretary, DARE, CMFRI, Kochi, 11 March 2024
- Meeting in connection with the celebration of International Women's Day with the theme "Inspiring Inclusion", ICAR-CMFRI, Kochi, 12 March 2024
- Interaction meeting with Prof. V. K. Ramachandran, Vice Chairperson, Kerala State Planning Board, ICAR-CMFRI, Kochi, 15 March 2024
- Interactive meeting with the Ministry of Earth Sciences-World Bank joint study on Blue Economy pathways-Meeting-Mission members with ICAR-CMFRI and ICAR-CIFT, 21 March 2024
- Interaction meeting with Dr. B. P. Mohanthy, ADG (Inland Fisheries), ICAR, ICAR-CMFRI, Kochi, 29 April 2024
- World Environment Day celebration at National Institute of Fisheries Post-Harvest Technology and Training (NIFPHATT), Kochi, as Chief Guest and delivered a keynote address entitled "Marine Biodiversity and Ocean Ecosystem: Sustainable use for Nutritional Security," 05 June 2024
- Meeting and signing of MoU, INCOIS, Hyderabad, 12 June 2024
- Visited and delivered a project presentation at NRSC, Hyderabad, 13-14 June 2024
- Annual General Body Meeting of the Marine Biological Association of India, ICAR-CMFRI, Kochi, 24 July 2024
- Meeting to discuss preparation for the 13th meeting of the IOTC Technical Committee on Allocation Criteria (TCAC) under the chairmanship of Joint Secretary (M. Fy.), DoF, Government of India (Online), 01 August 2024
- 2nd round of Review meetings of ICAR Institutes (Online), 01 August 2024
- Executive Council of the Marine Biological Association meeting' of India (MBAI) with Director, ICAR-CMFRI as President, ICAR-CMFRI, Kochi, 05 August 2024
- Meeting with M/s. Finley Marine Products, Kovilpatti, Thoothukudi District, Tamil Nadu, regarding Fishery Improvement Project (FIP) for lesser sardines by engaging the certification, London, UK (Online), 07 August 2024
- Meeting on New initiatives in Agricultural Education, and talk by Dr. R C Agrawal, DDG Education, ICAR and chaired by DG, ICAR, 10 August 2024
- Meeting on 31st Swadeshi Science Congress organised by ICAR-CIFT, Kochi (Online), 12 August 2024
- Meeting to discuss the Innovative Projects (innovation and innovative projects/activities and technology demonstration, including start-up incubators and pilot projects), NFDB, Hyderabad, 13 August 2024
- Meeting with Chairman, MPEDA, Shri Dodda Venkata Swamy, IAS, in MPEDA, Kochi, 14 August 2024
- Meeting with Dr. G. V. M. Gupta, Director, CMLRE, Kochi, 16 August 2024
- Inauguration of the tree planting campaign as part of the Global Campaign on 'plant4mother' at ICAR-CMFRI, Kochi, CMFRI residential quarters campus and KVK, Narakkal, 20 August 2024
- 3rd meeting of the Central Committee of Climate Resilient Coastal Fishermen

Village (CCCRCFV) for implementation of Climate Resilient Coastal Fishermen Villages under PMMSY, chaired by Fisheries Development Commissioner, MoFAH&D (Online), 22 August 2024

- Meeting with officials of Omega Fishmeal and Oil Pvt. Ltd., Ratnagiri (Online), 22 August 2024.
- 8th National Youth Convention on "New Perspectives for Sustainable Agriculture and Livelihood Security (NYC-NPSALS), jointly organised by ICAR and AIASA (Online), 23 August 2024.
- Keynote speaker for Technical Session VI on the topic "Technology Intervention for Ensuring Fisheries Production".
- XXVII Meeting of ICAR Regional Committee (Zone II) comprising the States of West Bengal, Odisha, Telangana, Andhra Pradesh and the Union Territory of Andaman & Nicobar Islands (Online), 23 August 2024
- Meeting in connection with the visit of Prof. S. P. Singh Baghel, Hon'ble Minister of State, MoFAH&D, to ICAR-CMFRI, Kochi, 25 August 2024
- International Workshop on "Conservation of Marine Mammals and Turtles: Experience Sharing on Meeting Trade Obligations by the Bay of Bengal Rim Countries" organised by BOBP-IGO in collaboration with ICAR-CMFRI and MPEDA, Chennai, 27-28 August 2024
- Expert Committee meeting for review of DST-funded projects supported under SCSP and TSP, ICAR-CMFRI, Kochi, 29-30 August 2024
- Chief Guest for the Inaugural function of the Hands-on training programme on "Estimation of Ecological Parameters in Inland Open Water Bodies, ICAR-CIFRI, Kochi, 02 September 2024
- Inauguration of National Seminar on "Aqua Food Excellence: Innovations in Post-Harvest Fisheries" by Shri P. Rajeeve, Hon'ble Minister for Law, Industries and Coir, Government of Kerala, jointly organised by ICAR-CIFT and Society of Fisheries Technologists (India), ICAR-CIFT, Kochi, 02 September 2024
- Launch of the XVII ASC brochure, logo, and official website of the XVII Agricultural Science Congress (XVII ASC), organised by NAAS in collaboration with the GB Pant University of Agriculture and Technology (GBPUA&T) at Pantnagar, Uttarakhand. (Online), 04 September 2024
- Meeting of the Sub-Committee to discuss and finalise the revised proposal by ICAR-CMFRI for conducting the Marine Fisheries Census 2024-2025 under the Co-Chairpersonship of the Joint Secretary (Marine Fisheries) and Joint Secretary (Inland Fisheries) (Online), 04 September 2024
- 19th IMC meeting of ICAR-CMFRI, Kochi, 06 September 2024
- Meeting with Ms. Aditya Rithvik Narra, Managing Director, Smartgreen Aquaculture, regarding testing of prototype Sea Cage "OceanGlobe" (Online), 09 September 2024
- Meeting with Prof. Venugopala, Emeritus Professor at Trans-Disciplinary University Yelahanka, Bengaluru, currently Scientific Counsellor of ICOMOS India (International Council on Monuments and Sites), one of the 3 advisory bodies to UNESCO on World Heritage, Maharaja's College, Kochi, 10 September 2024
- Meeting with National Accreditation Board for Testing and Calibration Laboratories (NABL), 10 September 2024
- 4th Anniversary of Pradhan Mantri Matsya Sampada Yojana (PMMSY) organised by DoF, Government of India, 11 September 2024
- Meeting on 'Swachhta Hi Sewa 2024', chaired by DG, ICAR with all DDGs, ADGs, Directors of ICAR Institutes and Nodal officers of ICAR/DARE (Online), 11 September 2024
- Meeting chaired by Secretary, DoF, Government of India to discuss and to oversee the implementation of Voluntary Carbon Market (VCM) in Fisheries Sector (Online), 18 September 2024
- Meeting to discuss the text of the agenda item of the CoP 16 to the CBD, titled "Marine and Coastal" under the Chairmanship of Shri Tanmay Kumar, Special Secretary, MoEF&CC, New Delhi, 19 September 2024
- Brainstorming Session on "Cellular Fish Meat Production: Prospects and Challenges" organised by NAAS, New Delhi, 20 September 2024
- Meeting with Seaweed Association of India (SAI) to discuss on promoting seaweed farming (Online), 23 September 2024
- PMSSY Project Review Meeting by DDG (Fy.) (Online), 23 September 2024
- 4th meeting of Technical Advisory Committee for promotion and development of seaweed farming, conducted by DoF, Government of India (Online), 24 September 2024
- Lecture Series "Matsya Manthan" on Latest technology applications for fisheries and aquaculture, organised by the DoF, Government of India (Online), 25 September 2024
- Meeting in connection with the visit of Shri George Kurian, Hon'ble Minister of State for Fisheries, Animal Husbandry and Dairying and Minority Affairs, Government of India to ICAR-CMFRI, Kochi, 26 September 2024
- Meeting in connection with the signing of MoU with Plan@Earth, at ICAR-CMFRI, Kochi, 03 October 2024
- Meeting on marine litter management, chaired by Shri Tanmay Kumar, Special Secretary, MoEFCC hosted by MOEFCC (Online), 07 October 2024
- Meeting with Shri Sheikh Pareeth, IAS, Managing Director, Kerala State Coastal Area Development Corporation (KSCADC), regarding the Tamil Nadu Artificial Reef project, ICAR-CMFRI, Kochi, 08 October 2024
- Meeting with Mr. Jitendra Soni, Zonal Manager, Garware Technical Fibres Ltd., Pune, at ICAR-CMFRI, Kochi, 08 October 2024
- First meeting of the Inter-Ministerial Committee for proposing suitable amendments in the 'Maritime Zone of India (Regulation of fishing by Foreign Vessels) Act, 1981' under the chairpersonship of Joint Secretary (Marine Fisheries), DoF, Government of India (Online), 09 October 2024
- Meeting to discuss the fisheries credit-related issues chaired by Secy., DoF, Government of India (Online), 09 October 2024

- Meeting regarding promotion of sea cage culture in coastal States under the Chairpersonship of Joint Secretary (Marine Fisheries), DoF, Government of India (Online), 11 October 2024
- Virtual meeting on "Future Agriculture – Seaweed Development Gujarat Perspective" organised by NCCSD-India with Dr. V. K. Saraswat, Hon'ble Member, NITI Aayog (), 11 October 2024
- Meeting to discuss progress on development of 100 Coastal Fishermen Villages as Climate Resilient Coastal Fishermen Villages (CRCFV) under the Pradhan Mantri Matsya Sampada Yojana (PMMSY), chaired by the Secretary, DoF, Government of India (Online), 11 October 2024
- Consultation meeting to discuss modalities of the upcoming 6th Meeting of India-Sri Lanka Joint Working Group on Fisheries (Online), 14 October 2024
- Delivered lecture on "Satellite Remote Sensing for Sustainable Marine Fisheries Management", for NRSC CSSTEAP Course on Satellite Remote Sensing for Ocean Applications, NRSC, Hyderabad, 16 October 2024
- Student-Scientist Interface meeting on the occasion of International Sawfish Day, ICAR-CMFRI, Kochi, 17 October 2024
- Meeting in connection with the visit of Shri Rajeeve P., Minister for Law, Industries and Coir, Government of Kerala, ICAR-CMFRI, Kochi, 21 October 2024
- Meeting in connection with the signing of MoU with Amala Eco Clean Lab and ICAR-CMFRI for Black Soldier Fly feed, ICAR-CMFRI, Kochi, 22 October 2024
- Served as a panellist in the Climate Smart Agriculture Workshop organised by Chanakya University, Bengaluru, 24 October 2024
- 6th meeting of the Joint Working Group (JWG) on Fisheries between India and Sri Lanka, in Sri Lanka, 29 October 2024
- Inauguration of Blue Pearl Fish Farmers Producer Company Ltd. by Shri George Kurian, Hon'ble Minister of State for Fisheries, Animal Husbandry and Dairying and Minority Affairs, Government of India, Kodungallur, 01 November 2024
- 31st Swadeshi Science Congress jointly organised by the Swadeshi Science Movement Kerala and ICAR-CIFT, Kochi. Delivered a lead talk in the "Ocean Sciences" session, 08 November 2024.
- Panel discussion on "Approaches and Strategies to Achieve Net Zero Emissions", ICAR-CIFT, Kochi, 09 November 2024
- Investors Meet organised by DoF, GoI at CARI, Port Blair, 14 November 2024
- International workshop on "Perspectives, Opportunities and Challenges in Fisheries Sciences in a Changing Climate: A Workshop for Emerging Scientists" organised by KSN University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka. Delivered a Lead Talk on "Impacts of climate change on marine fisheries resources and adaptation strategies", 19 November 2024
- Coco Fest-2024 jointly organised by KVK, Lakshadweep, ICAR-CMFRI and Kavaratti Island Coconut Farmers Producer Cooperative Society, Kavaratti, Lakshadweep, 20-22 November 2024
- Inauguration of Indo-German Science and Technology Centre (IGSTC) Workshop on "Challenges and New Opportunities in Vaccine Development for Aquaculture" (IMAQUAVAC-2024) organised by CUSAT, Kochi, 27 November 2024
- Meeting in connection with the visit of Dr. J. K. Jena, DDG (Fy.) ICAR-CMFRI, Kochi, 27 November 2024
- Signing of MoU with Shri Sheik Pareeth, IAS, Managing Director, Kerala State Coastal Area Development Corporation (KSCADC), Trivandrum, regarding Tamil Nadu Reef project, ICAR-CMFRI, Kochi, 06 December 2024
- Meeting on "Exploring Avenues for Establishment of a Marine Ornamental Fish Breeding Unit" in the A&N Islands, chaired by the Director of Fisheries, Andaman (Online), 09 December 2024
- Brainstorming session on IUCN Red Listing of Species, followed by training organised by ZSI and Botanical Survey of India (BSI) under the Ministry of Environment, Central National Herbarium (CNS), Botanical Survey of India, Howrah, Kolkata, 11 December 2024
- Interactive Workshop on Stock Assessment Continuum Tool organised by ICAR-CMFRI, Kochi (Online), 12 December 2024
- Attended an online talk on "Best Practices for Project Formulation" delivered by Dr. Himanshu Pathak, Secretary, DARE and Director General, ICAR, 16 December 2024.
- Meeting on Carbon footprint, Carbon credits and Carbon trade in Fisheries and Aquaculture, under the Chairmanship of Secretary (Fisheries), DoF. Government of India through Video Conferencing, 16 December 2024
- Meeting to discuss the issues pertaining to the submission of Fishery Statistics (2023) to IOTC, 16 December 2024
- Inaugural session of the Regional Expert Consultation meeting on "Resilient Strategies for Aquaculture and Fisheries to Face Extreme Weather Shocks in the SAARC Member States", Delivered keynote address entitled "Adaptation strategies for sustainable aquaculture and fisheries under changing climate scenario in South Asia" (Online), 17 December 2024
- Second Half yearly meeting of Kochi TOLIC for the year 2024-25 under the chairmanship of Principal Chief Commissioner of Income Tax (C-DOT Meet) (Online), 17 December 2024
- Interaction meeting with ICAR-NRCB, Trichy, for discussions on potential collaboration opportunities on seaweed micropropagation and strain improvement, 19 December 2024
- Brainstorming Session on "Climate Adaptive Conservation of Aquatic Genetic Resources" organised by NAAS under the Chairmanship of Dr. Himanshu Pathak, President, NAAS (Online), 20 December 2024
- One-day National Workshop on Mariculture Policy Framework, NFDB, Hyderabad, 23 December 2024

Abdul Azeez, P.

- Training on Stock assessment and management organised by Overseas Fishery Cooperation Foundation (OFCF) of Japan, 16 January to 22 February 2024

- Meeting under the Chairmanship of the Secretary (Fy), DoF, Government of India, to discuss the agenda for the 28th Session of the IOTC meeting scheduled during 13-17 May 2024 at Bangkok, Thailand including the proposed stand of the Indian Delegation on the CMM proposals (Online), 10 May 2024
- Meeting under Chairmanship of Joint Secretary, DoF, Government of India, regarding Annual Action Plan under PMMSY for 2024-25 of Andaman & Nicobar and Lakshadweep islands (Online), 03 July 2024
- IOTC Working Party meeting on Ecosystem and Bycatch (WPEB) (Online), 09-13 September 2024
- IOTC 15th Working Party meeting on Methods (WPM15) (Online), 24-26 October 2024
- NFDB-PMSSY meeting on implementation of various activities such as cluster approach–ornamental fisheries, pearl culture, seaweed culture, aqua crop insurance, certification and cooperatives (Online), 30 October 2024

Abdul Azeez, P., Abdussamad, E. M., Akhilesh, K. V., Anuja, A. R., Anulekshmi, C., Asha, P. S., Bindu Sulochanan, Chandrasekar, S., Divya Viswambharan, Eldho Varghese, Ganga, U., Jayasankar, J., Livi Wilson, Mahesh, V., Manas H. M., Margaret A. M. R., Miriam Paul Sreeram, Muktha, M., Najmudeen, T. M., Nakhawa Ajay, D., Pralaya Ranjan Behera, Prema, D., Purushottama G. B., Rajesh K. M., Raju, S. S., Ramkumar, S., Ramya Abhijith, Remya L., Ranjith, L., Ratheeshkumar, R., Rekha J. Nair, Sanal Ebeneezar, Sandhya Sukumaran, Saravanan, R., Shelton Padua, Shikha Rahangadale, Shoba Joe Kizhakudan, Sobhana, K. S., Sreenath, K. R., Subal Kumar Roul, Sujitha Thomas, Suresh, V. V. R., Surya S., Swatipriyanka Sen Dash, Thirumalaiselvan, S., Vaisakh, G., Vinod, K. and Vinothkumar, R.

- Brainstorming on Challenges and Opportunities for Sustainable Development of Marine Fisheries in India (Online), ICAR-CMFRI, Kochi, 21 November 2024

Abdul Azeez, P., Ambarish Gop, P., Divu, D. and Johnson, B.

- Virtual meeting on development of Ornamental Fisheries Cluster at Madurai, Seaweed Cluster in Lakshadweep and Tuna Fisheries cluster in Andaman and Nicobar Islands under the Chairpersonship of Joint Secretary (Marine Fisheries), DoF, Government of India, 11 December 2024

Abdul Azeez, P., Divu, D., Jayasankar, J. and Johnson, B.

- Meeting under the Chairmanship of the Secretary, Department of Fisheries, with all the ICAR Fisheries Research Institutes on Five Action Points under PMMSY for 2024-25 (Online), 10 May 2024
- Mmeeting on Production and Processing Clusters in the Fisheries Sector under the Chairmanship of Secretary DoF, Government of India (Online), 14 August 2024

Abdul Azeez, P., Divu, D. and Johnson, B.

- Meeting on Cluster Development at Hazaribagh, Madurai and Lakshadweep under the Chairmanship of Secretary DoF, Government of India (Online), 13 September 2024
- Meeting on development of Seaweed Cluster at Lakshadweep under the Chairmanship of Secretary DoF, Government of India, 16 October 2024
- Review meeting of Seaweed Park in Tamil Nadu under the chairmanship of Secretary, DoF, Government of India, 27 November 2024
- Meeting to discuss the formation of FFPOs/FCS for Seaweeds in Tamil Nadu under the chairmanship of the Chief Executive, NFDB (Online), 29 November 2024
- Meeting under Chairpersonship of Secretary, DoF, Government of India, to discuss the status of fisheries Clusters notified under the PMMSY, 12 December 2024

Abdul Azeez, P., Eldho Varghese, Jayasankar, J. and Johnson, B.

- Meeting with Secretary (Fy) on Lakshadweep & Andaman Nicobar Islands as a cluster hub and other issue through Video Conferencing (Online), 17 May 2024

Abdul Azeez, P., Eldho Varghese, Jayasankar, J., Mini, K. G., Muktha, M. and Somy Kuriakose

- IOTC 20th Working Party on Data Collection and Statistics (WPDCS20) (Online), 26-30 November 2024

Abdul Azeez, P., Eldho Varghese, Jayasankar, J., Muktha, M., Shoba Joe Kizhakudan and Surya, S.

- 28th Session of the IOTC (Online), 13-17 May 2024

Abdul Azeez, P., Jayasankar, J., Manas, H. M., Mini, K. G., Rajesh, K. M. and Surya, S.

- IOTC 26th Working Party meeting on Tropical Tunas (WPTT) (Online), 28 October–02 November 2024

Abdul Azeez P., Divu, D., Johnson, B., Sobhana, K. S. and Suresh, V. V. R.

- Meeting convened by NFDB to discuss on the Scope of work to be included in the Request For Proposal (RFP) to undertake GAP Analysis for formation of Lakshadweep Seaweed Cluster (Online), 01 November 2024.

Abdul Azeez, P., Johnson, B. and Sreenath, K. R.

- Meeting to review the progress on Seaweed Projects in Lakshadweep, Gujarat and Andaman & Nicobar Islands under the Chairmanship of Joint Secretary (Marine Fisheries), DoF, Government of India (Online), 05 June 2024

Abdul Azeez, P., Manas, H. M., Surya, S. and Vinothkumar, R.

- IOTC Working Party meeting on Billfish (WPB) (Online), 04-07 September 2024

Abdul Azeez, P., Muktha, M. and Shoba Joe Kizhakudan

- IOTC 27th Scientific Committee (SC) meeting (Online), 02-06 December 2024

Abdul Azeez, P. and Sreenath, K. R.

- Online workshop and drone demonstration, chaired by Shri Rajiv Ranjan Singh Ji, Hon'ble Union Minister, MoFAH&D, 19 October 2024

Abdul Azeez, P. and Surya S.

- IOTC 14th Working Party meeting on Neritic Tunas (WPNT14) (Online), 08-12 July 2024
- IOTC 6th Working Group meeting on FADs (WGFAD), 01-04 October 2024

Abdussamad, E. M.

- State Fisheries Management Council (SFMC) meeting, Thiruvananthapuram, Kerala, 09 January 2024
- State Fisheries Management Council (SFMC) meeting, Thiruvananthapuram, Kerala, 06 December 2024

Abdussamad E. M., Ganga U., Livi Wilson, Mahesh, V., Najmudeen T. M., Remya L., Shelton Padua and Shoba Joe Kizhakudan

- International Sawfish Day Programme at ICAR-CMFRI, Kochi, 17 October 2024

Abdussamad, E. M., Akhilesh, K. V., Anulekshmi, C., Ganga, U., Kalidas, C., Livi Wilson, Mahesh, V., Manas, H. M., Margaret, A. M. R., Muktha, M., Najmudeen, T. M., Nakhawa Ajay, D., Purushottama, G. B., Rajesh, K. M., Remya, L., Shikha Rahangadale, Shoba Joe Kizhakudan, Subal Kumar Roul, Sujitha Thomas, Surya, S., Swatipriyanka Sen Dash and Vinothkumar, R.

- Online Brainstorming Session on Non-Conventional resources organised by the ICAR-CMFRI, Kochi, 14 August 2024

Abdussamad E.M., Geetha Sasikumar, Lakshmi Pillai, S., Najmudeen, T. M., Rekha Devi Chakraborty and Vidya, R.

- SEAI Stakeholder Meeting at Hotel Casino, Willingdon Island, Kochi, 28 August 2024

Adnan Hussain Gora, Chandrasekar, S., Eldho Varghese, Johnson, B., Kajal Chakraborty, Miriam Paul Sreeram, Shinoj, P., Saima Rehman, Sanal Ebeneezar and Sreenath, K. R.

- Served as Resource persons for the ICAR-sponsored winter school, Harnessing recent advances in high-value compound development and seaweed biomass utilization for human well-being: Propelling Atmanirbhar Swastha Bharat and Empowering farmers, ICAR-CMFRI, Kochi, 15 February–06 March 2024

Ajay D. Nakhawa

- National Conference on Mangrove, Biodiversity and Environment Conservation, 24 July 2024

Ajay D. Nakhawa, Akhilesh K. V., Livi Wilson, Mahesh V., Muktha M., Najmudeen T. M., Purushottama G. B., Remya L., Shikha Rahangdale, Shoba Joe Kizhakudan, Subal Kumar Roul, Sujitha Thomas and Swatipriyanka Sen Dash

- Online International workshop on Important Shark and Ray Areas for Asia hosted by the IUCN from Bali, Indonesia, 22-25 January 2024

Akhilesh, K. V. and Anulekshmi, C.

- Meeting with the Hon. Minister of Forests, Govt of Kerala for Puthiyappa Fishing Village development at Kozhikode, 07 September 2024
- District PMMSY programme meetings at Kozhikode, 17 July 2024 and 06 December 2024

Akhilesh, K. V., Ganga, U., Livi Wilson, Mahesh, V., Najmudeen, T. M., Purushottama, G. B., Rajesh, K.M., Remya, L., Shikha Rahangdale, Shoba Joe Kizhakudan and Sujitha Thomas

- Workshop on sustainable harvest and utilisation of mesopelagic fishes organised by the Mangalore Regional Centre of ICAR- CMFRI Mangalore (Hybrid mode), 24 May 2024

Akhilesh, K. V., Livi Wilson, Muktha, M., Najmudeen, T. M., Purushottama, G. B., Remya, L., Shoba Joe Kizhakudan and Sujitha Thomas

- India-Oman Interactive Workshop for Capacity Building on Elasmobranch Taxonomy, Fisheries Management and Conservation at ICAR-CMFRI Kochi, 13-22 May 2024

Ambarish Gop, P.

- Fisheries Management Council meeting, Kollam District, 14 March 2024
- Meetings in connection with Establishing Oceanarium and Marine biological museum at Kollam, 10 May 2024, 22 June 2024, 19 July 2024, 09 October 2024 and 24 September 2024
- Expert committee meeting to evaluate the present status of Nucleus breeding centres in India, 15 July 2024
- Meeting in connection with Exploring avenues for establishment of marine ornamental fish hatchery at Andaman & Nicobar Islands, 09 December 2024

Ambarish Gop, P. and Anuraj, A.

- Workshop on Generative AI tools for Agriculture (Online), 26-28 June 2024

Ambarish Gop, P., Anuraj, A., Anuja, A. R., Jayasankar, J., Jeena, N. S., Miriam Paul Sreeram, Ramkumar, S., Ranjith, L., Ratheeshkumar, R., Rekha J. Nair, Remya, L., Shelton Padua, Shyam S. Salim, Sobhana, K. S., Sreenath K. R., Vidya, R. and Vinod, K.

- International Fisheries Congress and Expo 2024, organised by Kerala University of Fisheries and Ocean Studies (KUFOS) and College of Fisheries Panangad Alumni Association (COFPAA), Panangad, Kochi, 12-14 January 2024

Ambarish Gop, P. and Divu, D.

- Meeting on the promotion of sea cage culture in coastal states, chaired by the Joint Secretary (Marine Fisheries), DoF, Government of India (Online), 14 October 2024

Anikuttan, K. K.

- Coco Fest–2024 held at Kavaratti, Lakshadweep, 20-22 November 2024
- Invited talk during the special session to commemorate World Fisheries Day organised by KVK Lakshadweep at Kavaratti, 21 November 2024

Anikuttan, K. K. and Sakthivel, M.

- Second Fisheries Summer Meet 2024 Madurai, 12 July 2024

Anil, M. K.

- Expert Committee meeting of Vizhinjam International Seaport Limited, 06 September 2024
- Board of Studies Meeting, KUFOS, Panangad, 18 November 2024

Anuja, A. R.

- Training programme on Smart ways to use AI tools for teaching, Kerala Veterinary and Animal Sciences University (Online), 08 February 2024
- Kochi Corporation Cultural Policy Meeting convened by Hon'ble Mayor, 14 October 2024
- Pre-Budget discussion 2025-26 with the Hon'ble Finance Minister of Kerala, 06 December 2024

Anuja, A. R., Aswathy, N. and Shyam S Salim

- Stakeholders Consultation Meet on 'Transforming Agriculture Research (TAR)- Enhancing role of private sector' organised by the Ministry of Agriculture and Farmers Welfare (Online), 03 September 2024

Anuja, A. R., Aswathy, N., Chandrasekar, S., Jayasankar, J., Miriam Paul Sreeram, Prema, D., Raju, S. S., Ratheeshkumar, R., Rekha J. Nair, Reshma Gills, Sanal Ebeneezar, Shelton Padua and Sobhana, K. S.

- One-day workshop on "Drone application in Fisheries and drone demonstration" jointly organised by NFDB, ICAR-CMFRI and NFDB, MoFAH&D at CMFRI, Kochi, which was graced by the presence of Shri George Kurian, Hon'ble Minister of State for Fisheries, Animal Husbandry & Dairying and Minority Affairs, Government of India, 08 November 2024

Anuja, A. R., Asha P. S., Bindu Sulochanan, Chandrasekar, S., Dineshbabu, A. P., Divya Viswambharan, Eldho Varghese, Jayasankar, J., Josileen Jose, Lakshmi Pillai, S., Livi Wilson, Miriam Paul Sreeram, Najmudeen, T. M., Pralaya Ranjan Behera, Prema, D., Ramkumar, S., Ramya Abhijith, Ranjith, L., Ratheeshkumar, R., Rekha Devi Chakraborty, Rekha J. Nair, Reshma Gills, Saravanan, R., Shelton Padua, Shinoj, P., Shoba Joe Kizhakudan, Sanal Ebeneezar, Shyam S. Salim, Sobhana, K. S., Sreenath, K. R., Thirumalaiselvan, S., Vaisakh, G., Vidya, R. and Vinod, K.

- Workshop on "Harnessing Potential of Fisheries in Marine States" jointly organised by the NITI Aayog, DoF, MoFAH&D, New Delhi and ICAR-CMFRI, Kochi, 05 January 2024

Anuja, A. R., Jayasankar, J. and Reshma Gills

- Meeting on Corpus Fund and Ecoregional Working Group Programme for Coastal Agro-ecosystems, chaired by DDG (Fisheries), ICAR, New Delhi, 12 April 2024

Anuja, A. R. and Jayasankar, J.

- Expert committee review meeting of NASF Labour migration project (Online), 02 February 2024
- Meeting on Ecoregional Working Group Programme–DDG, Fisheries, 12 May 2024
- Meeting with the Economic Advisor, Mr. Gaurav Kumar, IES, at CIFNET, Kochi, 24 May 2024
- BOBP-IGO virtual conclave of BIMSTEC-India Marine Research Network (BIMREN) twinning research partners, 17 September 2024
- NASF project external review meeting, 06 November 2024

Anuja, A. R., Jayasankar, J. and Reshma Gills

- Field visit cum evaluation of DST-STI hub project by the Review committee of Projects supported under the Scheduled Caste Sub Plan (SCSP) and Tribal Sub Plan (TSP), 28 August 2024

Anuja, A. R., Johnson, B. and Reshma Gills

- Webinar on budget para-blue economy organised by the Ministry of Environment, Forest and Climate Change, 11 September 2024

Anuja, A. R. and Reshma Gills

- Farmer-scientist interaction meeting and monitoring of the field trials at Njarakkal for the Integrated Farming System model established under the DST-STI hub project, 01 May 2024
- Farmer scientist interaction meeting and monitoring of the field trials conducted at Aluva under the DST-STI hub project, 09 May 2024

Anuja, A. R., Margaret Muthu Rathinam, A., Purushottama, G. B., Reshma Gills, Raju, S. S and Vinothkumar, R.

- Meeting on Viksit Bharat, convened by Secretary DARE and DG (ICAR) (Online), 16 April 2024

Anulekshmi, C.

- Planning committee meetings in Kozhikode, 30 September 2024, 05 November 2024 and 11 November 2024

Anulekshmi, C., Ganga, U., Geetha Sasikumar, Muktha, M., Santhosh Bhendekar and Shoba Joe Kizhakudan

- FAO Regional Workshop on State of Stocks (SOS) Analysis for Area 51: Transparent Assessment Framework hosted by the BOBP-IGO at Kochi, 15-19 April 2024.

Anuraj, A.

- Training programme on Advances in mobile application development, 09-12 July 2024

Anuraj, A., Jeena, N. S., Livi Wilson and Kajal Chakraborty

- International Conference on Frontiers in Marine Sciences (MARICON-2024) organised by CUSAT, NCPOR and INSA-SCAR at the School of Marine Sciences, CUSAT, Kochi, 08-10 April 2024

Anuraj, A., Ratheeshkumar, R., Remya, L. and Sumithra, T. G.

- 31st Swadeshi Science Congress Jointly organised by the Swadeshi Science Movement Kerala and ICAR-CIFT, Kochi, 07-09 November 2024

Asha, P. S

- National Workshop on "Livelihood Opportunities and community-based

sustainable Tourism potential in Mangrove areas", jointly organised by Kerala Forest Department and Kerala Forest Research Institute, Thiruvananthapuram, 11 September 2024

- Orientation meeting on the project "Monitoring of Damaged Marine Ecosystems in Trivandrum Coast (2024-25), organised by Kerala State Biodiversity Board, Thiruvananthapuram, 20 November 2024

Asha, P. S., Ranjith, L. and Saravanan, R.

- Awareness programme on Jellyfish Sting Management and First Aid Procedure for Sagar Mitras, fishermen and officials from Tiruchendur Subramania Swamy temple, Tuticorin RS of CMFRI, 19 July 2024

Asha P. S., Bindu Sulochanan, Divya Viswambharan, Kalidas, C., Margaret Muthu Rathinam, A., Miriam Paul Sreeram, Pralaya Ranjan Behera, Prema, D., Purushottama, G. B., Raju, S. S, Ramkumar, S., Ramya Abhijith, Ranjith, L., Ratheeshkumar, R., Rekha J. Nair, Saravanan, R., Shelton Padua, Sobhana, K. S., Sreenath, K. R., Thirumalaiselvan, S., Vaisakh, G. and Vinod, K.

- Meeting on Viksit Bharat, 2047, Chaired by DDG, Horticultural Science, ICAR (Online), 02 May 2024

Asha, P. S., Bindu Sulochanan, Divya Viswambharan, Kalidas, C., Margaret Muthu Rathinam, A., Miriam Paul Sreeram, Pralaya Ranjan Behera, Prema, D., Ramkumar, S., Ramya Abhijith, Ranjith, L., Ratheeshkumar, R., Rekha J. Nair, Saravanan, R., Shelton Padua, Sobhana, K. S., Sreenath, K. R., Thirumalaiselvan, S., Vaisakh, G. and Vinod, K.

- Tree plantation drives undertaken at ICAR-CMFRI, Kochi, Regional Centres and Regional Stations as part of the Plant4Mother campaign of the Ministry of Agriculture and Farmers' Welfare, Government of India, 20 August and 17 September 2024

Asha P. S., Bindu Sulochanan, Divya Viswambharan, Miriam Paul Sreeram, Pralaya Ranjan Behera, Prema, D., Raju, S. S, Ramkumar, S., Ramya Abhijith, Ranjith, L., Ratheeshkumar, R., Rekha J. Nair, Saravanan, R., Shelton Padua, Sobhana, K. S., Sreenath, K. R., Thirumalaiselvan, S., Vaisakh, G. and Vinod, K.

- Meeting on Viksit Bharat, 2047, Chaired by DDG (Fy.), ICAR , 30 May 2024.
- Second Round Review Meeting of ICAR Institutes (Online), 02 August 2024
- Special lecture on "Toxic waters, toxic outcomes: The ripple effect of ocean health on human health" delivered by Dr. Neel Aluru, Woods Hole Oceanographic Institution, USA, ICAR-CMFRI, Kochi (Hybrid mode), 05 November 2024

Asha, P. S., Bindu Sulochanan, Dineshbabu, A. P., Divya Viswambharan, Miriam Paul Sreeram, Pralaya Ranjan Behera, Prema, D., Ramkumar, S., Ramya Abhijith, Ranjith, L., Ratheeshkumar, R., Rekha J. Nair, Saravanan, R., Shelton Padua, Sobhana, K. S., Sreenath, K. R., Thirumalaiselvan, S., Vaisakh, G. and Vinod, K.

- Launch programme of Online Jellyfish Outreach competitions (Jellyfish quiz, Jellyart and Jellyfish photography), in connection with the World Jellyfish Day organised by the MBEM Division (Hybrid mode), 30 October 2024
- Brainstorming on Fishery resources for fishmeal and Fishery Improvement programmes to meet the requirements for certification of fish meal exports from India, ICAR-MFRI, Kochi (Online), 19 November 2024

Asha, P.S., Bindu Sulochanan, Divya Viswambharan, Miriam Paul Sreeram, Pralaya Ranjan Behera, Prema, D., Ramkumar, S., Ramya Abhijith, Ranjith, L., Ratheeshkumar, R., Rekha J. Nair, Saravanan, R., Shelton Padua, Sobhana, K.S., Sreenath, K.R., Thirumalaiselvan, S., Vaisakh, G. and Vinod, K.

- Served as Resource persons for the training programme "Know your Marine Biodiversity and Environment (MarBiE 1)", organised by the MBEM Division, ICAR-CMFRI, Kochi, 05-09 February 2024
- Served as Resource persons for the training programme "Know Your Marine Biodiversity and Environment (MarBiE 2): Taxonomy of Marine Organisms", organised by the MBEM Division, ICAR-CMFRI, Kochi, 13-17 May 2024
- International Day for Biodiversity (IDB 2024) Celebrations, 21 May 2024
- Lecture Series "Matsya Manthan", 5th Meeting on latest technology applications for Fisheries and Aquaculture, with Barifilo Labs Pvt Limited (Online), 05 June 2024
- Beach clean-up programmes organised in connection with World Ocean Day 2024, at Kochi Hq., Regional Centres and Regional Stations of ICAR-CMFRI, 07 June 2024
- Special lecture on "Preventive Vigilance" held in connection with Vigilance Awareness Campaign (Hybrid mode), 04 October 2024
- Launch programme of Online Jellyfish Outreach competitions (Jellyfish quiz, Jellyart and Jellyfish photography), in connection with the World Jellyfish Day organised by the MBEM Division (Hybrid mode), 30 October 2024
- Served as Resource persons for the training programme "Know your Marine Biodiversity and Environment
- (MarBiE 3): Water and Sediment Analytical Techniques with Special Reference to Marine Life" organised by the MBEM Division, ICAR-CMFRI, Kochi, 25-29 November 2024
- NAAS brainstorming on Climate adaptation (Online), 20 December 2024

Asha, P. S., Aswathy, N., Bindu Sulochanan, Charles Jeeva, J., Divya Viswambharan, Miriam Paul Sreeram, Pralaya Ranjan Behera, Prema, D., Raju, S. S., Ramkumar, S., Ramya Abhijith, Ranjith, L., Ratheeshkumar, R., Rekha J. Nair, Saravanan, R., Shelton Padua, Sobhana, K. S., Sreenath, K. R., Thirumalaiselvan, S., Vaisakh, G., Vinaya Kumar Vase and Vinod, K.

- Online talk on "Best Practices for Project Formulation" by Dr Himanshu Pathak, Secretary DARE and DG, ICAR, 16 December 2024.

Aswathy, N.

- Workshop on Integrating gender into fisheries and aquaculture economics

and trade research, World Fish Centre, Malaysia, 15 July 2024

- Meeting on '*Swachhta Hi Sewa* 2024' convened by DG, ICAR (Online), 11 September 2024
- Workshop on Advanced technologies for waste management as part of the *Swachhta Pakhwada* 2024 campaign, 20 December 2024

Aswathy, N., Ganga, U., Livi Wilson, Remya, L., Saravanan, R., Sobhana, K. S., Sreenath, K. R. and Vinothkumar, R.

- "Editor's Workshop: Enabling a research ecosystem", organised by Education Division of ICAR (Online), 24 September 2024

Aswathy, N., Jayasankar, J., Johnson, B. Mini, K. G., Najmudeen, T. M., Narayana Kumar, R., Prema, D., Shelton Padua, Sobhana, K. S. and Somy Kuriakose

- Brainstorming Session on Marine Heat Waves, ICAR-CMFRI, Kochi, 09 May 2024

Aswathy, N. and Jayasankar, J.

- MSSRF Webinar by Prof. Madhura Swaminathan on "Rural Women and the Political Economy of Food Systems Transformation in India", 15 December 2024

Aswathy, N., Jayasankar, J. and Reshma Gills

- Lecture by Shiv Prasad Kimothi on Agricultural R&D roadmap during Amrit kal for a developed Bharat, ICAR-CMFRI, Kochi, 20 April 2024

Aswathy, N., Jayasankar, J. and Shinoj, P.

- Regional training programme on "CCRF and EAFM" organised by BoBP under BOB-LME project, ICAR-CMFRI, Kochi, 25 November 2024

Aswathy, N., Shyam S. Salim and Swathi Lekshmi, P. S.

- 21st Biennial Conference, International Institute of Fisheries Economics and Trade (IIFET 2024) organised by WorldFish and the Department of Fisheries, Penang, Malaysia, 15-19 July 2024

Bavithra, R., Johnson, B. and Sobhana, K. S.

- Interaction meeting with ICAR-NRCB, Trichy for discussions on potential collaboration opportunities on seaweed micropropagation and strain improvement, 19 December 2024

Bindu Sulochanan

- Public awareness programme on Ocean Health: Our Actions and Our future, organised by ICAR-CMFRI, NITTE University Centre for Science Education and Research, Mangalore and National Service Scheme, College of Fisheries, Mangalore, 26 January 2024
- Served as resource person for the Coastal Security Police training and delivered a talk on "Marine Environment and Harmful Organisms" at the Office of the Superintendent of Police, Malpe, Udupi, 01 February 2024
- National workshop on exploring the possibilities of harvesting and utilisation of mesopelagic fishes, organised by Mangalore RC of CMFRI and Yashaswi Fish Meal and Oil Company, Udupi, 17 May 2024
- Served as resource person in the Pollution Response seminar/ workshop/mock drill district level stakeholders programme organised by the Coastguard at the Headquarters No. 3, Panambur, Karnataka, 25-26 June 2024
- Awareness campaign on single-use plastics – How to manage? for SCSP farmers from the coastal district of Dakshina Kannda, organised by Mangalore RC of CMFRI, 02 August 2024
- Ocean Literacy Programme, organised by Mangalore RC of CMFRI for Dakshina Kannada Zilla Panchayat Higher Primary School, Bolara and Dakshina Kannada Lower Primary School, Hoige Bazar, 29 August 2024
- Delivered a talk on "Marine litter management" during the International Whale Shark Day celebration at Meenugarara Samudaya Bhavana, Malpe Fishing Harbour, Udupi, organised by Mangalore RC of CMFRI, and Department of Fisheries, Government of Karnataka, 30 August 2024

Bindu Sulochanan, Dineshbabu, A. P., Divu, D., Divya Viswambharan, Imelda Joseph, Joe K. Kizhakudan, Josileen Jose, Kajal Chakraborty, Livi Wilson, Manas, H. M., Purushottama, G. B., Rajesh, K. M., Rajesh, N., Rajkumar M., Ramkumar, S., Ramya Abhijith, Ranjith, L., Santosh Bhendekar, Saravanan, R., Shelton Padua, Shikha Rahangdale, Shilta, M. T., Shoba Joe Kizhakudan, Shyam S. Salim, Sobhana, K. S., Subal Kumar Roul, Swathi Lekshmi, P. S., Swatipriyanka Sen Dash, Thirumalaiselvan, S., Vidya R. and Vinod, K.

- 13th Indian Fisheries and Aquaculture Forum (IFAF): Fostering Indian Fisheries and Aquaculture for Attaining Sustainable Development Goal, ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, 23-25 February 2024

Bindu Sulochanan, Rajesh K. M. and Sujitha Thomas

- Walkathon for a cleaner and Greener India, jointly organised by Mangalore RC of CMFRI, NSS unit of College of Fisheries, Mangalore and Yashaswi Fish Meal and Oil Company, Udupi, 24 September 2024

Charles Jeeva, J., Kalidas, C., Margaret Muthu Rathinam, A., Purushottama, G. B., Rekha J. Nair, Sobhana, K. S. and Sreenath, K. R.

- Webinar on "Energy Efficiency Opportunities in Fisheries Sector" as part of the Lecture Series "Matsya Manthan" on latest technology applications for fisheries and aquaculture hosted by the Department of Fisheries, Government of India, 08 May 2024

Charles Jeeva, J., Rekha J. Nair, Sobhana, K. S. and Sreenath, K. R. and Vinothkumar R.

- Webinar on "Energy Efficiency Opportunities in Fisheries Sector" as part of the Lecture Series "Matsya Manthan" on latest technology applications for fisheries and aquaculture hosted by the Department of Fisheries, Government of India, 07 June 2024

Charles Jeeva, J. and Narayana Kumar, R.

- Matsya Sampada Jagruktha Abhiyan, CIFNET, Chennai, 23 Jan 2024

- Collaborative training programme on "Basic Econometric Tools and Techniques in Data Analytics", Pondicherry, 02 Feb 2024

Dineshbabu, A. P.

- Squid jigging operation and demonstration at Lakshadweep, 07-10 February 2024
- Workshop on Offshore Exploration Synergies and Opportunities (OESO), Mangalore, 15-16 February 2024
- Delivered a talk on "Best farming practices in aquaculture" at the Central University of Kerala, Kasaragod, 29 February 2024
- National Workshop on Climatic Risks and Adaptations in Fisheries, ICAR-CIBA, Chennai, 03-04 May 2024
- Meeting on Carbon credits hosted by the DoF, Government of India, 21 May 2024
- Webinar on the Application of GIS & RS in Fisheries, MANAGE Hyderabad, 30 September 2024
- Meeting convened in connection with the visit of Shri George Kurian, Hon'ble Minister of State, Fisheries, Animal Husbandry and Dairying, 26 September 2024
- Hindi workshop conducted by Rajabhasha Vibhag of ICAR-CMFRI, Kochi, 30 September 2024
- Meeting of the Inter-Ministerial Committee for proposing suitable amendments in the "Maritime Zone of India (Regulation of Fishing by Foreign Vessels) Act, 1981 (Online)", 09 October 2024
- Meeting on "Carbon trading in Fisheries" coordinated by DoF, Government of India, 09 October 2024
- First meeting for "Fishery Management Plans" to finalise the plan of action in the policy document release, 13 November 2024
- Meeting to finalise ICAR-CMFRI programmes under "Transformative R&D Frontier Areas" to be implemented in research institutes in the coming years, 13 November 2024
- Meeting on "Data sharing and data repository of ICAR organisations" coordinated by Director, IASRI, New Delhi (Online), 18 November 2024

Dineshbabu, A.P., Divu, D., Johnson, B. and Swathi Lekshmi, P. S.

- Virtual meeting on "Future Agriculture – Seaweed Development Gujarat Perspective" organised by NCCSD-India with Dr. V. K. Saraswat, Hon'ble Member, NITI Aayog, 11 October 2024

Dineshbabu, A. P., Geetha Sasikumar, Gomathi, P., Gyanaranjan Dash, Jasmine, F., Josileen Jose, Indira Divipala, Kavitha, M., Lakshmi Pillai, S., Anil, M. K., Rajan Kumar, Raj Kumar, M., Rajesh Kumar Pradhan, Rekhadevi Chakraborty, Santosh Bhendekar, Sunil Kumar S. Ail, Venkatesan, V. and Vidya, R., Ajay D. Nakhawa, Anulekshmi, C., Muktha, M., Najmudeen, T. M. and Shikha Rahangdale

- Refresher Training Workshop on Stock Health Assessments of Shellfishes of Indian coast through fishery biology methods conducted online by Shellfish Fisheries Division, ICAR-CMFRI, 05-07 November 2024

Dineshbabu, A. P, Geetha Sasikumar, Gomathi, P., Gyanaranjan Dash, Jasmine, F., Kavitha M., Rajan Kumar, Raj Kumar, M., Rajesh Kumar Pradhan, Santosh Bhendekar, Sunil Kumar S. Ail and Vidya, R.

- Training programme "Hands-on training on Designer Pearl production and possible innovations to enhance its market value" at Vizhinjam RC of CMFRI, 19-22 April 2024

Anil, M. K., Dineshbabu, A. P., Geetha Sasikumar, Gomathi, P., Gyanaranjan Dash, Jasmine, F., Indira Divipala, Josileen Jose, Kavitha, M., Lakshmi Pillai, S., Rajan Kumar, Raj Kumar, M., Rajesh Kumar Pradhan, Rekhadevi Chakraborty, Santosh Bhendekar, Sunil Kumar S. Ail, Venkatesan, V. and Vidya, R.

- Refresher training workshop on Stock Health Assessments of Shellfishes of the Indian coast through fishery biology methods, 05-08 November 2024

Dineshbabu, A. P., Joe K. Kizhakudan, Miriam Paul Sreeram, Prema, D. and Shoba Joe Kizhakudan

- Online talk on the subject "Antimicrobial Resistance: Educate, Advocate, and Act Now" by Dr. Subi Das, 19 November 2024

Dineshbabu, A. P., Joe K. Kizhakudan, Shoba Joe Kizhakudan, Suresh, V. V. R. and Vinod, K.

- Consultation meeting to discuss modalities of the upcoming 6th Meeting of India-Sri Lanka Joint Working Group on Fisheries (Online), 14 October 2024

Dineshbabu, A. P., Najmudeen, T. M. and Shoba Joe Kizhakudan

- Expert Committee meeting for revalidation of potential fishery resources in Indian EEZ, 20 June 2024

Divu, D.

- National Conference on Seaweed Farming at Koteshwar, Kutch, Gujarat, 27 January 2024
- Meeting to discuss proposals regarding the expansion of Seaweed Cultivation and for taking up activities at commercial levels under the chairmanship of the Joint Secretary (Marine), DoF, Government of India (Online), 08 May 2024
- 20th meeting of the Project Monitoring and Evaluation Unit (PMEU)-PMMSY under the chairmanship of Joint Secretary (Marine), DoF, Government of India (Online), 06 August 2024
- Meeting on "Strategy for the Development of Seaweed Value Chain" to encourage KVKs to conduct grassroots-level extension activities (Online), 21 October 2024
- Meeting with Excel Industries and ClimaCrew on Collaboration possibilities with ICAR-CMFRI, Veraval (Online), 22 October 2024
- Consultative meeting on seaweed sector development in Gujarat conducted by ICAR-CMFRI, Veraval Regional Station, in association with Invest India, Ministry of Commerce and Industries, Government of India (Online), 29 October 2024

Divu, D., Johnson, B., Ranjith, L., Sobhana, K. S., Suresh, V. V. R. and Vinod, K.

- Meeting organised on behalf of the Seaweed Association of India (SAI) for the development of the seaweed sector (Online), 23 September 2024.

Divu, D., Johnson, B., Ranjith, L., Sobhana, K. S. and Suresh, V. V. R.

- Meeting with officials from Sea6 Energy to discuss collaboration in Rough Water Seaweed Farming, at CMFRI (Online), Kochi 11 January 2024
- 4th TAC meeting to discuss "Promotion of Seaweed farming and value chain" organised by the DoF, Government of India (Online), 24 September 2024
- Meeting on "Strategy for the Development of Seaweed Value Chain" to discuss involving KVKs to conduct grassroot-level extension activities to raise awareness about seaweed farming among coastal communities (Online), 21 October 2024.

Divu, D., Johnson, B., Sobhana, K. S. and Suresh, V. V. R.

- "India-Philippines Seaweed Stakeholders' Consultation Meeting" organised by MPEDA (Online), 03 October 2024

Divya Viswambharan

- National Workshop on "Standardisation for Environment and Ecology", Organised by BIS, held at Yashobhoomi Convention and Expo Centre, Dwaraka, New Delhi, 12 August 2024
- Workshop on "Industry/Organisation meeting for skilling and development of Human Resources", organised by Government Tool Room and Training Centre, Government of Karnataka at Baikampady, Mangalore, 11 March 2024
- 18th Meeting of CGPB Committee-VI on "Marine Geology and Exploration and Coastal Geoscience" organised by GSI, held at Marine and Coastal Wing of Geological Survey of India, Mangalore, Karnataka, 24 September 2024

Divya Viswambharan, Ratheeshkumar, R. and Sobhana, K. S.

- International workshop on "Perspectives, Opportunities and Challenges in Fisheries Sciences in a Changing Climate: A Workshop for Emerging Scientists" organised by KSN University of Agricultural and Horticultural Sciences, Shimoga, Karnataka, 18-23 November 2024

Eldho Varghese

- Training/ collaborative research at IITB, Mumbai on Computer vision and deep learning algorithms with some applications to marine fisheries under the INSA Visiting Scientist Fellowship for the year 2023-24, 10 January to 15 February 2024
- Workshop on Bayesian Statistics: From Applications to Theory, and From Theory to Applications, jointly organised by SSCA and the Banasthali University, 23 February 2024
- 21-day training programme in virtual mode on Development of AI-based Android Applications in Agriculture organised under the aegis of CAFT at ICAR-IASRI, New Delhi, 05-25 March 2024
- Chintan Shivir Consultative Workshop with stakeholders for enhancing seafood exports at Bangaram Island, UT of Lakshadweep, 10-11 May 2024
- Webinar for Data Officers–For Round 2: Evaluation of Innovation Excellence Indicators, 24 May 2024.
- Online Interaction Session with Dr. Parvinder Maini, Scientific Secretary "Round 2: Evaluation of Innovation excellence Indicators of Public funded R&D Organisations", 07 June 2024.
- 2nd meeting of the Steering Committee for the promotion of marine products exports, at Vanijya Bhawan, New Delhi, 12 June 2024
- Meeting on NAAS Forum for Young Scientists, 02 August 2024
- Training course on Integrated Stock Assessment Using Stock Synthesis (SS3) at ICES Headquarters, Copenhagen, Denmark, 07-11 October 2024
- Webinar on "RTMB: Automatic differentiation in R" through Video Conferencing, 18 October 2024
- Meeting to review the progress of NICRA projects under Integrated Simulation Modelling at ICAR-IIHR, Bangalore, 18 December 2024

Eldho Varghese, Jayasankar, J. and Muktha, M.

- 13th Meeting of the Technical Committee on Allocation Criteria (TCAC) of IOTC, 21-24 October 2024

Eldho Varghese and Jayasankar, J.

- Meeting with officials of the Department of Fisheries, Andaman and Nicobar Islands, for A & N Marine Fish Landings 2023–Data Finalisation Interaction, 27 February 2024
- FAO regional workshop to review the SOFIA analysis for area 51 at Kochi, India, 14-19 April 2024
- Meeting with Hon'ble Commissioner of Fisheries (Maharashtra) and the joint commissioner at ICAR-CMFRI, Kochi, 08 May 2024
- Meeting with Secretary (Fy) at ICAR-CMFRI, Kochi, 15 May 2024
- Preparatory meeting of the 1st Regional Committee Meetings (RCM) on Fisheries to discuss and provide strategic recommendations for the comprehensive development of the fisheries industry in India (Online), 24 May 2024
- Meeting with FSI for finalisation of data to be submitted to IOTC, 28 June 2024
- Marine Fisheries Census 2025 meeting with DoF, Government of India, 19 August 2024
- Meeting to finalise National Report on Fisheries Statistics for FY 2023 for onward submission to the IOTC, 22 August 2024
- International Conclave on NexGen Technologies in the Seafood Sector, at Kochi, 30 August 2024
- 3rd meeting of the Steering Committee for promotion of marine products exports, at Vanijya Bhawan, New Delhi, 04 November 2024
- Meeting with DoF and FSI to discuss the issues pertaining to the submission of Fishery Statistics (2023) to IOTC, 16 December 2024

Eldho Varghese, Geetha Sasikumar, Gyanaranjan Dash, Muktha, M., Rajan Kumar, Santhosh Bhendekar, Vidya, R. and Vinaya Kumar Vase

- Workshop on "Stock Assessment Continuum Tool and Stock Synthesis", 12-14 December 2024

Ganga, U., Kalidas, C., Livi Wilson, Mahesh, V., Najmudeen, T. M., Purushottama, G. B., Rajesh, K. M., Ranjith, L., Remya, L., Sujitha Thomas and Vinothkumar R.

- International Whale Shark Day Celebration and Awareness on Marine Conservation organised by ICAR-CMFRI, Kochi, at the Government UP School, Vypin, Mangalore RC of ICAR-CMFRI at Malpe Fishing Harbour and Tuticorin RS of ICAR-CMFRI, 30 August 2024

Geetha Sasikumar

- Clam Expert Committee meeting held under the chairmanship of the District Collector, Kollam, 25 November 2024
- Second sitting of the Expert Committee meeting to address issues regarding mussel farming in Kerala held at the office of the Joint Director of Fisheries, Ernakulam, 15 October 2024
- Presentation on the topic "Mussel Farming Practices and Better Management" in the meeting organised by MPEDA to address the issues of mussel farmers at Payyanur, 07 April 2024

Geetha Sasikumar and Miriam Paul Sreeram

- Workshop on "Publishing Marine Biodiversity Data through the Indian Ocean Biodiversity Information System (IndOBIS)" at CMLRE, Kochi, 03 September 2024

Gyanaranjan Dash

- Interactive Stakeholder Meeting cum Brainstorming Session with progressive seaweed entrepreneurs of Odisha, 15 June 2024
- OMFRA Revision meeting at the Department of Fisheries, Cuttack, 12 July 2024
- Stakeholders' Workshop on the Implementation of TED, 27 September 2024
- Technical Meeting on the Sea Cage Culture project in Odisha, 02 October 2024
- 15th Krishi Fair at Puri, 21-25 December 2024
- Aqua-Insurance Mela at Puri, 26 December 2024

Gyanaranjan Dash and Swatipriyanka Sen Dash

- Matsya Pranee Samavesh Odisha (MPSO 2024) at Bhubaneswar, 16-18 February 2024

Jayasankar, J. and Johnson, B.

- Virtual meeting to discuss the proposals regarding expansion of Seaweed cultivation and for taking up activities at commercial levels with Coastal States/UTs/Research Institutes/ Seaweed Entrepreneurs under the Chairpersonship of Joint Secretary (Marine Fisheries), Department of Fisheries, Government of India, 10 May 2024

Jayasankar, J., Johnson, B., Mini, K. G., Shyam S. Salim and Somy Kuriakose

- Training programme on survey methodology for field data collection, FCSA app and species identification, 18-22 July 2024

Jayasankar, J. and Mini, K. G.

- IOTC 10th Meeting of the CSD working group (Online), 05-06 November 2024

Jayasankar, J., Mini, K. G. and Somy Kuriakose

- IOTC Working party on methods (Online), 24-26 October 2024

Jayasankar, J. and Reshma Gills

- Meeting to discuss the Training and Awareness Component of the Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PM-MKSSY) and the National Fisheries Digital Platform (NFDP), under the Chairmanship of the Secretary, Department of Fisheries, 18 December 2024

Jayasankar, J. and Shyam S. Salim

- Orientation meeting with Michigan State University students, U.S.A, at ICAR-CMFRI, Kochi (Online), 22 May -02 June 2024

Jeyabaskaran, R.

- Meeting under the Chairmanship of the Chief Secretary, Government of Tamil Nadu on "Controlling invasive Charru mussels (Kaakka Azhi) spread in Ennore-Pulicat Wetland", at Chennai, 22 August 2024
- Meeting on "Invasive mussels" convened by Principal Chief Conservator of Forests and Member-Secretary, Tamil Nadu State Wetland Authority, at Chennai, 27 August 2024.
- Participated as a member of the Field Inspection team of the Principal Chief Conservator of Forests and Member Secretary, Tamil Nadu State Wetland Authority regarding Charru Mussels at Pulicat Lake Bird Sanctuary, 06 September 2024.
- Resource Person in the "State Level Stakeholders" Workshop on Implementation of TED in Trawl nets' organised by MPEDA and Dept. of Fisheries, Puducherry, 13 September 2024.
- Panel Member in the "International Conference on Advancements in understanding life below the surface through aquatic exploration" organised by SRM University and NIOT; held at SRM University, Chennai, 04 December 2024.

Jeyabaskaran, R. and Narayana Kumar, R.

- Regional Dialogue on Conservation of Marine Mammals and Turtles: Experience sharing on meeting trade obligations by the Bay of Bengal Rim Countries, jointly organised by ICAR-CMFRI, MPEDA and BOBP-IGO, Chennai, 28 August 2024.

Joe Kizhakudan

- Meetings with the Department of Fisheries, at the Director's Office, Cuttack 29th January 2024.
- Meeting with the DoF Secretary Shri Abhishek Likhi IAS and Jt Sec., Smt Neetu Prasad IAS, Ministry of Fisheries, Animal Husbandry and Dairying, New Delhi and all the Directors/Commissioners /JD and Nodal officers of the coastal state Department of Fisheries and UTS,

Officials from NFDB, CIFNET and FSI (Online) 02 February 2024.

- The midterm review meeting of XXVI RCM-II at Puri F.C of CMFRI (online) 01 March 2024
- Annual General Body meeting of the Acharya N G Ranga Agri. Univ., NC Zone meeting at Zilla Parishad Hall, Visakhapatnam 22-23 April 2024.
- TOLIC meeting held at the Railway HQ in Vizag. 26 April 2024.
- Meeting with the Commissioner of Fisheries, Tamil Nadu, to update on the PMMSY AR project works in Tamil Nadu, 28 June 2024.
- Meeting with the Director of Fisheries, Karnataka, to update on the PMMSY AR project work in Karnataka, 29 June 2024.
- XXVI RCM of NE Zone ICAR at Cuttack, Odisha 23 August 2024.
- Meeting on Promotion of sea cage culture in coastal states under the chairpersonship of the Joint Secretary (Marine Fisheries), DoF, GoI. (Online) 22 October 2024.
- Meeting with the Minister of Agriculture, Cooperatives, Animal Husbandry and Fisheries, AP, Shri Atcham Naidu and Secretary Shri Nayak IAS and COF Shri Dola Sankar at Vijayawada Amravathi Assembly House to brief about the AR programme, 16 and 17 October 2024.
- Meetings with the Department of Fisheries, at the Director's Office, Cuttack 29th January 2024.
- Meeting with the DoF Secretary Shri Abhishek Likhi IAS and Jt Sec., Smt Neetu Prasad IAS, Ministry of Fisheries, Animal Husbandry and Dairying, New Delhi and all the Directors/ Commissioners /JD and Nodal officers of the coastal state Department of Fisheries and UTS, Officials from NFDB, CIFNET and FSI (Online) 02 February 2024.
- The midterm review meeting of XXVI RCM-II at Puri F.C of CMFRI (online) 01 March 2024
- Annual General Body meeting of the Acharya N G Ranga Agri. Univ., NC Zone meeting at Zilla Parishad Hall, Visakhapatnam 22-23 April 2024.
- TOLIC meeting held at the Railway HQ in Vizag. 26 April 2024.
- Meeting with the Commissioner of Fisheries, Tamil Nadu, to update on the PMMSY AR project works in Tamil Nadu, 28 June 2024.
- Meeting with the Director of Fisheries, Karnataka, to update on the PMMSY AR project work in Karnataka, 29 June 2024.
- XXVI RCM of NE Zone ICAR at Cuttack, Odisha 23 August 2024.
- Meeting on Promotion of sea cage culture in coastal states under the chairpersonship of the Joint Secretary (Marine Fisheries), DoF, GoI. (Online) 22 October 2024.
- Meeting with the Minister of Agriculture, Cooperatives, Animal Husbandry and Fisheries, AP, Shri Atcham Naidu and Secretary Shri Nayak IAS and COF Shri Dola Sankar at Vijayawada Amravathi Assembly House to brief about the AR programme, on 16 and 17 October 2024.

Johnson, B.

- Awareness-cum-training programme under Scheduled Caste Sub-Plan (SCSP), 21 February 2024
- Training programme on "Country boat fish net making for fisherfolks– An alternative livelihood" organised by the School of Marine Sciences, Dept. of Oceanography and CAS, Alagappa University, Thondi Campus, 23 February 2024
- National Symposium on Blue Carbon Sink (BCaS-2024) organised by Madurai Kamaraj University, Pudumadam, Ramanathapuram, 23 February 2024
- Science Day Celebration SHASC Kilakarai, 28 February 2024
- Workshop on Entrepreneurship in Aquaculture (EIA-2024), Syed Ammal Arts and Science College, Ramanathapuram, 11 March 2024
- India International Seaweed Expo and Summit 2024 (IISES); India International Centre, New Delhi, India, 19 March 2024
- Meeting with Prasmoagri, Kumbakonam for discussing seaweed farming and related activities at ICAR-CMFRI, Kochi, 21 March 2024
- Review meeting to discuss the drafting of Guidelines following CAA Rules 2024 (Rule 3) under the Chairmanship of the Joint Secretary (Marine Fisheries), DoF, Government of India, 03 June 2024
- 41st Meeting of the National Committee on Introduction of Exotic Aquatic Species into Indian Waters under the Co-Chairmanship of Joint Secretary (IF) and Joint Secretary (MF), 18 June 2024
- 96th ICAR Foundation and Technology Day at NAAS Complex, New Delhi, 16 July 2024
- Online meeting to discuss Madurai Ornamental Cluster and Lakshadweep Seaweed Cluster under the chairmanship of Joint Secretary (Marine Fisheries), DoF, Government of India, 26 September 2024.
- Virtual meeting on promotion of seaweed in Diu, Andhra Pradesh and Lakshadweep under the chairmanship of Joint Secretary (Marine Fisheries), DoF, Government of India, 02 December 2024
- Inter-Ministerial Committee and Technical Advisory Committee for Promotion and Development of Seaweed Farming and Value Chain under Chairpersonship of Secretary, DoF, Government of India, 24 December 2024

Johnson, B., Krupesha Sharma, S. R., Sobhana, K. S., Sumithra, T. G. and Suresh, V. V. R.

- Meeting of the Committee constituted to prepare Comments/Inputs on "Draft zero guidelines for Import and Quarantine of Seaweeds for their Culture and Propagation in India" for submission to the DoF, Government of India, ICAR-CMFRI, Kochi, 10 May 2024

Johnson, B., Sobhana, K. S., Suresh, V. V. R. and Vinod, K.

- Review meeting of Seaweed Park approved under PMMSY for Tamil Nadu, hosted by DoF, Government of India (Online), 27 November 2024
- Online meeting on "Formation of FFPOs for Seaweed in Tamil Nadu" hosted by NFDB, Hyderabad, 29 November 2024

Kajal Chakraborty

- 94th Annual Session of NASI and Symposium, 30 November 2024–03 December 2024
- 2nd National Conference on Natural Products/AYUSH System of Medicine, PGIMER, Chandigarh, 21 April 2024
- Webinar on "Genetic Diversity and IP in SDGs," by Dr. Kavitha Chalakkal, Professor, Inter University Centre for IPR Studies, CUSAT, Kochi, 30 April 2024
- National Conference on "Evolutionary Advancement in Ocean Studies and Research" (NEAOsr'24) at Dept. of Marine Science, Bharathidasan University, Trichy, 30 September and 01 October 2024
- National Seminar on "Advances in Environment Management for Sustainable Fisheries and Livestock Production (AEMS-2024)" at College of Fisheries, Kishanganj, 18 November 2024
- Role of Seaweeds and seagrasses in mitigating climate change" by Kerala Academy of Sciences, 05 June 2024
- Refresher Course in Sciences organised by UGC-Malaviya Mission Teacher Training Centre, Sardar Patel University, 14-27 October 2024
- International Symposium on Advances in Algal Research (AAR-2024) at JNTU, Hyderabad, 17-18 December 2024

Kalidas, C.

- Webinar on Administrative and Financial Matters, ICAR-CMFRI, Kochi, 01 August 2024
- Hindi workshop on the topic "Indian Languages and Artificial Intelligence", ICAR-CMFRI, Karwar Centre 26 September 2024
- AMR awareness campaign, ICAR-CMFRI, Karwar Centre, 19 October 2024
- Online National Workshop on writing proposals for funded projects, ICAR, New Delhi, 20 October 2024

Kalidas, C. and Mahesh, V.

- "Mathsyamela -2024" Biggest Fish Fair exposition at Murdeshwar, Karnataka on World Fisheries Day, 21-23 November 2024

Kalidas, C. and Margaret Muthu Rathinam, A.

- Matsya Manthan lecture series on "Latest technology applications for fisheries and aquaculture" organised by the Ministry of Fisheries, Government of India (Online), 25 April 2024

Kalidas, C., Margaret Muthu Rathinam, A. and Raju, S. S.

- Webinar on IP and the SDGs: Building our common future with innovation and creativity: Genetic Diversity, in connection with World Intellectual Property Day by Dr. Kavitha Chalakkal, 30 April 2024

Krupesha Sharma, S. R.

- Hands-on international workshop on utilising microbiome and genomic resources for understanding and mitigating antimicrobial resistance in one health context at FAO Reference Centre, NITTE University, Mangalore, 18- 22 November 2024

Loveson Edward, L., Muktha, M. and Pralaya Ranjan Behera

- Technical committee meeting of WRD 28-Coastal Zone Water Management of BIS, 30 September 2024

Loveson Edward, L. and Manas, H. M.

- Stakeholders workshop on Development and implementation of TED in India, organised by MPEDA and ICAR-CIFT, Visakhapatnam, 25 January 2024

Loveson Edward, L., Narayana Kumar, R. and Ranjith, L.

- State Level Stakeholders' "Workshop on the Implementation of TED in Trawl nets, organised by MPEDA-NetFish", at Centre for Incubation and Vocational Training in Fisheries, TNJFU, 13 September 2024

Loveson Edward, L. and Vinod, K.

- National Consultative Workshop on Implementation of the BOBLME-II Project in India (INCW-BOBLME) organised by BOBP-IGO and IUCN Chennai, 21-23 March 2024

Mahesh, V. and Purushottama, G. B.

- Aqua Goa Mega Fish Festival organised by the DoF, Goa, 02-04 February 2024

Mahesh, V., Margaret Muthu Rathinam, A., Sobhana, K. S. and Sreenath, K. R.

- Lecture Series "Matsya Manthan" on Latest technology applications for fisheries and aquaculture, organised by Dof, Government of India (Online), 25 September 2024

Manas, H. M.

- INCOIS Fishermen Feedback data collection Mobile App awareness programme, at Centre for Studies on Bay of Bengal (CSBOB), Andhra University, Visakhapatnam, 12 January 2024
- State-level workshop on Living Conditions of Fishers-Recommendations for Development organised by Fishing Community Organisations Network, Andhra Pradesh, 27 July 2024
- State Level Stakeholders meet organised by NABARD on Nucleus Breeding Centres for Shrimp Brood stocks and promotion of Shrimp farming, processing and export in Andhra Pradesh, 09 August 2024
- Stakeholders workshop on Implementation of TED in Trawl gears in Andhra Pradesh, 14 August 2024

Manas, H. M., Raju, S. S., Shelton Padua and Sobhana, K. S.

- Meeting in connection with National Space Day Celebrations, organised by DoF, Government of India (Online), 13 August 2024

Margaret Muthu Rathinam, A.

- 'State Level Stakeholders' Workshop on their implementation of TED in Trawl nets' organised by Marine Products Export Development Authority (MPEDA) and Department of Fisheries and Fishermen Welfare at Chennai, 24 August 2024.

Miriam Paul Sreeram

- Training Programme on Climate Risk Management: Policy and Governance at Lal Bahadur Shastri National Academy of Administration, Mussoorie, 09-13 December 2024

Muktha, M.

- National Workshop on "Harnessing Potential of Fisheries in Inland States" organised by NITI Aayog and Government of Andhra Pradesh, 13-16 February 2024
- 8th session of the Technical Committee on Management Procedures (TCMP) of the IOTC (Online), 10-11 May 2024
- National Space Day celebrations conducted by FSI, 09 August 2024

Muktha, M., Pralaya Ranjan Behera and Raju, S. S.

- National Workshop/awareness programme on conservation of marine protected species of Andhra Pradesh at Visakhapatnam Fishing Harbour, 10 September 2024

Najmudeen, T. M.

- Face-to-face programme" by Hon'ble Chief Minister of Kerala to discuss the New Kerala Vision of people from the Agricultural sector at Alapuzha, 02 March 2024
- CERA Editors online workshop organised by ICAR Education Division, 25 September 2024
- Workshop on Registration, Survey and Certification of Fishing Vessels at CIFNET, Kochi, 08 November 2024.

Najmudeen, T. M., Shoba Joe Kizhakudan and Sujitha Thomas

- Meeting to discuss Fishing Ban extension from 1st June to 15th August in coastal States/UTs of the West Coast, hosted by DoF (Online), 31 July 2024

Narayana Kumar, R

- Atlas of Climate Adaptation in South Asian Agriculture (ACASA) Workshop, Chennai, 03 May 2024
- Regional Level Workshop-cum-Training Programme for ICAR Nodal Officers of eHRMS, Kochi, 10 May 2024
- State Level Unit Cost Committee (SLUCC) Meeting of NABARD, Chennai, 24 June 2024
- 4th Project Steering Committee (PSC) meeting of the India-Norway Integrated Ocean Management and Research Initiative, Chennai, 20 September 2024

Pralaya Ranjan Behera

- Training programme on Microbial interventions in health management of marine finfish and shellfish aquaculture at Visakhapatnam RC of ICAR-CMFRI, Visakhapatnam, 11-15 March 2024
- Delivered a talk on the Importance of marine biodiversity to the general public on the occasion of the citizen awareness programme: A collaborative initiative by Andhra Pradesh Forest Department and local NGO, WCTRE at Visakhapatnam RC of ICAR-CMFRI, Visakhapatnam, 17 May 2024
- International conference of Animal Taxonomy Summit-2024 (ATS-2024) organised by Zoological Survey of India, 30 June-03 July 2024

Prema, D.

- National Seminar on Small Hydropower Plants, organised by the Water Resources Department, Bureau of Indian Standards (Online), 08 August 2024.

Prema, D., Miriam Paul Sreeram, Raju, S. S., Ratheeshkumar, R., Rekha J. Nair, Shelton Padua and Sobhana, K. S.

- Meeting in connection with the visit of Prof. S. P. Singh Baghel, Hon'ble Minister of State for Fisheries, Animal Husbandry and Dairying, Government of India, Kochi, 25 Aug 2024

Prema, D., Miriam Paul Sreeram, Ratheeshkumar, R., Rekha J. Nair, Shelton Padua and Sobhana, K. S.

- Beach cleanup drives in connection with the International Coastal Cleanup Day 2024, 20 September 2024
- Meeting in connection with the visit of Shri George Kurian, Hon'ble Minister of State for Fisheries, Animal Husbandry & Dairying and Minority Affairs, Government of India, 26 September 2024

Prema, D., Shelton Padua and Sobhana, K. S.

- Meeting on "Marine Litter Management" under the Chairmanship of Special Secretary, MoEFCC, Government of India (Online), 07 October 2024

Prema, D. and Sobhana, K. S.

- Meeting organised by the Maradu Municipality, Ernakulam District, in connection with the massive fish kill in Kundannur backwaters, held at Maradu Municipality Office, 28 June 2024
- Online meeting convened by the Regional Director, CPCB, Bangalore for reviewing the reports received by CPCB and the status of industries, as per the Hon'ble NGT SZ Order dated 20.08.2024 in OA No. 184 of 2024 (SZ), along with OA No. 233 & 234 of 2024 related to fish kill in Periyar River, 05 November 2024

Purushottama, G. B.

- 25th Scientific Advisory Council meeting of ICAR-K.V.K. Sirsi at Sirsi under the University of Agricultural Sciences, Dharwad, Karnataka, 17 January 2024
- National Conference on "Blue Revolution for Sustainable Fisheries Development" organised by Karnataka Science and Technology Academy, Bangalore, Karnataka, 25-27 September 2024
- International Conference on Artificial Intelligence & Machine Learning and Data Science (ICAMDS 2024) organised by MIT, Kundapura, Udupi, Karnataka, 16-17 September 2024

Rajesh, K. M.

- National Conference "NITTE-NAMASTE Conclave 2024 on Health, food and Environment in North-East India: Issues and Challenges" organised by NITTE University, Mangalore, 01-02 March 2024

Rajesh, K. M. and Sujitha Thomas

- Hands-on training programme and demonstration on fabrication of rafts

and preparation of green mussel seed ropes through participatory mode to the NFDB project beneficiaries at Paduthonse, Udupi District, Karnataka, 05 January 2024.

- "Mathsya Sampada Jagrutha Abhiyana" organised by the College of Fisheries, Mangalore, 20 February 2024
- Ek Ped Maa Ke Naam' plantation drive organised as part of the Swachhta Hi Sewa campaign of the Regional Centre of ICAR-CMFRI, Mangalore, 21 August 2024 and 17 September 2024

Raju, S. S.

- A talk on "Antarctica -A natural lab for climate change studies" by Dr. Ramesh Kumar, M. R., NIO, 26 June 2024
- Inaugural Session of 32nd International Conference of Agricultural Economists 2024 at NASC, New Delhi (Online), 04 August 2024
- Antimicrobial Resistance: "Educate, Advocate, Act now" organised by ICAR-CMFRI, Kochi, 19 November 2024
- Matsya Manthan lecture series on "Latest technology applications for fisheries and aquaculture" organised by the Ministry of Fisheries, Government of India, (Online), 19 December 2024

Ramkumar, S.

- 9th International Conference on "Current Approaches in Agricultural, Biological and Applied Sciences for Sustainable Development (CAABASSD-2024)", Kumaun University Nainital, Uttarakhand, 01-03 March 2024

Ranjith, L.

- National Conference on "Biodiversity Restoration: Current Trends and Emerging Opportunities", Department of Zoology, St. Xavier's College (Autonomous), Palayamkottai, 21 February 2024
- World Ocean Science Congress (WOSC-2024), National Institute of Ocean Technology (NIOT), Indian Institute of Technology (IIT), Chennai and Vijnana Bharati (Vibha) at IIT Madras Research Park, Chennai, 27-29 February 2024.
- National Level First Life Science Forum Annual Conference on Environmental Issues and Their Treatments, organised by V.O. Chidambaram College, Thoothukudi, 28 March 2024

Ratheeshkumar, R.

- Invited speaker during National Seminar on "Climate Change and Biodiversity in Indian Waters", Farook College, Calicut, 20 February 2024
- Indo-Australian International workshop on Impact of Marine debris and climate change on coastal resilience and Biodiversity, 06-07 August 2024
- Drone pilot training, Kasargod, 05-10 December 2024
- FTIR training, MG University, Kottayam, 18 December 2024

Ratheeshkumar, R. and Shelton Padua

- Workshop on Strategies for Managing FRP Debris from Coastal Environment, ICAR-CIFT, Kochi, 30 September 2024

Reshma Gills

- INYAS Workshop-Cum-Panel Discussion on "Dialogue on Science Diplomacy: Regional and Global Perspectives", 25 January 2024
- Membership induction ceremony in the Indian National Young Academy of Sciences (INYAS), New Delhi and General Body Meeting (GBM), 16-18 February 2024
- 11th National Seminar on "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" at Udaipur, organised by Society for Community Mobilisation for Sustainable Development (MOBILISATION), New Delhi, in association with Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, 05 -07 March 2024
- INYAS Prayojan: A flagship programme, meeting organised by INYAS-INSA, New Delhi, 18 April 2024
- Multi-disciplinary Science Symposium (MSS) organised by the Indian National Young Academy of Sciences (INYAS) at NGSMIPS, Paneer, Deralakatte, Mangalore, 14 June 2024
- Science Camp on 'Experiential AgriAnalytics: Field-to-Lab Knowledge Pathways', jointly done by ICAR-CMFRI, ATIC, and INYAS-INSA, New Delhi, 01-05 July 2024
- "Pratibhakalokkoppam" programme organised by Government UPS Vypeen, 27 July 2024
- International Webinars on Adaptation Reporting under the Enhanced Transparency Framework of the Paris Agreement organised by the Capacity-building Initiative for Transparency–Global Support Programme (CBIT GSP) of the UNEP Copenhagen Climate Centre, 13 September 2024 and 08-15 October 2024

Rekha J. Nair

- CITES–Marine Ornamental Fishes International Workshop (Online), Brisbane, Australia, 07-10 May 2024
- NAAS Foundation Day Lecture (Online), 05 June 2024
- NAAS PAAS National Workshop on Digital Agriculture (Online), 18 December 2024

Sandhya Sukumaran

- Training on "CRISPR-Cas gene editing in fishes" at King's College, London, 10 June 2024 and 28 June 2024
- Second National Genetics Congress organised by ICAR-IARI, New Delhi, 11-12 December 2024

Sandhya Sukumaran and Sreenath, K. R.

- International conclave on "NextGen Technologies in Seafood sector" at Kochi, 30 August 2024

Saravanan, R.

- Workshop on Marine Endangered Species, organised by DIVF centre of Tamil Nadu Fisheries University at Ariyaman for fishermen from Mandapam, Pamban and Thangatchimadam, 09 January 2024
- Brainstorming on Ocean Colour Science and Applications at NRSC, Hyderabad, 05 February 2024
- Meeting conducted by Ramanathapuram District Collector for the preparation of Integrated

Management Plan of Ramsar Sites, 03 September 2024

- Delivered a Lecture on Marine Wildlife for the 19th Batch RFO trainees (Chattisgarh) of OFRC Angul, Odisha, 27 September 2024
- Invited lecture at Syed Ammal Arts and Science College, Ramanathapuram, 30 September 2024
- Delivered Prof Dr. A. K. Kumaraguru endowment lecture on Taxonomy of Echinoderms at Madurai Kamaraj University, Madurai, 20 December 2024

Shelton Padua

- Brainstorming on Ocean Colour Science and Applications at NRSC, Hyderabad, 05 February 2024
- Review meeting (online) on "National Action Plan on Marine Plastic Litter from sea-based sources, under the chairmanship of the Joint Secretary, Dept of Fisheries, Government of India, 06 May 2024
- Webinar series on "Adaptation Reporting under the ETF of the Paris Agreement" organised by the UN, 13 September 2024

Shelton Padua and Sobhana, K. S.

- Meeting in connection with the signing of MoU on the Mangrove Restoration programme with Plan@ Earth, Kochi, 07 August 2024

Shikha Rahangdale

- International Whale Shark Day awareness lecture for fisheries graduates Veraval RS of ICAR-CMFRI, 30 August 2024

Shilta, M. T.

- PMSSY (Pradan Mantri Matsya Sampada Yojana) District level committee meeting conducted at the District Collector's chamber, Kozhikode, 27 February 2024

Shinoj, P.

- First meeting of the 'Blue Talks' Series organised by the Embassy of Costa Rica jointly with the Embassy of France and the Ministry of Earth Sciences, Government of India at Prithvi Bhawan, New Delhi, 29 February 2024
- 32nd Annual Conference of the Agricultural Economics Research Association (AERA) held at Indira Gandhi Krishi Vishwa Vidyalaya, Raipur, Chhattisgarh, 11-13 December 2024
- National Consultation Workshop on Mariculture Policy Framework held at National Fisheries Development Board (NFDB), Hyderabad, 23 December 2024

Shoba Joe Kizhakudan

- Stakeholders' consultation meeting to discuss the Draft National Management Plan and State-Specific Plans for Purse Seine Fisheries, to be submitted in the Hon'ble Supreme Court, convened by the Commissioner of Fisheries, Tamil Nadu, at Chennai, 09-11 January 2024.
- Expert Committee on Purse Seine fishery virtual meeting with Commissioner of Fisheries-Maharashtra, 19 January 2024.
- Meeting to discuss the report of the Expert Committee on Purse Seine Fishing to be submitted at Hon'ble Supreme Court before the next date of hearing in the SLP (C) 8442 of 2021 under the chairmanship of Joint Secretary (Marine Fisheries), DoF, Government of India, 29 April 2024.
- Consultation meeting to discuss the Revised Final Report of the Expert Committee on Purse Seine fishing under the chairpersonship of the Joint Secretary (Marine Fisheries), Government of India, 25 September 2024.
- Meeting to discuss the Draft Regional Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (RPOA-IUU), under the chairmanship of the Joint Secretary (Marine Fisheries), DoF, Government of India, 25 October 2024.

Shoba Joe Kizhakudan, Muktha M.

- First Session of the Sub-Committee on Fisheries Management (COFI SFMT) as part of the Indian delegation, 15-19 January 2024

Shoba Joe Kizhakudan and Sujitha Thomas

- Stakeholder Consultation on NPOA-Sharks–INDIA, conducted by BoBP-IGO at Kochi, 19 February 2024
- Meeting with M/s Finley Marine Products conducted by ICAR-CMFRI, 07 August 2024
- Meeting on Fish and Shrimp Feed Manufacturers convened under the Chairpersonship of the Joint Secretary, DoF, Government of India, 19 September 2024
- Meeting held under the chairpersonship of the Joint Secretary (Marine Fisheries), DoF, Government of India, to discuss the Draft National Plan of Action for Conservation and Management of Sharks in India, 24 September 2024

Shoba Joe Kizhakudan and Surya S.

- International Whale Shark Day awareness meeting organised by Wildlife Trust of India and Kerala Forests and Wildlife Department in Thiruvananthapuram, 30 August 2024

Shoba Joe Kizhakudan and Swatipriyanka Sen Dash

- Stakeholder workshop on "Endangered protected sharks'' at Paradeep Fishing Harbor, Jagatsinghpur, 06 March 2024

Shyam S. Salim

- Fisheries Export Promotion with focus on Shrimp Farming and Export Value Chain organised by DoF, Government of India, New Delhi, 03 September 2024
- Exploring possible avenues in developing a platform towards identifying the areas to collaboration between ICAR-CMFRI and Michigan State University, USA, 23-30 September 2024

Sobhana, K. S.

- Chaired a session "Future-Ready Aquaculture (Theme 4)" in the International Fisheries Congress and Expo 2024 (IFC&E 2024), KUFOS, Panangad, 12-14 January 2024
- Meeting in connection with signing MoU with M/s Neat Meatt Biotech

Private Limited, New Delhi, for collaboration on Lab-grown seafood research, at ICAR-CMFRI, Kochi, 23 January 2024

- Chaired a session and delivered a lead talk in the 13th Indian Fisheries and Aquaculture Forum 2024, Kolkata, 23-25 February 2024
- Institutional Biosafety Committee (IBSC) meeting of the National Centre for Aquatic Animal Health, at CUSAT, Kochi, as External Subject Expert, 18 April 2024
- 72nd Institute Management Committee (IMC) Meeting of ICAR-CIFT, Kochi, 19 June 2024
- Meeting convened by Joint Secretary (Inland Fisheries), Government of India, regarding preparation of Booklet on "Potential Indigenous Fish species" (Online), 03 September 2024.
- Institutional Biosafety Committee (IBSC) meeting of the National Centre for Aquatic Animal Health, CUSAT as External Subject Expert, 04 September 2024
- Brainstorming Session on "Cellular Fish Meat Production: Prospects and Challenges" held at NAAS, New Delhi, 20 September 2024
- Editor's Workshop: Enab ling a research ecosystem" for scientists, researchers, librarians and faculty members of ICAR institutions/ Agricultural Universities, organised by the Education Division of ICAR (Online), 24.09.2024
- 73rd meeting of the Institute Management Committee (IMC) of ICAR-CIFT, Kochi, 06 November 2024
- Chaired a session in the International Workshop on 'Perspectives, Opportunities and Challenges in Fisheries Sciences in a Changing Climate: A Workshop for Emerging Scientists' funded by the Australian Alumni Grant and organised by the KSN University of Agricultural and Horticultural Sciences (KSNUAHS), 20 November 2024

Sreenath, K. R.

- Co-ordinator of Theme 3: Climate Change-Challenges & Opportunities, Session 1 and Session 2 in the International Fisheries Congress and Expo 2024 (IFC&E 2024), KUFOS, Panangad, 12-14 January 2024
- Meeting on Carbon footprint, Carbon credits and Carbon trade in Fisheries and Aquaculture in Fisheries, under the Chairmanship of Secretary (Fisheries) through Video Conferencing, 19 June 2024
- International Workshop, 5th IOI Thailand, Capacity Building Workshop on regional ocean governance framework, implementation of the United Nations convention on the law of the sea (UNCLOS) and its related instruments in the Southeast Asian seas and the Indian Ocean, at Phuket, Thailand, 01-27 July 2024.
- Invited talk on "Ecosystem Modelling" in the National Workshop on Aquatic Ecosystem Assessment, KUFOS, Panangad, 08 August 2024
- Regional Capacity Building Workshop on Biodiversity Beyond National Jurisdiction (BBNJ), organised by BOBP-IGO, in collaboration with High Seas Alliance (HSA) and RISE UP, at Chennai, 27-28 August 2024
- Meeting to discuss MMPA study report at MPEDA, Kochi, 03 October 2024

Sreenath, K. R. and Vinod, K.

- The 7th Meeting of the Biodiversity Sectional Committee (SSD 20) of the Bureau of Indian Standards (BIS), Government of India, 11 January 2024
- 8th Meeting of the Biodiversity Sectional Committee SSD 20 in virtual mode, 26 April 2024
- Bureau of Indian Standards, Third meeting of SSD 20/WG2 – Guidelines for Restoration of Mangrove Ecosystem, 08 May 2024
- Meeting in connection with the discussion on the agenda items of the 4th Plenary meeting of ISO/TC 331– Biodiversity at Manaus, Brazil (Online), 10 May 2024
- Plenary Meeting of ISO/TC 331-Biodiversity held at Manaus, Brazil (Online), 20-24 May 2024
- Bureau of Indian Standards, ISO/ TC 331 4th Plenary Meetings, 10 June 2024

Subal Kumar Roul

- Workshop on "Futuristic approach for inland fisheries informatics: Harnessing benefits of tools and techniques hybridisation" held at ICAR-CIFRI, Barrackpore, 04 December 2024
- State Level Stakeholders' Workshop on Implementation of TED in Trawl gears in West Bengal" at Kolkata, organised by MPEDA RD Kolkata and MPEDA-NETFISH in association with West Bengal State Fisheries Department, 25 September 2024
- 27th National Agriculture Exhibition held at Science City, Kolkata, 11-14 September 2024

Subal Kumar Roul and Swatipriyanka Sen Dash

- Capacity building workshop on Role and responsibilities of Indian CITES Scientific authority in CITES implementation conducted by the MoEF&CC at Kolkata, 08 January 2024

Sujitha Thomas

- Six-monthly TOLIC meeting in Mangalore, 20 June 2024
- Third stakeholder meeting on small pelagic fisheries at Mangalore, conducted by Yashaswi Fish Meal and Oil Company, 21 June 2024
- National Space Day' Celebrations organised by College of Fisheries, Mangalore; Dept. of Fisheries, Govt of Karnataka; ISRO, Bangalore and Central Institute of Coastal Engineering for Fisheries, 16 August 2024
- Delivered keynote address at the Workshop on "Stock assessment of lesser sardines along the coast of Maharashtra & Goa" in connection with the Fishery Improvement Project (FIP) on Indian oil sardine and Indian mackerel along the coast of Maharashtra and Goa, in Goa, 27 November 2024

Surya, S.

- State credit seminar organised by NABARD, 13 January 2024
- One-day workshop on 'Energy efficient cold chain technologies' in Trivandrum, 07 March 2024

- One-day seminar on Ocean Day organised by the UDS group of hotels at Trivandrum, 08 June 2024
- One-day workshop on 'Livelihood opportunities and community-based sustainable tourism potential in mangrove areas' in Trivandrum, 11 September 2024
- Field day organised by ICAR-CMFRI Vizhinjam centre on the occasion of the farm trial initiation of Giant trevally, 12 November 2024

Sumithra, T. G.

- Meeting of Institute Biosafety Committee of College of Veterinary & Animal Sciences, Mannuthy, Thrissur, 03 July 2024
- AMR Conclave 2024: Strengthening One Health Action Plan" organised by the Department of Veterinary Public Health, CVAS, Mannuthy and School of Zoonoses, Public Health and Pathobiology in collaboration with ReAct Asia Pacific and INGSA-Asia, 20 November 2024
- Review meeting of Collaborative Research Projects Under Deep Ocean Mission (DOM)-Vertical 3 at NIOT, Chennai, 29 November 2024

Swathi Lekshmi, P.S.

- World Food India 2024, Pragati Maidan, New Delhi, 19-22 September 2024
- Online meeting with Invest India under the Ministry of Commerce and Industry with the mandate to support domestic and foreign investors in their business journey, promote exports, and drive technology and innovation in the country, 08 October 2024
- World Fisheries Day 2024 at Veraval College of Fisheries, Veraval, Gujarat, 21 November 2024
- Half yearly TOLIC meeting convened for development of Hindi as official language Implementation (Online), 30 December 2024

Swatipriyanka Sen Dash

- Awareness meeting for the celebration of International Sawfish Day at Astaranga, Puri, 01 November 2024
- International Conference on Sustainable Fisheries and Aquatic Resource Management held at Kolkata, 12-14 September 2024

Tanveer Hussain

- "7th Meeting of the expert committee for zonation and demarcation of the marine waters for mariculture in Goa", Directorate of Fisheries, Panaji, Goa, 08 July 2024
- Meeting on the promotion of sea cage culture in coastal states, chaired by the Joint Secretary (Marine Fisheries), DoF, Government of India (Online), 22 October 2024
- Delivered an invited talk (online) on "Cage-based breeding and RAS-based larval rearing for continuous seed production of *Etroplus suratensis*" in the training programme on pearlspot breeding and seed production on 25 September 2024 for Tamil Nadu State Department officials, conducted by ICAR-CIBA, 23-25 September 2024

Thirumalaiselvan, S.

- Served as Nodal Officer for conducting the Vikshit Bharat Sankalp Yatra (VBSY) in Ramanathapuram District and got an appreciation certificate from the Director, ICAR-ATARI Zone-X, Hyderabad, 15 November 2023 to 25 January 2024

Vaisakh, G.

- Online training programme on "Ecosystem Modelling and ecosystem Service Analysis in the Coastal Ecology", 14-18 October 2024

Vidya, R.

- Meeting on "Vembanad Kayal Rejuvenation" with the District Collector, Alappuzha, 07 December 2024

Vinaya Kumar Vase

- NRSC CSSTEAP Short Course on "Satellite Remote Sensing for Ocean Applications" on 14-25 October 2024
- Refresher Training-cum-workshop on "Stock Health Assessment of shellfishes of Indian coast through fishery biology methods", 05-07 November 2024
- Training programme on "Methods and Analytical approach to climate change research in Fisheries", 05-09 December 2024

Vinod, K.

- Virtual meeting convened by the DDG (FS) to discuss the project 'Enhancing productivity, profitability and resilience of the agri-food systems in the coastal ecoregion: Constraints, potentials, gaps and action plan, 04 April 2024
- Virtual meeting convened by the Joint Secretary (Marine Fisheries), Department of Fisheries, Government of India to discuss issues on broodstock and seed production of marine and brackishwater finfishes, 08 April 2024
- Online Workshop on "Coastal and Marine Biodiversity" organised by the Ministry of Environment, Forests and Climate Change (MoEF & CC), 19 September 2024
- Consultation Meeting at the Kadalundi Grama Panchayat Office in connection with the preparation of an Action Plan for the Kadalundi-Vallikunnu Community Reserve, 05 October 2024
- Delivered a Lecture on 'Seaweed Production and Expansion: An instrument towards carbon sequestration' during the World Fisheries Day 2024 celebration on the theme 'India's Blue Transformation: Strengthening small-scale and sustainable fisheries', at Sushma Swaraj Bhawan, New Delhi, 21 November 2024
- 4th Meeting of EED 06: Working Group 2: Restoration of Mangrove Ecosystem, Bureau of Indian Standards, Government of India (Online), 04 December 2024
- Debriefing meeting of the CBD COP 16 Conference under the Chairmanship of Shri Tanmay Kumar, Special Secretary, MoEF&CC at Indira Paryavaran Bhavan, New Delhi, 16 December 2024.

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