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ANNUAL REPORT 2025



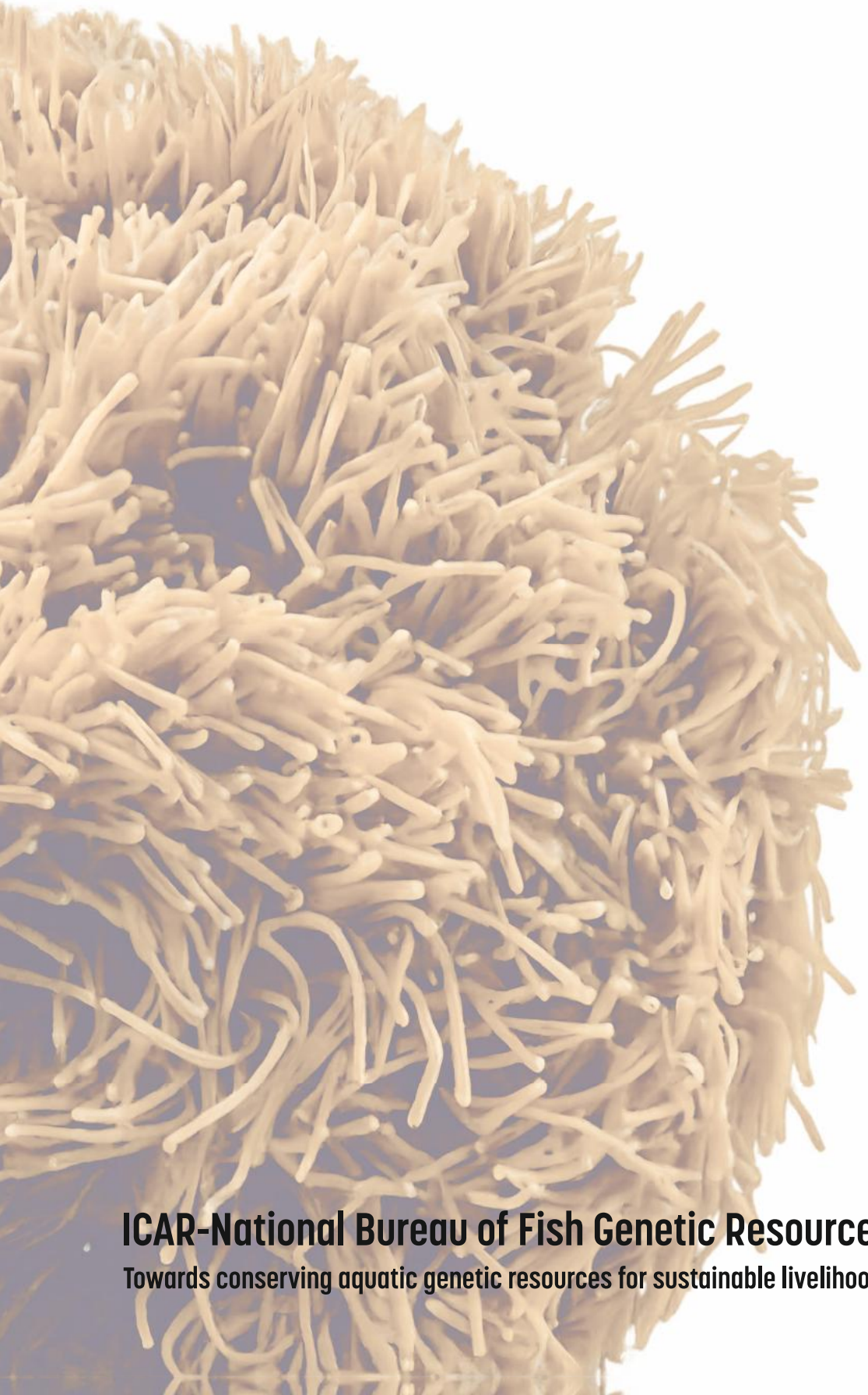
42 Glorious Years
OF
RESEARCH, INNOVATION & COMMUNITY EMPOWERMENT
ICAR-NBFGR
ESTD. 1983
Conserving Diversity • Enriching Future

ICAR-National Bureau of Fish Genetic Resources

Towards conserving aquatic genetic resources for sustainable livelihood and nutritional security


राष्ट्रीय मत्स्य आनुवंशिक संसाधन ब्यूरो
NATIONAL BUREAU OF FISH GENETIC RESOURCES
N.B.F.G.R.

ANNUAL REPORT 2025



ICAR-National Bureau of Fish Genetic Resources

Towards conserving aquatic genetic resources for sustainable livelihood and nutritional security

ICAR-NBFGR Annual Report 2025

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FRONT COVER

Captive propagated (bifurcated) Tentacle Sea anemone, *Radianthus magnifica*



BACK COVER

Tentacle Sea anemone *Radianthus magnifica* in its natural habitat at Agatti Island, Lakshadweep

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Preface



ICAR-National Bureau of Fish Genetic Resources is the premier Bureau continue serving the nation since 1983 under the aegis of ICAR towards the exploration, conservation, characterization and sustainable utilization of India's fish genetic resources. The Annual Report 2025 of ICAR-NBFGR presents the major scientific achievements, technological innovations and outreach activities undertaken during the year. The Bureau continued to strengthen its mandate through multidisciplinary research encompassing aquatic biodiversity assessment, genomics, conservation biology, fish health management, *ex situ* conservation, germplasm utilization, and National capacity building.

The fish diversity is explored and documented from diverse freshwater, brackishwater, marine and deep-sea ecosystems of the country. Comprehensive surveys conducted along the several river systems (Chenab, Teesta, Subansiri, Chubi, Tirap, Chindwin–Barak, Tuirial, Phukhinglang–Karnaphuli, Subarnarekha, Godavari, Saryu, Gomti, Periyar, Thamirabarani, Kabani, Lakshmana Tirtha, Harangi, Suvarnavathi, and Hemavathi), Wetlands (Bakhira and Haiderpur), six caves of Meghalaya, Lakshadweep islands, marine and deep-sea regions (off Kerala and Tamil Nadu coasts) and documented fish diversity.

The institute has discovered 9 new species and 5 new distributional records from Indian waters. *Cinetorhynchus himanshui* described from Lakshadweep, on the name of Hon'ble Former Secretary and Director General ICAR Dr. Himanshu Pathak; *Schistura densiclava*, from Limestone cave, Krem Mawjymbuin in East Khasi Hills, Meghalaya; *Olyra sancta* from Tissa River, and *Exostoma hajiensis*, from Subansiri River, from Arunachal Pradesh; *Apterichtus kanniyakumari*, and *Ariosoma tamilicum* eels from the Tamil Nadu coast; deep-sea eel, *Facciolella smithi*, from the Arabian Sea; *Labeo uru* and *Labeo chekida* from the rivers of the Western Ghats, and resolved the 150-year-old identity mystery of *Labeo nigrescens*, First described in 1870. Reported new distributional record of deepwater cardinalfish *Epigonus bispinosus* from the Arabian Sea; First record of Blackedge cusk eel, *Ophidion muraenolepis* from the Lakshadweep; saddle-headed moray eel, *Gymnothorax sagmacephalus* and Australian stargazer, *Xenocephalus australiensis* from the Arabian Sea; first record of endemic Red Sea parrotfish, *Scarus collana* from the Gulf of Mannar.

Significant milestones were achieved in germplasm utilization and conservation aquaculture such as development of designer clownfish (F4 generation). Captive breeding protocols were standardized for *Horabagrus obscurus*, *Horabagrus nigricollaris*, *Ompok malabaricus*, *Pethia pookodensis*, *Dawkinsia rohani*, *D. apsara*, *Macrobrachium dayanum*, and *Stenopus hispidus*, including successful hormone-free breeding and life-cycle closure of endangered endemic species. Biofloc technologies improved growth performance of *Ompok bimaculatus* and *Channa striata*. The institute has used herbal antioxidants for long-term milt cryopreservation, further strengthening the conservation technologies.

To date, 24 states and 2 Union Territories in India have designated their respective State fishes, demonstrating the implementation of ICAR-NBFGR's State Fish concept. Recently, Jharkhand, Punjab and Meghalaya declared *Clarias magur*, *Labeo rohita* and *Neolissochilus hexagonolepis*, respectively, as their State fishes. Efforts are ongoing to coordinate with the remaining States.

The institute is conserving indigenous and endemic fish germplasm through 9 Live Fish Germplasm Resource Centres (LFGRC) established in different parts of the country (Uttar Pradesh, Kerala, Lakshadweep, Maharashtra, Assam, Telangana, Manipur, and Tamil Nadu). The institute's LFGRC, Lucknow produced 685 lakh spawn of 14 fish species.

ICAR-NBFGR leads 3 National programmes, i.e., ICAR-Consortium Research Platform on Genomics; National Surveillance Programme for Aquatic Animal Diseases; and the All-India Network Project-Indian Network of Fisheries and Animal Antimicrobial Resistance.

Research on characterization and genetic diversity continued to generate valuable resources for fisheries management. ICAR-NBFGR contributed towards the whole genome sequencing of 13 important species till now. Recently, chromosome-level genome assemblies were generated for three important fishes, a dedicated genome browser for *Clarias magur* and a mitogenome browser for *Entacmaea quadricolor* are being developed, and genomic databases under the FisOmics portal were substantially enriched. Improved molecular diagnostics were developed for differentiating *Clarias magur*, *C. gariepinus* and their hybrids. The genetic stock evaluation confirmed the taxonomic status of the *Chromis viridis* complex. Novel genomic resources including the FiReFly repeat annotation server, SinghiTranscriptSSRdb, MahseerTranscriptSSRdb, validated microsatellite panels, adaptive loci, CRISPR-Cas9 guide RNAs and the Network-based Gene Essentiality Predictor (NGEP) tool were also developed.

The institute's National Repository of Fish Cell Lines presently hosts the world's largest cell line accessions. The Bureau further strengthened National *ex situ* conservation infrastructure by developing 8 new cell lines (3 cell lines from freshwater fishes and 5 cell lines from deep-sea fishes) and distributed 15 cell lines for research and development.

Fish health management programmes continued to expand through strengthened National aquatic animal disease surveillance, development of positive controls for emerging pathogens, confirmation of viral diseases, participation in international proficiency testing, enhancement of the ReportFishDisease mobile application, and extensive surveillance activities. Several diagnostic assays, antimicrobial resistance profiling, vaccines, pathogen inactivation protocols, microbiome analyses, immune response studies and therapeutic interventions were carried out, including an inactivated bivalent vaccine against *Aeromonas jandaei* and *Edwardsiella tarda*. Recently, ICAR-NBFGR has been recognised as the WOAH Reference Laboratory for *Aphanomyces invadans*. Recently, the OoNIL, ICAR-NBFGR's formulation for effective treatment of oomycete diseases in freshwater fishes, has been commercialised through Tata Rallis India via Agrinnovate India Ltd.

Several new facilities were created by ICAR-NBFGR in 2025, including cluster mode rearing unit for clownfish aquaculture at Pulicat; clownfish seed supply facility at Parangipettai, Tamil Nadu; ornamental fish bank integrated with farmer field school at Sitapur; bioinformatics server in the institute; upgradation of craft and gear section in the National Fish Museum cum Repository, etc.

Scientific dissemination remained a major strength of the Bureau. ICAR-NBFGR contributed to 83 research publications, 4 books, 18 book chapters, 24 popular and technical articles, 15 training manuals and 12 booklets/leaflets in 2025. ICAR-NBFGR honoured with Rajbhasha Puraskar from Town Official Language Implementation Committee for its Annual Hindi Magazine Matsya Lok 2025, National Workshop and work in Hindi.

The Bureau continued to serve farming communities through extensive extension programmes under the NEH, SCSP, and STC components across several states and Union Territories, benefitting over 6000 farmers. Under the Viksit Krishi Sankalp Abhiyan, over 12,588 farmers were sensitized on agriculture and fisheries-related technologies. The institute received technical recognition in 2025 from Food and Agriculture Organization in the field of sustainable aquatic food systems for its work towards skill development of women fish farmers.

The institute contributed to several policy matters including contributions to India's seventh National report to the Convention on Biological Diversity; translation of the Vision 2050 with implementable action plans aligning with Viksit Bharat 2047; review of aquatic species listed under the wildlife (protection) act, 1972 (amendment, 2022) for reclassification and sustainable utilization. The institute was part of several stakeholder consultations, such as expert consultation on translational genomics in Indian aquaculture; Uttar Pradesh Fisheries Investment & Growth Summit 2025 (Blue Transformation in Uttar Pradesh); NAAS Brainstorming Session on 'Regional Priorities in Agriculture and Allied Sciences in the context of Viksit Krishi'; NAAS Awareness

Programme 'Innovation to Impact: Inspiring Youth Careers in Agriculture and Allied Sectors through Intellectual Property Awareness'; Workshop on "Awareness to Action: Conserving Fish Diversity for Future Generations" in collaboration with Uttar Pradesh State Biodiversity Board; Live Broadcast of the Hon'ble Prime Minister's launch of PM *Dhan-Dhaanya Krishi Yojana* and *Dalhan Aatmanirbharta* Mission; release of 21st instalment of the PM-KISAN Samman Nidhi; Viksit Bharat Guarantee for Rozgar and Ajeevika Mission (Gramin) information dissemination; etc.

ICAR-NBFGR promoted digital governance and institutional efficiency through adoption of iGoT Karmayogi platform and implementation of ICAR policies related to data management, gender strategy, and communication systems. ICAR-NBFGR strengthened linkages and stakeholder engagement with State Governments, tribal communities, fisheries departments, universities, and academic institutions through MoUs, collaborative activities, and field-level programmes. ICAR-NBFGR signed 8 MoUs in 2025. ICAR-NBFGR enhanced institutional fund flow by securing multiple externally funded projects from agencies including DBT, MoES, ANRF, State Biodiversity Boards, and Department of Tribal Welfare, thereby strengthening the research funding base.

The institute has welcomed over 16,000 visitors at our facilities (National Fish Museum cum Repository and Ganga Aquarium) in 2025. Among distinguished visitors, Shri George Kurian, Hon'ble Minister of State, Ministry of Fisheries, Animal Husbandry and Dairying; Fisheries Minister of Uttar Pradesh, Dr. S. K. Nishad; Member of Parliament, Rajya Sabha and Former Deputy Chief Minister of Uttar Pradesh, Prof. Dinesh Sharma; Mayor, Lucknow Smt. Sushma Kharkhwal; Hon'ble Director General, ICRISAT & Former Secretary, DARE & Director General, ICAR, Dr. Himanshu Pathak; Shri Sagar Mehra, Joint Secretary (Inland Fisheries), Department of Fisheries, Government of India, Shri Sagar Mehra, Joint Secretary (Inland Fisheries), Department of Fisheries, Government of India, and recently, the Parliamentary Standing Committee on Agriculture, Animal Husbandry and Food Processing, comprising fifteen Hon'ble Members of Parliament, led by the Hon'ble Chairman, Shri Charanjit Singh Channi; Prof. S. P. Singh Baghel; Hon'ble Minister of State, Ministry of Fisheries, Animal Husbandry and Dairying; Dr. M. L. Jat, Hon'ble Secretary (DARE) & Director General ICAR; were special visitors.

We express sincere gratitude to the visionary leadership of the Ministry of Agriculture & Farmers' Welfare and the Ministry of Fisheries, Animal Husbandry & Dairying for his guidance and support. We are deeply grateful to Dr. M. L. Jat, Hon'ble Secretary (DARE) & Director General ICAR; Dr. Joykrushna Jena, DDG (Fisheries Science) ICAR; Dr. Shubhadeep Ghosh, ADG (Marine Fisheries) ICAR; and Dr. Devika Pillai, ADG (Inland Fisheries) ICAR, for their constant encouragement, invaluable guidance, and support. Sincere thanks are due to the DKMA, ICAR, for their consistent support in disseminating our achievements through ICAR web news and other outreach publications. We also extend our heartfelt appreciation to Dr. W. S. Lakra, Hon'ble Chairman, Research Advisory Committee, along with all the esteemed members of the RAC, for their insightful suggestions, constructive guidance, and continued encouragement, which have greatly contributed to our progress. I express my appreciation to the dedicated scientists, technical staff, and administrative personnel of ICAR-NBFGR, whose commitment, professionalism, and tireless efforts have been instrumental in accomplishing these achievements.

As Bharat moves towards the vision of Viksit Bharat 2047, ICAR-NBFGR remains committed to contributing meaningfully to this National aspiration.



(Kajal Chakraborty)
Director
May 25, 2026

Executive Summary

Program: Exploration, Documentation and Cataloguing

- In Chenab River, the assessment of fish, water and habitat characteristics across 10 geo-mapped sites was initiated and a total of 8 species from 3 orders, 4 families, and 7 genera were identified so far.
- A multi-seasonal exploration in Bakhira Wildlife Sanctuary resulted into a total of 61 fish species. For analysing the Stakeholders' perception on ecosystem services and impact of climate change, a total of 136 respondents' data was recorded.
- Exploratory surveys in Haiderpur Wetland resulted into 51 fish species.
- Exploratory surveys were carried out at 6 stations along the Periyar River and 57 fish species (>80% Least Concern; 15% Threatened; 2% Endangered) belonging to 12 orders, including 6 exotic species were recorded.
- Interpolation time series prediction models on 13 environmental parameters and species distribution have been developed. In addition, a time-series model for prediction of IMC landings (avg. tonne) for year 2030-2050 has been developed.
- In Teesta River, comprehensive assessments across 21 sites (Zero Point to the Tarai region), revealed 104 species (12 threatened species) with dominance by Cyprinidae and Danionidae. GIS-based habitat suitability model was developed for *Neolissochilus hexagonolepis*, and suitable habitats were identified in the main channel of river Teesta.
- Anthropogenic stressors were mapped and aquatic biodiversity risk scores were calculated to support conservation planning within the Teesta River basin. Furthermore, a 30-year climate data analysis (1994-2024) revealed significant declining trend in water spread area and emerging risks to riverine biodiversity
- An otolith atlas of freshwater fishes of India has been developed comprising otoliths from 115 species.
- In Subarnarekha River, 117 species (46 freshwater, 71 brackishwater) were documented from 10 sites with high proportion of carnivorous species (43.58%). Further, localized eutrophication risks in urban stretches were detected through water quality analysis.
- In Godavari River, two extensive seasonal surveys were conducted at 10 locations and documented 96 plankton species and fish species dominated by Cypriniformes (54%) order followed by Siluriformes (20%).
- Habitat prediction modelling was performed for endemic catfishes viz., *Rita gogra, R. kuturnee, R. bakalu* and *Clupisoma bastari* in the Godavari Basin.
- A patent filed for "Primer Set and Molecular Differentiation of *C. magur, C. gariepinus*, and their

  Hybrid" (Ref: 202511134673).
- Exploratory surveys were conducted in the Thamirabarani River in Tamil Nadu and a total of 46 fish species belonging to 11 orders and 17 families were recorded.
- A total of 823 specimens of 170 deep-sea species were collected from Kerala and Tamil Nadu coasts. First occurrence of *Xenocephalus australiensis* and *Ophidion muraenolepis* recorded from Indian waters.
- A total of 291 deep-sea fish species belonging to 30 orders, 86 families, and 165 genera were documented from 17 fish landing centres. Molecular signatures generated from the specimens revealed 38 first-time records from India. The integrative taxonomic study led to the discovery of 2 species new to science (*Apterichtus kanniyakumari* and *Bascanichthys chepakakiensis*) and 5 new territorial records.
- A total of 5 novel cell lines from marine species such as *Gerres filamentosus, Priacanthus hamrur*, and *Uranoscopus marmoratus* were developed.
- Exploratory surveys were conducted in the tributaries of river Cauvery and documented 60 fish species in Kabani River; 48 in Lakshmana Tirtha River; 56 in Harangi River; 28 in Suvarnavathi River and 44 in Hemavathi River.
- Carbon sequestration potential of 3 major Indian mangrove ecosystems viz., Pichavaram, Point Calimere, and Punnakayal was analysed, which revealed that Point Calimere holds the highest blue carbon stock (0.32 TgC).

- A comprehensive checklist of 148 species, belonging to 14 orders, 94 genera, and 39 families from diverse aquatic resources of Uttar Pradesh was prepared. A GIS-based framework was developed to map Fish Conservation Refugia in Rihand Dam.
- Under the NEH component, a total of six caves of Meghalaya and different north eastern rivers such as Subansiri river (28 species; 11 families), Chubi River (17 species; 14 families); Tirap River (16 species); Chindwin and Barak River Systems (27 species); Tuirial River (30 species; 12 families); Phukhinglang River and Karnaphuli River (73 species) were explored.
- Three fish species, new to science were discovered, including *Olyra sancta* and *Exostoma hajiensis*, from Arunachal Pradesh, and *Schistura densiclava* from Meghalaya caves.
- Conducted cytogenetic studies with first-time karyotype reports for *Channa andrao*, *Ctenops nobilis*, and *Danio dangila*.

Program: Characterization, Intraspecific diversity and Genetic stocks

- The fish diversity in Gomti River, Uttar Pradesh, was assessed using eDNA metabarcoding and recorded 61 species (belonging to 11 orders, 27 families and 44 genera), whreas conventional surveys identified 78 species. A portable low-cost eDNA water sampler was designed.
- An improved DNA based method was developed to differentiate *C. magur* from *C. gariepinus*. Further, a novel biosensor has been developed for detection of *C. gariepinus*
- Nano carbon dots were synthesized from fish scale waste of *Labeo rohita* using a hydrothermal carbonization method and standardized the protocol for converting *L. rohita* fish scale biowaste into biogenic hydroxyapatite.
- A total of 196 samples of *Wallago attu* were collected from commercial riverine catches (Chambal, Ken, Betwa, Jamni, Dhasan and Gomti) to document genetic variation across a wide geographical distribution range.
- Stock delineation and taxonomic evaluations of *Chromis viridis* provided the first robust evidence that the cryptic species complex comprises a single, well-supported putative species, which warrants recognition of this lineage as a distinct species.

Program: *Ex situ* and *in situ* Conservation

- Developed three muscle cell lines from *Labeo calbasu, Channa striata* and *Trichogaster chuna*. Three new cell line were added to the NRFC repository, totalling 86 accessions, and 15 fish cell lines were distributed for R&D.
- A comprehensive gross and histological atlas of gonadal development of *Clarias dussumieri* was prepared. The integration of developmental biology with hatchery practices contributed to enhanced larval survival, growth performance, and standardized early rearing strategies, which supports conservation-oriented seed production in *C. dussumieri*.
- Explorations (39 Nos.) conducted in 6 islands of Lakshadweep, led to the discovery of 2 new crustacean species; *Cinetorhynchus himanshui* and *Galathea balasubramaniani.*
- Experimental success was obtained in the captive propagation of *Stenopus hispidus.*
- Cluster-based clownfish rearing unit at Pulicat, Tiruvallur district was established, besides pearlspot & seabass farming and crab fattening for livelihood development of local tribal communities.
- Designer clown (F4 generation) was developed with cross breeding of *Amphiprion ocellaris & A. percula.*
- Rosemary extract at 2% and curry leaves extract at 4% is recommended as herbal antioxidant for long term milt cryopreservation of freshwater fishes.

Program: Genomic Resources for Important Fishes

- A total 269 DEGs were obtained from the transcriptome data of slow and fast-growing individuals of *Clarias magur* at 12-month age and the highest number of genes are involved in the cell cycle process, followed by cell division.
- Using multi-omics approach, a total of 14 genes were identified to be related to growth in *C. magur*, which may serve as the potential target for gene editing to increase growth.
- Genomic resource databases were updated regularly with the addition of new data available in the public domain

for FBIS, FMiR, FishMicrosat and Fish Karyome databases under FisOmics webportal.

- The thermal tolerance thresholds and physiological biomarkers relevant for climate resilience and stress management was determined for *Rita rita*.
- Genome-transcriptome-proteome interactions and molecular pathways involved in gene regulation and adaptation were characterized in *Heteropneustes fossilis*. Sting tissue of *H. fossilis* was analyzed to identify venom-associated peptides and characterize bioactive components.
- Novel bioactive peptides from *C. magur* were identified for developing therapeutics against cancer and bacterial infections.
- Dedicated genome browser of *C. magur* and mitogenome browser of *Entacmaea quadricolor* has been developed and is being integrated with functional tools
- Putative toxin types (Acrorhagin I, actinoporin, Phospholipase A2, actinoporin Cjtox I, U-actitoxin-Ugr1c etc.) genes were identified in bubble-tip anemone, *Entacmaea quadricolor* based on genome mining and comparative analysis of Cnidarian toxins.
- A validated panel of microsatellite markers was developed for *Labeo bata* and individual genotyping to assess genetic diversity parameters. In addition, adaptive microsatellite loci were identified in both *H. fossilis* and *L. bata*, strengthening resources for conservation genetics and stock improvement programs.
- Chromosome-level assemblies were generated for *Heteropneustes fossilis*, *Ompok bimaculatus*, and *Chitala chitala*.
- A web-based server, named FiReFly (Find Repeat Families), was designed for comprehensive identification and annotation of repetitive elements in fish genomes. In addition, two on-line genomic databases namely SinghiTranscriptSSRdb and MahseerTranscriptSSRdb were developed.
- A total of 12 species of cone snails were identified from the specimens collected from 8 major landing centres of Kerala and Tamil Nadu. Novel conotoxin genes belonging to 23 conotoxin superfamilies were identified from *Conus inscriptus* transcriptome data.
- Hi-C scaffolding was done for *Trichogaster chuna* to improve Scaffold N50 (10.80 Mb to 18.74 Mb), delivering a near-chromosome-scale resource with 99.1% completeness.
- CRISPR-Cas9 sgRNAs were designed and validated for key growth and metabolic genes in *Labeo rohita*. An integrated *in silico* pipeline was developed to perform pathway analysis and predict gene essentiality. A Network-based Gene Essentiality Predictor (NGEP) tool has been developed.

Program: Evaluation of Indigenous Germplasm for Utilization

- Supplementation of carbon sources like rice flour with probiotics in biofloc system improves water quality and effectively promotes growth of *Ompok bimaculatus*.
- Captive breeding protocol of small indigenous freshwater prawn, *Macrobrachium dayanum* was standardized with larval hatching (>70%) and incubation periods of 23-35 days, which provides a framework for conservation-oriented ornamental aquaculture and low-input backyard farming.
- Captive breeding protocol of newly discovered endemic catfish, *Horabagrus obscurus* has been standardized and optimized larval rearing conditions for an endangered catfish, *H. nigricollaris* aiding the conservation aquaculture of endemic fishes of the Western Ghats.
- Successful life-cycle closure of the Endangered endemic catfish *H. nigricollaris* and *O. malabaricus* were achieved in captivity, establishing a self-sustaining population.
- Evaluated striped murrel, *Channa striata* as a candidate species under biofloc system with 5 different carbon sources.
- Successful captive breeding and rearing of *Pethia pookodensis*, a critically endangered barb of Wayanad region in Kerala, was achieved.
- Hormone-free captive breeding was accomplished for ornamental barb *Dawkinsia rohani* and *D. apsara*, establishing a low-cost, eco-friendly natural spawning protocol.

Program: Assessment of Exotics, and Fish Health Management

- Strengthened the ongoing disease surveillance programme by developing positive controls for emerging pathogens and sharing with Collaborating Centres;

screening and confirming viral infections (SHRV, KHV, and IMNV); and participating in the Asia-Pacific proficiency-testing programme conducted by CSIRO.

- Reporting of aquatic animal diseases was strengthened by developing desktop version for Admin panels, Hindi content for the major diseases affecting aquatic animals and iOS version under the ReportFishDisease (RFD) app.
- Under passive disease surveillance, 28 disease cases affecting farmed food fishes and 72 disease cases in ornamental fishes were reported from different districts of Uttar Pradesh.
- An extensive disease surveillance of food and ornamental fishes in Kerala included 58 sampling events, testing 563 specimens for detecting the pathogens. Emerging bacterial pathogens, *Lactococcus formosensis* and *Chryseobacterium* sp., infecting freshwater ornamental fishes were isolated and characterized.
- A total of 346 bacterial isolates comprising *Escherichia coli*, *Aeromonas* spp. and *Staphylococcus* spp. were recovered from a total of 157 freshwater fish farms of Uttar Pradesh (4 districts), and AMR profiles were determined.
- A dot blot assay and indirect ELISA for detection of *Flavobacterium columnare* specific antibodies in the serum of IMC has been standardized.
- The differential gene expression studied in two temperature conditions (28 °C and 40 °C) led to the identification of important proteins crucial for maintaining intracellular amino acid in bacteria.
- Efficacy of BKC in hatching and larval survival following *Aeromonas veronii* infection has been determined. Therapeutic potential of Iodophor and Chloramine T-Trihydrate against *Saprolegnia parasitica* and *Aphanomyces invadans* has been evaluated.
- TiLV was inactivated using heat or formalin for immunizing Nile tilapia and Heat-inactivated TiLV showed a 70% protection in Nile tilapia against TiLV infection.
- Outer membrane protein (OMP) of *Edwardsiella ictaluri* was purified and mice immunized with purified E-OMP were selected for hybridoma production.
- Gut microbiome profile between EHP-Positive and EHP-negative *Penaeus vannamei* cultured in inland saline farms showed dominance of harmful bacterial group from the orders Vibrionales, Pseudomonadles and Aeromonadales in EHP-positive shrimps.
- Immune gene expression profile in pangas exposed to different temperatures has been determined with significant upregulation of *CRP, C3, MHC-II, IL-1β*, transferrin, *HSP 70* and *HSP 90* at 16 °C, and *C3, MHCII* and *IL-1β* at 22 °C. Three genes (*C3, MHCII, transferrin*) showed significant upregulation in pangas challenged with *S. parasitica* at 28 °C.
- Inactivated bivalent vaccine was developed against *Aeromonas jandaei* and *Edwardsiella tarda*.

Publications

- The institute published 83 research articles in different peer-reviewed National and International journals, 24 popular/technical articles, 5 books, 18 book chapters, 15 training manuals and 12 leaflets during the year.

Conference/webinar/workshop

- 'Awareness-Cum-Workshop on ReportFishDisease app for strengthening farmer-based fish disease surveillance' was organized in Barabanki, Uttar Pradesh on June 12, 2025, where 124 fish farmers participated.
- A workshop on 'Fisheries biotechnology & genetic improvement program in aquaculture' was organised in collaboration with SRM Institute of Science and Technology, Chennai at Chennai on July 16, 2025, where 350 students and research scholars participated.
- A workshop on 'NGS data analysis' was organized during July 21-23, 2025 and was attended by 21 participants.
- Expert Consultation on 'Development of a Roadmap for Translational Genomics in Indian Aquaculture' was organized at ICAR-NBFGR, Lucknow in collaboration with Asian Fisheries Society Indian Branch on August 29, 2025.

Extension and community outreach

- Various extension and community outreach activities under NEH, SCSP and TSP in Arunachal Pradesh, Assam, Kerala, Lakshadweep, Madhya Pradesh, Nagaland, Goa,

Tamil Nadu, Tripura, Uttar Pradesh, West Bengal etc. were conducted.

- A total of 12588 farmers were sensitized on agriculture related activities through Viksit Krishi Sankalp Abhiyan (VKSA-2025) during May 29 to June 12, 2025.

Live Fish Germplasm Resource Centre, National Fish Museum and Ganga Aquarium

- The institute produced 685 lakh spawn of 14 species and a revenue of Rs. 10,34,000/- generated. Fish seeds were supplied to fish farmers and hatchery owners.
- A total of 16120 visitors including school children, university students, and tourists, visited the National Fish Museum and Repository facility and generated revenue of Rs. 2,09,575/-.
- A total of 7694 visitors visited the Ganga Aquarium, and generated revenue of Rs. 1,65,605/-.

Introduction

India's diverse topography and rich natural resources play an important role in maintaining ecological balance, conserving genetic diversity, and supporting livelihoods. These resources are also essential for ensuring food and nutritional security for growing population. However, many of these valuable resources remain underutilized and are increasingly threatened by human activities and climate change. This makes it essential to scientifically document, conserve, and sustainably manage the country's biological wealth. In this direction, the ICAR-National Bureau of Fish Genetic Resources (ICAR-NBFGR), established in 1983 at Prayagraj and later shifted to Lucknow, has emerged as a leading institute for fish genetic resource research and conservation. The Institute functions through its 3 divisions in Lucknow and 1 at Kochi, along with Aquaculture Research and Training Unit at Chinhat, Lucknow.

ICAR-NBFGR combines traditional biodiversity studies with advanced scientific technologies with modern facilities for genomics, bioinformatics, disease diagnostics, and environment-controlled investigations. Major research includes whole-genome and transcriptome sequencing, sperm cryopreservation, *ex situ* conservation, and molecular diagnostics for aquatic animal diseases, including WOAH-listed pathogens and antimicrobial resistance monitoring.

Institute also undertakes extensive field surveys in remote and unexplored regions to document fish diversity and identify important indigenous and endemic species. Through collaborations and stakeholder engagement, ICAR-NBFGR promotes sustainable use and conservation of aquatic genetic resources while supporting livelihood development and national fisheries growth. Its integrated approach helps ensure long-term nutritional, ecological, and environmental wellbeing of the country.



Budget (April, 2025-March, 2026)

(Rs in Lakhs)

Head	Capital		General	
	Allocation	Expenditure	Allocation	Expenditure
Institute	450.00	450.00	709.50	709.50
NEH	8.00	8.00	155.00	155.00
STC	8.00	8.00	68.50	68.50
SCSP	8.00	8.00	118.00	118.00
Sub-Total	474.00	474.00	1051.00	1051.00
Total Allocation	**1525.00**			
Total Expenditure	**1525.00**			

Staff Position

(as on December 31, 2025)

Category of Post	Sanctioned Post	Staff-in-Position	Post Vacant
Research Management Position (Director)	01	01	-
Scientist	44	34	10
Technical	38	28	10
Administrative	27	19	08
Multi-Tasking Staff	18	11	07
Total	**128**	**93**	**35**

Vision, Mission & Mandate



VISION

Assessment and conservation of fish genetic resources for intellectual property protection, sustainable utilization and posterity.



MISSION

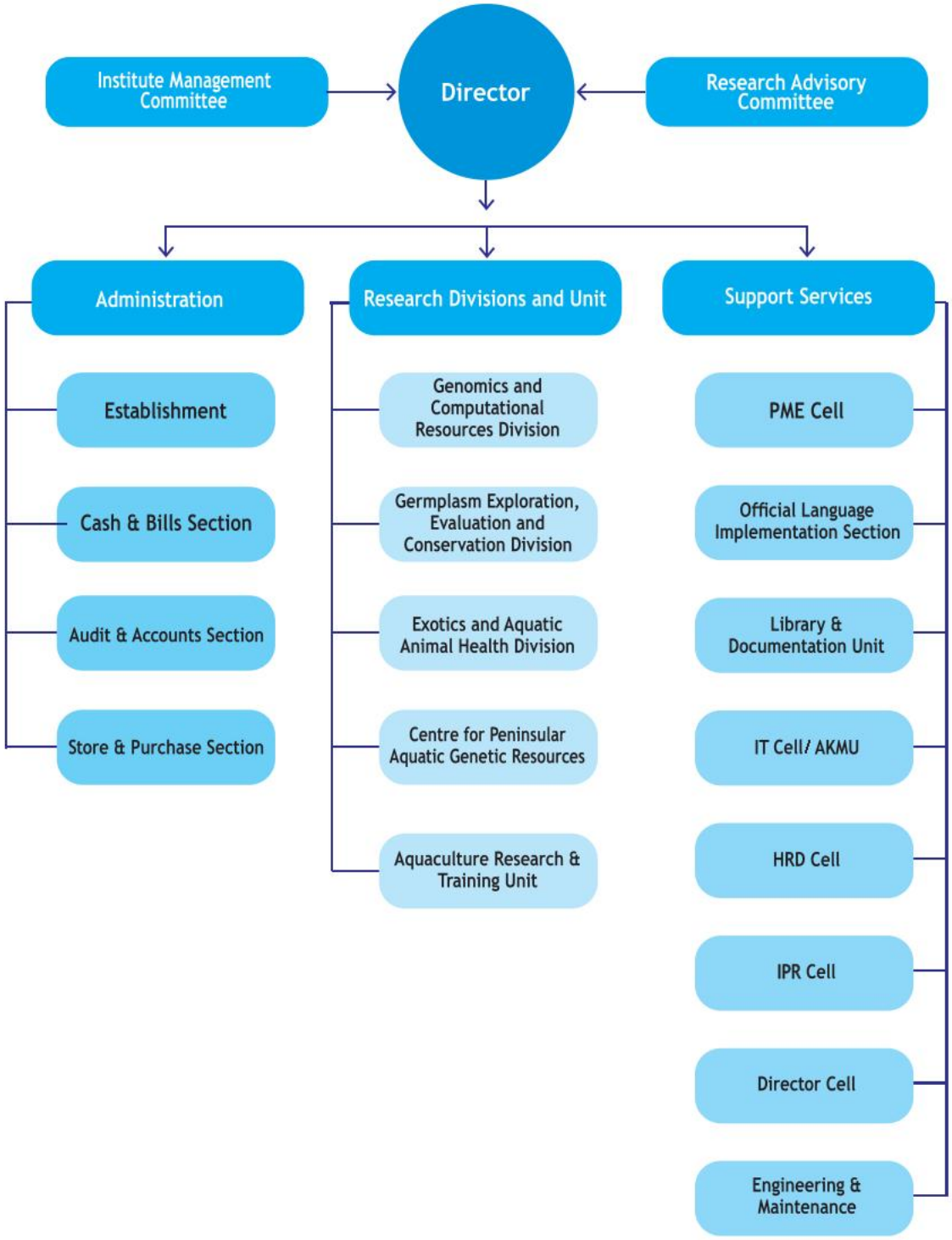
Collection, cataloguing and documentation of fish genetic resources using operational strategies of partnership and cutting-edge technologies.



MANDATE

- Exploration, characterization and cataloguing of fish genetic resources.
- Maintenance and preservation of fish genetic resources for conservation and utilization of prioritized species.
- Evaluation of indigenous and exotic germplasm including risk assessment and fish health.

Organogram


Institute Management Committee
Director
Research Advisory Committee
Administration
Research Divisions and Unit
Support Services
Establishment
Cash & Bills Section
Audit & Accounts Section
Store & Purchase Section
Genomics and Computational Resources Division
Germplasm Exploration, Evaluation and Conservation Division
Exotics and Aquatic Animal Health Division
Centre for Peninsular Aquatic Genetic Resources
Aquaculture Research & Training Unit
PME Cell
Official Language Implementation Section
Library & Documentation Unit
IT Cell/ AKMU
HRD Cell
IPR Cell
Director Cell
Engineering & Maintenance

New Discoveries in 2025



Scientific Name : *Ariosoma tamilicum*

Common Name : Tamil short-tail conger eel

Location of Discovery : off the coast of Thoothukudi, Tamil Nadu, Bay of Bengal

Ecosystem : Marine/Deep-sea

Use : Minor commercial



Scientific Name : *Apterichtus kanniyakumari*

Common Name : Kanniyakumari finless snake eel

Location of Discovery : Colachel coast of Tamil Nadu, Arabian Sea

Ecosystem : Marine/Deep-sea

Use : Minor commercial



Scientific Name: *Exostoma hajiensis*

Location of Discovery : Subansiri River of Brahmaputra River basin in Arunachal Pradesh

Ecosystem : Freshwater

Use : Minor commercial



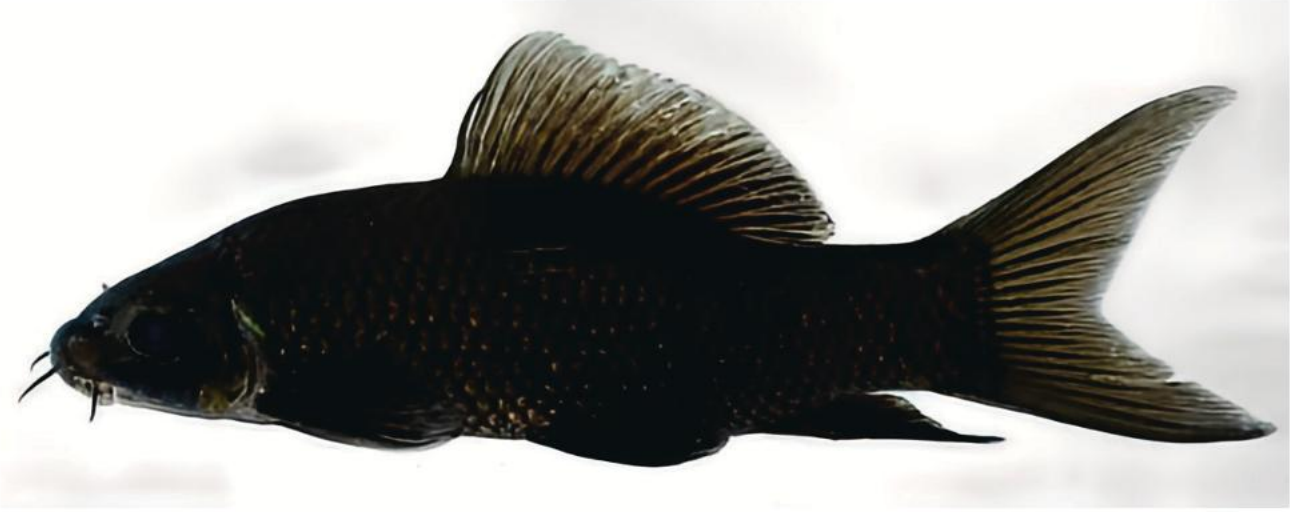
Scientific Name : *Facciolella smithi*

Common Name : Smith's witch eel

Location of Discovery : off the Kerala coast in the Arabian Sea

Ecosystem : Marine/Deep-sea

Use : Minor commercial



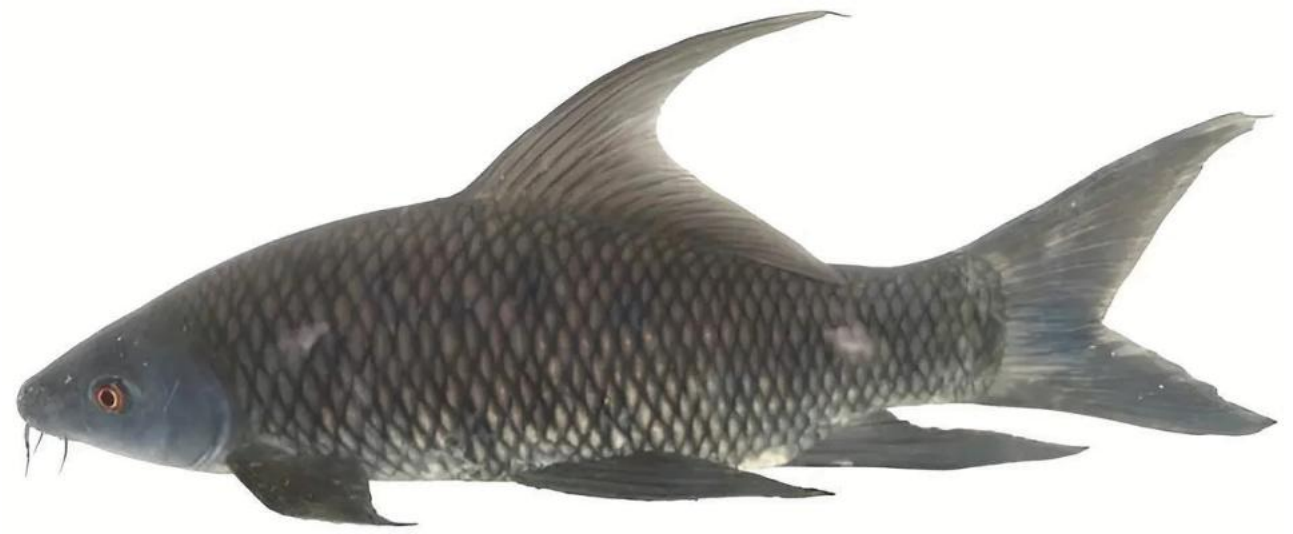
Scientific Name : *Labeo chekida*

Common Name : Kaka chekida / crow chekida

Location of Discovery : Chalakkudy River, Western Ghats in Kerala

Ecosystem : Freshwater

Use : Food fish



Scientific Name : *Labeo uru*

Location of Discovery : Chandragiri River, Western Ghats in Kerala

Ecosystem : Freshwater

Use : Food fish



Scientific Name : *Olyra sancta*

Location of Discovery : Tissa River, Brahmaputra River drainage in Arunachal Pradesh

Ecosystem : Freshwater

Use: Minor commercial



Scientific Name : *Schistura densiclava*

Location of Discovery : Limestone cave, Krem Mawjymbuin in East Khasi Hills, Meghalaya

Ecosystem : Freshwater

Use : Minor commercial



Scientific Name : *Cinetorhynchus himanshui*

Location of Discovery : Lakshadweep Island

Ecosystem : Marine

Use : Ornamental value

Exploration, Documentation and Cataloguing



Project

Exploration of ichthyofauna and spatial habitat ecology of the Western Himalayan River Chenab, India

Period: April, 2025 – March, 2028

Personnel: Jaspreet Singh (PI), Rajeev Kumar Singh, Rejani Chandran, Monika Gupta, Amit Singh Bisht and Deva Narayan

Funding Support: Institutional, ICAR-NBFGR

River Chenab originates from two glacial melt-fed streams in the Himalayas, namely Chandra and Bhaga, at an altitude of 5600 meters above sea level. The Chenab basin in India spans parts of Himachal Pradesh (45.05%) and Jammu & Kashmir (54.95%). The present study aims to document ichthyofaunal diversity, characterize habitats, assessment of water quality, biological characteristics of key species, anthropogenic effects, and identify *in situ* conservation locations for key species.

Preliminary site selection survey along the Chenab River was carried out from October -November, 2025. A total of ten locations (five in Himachal Pradesh and five in Jammu & Kashmir) were chosen for assessment of fish, water and habitat characteristics (Fig. 1). The experimental fishing was performed in these sites.

A total of 8 species from 3 orders, 4 families, and 7 genera were identified in the initial survey (Fig. 2). The current study presents fish with varying feeding habits: carnivorous (37.5%), omnivorous (37.5%), and herbivorous (25%) (Fig. 3).

The water quality assessments across all sampling locations indicated suitability for cold water species. Temperature and dissolved oxygen (DO) levels varied across the sampling locations, ranging from 3.6 to 16.9 °C and 5.25 to 9.2 ppm, respectively (Fig. 4). The lower stretch near urban areas exhibited slightly elevated ammonia levels compared to the upper stretch.

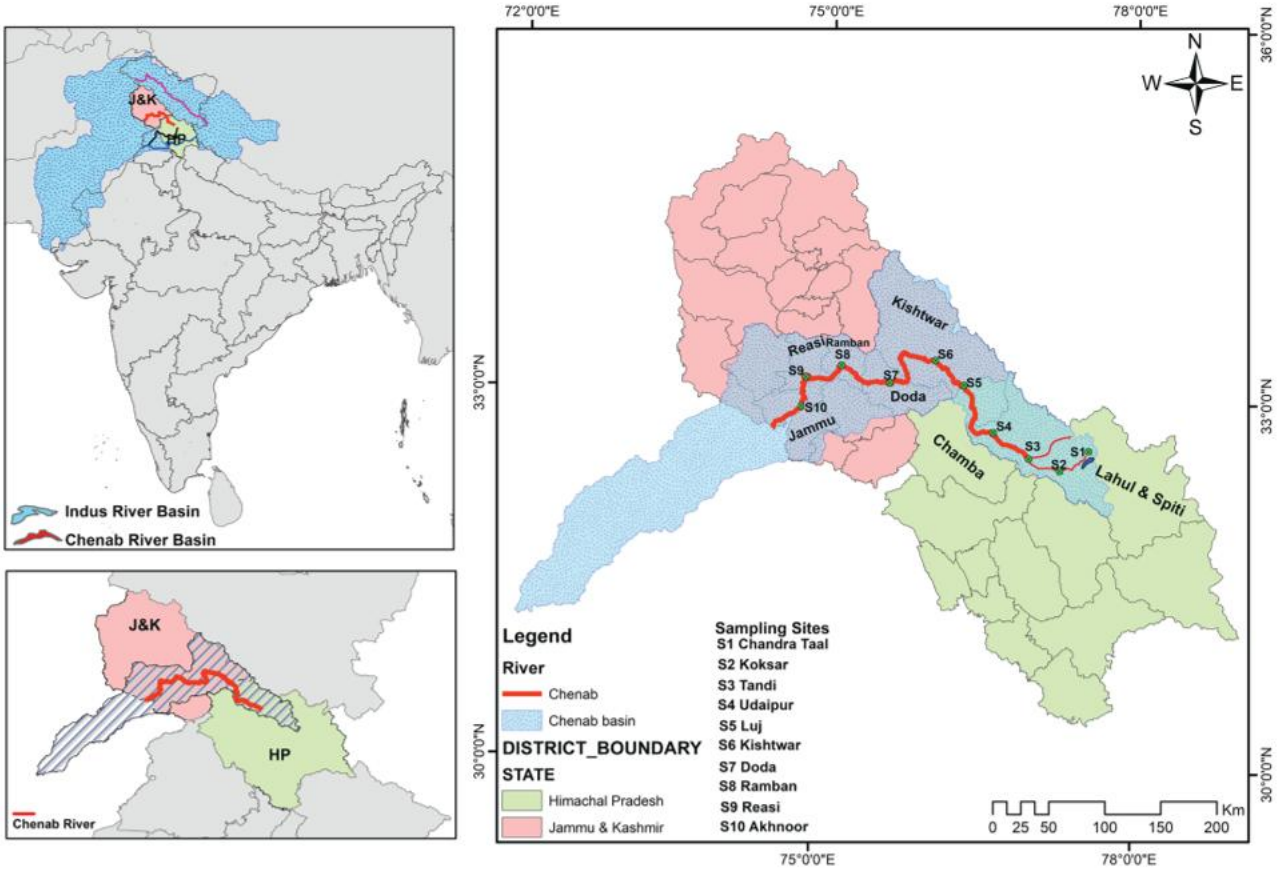


Fig. 1. Chenab River basin and selected sampling location's map

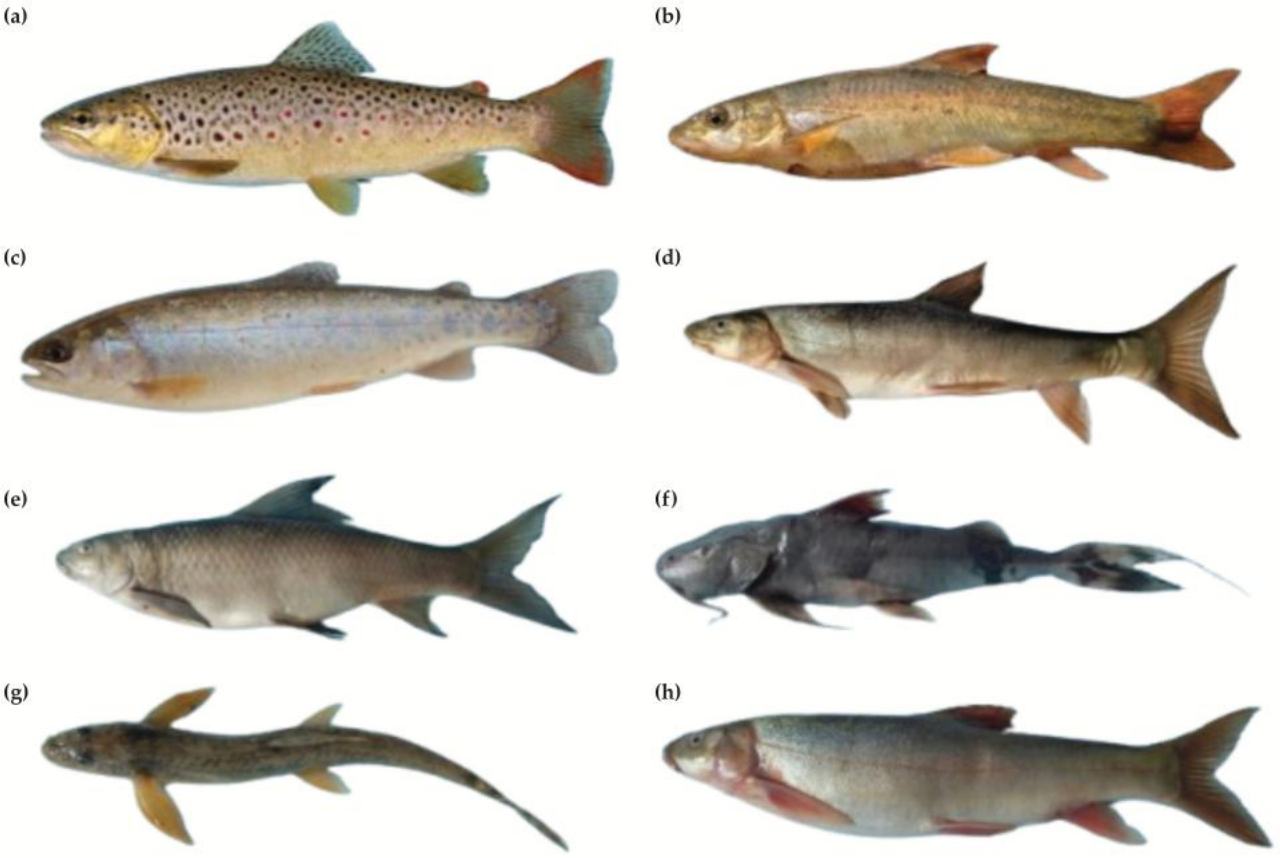


Fig. 2. Identified fish species: (a) *Salmo trutta,* (b) *Schizothorax richardsonii,* (c) *Oncorhynchus mykiss,* (d) *S. curvifrons,* (e) *Labeo dyocheilus,* (f) *Bagarius* spp., (g) *Triplophysa kashmirensis* and (h) *Schizothorax* spp. during survey along Chenab River

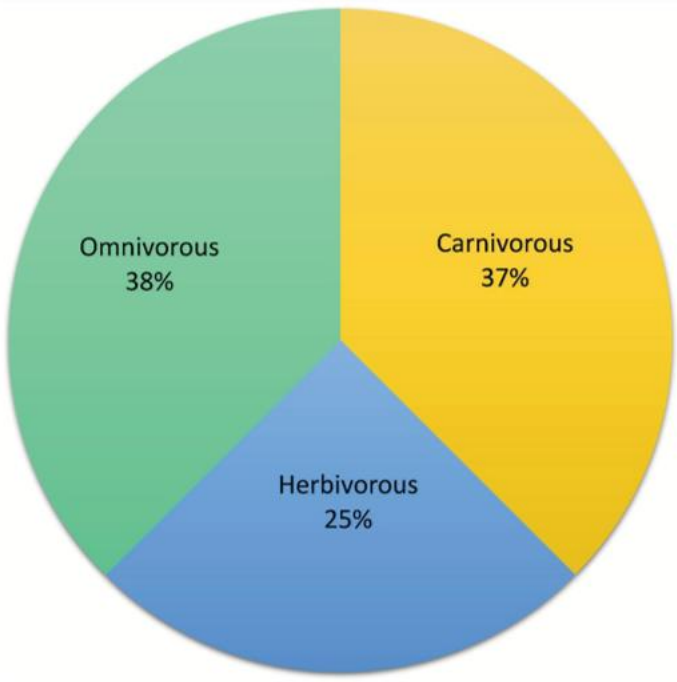


Fig. 3. Feeding habit of identified fish species from Chenab River

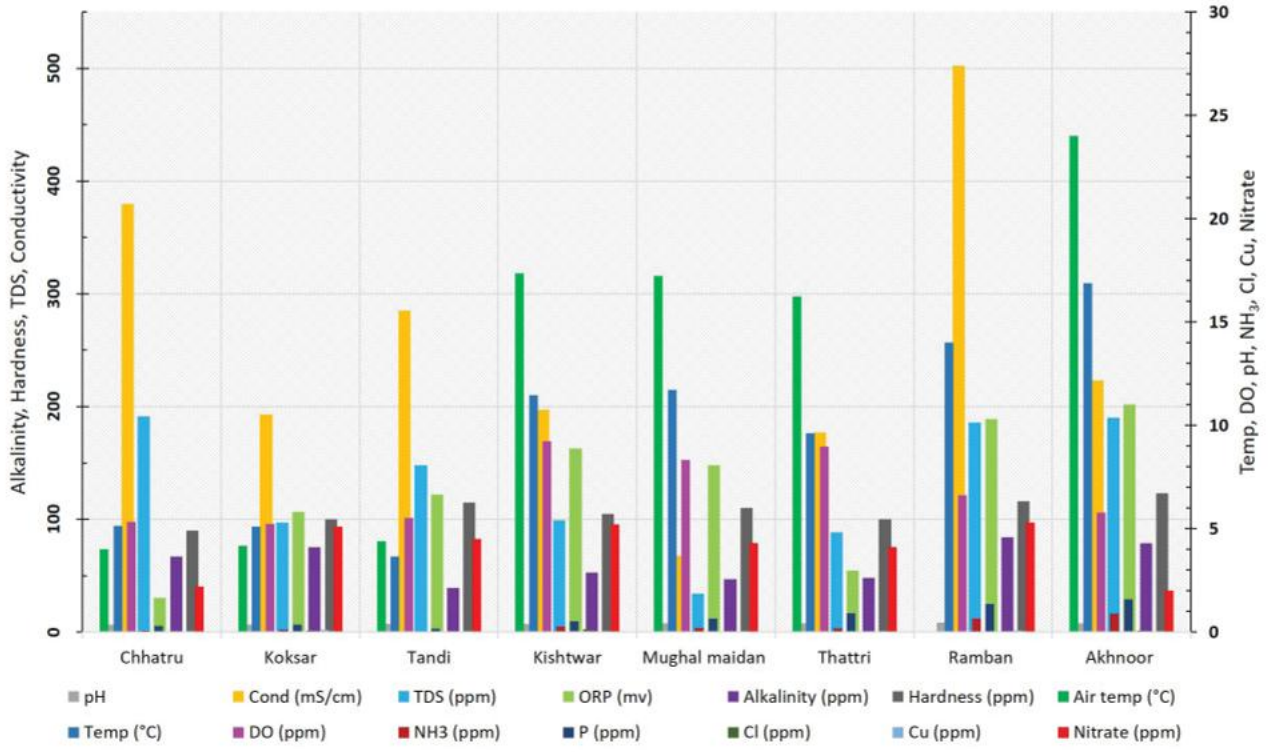


Fig. 4. Site wise water quality parameters

Project

Fish diversity assessment of Ramsar wetlands of Uttar Pradesh by integrating ecological approaches and stakeholder perception under climate change scenario

Period: April, 2023 - March, 2026

Personnel: Rejani Chandran (PI), Rajeev Kumar Singh, Lalit Kumar Tyagi, Achal Singh, Ajey Kumar Pathak, Kantharajan G., Amit Singh Bisht, Deva Narayan and Ranjan Singh

Funding Support: Institutional, ICAR-NBFGR

The Ramsar Convention designates wetlands of international importance to conserve surface water, preserve ecosystems, and promote sustainable development in biodiversity-rich regions. In India, it has been observed that several Ramsar sites require proper documentation of ichthyofauna diversity and habitat status in the context of anthropogenic pressures and climate change. This project aims to catalogue fish diversity and assess fish communities in the Ramsar wetlands of Uttar Pradesh, considering the impact of climate change. The findings will help in understanding the ecosystems of these wetlands, facilitating the development of sustainable management strategies for aquatic germplasm resources.

Random sampling methods were used at selected sites, with fishing gear operated a minimum of three times in various sections of each site. Fish diversity was assessed based on specimens collected through experimental fishing. Individual specimen was photographed, and the data on length and weight were recorded. The tissue samples were preserved in ethanol for molecular studies. All collected samples were tagged and stored in 10% formalin. Physico-chemical water quality parameters, including total suspended solids (TSS), were recorded at each site.

Bakhira Wildlife Sanctuary

The Bakhira Wildlife Sanctuary in the Sant Kabir Nagar district is the largest natural freshwater floodplain wetland of eastern Uttar Pradesh, with an area of 2894 ha. This perennial wetland is connected to the Ami River, a tributary of the river Rapti, and is protected under the Wildlife Protection Act (1972). An "eco-sensitive zone" extends up to 1 km

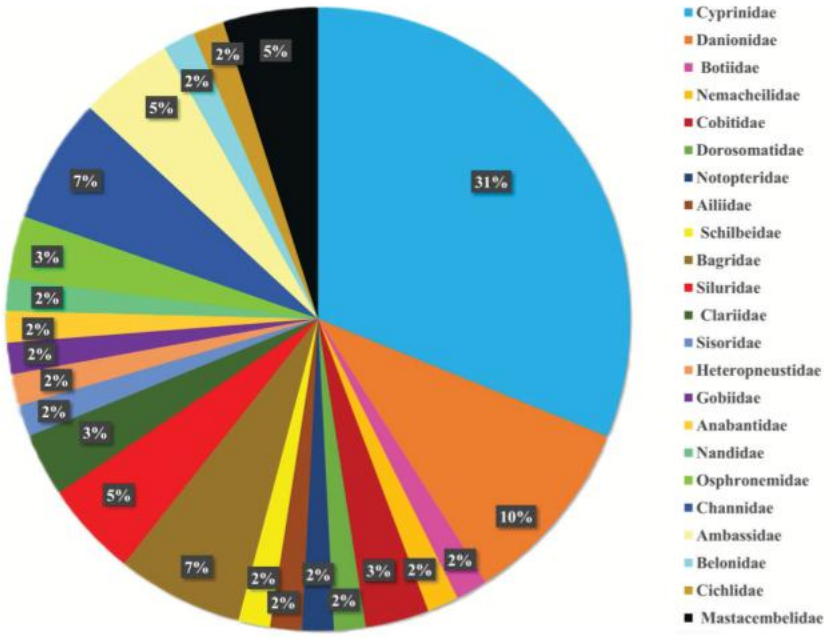


Fig. 5. Distribution of fishes in various families documented from Bakhira Wildlife Sanctuary

around its boundary. The wetland is internationally significant for its biodiversity, particularly its birdlife, supporting over 80 bird species. It also harbours 119 plant species. Exploratory surveys were conducted 5 times at 6 sampling locations. A total of 61 species belonging to 23 families were recorded. Cyprinidae is the most dominant family with 19 species (31%), followed by Danionidae with 6 species (10%); Bagridae and Channidae contribute 4 species each (7%); Ambassidae, Mastacembelidae, and Siluridae each contributed 3 species (5%) (Fig. 5). The presence of both commercially important and small indigenous fishes highlights the ecological complexity and productivity of the wetland ecosystem. DNA isolation from over 310 specimens has been completed for generating barcodes.



Fig. 6. Local women fish vendors of Bakhira Wildlife Sanctuary



Fig. 7. Documenting fishermen perception from Govindpur village of Bakhira Wildlife Sanctuary

Stakeholders' perception on ecosystem services and impact of climate change

A total of 136 respondents' data was recorded from 7 villages, i.e. Shanichara, Jasowal Bharwaliya, Jhuniya, Bakhira, Mahla, Newas, and Govindpur. The name, occupation, experience of fishing and selling, age, sex, name and distance of nearest town, residence and residence type in the studied area, and dependence on fisheries (major dependence, partial dependence, and occasional dependence) data recorded (Figs. 6, 7). Villages Shanichara and Jhuniya are the major fishing villages compared to others. People of Jasowal Bharwaliya and Mahla mainly depend on the wetland for the collection of grass and livestock grazing.

Haiderpur Wetland

Haiderpur *wetland* is a floodplain wetland of the river Ganga, located near the Bijnor Barrage, falling in the Muzaffarnagar and Bijnor Districts of Uttar Pradesh. With an area of 6098 ha, this wetland came into existence in 1984 after the construction of the Madhya Ganga Barrage on the river Ganga, about 10 km west of Bijnor city, and is located within the boundaries of Hastinapur Wildlife Sanctuary. It is an internationally important Ramsar Site declared in April, 2021. This diverse aquatic habitat thrives with life forms and provides a significant abode, especially for the migratory water birds (Fig. 8). This wetland is not only significant ecologically but also supports the local communities, which depend on the wetland for food, fisheries, and livelihoods. During the monsoon season (August, 2025), a total of 51 fish species belonging to 22 families were recorded. Cyprinidae is the most dominant family with 12 species (24% of total), followed by Danionidae with 5 species (10%), Bagridae 4 species (8%), Channidae, Ambassidae, Mastacembelidae,



Fig. 8. Haiderpur wetland during monsoon

and Sisoridae each with 3 species, and most other families (Notopteridae, Heteropneustidae, Belonidae, Cobitidae, etc.) were represented by a single species.

Project

Quantifying metastructure matrices of biodiversity & ecosystem services for the assessment of fish genetic resources

Subproject 1: Quantifying metastructure matrices in Western Ghats

Period: April, 2023 - March, 2026

Personnel: V. S. Basheer (PI), Divya P.R. and Charan R.

Funding support: Institutional, ICAR-NBFGR

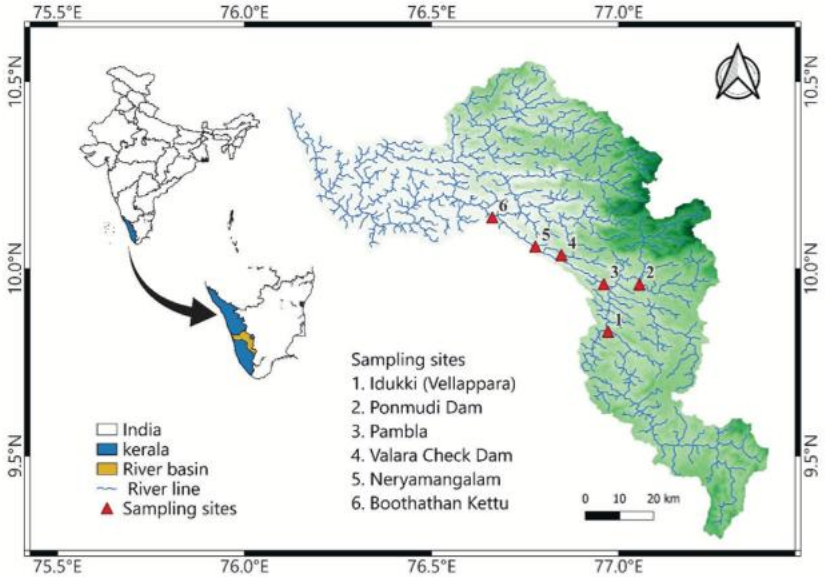


Fig. 9. Sampling locations in the Periyar River Basin, Kerala

Fish exploratory surveys were carried out at 6 stations *viz.*, Vellappara, Valara check dam, Ponmudi dam, Pambla, Neryamangalam, and Boothathan kettu, along the Periyar River, one of the longest rivers in Kerala, from Valara in Idukki district to Bhuthathankettu in Ernakulam district (Fig. 9). Most of the habitats were characterized by sandy shore, rock boulders and shallow streams with gravel beds (Fig. 10). River width varied from 30-100 m and the seasonal wetted channel width varied from 20-200 m. A total of 57 fish species belonging to 12 orders and 19 families, including 6 exotic species (*Clarias gariepinus*,



Fig. 10. Experimental fishing in the streams of Periyar River

Cyprinus carpio, Ctenopharyngodon idella, Oreochromis niloticus, O. mossambicus and *Pterygoplichthys spp.*) were recorded. Cypriniformes order dominated (48%) (Figs. 11, 12). In the Dam area, Indian major carps, *Labeo rohita* and *L. catla,* were available, which might have been introduced into reservoirs by the Kerala Fisheries Department as a part of fishery improvement programme. Exotic fishes like common carp, *Cyprinus carpio* and grass carp, *Ctenopharyngodon idella,* endemic fishes like kooral, *Hypselobarbus kurali* were available in all sampling areas but in small numbers. Among exotic species, tilapia, *Oreochromis niloticus,* was present in almost all sampling stations and in 2 stations, *O.*



Oreochromis niloticus and *O. mossmabicus*



Labeo rohita and *L. catla*



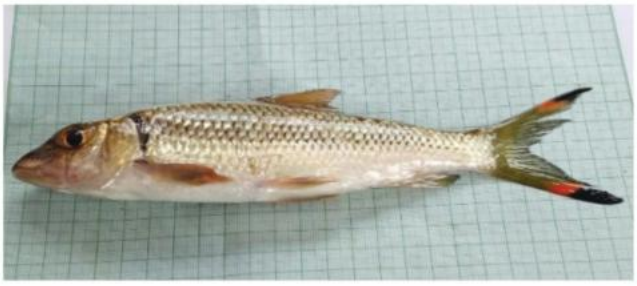
Ctenopharyngodon idella



Anabas testudineus



Systomus sarana subnasutus



Hypselobarbus kurali



Channa striata



Wallago attu

Fig. 11. Fish specimens collected from different sampling stations

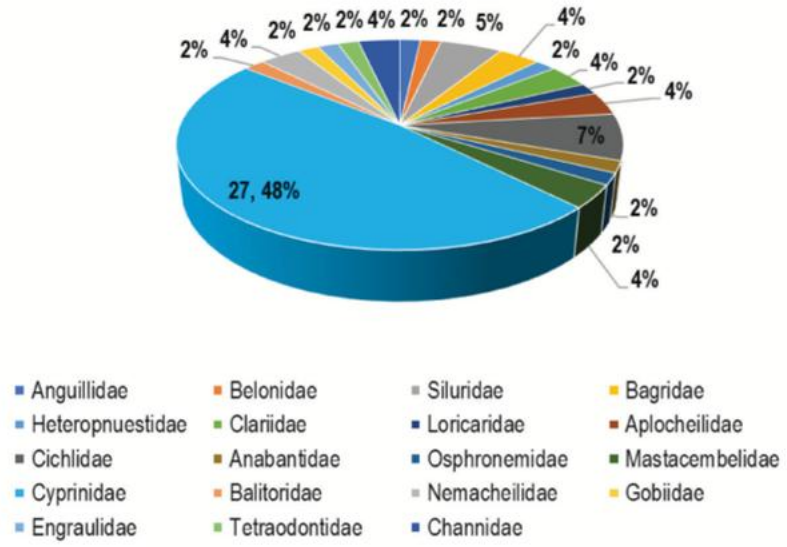


Fig. 12. Family-wise fish composition along Periyar River

mossambicus was sampled. Though exotic fishes were present, data shows not much influence on native fishes. Among minor barbs, *Haludaria fasciata, Dawkinsia filamentosa, Pethia ticto,* were more in the collection. Endemic catfishes, *Clarias dussumieri* and *Ompok malabaricus* were rarely found. It was observed that most of the fish (>80%) belonged to Least Concern category. Only 15% of the fish were in Threatened category, and 2% in Endangered category.

Sub Project 2: Quantifying meta-structure matrices in Ganga basin

Period: April, 2023 – March, 2026

Personnel: Achal Singh (PI), Rejani Chandran, Raghvendra Singh, Tarachand Kumawat, Ajey Kumar Pathak, Jaspreet Singh and Vikash Kumar

Funding Support: Institutional, ICAR-NBFGR

Interpolation model for generation of high-dimensional matrix on environmental parameters

Meta data on thirteen physico-chemical parameters; temperature, pH, TDS, electrical conductivity, sulphate, phosphate, alkalinity, chloride, total hardness, nitrate, DO, COD and BOD; was collected for six-year-groups (1960, 1985-90, 1995-96, 2016-17, 2019 and 1960-2019) and arranged in 6*13 data matrix for Ganga river landscapes (Allahabad). The computation of 13 parameters at one year-gap interval was performed through interpolation model & by R-package fpp2 and provided a data matrix 60*13, which was used for development of time series prediction model (Fig.13).

Interpolation model for generation of high-dimensional matrix on Species distribution

Meta data was collected from public domain for IMC landings (avg. tonne) for Ganga river landscape (Allahabad) during period 1960-2020. The period 1960-2020 have fish species landings data available for period 1960-69 in one-year interval along with data for the years 1980, 1990, 2000, 2007, 2016, 2020 that was arranged in 16*1 data matrix with non-uniform interval. Further, year-group was subdivided in uniform

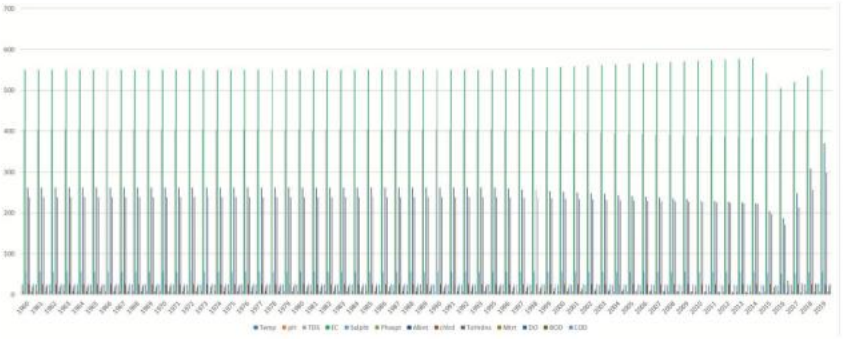


Fig. 13. Interpolation of 13 parameters at 1-year interval for the period 1960-2019

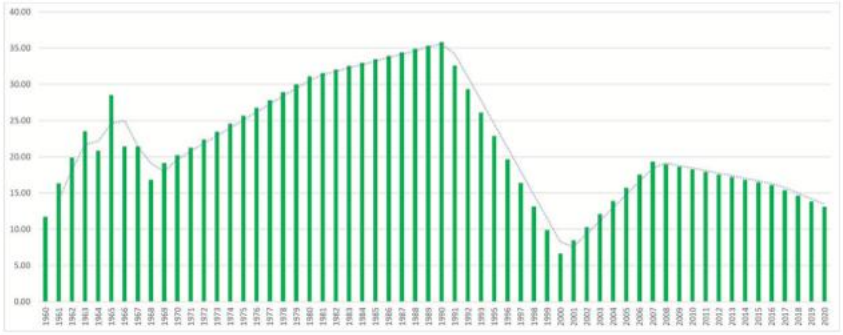


Fig. 14. Interpolation of IMC fish landings (avg. tonnes) at 1-year interval for the period 1960-2020

Table 1. Performance measures of Time series model-ARIMA

Model building parameters			Metrics for performance of best model							
Model parameter	Coefficient	SE	Variance-model	AIC	AICc	BIC	RMSE	MAE	MAPE	-log likelihood
ar1	0.0959	0.1076	3.864	251.96	252.74	258.2	1.9159	1.1655	6.559	122.98

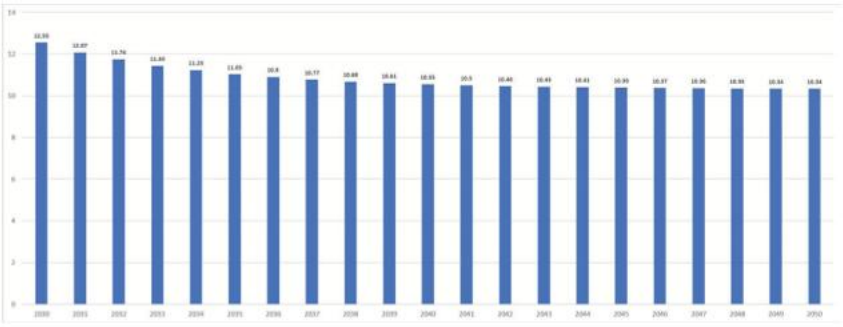


Fig. 15. Prediction of species landings for the period 2030-2050

one-year interval and for each year the IMC landings (avg. tonne) was interpolated using R-package fpp2. It provided 60*1 landing data matrix for the period 1960-2020, at one-year interval (Fig.14). This high-dimensional data matrix 60*1 was used for development of time series prediction model.

Time series model for species (landings) prediction

The 60*1 matrix was subjected to time series analysis for selection of a suitable time series model. Since a general guideline is to have more than 50 data points for yearly data to capture potential long-term trends and patterns in IMC landings data, thus, Autoregressive Integrated Moving Average (ARIMA) method from 'forecast' package-in R-software was applied. The performance of proposed model is presented in Table 1.

The selected model-ARIMA was applied for prediction of IMC landings (avg. tonne) for year 2030-2050 (Figs. 15,16).

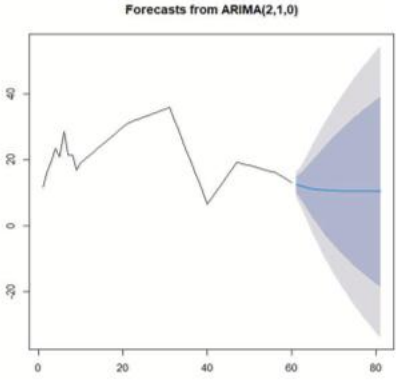


Fig. 16. Forecast by ARIMA model for IMC landings for the period 2030-2050

Sub project 3: Quantifying meta-structure matrices in NEH region

Period: April, 2023 – March, 2026

Personnel: Rejani Chandran (PI), Lalit Kumar Tyagi, Achal Singh, Ajey Kumar Pathak, Labrechai Mog Chowdhury, G. Kantharajan and Amit Singh Bisht

Funding Support: ICAR-NEH Component

Exploratory surveys were carried out in the Teesta River, which originates from Lake Tso Lhamo at Pahunri glacier above 7068 m in the eastern Himalayas, and flows through Sikkim and West Bengal before entering Bangladesh. Flowing through the entire geographic length of Sikkim, the Teesta is considered the state's lifeline. Teesta provides livelihoods for the residents along its entire length of 393 km with a drainage area of 12540 km^2. Teesta Valley in Sikkim is also rich in unique and endemic biodiversity, due to the wholly undulating topography of the state with varying altitudes from 300 m in the subtropical belt to 5500 m in the temperate alpine zone.

During surveys, fish diversity and habitat parameters were collected from 21 prioritized sites including high-altitude sampling at Zero point (16000 ft MSL), Yumthang Valley, and Tarai region of North Bengal (Fig. 17). Fish diversity was assessed from selected sampling sites, fish landing centres, and local fish markets (Fig. 18). Experimental fishing was carried out at 12 sites employing the expertise of local fishermen to capture the indigenous fish diversity. In each haul, the total number of species, the total number of individuals in a sample, and the total number of individuals of each species were recorded. A total of 104 fish species belonging to 11 orders and 27 families were recorded. Cyprinidae was observed as the richest family, in terms of the number of species (26 species), followed by Danionidae (23 species). As per IUCN, 7 species belonged to the Near Threatened category, while 3 species were Vulnerable, and 2 were Endangered. Exotic species, *Hypophthalmichthys nobilis, H. molitrix, Ctenopharyngodon idella, Clarias gariepinus, Oreochromis niloticus,* and *O. mossambicus* were recorded. Genomic DNA was

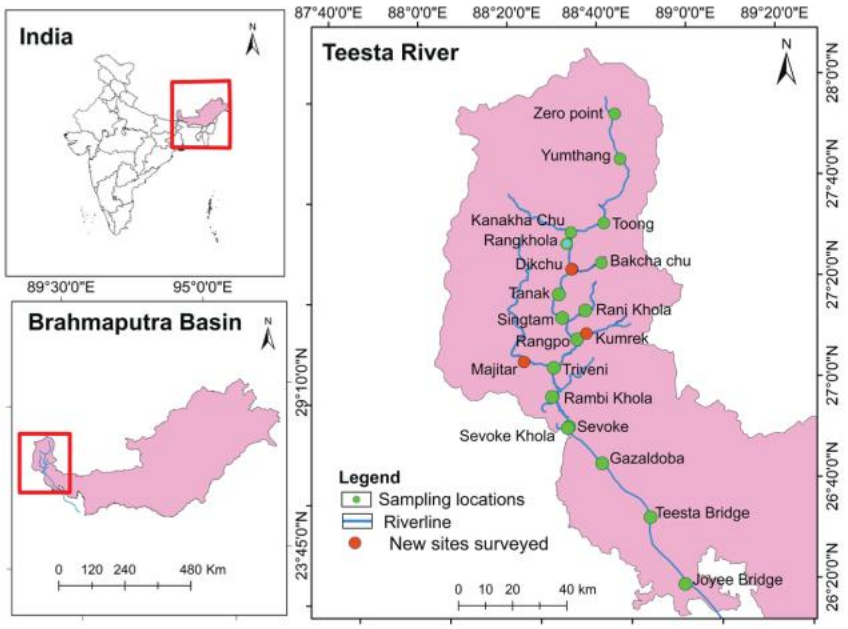


Fig. 17. Sampling locations in Teesta River

isolated from 108 tissue samples, and amplicons were sequenced bidirectionally.

Physico-chemical water quality parameters (temperature, pH, DO, conductivity, ORP, and TDS) were recorded (Fig. 19). Total suspended solids from water samples was also assessed. The lowest water temperature was recorded at Zero point (5.6°C), while the highest was recorded at Sevoke (34.9°C). A higher range of pH (7.7-8.9), conductivity (37-154 µs/cm), and TSS (15-150 ppm) was observed during the post-monsoon season.

Habitat suitability mapping of Chocolate Mahseer

The spatial data on ecological and habitat requirements, including topography, hydrological, and physico-chemical status datasets, were developed and analysed using the Geographic Information System (GIS) to prioritize and map the suitable habitats for the flagship and economically important species, *Neolissochilus hexagonolepis*, in Teesta River basin. Teesta main channel was moderately suitable (7.50 km^2; 79% of study area), highly suitable (1.90 km^2; 20%), least suitable (0.10 km^2; 1%). Likewise, its tributaries, *viz.* Rangit, Rangpo Chu, Rani Khola, Bakcha Chu, Kanakha Chu and Rang Khola, were also moderately suitable habitats (70-95% of total area) (Fig. 20).

A significant portion of the Rangit River (23%) supports highly suitable habitat conditions primarily due to the optimal water turbidity, conducive flow, and the presence of riffles and pools with appropriate substrates, providing a safe refuge and better spawning conditions.



Fig. 18. Collection of samples from local fish vendors at Jorethang, Sikkim

However, the optimal habitat conditions in the Teesta River are vulnerable to sedimentation, impaired water quality, and flow alterations, which could ultimately impact the spawning success and juvenile survival. In contrast, the tributaries serve as safe corridors for movement and sustaining juveniles and young ones in such adverse conditions due to their calmer flow, complex microhabitats, lower predation risks, and higher food availability. Additionally, the lower turbidity in the tributaries may be attributed to their small catchment area, riparian vegetation, and higher substrate composition, which act as natural buffers to maintain clear water conditions. These tributaries also offer stable microhabitats with spawning substrates, which may be lacking in the more turbulent main channel. As a result, tributaries are ecologically vital, serving as clean-water refugia and temporary holding areas for species that require a more stable, less disturbed environment. However, upstream tributaries like Kanakha Chu and Rang Khola, characterized by strong currents, low temperature, lack of suitable substrate, and limited food availability, are less suitable for sustaining chocolate mahseer populations.

Assessment of anthropogenic stressors in Teesta River

Anthropogenic stressors affecting the riverine habitats along the Teesta River basin were identified, classified, and mapped using primary data (field surveys, stakeholder interviews, and geospatial analysis) and secondary literature. Anthropogenic risks were spatially mapped using a habitat assessment model to support riverine conservation and mitigation planning. Water quality and habitat fragmentation data were used to calculate aquatic biodiversity risk scores for the Teesta River.

Climatic data (T_{max} and T_{min}) for the Upper (27.75°N, 88.72°E) and Lower (26.56°N, 88.74°E) Teesta basins for 1994-2023 were obtained from Indian Meteorological Department (IMD). Gridded datasets (1° × 1°) were extracted using Google Colab. Decadal means showed increasing trends in both T_{min} and T_{max}. Mann-Kendall analysis revealed a significant rise in T_{min} (p<0.001) in both basins, while T_{max} trends were non-significant (p>0.05).



Fig. 19. Recording of water quality parameters at Tanak, Sikkim

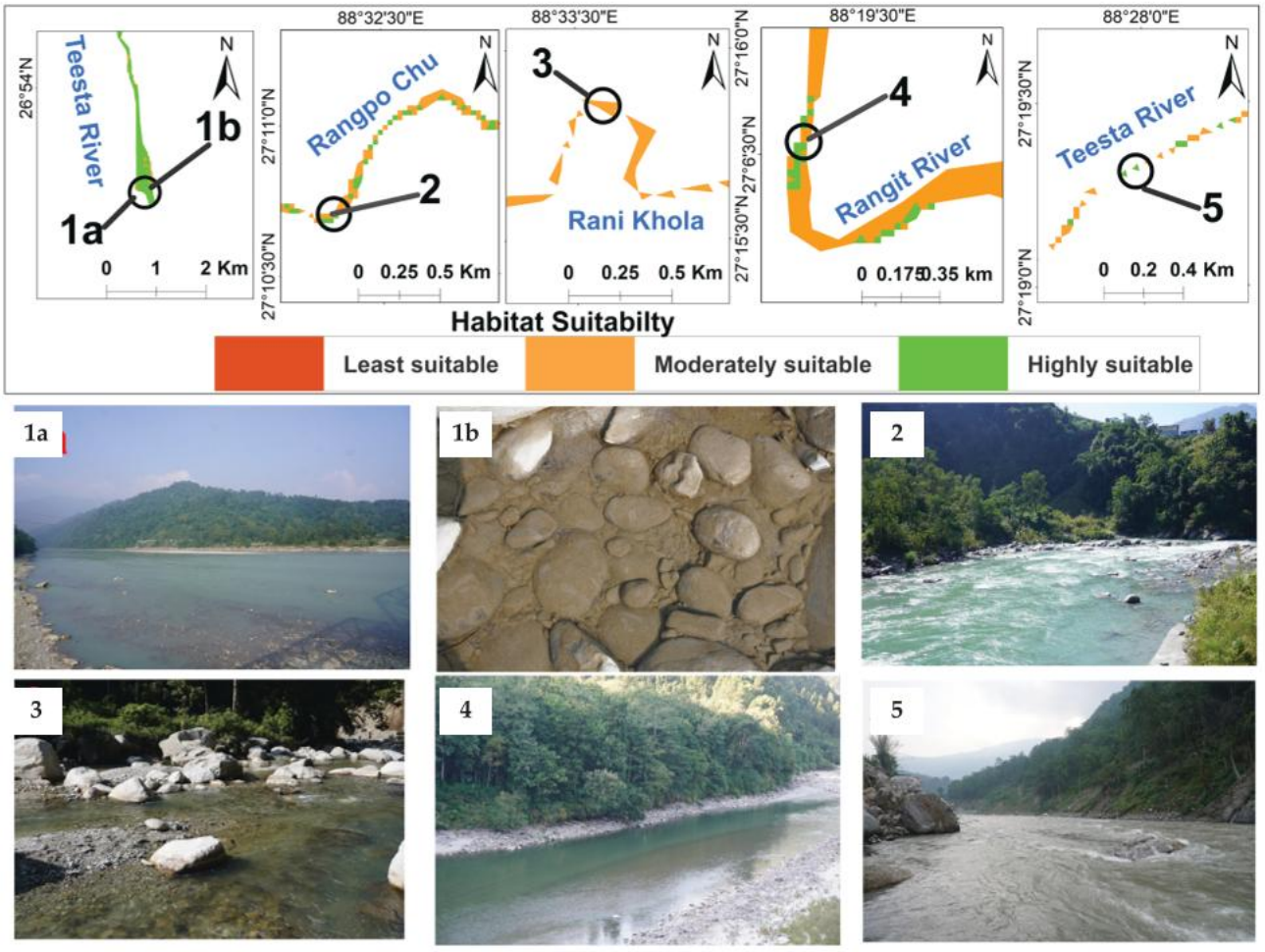


Fig. 20. Validation of preferred habitats of chocolate mahseer: 1a. Sevoke, 1b. Potential spawning habitat at Sevoke, 2. Kumrek, 3. Chuba, 4. Majitar, 5. Tanak

Project

Atlas of freshwater bony fish otolith of Uttar Pradesh, India

Period: May, 2024 - May, 2026

Personnel: Rajeev Kumar Singh (Mentor) and Farah Bano (PI)

Funding Support: National Post Doctoral Fellowship (ANRF-NPDF)

Otolith, a unique resource for recording live and fossilized fish fauna could be potentially useful even if specimen is unavailable. It may even be useful, if the specimen lacks reliable taxonomic characters. In such instances, otolith serves as a potential alternative, enabling differentiation between the native and invasive stocks, vulnerable inspections in illegal trade surveys, ecological monitoring of threatened fish faunas and helpful in conservation planning.

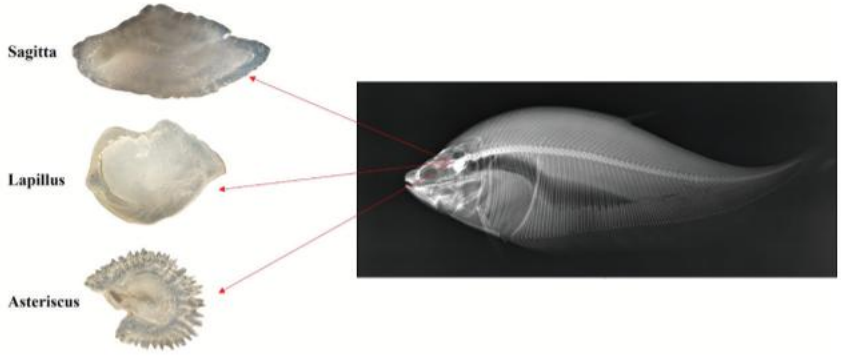


Fig. 21. A typical image of three different types of otoliths found in freshwater teleost fish.

This project is aimed to morphologically characterize the

otoliths of diverse ichthyofauna of the rivers flowing in Uttar Pradesh, and to develop the diagnostic keys for species identification, eventually leading to sustainable fisheries management and biodiversity conservation.

Exploratory surveys, otolith extraction and visualization

Multiple field surveys were conducted in different rivers of Uttar Pradesh (Ganga, Rapti, Yamuna, Gomti, and Ghaghara) and otoliths from 115 species were extracted, photographed, and preserved. Otoliths exhibit characteristic shapes across the orders, genus and also the species level. Three types of otoliths were collected, namely sagittae (arrow-like), asteriscus (disc-like) and lapillus (stone-like) (Figs. 21, 22).

Generally, the shapes of otolith and sulcus are species specific in fishes, however fluctuation in margins (smooth, sinuate, crenate and dentate) were noted. Otolith asymmetry, crystallization, and malformations were also documented. Abnormal otoliths were observed for the first time in specimens of *Rhinomugil corsula* and *Trichogaster bejeus*. The asymmetry and crystallization appearance were found on distal surfaces of otolith in *Clarias magur*, *Wallago attu* and *Sperata seenghala*.

Otolith atlas was developed, using which, the researchers can validate the 'otolith type' and avoid the incorrect identification of fishes. This is the first report on otolith atlas of freshwater fishes of India, and will be useful as a reference book for taxonomy and the evolutionary studies.



Fig. 22. The representative images of otoliths in selected fishes from Uttar Pradesh, India

Project

Assessment of ichthyofaunal diversity and habitat status with traditional knowledge in fisheries along Subarnarekha River and its tributaries for cataloguing, conservation and management

Period: April, 2024 - March, 2027

Personnel: Ajey Kumar Pathak (PI), Mahender Singh, Raghavendra Singh, Tarachand Kumawat, Jaspreet Singh, Ravi Kumar and Vikas Kumar

Funding Support: Institutional, ICAR-NBFGR

Subarnarekha River has multifaceted ecological profile, featuring a variety of habitats from upstream to downstream *viz.* well, dam, barrage, deep pools, rocky cliff, rocky riffle, sandy-muddy pool and estuary at river mouth.

Fish Biodiversity Assessment

Extensive experimental fishing was conducted across 10 sampling stations (Fig. 23), resulting in diverse assemblage of 117 species (46 freshwater, 71 brackishwater species), comprising 97 finfish and 20 shellfish species. The assemblage belongs to 24 orders and 51 families. Perciformes (23.93%) and Cypriniformes (17.94%) were the dominant order. Cyprinidae exhibited the greatest species richness with 16.23%, followed by Sciaenidae and Engraulidae, each with 5.98%. The riverine ecosystem sustains a complex food web characterized

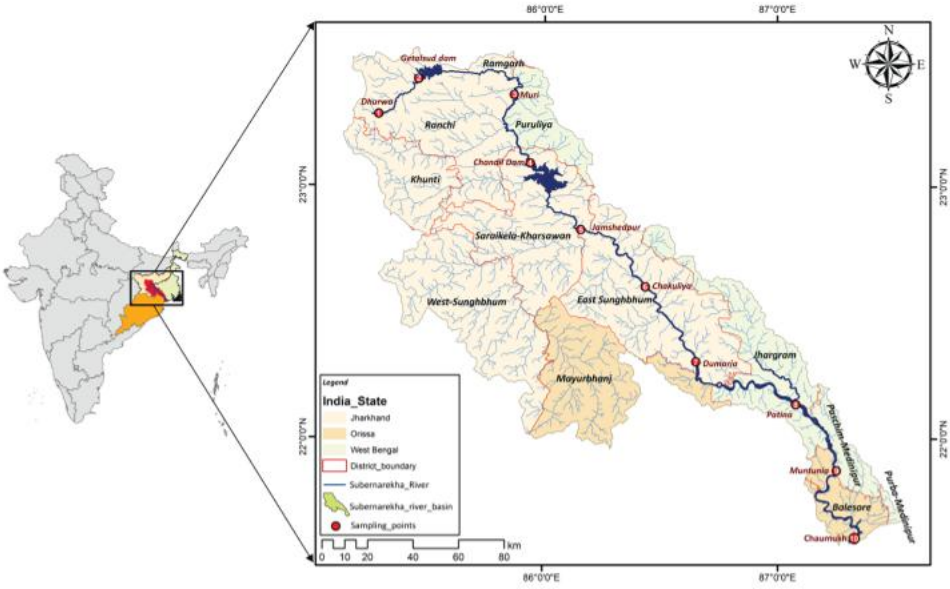


Fig. 23. Sampling location map of Subarnarekha River

by carnivores (43.58%), omnivores (33.33%), planktivorous (21.36%) and herbivores (19.65%).

Based on the seasonal assessment of the Subarnarekha River, the pre-monsoon period exhibited peak species richness (93 species) and complexity with a Shannon Index above 4.0. In contrast, the post-monsoon season demonstrates a more stable community structure with higher evenness (0.69) and lower species dominance (0.05). Overall, these indices reflect a healthy and highly diverse ecosystem across both sampling periods (Fig. 24).

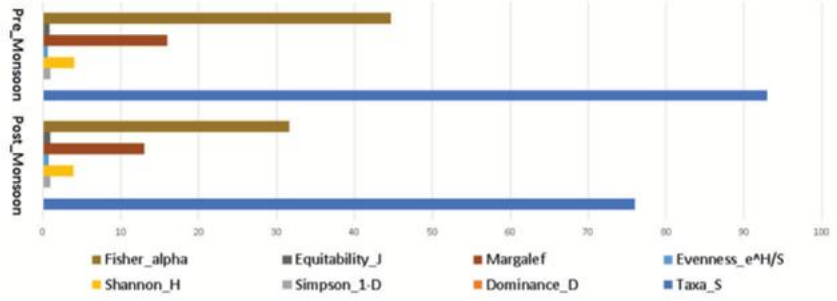


Fig. 24. Different fish biodiversity indices in Subarnarekha River for pre and post monsoon seasons

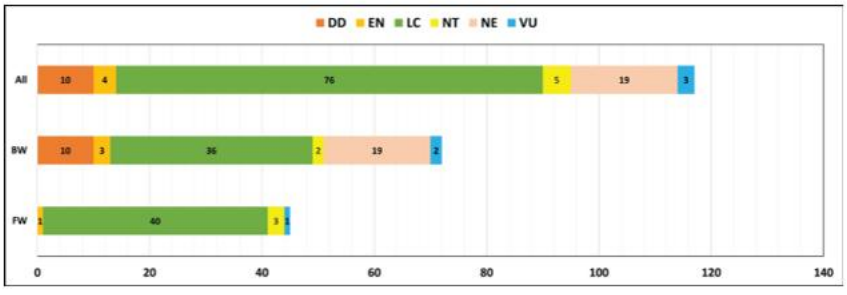


Fig. 25. Conservation status of recorded fishes as per IUCN Red List Criteria 2025

The conservation status assessment as per the IUCN Red List Criteria 2025 revealed that 64.95% of recorded species were categorized as Least Concern, 4.27% Near Threatened, 2.56% Vulnerable, 3.41% Endangered and 8.54% classified as Data Deficient (Fig. 25). To resolve taxonomic ambiguities at the molecular level, more than 100 tissue specimens were taken from collected fish specimens. As of now, DNA extraction has been done from 73 specimens, which are under PCR processing for DNA barcoding and genetic divergence analysis.

DD: Data deficient, EN: Endangered, LC: Least concern, NT: Near threatened, NE: Not evaluated, VU: Vulnerable

Water Quality Assessment

The overall water quality in the Subarnarekha basin supports fish survival, yet isolated stresses are apparent (Fig. 26). Low dissolved oxygen levels (< 5 ppm) in the Dhurwa,

Getulsud and Chandil Dams, along with increased ammonia and phosphate concentrations near metropolitan areas, signify escalating eutrophication. The spectral indices (NDVI, NDWI and NDTI) reflecting water spread and quality for the Getulsud Dam and Dhurwa Dam indicate seasonal fluctuations, with elevated turbidity in the post-monsoon period and enhanced vegetation during the pre-monsoon season, possibly associated with changing water levels and nutrient influx (Figs. 27, 28).

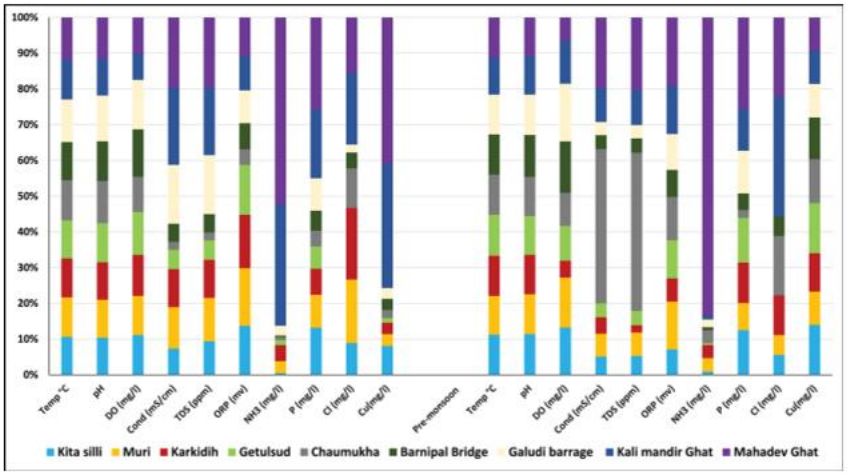


Fig. 26. Different water quality parameters at various sampling locations along Subarnarekha River

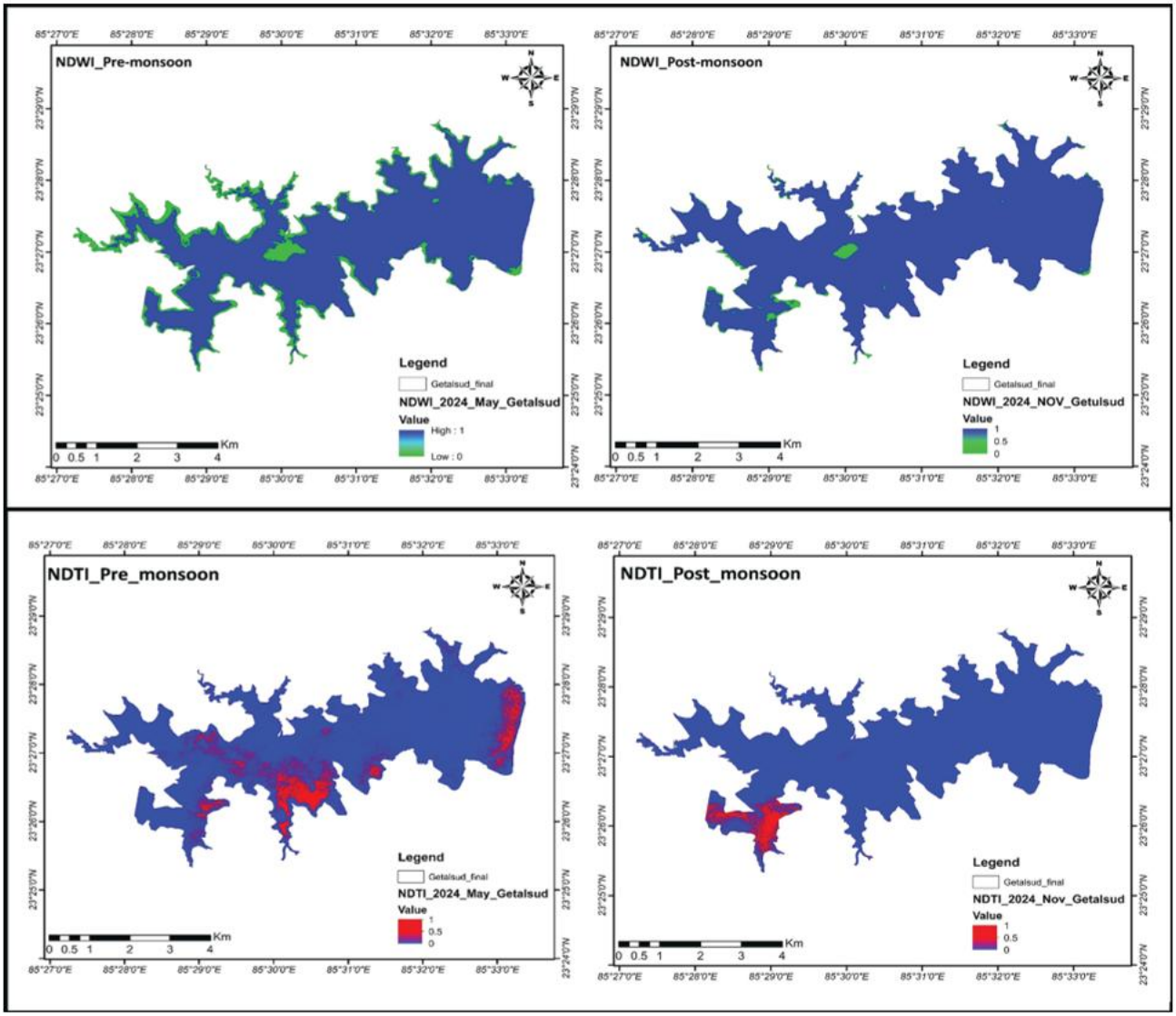


Fig. 27. Spectral indices representing water spread and quality of Getulsud Dam along Subarnarekha River

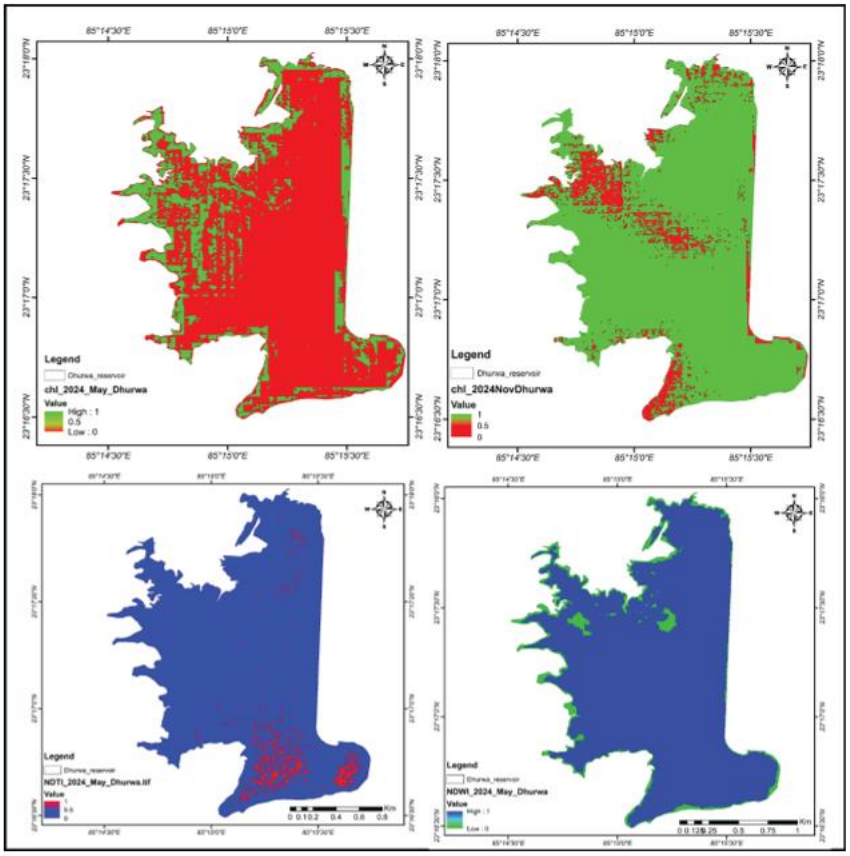


Fig. 28. Spectral indices representing water spread and quality of Dhurwa Dam along Subarnarekha River

Project

Quantifying agrobiodiversity and ecosystem services in Godavari River Basin landscape

Period: September, 2021 – November, 2025

Coordinator: Kajal Chakraborty

Personnel: Rajeev Kumar Singh (PI), Lalit Kumar Tyagi, Achal Singh, Rejani Chandran and Kantharajan G.

Funding Support: The Alliance of Bioversity International & CIAT

The study focuses on the quantitative assessment of agrobiodiversity and key ecosystem services in prioritized areas along the river Godavari. It also evaluates the impact of existing agricultural practices on aquatic ecosystem, and the socio-economic status of local communities. Based on these insights, the information generated will be valuable for developing sustainable management protocols for both terrestrial and aquatic ecosystems, ensuring alignment with the goals of sustainable agricultural development.

Assessment of fish diversity of distinct landscapes

Two extensive exploratory surveys (pre-monsoon and post-monsoon) were undertaken in the upstream section of the river Godavari to collect data on fish diversity and habitat parameters at 10 selected sites (Figs. 29, 30). Cypriniformes (54%) order was dominant followed by Siluriformes (20%) and Anabantiformes (5%). The most species-rich family was Cyprinidae (35%). As per IUCN criteria, most of the species were classified as Least Concern (76%), followed by Near Threatened (7%), Data Deficient (6%), Vulnerable (5%), and Endangered (3%). Endemic species such as *Rita bakalu, R. kuturnee, R. gogra, Clupisoma bastari, Osteobrama dayi, Hypselobarbus curmuca*, and *H. kolus* were also recorded.

Habitat characterization

In the upstream stretch of Godavari, pH of the water samples, varied from 8.5 (Pravarasangam) to 9.0 (Vishnupuri). The highest TDS was recorded at Rajapur (742 ppm), followed by Manjarath (488 ppm). The lowest DO was observed at Vishnupuri (2 ppm), where substantial growth of micro and macro-algae was seen (Fig. 31). The Nandur-Madhyameshwar dam was observed to be extensively covered by aquatic weeds *Eichhornia crassipes*, *Wolffia*, *Ipomoea* and *Typha*. Furthermore, the mortality of fishes, including big-sized fishes like *Wallago attu*, Indian Major Carps and Nile tilapia was documented during the pre-monsoon season in Vishnupuri area.

Spatio-temporal variations in phytoplankton and zooplankton diversity and assemblage were assessed in the upper stretch of river Godavari. A total of 96 plankton species (73 phytoplankton and 23 zooplankton) were identified. Among these, Bacillariophyceae and Rotifera exhibited the highest species richness and abundance. The pre-monsoon season recorded the highest species richness, abundance, and diversity indices.

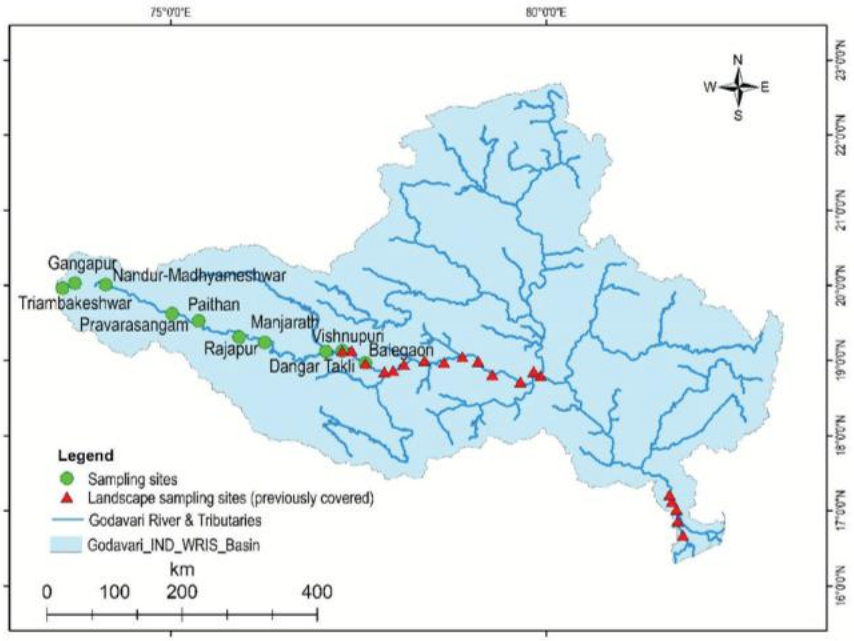


Fig. 29. Sampling sites in the upstream areas along Godavari River, India

Statistical analysis revealed that the water quality parameters (water temperature, pH, DO, TDS, conductivity, total nitrogen and phosphate) had a strong influence on plankton composition.

Habitat prediction modelling

Ecological niche modelling was performed to predict the distribution, and identify key environmental variables influencing four endemic catfishes *viz., Rita gogra, R. kuturnee, R. bakalu* and *Clupisoma bastari* in the Godavari Basin. The models showed high predictive performance (AUC = 0.917-0.977) based on 10 selected uncorrelated environmental variables covering topography, hydrology, landscape and bioclimate. Hydrological predictors *viz.,* stream transportation index, stream order and compound topographic index accounted for 65-85% of model contributions, followed by landscape (land use and land cover). The highly suitable habitats were predicted in high-order streams, especially in lower and middle stretches of the main channel. Species-wise, moderate to highly suitable habitats extended throughout the basin for *R. gogra* (3360 km^2) and *C. bastari* (2222 km^2), with patchy distribution for *R. kuturnee* (1111 km^2) and *R. bakalu* (908 km^2) in the middle and lower stretches. Main river habitats were more suitable for *R. kuturnee*, *R. bakalu*, and *C. bastari*, whereas *R. gogra* exhibited greater suitability both in tributaries and main channel, indicating clear spatial niche differentiation. These findings have significant applications for the management of endemic species in the river.



Fig. 30. Collection of habitat data (a) and plankton (b) in the upstream of Godavari, Maharashtra during pre-monsoon season

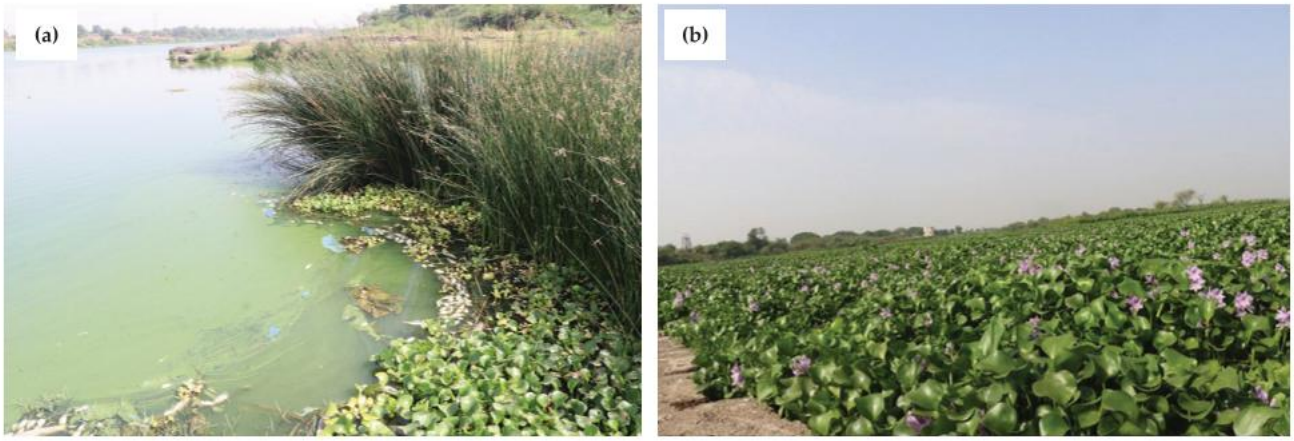


Fig. 31. Infestation of micro and macro-algae at Vishnupuri in Nanded landscape (and fish mortality) (a) and Nandur-Madhyameshwar dam (b) during pre-monsoon season

Fish community structure assessment

During the pre-monsoon season, the riverine (3.80) and below-dam (3.69) habitats exhibited highest diversity indices, whereas in the post-monsoon season, impounded habitats recorded highest value (2.99) across the selected landscapes. A consistent pattern was observed in richness index (riverine > below-dam > impounded habitats), across all seasons. Both habitat and season had a significant influence on diversity and dominance indices, highlighting their complex role in structuring fish assemblage structure.

Beta diversity analysis indicated highest overall species dissimilarity between impounded and below-dam habitats (0.36). In contrast, species assemblage structure was more similar between riverine and below-dam habitats across all seasons, while a comparable similarity between impounded and below-dam habitats was noted during post-monsoon season. Riverine habitats represented a distinct fish assemblage compared to impounded and below-dam habitats. It was observed that the omnivores (39-55%) were the dominant feeding guilds across all habitats.



Fig. 32. Glimpses of stakeholder meeting/interview conducted at Niphad, Pravarasangam on availability of indigenous and exotic fishes and ecosystem perception

Fishermen's perception of ecosystem services

The majority of the fishermen surveyed, opined that their preferred/targeted fish species had decreased over time and decline of fish size in catches. They also reported deteriorating quality of aquatic habitats, including aquatic vegetation. The major causes of these changes, as perceived by the fishermen, included loss of essential fish habitats (such as deep pools), riverbed sedimentation, deteriorating water quality due to runoff, reduced primary productivity, and overfishing. Some fishermen also perceived that pollutants from the agrochemicals get mixed with run-off water and reach rivers, often leading to fish mortality.

Interactions with stakeholders at Jayakwadi dam indicated that tilapia has become highly abundant over the past five years, now contributing approximately 20-60% of the total fish catch in some locations (Fig. 32). Experimental fishing and evidences from commercial catches in the upstream locations (Maharashtra) revealed predominance of Nile tilapia. They further perceived that dominance of tilapia has contributed to the loss of aquatic vegetation and a consequent decline in native fishes, including *Mastacembelus armatus*, *Anguilla bengalensis*, *Mystus malabaricus*, and *Silonia childreni*. However, many fishers are concerned that removing tilapia from the river could adversely affect their livelihoods in the absence of a viable alternative fishery resource.

Project

Intellectual property management and transfer/ commercialization of agricultural technology scheme (Up-scaling existing components i.e. Intellectual Property Right)

Period: October, 2022 - March, 2026

Personnel: Poonam Jayant Singh (PI), Mahender Singh and Arun Sudhagar S.

Funding Support: ICAR Plan Scheme (NAIF)

Compendium of technologies: Transforming fisheries and aquatic genetic resources

The technology manual compiled by ICAR-NBFGR serves as a comprehensive repository of the institute's scientific and technological advancements. It encompasses innovations in fish genetics, molecular taxonomy, cell line development, disease diagnostics, vaccine formulation, bioinformatics, and aquaculture technologies. Each entry details objectives, methodology, outcomes, and applications, supporting researchers, policymakers, entrepreneurs, and industry stakeholders.

Strategic IPR filings: Design for institutional assets

ICAR-NBFGR initiated comprehensive efforts in strengthening its Intellectual Property Rights (IPR) portfolio on August 13, 2025. The registration process for design protection has been initiated, ensuring that innovative outputs are adequately safeguarded. ICAR-NBFGR initiated the process of design registration on September 16, 2025, to protect its innovative and aesthetic creations. This proactive step ensures that the institute's novel designs arising from its research, technological developments, and creative outputs are formally safeguarded under intellectual property law. The institute achieved a milestone on December 31, 2025 by filing a Patent on 'Primer Set and Molecular Differentiation of *Clarias magur*, *C. gariepinus*, and their Hybrid' (Ref: 202511134673).

Empowering women-led micro-entrepreneurs: Successful hub-and-spoke model

Through training and start-up kits (iceboxes, solar lights, weighing machines), over 325 women have enhanced their income, a few with increased fish production in 9 months. Hands-on training at KVK, Unnao was conducted in January, 2025 to strengthen technical and market skills. Mission Navshakti 2.0 now stands as a scalable model of women's empowerment, financial independence, and rural resilience.

Protecting ideas, driving innovation

ICAR-NBFGR, Lucknow, organized an interactive session for 120 students and 4 educators from Government Girls Inter College, Hastinapur, Meerut on January 28, 2025.



Fig. 33. Participants of IPR sessions

Bridging rural women entrepreneurs with urban markets: Empowering microenterprises through innovation and market linkages

ICAR-NBFGR, under Mission Navshakti 2.0, empowered 51 women from 13 self-help groups across eight Unnao villages through an exposure visit to the Ganga Aquarium and Lulu Mall Hypermarket, Lucknow on January 29, 2025. The visit provided insights into the ornamental fisheries trade, branding, and market dynamics, inspiring participants to pursue aquarium fabrication aligned with 'Har Ghar Machli Ghar'.

Empowering rural women entrepreneurs: Connecting microenterprises to urban opportunities

As Mission Navshakti marks its first anniversary, celebration was held on February 21–22, 2025 at Dhankutti, Barabanki to honour 10 outstanding entrepreneurs. Moving into Mission Navshakti 2.0, the initiative advances financial independence and rural resilience through scalable, women-led aquaculture enterprises.

Protecting ideas, driving innovation: Strategic importance of IPR

ICAR-NBFGR, Lucknow, conducted interactive IPR sessions on role of IPR in fostering innovation and sustainable development, with practical insights on patents, trademarks, and technology commercialization for over 240 students and 10 educators from Amethi and Hardoi on February 13 and 18, 2025 (Fig. 33).



Fig. 34. Exposure visit of women entrepreneurs to Ganga Aquarium



Fig. 35. Interactive sessions conducted to educate young minds

Bridging rural & urban markets: Growth of women aqua-entrepreneurs

Mission Navshakti continues to empower rural women through ornamental fish farming and aquarium fabrication, fostering sustainable livelihoods and rural entrepreneurship. An interactive studio session at KVK, Kanpur Dehat was conducted where 50 women micro-entrepreneurs were trained during March 5-6, 2025. An exposure visit to Ganga Aquarium was organized on March 28, 2025 that provided hands-on learning to participants and 2 entrepreneurs from KVK, Unnao were honoured (Fig. 34).

With Mission Navshakti 2.0, the Navshakti: Aquagri Business Incubation Centre was initiated as a dedicated marketplace for mini aquariums, ornamental fish, and clay décor, strengthening women-led enterprises and advancing financial independence and inclusive growth across Uttar Pradesh.

Fostering innovation: ICAR-NBFGR's knowledge sessions on IPR

ICAR-NBFGR, Lucknow, organized interactive sessions on March 12 and 26, 2025, to educate young minds on the importance of IPR in driving innovation and sustainable development. The programs engaged 50 students and 6 educators from a slum area in Lucknow. A highlight was the WIPO competition story, where children from the slum area created music using everyday objects, showcasing that innovation stems from ingenuity, not resources (Fig. 35).

Empowering rural women aqua-entrepreneurs

A strategic meeting at the NABARD Regional Office was held on April 21, 2025 with a focus to establish a Farmer Producer Organization under the brand 'Mission Navshakti' to empower rural women aqua-entrepreneurs across Uttar Pradesh.

World Intellectual Property Day 2025 with One-Day Workshop on 'IP Manthan: IP Awareness for Encouraging Creativity and Innovation

ICAR-NBFGR celebrated World Intellectual Property Day on 26 April 2025 with a hybrid workshop titled 'IP Manthan: IP Awareness and Encouraging Creativity and Innovation'. Around 70 researchers and students explored the interface of AI, IPR, and scientific innovation. Expert lectures on AI's impact on copyright and evolving IP regimes sparked vibrant discussions on techno-legal challenges.

Nurturing young minds through IP awareness

A sensitization lecture on IPR was conducted for 120 students and 4 teachers of Rajkiya High School, Barabanki on December 15, 2025. The session highlighted the role of patents, copyrights, and trademarks in protecting innovation and promoting sustainable development.

Project

Spatio-temporal profiling of fish diversity and ecological niches in the Thamirabarani, an east-flowing river in the Peninsular India

Period: April, 2025 - March, 2027

Personnel: Kantharajan G. (PI), T.T. Ajith Kumar and A. Kathirvelpandian

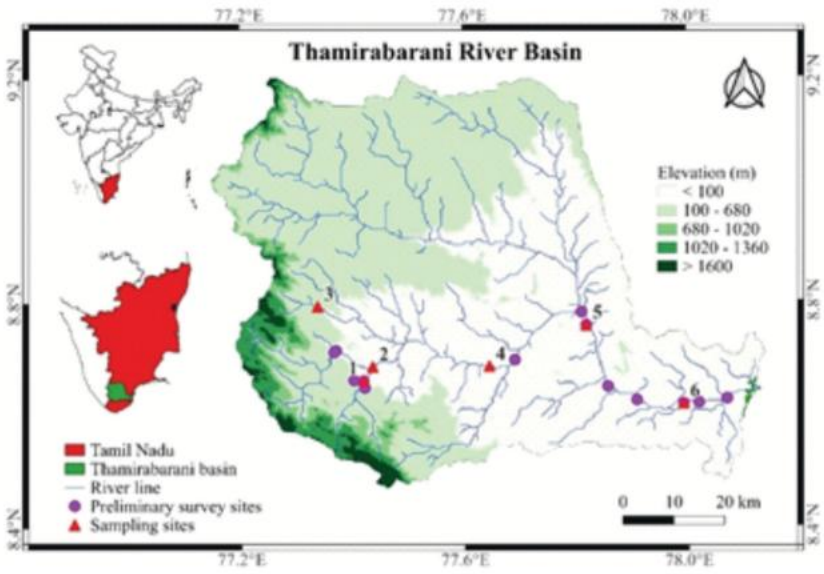


Fig. 36. Sampling sites surveyed during the North-East Monsoon season (Site codes: 1– Manimuthar; 2 – Ambasamudram; 3 – Sambankulam; 4 – Gopalasamudram; 5– Marudhur; 6 – Srivaikuntam)

Funding Support: Institutional, ICAR-NBFGR

Thamirabarani River system, originating from the Pothigai Hills of the Western Ghats, is one of the few perennial east-flowing rivers in Peninsular India, supporting diverse and relatively pristine macro- and micro-habitats. Rising at an elevation of approximately 1600 m above MSL, the river flows for about 125 km before draining into the Gulf of Mannar. This study aims to comprehensively document the fish assemblage structure to generate baseline scientific data for effective conservation and



Fig. 37. On-site fish collection during post-monsoon survey

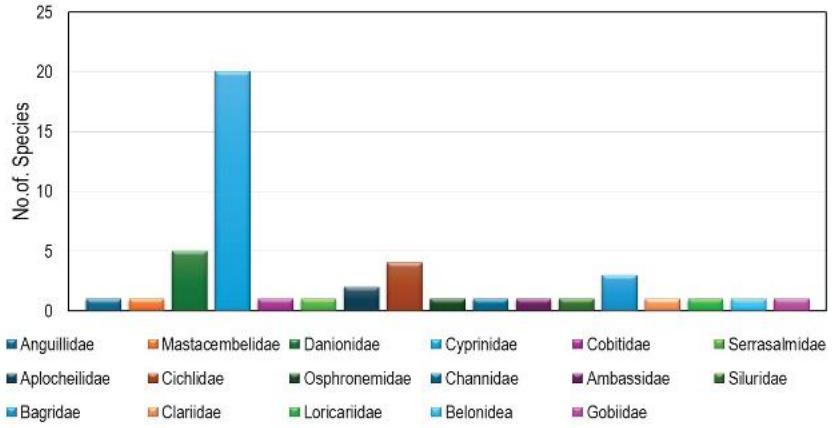


Fig. 38. Family-wise fish species distribution in the Thamirabarani River Basin

sustainable management of the river ecosystem.

A preliminary survey was conducted during September, 2025 to identify and select appropriate sampling sites and establish contact with local fishermen to facilitate future fieldwork. Subsequently, an extensive exploratory survey was conducted during post-monsoon season (December, 2025) to document fish diversity across 6 prioritized sampling sites in the middle and downstream (Fig. 36). Experimental fishing was conducted using gill nets, cast nets, scoop nets, and hook-and-line methods in 6 sites. Information was also collected from commercial landings at Srivaikuntam. Further, comprehensive environmental data were recorded at each site, including water quality parameters, habitat type, riparian zone characteristics, riparian vegetation abundance, instream fish cover, habitat complexity, and substrate composition (Fig. 37). At each site, species-wise abundance data were recorded. Furthermore, length–weight measurements were recorded for 280 specimens representing 16 species to support future analytical studies.

A total of 46 fish species belonging to 11 orders and 17 families were recorded from the study area (Fig. 38). Among these, Cyprinidae was the most speciose family, comprising 20 species, followed by Danionidae with 5 species. Exotic species recorded during the study included *Clarias gariepinus, Pterygoplichthys pardalis, Oreochromis mossambicus, O. niloticus,* and *Cyprinus carpio* (Fig. 39).

Fish diversity showed clear spatial variation among the 6 sampling sites, with Srivaikuntam recording highest species richness (S = 29), Margalef's richness (d = 6.8), and Shannon diversity (H′ = 3.1). It also showed the lowest Simpson's dominance (λ = 0.05), indicating a highly diverse fish community with low species dominance.

The physico-chemical parameters, including atmospheric temperature, water temperature, dissolved oxygen (DO), pH, conductivity, oxidation–reduction potential (ORP), and total dissolved solids (TDS), were measured on-site at all 6 sampling locations. Water temperature varied from 24.52°C (Ambasamudram) to 28.14°C (Srivaikuntam). DO levels ranged from 5.93 mg/l at Ambasamudram to 8.50 mg/l at Srivaikuntam.

A habitat niche model is being developed for the endemic and endangered species *Dawkinsia tambraparniei* (Silas, 1954) to identify its potential distribution and habitat suitability within the Thamirabarani basin. Occurrence records of the selected species were primarily collected through systematic field surveys. In addition, distribution data were compiled from published literature and from the Global Biodiversity Information Facility (GBIF) database. A total of 61 validated occurrence points were obtained, which will be used for the modelling.



Fig. 39. Exotic fish species in net catches during sampling

Project

Taxonomic studies of the deep-sea fish resources along southern coasts of India

Period: April, 2022 - March, 2026
Personnel: Teena Jayakumar T.K. (PI)

Funding Support: Institutional, ICAR-NBFGR

The deep-sea ecosystems within India's Exclusive Economic Zone (EEZ) are known for their rich biodiversity; however, detailed information on deep-sea fish diversity in this region remains limited. Considering the need for sustainable management of deep-sea fishery resources, the present project was undertaken to systematically document the diversity of deep-sea fish species along the southern coasts of India.

Surveys were carried out at Munambam, Kalamukku and Kollam (Kerala) (Fig. 40), Kasimedu, Nagapattinam, Mudasalodai, Thoothukudi, Mandapam and Colachel (Tamil Nadu), Visakhapatnam, Kakkinada (Andhra Pradesh) and Mangaluru (Karnataka). A total of 237 specimens of 58 species [Kerala (136 specimens; 66 species), Andhra Pradesh (35 specimens; 12 species), Tamil Nadu (40 specimens; 22 species) and Karnataka (26 specimens; 10 species)] were collected from these landing centres during the current year.

Most of the catch along Kerala coast was dominated by *Psenopsis cyanea, Diaphus watesi, Parascombrops pellucidus, Bembrops caudimacula, Cubiceps baxteri* and *Chlorophthalmus bicornis*. Some rare species documented include *Xenocephalus elongatus,* (Fig. 41) *Notacanthus laccadiviensis* and



Fig. 40. Deep-sea fish landing at Sakthikulangara landing centre, Kollam, Kerala

Acropoma lacrima.

A total of 586 specimens of 112 species were collected from different landing centres of Tamil Nadu. Most of the catch along Tamil Nadu coast was dominated by *Alepocephalus bicolor, Physiculus*

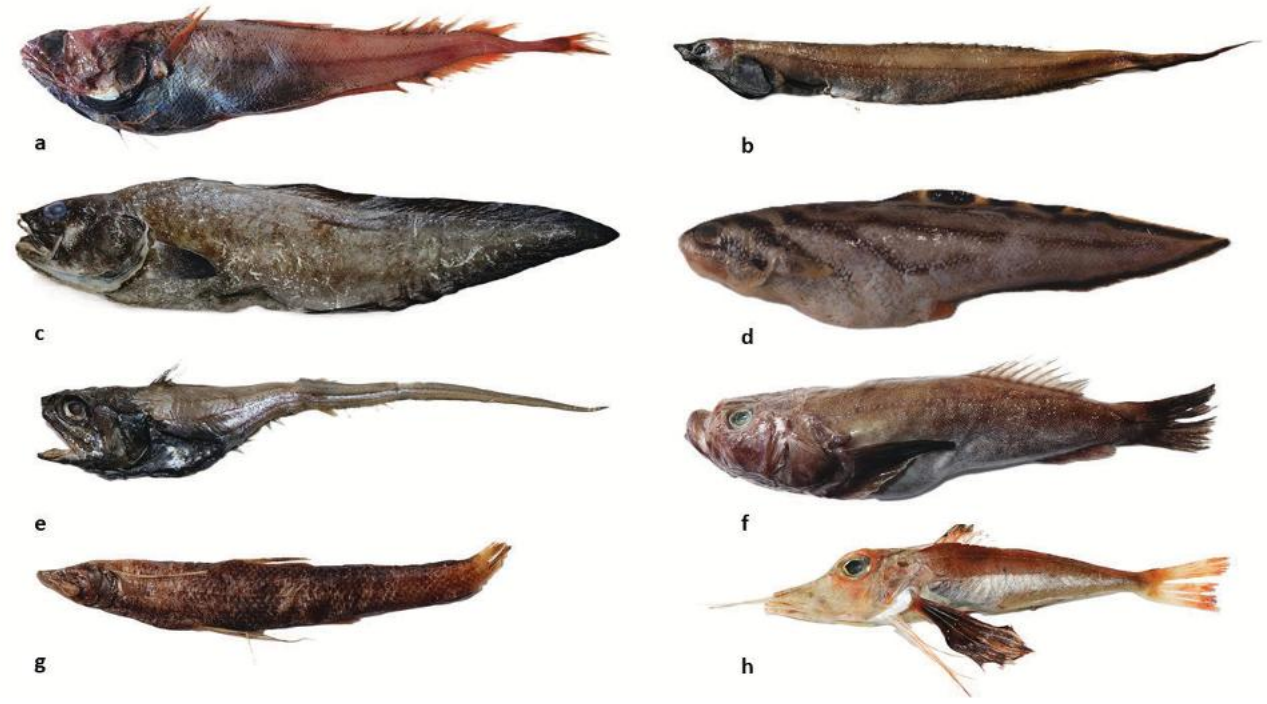


Fig. 41. a. *Physiculus roseus*, b. *Notacanthus laccadiviensis*, c. *Brotula multibarbata*, d. *Sirembo jerdoni*, e. *Malacocephalus laevis* f. *Xenocephalus elongatus* g. *Bathypterois atricolor* h. *Pterygotrigla macrorhynchus* collected from different landing centres of Southern coasts of India

roseus, Chascanopsetta lugubris, Trichiurus auriga, Neopinnula orientalis and *Zenopsis conchifer*. A few rare species documented includes, *Bregmaceros mcclellandi, Sirembo jerdoni, Nezumia* sp., *Bathypterois articolor* (Fig. 41), *Dicrolene* sp. and *Lamprogrammis* sp. Thirty-five specimens of 12 species were collected from landing centres of Andhra Pradesh and 26 specimens of 10 species from landing centres of Karnataka. The species diversity and abundance were more in the Sakthikulangara landing centre in Kerala, followed by Nagapattinam and Colachel landing centres in Tamil Nadu.

The cumulative collection, including both earlier and current year specimens, totals 1461 specimens representing 195 species under 74 families and 28 orders (Figs. 42, 43). The largest species diversity was found in the order Perciformes (38 species) followed by Anguilliformes (29), Ophidiiformes (15), Sygnathiformes (14), Labriformes (10), Lophiiformes (9), Tetraodontiformes (9), Acanthuriformes and Acropomatiformes (8 each). The orders Perciformes, Anguilliformes, Ophidiiformes, Sygnathiformes and Labriformes contributed to 56% of species diversity. Ophidiidae and Scorpaenidae were the most speciose family with 13 species followed by Congridae (11), Synanceiidae and Uranoscopidae (8 species each). The conservation assessment showed that the majority of species (74%) belong to the IUCN Least Concern category, followed by 24% Not Evaluated and 2% Data Deficient.

Molecular analysis using cytochrome oxidase 1 gene was carried out for species of the family Uranoscopidae, Ophidiidae, Callionymidae, and Macrouridae. A total of 85 molecular signatures were developed. As an integrated taxonomic approach, morphomeristic characters and molecular markers were used for resolving the taxonomic ambiguity in many families.

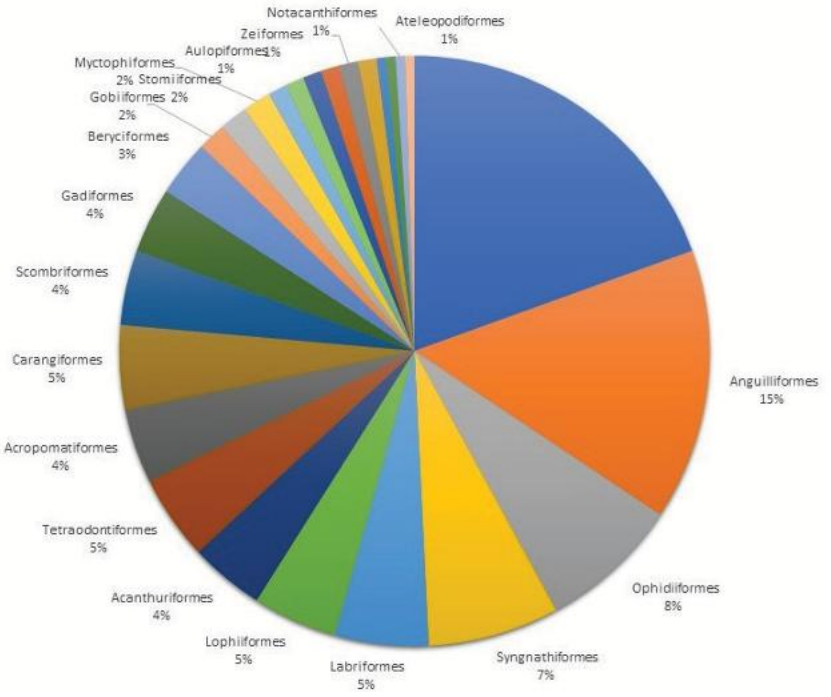


Fig. 42. Order wise species composition of deep-sea fishes collected from Southern coasts of India

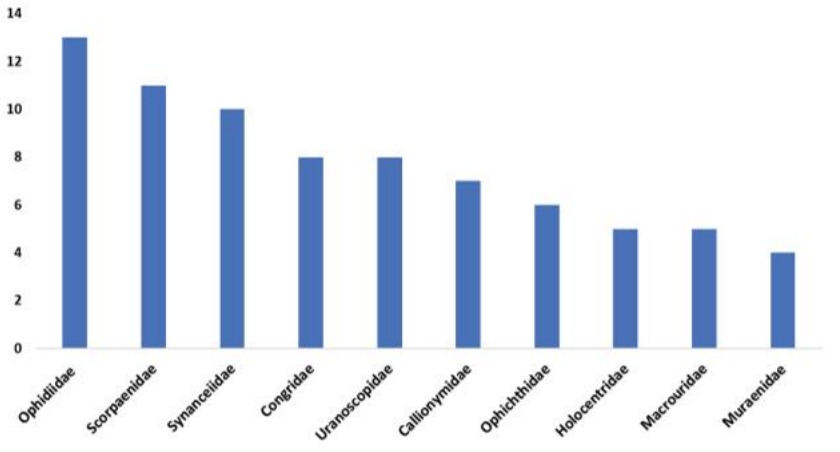


Fig. 43. Family (top 10) wise species composition of deep-sea fishes from Southern coasts of India

In the order Ophidiiformes 15 species, *viz. Brotula multibarbata, Sirembo jerdoni, Neobythites stefanovi, N. steatiticus, Ophidion smithi, Ophidion muraenolepis., Dicrolene* sp., *D. longimana, Glyptophidium oceanium, G. argentium, Pycnocraspedum squamipinne, Grammonus robustus,*



Fig. 44. Species reported for the first time from Indian waters: a) *Xenocephalus australiensis*, Australian stargazer, b) *Ophidion muraenolepis*, Blackedge cusk

Hypopleuron caninum, Physiculus roseus and *Lamprogrammus fragilis,* were documented and molecular signatures developed. The interspecific genetic distance for COI gene in the family Ophidiidae ranged from 10.2 to 24.9% with an overall mean genetic divergence of 16.4 %. *Sirembo jerdoni* was rare and *Hypopleuron caninum, Physiculus roseus, Pycnocraspedum squamipinne* and *G. oceanium* were most abundant in the landings of Ophidiids. In the family, Uranoscopidae, *Uranoscopus marmoratus, U. crassiceps, U. guttatus, U. archionema, Uranoscopus* sp., *Xenocephalus australiensis, X. elongatus* and *Ichthyoscopus lebeck* were documented and molecular signatures developed. The genetic divergence among the species of Uranoscopids ranged from 7.1 to 28.4% with an overall mean genetic divergence of 19.0%. The species in the genus *Xenocephalus* were encountered very rarely. In the family Callionymidae, 6 species namely, *Callionymus omanensis, C. gardineri, C. margaretea, Synchiropus lineolatus, Bathycallionymus. kaianus* and *Callionymus* sp. were documented and molecular signatures developed. The genetic divergence among the species of callionymids ranged from 4.8 to 32% with an overall mean genetic divergence of 21%.

The study reported the first occurrence of *Xenocephalus australiensis*, Australian stargazer and *Ophidion muraenolepis,* Blackedge cusk, for the first time from the Indian waters (Fig. 44). It also documented rare six-armed brittle star, *Ophiolepis superba,* from Indian waters.

Project

Diving down the deep: Exploring the deep-sea ichthyo-faunal resources of Indian waters for sustainable utilization-multidisciplinary approach

Period: April, 2024 - April, 2026
Coordinator: T.T. Ajith Kumar
Personnel: A. Kathirvelpandian (PI), Ravindra Kumar, Mahender Singh, Murali S., Arun Sudhagar S. and Kantharajan G.

Funding Support: Ministry of Earth Sciences (MoES)

This research project aims to generate species-specific molecular signatures of deep-sea fishes from Indian waters and to understand the evolutionary and demographic history of the deep-sea fishes of Indian waters. Further, the project also aims to establish somatic cell bank for deep-sea fishes. By bridging evolutionary biology, taxonomy, and cellular biotechnology, the project provides essential baseline data and novel scientific tools required for the sustainable management, conservation, and industrial application of deep-sea marine resources.

Molecular Signatures and Biodiversity of Deep-Sea Fishes

Deep-sea fishes, often caught as bycatch in deep-sea shrimp trawling, hold significant untapped potential for commercial and scientific applications. To comprehensively document this biodiversity, the project executed extensive sampling across 17 major landing centres spanning the Indian coastline, including locations in Tamil Nadu, Kerala, Karnataka, Gujarat, Andhra Pradesh, and Maharashtra. To capture true deep-sea diversity, these efforts were heavily supplemented by scientific cruises. Samples were procured from the Centre for Marine Living Resources and Ecology cruises (Nos. 411 and 412) in the Andaman Sea. Furthermore, project personnel actively participated in the FORV Sagar Sampada cruises (Nos. 417 and 420), utilizing Issacs-Kid Midwater

Trawls (IKMT) and High-Speed Demersal Trawls (HSDT) at depths ranging from 250 to 700 m along the Central Arabian and Lakshadweep Seas.

Following standard taxonomic keys, the study successfully documented 291 species belonging to 30 orders, 86 families, and 165 genera. Sakthikulangara fishing harbour emerged as the most diverse landing center (180 species). Detailed biometric data were recorded for 1265 samples across key species (Figs. 45-47). A meta-analysis of 218 references culminated in a consolidated checklist of Indian deep-sea ichthyofauna. Additionally, a comprehensive 'Field Identification Guide of Deep-Sea Finfishes from Indian Waters', featuring 160 species, was finalized to assist researchers and conservation managers. Furthermore, 400 specimen records were systematically submitted to the INDOBIS database, and proximate composition analyses (moisture, protein, lipid profiles) were completed for six targeted deep-sea species.

The integrative taxonomic study led to the discovery of 2 species new to science (*Apterichtus kanniyakumari* and *Bascanichthys chepakakiensis*) and 5 new territorial records, including *Gymnothorax sagmacephalus* and *Epigonus bispinosus*.

Molecular validation and evolutionary history

Tissue samples were preserved in 95% ethanol for molecular investigation targeting the mitochondrial COI and 16S rRNA genes. A total of 279 DNA sequences were generated for 130 species. Notably, 25 of these sequences are entirely new, and 38 represent first-time reports from Indian waters. Phylogenetic trees were constructed using IQ-TREE and MEGA 11 software, leading to mapping of evolutionary interrelationships within major deep-sea orders, such as Perciformes, Acanthuriformes, and Anguilliformes.

Standardization of live transport and primary culture

Establishing viable cell lines from deep-sea organisms is a highly complex endeavour due to pressure and temperature constraints. Live specimens were sourced from local fishermen and commercial trawlers operating at depths of 50 to 200 m. A rigorous transportation protocol was implemented using specialized 50 L aeration tanks with controlled temperatures (23-28°C) and frequent water replacements to minimize stress (Fig. 48).

A total of 5 novel cell lines from species such as *Gerres filamentosus* (brain), *Priacanthus hamrur* (caudal and pectoral fin), and *Uranoscopus*



Fig. 45. Deep-sea fishes collected from landing centers across Indian coast



Fig. 46. Deep-sea fishes collected from FORV Sagar Sampada

marmoratus (eye and heart). Utilizing aseptic facilities onboard the FORV Sagar Sampada, primary cultures were directly established from the eye tissue of the deep-sea myctophid, *Myctophum nitidulum*. These cells successfully emerged after 25 days, were transported to the laboratory in



Fig. 47. New reports and new species recorded



Fig. 48. Explant culture from ice-cold deep-sea fish specimens

portable incubators, and have since achieved 17 continuous passages. All established cell lines underwent rigorous characterization to validate their utility for future *in vitro* research. Cells were preserved in liquid nitrogen (-196°C) with 10% DMSO demonstrated >80% viability and retained normal morphological characteristics upon revival after 1, 3, and 6 months. Fluorescent staining with Hoechst 33258 confirmed that all established lines remained completely free of mycoplasma contamination. Protein expression was confirmed via immunofluorescence (Fig. 49).

The brain cell line (*GFb*) successfully underwent genetic transfection using pEGFP-N1 plasmid, exhibiting strong green fluorescent protein expression. Furthermore, the cells demonstrated expected morphological responses (neurite outgrowth) during neuronal differentiation assays using all-trans retinoic acid and were effectively utilized for heavy metal cytotoxicity assessments using mercuric chloride.

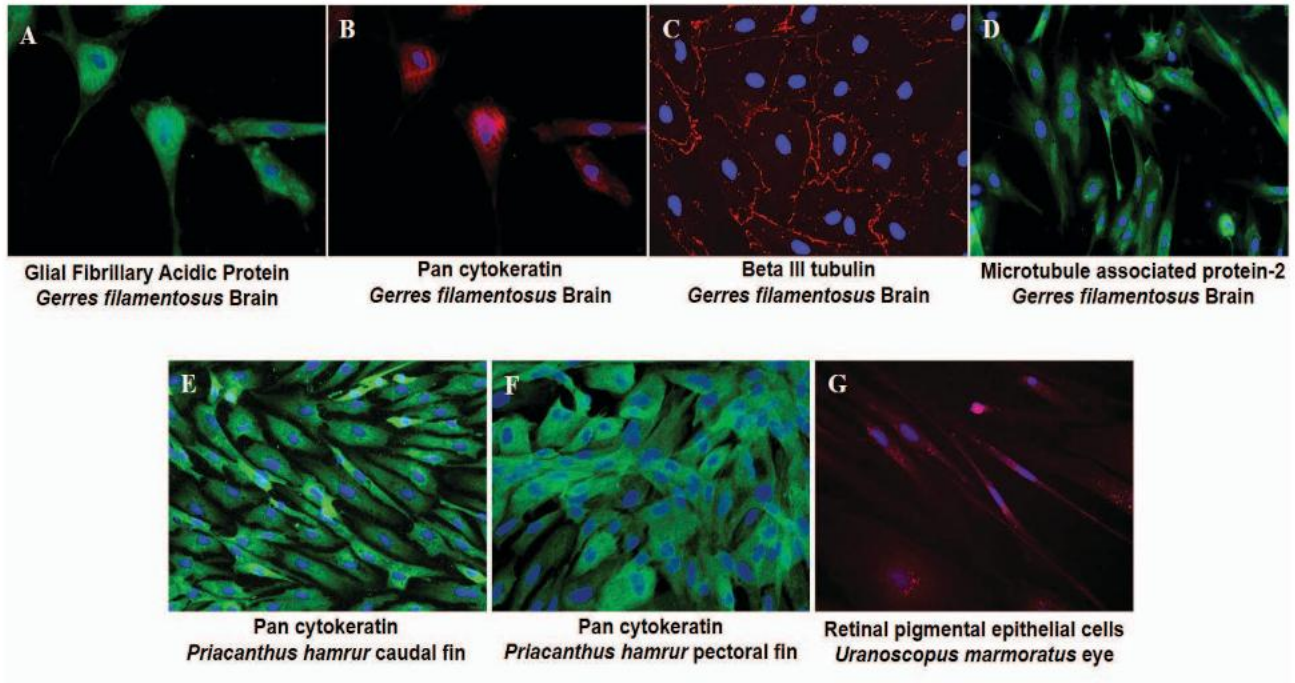


Fig. 49. Immunofluorescence staining showing the presence of different proteins in the established cell lines: (A) GFb cells showed positive for GFAP (green), (B) pan cytokeratin (red), (C) β-tubulin III (red), (D) MAP2 (green). (E) PhCF showed positive for pan cytokeratin (green), (F) PhPF showed positive for pan cytokeratin (green) and (G) UME showed positive for retinal pigmental epithelial (red). In all the cells, the nucleus was counter-stained with Hoechst 33258 (blue)

Project

Exploration of the tributaries of Cauvery River for fish species diversity and detailed studies on mahseer in Cauvery

Period: April, 2023 – March, 2026

Personnel: V.S. Basheer (PI), Charan R. and Divya P.R.

Funding support: Institutional, ICAR-NBFGR

Exploratory surveys conducted across multiple tributaries of Cauvery River basin documented significant ichthyofaunal diversity (Fig. 50). A total of 60 fish species belonging to 8 orders and 14 families, including 5 exotic species, were recorded from Kabani River (8 stations); 48 species from 7 orders and 12 families in Lakshmana Tirtha River (6 stations); 56 species from 7 orders and 12 families, including five exotics, in Harangi River (8 stations); and 28 species from 5 orders and 9 families, including 3 exotics, in Suvarnavathi River (6 stations). Additionally, 44 fish species representing 7 orders and 12 families (Fig. 51), including five exotic species, were documented from Hemavathi River (8 stations), along with the occurrence of large-growing barbs such as *Hypselobarbus carnaticus* and *Tor khudree*.

Mahseer identification using molecular marker

Mitochondrial (COI) and nuclear (histone genes) markers were used to confirm *Tor* species in Cauvery River basin and to investigate potential hybridization in mahseers. Data analysis generated a maximum likelihood tree that differentiated the samples into 2 clades namely, *T. khudree* and *T. remadevii* separately (Fig. 52). Divergence percentage detected using histone genes was only 0.6%, which was incapable of differentiating the species. In the study, no variation was detected in the histone sequences of *Tor* species.

Biological studies of *Hypselobarbus carnaticus*

H. carnaticus, called the carnatic carp (Fig. 53), is one of the major large-growing barbs from the Cauvery River and its tributaries. It has aquaculture potential, since it grows bigger. During survey, 18 specimens were collected, and biological parameters (length, weight, food and feeding, gonad weight, and maturity stages) were studied. Length varied from 50-250 mm, and weight ranged from 30-280 g. Gut content analysis showed mostly algal matter (80%) and some aquatic insects and molluscs. Gonadal observation showed that some of the big male fishes were oozing milt but all female fishes were in immature stage.

Documentation of exotic fishes

Two tilapias, *Oreochromis niloticus* and *O. mossambicus* were recorded. *O. niloticus* was recorded in greater abundance than *O. mossambicus* in experimental fishing and in landing centres. Though *Clarias*



Fig. 50. Experimental fishing in Lakshmana Tirtha, tributary of Cauvery River



Fig. 51. A few selected fish collected during the field surveys

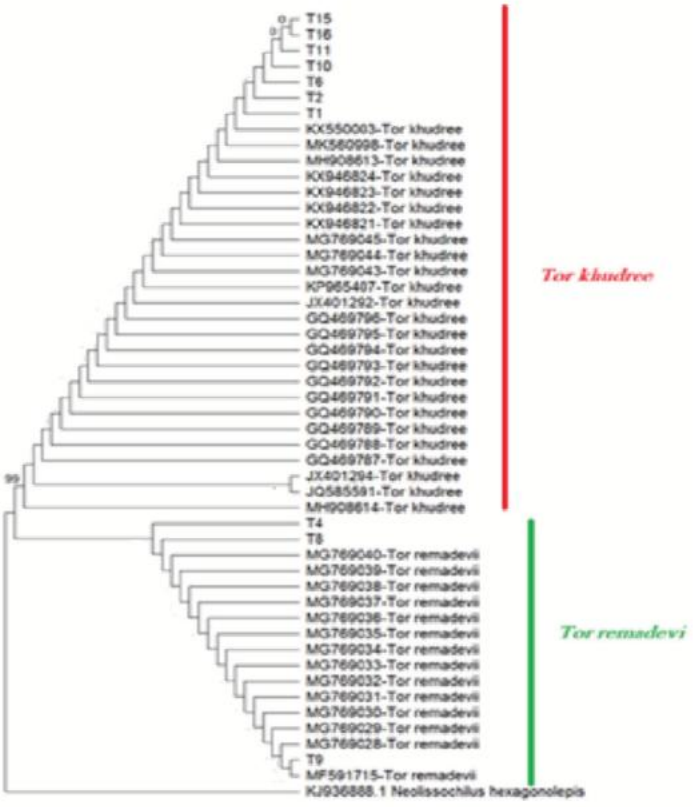


Fig. 52. Phylogenetic tree indicating genetic divergence between samples of *Tor khudree* and *T. remadevii*

gariepinus was not recorded in field sampling, it was present in good numbers in the upper reaches where sewage inflows into the river, as perceived by the local people (Fig. 54). This indicates that the lentic system with poor water quality supports *C. gariepinus*. It was also learned that sucker catfish, *Pterygoplichthys* sp., were available in many parts of the river. Field observations further indicated that river stretches adjacent to agricultural areas exhibited a higher level of pollution and less fish diversity. The consistent occurrence of exotic species across tributaries highlights the need for continuous monitoring and management interventions to safeguard native fish diversity.



Fig. 53. Carnatic carp, *Hypselobarbus carnaticus*

A total of 180 stakeholders were surveyed in the Sunderbans mangrove region to document their perceptions on aquatic genetic resources, fisheries, aquaculture, impacts of natural calamities on ecosystems and livelihoods, associated threats, mitigation options, and gender roles in climate resilience. Biodiversity assessments indicated



Fig. 54. *Clarias gariepinus* and *Oreochromis niloticus* documented during field sampling

Project

Assessment of fish diversity, vulnerability indicators, and ecosystem services in the coastal ecosystems of the East Coast of India

Period: April, 2023-March, 2025

Personnel: A. Kathirvelpandian (PI), T.T. Ajith Kumar, Ajey Kumar Pathak, Poonam Jayant Singh, Teena Jayakumar T. K. and Kantharajan G.

Funding Support: Institutional, ICAR-NBFGR

The project was undertaken to assess the status of coastal fish diversity in the Pichavaram mangrove region, identify climate change vulnerability indicators and evaluate ecosystem services of Pichavaram Ramsar wetland along the East Coast of India. Climate change vulnerability of the wetland was assessed using a stakeholder-based approach (n=240), while long-term climatic analysis (1951–2021) indicated a significant increase in mean annual temperature. The findings revealed that fishers are highly vulnerable across multiple dimensions, including fishery resources, user groups, community structure, and ecosystem health, with mangrove and estuarine fishers exhibiting greater vulnerability compared to marine fishers. Appropriate mitigation measures and adaptive strategies were proposed to reduce climate risks in Pichavaram and similar coastal wetlands in India. the occurrence of 64 fish species belonging to 23 families from the Namkhana and Fraserganj region. Further, the study evaluated the carbon sequestration potential of 3 major Indian mangrove ecosystems *viz*., Pichavaram, Point Calimere, and Punnakayal, revealing that Point Calimere holds the highest blue carbon stock (0.32 Tg C). Scenario-based analysis for the year, 2035 demonstrated that conservation approaches consistently yield higher blue carbon stocks and economic benefits compared to developmental scenarios, underscoring the critical importance of mangrove conservation for climate change mitigation and sustainable ecosystem service delivery.

Project

Assessment of climate change impact in the waterbodies of Uttar Pradesh and developing climate resilient strategies for sustainable fisheries management

Period: January, 2024 - January, 2027

Personnel: Lalit Kumar Tyagi (PI), Kantharajan G., Ajey Kumar Pathak, Santosh Kumar, Rejani Chandran and Tarachand Kumawat

Funding Support: Council of Science & Technology, Uttar Pradesh

A comprehensive checklist was prepared, which recorded a total of 148 species, belonging to 14 orders, 94 genera, and 39 families from diverse aquatic resources of Uttar Pradesh (Fig. 55). The updated checklist had more species compared to prior comprehensive datasets, such as UPFBase, which recorded 129 fishes. Among the species listed in the present study, 139 fish species were reported from lotic ecosystems, while 105 species were recorded exclusively from lentic ecosystems. The compiled checklist revealed the presence of 10 exotic fish species distributed across rivers, wetlands, and lakes in Uttar Pradesh. A total of 114 species were under Least Concern category, while 15 species were listed under different threatened categories of IUCN. This includes 1 Critically Endangered species (*Pinniwallago kanpurensis*), 4 Vulnerable (*Wallago attu, Bagarius bagarius, Cirrhinus cirrhosis, Laubuca fasciata*), 8 Near Threatened (*Chitala chitala, Parambassis lala, Ailia coila, Ompok bimaculatus, O. pabda, O. pabo, Anguilla bengalensis, Labeo pangusia*), and 2 Endangered species (*Tor putitora, Clarias magur*).

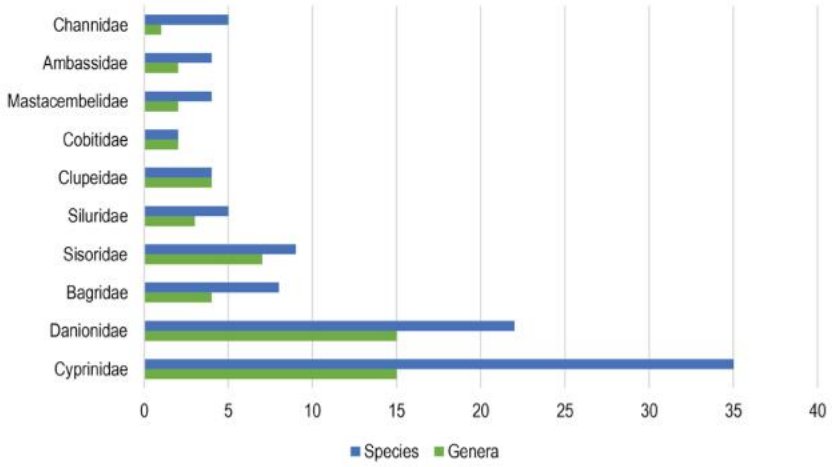


Fig. 55. Fish diversity in top 10 families in Uttar Pradesh

To assess the vulnerability of selected riverine fish species and the aquatic ecosystem, over



Fig. 56. Experimental fishing in the Gomti River

100 specimens comprising *Labeo calbasu, Eutropiichthys vacha,* and *Puntius* spp., along with water quality parameters, were collected from 6 ecologically distinct sampling sites along the Gomti and Ganga rivers, encompassing Lucknow (Pakkapul, Dubagga, and Ghaila Pul) and Kanpur (Vijay Nagar, Jajmau, and Atal Ghat) stretches, respectively (Fig. 56). These sites were strategically selected to represent gradients of anthropogenic pressure, urban expansion, industrial activity, habitat modification, and hydrological variability along the river continuum. *L. calbasu*, a commercially important carp species, was selected due to its economic significance; *E. vacha,* a catfish species, represents higher trophic levels; while *Puntius spp.*, considered weed fish, serve as indicators of environmental conditions. The reproductive biology of *L. calbasu* and *E. vacha* was studied to understand the maturity pattern, breeding season, spawning cycle, and reproductive potential under varying environmental conditions of the studied rivers. The length–weight relationship of the targeted fish species was analysed to understand their growth pattern and overall condition in the Gomti and Ganga River systems (Fig. 57). Gut content analysis was also carried out for both species.



Fig. 57. Length–weight relationship and truss morphometric analysis of the targeted fish species

A spatial approach for identifying potential fish conservation refugia sites within the 500 m buffer zones of reservoir was demonstrated in the Rihand Reservoir, Uttar Pradesh, which resulted in the delineation of 7 refugia zones. Sentinel-2 MSI surface reflectance datasets for the years 2020–2024 were used in Google Earth Engine platform. The permanent water composite map (2020–2024) indicated that a large proportion of the reservoir maintains stable water availability. This highlights strong baseline potential for fisheries-based spatial planning and sustainable resource management. The qualitative mapping of primary productivity exhibited widespread favourable conditions for phytoplankton growth and fish food availability. Similarly, coloured dissolved organic matter suitability covered about 24250 ha, reflecting nutrient-rich organic matter-supported habitats. Turbidity analysis showed around 19800 ha of suitable area, indicating localized sediment stress zones. In contrast, water depth suitability was comparatively restricted, with about 11800 ha area implying depth-related limitations to fish refugia sites (Fig. 58). The habitat suitability assessment of Rihand Reservoir revealed considerable spatial variation across key ecological indicators relevant to fisheries potential. Overall, the reservoir demonstrates high potential in terms of water permanence, productivity, and organic matter availability, while depth and turbidity variations play a crucial role in defining conservation refugia areas. This methodology provides a useful framework for locating and prioritizing similar fish refugia sites in other reservoirs across Uttar Pradesh, thereby supporting reservoir fisheries conservation and sustainable management planning.

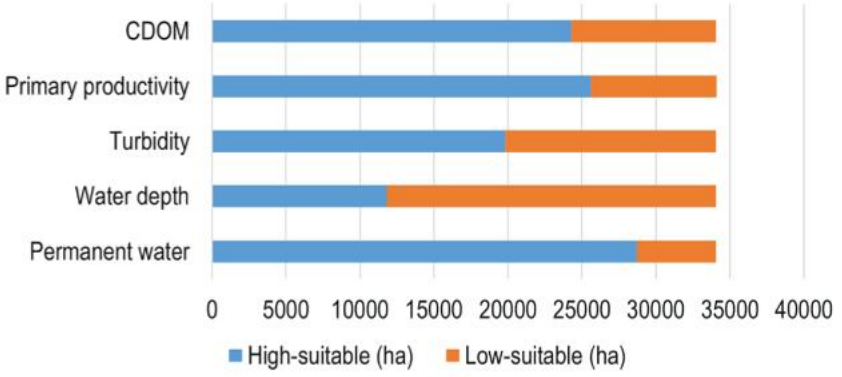


Fig. 58. Habitat parameter-wise qualitative assessment of potential fish habitats based on spectral indices in Rihand Reservoir, Uttar Pradesh

Project

Participatory programme on exploration and characterization of fish germplasm resources and indigenous knowledge in North-Eastern region of India

Period: April, 2020 - March, 2025

Coordinator: T.T. Ajith Kumar; Uttam Kumar Sarkar (up to February, 2025)

Personnel: Rejani Chandran (Nodal Officer), Lalit Kumar Tyagi, Ajey Kumar Pathak, Aditya Kumar, Labrechai Mog Chowdhury, Raghvendra Singh, Tarachand Kumawat, G. Kantharajan and Amit Singh Bisht

Collaborating partners: Dandadhar Sarma, Irengbam Linthoingambi Devi, Kouberi Nath, Pranay Punj Pankaj, Sarbojit Thaosen, Ratul Chandra Bharali, Hrishikesh Choudhary, Limatemjen, and Trishna Barman

Funding support: ICAR-NEH Component

The North-East Hill (NEH) component of the Institute conducts research programs across the North-Eastern region of India under the following 3 sub programs in collaboration with various regional institutions:

I. Under the sub-program "Exploration and documentation of fish germplasm resources and indigenous knowledge from selected parts/rivers of the NE region", following 7 subprojects were undertaken:

1) Exploration and characterization of cavernicole fish species of Meghalaya

   Five caves *viz.* Krem Mawjymbuin, Krem Leiwlong, Krem Chiabole, Krem Nakama, and Krem Sonarenga located in the Garo, Khasi, and Jaintia Hills were explored. A new species, *Schistura sonarengaensis*, was described based on 3 cave-dwelling populations from Krem Sonarenga, Krem Nakama, and Krem Chiabole in South Garo Hills, Meghalaya. Additionally, 3 species under genera *Schistura* and *Glyptothorax* were collected and are currently under validation. In total, 13 fish species were recorded, including 1 cavernicolous species.

2) Exploration and evaluation of ichthyofaunal diversity and assemblage, and habitat ecology of Umiam River, North East India

   Monthly surveys were conducted at 10 sampling sites along the Umiam River across Meghalaya and Assam. A total of 41 fish species belonging to 18 families were recorded, including 3 exotic species. The families Cyprinidae and Bagridae contributed 39% and 9.7% of the total species composition, respectively. Most species were categorized as Least Concern (27 species), followed by Vulnerable (5 species) and Near Threatened (1 species) based on IUCN criteria. Five exotic species, *Barbonymus gonionotus, Ctenopharyngodon idella, Cyprinus carpio, Hypophthalmichthys molitrix*, and *Oreochromis mossambicus*- and four endemic species-*Danio meghalayensis, Pethia shalynius, Physoschistura elongata*, and *Schistura reticulofasciata* were recorded in the upstream and midstream sections. Fish assemblage patterns varied with riverbed types (rocky, sandy, and mixed), with higher diversity observed in midstream and downstream sections. *Neolissochilus hexagonolepis* was the most abundant species (RA=22.8%). Human disturbance was minimal, except for agriculture along the riverbanks.

3) Impact of Doyang Hydroelectric Project (DHEP) on ichthyofaunal diversity along the Doyang River, Nagaland: Conservation implications, indigenous traditional fishing practices, and the potential for ecotourism development

   Exploratory surveys of the Doyang River in Nagaland documented 32 fish species belonging to 5 orders and 12 families. Indigenous traditional knowledge related to fishing practices was also recorded. A total of 3 types of fishing gear, 1 collection accessory, 1 craft, and 2 miscellaneous fishing techniques were documented. Habitat inventories were prepared for all sampling sites. Market surveys and stakeholder consultations were conducted to assess the potential for ecotourism development.

4) Exploration and evaluation of fish biodiversity, distribution pattern and habitat ecology of Tizu River (lower stream) in Phek district, Nagaland

   Three exploratory surveys were carried out at 6 sites along 6 Tizu River. A total of 25 fish species were documented. Subsistence fishing practices were observed, and various traditional fishing methods used by local communities were recorded. Habitat

characteristics and physico-chemical water quality parameters were also analyzed at all sites.

5) Exploration and evaluation of fish biodiversity and habitat ecology of Subansiri River (Downstream)

Subansiri River was surveyed at 16 sampling locations, from the foothills of Arunachal Pradesh to its confluence with the Brahmaputra River. Seasonal sampling (pre-monsoon, monsoon, and post-monsoon) recorded a total of 200 fish species belonging to 34 families and 101 genera. Cyprinidae was the dominant family (70 species), followed by Sisoridae (16 species). Fish diversity, physico-chemical parameters, and anthropogenic impacts were assessed. The impact of the Gerukamukh dam for hydroelectric power generation is currently under evaluation. Indigenous traditional knowledge related to fishing was also documented.

6) Exploration & Evaluation of fish faunal diversity of Tizu and Zungki river of Chindwin drainage system Nagaland

Exploration of the Zungki River at 6 sites-Langdangsee, Thang Nokyan, Lengnyiu, Trongpuh, Longmatra, and the Zungki-Mutriki confluence resulted in the documentation of 17 fish species, with Cyprinidae as the dominant family. Anthropogenic activities such as dynamite fishing, electrofishing, chemical fishing, and extraction of boulders and gravel were observed at multiple sites. Physical habitat features, water quality parameters, and GPS coordinates were recorded.



Fig. 59. Sampling along Tirap River, Arunachal Pradesh

7) Characterization of Fish Biodiversity of Tirap region of Arunachal Pradesh for morphological and molecular approaches for its conservation and propagation giving special preference to their fishing communities

Baseline surveys conducted in Tirap and Changlang districts focused on the Tirap River and its tributaries (Fig. 59). A total of 20 fish species belonging to 8 families and 3 orders were recorded. Fish were primarily harvested using drag nets, gill nets, scoop nets, and cast nets. Cyprinidae was the most dominant family in the study area.

II. Under the sub-program "Development of regional live fish germplasm resource centres of indigenous food and ornamental fishes for resource enhancement and sustainable livelihood generation", following 2 subprojects were undertaken:

8) Development of live germplasm resource center for indigenous food and ornamental fishes for resource enhancement and sustainable livelihood generation in Assam

Efforts were made to improve breeding and larval rearing protocols for commercially important and endemic ornamental fishes at the Live Germplasm Resource Centre, Assam. Successful breeding and larval rearing of *Trichogaster chuna, Devario devario, Channa gachua*, and *Channa quinquefasciata* were achieved, with larval survival rates ranging from 75% to 85%. Similarly, *Danio aequipinnatus, Danio dangila, Trichogaster chuna*, and *Badis assamensis* showed high breeding performance, with about 95% fertilization and over 85% larval survival. Natural breeding trials of *Channa stewartii, Microphis deocata*, and *Ctenops nobilis* also yielded high



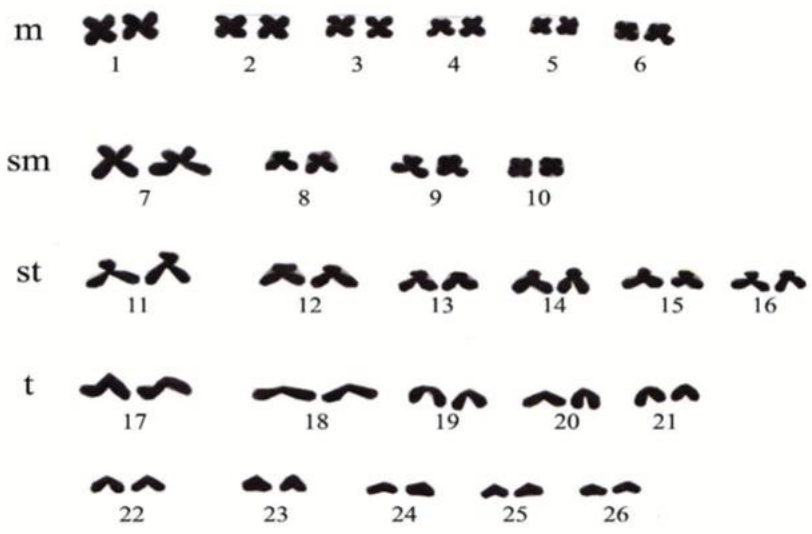


Fig. 60. Karyotype information of *Channa gachua*

success rates exceeding 90%. Colour retention in selected indigenous ornamental species, namely *Pethia gelius* and *Oreichthys crenuchoides*, was effectively maintained using formulated supplementary feed enriched with astaxanthin sources such as hibiscus and synthetic additives. In addition, 4 breeding trials were conducted for *Ompok pabda, Clarias magur*, and *Heteropneustes fossilis*, achieving around 90% breeding success and approximately 80% larval survival in *O. pabda* and *H. fossilis*.

9) Collection, stock development and captive breeding of economically important vulnerable native fish germplasm for conservation and mass seed production

The growth performance of *Systomus sarana* was evaluated over a period of 110 days under controlled indoor conditions using a 5000 L tarpaulin circular tank. Fish were stocked at a density of 300 individuals per tank with an initial average weight of 12±0.05 g and were fed floating pelleted feed at 5% of their body weight. At the end of the experiment, the mean weight reached 56.75±0.075 g, with a survival rate of 50% and a daily weight gain of 0.41 g/day.

III. Under the sub-program "Cytogenetic characterization of endemic fishes of North-Eastern India", following sub project was undertaken:

10) Karyotyping and Banding of some selected indigenous fish species of the undivided Goalpara district & Adjacent districts of Meghalaya

A total of 10 sites in Goalpara *viz.* Urpad Beel, Singimari Beel, Hasila Beel, Kumri Beel, Panchgaratna Ghat, Kachari Ghat, Tamronga Beel, Daloni Beel, Dheer Beel, and Balbala Beel were surveyed, resulting in collection of 15 fish species. Karyotypic analysis was carried out for selected species, including *Channa bleheri, C. gachua* (Fig. 60), *Badis badis, B. assamensis, Puntius terio, Mystus tengra, M. bleekeri, Pethia conchonius, P. canius, Trichogaster lalius*, and *T. fasciata*.

Project

Participatory programme on exploration, characterization, and conservation of fish germplasm resources and indigenous knowledge in North-Eastern region of India

Period: April, 2025 - March, 2028

Coordinator: Kajal Chakraborty

Personnel: Rejani Chandran (Nodal Officer), Lalit Kumar Tyagi, Ajey Kumar Pathak, Aditya Kumar, Labrechai Mog

Chowdhury, Raghvendra Singh, Tarachand Kumawat, Kantharajan G. and Amit Singh Bisht

Collaborating partners: Dandadhar Sarma, Yumnam Bedajit Singh, Lalramliana, Irengbam Linthoingambi Devi, Kouberi Nath, Pranay Punj Pankaj, Sarbojit Thaosen, Ratul Chandra Bharali, Pradyut Biswas, Rameshori Yumnam, Pema Khandu Thungon, Sri Hari M. and Trishna Barman

Funding support: ICAR-NEH Component

The North-East Hill (NEH) component of the Institute conducts research programs across North-Eastern region of India under the following 2 sub programs in collaboration with various regional institutions:

I. Under the sub-program, "Exploration, documentation and characterization of fish germplasm resources and indigenous knowledge from selected parts/rivers of the NE region", following 9 subprojects are being undertaken

1. Exploration, cataloguing, and characterization of cavernicolous fish species in Meghalaya

   Six caves in Meghalaya *viz.* Krem Mawjymbuin, Krem Leiwlong, Krem Janiaw, Krem Tyllongsiej and Krem Dam (East Khasi Hills) and Krem Khung (East Jaintia Hills) were explored (Fig. 61). One new species, *Schistura densiclava* (Fig. 62), was described from Krem Mawjymbuin. It is distinguished by 14-20 greyish-black bars over a black mid-lateral stripe on a greyish-brown to pale beige body (yellowish-green in life), with thin, numerous pre-dorsal bars wider than interspaces and sometimes incomplete. Three additional species of *Schistura* and *Glyptothorax* were collected and are under validation.

2. Exploration and evaluation of fish diversity and habitat ecology of river Subansiri (Upstream)

   The upstream Subansiri River (Brahmaputra tributary) in Arunachal Pradesh was surveyed after obtaining permits from Upper Subansiri, Lower Subansiri, and Kamle districts. Five sites in the Kamle River (sub-tributary) and three in the main channel were sampled. A total of 28 species belonging to 23 genera and 11 families were recorded, with Cyprinidae (8 species) and Sisoridae (6 species) being dominant. Habitat characteristics of each site were documented.

3. Assessment of ichthyofaunal diversity, conservation practices, and indigenous knowledge of traditional fishing practices along Chubi River, Nagaland

   The Chubi River, a perennial

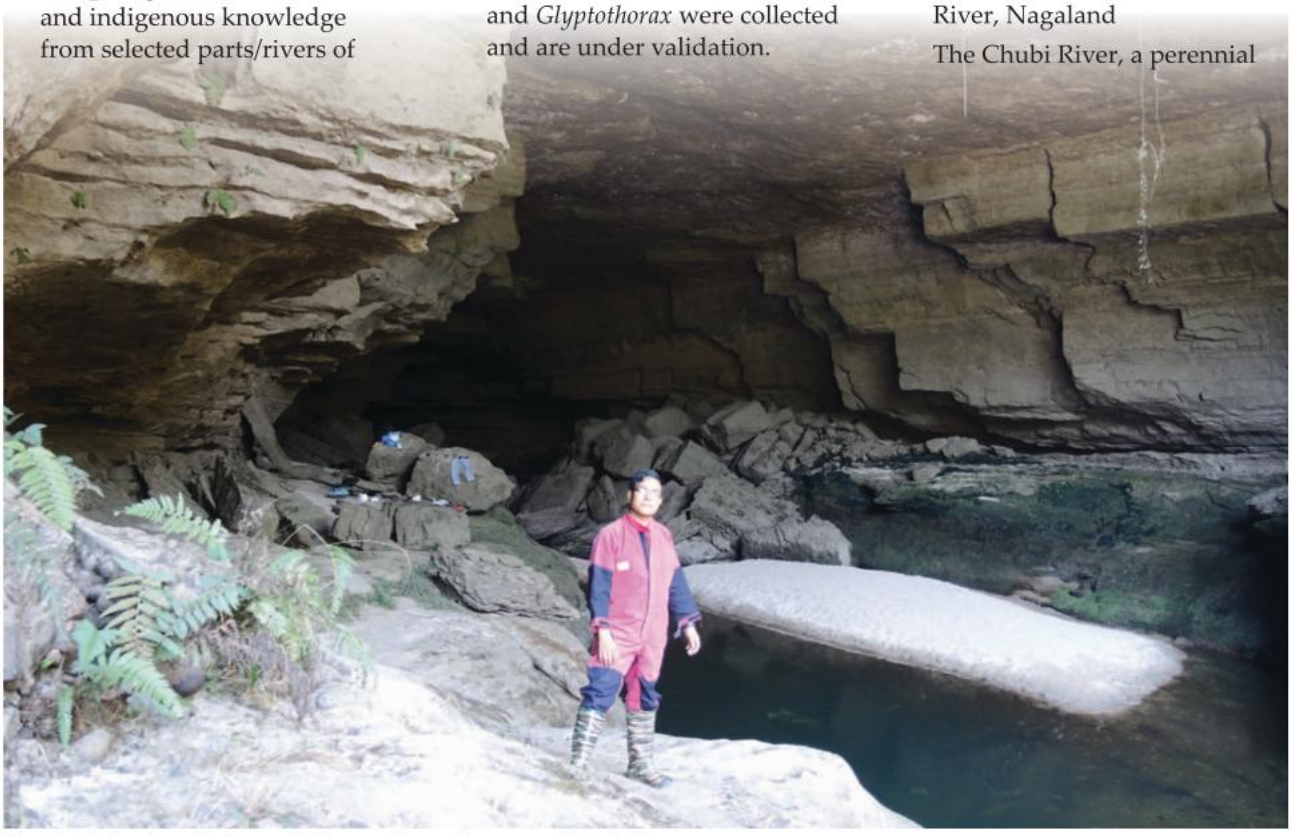


Fig. 61. Explorations being carried out at Krem Dam cave of Meghalaya



Fig. 62. Newly discovered loach, *Schistura densiclava*

tributary of the Doyang River in Mokokchung district, Nagaland, was surveyed at 5 stations. A total of 29 species belonging to 6 orders and 14 families were recorded. Cypriniformes dominated and diversity indices ranged from 1.95-3.18 with the highest richness in midstream stretch. Habitat-specific taxa indicated microhabitat heterogeneity. Seasonal, low-impact traditional fishing practices using bamboo sieves and temporary diversion structures were documented (Fig. 63), along with ITK relevant to sustainable fisheries management.

4. Characterization of ichthyofaunal diversity of Tirap River and its tributaries at Changlang and Tirap district of Arunachal Pradesh using integrated taxonomy for its conservation and propagation, giving special preference to fishing communities

   Fish sampling in selected stretches of the Tirap River and its tributaries (Tirap and Changlang districts, Arunachal Pradesh) covered 4 sites with assistance from local fishers. Multiple fishing gears were used to sample different microhabitats, resulting in 16 recorded species. Dominant genera included *Schizothorax*, *Devario* and *Garra*.

5. Ichthyofaunal inventory, molecular, characterization and conservation assessment of the Chindwin (Chatric and Tizu) and Barak River Systems in Manipur, India.

   Systematic sampling was conducted at 6 locations in Chindwin (Tizu tributaries) and Barak River systems in Manipur (Fig. 64), covering diverse habitats, elevations, and hydrological conditions. Endemic species



Fig. 63. Temporary diversion technique (Kilang in local dialect) used by Ao tribe, Nagaland

such as *Mustura prashadi, M. sikmaiensis, Channa gachua, Lepidocephalichthys berdmorei, Barilius lairokensis, B. dogarsinghi, Batasio affinis, Pseudecheneis ukhrulensis, Garra ukhrulensis, G. compressus,* and *Neolissochilus stracheyi* were recorded. A total of 27 species were documented. Tizu tributaries showed high riffle-pool habitat heterogeneity, while Barak sites showed floodplain influence and higher fishing pressure.

6. Assessment of Ichthyofaunal diversity and traditional insights into fisheries practices in the Tuirial River Basin

   Experimental fishing using gillnets and scoop nets was conducted in the middle and upper stretches of the Tuirial River, Mizoram. The ichthyofaunal assemblage comprised 30 species belonging to 7 orders and 12 families. Cypriniformes was the most diverse order, followed by Siluriformes, Cyprinidae and Danionidae were the dominant families. ITK was documented using a structured questionnaire with 12 fishers (Fig. 65), who reported reduced fish availability due to floods, landslides, and destructive practices such as dynamite fishing and electrofishing.

7. Exploration and habitat ecology of fish Fauna and Habitat Ecology of Tiseylang/ Phukhinglang River (Myanmar Border) in Meluri District, Nagaland

   Explorations were conducted at Liiratikhing, Tshiiliichock and Jinglongdang along the Tiseylang/Phukhinglang River near the Myanmar border in Meluri district, Nagaland.

8. Exploration and assessment of ichthyofauna in Mizoram: Morphological and molecular characterization

   Fish diversity in Karnaphuli River drainage of Mizoram was assessed at 12 sites through 3 exploratory surveys. A total of 73 species were recorded, dominated by Cyprinidae (29 species). Species identification used an integrative taxonomy approach, and *Danio rerio* was recorded for the first time from the rivers of Mizoram.

9. Cytogenetic investigation of selected endemic fishes of North East, India

   Karyotyping was carried out for *Channa andrao, Ctenops*



Fig. 64. Experimental fishing in Rangazak kong River (Tizu River system), Ukhrul District of Manipur



Fig. 65. Documenting ITKs by interacting with stakeholders at Turial River, Mizoram

nobilis, Danio dangila, and *Devario devario*. Cytogenetic information for the first 3 species was reported for the first time.

Explorations by ICAR-NBFGR

Exploration in Arunachal Pradesh led to the discovery of following 2 new species:

- ***Olyra sancta,*** a new anguilliform Bagrid catfish, from Tissa River, Brahmaputra River drainage in Arunachal Pradesh
- ***Exostoma hajiensis,*** a new Sisorid Catfish (Teleostei: Sisoridae) from Arunachal Pradesh

II. Under sub-program "Development of regional live fish germplasm resource centres of indigenous food and ornamental fishes for resource enhancement and sustainable livelihood generation", following 4 sub-projects are being undertaken:

10. Establishment of live germplasm resource center for high-value indigenous food and ornamental fishes: A resource enhancement and sustainable conservation approach Induced breeding of *Devario devario*, a freshwater cyprinid with significant ornamental aquaculture potential, was successfully conducted at the live germplasm resource centre at Gauhati University, Guwahati. A total of 75 mature individuals were collected and subjected to breeding trials using varying hormonal doses. The embryonic period lasted 20.04 hours, yielding larvae measuring 3.46 ± 0.4mm, demonstrating higher efficiency compared to similar species. An induced breeding protocol for *Channa andrao*, a highly traded ornamental fish, was established employing synthetic hormone (OVASIS). Natural breeding of *C. gachua* was successful in 8 pairs of brooders. Post-hatching larval



Fig. 66. *Ophichthys cuchia*

survival was found to be 93-95%. Natural breeding of *C. quinquefasciata* occurred with 3 successful spawning events, demonstrating mouthbrooding behavior lasting 12-18 days post-spawning. *Mystus tengara* was successfully induced bred in captivity using synthetic hormone (GONOPRO-FH).

11. Establishment of a live gene bank for endemic fish species of Northeast India

    Efforts to establish a live germplasm resource centre in collaboration with the College of Fisheries, Lembucherra, was initiated. Exploratory sampling to collect endemic and indigenous fishes of the NE region was carried out in Imphal, Iril, and Thoubal rivers. Samples of *Bangana devdevi, Hypsibarbus myitkyinae, Cirrhinus cirrhosus, Lepidocephalichthys berdmorei, Barilius ngawa, Schistura sp.* were collected and maintained in the wet laboratory of the college.

12. Development of seed production technology and co-culture system for *Ophichthys cuchia* (Hamilton, 1822) with *Wolffia arrhiza*

    Ophichthys cuchia is a freshwater air-breathing fish of the family Synbranchidae. It is highly valued for its taste, nutritional richness, and medicinal importance, commanding premium prices in national and international markets. The species is listed as Near Threatened by the IUCN Red List due to declining natural populations in North East India and Bangladesh (Fig. 66). Three experimental setups were established for domestication and initial feeding trials. The collected specimens were offered 4 types of feed to assess acceptance: small dead loaches, boiled chicken intestine, ground tubifex mixed with a binder, and

live tubifex. The substantial increase in condition factor indicated positive growth response, successful adaptation to captivity, and effective domestication under controlled conditions. Proximate composition analysis was carried out on 3 distinct body regions (head, body, tail) of *O. cuchia* collected from natural water bodies. Standard AOAC methods were employed to estimate protein (Kjeldahl method), lipid (Soxhlet extraction with petroleum ether), fibre, moisture and ash contents. Significant variations were observed across body regions. Comparative analysis with IMCs showed that *O. cuchia* has superior crude protein, lipid, and ash content, confirming its high nutritional value and its premium market positioning as a high-value food fish with medicinal properties.

13. Breeding biology and stock characterization of *Gudusia chapra* in Amarsagar and Dhanisagar lakes

    Samples of *G. chapra* were collected from Amarsagar and Dhanisagar lakes in Tripura. The fishes were captured using drag nets and gill nets in Dhanisagar Lake, whereas only drag nets were used in Amarsagar Lake. The total body weight of specimens ranged from 4.48 g to 74 g in Dhanisagar Lake and from 0.73 g to 4.66 g in Amarsagar Lake. Three distinct age groups were recorded in each sampling. Notably, larger individuals were predominantly caught using gill nets in Dhanisagar Lake.

Project

Ecosystem dynamics and conservation strategies of the sacred rivers: Assessment of physicochemical attributes, fish biodiversity, and human impacts

Period: April, 2024 - March, 2026

Personnel: Tarachand Kumawat (PI), Mahender Singh, Rejani Chandran, Kantharajan G., Jaspreet Singh and Vikash Sahu

Funding Support: ICAR-NBFGR Corpus Fund

The study was conducted across 5 sampling sites (Elgin

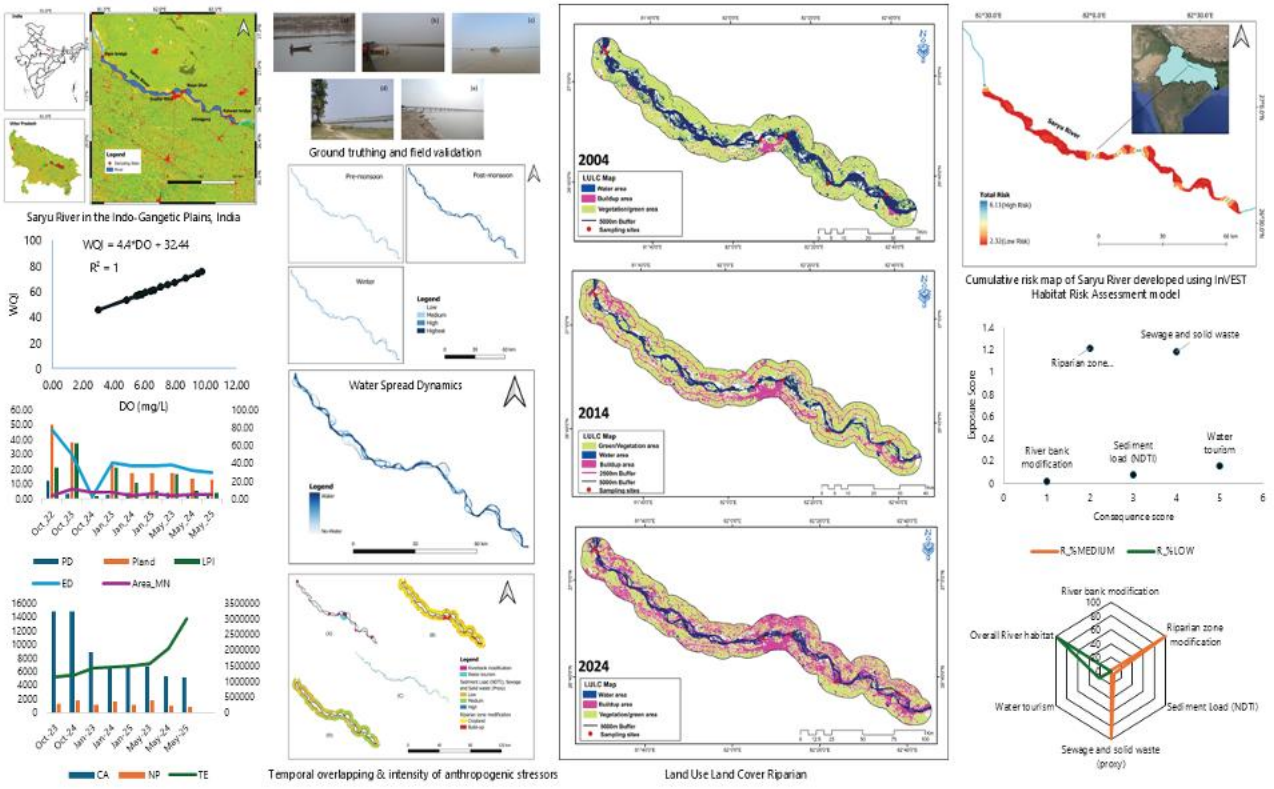
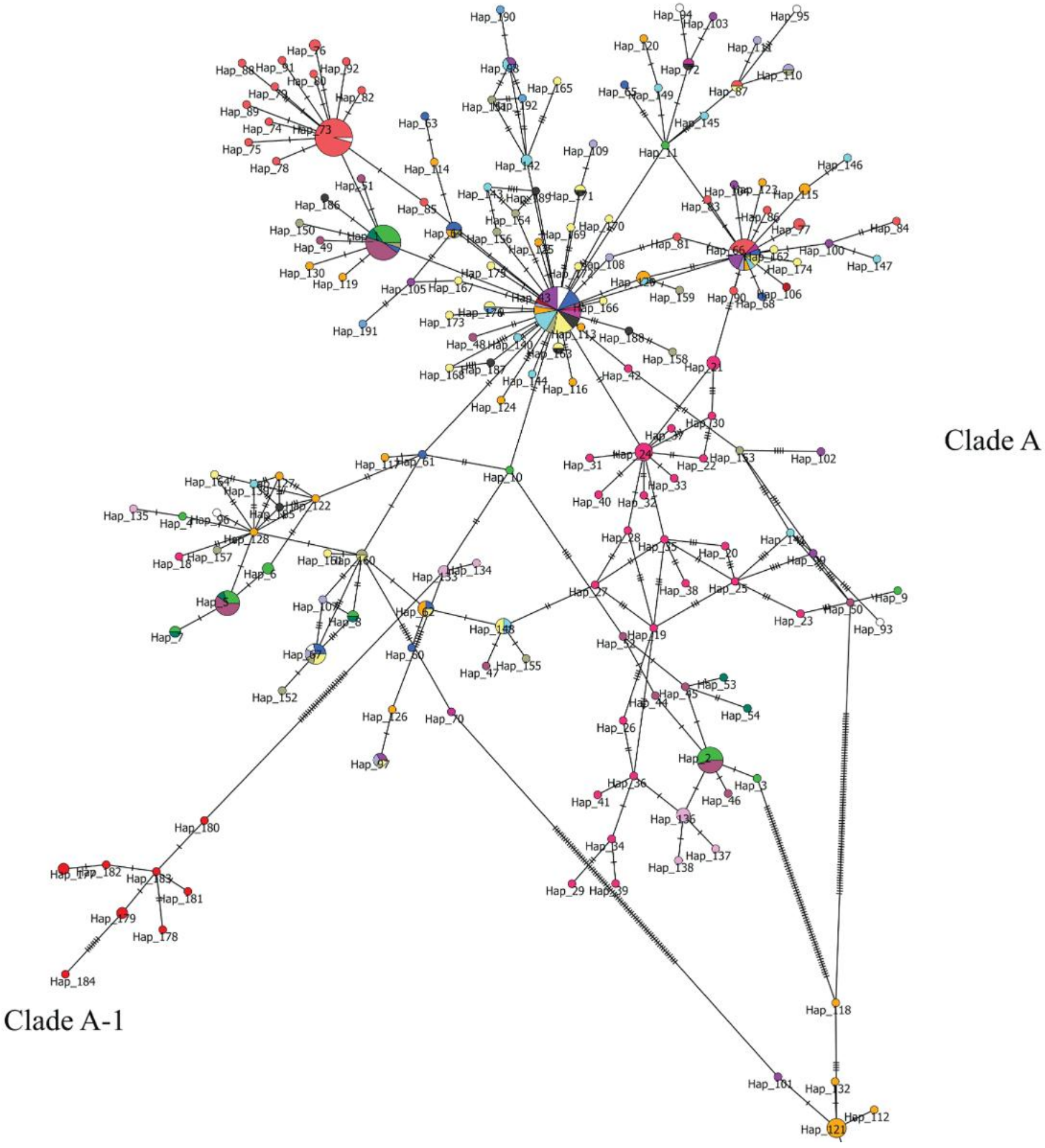


Fig. 67. A process-linked geospatial framework of Saryu River

Bridge, Guptar Ghat, Nayaghat, Dilasiganj, and Kalwaei Bridge) of the India's epical sacred Saryu River, a snow-fed tributary of the Ganga in Indo-Gangetic Plains. The ichthyofaunal survey recorded a total of 69 fish species belonging to 50 genera, 25 families, and 13 orders, indicating high taxonomic diversity within Saryu River. Cypriniformes emerged as the most species-rich order (27 species), followed by Siluriformes (19). At family level, Cyprinidae dominated with 15 species, followed by Danionidae (10) and Bagridae (6). Native species dominated the assemblage, with only 3 exotic taxa (*Oreochromis niloticus*, *Hypophthalmichthys molitrix*, and *Pterygoplichthys* sp.) recorded. This study integrates multi-year water-spread dynamics, landscape fragmentation, riparian land-use intensity, nutrient patterns, and spatial habitat risk modelling. The framework was applied to Saryu river, using Sentinel-2 observations (2022–2025), landscape metrics, field-based water-quality data, and InVEST Habitat Risk Assessment model. Perennial water extent declined from 60.13 to 47.93 km^2 and seasonal water from 139.77 to 103.39 km^2, accompanied by a sharp reduction in Large Patch Index (21.14% to 4.71%), indicating progressive habitat fragmentation. Downstream nutrient enrichment revealed ammonia concentrations of 1.16 mgL^{-1} and phosphate of 0.88 mgL^{-1}, coinciding with intensified riparian land-use pressure. LULC mapping revealed a significant transformation between 2004 and 2024. Habitat risk modelling identified localised medium-risk zones primarily associated with riparian modification and untreated waste discharge, despite an overall low system-wide risk. This framework (Fig. 67) helps river ecosystem monitoring and provides a scalable early-warning tool for adaptive management of snow-fed and monsoon-driven river systems under accelerating anthropogenic pressure.

Characterization, Intraspecific Diversity and Genetic Stocks



Project

Development of molecular system for identification of fishes

Period: April, 2023 - March, 2026

Personnel: Mahender Singh (PI), Poonam Jayant Singh, Santosh Kumar, Jaspreet Singh, Tanwy Dasmandal, and Deva Narayan

Funding Support: Institutional, ICAR-NBFGR

The project is envisaged to develop environmental DNA (eDNA) based molecular system for identification of fish species. The fish diversity in Gomti River, Uttar Pradesh, was assessed using eDNA metabarcoding. The universal MiFish-U-F/R primer set was used to generate amplicon of ~230 bp. Conventional sampling recorded 78 fish species (belonging to 12 orders, 34 families and 64 genera), while metabarcoding detected 61 species (belonging to 11 orders, 27 families and 44 genera) (Fig. 68). A total of 53 species were common to both approaches, while 25 were captured exclusively by the conventional method, and 8 were uniquely detected in eDNA samples. Four species (*Labeo dyocheilus, Opsarius bendelisis, Glyptothorax telchitta* and *Sperata aor*) were detected in eDNA samples, which also have historical records in Gomti River. *Pangasianodon hypophthalmus* (Endangered; EN) was exclusively detected from eDNA water samples, whereas *Clarias magur* (EN) was detected using both methods. Comparison with historical data (~15 years prior) revealed 22 fish taxa that were first recorded in current experimental fishing surveys during 2023 - 2024. Cyprinids dominated the group in both the approaches. Seven exotic species were captured in fishing net, whereas eDNA detected two species only (*Oreochromis niloticus* and *C. gariepinus*). A portable low-cost eDNA water sampler was designed from chlorinated polyvinyl chloride polymer components. An improved DNA based method with newly designed primer pairs was developed to differentiate *C. magur* from *C. gariepinus*. One patent was filed in Indian Patent Office (reference no. 202511134673, December 31, 2025) and one ICAR-Certified Technology was received for molecular identification of *C. magur*, *C. gariepinus* and their hybrids (Ref: ICAR-FS-NBFGR-Technologies-2025-042 dated 16 July, 2025). A novel biosensor has been developed for detection of *C. gariepinus*.

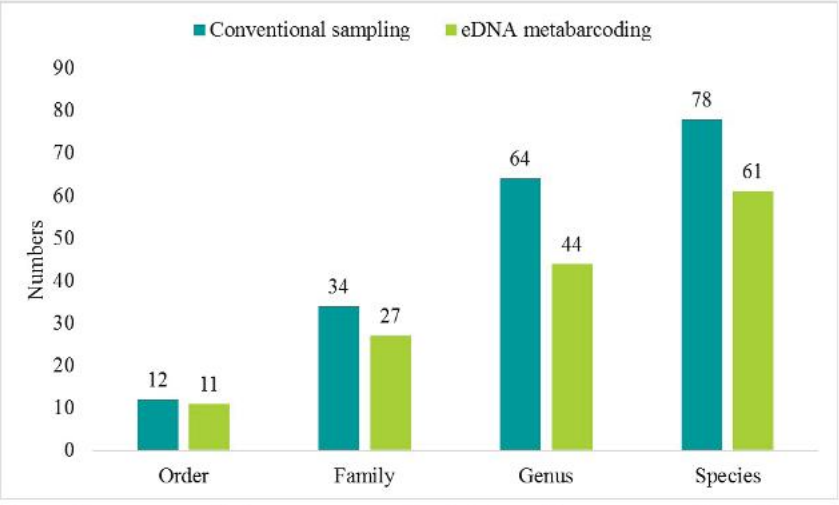


Fig. 68. Comparison of different taxonomic levels detected by conventional sampling and eDNA metabarcoding

Project

Nanofibre and biocomposite development from fish waste resource for circular economy

Period: April, 2023 - March, 2026

Coordinator: Kajal Chakraborty

Personnel, ICAR-NBFGR: Poonam Jayant Singh (PI), Ajey Kumar Pathak, A. Kathirvelpandian, Mahender Singh, S. K. Srivastava (upto June, 2025) and Ravi Kumar

Personnel, ICAR-CIRCOT: GTV Prabhu (PI) and Senthil Kumar

Personnel, ICAR-IISR: Manoj Kumar Srivastava (PI)

Funding Support: Institutional, ICAR-NBFGR

Fish waste is a global problem arising from discards, also causing environment problems. The project aims to upcycle fish waste, find alternative uses and cater to SDG 12 for responsible consumption, production and nearing to zero waste discards for enhancing bio-economy and utilising green synthesis. The present study demonstrates sustainable upcycling of fish and shellfish biowaste into high-value biomaterials, including nanoparticles, bio-composites and nanofibers. Fish scales provided collagen, hydroxyapatite and chitin for green nanoparticle synthesis, while oyster shells supported eco-friendly nanomaterial production. The piezoelectric

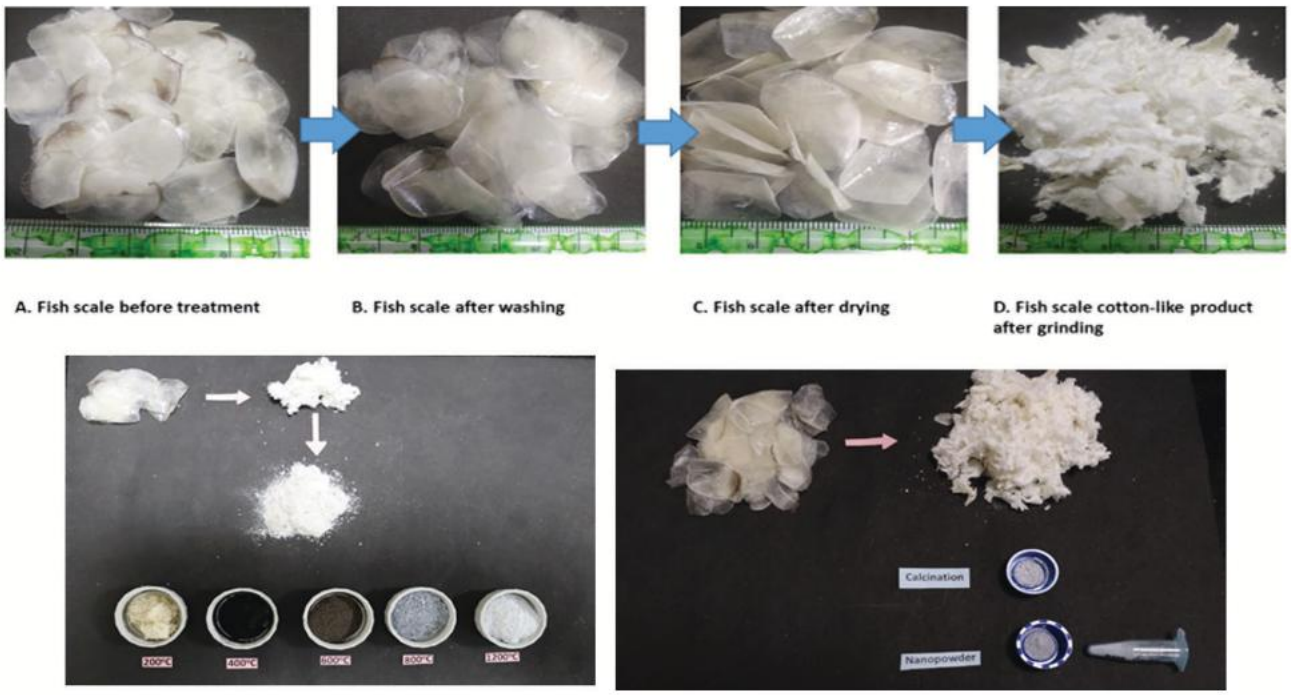


Fig. 69. Fish scale processing for calcination and nanopowder from calcined fish scale

potential of fish scales was also explored for biosensing and energy applications, highlighting a circular bio-economy approach.

Green synthesis of nanoparticles from fish biowaste

Fish scales were collected from *Labeo rohita* (45 cm SL; 1.5 kg), thoroughly cleaned, oven-dried, crushed, and calcined at 200°C, 400°C, 800°C, 1000°C and 1200°C to obtain biogenic hydroxyapatite (HAP) powder (Fig. 69). The calcined material was further ground using stainless steel beads in a FastPrep 24 system to produce nano-HAP (nHAP). The samples were characterized using FTIR, XRD and SEM to evaluate the structural and morphological properties.

Green synthesis of nanoparticles

Shells of oyster, *Crassostrea madrasensis* (Preston, 1916), were collected from Vembanand Lake, Kochi, Kerala. The shells were washed, ground and directly calcined at temperatures ranging from 200 to 1200°C. The calcined shells were analysed for FTIR, XRD and SEM for evaluating its properties. Nanopowder prepared after calcination were also analysed.

Fourier Transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) analysis

Powdered Oyster shells were subjected to SEM and FTIR analysis before and after calcination for analysing functional group and structure. Temperature induced changes can be seen in Fig. 70.

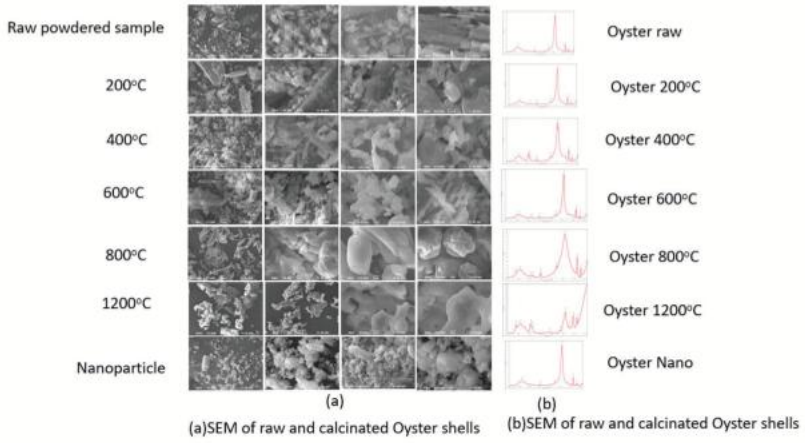


Fig. 70. Image showing raw and calcinated oyster shells from scanning electron microscopy

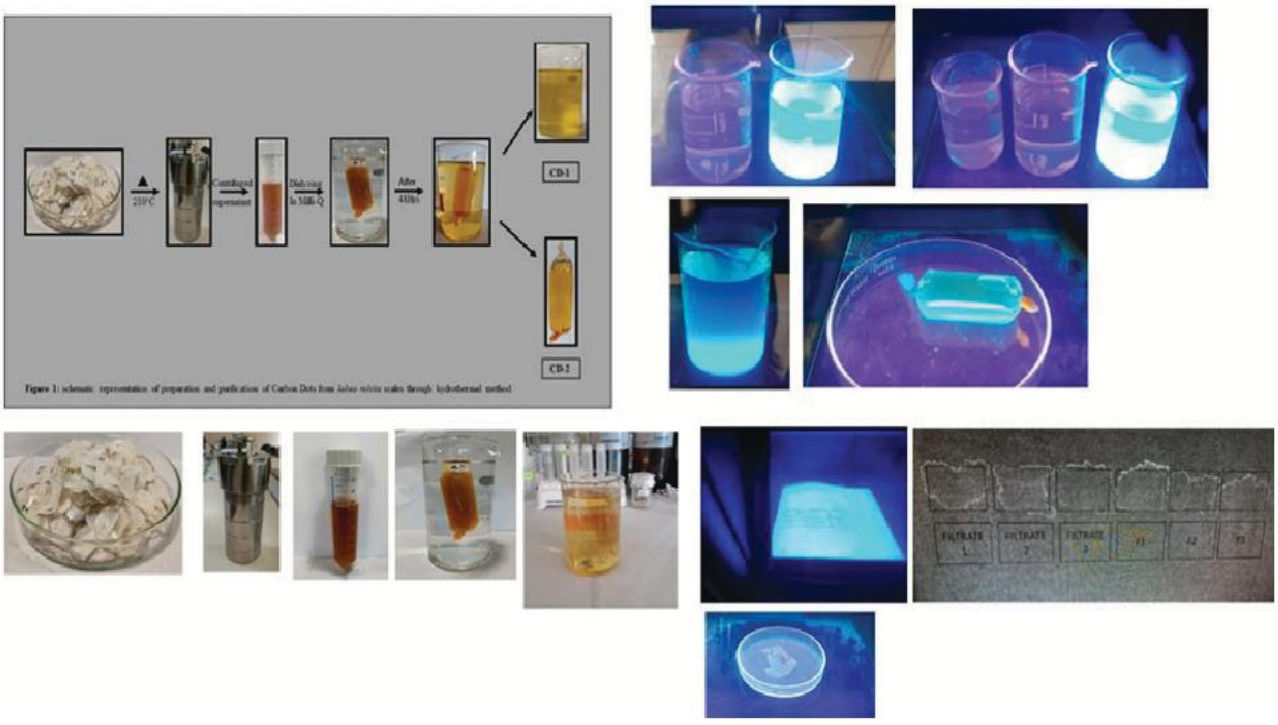


Fig. 71. Fish scales nano carbon dots

Bio-composite development

Bio-composites were developed using powdered oyster shells and fish scales as reinforcement biomaterials. Scales were further processed to extract collagen, chitin and hydroxyapatite for fabrication of nanofibers, biodegradable films and bio-composites using natural polymer matrices, promoting sustainable utilization of fish biowaste.

Preparation and purification of nano carbon dots

Nano carbon dots were synthesized from fish scale waste of *Labeo rohita* using a hydrothermal carbonization method. The collected fish scales were thoroughly washed, dried, and pulverized to obtain a homogeneous precursor material. The processed biomass was subjected to hydrothermal treatment under controlled

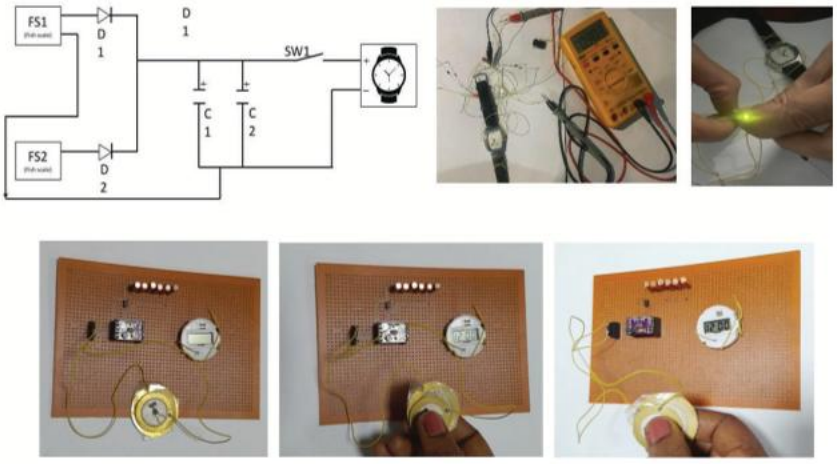


Fig. 72. Modified integrated assembled circuit with taping

temperature and pressure conditions, enabling carbonization and formation of nanoscale carbon dots. The resulting suspension was purified through sequential centrifugation and membrane filtration to remove unreacted residues and larger particles. The purified fish scales nano carbon dots were collected and preserved for subsequent physicochemical and optical characterization to evaluate their suitability for applications in bioimaging, sensing and functional nanomaterial development (Fig. 71).

Harnessing fish scale piezoelectricity

Initial experiments assessed the piezoelectric potential of

fish scales (FS1 and FS2) as sustainable bioenergy sources. The scales generated alternating current (AC) sufficient to power a quartz watch and illuminate an LED. Diodes were used for AC-DC conversion, and polarized capacitors (10 μF/63 V) stored and stabilized the charge. A switching mechanism activated the circuit once the voltage exceeded 1200 mV, ensuring reliable operation (>1100 mV) (Fig. 72). Although the current was below 10 μA, the system successfully powered a quartz movement (1.5 V, 1.5 μA), demonstrating the feasibility of fish scale-based piezoelectric biomaterials for low-power, eco-friendly energy harvesting.

Project

Molecular characterization and identification of genetic stocks of vulnerable *Wallago attu* (Bloch & Schneider, 1801) from the rivers of central India for its conservation and management implications

Period: February, 2024 - February, 2027

Personnel: Rajeev Kumar Singh (Mentor) and Rupesh Kumar Luhariya (PI)

Funding Support: Anusandhan National Research Foundation (ANRF)

The 'freshwater shark' or 'Asian sheat catfish', *Wallago attu* (Bloch and Schneider, 1801), categorized as vulnerable as per IUCN, is a fast-growing catfish belonging to family Siluridae. Even though it is a hardy in nature, its population is rapidly declining due to over fishing, environmental degradation, pollution and lack of proper genetic management. This requires genetic and morphological diversity data for scientific management aimed at conservation. Thus, the present study aims to evaluate genetic variability and stock structure of this important species applying TRUSS morphometry and population genetics.

Collection of samples

A total of 196 tissue samples of *W. attu* were collected from commercial riverine catches (Chambal, Ken, Betwa, Jamni, Dhasan and Gomti) to document genetic variation across a wide geographical distribution range (Table 2, Fig. 73). Weights of specimens ranged from 0.9 to 4.5 kg.

DNA extraction and PCR amplification

Genomic DNA of 150 samples was extracted, and quantity as well as quality was checked on DeNovix. Universal primers were employed to amplify genomic DNA. The reaction set up and amplification conditions were optimised for better results.

Table 2. Sampling details of *Wallago attu*

Sl. No.	River	Location/ Collection sites	Sample size
1.	Jamni	Tikamgarh, Madhya Pradesh	39
2.	Dhasan	Chhatarpur, Madhya Pradesh	29
3	Betwa	Jhansi, Uttar Pradesh	29
4	Ken	Hamirpur, Madhya Pradesh	25
5	Chambal	Kota, Rajasthan	35
6	Chambal	Gwalior, Madhya Pradesh	34
7	Gomti	Lucknow, Uttar Pradesh	05



Fig. 73. Sampling locations and tissue sampling of *Wallago attu*

Project

Unravelling the genetic diversity and population structure of *Chromis viridis* in Indian waters

Period: February, 2024 - March, 2026

Personnel: Rekha M.U. (PI), Teena Jayakumar T.K. and Rejani Chandran

Funding support: Institutional, ICAR-NBFGR

Comprehensive genetic analyses were conducted employing mitochondrial (control region and *cytochrome b*) and nuclear (*Rag2*) markers to evaluate population structure and connectivity of *Chromis viridis* across Indian waters. This study constitutes a major advance in understanding the population structure, dispersal dynamics, and evolutionary history of coral reef fishes by providing the first Indo-Pacific-wide, lineage-explicit population genetic assessment of *C. viridis*. By explicitly accounting for previously documented cryptic mitochondrial lineages (Clades A and B), this work overcomes a key limitation of earlier studies that treated genetically divergent lineages as a single panmictic unit- an approach known to obscure true population structure and bias ecological and management inferences. The adoption of a clade-explicit analytical framework therefore establishes a robust methodological benchmark for population genetic studies of widely distributed reef fishes.

Population genetic analyses were conducted independently for Clade A and for a combined Clade A + B dataset using both mitochondrial and nuclear markers. Hierarchical AMOVA of the mitochondrial control region revealed significant genetic structuring across the Indo-Pacific region, driven primarily by peripheral isolation rather than simple isolation-by-distance. When French Polynesia was treated as a distinct geographic region, Φ_{ST} values increased substantially in both datasets, highlighting the pronounced genetic isolation of this peripheral population. Elevated Φ_{ST} values in the combined dataset (0.279; $p < 0.001$) and in the Clade A-only analysis (0.121; $p < 0.001$) underscore the disproportionate role of marginal regions in shaping large-scale genetic structure. In contrast, global Φ_{ST} values were low but statistically significant, consistent with high dispersal potential tempered by regional barriers and historical processes.

Analyses based on the *cytochrome b* marker independently corroborated these patterns, revealing moderate yet

Table 3. AMOVA of mitochondrial control region *(D-loop)* across 12 *Chromis viridis* populations

Structure tested	Observed partition			
	Variance	%total	Φ statistics	p (after Bonferroni correction)
Combined				
One gene pool (French Polynesia, Lizard Island, New Caledonia, *Agatti, Androth, Kiltan, Kavaratti, Kadmat, Minicoy, Kalpeni,* North Bay *and Krusadai*)				
Among populations	0.01815	3.63	Φ_{ST}= 0.036	<0.001
Within populations	0.48196	96.37		
Two gene pools 1. (French Polynesia) 2. (Lizard Island, New Caledonia, *Agatti, Androth, Kiltan, Kavaratti, Kadmat, Minicoy, Kalpeni,* North Bay *and Krusadai)*				
Among groups	0.86249	6.37	Φ_{CT}= 0.064	0.143
Within groups	2.90757	21.48	Φ_{SC}= 0.229	<0.001
Within populations	9.76339	72.14	Φ_{ST}= 0.279	<0.001
Clade A				
One gene pool (French Polynesia, Lizard Island, New Caledonia, *Agatti, Androth, Kiltan, Kavaratti, Kadmat, Minicoy, Kalpeni,* North Bay *and Krusadai*)				
Among populations	0.02339	4.68	Φ_{ST}= 0.047	<0.001
Within populations	0.47674	95.32		
Two gene pools 1. (French Polynesia) 2. (Lizard Island, New Caledonia, *Agatti, Androth, Kiltan, Kavaratti, Kadmat, Minicoy, and Kalpeni,* North Bay *and Krusadai)*				
Among groups	0.05197	9.58	Φ_{CT}= 0.096	0.071
Within groups	0.01360	2.51	Φ_{SC}= 0.026	<0.001
Within populations	0.47674	87.91	Φ_{ST}= 0.121	<0.001

highly significant population differentiation across the Indo-Pacific. Notably, Φ_{ST} estimates were consistently higher in Clade A-only (0.87, $p < 0.001$) than in the combined dataset (0.81, $p < 0.001$), demonstrating that inclusion of Clade B masks lineage-specific population structure (Table 3). This finding provides clear empirical evidence that failure to account for cryptic lineages can lead to underestimation of true genetic differentiation.

Within Clade A, populations from Agatti, Androth, Kadmat, Kavaratti, Minicoy, and the Gulf of Mannar exhibited subtle but statistically significant genetic differentiation, revealing previously undocumented fine-scale structuring within Indian Ocean populations. This result challenges the prevailing assumption of regional genetic homogeneity in reef fishes and highlights the influence of localized oceanographic processes, habitat discontinuities, and historical demographic events on population connectivity, even in species with high dispersal potential.

The identification and characterization of 2 deeply divergent mitochondrial lineages further reveal a complex evolutionary history shaped by ancient vicariance and long-term restriction of gene flow. Mitochondrial data clearly delineate a widespread Clade A and a more geographically restricted Clade B, separated by approximately 55 mutational steps in the control region (Fig. 74) and 70 steps in *cytochrome b*, indicating long-standing evolutionary independence.

Importantly, the inclusion of Indian Ocean populations enabled refined divergence time estimates, revealing that the split between Clades A and B likely occurred around ~8.4 million years ago. This estimate is substantially older than previous approximations (~3 Mya) derived from geographically limited datasets, placing lineage divergence within a period of major paleo-oceanographic change in the Indo-Pacific. These results demonstrate the critical importance of broad geographic sampling for accurately reconstructing evolutionary histories in widespread marine taxa. Stock delineation analyses provided the first robust evidence that the cryptic species complex comprises a single, well-supported putative species. Independent taxonomic evaluations further corroborated this conclusion, collectively warranting recognition of this lineage as a distinct species.

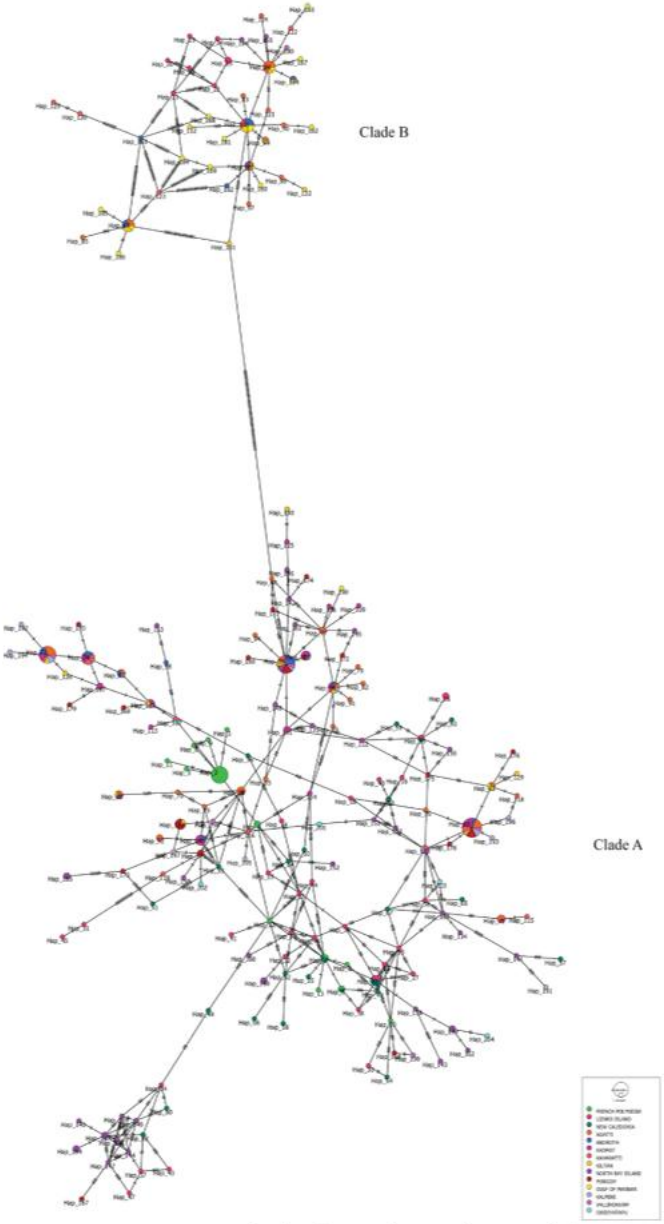


Fig. 74. Minimum spanning network of Indo- Pacific populations of *Chromis viridis* based on mitochondrial control region sequences

Ex situ & *in situ* conservation



Project

Development of fish cell lines from prioritized fish species for conservation and *in vitro* applications

Period: April, 2023 - March, 2026

Personnel: Basdeo Kushwaha (PI), Ravindra Kumar, Murali S., Akhilesh Kumar Mishra and Vijay Kumar Singh

Funding Support: Institutional, ICAR-NBFGR

Establishing primary culture is a basic step towards development of a cell line. The primary objective of the project was to develop cell lines from prioritized fish species particularly from the muscle tissues. Explant culture trials were undertaken for developing primary culture and cell lines from 3 fish species, *viz.*, *Labeo calbasu*, *Channa striata* and *Trichogaster chuna*.

Labeo calbasu

L. calbasu, the State Fish of Haryana, commonly called orangefin labeo, belongs to Cyprinidae family with good aquaculture potential. Primary culture was initiated from muscle tissue for evaluating it for lab-based meat culture. Explant method of culture was employed, where thin strips of muscle tissue was aseptically removed and maintained in Leibovitz- 15 medium supplemented with 20% FBS (Fetal Bovine Serum) and 500 IU/ml penicillin, 500 µg/ml streptomycin, and 2.5 mg/ml Amphotericin. Cells started to radiate from the explants in 5-6 days. The media was changed every 3-4 days and the cells were subcultured on formation of cell monolayer (Fig. 75).

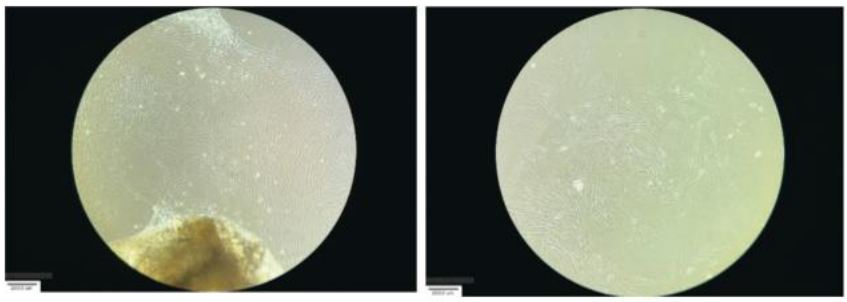


Fig. 75. *Labeo calbasu* muscle tissue explants and monolayer

Multiple copies of the cell line are being maintained for characterization. The *L. calbasu* muscle cell line has been subcultured 11 times to date and has been cryopreserved for long-term storage.

Channa striata

C. striata, the State Fish of Andhra Pradesh and Telangana, commonly called striped snakehead, is important food and ornamental fish species. The explant method was used for initiating primary culture. The culture was maintained in Leibovitz-15 medium supplemented with 20% FBS and 500 IU/ml penicillin, 500 µg/ml streptomycin, and 2.5 mg/ml Amphotericin and the media was changed every 4 days. Muscle cells started to radiate from the explants in 6-7 days and monolayer formation took 15 days (Fig. 76).

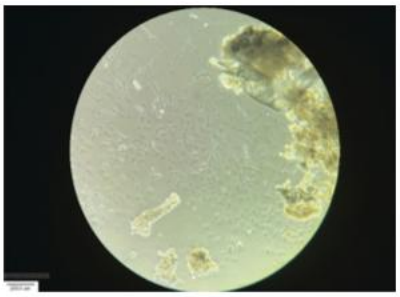


Fig. 76. *Channa striata* muscle explants

Trichogaster chuna

T. chuna, commonly called honey gourami, is an important indigenous ornamental fish species of Northeast India belonging to Osphronemidae family. *T. chuna* specimens were transported in live conditions from Guwahati, Assam, to ICAR-NBFGR farm section. The specimens were acclimatized for 2 weeks and explant method was used for initiating muscle culture. Muscle cells started to radiate from the explants in 2-3 days and monolayer formation took 10 days (Fig. 77).

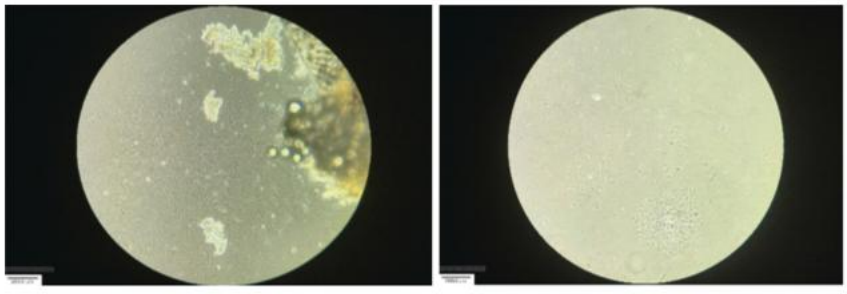


Fig. 77. *Trichogaster chuna* muscle explants and monolayer

Cell line characterization

Chitala chitala

Characterization work was carried out for *C. chitala* muscle (ChCM-1) and gill (ChCG-1) cell lines. The origin of both the cell lines was confirmed by COI gene sequencing. The chromosome analysis was performed at passage # 25 for ChCG-1 cells. A total of 30 metaphase spreads were counted, revealing a diploid chromosome number ranging from 36 to 44, with 42 being the most common (Fig. 78).

The ChCG-1 cell line was also evaluated for viral susceptibility to SHRV, TiLV and SRDV. The cells were susceptible to SRDV, but resistant to SHRV and TiLV.

NRFC cell line acquisition, distribution and HRD

NRFC repository was enriched with the addition of 3 new cell line accessions (NRFC084: *Oncorhynchus mykiss* liver cell line 'RBTL-1' received from ICAR-CICFR, Bhimtal and NRFC085: *Piaractus brachypomus* brain cell line 'PBB' and NRFC086: *Chitala chitala* gill cell line 'ChCG-1' received from ICAR-NBFGR, Lucknow). Cell line maintenance activities, like revival and cryopreservation, were carried out for 15 fish cell lines. A total of 15 fish cell lines were distributed for R&D purposes to ICAR-CIFRI, Barrackpore; KUFOS, Kochi; and CUSAT, Kochi.

Two M.F.Sc students from ICAR-CIFE were trained on chromosome preparation, genotoxicity and cytotoxicity. Dissertation training of 1 M.F.Sc student from CAU(I), Lembucherra on primary cell culture was undertaken.

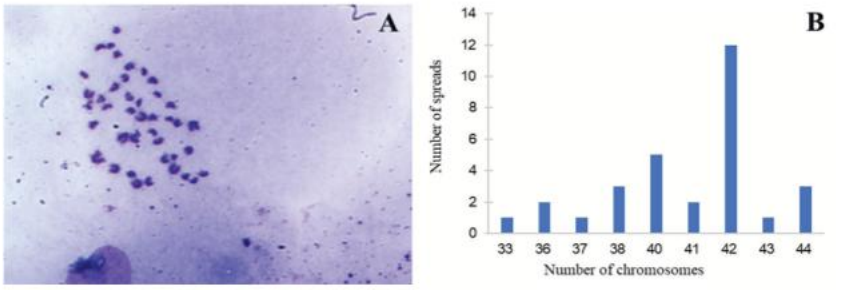


Fig. 78. Metaphase spread from *Chitala chitala* gill cell line 2n=42 (A) and frequency distribution of chromosome counts (B)

Project

Physiological insights into the reproductive mechanism of *Clarias dussumieri*

Period: April, 2024 - March, 2026
Personnel: Charan R. (PI), Rekha M.U. and Aditya Kumar

Funding support: ICAR-NBFGR Corpus fund

The present study focuses on understanding the reproductive physiology of *Clarias dussumieri*, a near-threatened endemic catfish of the Western Ghats. The species holds significant ecological and aquaculture importance due to its restricted distribution, high local food value, and potential for culture diversification. However, its large-scale propagation is constrained by inadequate knowledge of reproductive physiology and inconsistent seed availability. This project aims to generate comprehensive baseline information on reproductive physiology, which is essential for developing reliable breeding and conservation strategies.

Reproductive biology and broodstock management

The study elucidated the complete annual reproductive cycle under captive conditions at PAGR Centre, Kochi, through an integrated approach combining



Fig. 79. Sexual dimorphism in *Clarias dussumieri*

gonadosomatic indices (GSI), histological analysis and serum steroid profiling (Fig. 79).

A well-defined seasonal reproductive pattern was established, identifying early to mid-monsoon as the principal spawning phase, with evidence of a secondary post-monsoon recrudescence, indicating a fractional or batch spawning strategy. This finding refines earlier assumptions of single season spawning and provides a more accurate framework for hatchery planning.

A comprehensive gross and histological atlas of gonadal development was prepared, covering ovaries, testes, and accessory reproductive structures across multiple maturity



Fig. 80. Testis of *Clarias dussumieri*

phases. This serves as a practical diagnostic tool for assessing broodstock readiness (Fig. 80).

The study demonstrated the feasibility of non-lethal milt collection during peak maturity, enabling repeated use of broodstock, while adhering to ethical and conservation-oriented practices. This advancement is particularly important for managing threatened endemic species.

Seasonal endocrine profiling established clear patterns in key reproductive hormones (E2, testosterone, 11-ketotestosterone, and 17α-hydroxyprogesterone) in relation to gonadal maturation. These hormonal benchmarks provide reliable indicators for broodstock conditioning, maturity assessment, and timing of induced breeding operations.

Nutritional profiling and fatty acid composition

Comparative analysis of lipid profiling revealed that wild samples possessed higher levels of omega-3-rich PUFAs (EPA, DHA), whereas captive fish showed elevated SFA and MUFA with reduced PUFAs. The lower n-3/n-6 ratio in captive fish indicates an imbalance in essential fatty acids, primarily due to differences in diet between natural prey and formulated feeds.

Early ontogeny and larval development

Detailed observations of embryonic and larval development provided critical insights into early life-stage biology (Fig. 81). Key developmental milestones were clearly identified, including the onset of active exogenous feeding, development of feeding-related structures, such as pharyngeal teeth, and the functional digestive system.

Morphometric and allometric analyses, including parameters such as total length, mouth opening and eye diameter, of larvae enabled identification of critical growth transitions and developmental thresholds. These findings are essential for understanding feeding capability, prey size selection, and survival dynamics during early life stages (Fig. 82).

The study generated practical inputs for larval rearing protocols, particularly in optimizing the transition from endogenous to exogenous feeding and improving feeding efficiency. Structured feeding regimes using live feeds followed by gradual weaning to

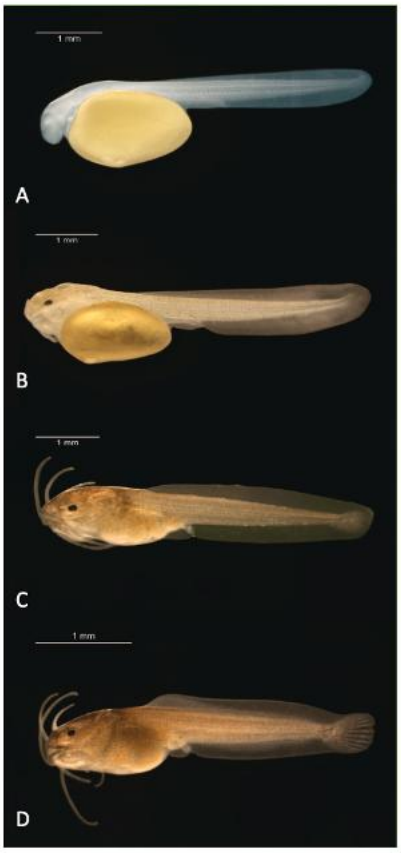


Fig. 81. Early developmental stages of *Clarias dussumieri*: yolk-sac (A), preflexion (B), flexion (C), and late flexion stages (D)

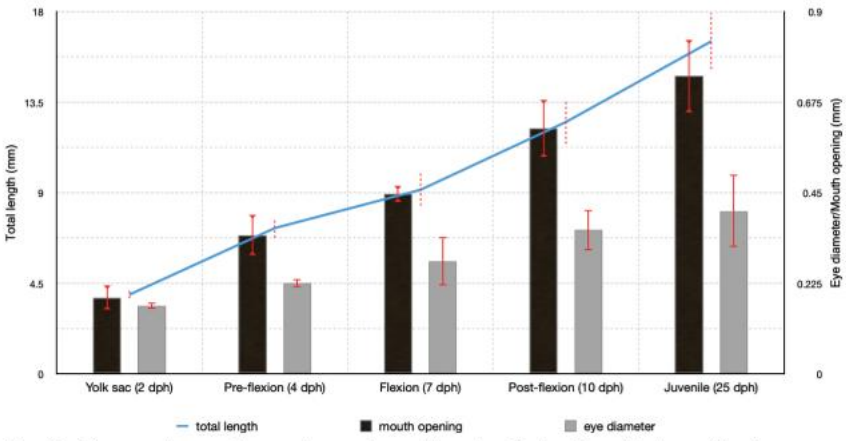


Fig. 82. Changes in mouth opening and eye diameter during larval to juvenile phase

formulated diets were validated under controlled conditions. Overall, the integration of developmental biology with hatchery practices contributed to enhanced larval survival, improved growth performance, and standardized early rearing strategies, supporting conservation-oriented seed production.

Project

Mainstreaming marine ornamental shrimp diversity for actions to enhance livelihood and gender empowerment opportunities among native Lakshadweep communities

Period: May, 2022 - September, 2025

Personnel: T. T. Ajith Kumar (PI) and Rejani Chandran

Funding support: Centre for Marine Living Resources and Ecology, Ministry of Earth Sciences.

A total of 39 exploratory surveys were conducted across 4 major islands (Kalpeni, Andrott, Pitti and Kadmat), along with additional observations made at Agatti and Kalpati islands, covering 132 sampling locations (Fig. 83). These efforts resulted in the discovery of a new shrimp (*Cinetorhynchus himanshui*) and a crab species (*Galathea balasubramaniani*) (Fig. 84). Experimental studies yielded success in the captive propagation of *Stenopus hispidus*, alongside improved survival rates in the juvenile production of *Gnathophyllum americanum* (Fig. 85). As part of extension activities, a technology dissemination program was organized at Andrott Island, and a hands-on training in marine ornamental aquaculture was provided at the Germplasm Resource Centre, Agatti. Additionally, seed supply of *Thor hainanensis* and *Ancylocaris brevicarpalis* to the beneficiaries is being continued, along with the operation of display units (Courtesy TSP) to support awareness and livelihood enhancement.



Fig. 83. Intertidal sampling at Kadmat island, Lakshadweep



Fig. 84. New crab species, *Galathea balasubramaniani*



Fig. 85. Captive propagated, *Gnathophyllum americanum*

Project

Sustainable livelihood promotion for tribal community in Tiruvallur District, Tamil Nadu through aquaculture practices

Period: November, 2024 - October, 2026

Personnel: T. T. Ajith Kumar (PI) and Divya P. R.

Funding support: Department of Tribal Welfare, Govt. of Tamil Nadu

The project aims to enhance

the livelihoods of the tribal community in Pulicat region, Tiruvallur district, Tamil Nadu, by introducing and promoting sustainable aquaculture practices, focusing on marine ornamental aquaculture, pearlspot/seabass culture and crab fattening.

A comprehensive socio-economic survey was conducted in the region, leading to the identification of 155 potential beneficiaries. Sensitization programmes were subsequently organized at village level to mobilize and select beneficiaries interested in adopting 3 aquaculture activities, namely crab fattening, pearlspot/seabass farming, and clownfish aquaculture.

Capacity-building initiatives were undertaken through hands-on training programmes in clownfish aquaculture and pearlspot/seabass farming, with 5 batches (20-25 participants), covering a total of 100 beneficiaries. A cluster-based clownfish rearing unit was established at Chenchi Amman Nagar in Pulicat, Tiruvallur district, which was inaugurated virtually by Hon'ble Chief Minister of Tamil Nadu (Fig. 86). The facility was stocked with captive propagated juveniles of clownfish species (*Amphiprion percula*, *A. ocellaris*, and *A. melanopus*), and rearing activities are in progress. In addition, 3 earthen ponds (1.0, 0.75, and 0.5 ha size) were constructed, of which 3 ponds have been stocked with pearlspot and seabass seeds. The female beneficiaries were involved in clownfish rearing units, while male beneficiaries were engaged in pearlspot and seabass farming activities, thereby, promoting equitable livelihood opportunities within the community (Fig. 87).



Fig. 86. Clownfish Aquaculture Centre at Chenchi Amman Nagar, Pulicat, Tamil Nadu



Fig. 87. Snapshot of capacity building programme on clownfish aquaculture held at ICAR-NBFGR facility at Annamalai University for the beneficiaries of Pulicat

Project

Establishment of marine ornamental species hub in Pichavaram Region, Tamil Nadu for sustainable livelihood development of local SC fisher folks

Period: June, 2022 - March, 2026

Personnel: T. T. Ajith Kumar (PI) and A. Kathirvelpandian

Funding support: Department of Science and Technology (DST), New Delhi

ICAR-NBFGR & DST- Science for Equity Empowerment and Development (SEED) facility is currently maintaining 15 species of indigenous clownfish available in Indian waters, of which standardized technology packages have been developed for 12 species, utilizing estuarine/ backwater (low saline). Captive propagation has successfully been upscaled, and the produced juveniles are being supplied to cluster-based rearing units for subsequent grow-out and marketing. Notably, the F4 generation broodstock obtained with the cross breeding of *Amphiprion ocellaris* and *A. percula* has started spawning and juvenile production is in progress (Fig. 88). The initiative has also contributed to livelihood generation, with 25 women beneficiaries actively engaged in clownfish rearing and sale (Fig. 89).



Fig. 88. F4 Generation of designer clown, a crossbred of *Amphiprion percula* x *Amphiprion ocellaris*

Project

Empowering coastal tribal community: Aquaculture and value addition for livelihood development in Pichavaram region, Cuddalore district, Tamil Nadu

Period: July, 2025 - June, 2027

Personnel: Divya P. R. (PI) and T. T. Ajith Kumar

Funding support: Department of Tribal Welfare, Govt. of Tamil Nadu

This project aimed to enhance the livelihood of the tribal community in Pichavaram region of Cuddalore District, Tamil Nadu, by promoting sustainable aquaculture practices, including marine ornamental aquaculture, pearlspot/seabass culture, crab



Fig. 89. Capacity building on water quality monitoring to the beneficiaries



Fig. 90. Beneficiaries of M.G.R. Nagar and Kalaignar Nagar attending Awareness Programmes

fattening and value addition to seafood through pickle and dry fish preparation.

A socio-economic survey was conducted in 2 villages for identification of 200 beneficiaries. As part of outreach and capacity-building efforts, 2 awareness and technology dissemination programmes were organized at M.G.R. Nagar and Kalaignar Nagar in the Pichavaram region to support the livelihood development of the Irular tribal community (Fig. 90). Furthermore, exposure visits and demonstration programmes on marine ornamental fish rearing were provided to 100 beneficiaries through training conducted at ICAR-NBFGR facility, Annamalai University (Fig. 91).

Project

Fish milt cryopreservation for broodstock development and quality seed production

Period: April, 2023 - March, 2026

Personnel: Santosh Kumar (PI HQ), Charan R. (PI PAGR), V.S. Basheer, A. Kathirvelpandian, Aditya Kumar, Raghvendra Singh, Monika Gupta and Ramashankar Sah

The project is aimed at developing cryopreservation technology for commercial seed production of carp and creation of cryobanks. Cryovials of 2, 5 and 12 ml of multiple Indian brands were evaluated on IMCs. Freezing and thawing procedures were established with a hatching rate of >60%. An attempt was made to standardize species-specific protocol for cryopreserving milt of *Labeo bata*, *L. calbasu*,



Fig. 91. Demonstration programme on marine ornamental fish rearing at ICAR-NBFGR facility, Annamalai University



Fig. 92. Fertility trials for evaluating cryopreserved milt

Systomus sarana sarana and Ompok bimaculatus and 4 extenders were screened for sperm motility. Shortlisted extenders (>70% motility) were used to cryopreserve milt. Follow-up fertility trials revealed promising results, with respect to hatching percentages (Fig. 92).

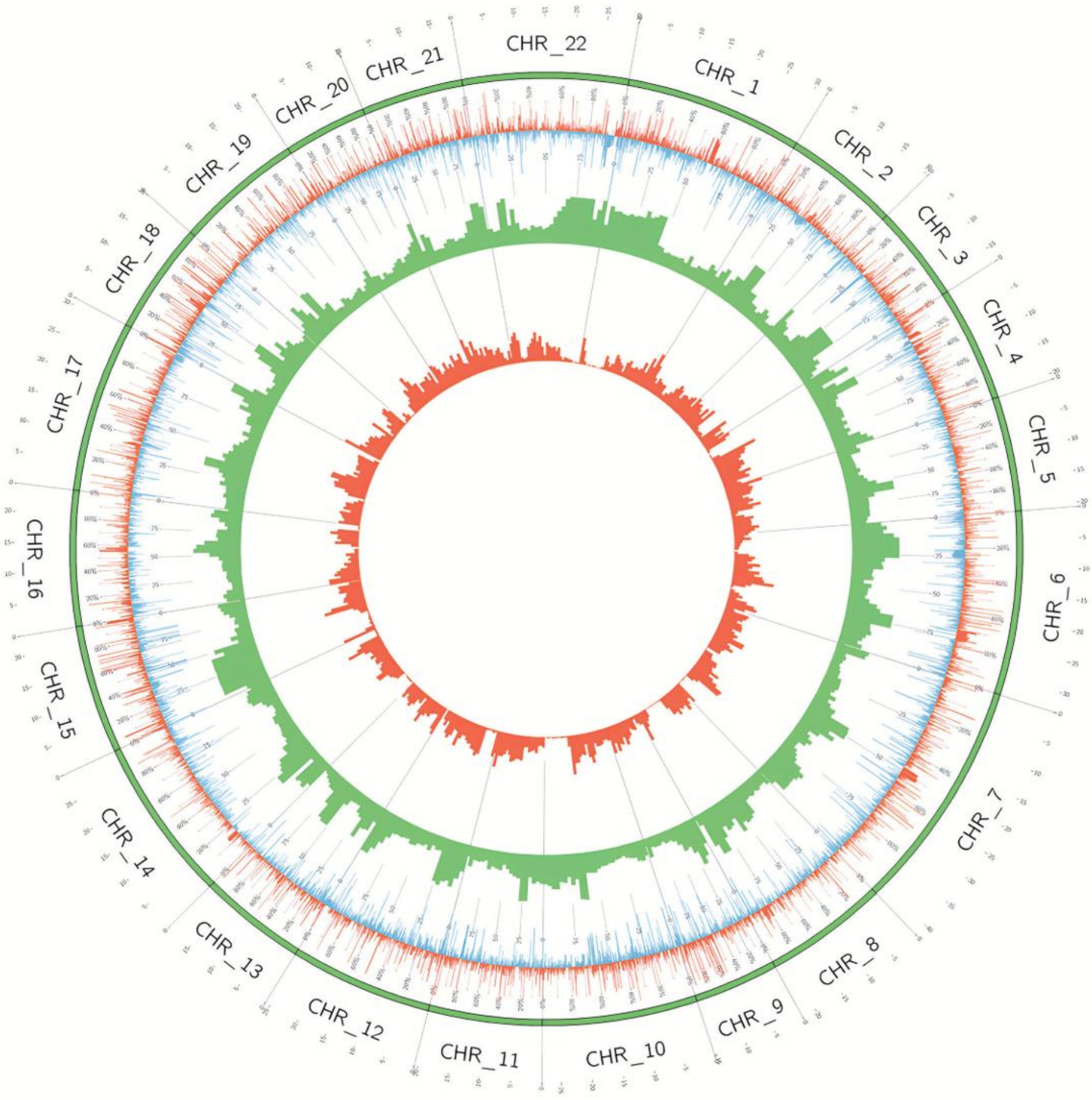
Antioxidants play a crucial role in sperm cryopreservation, because freezing and thawing expose sperm cells to oxidative stress, which can severely impair their function. Oxidation will lead to lipid peroxidation and it will end up in DNA fragmentation and damage. To avoid DNA damage, it is pre-requisite to add antioxidants in the extender during cryopreservation. Hence, work was undertaken with following 4 easily available herbal antioxidants. Aqueous extract was prepared using rosemary, curry leaves, moringa and turmeric leaves. These extracts were added in the extender during cryopreservation. In first experiment, 2% inclusion level was tested using all 4 herbal extracts and based on hatching obtained (above 70%), 2 best extracts were selected and inclusion level test with 4 inclusion levels (1 to 4%). Rosemary at 2% and curry leaves at 4% is recommended for long term milt cryopreservation.

Primary framework for developing fish embryo cryopreservation protocol

A feasibility trial was conducted for cryopreservation of fish embryos of carps and catfish species and *H. fossilis* was selected for further study. Different embryonic stages were evaluated, and toxicity of varying concentrations of several cryoprotectants was assessed. The key parameters of embryo cryopreservation were developmental stage and cryoprotectant concentration along with chilling sensitivity.

A series of experiments were conducted to evaluate cryoprotectant toxicity and temperature sensitivity in different embryonic stages following chorion removal. Three permeable cryoprotectants (DMSO, methanol, DMA) and one non-permeable cryoprotectant (sucrose) were tested. Based on screening results, DMSO and methanol were further evaluated at higher concentrations with variable time exposure to reduce osmotic shock. Toxicity was assessed through hatching rate. Although some treatments showed statistically lower hatching rates, survival remained above 70% across all groups, indicating biologically acceptable tolerance levels and suitability of these conditions for further embryo cryopreservation studies. Further, embryos were exposed to various temperatures (0 to -196 °C) with varying time slots (10-60 min) to evaluate chilling and ultra-low temperature tolerance. Embryos exhibited tolerance up to -20 °C for short duration storage. These findings provide a baseline information for developing standardized protocols for fish embryo cryopreservation, with significant implications for biodiversity conservation and genetic resource management.

Genomic and Computational Resources



Project

Network Project on Agricultural Bioinformatics and Computational Biology

Subproject: Understanding genomic factors responsible for growth performance in *Clarias magur*

Period: July, 2020 - March, 2026

Personnel: Ravindra Kumar (PI), Basdeo Kushwaha, Murali S., Tanwy Dasmandal and Santosh Kumar

Funding Support: CABin Scheme of ICAR, implemented through ICAR-IASRI, New Delhi

Growth is one of the most important economic traits for aquaculture selection, but genetic selection for many aquaculture species in India is still evolving and most of the species are usually collected from the wild for culture. The present study aims to identify growth genes and to interpret the molecular processes involved in the growth of *Clarias magur*.

Collection and breeding of magur stock

Survey and collection of *C. magur* was carried out in Guwahati and nearby areas in Assam and 22 specimens (11 male and 11 females) were collected in March, 2025. The specimens were transported to ICAR-NBFGR, Lucknow and transferred to cemented tank (5 male and 5 female) and small poly lined earthen pond (6 male and 6 female) for further breeding. The species was identified using established taxonomic keys and mitochondrial COI gene region sequencing. Breeding was attempted to generate full-sib families in the last week of June, 2025, but breeding was not successful.

Transcriptome data analysis

Transcriptome data was analysed to identify differentially expressed genes (DEGs) for 2 growth conditions, i.e. slow and fast-growing individuals at 12-month age. Reference-based assembly was performed using HISAT2 to map reads against *C. magur* genome. DESeq2 was used to analyse and identify DEGs. The total DEGs obtained after analysis were 269 at a p-value cut-off of <0.05 (31 up-regulated and 238 down-regulated). All the 269 DEGs were above 2-fold change with maximum fold-change being 3.57 and -7.35 for up-regulation and down-regulation, respectively (Fig. 93).

DEGS obtained from DESeq2 analysis were mapped against UniProt database. Subsequently, gene ontology annotation of the DEGs was carried out using Database for Annotation, Visualisation and Integrated Discovery (DAVID) web server, with *Ictalurus punctatus* as reference organism. The analysis revealed that the highest number of genes are involved in the cell cycle process, followed by cell division (Fig. 94).

Pathway analysis of upregulated genes using DAVID revealed their involvement in KEGG pathways, like cytoskeleton in muscle cells, lysine degradation etc. Cytoskeleton organization in muscle cells supports enhanced muscle fiber formation and structural remodeling, which directly contributes to somatic growth in fish. Similarly, the activation of the lysine degradation pathway reflects increased amino acid turnover and

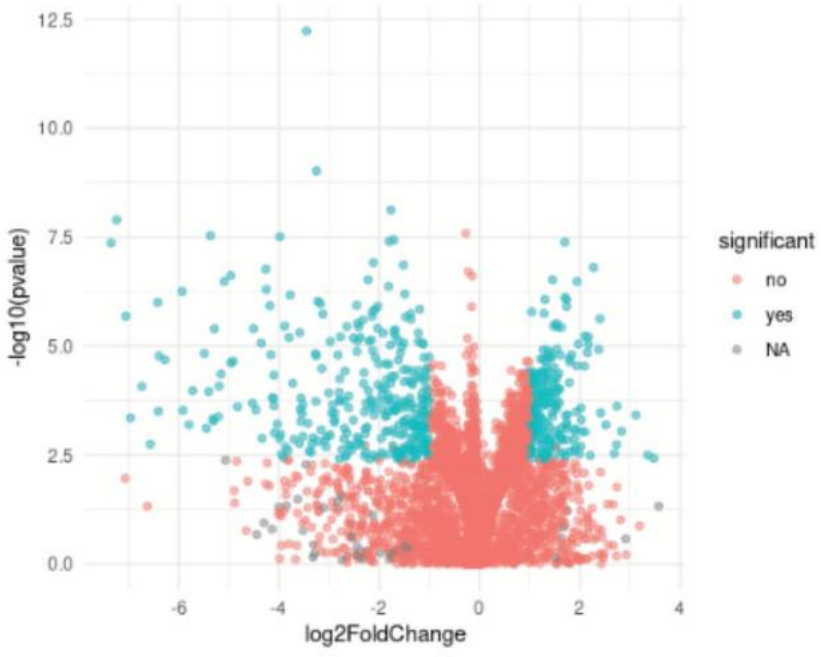


Fig. 93. Volcano plot of DEGs between fast and slow-growing *Clarias magur* specimens. The red, teal, and grey dots indicate the statistically non-significant, significant, and filtered DEGs

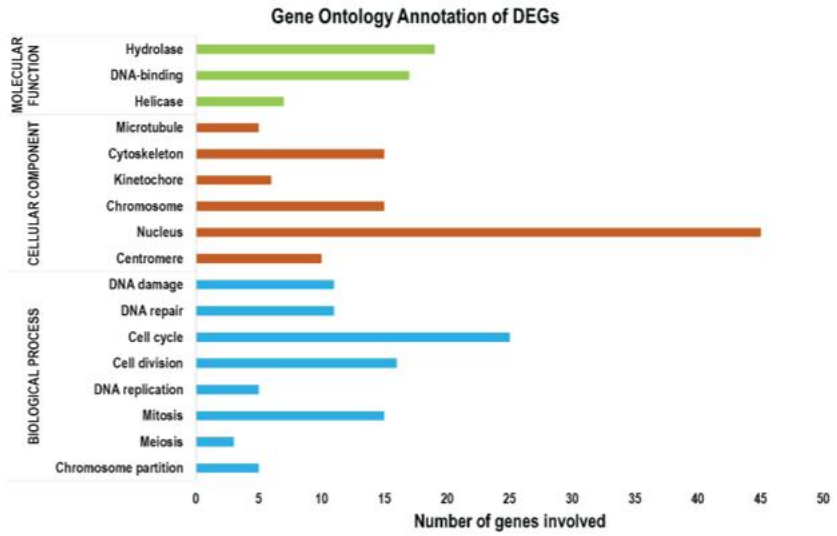


Fig. 94. Gene Ontology of DEGs identified between slow and fast-growing *Clarias magur* specimens

energy metabolism, supplying substrates and energy required for rapid tissue growth and muscle accretion. Down-regulated genes were found to be involved in 13 KEGG pathways, including reduced activity in multiple amino acid and vitamin metabolism pathways (lysine, methionine, vitamin B6, thiamine), suggesting a lowered anabolic and cofactor supply state that can constrain protein synthesis and growth. Moreover, down-regulation of purine and nicotinamide metabolism implies decreased nucleotide turnover and cellular energy balance, which may limit cell proliferation. Suppression of glutathione and arachidonic acid metabolism reflects reduced redox regulation and lipid-mediated signalling, both of which are important for muscle maintenance and stress adaptation during growth. Altered glycerolipid metabolism suggests changes in lipid storage and energy utilization, potentially shifting resources away from growth.

DNA methylation analysis

DNA methylation analysis was performed on 6 samples collected from 3 geographic locations (i.e. Lucknow, Bhubaneshwar and Gumla), with each location represented by 1 high and 1 slow-growing individual. Whole genome bisulfite sequence data was processed using Bismark tool and differential methylation analysis was conducted using methylKit package in R, comparing high-grown versus slow-grown individuals across locations. CpG sites were filtered based on coverage to remove low-confidence positions, and differentially methylated regions (DMRs) were identified using a minimum methylation difference cut off of 25%. The analysis identified around 2,200 DMRs, indicating substantial epigenetic differences associated with variation in growth among individuals. These DMRs provide a basis for downstream functional annotation and pathway analysis to understand the epigenetic regulation of growth in fish.

Table 4. Genomic database updation status

Sl. No.	Database name	Existing records	New records added	Total records
1	FBIS	45709	368	46077
2	Fish Karyome	1702	61	1763
3	FishMicrosat	66833	1753	68586
4	FMiR	3870	1	3871

miRNA analysis

miRNA profile of magur muscle was generated from differentially grown individuals to find their role in growth regulation. A total of 77 miRNAs were identified to be differentially expressed (DEmiRNAs). miR-10 and let-7 were the most abundant miRNA families. Results indicate that the DEmiRNAs exert influence over multiple genes within cell cycle pathway, potentially playing a key role in regulating growth by precisely coordinating cell division, DNA replication, and checkpoint signalling. A key regulator identified was *PLK1* gene, which was downregulated and found to be targeted by 3 miRNA families. *PLK1* serves as a principal regulator of cell cycle progression, significantly influencing several phases, including G2/M checkpoint regulation, spindle assembly, chromosomal segregation and cytokinesis. In addition to mitosis, the *PLK1* is also involved in DNA replication and the DNA damage response, ensuring genomic stability throughout the cell division. The selective targeting of *PLK1* gene by miRNAs indicates an extra post-transcriptional mechanism of growth control in *C. magur*, with its modulation

potentially affecting proliferation rates and phenotypic growth variability. This was also proved in expression analysis by RT-PCR and transcriptome validation.

Growth gene information

Using multi-omics approach of RNA-Seq and miRNA analysis, a total of 14 genes were identified to be related to growth in *C. magur*. These genes may be potential targets for editing to increase growth of this important catfish species.

Validation of gene

One gene, *PLK1*, was found to be down-regulated through transcriptome analysis as well as targeted by DEmiRNAs, was selected for validation using RT-qPCR. *GAPDH* was used as housekeeping gene. The relative expression of the *PLK1* gene showed differential levels between the fast- and slow-growing individuals and was significant based on RT-qPCR ANOVA.

Updation of genomic resource databases

Genomic resource databases were regularly updated with the addition of new data available in the public domain (Table 4). FisOmics web portal, hosting and maintaining FBIS, FMiR, FishMicrosat, Fish Karyome and HRGFish genomic resource databases, has 187 unique from 10 countries (India, Taiwan, USA, Australia, Germany, Singapore, UAE, Nepal, Hong Kong and Brazil) in the reporting year.

Project

Part A: Developing adaptive markers in freshwater fishes for temperature stress

Period: April, 2022 - March, 2025

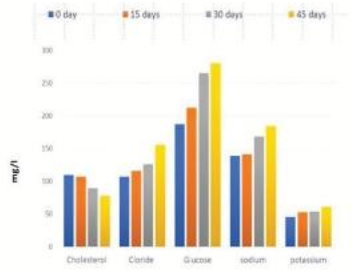
Personnel: Satish K. Srivastava (PI), Poonam J. Singh and Akhilesh Kumar Mishra

Funding Support: Institutional, ICAR-NBFGR

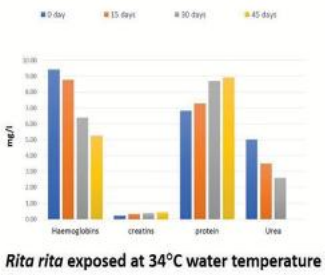
The project aims to estimate critical limits of temperature and investigate biochemical changes occurring due to stress in fish species and understand the development of adaptive mechanisms towards thermal stress.

Evaluating thermal stress responses and biomarkers in *Rita rita*

Specimens of *R. rita* were collected from Gomti River, Lucknow, and acclimatized for 15 days in a recirculatory aquaculture system at ICAR-NBFGR under controlled conditions. Thermal tolerance was assessed by gradually increasing water temperature (1 °C/day from 26 °C) until 50% mortality, establishing a critical temperature of 38 °C. A second trial exposed fish to sublethal heat stress (34 °C) for up to 45 days to evaluate chronic effects. Blood analyses (hemoglobin, urea, serum protein, cholesterol, and glucose) indicated notable thermal adaptability after acclimatization (Fig. 95). Chronic heat stress elevated glucose, protein, and electrolyte levels while reducing urea, hemoglobin, and cholesterol. The findings define thermal tolerance thresholds and physiological biomarkers relevant for climate resilience and stress management in freshwater aquaculture.



Rita rita **exposed at 34°C water temperature for 45 days**



Rita rita **exposed at 34°C water temperature for 45 days**

Fig. 95. Biochemical parameters of *Rita rita* exposed to thermal stress

Part B: Proteome profiling of cultivable fresh water fishes and bioprospecting for bioactive peptides and regulatory factors through integrative approach

Period: April, 2022 - March, 2025

Personnel: Poonam J. Singh (PI), Satish K. Srivastava and Akhilesh Kumar Mishra

Funding Support: Institutional, ICAR-NBFGR

The study aimed to develop a comprehensive proteomic profile and identify regulatory elements controlling gene expression in fish through integrated multi-omics analysis.

Integrated proteome-transcriptome analysis

To elucidate mechanisms governing functional protein

expression by correlating transcriptomic and proteomic datasets, RNA and proteins were extracted from muscle tissue of *Heteropneustes fossilis*. Additionally, genome-transcriptome-proteome interactions were examined and molecular pathways involved in regulation and adaptation were characterized.

Protein profiling and peptide analysis

Muscle and sting tissues were flash frozen in liquid nitrogen prior to protein extraction. Samples were lysed using buffer supplemented with protease inhibitor cocktail and PMSF. Extracted proteins were subjected to in-solution digestion using trypsin following reduction with DTT and alkylation with iodoacetamide. The resulting peptides were analyzed using LC-MS/MS for proteomic profiling (Fig. 96). Sting tissues were specifically analyzed to identify venom-associated peptides and characterize bioactive components.

Bioprospecting and validation of bioactive peptides

A total of 5 anticancer peptides previously bioprospected from *Clarias magur* muscle tissue were custom synthesized and evaluated through *in vitro* validation studies, along with 2 peptides (CM9 and CM11) synthesized and tested for functional activity in cell line models. Novel Bioactive peptides of *C. magur* identified by LC-MS/MS, of which 88 novel Anti-Bacterial Peptides were isolated/extracted from *C. magur* and analyzed for its usage as potential molecular therapeutic agent for future research in drug development.

MicroRNA, lncRNA, and micropeptide analysis

To understand post-transcriptional regulation and transcriptome-proteome correlation, small RNA and total RNA sequencing was performed. MicroRNAs (miRNAs) involved in post-transcriptional gene regulation were sequenced using Illumina NovaSeq 6000 platform. Raw reads were quality filtered using FASTP, followed by size selection (15-25 bp) using Trimmomatic. Reads were mapped against *Danio rerio* reference sequences using Bowtie, and known miRNAs were identified via alignment with miRBase database (Fig. 97). Unaligned reads were subjected to *de novo* prediction using miRDeep2, and RNA secondary structures validated based on minimum free energy (< -20 kcal/mol) and minimal folding free energy index (>0.8) using Randfold.

lncRNA and transcriptome sequencing

Total RNA was extracted from snap-frozen muscle tissue

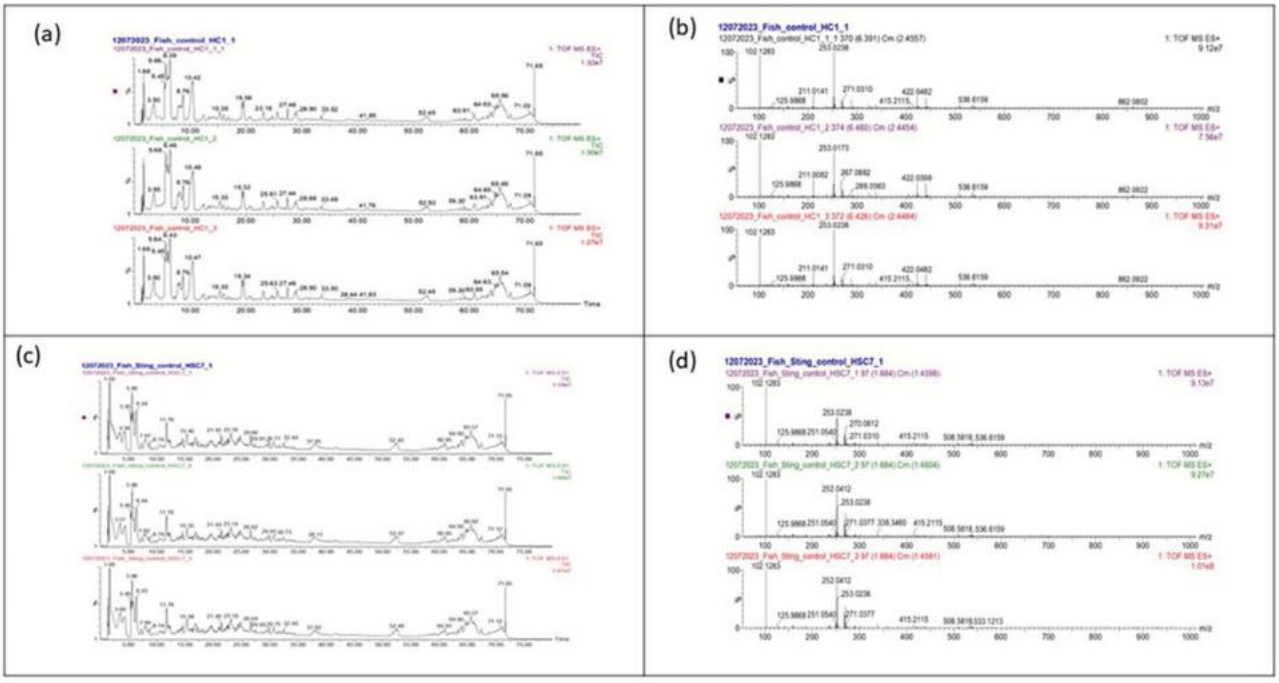


Fig. 96. Nano LC/MS chromatogram of muscle tissue (a and b) and sting (c and d) of *Heteropneustes fossilis*

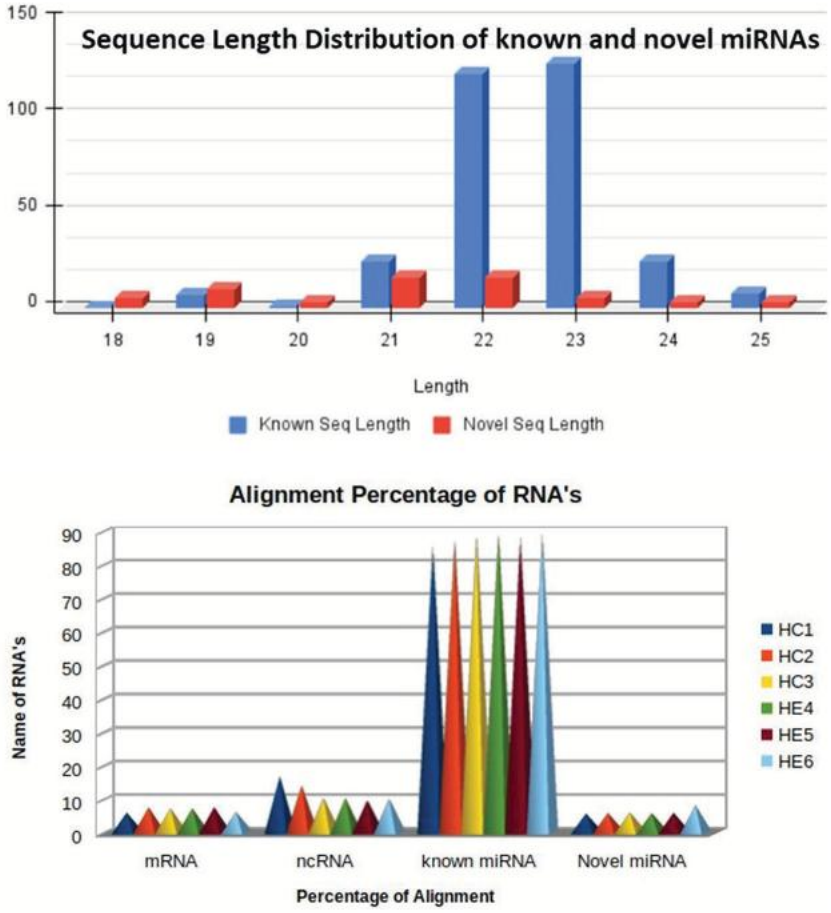


Fig. 97. Length (a) and alignment statistics (b) of miRNA sequences

and assessed for quality and quantity using Nanodrop and Agilent TapeStation (Fig. 98). Following rRNA depletion, RNA-Seq libraries were prepared and sequenced on the Illumina NovaSeq 6000 platform (2×150 bp). Bioinformatics analysis using high-quality reads (≥100 bp) obtained after trimming were aligned to *D. rerio* reference genome using STAR. Transcripts were classified and screened for coding potential using CPC2, retaining non-coding transcripts >200 bp and excluding those with conserved protein domains to obtain high-confidence lncRNAs.

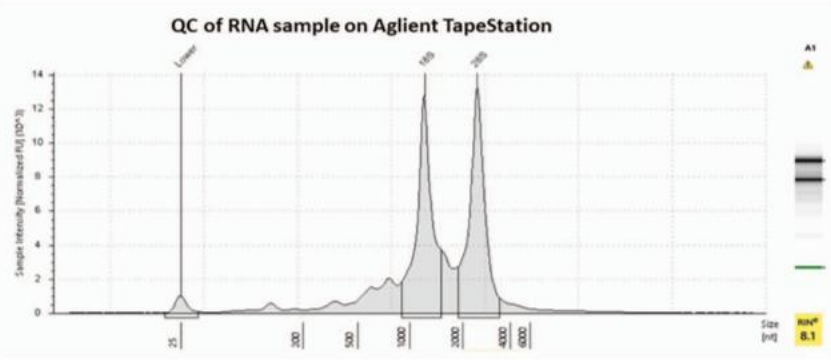


Fig. 98. QC of RNA sample from muscle tissue of *Heteropneustes fossilis*

Micropeptide identification

Short open reading frames within lncRNAs were analyzed to identify micropeptides (<100-150 amino acids), revealing hidden coding potential among 4042 identified transcripts. Homology analysis of identified lncRNA transcripts against the *D. rerio* micropeptide database revealed 1041 candidates with potential to encode functional micropeptides, highlighting the regulatory significance of non-coding RNAs and their role in protein regulation pathways.

Project

NNP (Agri-genomics Repository and Intelligent Analytics System) of ICAR-Indian Agricultural Statistics Research Institute, New Delhi

Period: September, 2024 - March, 2029

Personnel: Murali S. (PI) and Basdeo Kushwaha

Funding Support: Department of Biotechnology

Bioinformatics and computational tools are required to integrate ever-increasing large genomic databases, software and tools, genome browsers with high-end computational support. Therefore, it is required to develop efficient biological genome browsers, analytics tools and intelligent analytical solutions. Genome browser helps integrate genome assembly, regulatory regions, repeats, markers and annotations

in one platform providing easy visualization of genes, functions and marker information. In the present project, dedicated genome browsers of *Clarias magur*, *Labeo rohita* and mitogenome browser of *Entacmaea quadricolor* (Table 5) are being developed and integrated with functional tools for data analysis and effective visualization. For developing genome browser, Ubuntu operating system was used and genome data visualization was achieved using J-Browse desktop and J-Browse cli tools.

For the front-end development of the browser, a system with Ubuntu (version 22) was set up, and J-Browse desktop and J-Browse web were configured on local host for *E. quadricolor* mitogenome and whole genomes. Back-end support to the browser was provided with php, html and custom perl scripts (Fig. 99).

The browser provides a visual depiction of genomes with zoom function in both circular and linear fashion with gene annotation track associated with it for detailed analysis of genes. Simple sequence repeats (SSRs) from the magur genome were identified using MISA tool and are being incorporated in the magur genome browser. The genome browser will enable users to search specific genes related to growth, development, adaptation etc. and design primers or identify associated markers with these genes, once the browser is enriched with functional annotation. This information will be useful for viewing and retrieving selected genes, obtaining information on their function/markers, designing primers and helping understand the genetic basis of biological processes and supporting genomics-assisted breeding strategies for trait improvement.

Table 5. Details of genomes collected for developing genome browsers

Species	Data type	Genome size	No. of genes
Entacmaea quadricolor	Whole genome	363.46 Mb	27857
Entacmaea quadricolor	Mitogenome	20720 bp	17

Project

Mining and characterization of bioactive compounds for insights into sea anemone ecological adaptation

Period: April, 2022 - March, 2025

Personnel: Murali S. (PI), Ravindra Kumar, Basdeo Kushwaha and A. Kathirvelpandian

Funding Support: Institutional, ICAR-NBFGR

Sea anemones are a primitive metazoan, rich in various bioactive compounds, like neurotoxins. The present study aimed to decipher the whole genome sequence information, including mitogenome, and mine potential bioactive compounds from an important sea anemone, *Entacmaea quadricolor* (bubbletip anemone) of Actinaria order, collected from Lakshadweep Islands.

Whole mitogenome information

The mitogenome sequence

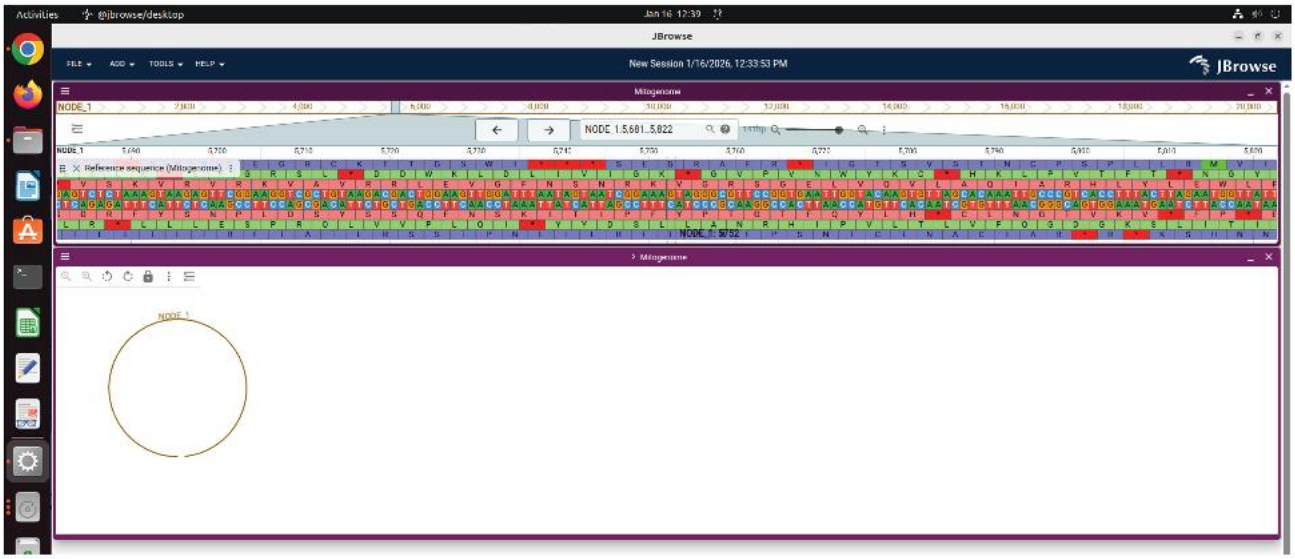


Fig. 99. Linear and circular view of mitogenome information of *Entacmaea quadricolor*

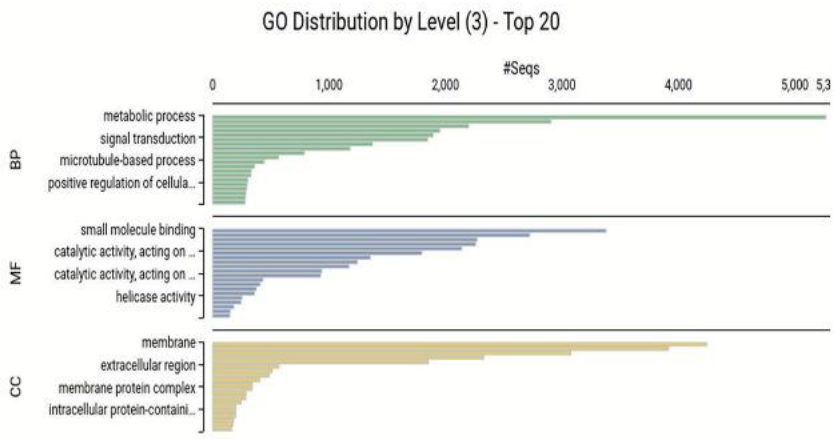


Fig. 100. Top 20 GO terms associated with *Entacmaea quadricolor* genome

was assembled from pooled *E. quadricolor* tentacle and column muscle tissues (121.1 million reads). Mitoz tool was used for de novo mitogenome assembly. Mitoz, Mfannot and MITOS2 tools were used for annotation and CircularMT tool used for visualization. The mitogenome size of *E. quadricolor* was estimated to be 20720 bp. Sea anemone mitogenomes possesses only 2 tRNA genes, unlike commonly observed 22 tRNAs. In *E. quadricolor*, 13 protein coding genes, 2 tRNA genes, 2 rRNA genes were predicted along with 5 ORFs and an intron in *ND5* gene. All the genes were encoded on the heavy chain. This is the first report of *E. quadricolor* mitogenome and whole genome from India.

Genome annotation and toxin mining

Gene prediction and annotation was carried out using Augustus. A total of 27857 genes was predicted. OmicsBox V3.2 software was used for annotation and gene ontology (GO) analysis and KEGG was used for pathway analysis. GO terms could be obtained for 15011 genes. Maximum GO terms were associated with metabolic process in biological process category, small molecule binding in molecular function and membrane linked in cellular processes category. A total of 324 pathways linked to 4764 genes were identified. Maximum genes were related to metabolism, organismal systems, environmental information processing, cellular processes and genetic information processing pathways (Fig. 100).

Based on genome mining and comparative analysis of Cnidarian toxins, the putative toxin types (Acrorhagin I, actinoporin, Phospholipase A2, actinoporin Cjtox I, U-actitoxin-Ugr1c etc.) were identified.

Project

Development of novel microsatellite markers for genetic and adaptive divergence in natural populations of selected fish species

Period: May, 2024 - May, 2026

Personnel: Rajeev K. Singh (PI), Labrechai Mog Chowdhury and Vindhya Mohindra (till May 31, 2025)

Funding Support: Institutional, ICAR-NBFGR

Labeo bata genome sequencing, SSR identification and validation

Genome sequencing of *L. bata* generated 32910 genomic scaffolds. The annotation revealed 24156 genes comprising 148923 exons, and 12845 UTRs, with intron boundaries. Functional annotation was assigned to 18642 genes, incorporating Gene Ontology (GO) terms, KEGG pathways, and protein descriptions. MISA identified 51257 SSR loci across all motif types. A total of 1338 genes linked to Environmental Information Processing pathways were identified. SSR primers associated with specific pathways like membrane transport and signal transduction were designed and custom synthesized.

A total of 100 primers were used for amplifying the individuals of *L. bata*. The annealing temperatures (Ta) ranged from 51-59°C. The banding patterns were polymorphic for 28 primer pairs, while remaining amplified as a monomorphic band, or did not amplify at all. These polymorphic primers were validated on 3 distant populations, each representing 12 samples (Table 6). The primers covered a broad range of gene types, including those involved in cell signalling, transport, metabolism, protein phosphorylation, and development. The expected PCR product sizes were small to moderate. The panel of microsatellites thus created will be useful for characterizing natural populations of *L. bata* below the species level.

Table 6. Details of polymorphic loci in *Labeo bata*

S. No	Code	Forward Primer	Reverse Primer	Ta (°C)
1.	LB-01	GCCCAGTCTGTCAGGAGAAA	TCAAATCCACTGGTCAAACTCA	53
2.	LB-03	GGCAACTACCCACATACACAG	GCTGGTAAAATCTGAAGCGC	55
3.	LB-06	TGCAGATCAGAAACCCAGAAG	AATCTGGTCTCCGGGCTTTT	55
4.	LB-08	AGGACTGATCACACCAAGGA	TGGTTTTATCCTCCATCAGCTG	55
5.	LB-10	TTGCAAGGCTAGACAGGGAA	CAGCTGCAGGTAAACAAGACA	57
6.	LB-11	TGCAAATACGATACAGCCCA	GGAACACAACCACCCTACAA	53
7.	LB-13	CTGCGCATTTCTGTATTTGGTC	GCCCGAGAGAGCTTAATGAAC	55
8.	LB-16	TGCAGGGATGGAGAGCAG	ACATTTGGCAAGTGTATGTCCA	53
9.	LB-18	TGTGTTATGCTACTTTTGCGTT	ACTGTACAGATGTGAAAGGGC	55
10.	LB-20	AGCGCACTTTCAAACAGTTT	GGAACATTTCAGCAGGTCGA	51
11.	LB-21	TCTTCATTTTGGGGTGGAGTAA	GCCGTCTTCACACTGGAAAA	55
12.	LB-22	AACACACTGCAAAATGTCTTGA	ACGTGTACTATATGTCAGGAGCA	55
13.	LB-25	GCTATCAAGAGTGTGAAGTGCA	ATGGGAGGCCTTGAAGTCAA	55
14.	LB-27	GGTAGACAAACCGGCTCCT	TCTCTTGGTGGGATCATACATTT	55
15.	LB-36	AACGAGAGCAGAGAGACAGG	TGGACTGCTACATTTGTCTGC	57
16.	LB-38	TGGAGAGGTTGTACTACTAGGT	TGAAGAAAGGTCAACACTCATCT	59
17.	LB-48	GCAATTTCAGTTGTCCTCCGT	TTTGACCCTGGTTTGATGCC	55
18.	LB-49	ACTCTCGCCTTTCTTACTCTTT	AGTTCGGAGGCCATATCTGT	55
19.	LB-51	TCCCCTGTATCTCTAGCTCCA	ACAAGTCCTGCTGATCCCAA	55
20.	LB-54	GATCAGGTTCAACACACGGG	TGGGCCTGTAACCTAAACCA	55
21.	LB-58	ACCTGCATGAGTTTCTTTTGGA	AACCCAGCTGTTTTAGTGACT	55
22.	LB-61	CACTGGCTTATGAACATGCAA	TGGTGGCAATATCTAACGTTTTC	55
23.	LB-62	CACTTCATTCACGTGCTGACA	CAGATTGTTGCTGGTCCTCA	55
24.	LB-64	AGACATCACTGCAAAAGCCA	CACACGTTGAAGTTGCTCCA	53
25.	LB-66	ACGCTGTTCTTCTGATCTCTCT	TCATTACTCCAGTCACATGATCC	59
26.	LB-71	GCTCTTCCCTCTTGTCCAGT	ACAGTTAAAGAGGCAGTCAGAA	53
27.	LB-73	TCCCAATTAACCTGATTTCACCA	ATTCTCACCTCACCACTGCT	55
28.	LB-75	GTTCATCCGCCATTCTCCAC	GGGGTGGGGAAATGAAGTTT	55
29.	LB-76	GATCAGCCTGGTGAAGAACG	CGCCTCCATCTCTCACTGAT	57
30.	LB-91	TCGAGTTCATGTAAGTTGCAAGA	TGCCACATGACCAACACTCT	53
31.	LB-96	GCAACAGGGGACGGACTTTT	GGCTGCATGTTTGTAAGAAGC	56
32.	LB-97	GTGTGCTGCTCTAAGGATGC	TGCACTTCTCCCTCTCTGAC	57
33.	LB-100	TGTCTCTCAAACCCAGCCAA	TTCCTAAAGCCTGACAGCCA	53
34.	LB-101	TCCGACTGCAATTCCTCAAA	ATACGGACGAGGATCTCAGC	53
35.	LB-103	TCCACCCTCATTACCAAGTGA	AGCCTGCAAACATTAGCCTG	55
36.	LB-104	CGACACCAACGGCAACTATC	CCGCCCACCTACAGTACAAA	57
37.	LB-107	CCTGATCATTCCCTCGACCA	ACGATTCATTCTGTGTGATTCCA	57

Table 7. Details of samples analyzed for two species

Heteropneustes fossilis						
S. No.	**River**	**Location**	**Latitude**	**Longitude**	**Year**	**Total Samples**
1.	Gomti	Indira canal	26.78	80.93	2025	27
2.	Ganga	Haiderpur Wetland	29.37	78.03	2025	31
3.	Rapti	Bakhira Lake	26.90	83.13	2023,2024, 2025	84
4.	Brahmaputra	Kolongpar, Jhalukbari	26.49	92.52	2021	26
5.	Chambal	Gwalior, Kota	26.25	78.16	2009	25
6.	Godavari	Adilabad, Satnala	24.60	80.83	2021	25
7.	Ghaghra		26.78	80.93	2024	31
8.	Teesta	Gazaldoba, Jalpaiguri	26.75	88.58	2023, 2024	47
Labeo bata						
1.	Gomti	Indira canal	26.78	80.93	2024	27
2.	Hooghly	Namkhara, Nischintapur	29.37	78.03	2025	36
3.	Sharda		26.78	83.93	2025	43
4.	Brahmputra	Ujan bazar	26.49	92.52	2023	28
5.	Godavari	Dharampur Warangal	79.59	17.98	2002	28
6.	Ghaghra		26.87	81.01	2024	37

Genetic diversity

Genetic diversity studies provide a scientific basis for sustainable utilization and long-term conservation in important freshwater fish species. Delineating genetic stocks across different river basins enables the formulation of scientific management strategies. Two mitochondrial genes (*Cytochrome b* and *ATPase6/8*) were employed to quantify the extent and pattern of genetic variability in these 2 important genetic resources across different rivers.

Mitochondrial sequence variations (concatenated *cytochrome b* and *ATPase6/8 genes*) was analyzed for *H. fossilis* collected from 8 geographically distinct populations across Indian freshwater systems: Godavari, Bakhira Lake, Brahmaputra River, Ghagra River, Gomti River, Haiderpur Wetland, and 2 locations of Teesta River (Table 7).

The analysis revealed a total of 71 unique haplotypes, with overall haplotype diversity (Hd) of 0.9706, while the overall nucleotide diversity (Pi) was 0.0051. The most frequent haplotype was shared across 4 populations (Bakhira Lake, Gomti River, Haiderpur Wetland, and Teesta River). The majority of haplotypes were singletons observed in only 1 individual.

Pairwise Fst values revealed a heterogeneous pattern of genetic differentiation. Godavari was the most genetically distinct population, showing moderate to high Fst values (Fst = 0.061-0.706). The overall Tajima's D values indicated a significant departure from neutrality, consistent with balancing selection. Brahmaputra River contributed the most private haplotypes. The high proportion of private haplotypes underscores the substantial genetic uniqueness of individual populations.

For characterizing natural populations of *L. bata*, the individuals sampled from different river systems *i.e.* the Godavari, Teesta, Ghaghra, Gomti, Hooghly, and Sharda were amplified for full length mitochondrial gene *cytochrome b* to understand patterns of genetic variability and historical demography. Sequence alignment of 1044 bp revealed 133 segregating sites, from which 14 distinct haplotypes were identified. Haplotype diversity was moderate (Hd = 0.473), while nucleotide diversity was low, a characteristic of populations that have undergone recent demographic expansion after a bottleneck. Samples from Hooghly River exhibited highest haplotype diversity. Tajima's D was strongly negative (D = −2.773), indicating a significant excess of low-frequency variants relative to neutral expectations. Such a pattern is usually attributed to post-pleistocene population expansion.

Project

CRP on Genomics: Structural and functional characterization of *Clarias dussumieri, Chitala chitala* and *Catla catla* genomes and transcriptomes

Period: April, 2023 - March, 2026

Coordinator: J. K. Jena, Deputy Director General (Fisheries Science), ICAR, New Delhi

Personnel: Vindhya Mohindra (PI till May 31, 2025), Rajeev K. Singh (PI since June 1, 2025), Basdeo Kushwaha, Labrechai Mog Chowdhury and Tanwy Dasmandal

Funding: ICAR Plan Scheme, New Delhi

CRP on Genomics aims to explore and characterize genomes of prioritized germplasm to identify novel gene variants associated with important traits. The generated resources will facilitate the discovery of useful genetic diversity, which can be harnessed for genetic improvement, and sustainable utilization of agrobiodiversity. Chromosome level genome assembly of the following species were generated:

Heteropneustes fossilis

H. fossilis (singhi) is an economically and ecologically important freshwater catfish species, particularly for its nutritional and medicinal significance. Despite its importance, genomic information for this species is still limited. A high-quality, chromosome-level genome assembly for *H. fossilis* was generated. Genome scaffolding was performed using OmniC (Hi-C) proximity ligation data, and resultant assembly (HFX331LM), comprised of a genome size of 828.1 Mb. The N50 scaffold length was ~28.35 Mb. The longest scaffold was ~59.6 Mb, while the shortest was 5662 bp. The assembly contained 0% ambiguous bases (Ns) indicating no gaps within the scaffolds. Genome completeness was evaluated using the BUSCO framework which presented a high score (98.3%).

A total of 3354 conserved ortholog groups were observed. The singhi genome was organized into 28 chromosomes using the Hi-C contact map data. Overall, the genome assembly demonstrated high contiguity and completeness, making it a valuable reference resource for advanced genomic and functional studies (Fig. 101).

Ompok bimaculatus

O. bimaculatus (butter catfish) is a commercially important freshwater species especially for aquaculture and conservation. Developing an improved genome assembly is therefore crucial to enable advanced research and informed breeding interventions. The primary genome assembly of *O. bimaculatus* (~1 Gb) was further improved through scaffolding using Omni-C (Hi-C). The initial assembly, generated using PacBio HiFi reads, comprised 320 scaffolds. However, upon scaffolding, this was refined to 260 contigs, reflecting an improvement

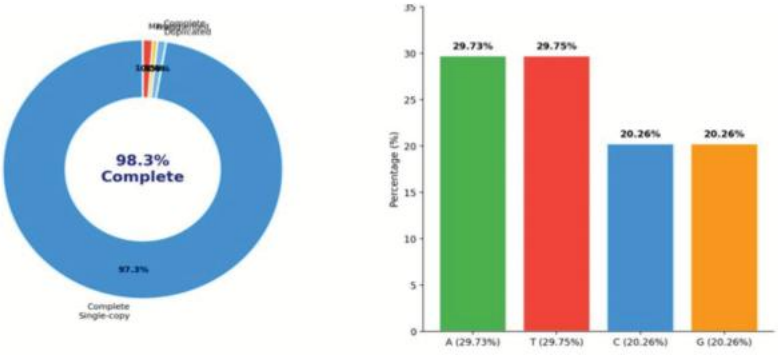


Fig. 101. Completeness and nucleotide composition (%) of singhi genome

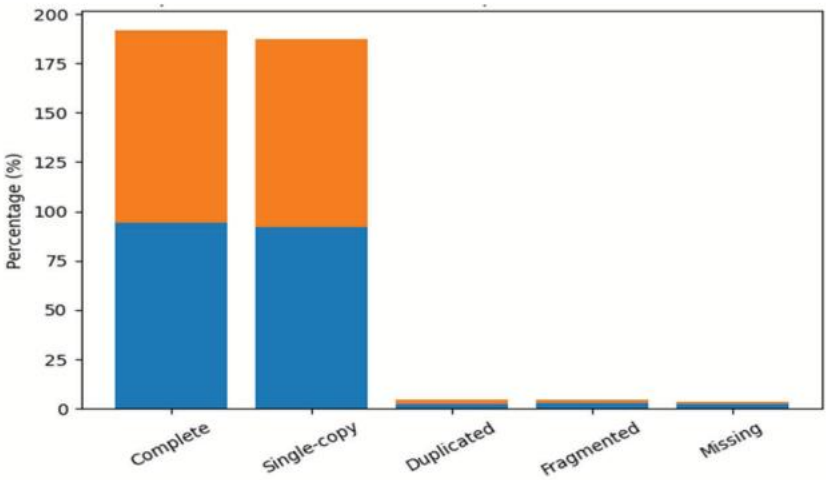


Fig. 102. Proportion of complete and single-copy orthologs in the *Ompok bimaculatus* genome

in genome contiguity. The largest contig size increased markedly from 28.5 Mb to 48.5 Mb after scaffolding. Gap was minimal (0.0015%) in the scaffolded assembly. Genome completeness, assessed using BUSCO analysis, identified 3640 conserved single-copy orthologs, indicating that the assembly is of high-quality and nearly complete, and well-suited for downstream genomic and evolutionary studies (Fig. 102). Additionally, the percentage of internal stop codons was reduced in the scaffolded assembly, indicating improved structural and coding integrity.

Chitala chitala

A high-quality reference genome (98.8% completeness) was generated, which comprised of 133 scaffolds (841.22 Mb), and N50 of 40.19 Mb. Genome annotation highlighted about 24.64% as repetitive, with LINEs constituting the predominant class of interspersed elements. Gene prediction resulted in 83536 gene models. Orthology analysis conducted across *C. chitala* and 14 representative teleost genomes identified 486 single-copy orthologs, which were used to reconstruct a robust species phylogeny. The resulting phylogenetic tree placed *C. chitala*, forming a sister lineage to *Scleropages formosus* and *Heterotis niloticus*, which is consistent with established evolutionary relationships among teleosts.

Development and validation of FiReFly

A web-based server, named FiReFly (Find Repeat Families), was designed for comprehensive identification and annotation of repetitive elements in fish genomes. The server accepts user information as a FASTA sequence. A job ID is created to secure result tracking. Repeat identification was performed using a combination of distinct programs for *de novo* repeat discovery, SSR detection, and classification of repeat families, such as LINEs, SINEs, and LTR elements (Fig. 103). The server provides a comprehensive summary table of repeat families along with downloadable masked sequences and result files. It has been validated for identifying repeat family members for genomes of *Tetraodon* and *Catla.*

Development of online databases

Singhi Transcript SSRdb is a web based searchable database developed using sequence data from brain transcriptomes of *H. fossilis*. The database is designed to identify and catalogue SSRs within the coding sequence regions of transcripts, facilitating discovery of functional markers and enabling gene-associated SSR analysis. The datasets used for its development have been sourced from publicly available NCBI's SRA database (Fig. 104a).

Mahseer Transcript SSRdb was developed as a dedicated, searchable resource developed for transcriptome-derived microsatellites of golden mahseer



Fig. 103. Homepage of FiReFly



(a) **(b)**

Fig. 104. Homepages of singhi (a) and mahseer (b) SSR databases

(*Tor putitora*). The database was built from muscle transcriptomes and comprehensively catalogues SSRs identified across expressed transcripts. This enables marker discovery for population genetics, conservation genomics, and selective breeding. The dataset has been curated from validated NCBI repositories, ensuring transparency, traceability, and reproducibility (Fig. 104b).

Project

Identification of conotoxins from the selected Cone snails from Indian waters using transcriptome sequencing

Period: April, 2022 - March, 2025

Personnel: A. Kathirvelpandian (PI), Arun Sudhagar S. and Murali S.

Funding Support: Institutional, ICAR-NBFGR

Cone snail specimens were collected from 8 major landing centres along the coasts of Kerala (Kalamukku and Sakthikulangara) and Tamil Nadu (Cuddalore, Mudassalodai, Therespuram, Vellapatti, Kayalpattinam, and Parangipettai), along with reconnaissance visits to key fish landing sites, including Kasimedu, Akkarapettai and Punnakayal in Tamil Nadu, Thykkal and Munambam in Kerala. A total of 12 species of cone snails were identified, and 22 mitochondrial *COI* gene sequenced for molecular characterization.

Transcriptomic analysis was carried out for *Conus inscriptus* and *C. monile* using Illumina next-generation sequencing (NGS) platform. Novel conotoxin genes in *C. inscriptus* were identified through BLAST analysis using ConoServer and other reference databases. *De novo* assembly of *C. inscriptus* transcriptome resulted in 259828 transcripts, covering a total transcriptome size of 297.2 million bp, with an average transcript length of 1143.95 bp, a maximum length of 29867 bp, and

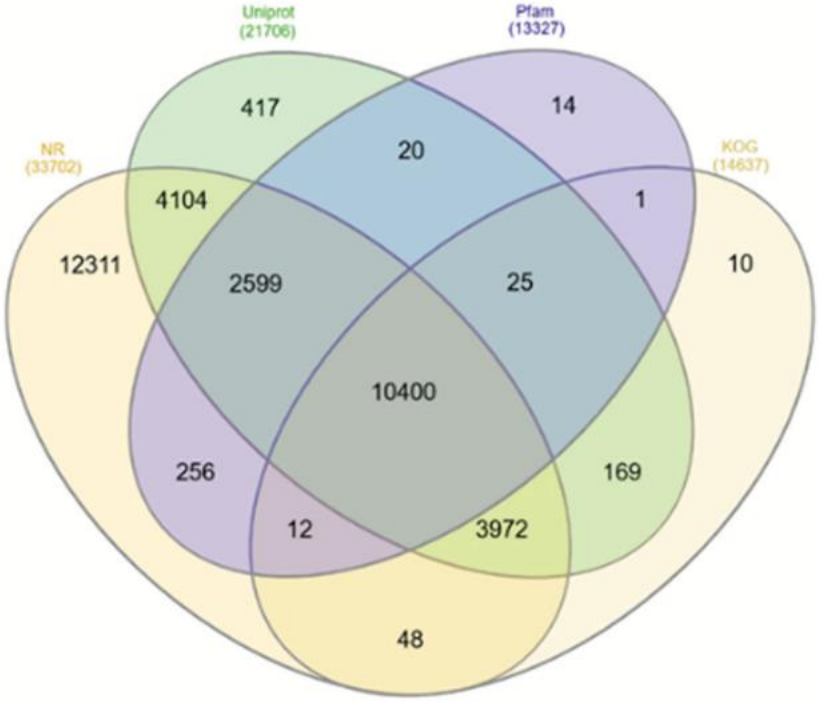


Fig. 105. Venn diagram showing alignment of 9714 genes and predicted proteins

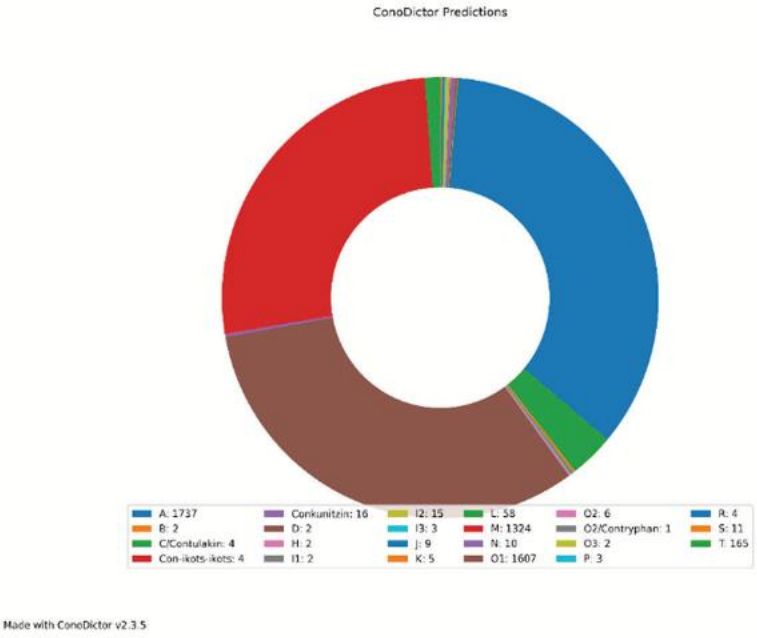


Fig. 106. Conotoxin superfamily identified in *Conus inscriptus*

a minimum length of 300 bp. The generated transcriptome data have been submitted to the NCBI's SRA (Accession No.: PRJNA1181646; BioSample accessions: SAMN44567475, SAMN44567476, SAMN44567477).

Transcriptome sequencing of venom ducts and venom bulbs from *C. inscriptus* yielded 297,232,666 bp of reads from 3 individuals, which were assembled using Trinity platform, resulting in 259828 transcripts. Of the assembled transcripts, 75366 were further analyzed, among which 33702, 13327, 21706 and 14637 coding domain sequences showed positive BLAST hits against NCBI-nr, Pfam, UniProt, and KOG databases, respectively. Further analysis using ConoDictor 2 identified 6066 unigenes corresponding to 23 conotoxin superfamilies and 1046 genes encoding unknown conopeptides (Figs. 105, 106).

Project

Genome editing of *Labeo rohita* and *Trichogaster chuna* for enhancement of economic traits

Period: April, 2023 - March, 2026

Personnel: Labrechai Mog Chowdhury (PI), Vindhya Mohindra (till May 31, 2025), Mahender Singh, Aditya Kumar, Murali S. and Dandadhar Sarma (Gauhati University)

Funding Support: ICAR-NEH component

CRISPR sgRNA *in vitro* transcription and validation

Single guide RNAs (sgRNAs) were designed for 5 genes, including *mstn, bmp6, runx2b, lepr* and *leprot* in *Labeo rohita* and *SLC45* and *OCA2* gene in *Trichogaster chuna* using CRISPR design tools, ensuring the presence of a canonical PAM sequence (NGG for SpCas9). The designed sgRNAs were synthesized through *in vitro* transcription using a sgRNA synthesis kit (Fig. 107). Functional screening of the synthesized sgRNAs was performed using an *in vitro* cleavage assay (Fig. 108). The assay evaluated the ability of each sgRNA-Cas9 complex to induce site-specific DNA cleavage. Cleavage efficiency was analyzed to identify highly active sgRNAs suitable for further validation and microinjection into fertilized eggs. Primers specific to sgRNA target regions were designed using Primer3Web. These primers were used for PCR-based validation of CRISPR activity in wet lab experiments. Amplification and downstream analyses confirmed the specificity of sgRNA targeting and successful cleavage.

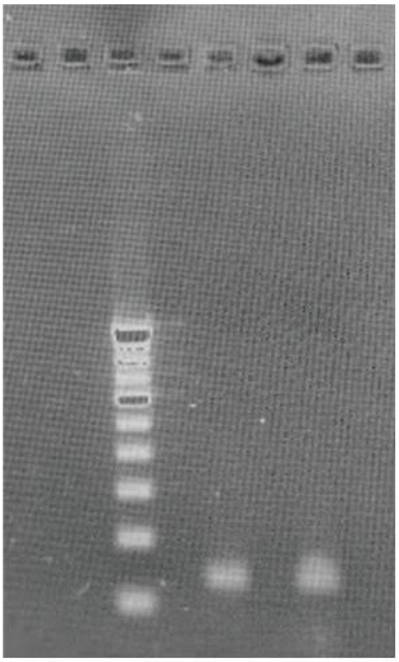


Fig. 107. *In vitro* transcription of sgRNA for *Labeo rohita* and *Trichogaster chuna*

An integrated *in silico* pipeline was developed to perform pathway analysis and predict gene essentiality. The pipeline utilizes machine learning and network topology-based approaches, where gene interaction networks are constructed and analyzed. This framework enables the identification of critical genes whose perturbation may lead to lethal or severe phenotypic consequences. To enhance biological relevance and predictive accuracy, the pipeline incorporates experimentally validated lethality and essential gene databases as training and validation resources. This integration enables robust identification of genes whose disruption is likely to result in lethal or severe phenotypic outcomes. Overall, the pipeline serves as an efficient pre-screening platform for gene-editing projects, allowing prioritization of viable target genes while minimizing experimental failure due to unintended lethality. This approach supports rational design in functional genomics, CRISPR-based knockout studies, and precision trait engineering by reducing cost, time, and ethical concerns associated with trial-and-error experimentation.

Network-based Gene Essentiality Predictor (NGEP) tool has been developed, as a unified computational platform that merges the topological characteristics of biological pathway networks with a XGBoost machine learning classifier to estimate gene essentiality scores, thereby, enabling strategic prioritization of target genes for genome editing (Fig. 109). NGEP has been used for candidate gene selection *in silico* for skin pigmentation modulation in *Cyprinus carpio* koi. From ~1.6 Gb koi carp genome, a total of

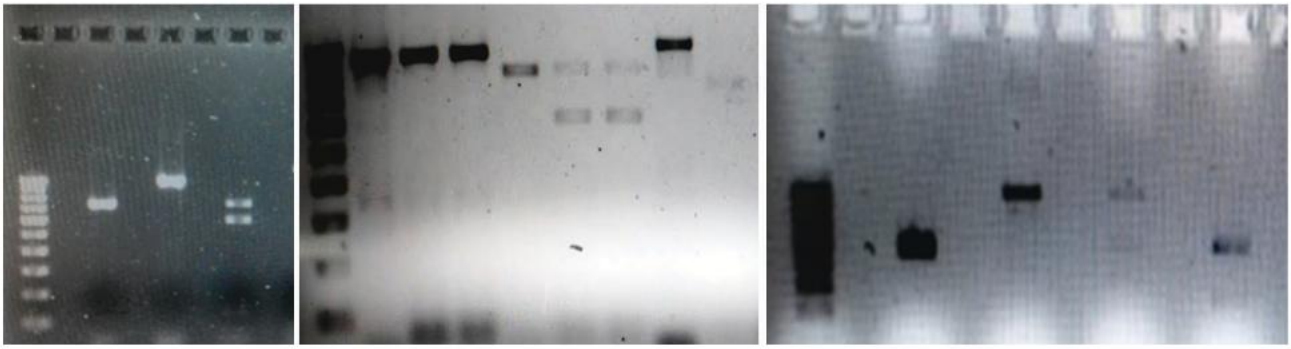


Fig. 108. Cleavage assay of sgRNA

42783 genes were predicted using AUGUSTUS and subsequently annotated through OmicsBox and KEGG via KAAS. A subset of 70 pigmentation-associated genes was identified through gene enrichment analysis, benchmarked against model organism, *Danio rerio*. NGEP evaluated these candidates across validated WikiPathways and reactome pathways, achieving high specificity for nonessential gene classification with essentiality predictions, supporting safe target selection. An interactive dashboard enables pathway-level knockout cascade visualization and per-gene functional annotation retrieval.

Genome assembly improvement of *T. chuna*

The primary genome assembly, generated solely based on PacBio long-read sequencing data, was further improved using chromatin conformation capture information. The Omni-C data was integrated using YaHS scaffolding pipeline, which exploits long-range interaction frequencies to accurately order and orient contigs into larger scaffolds. Quantitative assessment of assembly contiguity and quality was performed using QUAST. The total genome size remained stable at approximately 571 Mb. In final assembly, the number of scaffolds was 189, and the largest scaffold length was ~27.8 Mb. Scaffold N50 value was 18.74 Mb following Hi-C scaffolding, accompanied by a reduction in L50 from 19 to 13, with only a minimal introduction of gaps (0.001%) and a very low density of ambiguous bases (1.14 Ns per 100 kb).

Assembly completeness was independently evaluated using BUSCO. Both the primary and scaffolded assemblies exhibited exceptionally high completeness, with 99.1% of BUSCO genes identified as complete. Of these, 98.2% were present as single-copy orthologs, while only 0.9% showed duplication, indicating minimal redundancy. Fragmented and missing BUSCOs collectively accounted for less than 1%. Overall, the Hi-C-assisted scaffolding improved the architectural continuity of genome assembly.

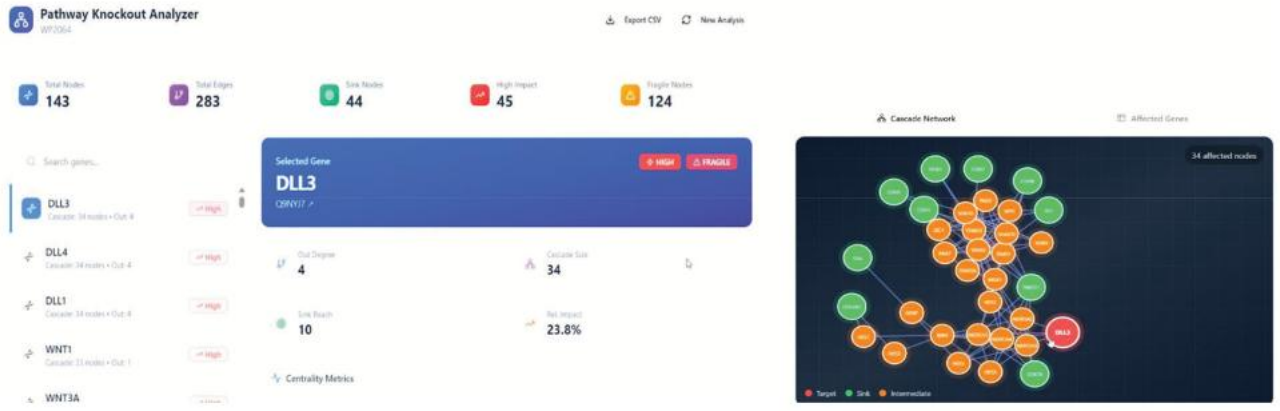


Fig. 109. Machine learning driven gene essentiality prediction

Evaluation of Indigenous Germplasm for Utilization



Project

CRP on Agrobiodiversity: Evaluation of fish germplasm from Indo-Gangetic rivers for their captive breeding, domestication, and conservation aquaculture (NBFGR HQ component)

Period: April, 2021 - March, 2026

Personnel: Aditya Kumar (PI), Rajeev Kumar Singh, Santosh Kumar, Raghvendra Singh and Monika Gupta

Funding: ICAR Plan Scheme, New Delhi

Agrobiodiversity is crucial for food security, sustainable agriculture, and ecosystem services. CRP-Agrobiodiversity aims to evaluate prioritized indigenous fish germplasm for conservation, aquaculture, and to develop protocols for captive culture of indigenous fish species to popularize and promote new species for aquaculture diversification and address region-specific problems.

Germplasm collection

Live individuals of 2 species, namely *Rita rita* (n=24) and *Heteropneustes fossilis* (n=400), were collected and stocked at the Fish Germplasm Resource Centre of ICAR-NBFGR, Lucknow, for raising as broodstock.

Captive breeding and larval rearing

Captive breeding and larval rearing of 4 catfishes (namely, *H. fossilis, C. magur, O. bimaculatus, and M. tengara*) were carried out for on-farm evaluation (Table 8).

Evaluation of *Ompok bimaculatus* in biofloc aquaculture system

The study aimed to investigate the impact of different carbon sources, T1 (molasses), T2 (rice flour), and T3 (tapioca flour), on the growth performance of *O. bimaculatus* reared in a biofloc tank system, with a control group for comparison. The experiment was conducted in a controlled environment with triplicate treatments, each having a stocking density of 300 fish/m^3. Fish were fed a commercial diet at 2% of their body weight over a 90-day period. Growth performance (Fig. 110), water quality parameters, and total heterotrophic bacteria (THB) were assessed.

Floc volumes and total suspended solids were found to be highest in T1, followed by T2 (and T3. Growth performance data indicated that specific growth rate (SGR), weight gain, and feed conversion ratio (FCR) were best in T2, followed by T1 and T3, while the lowest performance was observed in control group. Bacterial enumeration revealed that THB levels were highest in T1, followed by T2 and T3, both in the fish gut and biofloc water. A significant finding of the study demonstrated that biofloc treatments with probiotics resulted in higher total bacterial

Table 8. Breeding performance of catfishes

Species	Breeding pairs	Fertilization rate (%)	Hatching rate (%)	Larval survival (%)	Fingerlings harvested
H. fossilis	120	76-81	79-83	54-71	~21000
C. magur	07	56-61	59-63	34-41	~1200
O. bimaculatus	24	64-66	62-65	43-45	~1200
M. tengara	08	56-61	59-63	44-51	~450

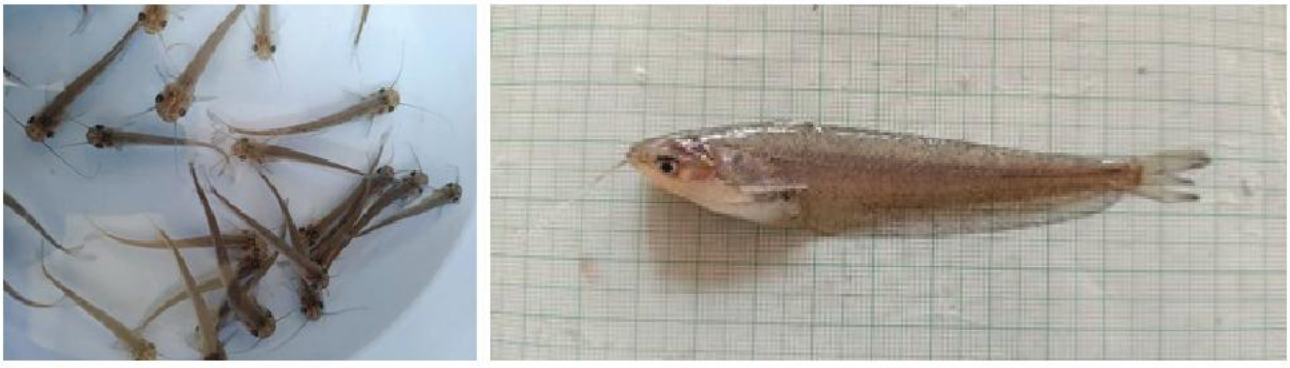


Fig. 110. Young ones and adult of *Ompok bimaculatus*

counts, improved water quality parameters, and increased floc volumes that supports fish growth. Probiotics likely suppressed the growth of disease-causing bacteria, enhancing the overall health and well-being of the fish. The study revealed that supplementing carbon sources like rice flour with probiotics effectively promotes fish growth, improves water quality, and ensures the performance of *O. bimaculatus* in a biofloc system.

Evaluation of reproductive potential and breeding performance of *Macrobrachium dayanum*

Reproductive biology and captive breeding potential of small indigenous freshwater prawn, *M. dayanum* was evaluated. Breeding occurred from April to September with peak activity during May to July. Incubation period ranged from 23 to 35 days and declined with increasing temperature. Fecundity varied from 42 to 87 eggs and increased with female size, while sexual maturity was observed at Lm = 3.92 cm (Fig. 111). Successful larval hatching was achieved in about 70% berried females without eye stalk ablation, hormonal induction, or salinity manipulation. This study supports the culture of *M. dayanum* in conservation-oriented ornamental aquaculture and low-input rural/ backyard farming.

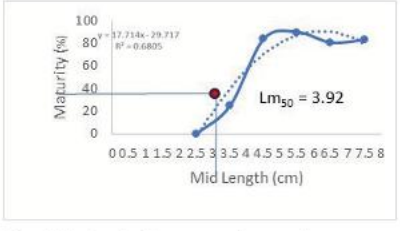


Fig. 111. Logistic curve of sexual maturity for *Macrobrachium dayanum*, where dotted line represents class interval at 50% maturity

Project

CRP on Agrobiodiversity: Conservation aquaculture of endemic fish species from peninsular rivers through captive propagation and culture evaluation

Period: April, 2021 - March, 2026

Personnel: Charan Ravi (PI), Rekha M.U., Teena Jayakumar T.K., Kantharajan G., V.S. Basheer and T.T. Ajith Kumar

Funding Support: ICAR Plan Scheme, New Delhi

The project aims to safeguard and augment native fish populations of peninsular rivers, contributing to biodiversity conservation and sustainable aquaculture.

Germplasm collection for performance evaluation

As part of germplasm collection and live gene banking, 2 newly described species, *Labeo chekida* and *L. uru*, from Chalakudy and Chandragiri Rivers, respectively were collected and maintained. Additionally, broodstock of *Horabagrus obscurus* (50), *H. nigricollaris* (50), *Clarias dussumieri* (110), and *Mystus malabaricus* (30) were sourced from Kerala and Karnataka and maintained in captivity for performance evaluation and conservation.

Captive breeding and larval rearing of indigenous fishes

Horabagrus obscurus: Captive breeding and larval rearing of *H. obscurus*, a newly described endemic catfish of the Western Ghats, were successfully standardised under controlled conditions. Induced breeding of brooders (170-1147 g) with WOVA-FH (1.0 ml/kg), achieving 78-96% fertilization, fecundity of 200-230 eggs/g and 82-90% hatching at 26-28 °C. Larval survival reached 78-95% under optimised conditions (Fig. 112).



Fig. 112. Captive raised young ones of *Horabagrus obscurus*

***Horabagrus nigricollaris*:** Successful life-cycle closure of the Endangered endemic catfish *H. nigricollaris* was achieved in captivity, establishing a self-sustaining population. Nearly 200 F1 individuals matured at 2+ years, and 10 F1 pairs (♀ 36-48 g; ♂ 26-44 g) produced viable F2 progeny (300-700 fry/female), with reproductive performance comparable to wild broodstock. This confirms the feasibility of maintaining a closed captive lineage and strengthens the foundation for conservation breeding and stock enhancement programmes.

***Ompok malabaricus*:** Achieved complete life-cycle closure with F2 production from F1 brooders after 2 years. F1 fish (20-25 cm; 50-65 g) responded to WOVA-FH (1 ml/kg), achieving natural spawning in 100% of trials. Females produced 5000-7500 demersal eggs per spawning with fertilization (80-



Fig. 113. Captive raised young ones of *Ompok malabaricus*

90%) and hatching (77-85%) within 24-28 h (Fig. 113).

***Mystus malabaricus*:** Preliminary captive breeding was successfully achieved, along with documentation of embryonic and larval development. Three induced breeding trials (1:1 ratio) yielded 1300-1500 eggs/female, with 80-90% fertilization, 75-90% hatching, and 85-95% larval survival. Yolk absorption was completed by 3 days post-hatching.

Upscaling/ mass scale captive propagation of endangered fishes

Horabagrus nigricollaris: Ten breeding trials of *H. nigricollaris* were conducted using single-pair (♀ 66.6–120 g; ♂ 70–95 g) induced with WOVA-FH (1.0 ml/kg). Latency period was 11-12 h and dry stripping yielded 1350-2700 adhesive eggs/female with fertilisation (66-71%) and hatching (69-73%) at 26-28 °C. Larval survival ranged from 84-91%, and optimised rearing (6 larvae/L with waterlogged wood substrate) produced 2000-2650 fingerlings (18.2-32.6 mm in 30 days) (Fig.

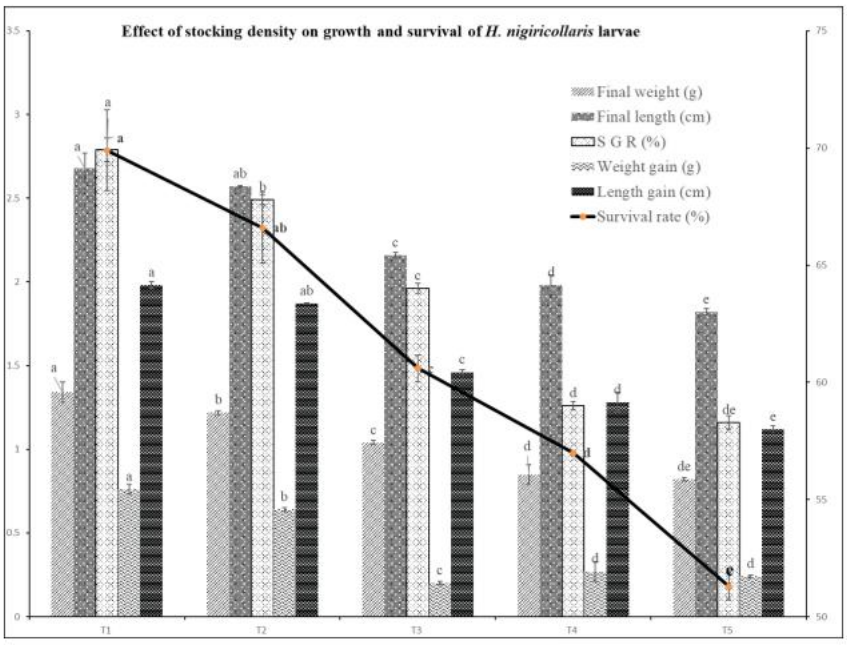


Fig. 114. Effect of larval stocking density on growth and survival of *Horabagrus nigricollaris*

114). Seed was also distributed to fish farmers to promote this indigenous species.

Horabagrus brachysoma: Twelve breeding trials were carried out using 10 pairs of brooders (117-350 g; 20-35 cm), yielding approximately 1.0 lakh spawn. As part of conservation and stock enhancement initiatives, 5000 fry were supplied to the Department of Fisheries, Kerala, and 13500 fingerlings were distributed to farmers and NGOs.

Hemibagrus punctatus: Five breeding trials were conducted using broodstock (♀ 150–368 g; ♂ 139–352 g) induced with WOVA-FH (1.0 ml/kg). Spawning was achieved in 3 trials (~12 h latency) under low-light conditions. A non-lethal stripping method was standardised. Females produced 6740-12000 adhesive olive-green eggs with 78% fertilization and 73.3% hatching at 26-28 °C (larval survival: 79% at 3 days). Improved larval management minimised cannibalism, resulting in ~1,000 fingerlings (>2-inch size).

Labeo dussumieri: Three breeding trials were conducted using 4 pairs (1:1 ratio) of brooders, with females averaging 24.5 cm (225 g) and males 23.5 cm (189 g). The trials resulted in the production of approximately 1.4 lakh hatchlings.

Clarias dussumieri: Ten breeding trials involving 20 brooder pairs (70-450 g; 13-40 cm) produced approximately 50000 fry. Around 1000 fingerlings were distributed to fish farmers and the Department of Fisheries, Kerala.

Technology dissemination of endangered catfish captive breeding

Facilitated first private hatchery-level seed production of *H. obscurus* to Mr. Lijoy (Bio Organic World, Chalakudy) through technical guidance enabling adoption of standardized breeding protocols.

A 7-day hands-on training programme on *'Captive breeding and larval rearing of indigenous*

fishes' was conducted with practical exposure to breeding and seed production techniques from September 8-14, 2025, where 24 trainees participated.

River ranching

Successfully ranched 2000 captive-produced advanced fingerlings (>5-inch size) of *Horabagrus obscurus* in the Chalakudy River (Vettilappara). Additionally, 1000 captive-bred fingerlings of *H. brachysoma* was distributed to St. Albert's College, Kochi for ranching in Periyar River (Aluva) and 2500 fingerlings distributed to Hornbill Foundation (MES Asmabi College, Kodungallur) for ranching in Chalakudy River basin.

Project

Evaluation of new candidate species striped murrel, *Channa striata* under Biofloc Aquaculture System for livelihood enhancement of farmers of Uttar Pradesh

Period: November, 2024 - November, 2027

Personnel: Aditya Kumar (PI), Rajeev Kumar Singh, Chandra Bhushan Kumar and Raghvendra Singh

Funding Support: Council of Science & Technology, Uttar Pradesh

The project aims to evaluate the striped murrel, *Channa striata,* under the Biofloc Aquaculture System for the diversification of aquaculture. The experimental setup consisted of 12 fibre-reinforced plastic (FRP) tanks with a total capacity of 600 L, each maintained with 500 L of freshwater (Fig. 115). Before stocking, the fish were acclimated for two weeks in a large cement tank under controlled conditions, with continuous aeration, regular feeding, and 30% water exchange conducted twice weekly. The study included 5 experimental treatments, each conducted in triplicate, using different carbon



Fig. 115. Biofloc experiment setup

sources to promote biofloc formation: T1 (molasses), T2 (rice flour), T3 (tapioca flour), T4 (arrowroot), T5 (wheat flour), and control (with no addition of probiotics and carbon sources). All tanks were filled with dechlorinated freshwater and continuously aerated using a blower to maintain optimal water conditions. Biofloc development was initiated by supplementing the culture water with calcium carbonate, nitrogen, carbon, probiotic, and common salt according to treatment groups. After 7-8 days, once the water exhibited turbidity indicative of floc formation, *C. striata* fingerlings (mean body weight of 9.72 g) were stocked at a density of 160 fish/m^3 in each tank. Fish were provided with a commercial floating balanced feed (40% crude protein and 6% crude fat) at 3% of body weight, twice daily over 150 days rearing period. Carbon sources were applied on alternate days to maintain a C:N ratio of 10:1 to enhance heterotrophic bacterial growth.

Water quality parameters

The physico-chemical parameters (namely pH, temperature, TDS, TSS, floc volume, nitrite-nitrogen, nitrate-nitrogen, total ammonia-nitrogen, and alkalinity) were recorded across treatments (T1-T5) and control. Significant variation in ammonia-N concentrations was observed among the treatments. The lowest ammonia-N level was detected in the control group (0.40 mg/L), whereas elevated concentrations were recorded in T4 and T5. Nitrite-N concentrations were highest in T2 and lowest in the control (0.17 mg/L), with significant differences between treatment groups and control. Nitrate-N levels were greater in T3 and T4, while the control group exhibited the lowest concentration (4.28 mg/L). Alkalinity varied across all groups, with T1 showing the highest value and control having the lowest. Throughout the study period, pH values remained stable and within acceptable limits, with no significant differences observed among treatments or control, although marginally higher pH values (8.6) were noted in T3 and T4. Water temperature did not differ significantly among the experimental groups. Conversely, differences were detected in TDS levels across treatments. The highest mean TDS concentrations were recorded in T5 and T3, while T2 exhibited lowest value. A comparable pattern was observed for TSS, with T4 recording the highest concentration and control group the lowest (29 mg/L). Notably, significant differences in TSS were apparent from the early stages of the culture period. Floc volume differed significantly among treatments, with T1 showing the greatest volume, followed by T4, whereas the control group had the lowest floc volume (3 mL/L).



Fig. 116. *Channa striata* reared in biofloc

Growth performance

Growth performance parameters, including net weight gain, percentage weight gain, specific growth rate (SGR), survival rate, and feed conversion ratio (FCR), were evaluated among the treatment groups (T1-T5) and control. Among groups, T4 exhibited highest mean weight gain, which was significantly higher than other groups, while lowest weight gain was in control group (33.36 g). A similar pattern was noted for percentage weight gain and SGR, with T4 achieving the highest values, which were significantly higher than other treatment groups. The FCR was best in T4, which recorded the lowest value, and control with the lowest value (2.64). Survival rate was significantly greater in T4 compared to control group (84.37%) and other biofloc groups (Fig. 116).

Project

Network Project on Ornamental Fish Breeding and Culture (NPOFBC)

Period: April, 2018 - September, 2026

Personnel: V. S. Basheer (PI), Charan R., Rekha M.U., Monika Gupta, Aditya Kumar and Raghvendra Singh

Funding Support: ICAR Plan

Standardised mass scale breeding and larval rearing of indigenous ornamental fishes, *Dawkinsia arulius* (7 trials) and *Pethia setnai* (5 trials), were done. The brood fishes were kept in 500 L fibre glass tanks at 1:1 sex ratio. In each tank, a round plastic tub was kept

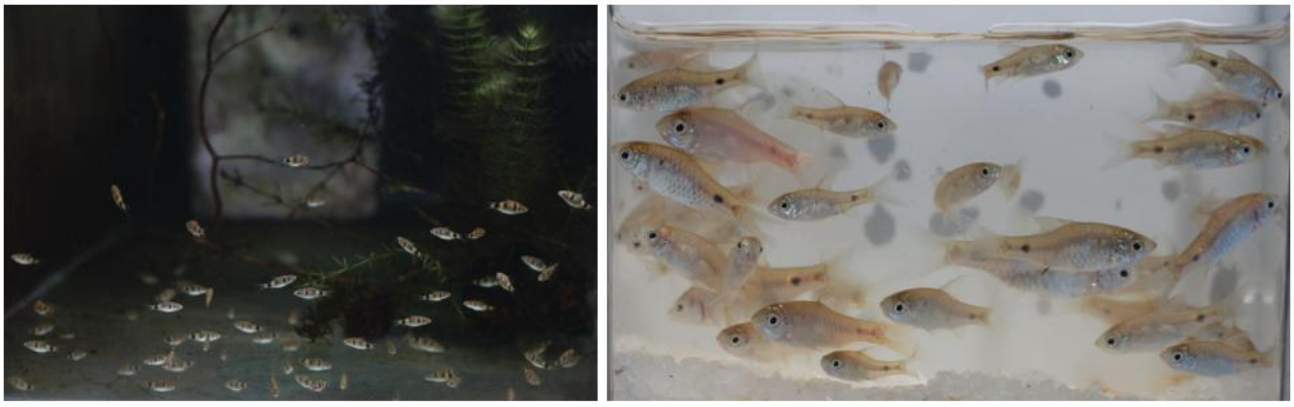
with ceramic rings and plastic fibres and continuous aeration was given. Water quality parameters, such as dissolved oxygen, pH, alkalinity, were maintained. Breeding was observed after 24 h. Each tub produced ~1400 hatchlings of *D. arulius* and ~550 hatchlings of *P. setnai* (Fig. 117a). The present set up demonstrated reliable seed production and strong potential for scale-up in ornamental aquaculture.

Successful captive breeding and rearing of *P. pookodensis*, a critically endangered barb found mostly in Wayanad region of Kerala, was achieved at 1:1 male and female ratio. The brood fishes were kept in 100 L glass tanks with good aeration, and spawning was observed within 24 h. About 450 hatchlings were produced from a single pair. This demonstrated closing the life cycle in captivity under standardised rearing protocols (Fig. 117b).

D. apsara was successfully bred for the first time in 3 trials (2:1 male:female ratio). The water was maintained at 26.0°C, pH of 6.8, and with good aeration. Spawning was observed after 16 h, and ~620 hatchlings were produced per pair. No hormone was injected for captive breeding. The hatchlings were maintained with live feed for 15 days, and after that on artificial feed (Fig. 118a).

D. rohani, another indigenous ornamental fish barb, was collected from rivers and maintained in the lab for the development of brood fish kept in 500 L FRP tanks. Brooders were introduced in 100 L glass tanks at 1:1 ratio. The water was maintained at 26 °C, pH of 7.2, with good aeration. Spawning was observed after 20 h and ~500 hatchlings were produced per pair. Young ones were maintained with live feed for 20 days and after that on artificial feed (Fig. 118b).

Brooders of *Garra mullya* were collected from the river and maintained in 500 L FRP tanks. Preliminary captive breeding of *G. mullya* was achieved, using WOVA-FH hormone. Brooders were kept in FRP tank with good aeration, and spawning was observed after 12 h. About 5000



(a) (b)

Fig. 117. Young ones of *Pethia setnai* (a) and *Pethia pookodensis* (b)



(a) (b)

Fig. 118. Young ones of *Dawkinsia apsara* (a) and *Dawkinsia rohani* (b)



Fig. 119. Young ones of *Garra mullya*



Fig. 120. Hatchling of *Schistura scaturigina*

eggs were observed per spawning, and 4000 hatchlings produced. Hatchlings were maintained with live feed for 15 days (Fig. 119).

Preliminary success in captive breeding of Victor loach, *Schistura scaturigina,* was achieved through induced breeding. However, further work is required to standardise larval and juvenile rearing protocols to improve survival and enable large-scale seed production (Fig. 120).

Studies were initiated on the biology of *Etroplus canarensis,* an endangered fish having ornamental trade value. Length-weight relationship and histological characterisation of gonads were investigated in this species (Figs. 121, 122).

A hands-on training was given to 20 participants, including farmers, entrepreneurs, faculty member and other stakeholders. Among

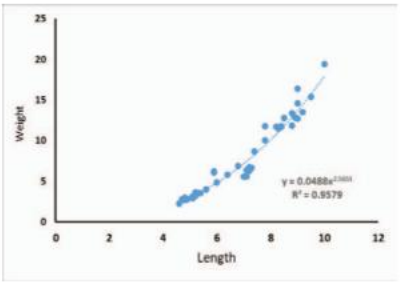
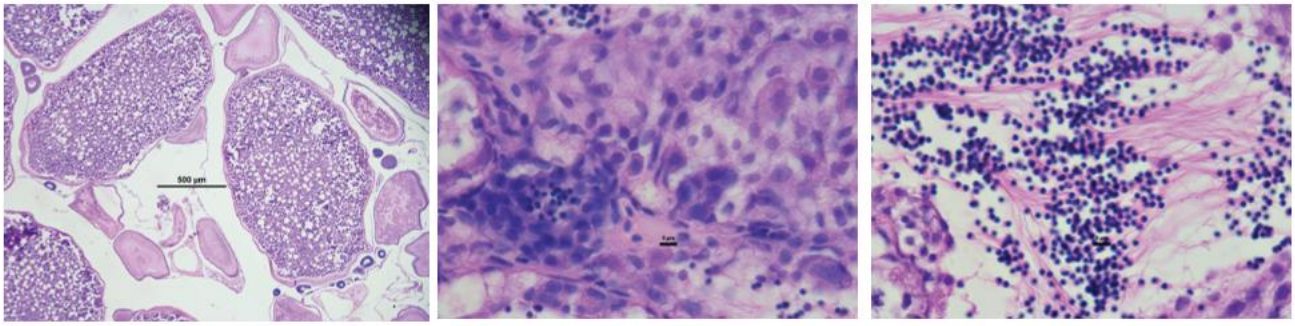


Fig. 121. Length-weight relationship of *Etroplus canrensis*



(a) **(b)** **(c)**

Fig. 122. Histological sections of mature ovary (a), immature testis (b) and spermatozoa (c) of *Etroplus canarensis*

these, 2 farmers successfully bred the indigenous ornamental fish in their farm. One farmer was awarded 'Millennium Farmer of the Year Award' by Krishi Jagran group, based in New Delhi.

Project

Study of Reproductive phenology variation of *Notopterus notopterus* in wild and captive environment

Period: April, 2024 - March, 2026
Personnel: Monika Gupta (PI), Kantharajan G. and Raghvendra Singh

Funding Support: ICAR-NBFGR Corpus Fund

The study aimed to assess seasonal reproductive dynamics of *Notopterus notopterus,* an important indigenous freshwater fish species under wild and captive conditions and to develop predictive models to understand the potential impacts of climate variability on breeding periodicity. The study successfully generated the first comprehensive seasonal reproductive profile of *Notopterus notopterus* under both wild and captive conditions. For this a total of 500 specimens were procured and maintained under captive pond systems, alongside comparative assessment of wild riverine populations. Monthly sampling was conducted to record biometric parameters (total length and body weight) and reproductive indicators including gonad weight, fecundity, oocyte diameter, and Gonadosomatic Index (GSI).

Distinct seasonal variation in reproductive activity was observed. In wild populations, GSI ranged from 0.69 to 2.16, with peak reproductive activity recorded in July during the monsoon season. In captive pond systems, GSI ranged from 0.48 to 2.45, with peak maturation observed in June, indicating slightly advanced gonadal development under stable environmental conditions. The study quantitatively demonstrated earlier and enhanced gonadal maturation under captive conditions, confirming the feasibility of controlled pond systems for broodstock development and breeding optimization.

Environmental monitoring revealed substantial differences between river and pond systems. Dissolved oxygen levels were significantly lower in river habitats (0.12–3.5 mg/L) compared to ponds (3.6–5.0 mg/L), indicating possible oxygen stress in natural environments. Greater fluctuations in hardness, alkalinity, conductivity, and total dissolved solids were also recorded in river systems. Seasonal temperature reached up to 33°C during July, coinciding with peak spawning activity. The alignment of peak reproductive indices with increased temperature and monsoon rainfall confirms strong climate-mediated regulation of reproductive phenology in *N. notopterus*. To further quantify these relationships, long-term historical datasets on rainfall and air temperature have been compiled. A modelling framework incorporating Generalized Linear Models (GLM) and time-series analysis is being developed to assess climatic influences, detect lag effects, and simulate potential shifts in breeding windows under future climate scenarios.

Collectively, these outcomes provide baseline reproductive benchmarks, for validated captive breeding strategy, and a climate-responsive analytical framework that supports conservation planning, hatchery protocol development, and climate-resilient management of *N. notopterus*.

Project

Development and evaluation of a small-scale prototype of species specific Recirculatory Aquaculture System

Period: April, 2024 - March, 2026
Personnel: Raghvendra Singh (PI), Aditya Kumar and Monika Gupta

Funding Support: ICAR-NBFGR Corpus Fund

A working yard type facility has been developed using locally available material like bamboo poles, bamboo fence shade nets etc. A small-scale RAS prototype was made by incorporating various components like, filtration unit, pumping system, aeration and fish rearing unit using low cost locally available material. Components used in making filtration system were bio balls, coconut fibre rope, light weight cinder, live plants and hydroponic cups. Filtration unit was set in such a manner that it should remain operation friendly particularly during disassembling and reassembling for easy periodic maintenance. During the setup of experimental unit, system was arranged vertically in two tiers to minimize the use of horizontal space. Electrical connections are given separately to every single unit for proper working of RAS system and optimize the wattage load to single

point. Water recirculation was made using a pumping system composed of small submersible air cooler pump, flow controllers and valves in combination with auto working siphoning system for unidirectional flow. During designing the prototype of RAS system water flow was directed and controlled in such a way that no separate aeration device was needed for maintaining optimum dissolved oxygen level thereby reducing the cost of the system. Water flow and siphoning mechanism was standardized for a 400 liter capacity prototype. Before stocking of fishes, the RAS was started and beneficial bacteria were inoculated so that they may flourish sufficiently for effective conversion of ammonia to nitrate. In filtration unit of the system three plants *viz.* tomato, lettuce and spring onion are under trial for standardizing the effectiveness of the system. Fish growth/survival trails are ongoing for which fishes (*Mystus vittatus)* of size 3-3.5 cms were stocked at a stocking density of one fish per 16 liters for assessing the growth and survival. Water quality parameters are monitored weekly with about 20 percent water top up to compensate losses due to evaporation.

Assessment of Exotics, and Fish Health Management



Project

National surveillance programme for aquatic animal diseases (NSPAAD)-Phase II

Period: April, 2022 - March, 2027

Coordinator: J. K. Jena, Deputy Director General (Fisheries Science), ICAR, New Delhi

Co-coordinator: Kajal Chakraborty

Personnel: Neeraj Sood (**Consortium** PI), P. K. Pradhan, Anutosh Paria, Chandra Bhushan Kumar, Arun Sudhagar S., V. S. Basheer, Gaurav Rathore and Ranjan Singh

Funding Support: Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India

Phase II of National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) funded under Pradhan Mantri Matsya Sampada Yojana (PMMSY) by Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India is being implemented pan-India and coordinated by ICAR-NBFGR, Lucknow.

Positive controls for *Candidatus* Hepatobacter penaei (NHP-B), infectious pancreatic necrosis virus (IPNV), similar damselfish virus (SRDV) and snakehead rhabdovirus (SHRV) were developed (Fig. 123). Besides, positive controls for different pathogens with NSPAAD collaborating centres were shared as per their requirement.

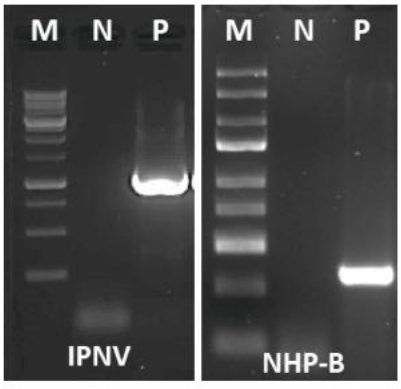


Fig. 123. Gel image showing amplicon of positive controls for IPNV and NHP-B

Murrel samples, collected by KUFOS from Thrissur, Kottayam, Idukki, Mallapuram and Pathanamthitta districts of Kerala, were screened for SHRV. In the PCR, band corresponding to the positive control was observed in a few samples. The amplicons (4 numbers) were sequenced, but none of the sequence showed similarity with SHRV sequence. Further, investigation of disease outbreak in murrel farm in Dehradun, Uttarakhand, revealed SHRV infection in 3 samples. In addition, 5 gill samples from koi carps received from College of Fisheries, Mangaluru, 2 samples were found positive for koi herpes virus, whereas 3 of 16 shrimp samples received from MPEDA were positive for infectious myonecrosis virus. A total of 26 samples received from Animal Quarantine and Certification Services (AQCS) were screened for desired pathogens and reports were submitted to AQCS.

Aquatic Animal Health Laboratory, ICAR-NBFGR, participated in Asia-Pacific Proficiency Testing Program for Aquatic Animal Diseases, 2025 conducted by CSIRO/Australian Centre for Disease Preparedness (ACDP) on behalf of the Australian Department of Agriculture, Fisheries and Forestry, for finfish and shrimp pathogens.

An iOS version of the ReportFishDisease (RFD) was prepared and hosted on Apple Store. In addition, desktop version of the App for Admin Panels was prepared for ease of using the App, and the same was shared with State Fisheries Departments and NSPAAD collaborating centres. Further, the basic information about finfish, shrimp and molluscan diseases was translated in Hindi and included in the App. For popularisation of RFD app, sensitization programmes for Officers of State Fisheries Department, Government of Meghalaya, was organised in Shillong. In addition, awareness programmes on use of RFD app were also organised for fish farmers of Dimapur district, Nagaland; and Patna, Gaya, Buxar and Vaishali districts of Bihar. In addition, filters were added to the National Database on Aquatic Animal Diseases to extract information on time scale, collaborating centre-wise, pathogen-wise and state-wise information.

A cell line has been established from the heart tissue of three spot gourami *Trichopodus trichopterus* using explant method, and designated as TSGH cell line. Cells were susceptible to ISKNV, CyHV-2 and TiLV as evidenced by cytopathic effects and PCR/RT-PCR. This novel cell line would be helpful for the surveillance of viral diseases affecting gouramis.

A hands-on training programmes on 'Fish Diseases and their Diagnosis' were organized during November 17-21, 2025 for officers of State Fisheries Departments under NSPAAD. A total of 8 fisheries officers from Directorate of Fisheries, Bihar, and 3 officers from Fisheries Department, Government of Punjab, participated.

A School on Aquatic Animal Epidemiology was organized during October 6-10, 2025

involving resource person, Prof. Kenton L. Morgan, Emeritus Professor of Epidemiology, University of Liverpool, United Kingdom. The training was attended by 20 participants from 10 organizations/institute.

Quarterly Aquatic Animal Disease Reports for the period, October-December, 2024, January-March, April to June and July to September 2025 received from collaborating centres, were compiled and submitted to Department of Fisheries, Government of India. Besides, monthly reports from NSPAAD collaborating centres were compiled and uploaded on PMMSY portal.

During the programme, a total of 128 awareness programmes involving 3924 fish farmers were organised, whereas 40 training programmes involving 1256 officers of State Fisheries Departments and research scholars were organised by NSPAAD collaborating centres. Besides, 480 disease cases of finfish and 305 disease cases affecting shrimps were investigated by collaborating centres.

Project

Surveillance of freshwater fish and shellfish diseases in Uttar Pradesh-NSPAAD Phase II

Period: June, 2022 - March, 2027

Personnel: P. K. Pradhan (PI), Chandra Bhushan Kumar, Ranjana Sinha, Vikash Sahu, Ranjan Singh and Neeraj Sood

Funding Support: PMMSY, Government of India

Under passive disease surveillance, a total of 28 disease cases were reported from different districts of Uttar Pradesh in Indian Major Carps (n=5), pangasius (14), tilapia (4), and other fish species (5). Investigation revealed 3 cases of Argulosis, 1 of Lernaeosis, 2 of Dactylogyrosis, 9 of Motile *Aeromonas* septicemia, 4 of TiPV infection, 1 of Saprolegniosis, 1 of Edwardsiellosis, 1 of Trichodinosis, and 6 cases associated with poor water quality. A total of 114 ornamental fish shops were surveyed, of which parasitic infestation was observed in 72 shops. Among these, Monogenea were the most prevalent (40 shops), followed by Ich (*Ichthyophthirius multifiliis*) (24 shops), *Argulus* spp. (7 shops), and Lernaea (1 shop). Additionally, 684 stakeholders, including farmers and trainees from various districts of Uttar Pradesh, were sensitized on the functionality and use of RFD App through awareness programs, sampling drives, and farmer training sessions.

Project

Surveillance of freshwater fish diseases in Kerala-NSPAAD Phase II

Period: June, 2022 - March, 2027

Personnel: V.S. Basheer (PI) and Arun Sudhagar S.

Funding Support: PMMSY, Government of India

A comprehensive surveillance program, encompassing 58 samplings, were undertaken. A total of 563 fish specimens representing diverse groups, such as cyprinids, cichlids, characids, channids, and livebearers, were collected and analyzed for disease diagnosis. As part of stakeholder engagement, an awareness-cum-interaction meeting on the 'ReportFishDisease' mobile app was conducted on October 15, 2025 at Kalawoor in Alappuzha district, Kerala, benefiting 43 farmers and Sagar Mitras for promoting participatory disease reporting.

Microbiological investigations led to the isolation of a wide range of bacterial pathogens, including *Vibrio* sp., *Aeromonas* spp., *Proteus* sp., *Lactococcus* spp., *Staphylococcus* sp., *Pseudomonas* sp., *Serratia* sp., *Edwardsiella* sp., and *Shewanella* sp., from infected fish samples. Notably, important disease outbreaks were identified during the surveillance period. Carp Edema Virus was detected in koi carp from Chennai and Kochi, while a co-infection of ISKNV and *Mycobacterium* sp. was confirmed in *Betta splendens* from Thumboor (Thrissur) (Fig. 124). Additionally, EUS was diagnosed in *Channa striata* collected from Vengoor (Ernakulam) (Fig. 125). Parasitological screening further revealed the presence of parasites such as *Piscinoodinium* sp., *Dactylogyrus* sp., *Trichodina* sp., (Fig. 126) and *Ichthyophthirius* sp. in diseased fish samples from Kerala.

Advanced molecular characterization was also undertaken for emerging pathogens. Whole genome sequencing of *Chryseobacterium* sp., isolated from diseased goldfish, revealed a genome size of 4.58 Mb comprising 97 scaffolds, 4276 predicted coding sequences, 77 tRNA genes, and 10 rRNA genes. Furthermore, an emerging bacterial pathogen, *Lactococcus formosensis*, isolated from infected oscar fish (*Astronotus ocellatus*),



Fig. 124. *Betta splendens* specimen exhibiting dropsy associated with co-infection by ISKNV and *Mycobacterium* sp.



Fig. 125. *Channa striata* affected with EUS

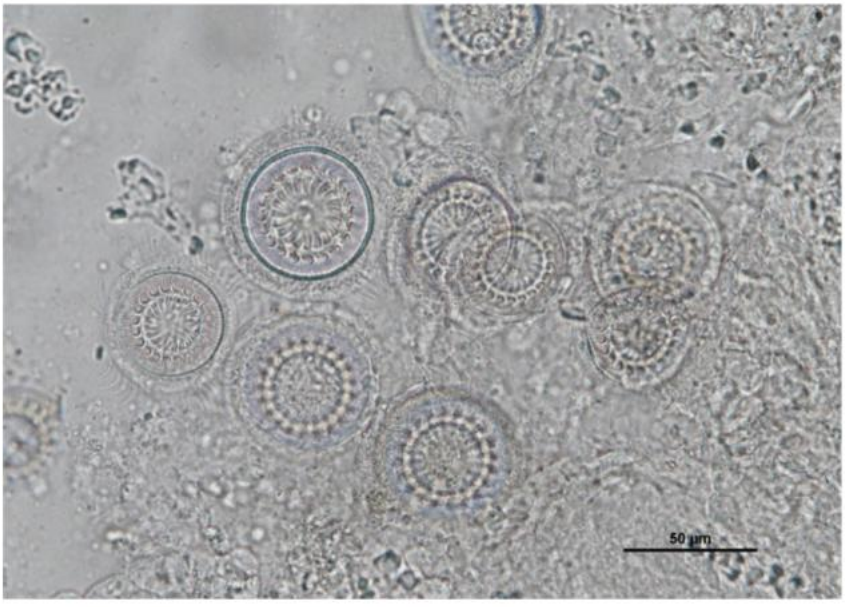


Fig. 126. *Trichodina* sp. isolated from gill of diseased pangas

was successfully characterized and found to possess multiple putative virulence-associated genes, including *hemolysins* (1, 2, and 3), *NADH oxidase*, *Adhesin Pav*, and *Adhesin Cluster* 1, indicating its pathogenic potential in aquaculture systems.

Project

All India network project on antimicrobial resistance (AMR) in fisheries and aquaculture

Period: April, 2024 - September, 2026

Coordinator: J. K. Jena, Deputy Director General (Fisheries Science), ICAR, New Delhi

Co-coordinator: Kajal Chakraborty

Personnel: Gaurav Rathore (PI), Chandra Bhushan Kumar, Anutosh Paria and Vikash Sahu

Funding Support: ICAR Plan Scheme, New Delhi

Sampling for Antimicrobial resistance (AMR) analysis

A total of 157 freshwater fish farms of Azamgarh, Gorakhpur, Lucknow and Mau districts of Uttar Pradesh were sampled for isolation of *E. coli*, *Aeromonas* spp. and *Staphylococcus* spp. A total of 346 isolates comprising of 154 *E. coli*, 12 *S. aureus*, 130 Coagulase negative *Staphylococcus* (CONS) and 153 isolates of *Aeromonas* spp. were recovered from the samples (Table 9). Antimicrobial susceptibility testing (AST) was done by disc diffusion method following CLSI breakpoints and data were analysed by WHONET software.

Table 9. Details of samples collected and isolates recovered for AMR analysis

Type of sample	No. of Farms	*E. coli*	*S. aureus*	CONS	*Aeromonas* spp.
Catla catla (cca)	4	4	0	4	4
Cyprinus carpio (ccr)	1	1	0	1	1
Ctenopharyngodon idella (cid)	4	4	0	4	4
Cirrhinus mrigala (cmr)	6	6	0	6	6
Hypophthalmichthys molitrix (hmo)	5	4	0	4	4
Labeo rohita (lro)	11	10	0	10	11
Total carps	**31**	**29**	**0**	**29**	**30**
Pangasianodon hypophthalmus (phy)	48	48	3	39	47
Total fish	**79**	**77**	**3**	**68**	**77**
Carp pond water (cpw)	30	29	3	25	30
Pangas pond water (ppw)	48	48	6	37	46
Total pond water	**78**	**77**	**9**	**62**	**76**
Total	**157**	**154**	**12**	**130**	**153**

Farming practices

Data analysis on farming practices, showed that 83% farms belonged to private ownership and 17% were community type; 89% farms used borewell as source of water; 34% of the farms had village drainage in the pond; 31% farms had animal entry, and faecal contamination was observed in 21% of the farms. Disease was reported in ~10% farms, and use of antibiotics was reported in 16% of the farms. Low DO was recorded in 28% of the farms. High ammonia (>1ppm) was observed in 42% farms, while high nitrite was (>0.2ppm) was noted in 26% farms.

AMR profile of *E. coli*

A total of 148 isolates of *E. coli* were analysed for AMR for 15 listed antibiotics. Out of these, higher resistance of was seen against ampicillin, nalidixic acid and tetracycline. Higher resistance was observed in pangas than carp isolates. A total of 22 isolates were MDR (18.9%). The most common AMR combination observed in MDR isolates was Ampicillin (86%), 3rd generation cephalosporins (68%) and tetracycline (63%). A total of 36 isolates were resistant to cephalosporins, 17 isolates were positive for ESBL production. AmpC producers were 14 out of 27 isolates resistant to Cefoxitin. ESBL producing isolates were tested for antimicrobial resistance genes by PCR. Out of 18 isolates tested, 9 isolates were positive for *bla*CTXM-1 gene. In the AmpC producing isolates, *bla*DHA was detected in 7 isolates out of 15 screened. Majority of quinolone resistant isolates carried *qnr*B or *qnr*S, Tetracyline resistance was mainly mediated by *tet*A gene.

AMR profile of *S. aureus*

A total of 12 isolates of *S. aureus* were analysed for AMR for 9 listed antibiotics. Out of these, 83% isolates were resistant to penicillin, and 33% isolates were resistant to cefoxitin and erythromycin. High resistance to tetracycline was also noticed. A total of 4 isolates were cefoxitin resistant and only 3 isolates carried *mec*A gene and were classified as methicillin-resistant *S. aureus* (MRSA). Further, 4 isolates were MDR (33%) with all 4 being resistant to FOX, CIP, ERY & PEN and TCY. Majority of tetracycline resistant isolates carried *tet*k gene, erythromycin resistance was mainly mediated by *erm*A gene.

AMR profile of CONS

A total of 127 isolates of Coagulase negative *Staphylococcus* species were analysed for AMR for 9 listed antibiotics. Out of these, 65% isolates were resistant to penicillin, and 29% isolates were resistant to cefoxitin. AMR profile of CONS isolates from carps and pangas were almost similar. Although erythromycin resistance in pangas isolates was higher. Only 10 isolates were cefoxitin resistant and 3 isolates carried *mec*A gene and classified as MR-CONS. A total of 28 isolates were MDR (22%). MDR isolates were resistant to penicillin (100%), erythromycin (92%) and cefoxitin (60%). Chloramphenicol, ciprofloxacin, tetracycline and sulphonamide resistance was observed in 20-25% of MDR isolates. All of tetracycline resistant isolates (12 no.) carried *tet*k gene, *erm*C was detected in 10 isolates, while 4 isolates harboured *erm*A.

AMR profile of *Aeromonas*

A total of 150 isolates of *Aeromonas* were analysed for AMR for 12 listed antibiotics. Out of these, 30% isolates were resistant to cefoxitin. None of the isolates were resistant to tetracycline, although 18% isolates showed resistance to imipenem. No major differences in AMR profile of *Aeromonas* from fish and water was observed. A total of 21 isolates were MDR (14%). The most common AMR combination was cefoxitin (100%), ciprofloxacin (57%) and 38% each to imipenem, 3rd generation cephalosporins, and amoxycillin-clavulanic acid. Fourth generation cephalosporin and tetracycline resistance was observed in nearly 23% and 14% of MDR isolates, respectively. Out of the 10 isolates resistant to cephalosporins, 6 isolates were positive for ESBL production. *Amp*C producers were 31 out of 48 isolates resistant to cefoxitin. Of 24 isolates tested, 5 isolates were positive for *bla*CIT gene and *bla*MOX was detected in 9 isolates. Majority of tetracycline resistant isolates carried *tet*A or *tet*E.

Project

Novel approaches for disease free health certification in finfish and development of high health shrimp for sustainable aquaculture

Period: June, 2022 - May, 2025

Personnel: Gaurav Rathore (PI), Neeraj Sood and Chandra Bhushan Kumar

Funding Support: ICAR-NASF, New Delhi

Detection of *Flavobacterium columnare* specific antibodies

The detection of *F. columnare* specific antibodies in the serum of IMC was done by dot blot. The whole cells of *F. columnare* (10^5 cells/spot) were spotted on nitrocellulose membrane. The blocking was done with blocking buffer (5% skim milk powder) followed by 1 h of incubation at 37 °C. After washing, 1:200 dilution of fish serum immunized was added. MAbs P7D10 (1:10 dilution) was used for detection of antibodies. The bluish green colour spots were seen in fish serum immunized with OMPs of *F. columnare*. Whereas, no colour was seen in the serum of unimmunized fish. The study inferred that the dot blot can detect *F. columnare* specific antibodies in the serum of fish immunized with *F. columnare*. Whereas, in the field samples, no reactivity was observed indicating absence of *F. columnare* infection in tested fishes.

Specificity testing of Monoclonal Antibodies (MAbs)

ELISA plates were coated with whole cells (10^5 cells/ml) of *F. columnare*, *E. tarda*, *A. hydrophila*, *A. dhakenesis*, *E. coli*, and *E. faecalis*. After blocking, 1:200 dilution of serum from fish immunized with *F. columnare* was added. The MAbs P7D10 (1:10 dilution) was used for detection. In immunized fish, the average OD of well coated with *F. columnare* was 1.84 ± 0.24. While, the average OD of well coated with *E. tarda*, *A. hydrophila*, *A. dhakenesis*, *E. coli*, *E. faecalis* was 0.099 ± 0.002, 0.12 ± 0.001, 0.15 ± 0.005, 0.13 ± 0.005 and 0.17 ± 0.006, respectively. In non-immunized fish, the average OD was 0.12± 0.001 for all the 6 tested antigens.

Limit of antigen detection of *F. columnare*

To detect the limit of detection of antigen by P7D10 MAbs, the nitrocellulose membrane was spotted with 10^6, 10^5, 10^4, 10^3, 10^2 and10^1 inactivated whole cells of *F. columnare* per spot. Both immunized and unimmunized serum (1:1000 of dilution) of IMC were used in the test. MAbs P7D10 (1:10 dilution) was used for detection of antibodies. The limit of detection was observed to be 10^4 cells when using serum of immunized fish, whereas no colour was observed in unimmunized fish serum.

Project

Global warming a potential driver of antimicrobial resistance in aquaculture: An *in vitro* study in *Aeromonas hydrophila*

Period: January, 2022 - March, 2025

Personnel: Gaurav Rathore (PI) and Chandra Bhushan Kumar

Funding Support: ICAR-NICRA, New Delhi

Gene expression studies

Differential gene expressions (DEGs) were studied in 2 conditions (Control vs T28 °C and Control vs T40 °C). Annotation of DEGs were performed using BLAST2GO Software. Most of the top downregulated genes identified in response to tetracycline exposure were related to flagellar biosynthesis and flagellar motor proteins.

Downregulation of flagellar proteins in bacteria can have significant implications for their physiology and pathogenicity. Flagella plays crucial role in motility, biofilm formation, and host interactions. Modulating the expression of flagellar genes allows bacteria to adapt to environmental stresses, evade host immune responses, and optimize resource allocation. Highest upregulated gene was *YajL*, which functions as a covalent chaperone that protects cells from oxidative stress by stabilizing proteins and maintaining translational accuracy. The upregulated 2-Dehydropantoate 2-reductase, also known as ketopantoate reductase (KPR), plays a crucial role in maintaining cellular energy metabolism and overall metabolic homeostasis. Upregulated *ZapC* (Z-associated protein C), plays a protective role in maintaining Z-ring stability under conditions where division is otherwise inhibited. Further, threonine efflux proteins, integral membrane transporters that facilitate export of L-threonine from bacterial cells, were also upregulated. These proteins are crucial for maintaining intracellular amino acid homeostasis and preventing toxic accumulation of threonine.

Project

All India network project on fish health

Period: April, 2022 - September, 2026

Personnel: P. K. Pradhan (PI), Anutosh Paria, Gaurav Rathore and Neeraj Sood

Funding Support: ICAR Plan Scheme, New Delhi

Evaluation of efficacy of BKC in hatching and larval survival

Evaluated the efficacy of Benzalkonium Chloride (BKC) in controlling *Aeromonas veronii* infection in fertilized eggs of rohu (*Labeo rohita*) under controlled experimental challenge (10^6 CFU/mL). Eggs were distributed in triplicate groups (30 eggs per tank) and subjected to different BKC bath protocols: prolonged (0.5 ppm), short (5 ppm, 20 min), dip (10 ppm, 2 min), and combination treatments, along with negative and positive controls. Results demonstrated severe pathogenic impact of *A. veronii*, with positive control showing only 10% hatching and nearly 0% larval survival, compared to 89% hatching and 87% survival in negative control (Table 10). It was found that prolonged bath alone or a combination with immersion bath can be effective in treating *A. veronii* infection in eggs and larvae.

Evaluation of therapeutic potential of multiple anti-fungal compounds

Evaluated antifungal efficacy of Iodophore (1.6%) against *Aphanomyces invadans* and *Saprolegnia parasitica* by assessing inhibition of sporulation and hyphal growth across concentrations ranging from 0-128 ppm. Results demonstrated a clear dose-dependent suppression in both pathogens. In *A. invadans*, spore production declined progressively with increasing concentration and was completely inhibited (no detectable spores) at 64 ppm or above, with total hyphal growth inhibition observed at 128 ppm (Fig. 127).

Similarly, *S. parasitica* showed marked reduction in sporulation and radial growth with increasing concentrations, with no detectable spores at 128 ppm and substantial growth restriction >32 ppm. Similarly, Chloramine T-trihydrate exhibited dose-dependent, but partial antifungal activity against both *S. parasitica* and *A. invadans*, without achieving complete inhibition up to 128 ppm. In *S. parasitica*, sporulation showed only modest reduction from control levels (7.2-7.4 × 10^4 spores/mL) to 6.1-6.5 × 10^4 spores/mL at 128 ppm (Table 11), while hyphal growth decreased slightly from 5.8-5.9 cm to 5.0-5.1 cm. Similarly, in *A. invadans*, spore production declined moderately from 4.1 × 10^4 to 2.7-2.8 × 10^4 spores/mL at 128 ppm, and colony radius reduced from 2.0 cm to 0.95-1.0 cm. Overall, Chloramine T-trihydrate demonstrated moderate sub-MIC activity, producing measurable but incomplete suppression of both sporulation and hyphal growth in the tested oomycetes.

Table 10. Efficacy of BKC bath treatments on hatching success and larval survival against *A. veronii* challenge in rohu

Groups	Hatching %	Larval Survival %
Negative Control	88.8	86.6
Positive Control	10	0
Prolong Treatment	95.5	93.3
Immersion Treatment	62.2	38
Dip Treatment	33.3	0
Immersion + Dip Treatment	84.4	89.7
Dip + Prolong Treatment	92.2	87.7

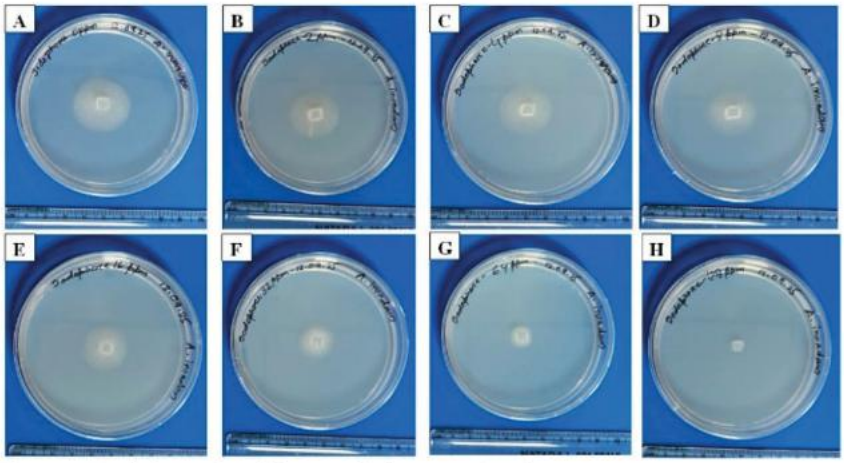


Fig. 127. Hyphal growth inhibition of *Aphanomyces invadans* at increasing concentrations of Iodophore: (A) 0 ppm (control); (B) 2 ppm; (C) 4 ppm; (D) 8 ppm; (E) 16 ppm; (F) 32 ppm; (G) 64 ppm; (H) 128 ppm

Table 11. Evaluation of therapeutic potential of Chloramine T-Trihydrate against *Saprolegnia parasitica*

Conc. (ppm)	Spore/mL		
	Exp. I	Exp. II	Mean
0 (Control)	7.2×10^4	7.4×10^4	7.30×10^4
2	7.2×10^4	7.4×10^4	7.30×10^4
4	7.4×10^4	7.3×10^4	7.35×10^4
8	7.2×10^4	7.4×10^4	7.30×10^4
16	7.1×10^4	7.2×10^4	7.15×10^4
32	6.9×10^4	7.0×10^4	6.95×10^4
64	6.8×10^4	6.9×10^4	6.85×10^4
128	6.1×10^4	6.5×10^4	6.30×10^4

Project

CRP on vaccines and diagnostics: Development of point-of-care diagnostic kit and vaccine against Tilapia Lake Virus

Period: January, 2023 - March, 2026

Personnel: Anutosh Paria (PI), Neeraj Sood and P. K. Pradhan

Funding Support: ICAR Plan Scheme, New Delhi

Immunization of Nile tilapia with inactivated TiLV

Juveniles of Nile tilapia were immunized with either heat (50°C for 2.5 h) or formalin-inactivated TiLV (0.05% formalin for 24 h) in conjunction with Freund's Adjuvants. For carrying out immunization trial, juveniles were divided into 4 groups: Naïve control, adjuvant control, heat-inactivated group and formalin-inactivated group; each group containing 90 fish. Initially, fish were immunized with inactivated TiLV and Freund's complete adjuvant by intraperitoneal injection and a booster dose was given after 4 weeks in conjunction with Freund's incomplete adjuvant. Nile tilapia vaccinated with inactivated TiLV showed less or no typical clinical signs, such as bilateral exophthalmia, swollen abdomen, scale protrusion, etc. (Fig. 128). As observed from the experimental challenge followed by immunization, a delayed infection with cumulative mortality of 29% was recorded in the immunized group challenged with heat-inactivated TiLV, while 41% mortality was recorded in formalin-inactivated TiLV group. In comparison, 87% mortality was recorded in control group (Fig. 129).

Development of MAb against TiLV

For development of a MAb specific against TiLV, the TiLV was initially propagated in bulk in Nile tilapia heart (OnH) cell line and supernatant was collected. TiLV was purified by ultracentrifugation of filtered supernatant at 149000 g for 2.5 h. Resultant pellet was resuspended in PBS and purified virus revealed prominent band in SDS PAGE (Fig. 130).

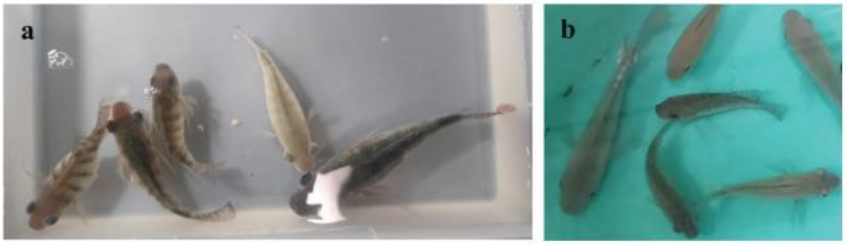


Fig. 128. Clinical signs in Nile tilapia at 8-days post challenge with TiLV: control fish (a), fish immunized with heat-inactivated TiLV (b)

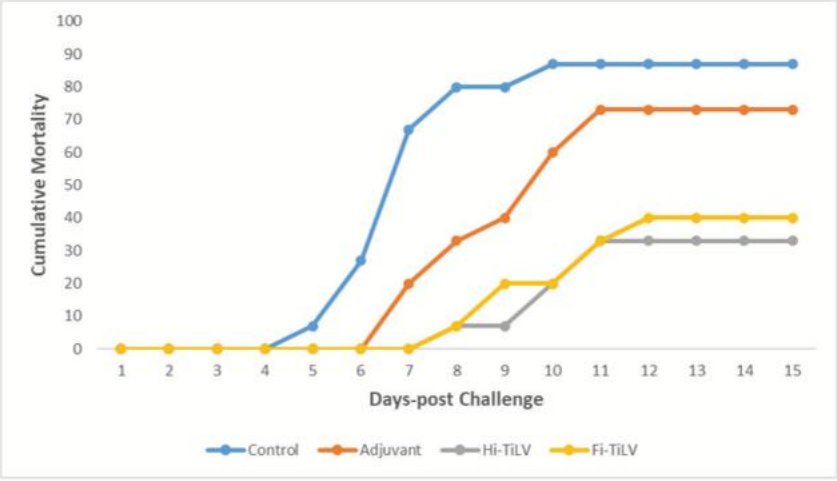


Fig. 129. Cumulative mortality of Nile tilapia under different experimental groups

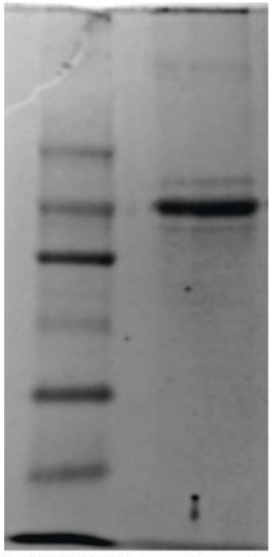


Fig. 130. SDS PAGE of purified virus

BALB/c mice was immunized with 100 µg of purified TiLV along with Freund's complete adjuvant. Three booster doses with same dose of TiLV with Freund's incomplete adjuvant were given at 2 weeks interval. The serum antibody titre of the BALB/c mice determined through an indirect ELISA showed moderately high level of serum Ig level against TiLV with titre till 1:12800 (Fig. 131). Splenocytes from immunized BALB/c mice with TiLV were fused with SP 2/0 myeloma cells for generating hybridomas specific to TiLV.

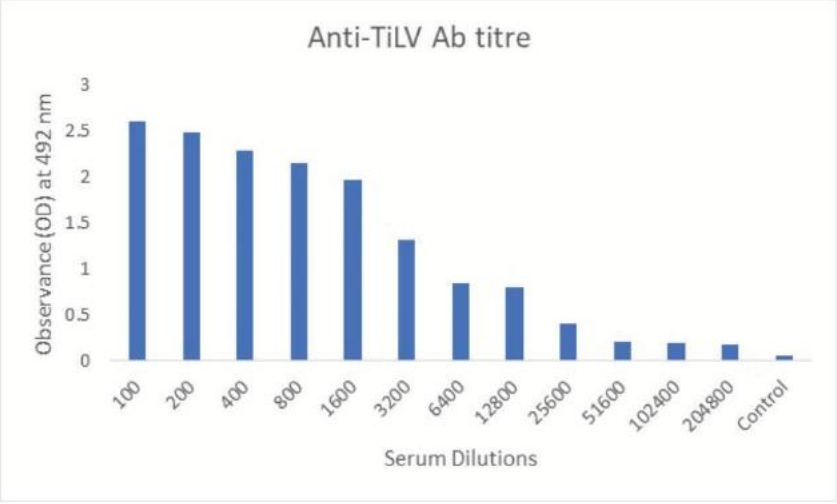


Fig. 131. Serum Ig titre in mice against TiLV

Project

Development of monoclonal antibody-based assay for detecting *Edwardsiella ictaluri* infection in fish

Period: April, 2025 - March, 2028

Personnel: Chandra Bhushan Kumar (PI), Neeraj Sood, Gaurav Rathore and P.K. Pradhan

Funding Support: Institutional, ICAR-NBFGR

Edwardsiella ictaluri, a Gram-negative intracellular devastating bacterial pathogen, affects several fish species and is the cause of Bacillary Necrosis in Pangasius (BNP) in several countries. Under NSPAAD, this pathogen was detected, causing large-scale mortality (70-80%) in farmed pangas. To date, there are no assays developed for detection of this pathogen in the country. Immunoassays utilising monoclonal antibodies (mAb) are known for high specificity, sensitivity, consistency, and reproducibility, and are being used in point-of-care diagnostics. Hence, the objective of this study is to develop mAb against *E. ictaluri* that will be useful for detection of *E. ictaluri* infection in fish.

Preparation of formaldehyde-killed whole cell (FK-WC) *E. ictaluri*

Edwardsiella ictaluri PKV1 was revived and inactivated using formaldehyde. Briefly, a single colony was inoculated in Tryptic Soy broth. After desired bacterial growth in the medium, the bacterial suspension was pelleted down and resuspended into 1X

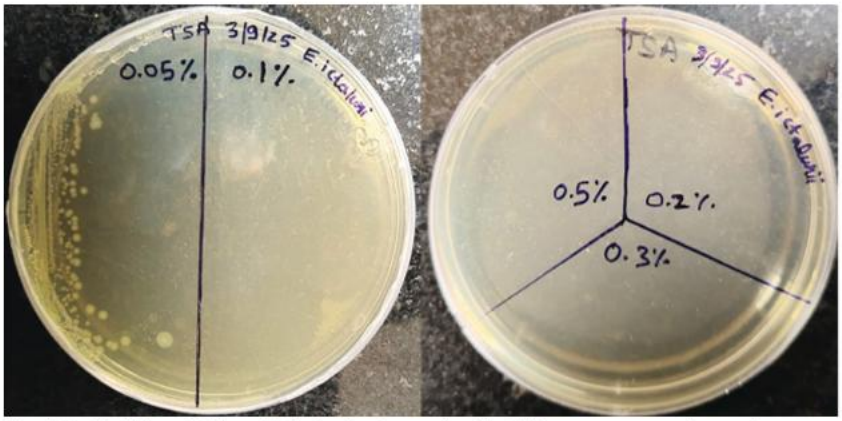


Fig. 132. Viability of *Edwardsiella ictaluri* treated with different concentrations of formaldehyde

PBS of 10^8 CFU/mL. Thereafter, aliquots were treated with 0.05, 0.1, 0.2, 0.3, 0.5 % (v/v) of formaldehyde and incubated overnight. Viability of bacteria was checked by visible growth on Tryptic Soy Agar (TSA). The results showed that ≥ 0.1 % formaldehyde killed the bacterium (Fig. 132).

Purification of outer membrane protein (OMP) and its comparison with whole cell proteins

Outer membrane proteins of *E. ictaluri* PKV1 (E-OMPs) were purified following standard method. Briefly, PKV1 stain was cultured, and bacterial suspension was pelleted down followed by washing thrice with chilled PBS. The pellet was resuspended in HEPES buffer with PMSF and sonicated. After sonication, the supernatant was collected and subjected to ultra-centrifugation at 100000 × g at 4°C for 1 h. The pellet obtained was dissolved with HEPES buffer and sodium lauryl sarcosine, and ultra-centrifuged. Thereafter, the pellets were dissolved in chilled PBS for further analysis. Several batches were processed to get desired protein concentrations sufficient for immunisation. The protein concentration was estimated by Bradford method. The protein concentration was 2.24 ± 0.79 kDa. E-OMPs were analysed in SDS-PAGE. The number of protein bands in whole cell proteins were >33, and the bands in the purified OMPs were around 16. Out of 16, 4 major protein bands were visualised.

Immunization of BALB/c mice

BALB/c mice were immunized with purified E-OMPs using standard procedure. Briefly, individual mice were intraperitoneally injected with 0.1 mL of E-OMPs, following the guidelines of the Committee for Control and Supervision of Experiments on Animals, Government of India (Fig. 133). The initial dose of immunogens was emulsified in Freund's complete adjuvant, followed by 3 booster doses with Freund's incomplete adjuvant at 2-week intervals. A final booster without adjuvant was administered before fusion.

Determination of antibody titre of immunized mice

After 3rd booster, the blood was drawn from anesthetized mice. Blood was kept for 30 min at ice and centrifuged at 4000 rpm for 10 min at 4°C, and serum was collected. The collected serum from mice was used for estimating anti-*E. ictaluri* titre by indirect ELISA. Before estimating the titre, indirect ELISA was standardised. Briefly, E-OMP was coated on to 96 well ELISA plate for overnight incubation. The wells were washed with 1X PBST thrice, blocking was done with blocking buffer (3% BSA in 1X PBST) and incubated at 37°C for 1 h. After incubation, washing was done and serum was added into the wells at serial dilutions from 1:100 to 1:204800. Anti-mouse IgG conjugated with peroxidase enzyme and O-Phenylenediamine dihydrochloride substrate was added to the wells. Thereafter, reaction was stopped after 30 mins with 1M H_2SO_4, and absorbance was recorded at 492 nm. The antibody titre of the mice is shown in Fig. 134. The mice showing highest titre of serum dilutions (1:100, 1:200, 1:400, 1:800, 1:1600, 1:3200, 1:6400, 1:12800) were selected for hybridoma production.



Fig. 133. Immunization of BALB/c mice with E-OMPs

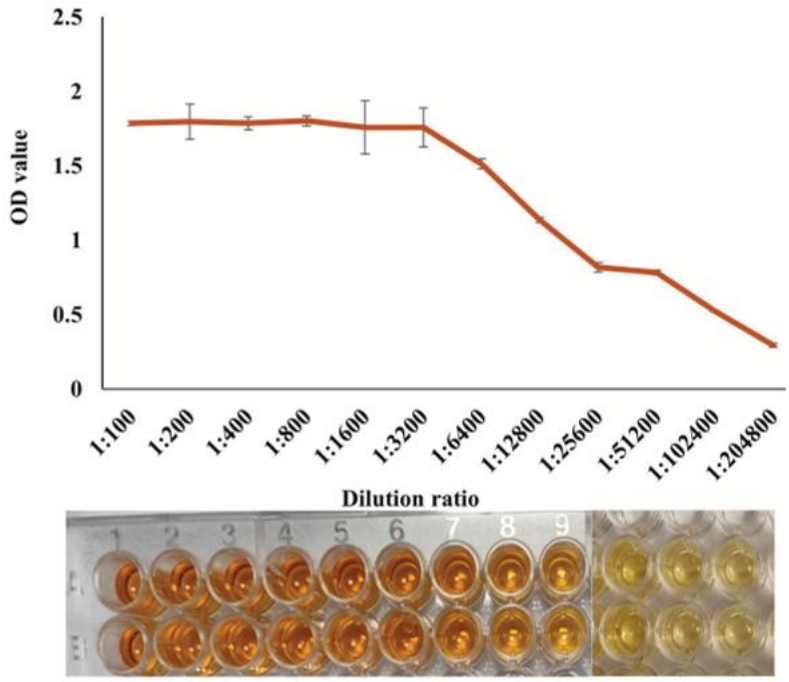


Fig. 134. Antibody titre of OMP-immunised mice against E-OMPs

Project

Assessment of exotic fishes' prevalence and their impacts on indigenous fish diversity

Period: April, 2023 - March, 2026

Personnel: Tarachand Kumawat (PI), V.S. Basheer, Sharad K. Singh, Achal Singh, Ajey K. Pathak, Divya P.R., Aditya Kumar, Anutosh Paria, Ranjana Sinha, Ravi Kumar and Vikash Sahu

Funding Support: Institutional, ICAR-NBFGR

Freshwater ecosystems across India are increasingly influenced by biological invasions, particularly by non-native fish species introduced for aquaculture, fisheries enhancement, or accidental release. Understanding the magnitude and consistency of their ecological impacts is essential for effective conservation and management. To address this, a quantitative meta-analysis was conducted to synthesize empirical and model-based evidence on the impacts of invasive fishes on native freshwater assemblages across Indian ecosystems. This yielded 126 records. Studies were grouped into 3 categories: (i) those assessing invasive fish dominance and community restructuring, (ii) those evaluating production–biodiversity trade-offs, and (iii) those lacking sufficient data for effect-size estimation, used for secondary synthesis and mechanistic interpretation. Following screening and data extraction, 11 studies were included, generating 21 independent effect sizes representing impacts across diverse freshwater habitats, including reservoirs, rivers, ponds, lakes, and mixed freshwater systems. Reservoir systems contributed the largest number of observations, followed by rivers, ponds, and lakes. The dataset included several major invasive taxa, most prominently *Oreochromis mossambicus*, *Clarias gariepinus*, and *Cyprinus carpio*, as well as multi-species invasive assemblages. Response variables included native fish abundance, biomass, catch composition, species richness, and diversity indices derived from field surveys, long-term fishery records, and ecosystem modelling outputs. Standardization using the log response ratio (lnRR) enabled comparison of proportional changes in native assemblages between invaded and reference conditions.

The random-effects meta-analysis revealed a strong and statistically significant negative overall effect of invasive fishes on native freshwater assemblages. The pooled effect size was −0.88 (95% CI: −1.13 to −0.64), indicating substantial reductions in native fish abundance, diversity, or productivity in invaded systems. The confidence interval did not overlap zero, and the probability value was highly significant ($p < 0.001$), demonstrating a consistent pattern of adverse ecological impacts associated with invasive fish presence. Moderate heterogeneity was observed among studies ($I^2 \approx 40\%$), indicating variation in effect magnitude across ecosystems and assessment contexts while maintaining a consistent direction of impact. This variability likely reflects differences in invasive species identity, invasion intensity, trophic interactions, and local environmental conditions.

Species-specific patterns

The forest plot illustrated that most individual effect sizes were negative, reinforcing strong overall pattern of invasive-driven decline in native assemblages

(Fig. 135). Studies involving *O. mossambicus* consistently exhibited negative effect sizes across multiple ecosystems, highlighting its strong competitive and reproductive capacity in invaded habitats. Similarly, *C. gariepinus* showed pronounced negative impacts, likely due to its predatory behaviour and ecological dominance. In contrast, studies involving *C. carpio* displayed more variable responses, with some reporting moderate negative impacts and others showing weaker or context-dependent effects. Studies examining multiple invasive species simultaneously reported consistently negative outcomes, indicating cumulative or synergistic pressures on native fish communities.

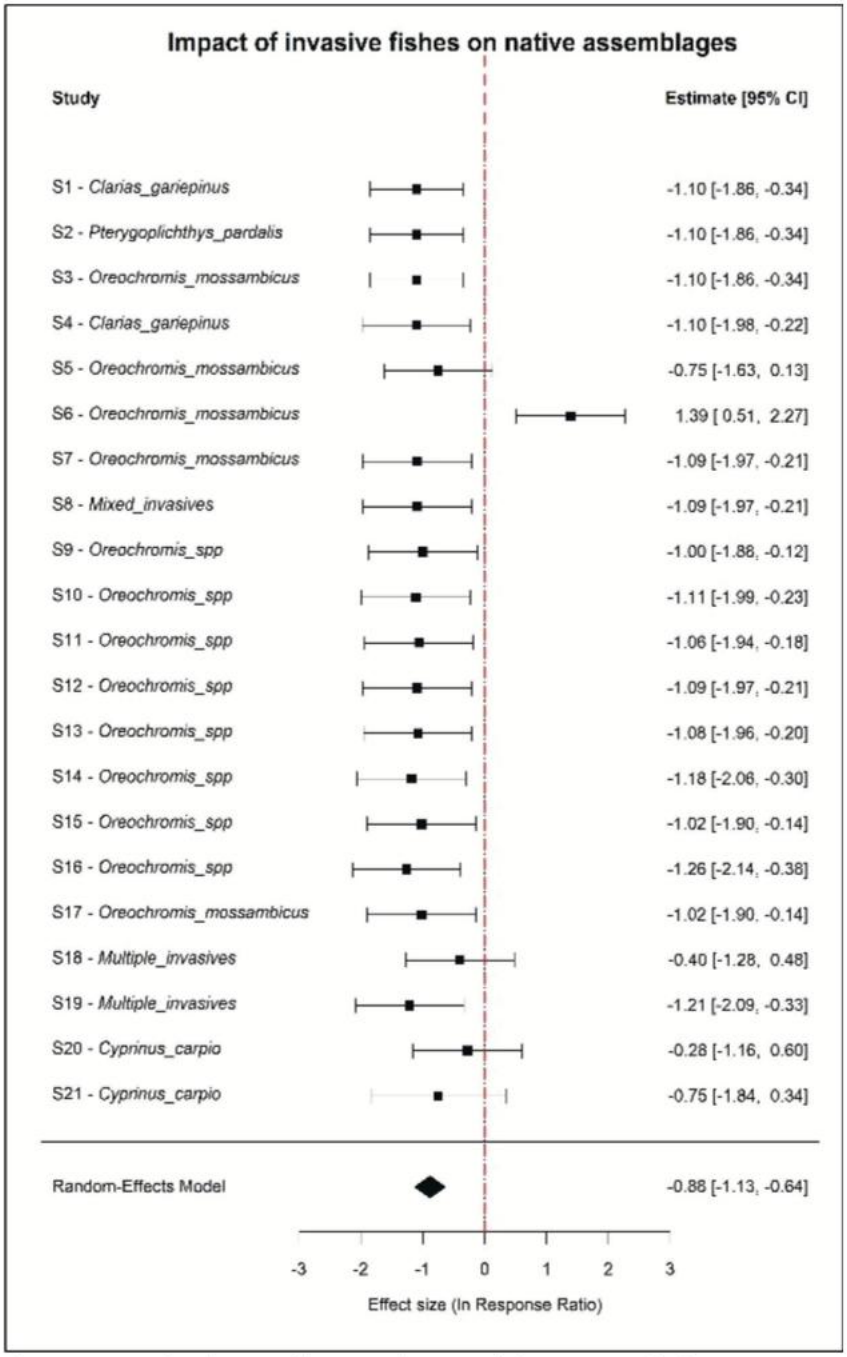


Fig. 135. Forest plot showing effect sizes of invasive fishes on native freshwater assemblages across Indian ecosystems.

Ecosystem-level variation

Negative impacts of invasive fishes were observed across all freshwater ecosystem types included in analysis (Fig. 136). Reservoirs and rivers exhibited particularly strong negative responses, suggesting that hydrologically connected and intensively used systems may be more vulnerable to invasion impacts. Lakes and ponds showed slightly more variable responses but still demonstrated overall negative trends. These patterns highlight the role of ecosystem characteristics, connectivity, and anthropogenic pressures in shaping invasion outcomes.

Leave-one-out sensitivity analysis confirmed the robustness of the meta-analytic findings. Sequential removal of individual studies resulted in pooled effect sizes that remained consistently negative and statistically significant. This indicates that the overall conclusion was not driven by any single assessment. Minor fluctuations in between-assessment variance was observed, but the direction and magnitude of the pooled effect remained stable across all iterations. Influence diagnostics further supported model stability (Fig. 137). Most studies showed low leverage and balanced contributions to the overall model, with only one assessment exhibiting moderate influence on heterogeneity estimates. However, removal of this assessment did not alter the overall inference, confirming the reliability of the pooled effect size.

Funnel plot analysis revealed a relatively symmetrical distribution

of effect sizes around the pooled estimate (Fig. 138). Although minor asymmetry was observed, likely reflecting ecological variability among studies, there was no strong evidence that publication bias substantially influenced the overall results. Both large and small studies consistently reported negative effects of invasive fishes on native assemblages.

Overall, quantitative synthesis provides compelling evidence that invasive fishes exert significant and consistent negative impacts on native freshwater fish assemblages across India. The strong pooled negative effect observed across diverse ecosystems underscores the ecological risks associated with continued introductions and spread of invasive fishes.

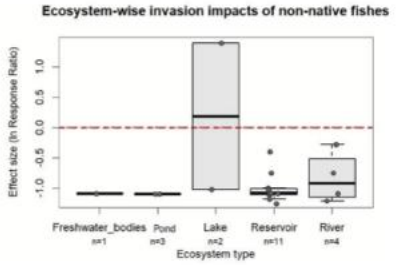


Fig. 136. Ecosystem-wise variation in the impact of invasive fishes on native assemblages.

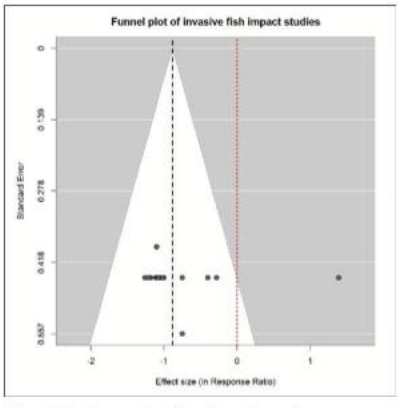


Fig. 138. Funnel plot showing the distribution of effect sizes (ln response ratio, lnRR) against standard error for studies included in the meta-analysis.

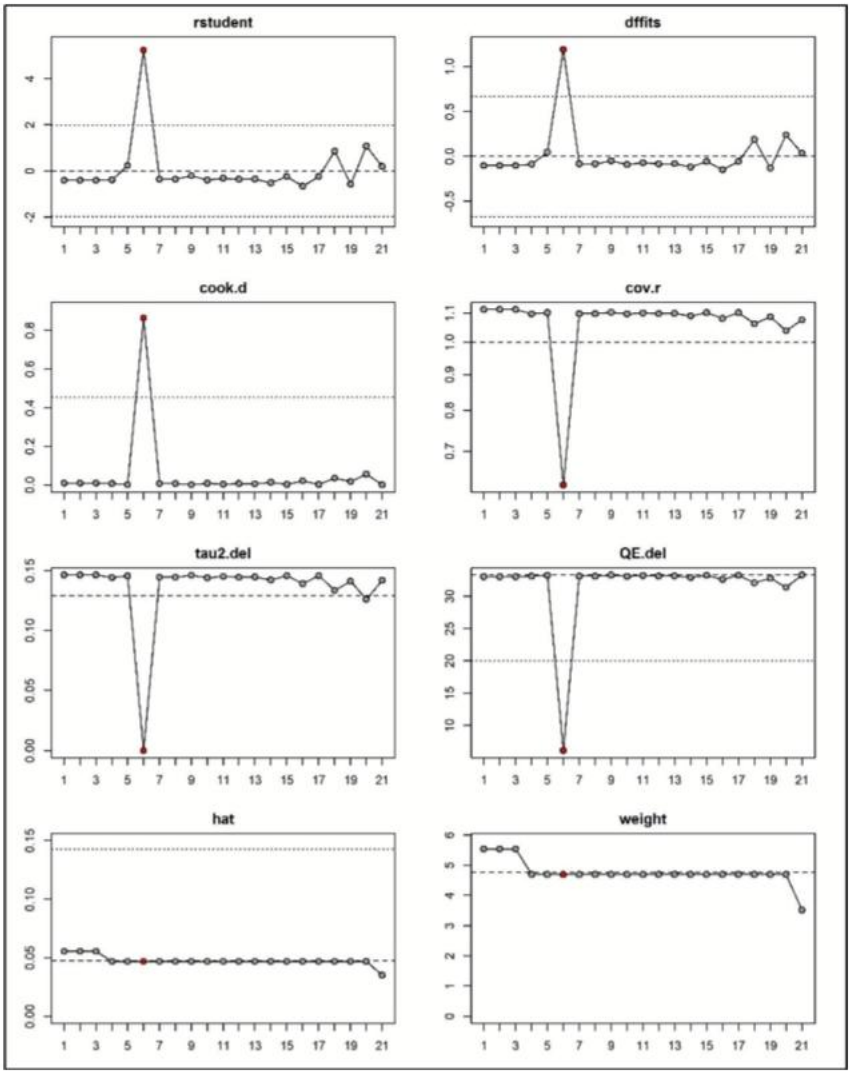


Fig. 137. Influence diagnostics plot assessing the impact of individual studies on the meta-analysis.

Project

Understanding the association of gut microbiome with *Enterocytozoon hepatopenaei* (EHP) infection in inland saline shrimp culture system

Period: February, 2024 - March, 2026

Personnel: Anutosh Paria (PI), Neeraj Sood and P.K. Pradhan

Funding Support: ICAR-NBFGR Corpus Fund

Hepatopancreatic microsporidiosis (HPM), caused by microsporidian *Enterocytozoon hepatopenaei* (EHP), is an emerging pathogen responsible for substantial economic losses in penaeid shrimp aquaculture worldwide. Importantly, EHP has been identified as the major cause of losses in shrimp farms due to retarded growth in shrimp in inland saline culture systems and is considered a major constraint

to the growth of inland shrimp culture.

Sample selection for microbiome sequencing

Two sampling trips were conducted in 3 different districts of Haryana (Rohtak, Sirsa and Jhajhar) and samples were collected from 30 farms, where 9 farms tested positive for EHP (First step positive: 1; Second step positive: 8). The intestine from collected shrimp samples were further subjected to targeted microbiome analysis (16S rRNA) in Illumina MiSeq platform.

Gut microbiome profile of *Penaeus vannamei*

To understand the microbial dynamics in gut of *P. vannamei* cultured in inland saline shrimp farms with progression of the culture duration, a total of 9 samples (3 samples each for 30, 60 and 90 days) were analyzed. It was observed that diversity of bacteria (alpha diversity) was highest at 30 days which gradually decreased to minimum at 90 days (Fig. 139). Moreover, the bacterial group representing *vibrio* became dominant as the culture period increased (Fig. 140)

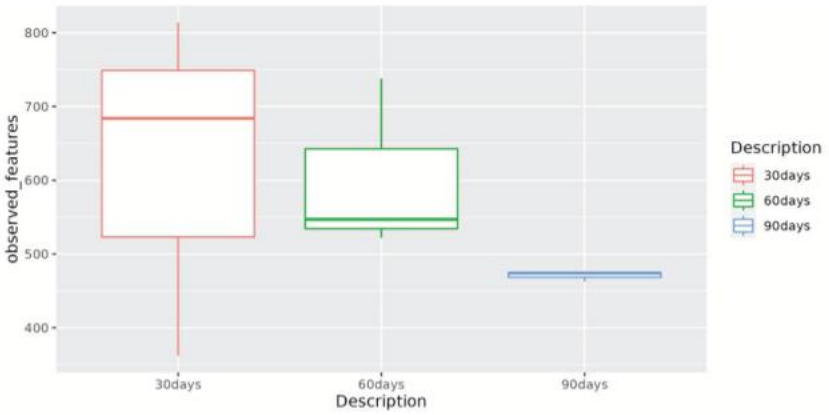


Fig. 139. Bacterial diversity in gut of *Penaeus vannamei* at different culture periods

Gut microbiome profile of EHP-positive and EHP-negative *P. vannamei*

A comparative analysis of the gut microbiome profiles of 9 EHP-positive samples with 6 EHP-negative samples showed that, although the dominant bacterial representation by 2 major orders i.e. Lactobacillales and Bacteriodales (Porphyromonas) are similar in both EHP-positive and EHP-negative groups, however harmful bacterial representative from the orders Vibrionales, Pseudomonadales and Aeromonadales is significantly higher in EHP-positive shrimps (Fig. 141)

Gut microbiome profile in EHP-Positive *P. vannamei* cultured in inland saline farms

For identifying any possible bacterial group associated with growth retardation in EHP-positive shrimps cultured in inland saline shrimp farms, 4 EHP-positive samples with growth retardation were compared with 4 EHP-positive samples without growth retardation. For both the groups, most of the dominant bacterial phyla were found to be similar, however abundance

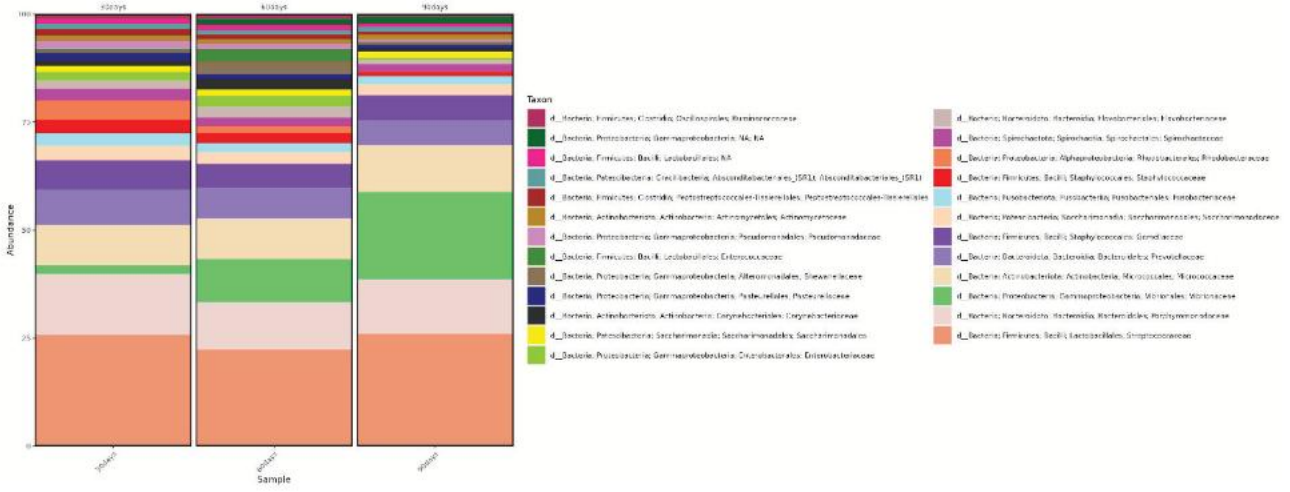


Fig. 140. Family-level bacterial diversity at different culture periods

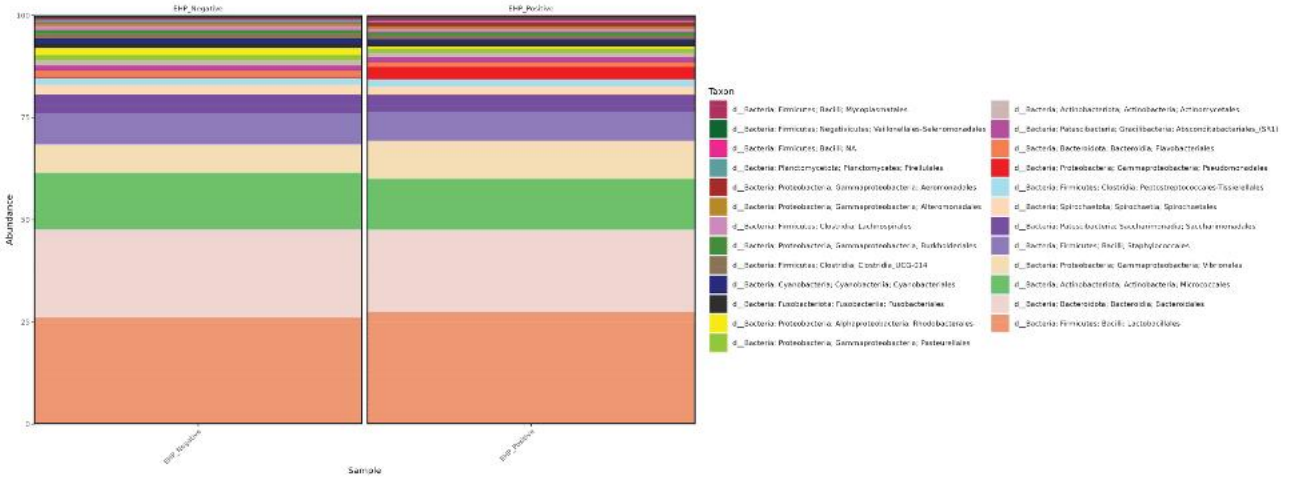


Fig. 141. Order-level bacterial diversity in EHP-positive and EHP-negative *Penaeus vannamei*

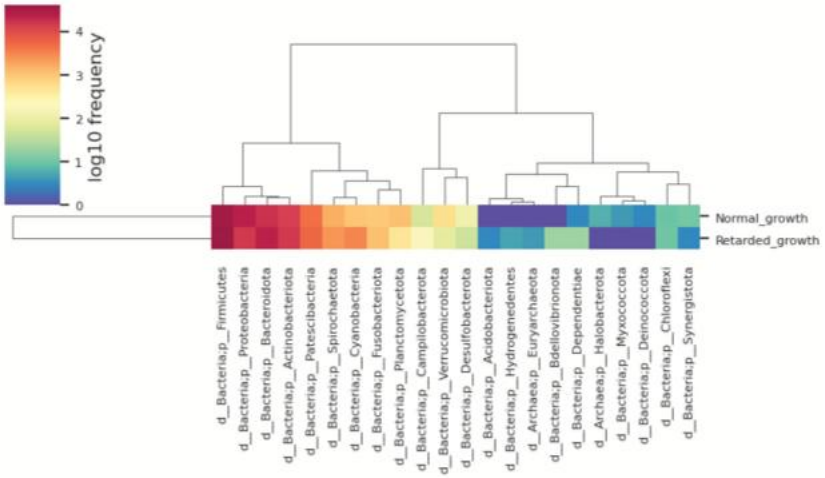


Fig. 142. Heatmap of different bacterial groups in EHP-positive *Penaeus vannamei* with or without growth retardation

of Cyanobacteria was relatively higher and Bdellovibrionota was lower in EHP-positive shrimps with growth retardation in comparison to the EHP-positive shrimps with normal growth (Fig. 142).

Project

Elucidating the role of temperature on immune response and susceptibility of *Pangasianodon hypophthalmus* against infection with *Saprolegnia parasitica*

Period: February, 2024 - March, 2026

Personnel: Chandra Bhushan Kumar (PI), P.K. Pradhan and Neeraj Sood

Funding Support: ICAR-NBFGR Corpus Fund

The striped catfish, *Pangasianodon hypophthalmus* locally called pangas, is a widely cultured fish due to its rapid growth, low price, and high market demand. During winter, saprolegniosis associated mortality in pangas is a major challenge for farmers. This study aimed to elucidate the effect of water temperature on immune response and heat shock protein genes in pangas, and determining the expression of immune genes in pangas challenged with *Saprolegnia parasitica* at different temperatures.

Fingerlings of pangas were procured and acclimatised under laboratory condition for 2 weeks before experiment. For deducing the effect of temperature, a protocol was developed and standardised to conduct low-temperature experiment. Thereafter, fish were allocated at 28°C, 22°C and 16°C water temperatures. Following exposure of fish to these designated temperatures, sampling of fish was done at 1, 7 and 14 days. Briefly, fish was euthanised with MS-222

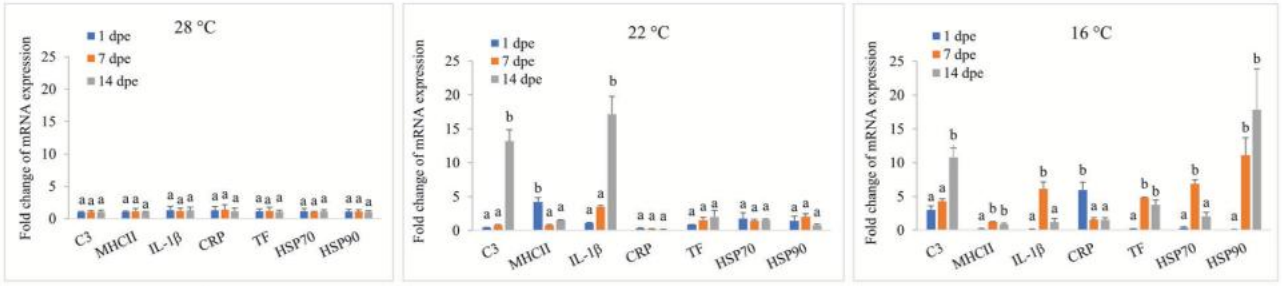


Fig. 143. Expression of genes in *Pangasianodon hypophthalmus* exposed to 28°C, 22°C and 16°C.

(250 mg/L), and kidney tissue from individual fish was collected in RNAlater® solution, and tissues were stored at -80°C for further analysis. Total RNA extraction from tissues followed with cDNA synthesis was done as per standard procedure. Previously reported primers of innate immune (*CRP, C3, MHC-II, IL-1β, transferrin (TF)*), housekeeping and *HSP 90* genes were used for gene expression study. A new primer set for *HSP 70* gene of *P. hypophthalmus* was designed (XM_026934573.3).

Effect of water temperature on gene expression in pangas

The expression of immune and heat shock protein genes in pangas post exposure (dpe) to 28°C, 22°C and 16°C was determined at 1, 7 and 14 days. The lowest water temperature (16°C) showed significant upregulation ($p< 0.05$) of *CRP, C3, MHC-II, IL-1β, TF, HSP 70* and *HSP 90* genes. At 22°C, significant upregulation ($p< 0.05$) of *C3, MHCII* and *IL-1β* was observed. Importantly, no genes were upregulated at 28°C. The upregulation of genes at lower temperature suggests that fish can moderately adapt to cold stress (Fig. 143).

Immune gene expression in pangas following *S. parasitica* infection

Susceptibility of pangas against *S. parasitica* infection and expression of immune genes at 3 different temperatures, 28°C, 22°C and 16°C was assessed. In this regard, fingerlings of pangas were maintained at designated water temperatures and were marked as infected, control and Relative Percent Survival (RPS) groups. Sampling and collection of fish tissues was done at 6, 12, 24, 48 and 72 h from control and infected groups (Fig. 144a). Sample preservation, RNA extraction and cDNA preparations were done. Briefly, before the experiment, *S. parasitica* PB1 was revived, and identity confirmed by ITS amplification and Sanger sequencing. *S. parasitica* zoospore germination was checked, and LD_{50} of *S. parasitica* zoospore was determined at 16°C, *viz.*, 5 x 10^5/L. This LD_{50} dose was used in challenging fish to *S. parasitica* zoospores by ami-momi treatment. In control groups, fish were treated like infected groups without zoospores. RPS groups were used for recording the mortality of fish during experiment. Primarily, fish infected with *S. parasitica* at lower temperatures exhibited prominent clinical signs of cotton wool-like growth on skins and eyes (Fig. 144b). However, lesions at 16°C in fish were more pronounced and visible earlier than in fish exposed to 22°C, whereas no lesion was observed during the experiment at 28°C.

Compared to control, at 28°C, *C3, MHCII, TF* showed significant upregulation ($p< 0.05$) in pangas challenged with *S. parasitica*. At



Fig. 144. Collection of tissues for gene expression analysis (a), cotton-wool like growth in experimentally challenged *P. hypophthalmus* with *S. parasitica* PB1 zoospores (b).

22°C, all except *CRP* gene were significantly upregulated. In contrast, at 16°C, almost all genes were significantly downregulated. The results suggest that the pangas exposed to lower temperature, especially at 16°C are more prone to infection with *S. parasitica*. Hence, suggesting farmers either to avoid rearing pangas during extreme winter conditions or temperature of pond water to be maintained above 22°C.

Project

Development and evaluation of autogenous inactivated vaccine against *Aeromonas* sp. and *Edwardsiella tarda* in oscar fish (*Astronotus ocellatus*)

Period: February, 2024 - March, 2026

Personnel: Arun Sudhagar S. (PI), Anutosh Paria and Rekha M. U.

Funding Support: ICAR-NBFGR Corpus Fund

The developed bivalent vaccines provided robust protection against dual bacterial challenge (*Aeromonas jandaei* and *Edwardsiella tarda*) in oscar fish, with high relative percent survival (RPS) values of 92.6% for formalin-inactivated vaccine (VFI) and 82.5% for heat-inactivated vaccine (VHI). These findings clearly indicate strong protective efficacy of both vaccine formulations and underscore their potential for effective disease management in aquaculture systems.

Biochemical analyses revealed that vaccinated groups maintained significantly lower

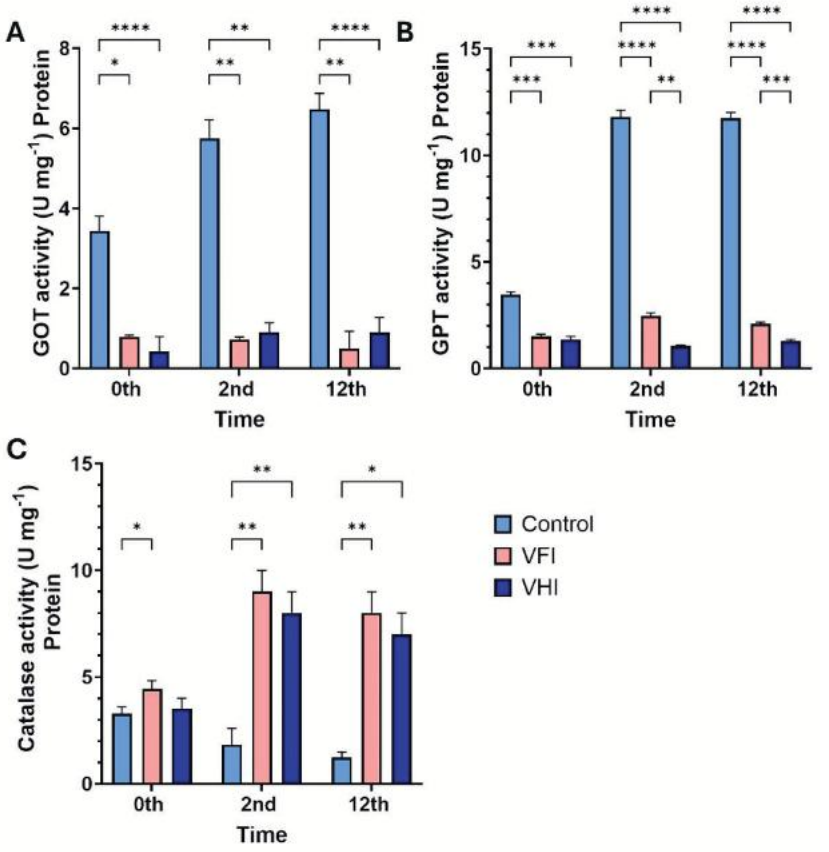


Fig. 145. Biochemical (GOT, GPT) and oxidative stress (catalase) parameters in control, VFI, and VHI groups at 0, 2, and 12 days post-challenge in oscar fish

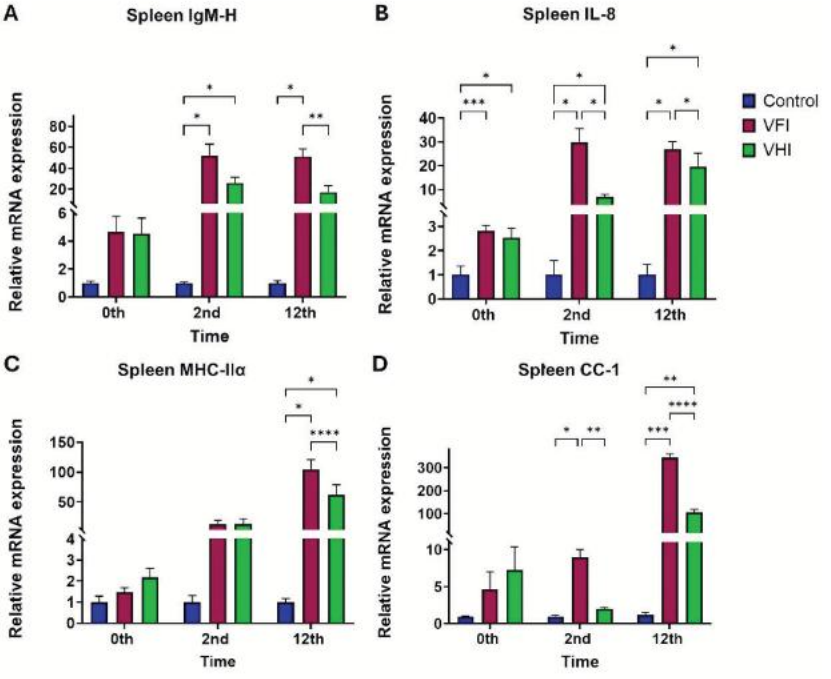


Fig. 146. Relative expression of immune-related genes in the spleen of oscar fish immunized with VFI and VHI at 0, 2, and 12 days post-challenge

levels of glutamate oxaloacetate transaminase (GOT) and glutamate pyruvate transaminase (GPT) compared to the control group ($p< 0.05$), suggesting reduced hepatic damage following pathogen challenge. In addition, increased catalase activity in vaccinated fish indicated an enhanced antioxidant defence system, highlighting the role of vaccination in mitigating infection-induced oxidative stress (Fig. 145).

Molecular investigations involved successful design and optimization of qPCR primers targeting key immune-related genes, including *IgM-H*, *Interleukin-8* (IL-8), *Major histocompatibility complex-IIα* (MHC-IIα), and *Chemokine*-1 (CC-1). The primers exhibited high efficiency (104-108%), strong linearity ($R^2 \geq 0.94$), and specific amplification with single-peak melt curves, ensuring reliable quantification of gene expression. Gene expression analysis further revealed significant upregulation of these immune-related genes in spleen and kidney tissues, indicating activation of both innate and adaptive immune responses following vaccination and bacterial challenge (Figs. 146, 147). Vaccinated fish showed significantly higher pathogen-specific antibody titres over a 5-week period post-booster ($p< 0.05$), confirming induction of a strong and sustained humoral immune response against *A. jandaei* and *E. tarda* (Fig. 148).

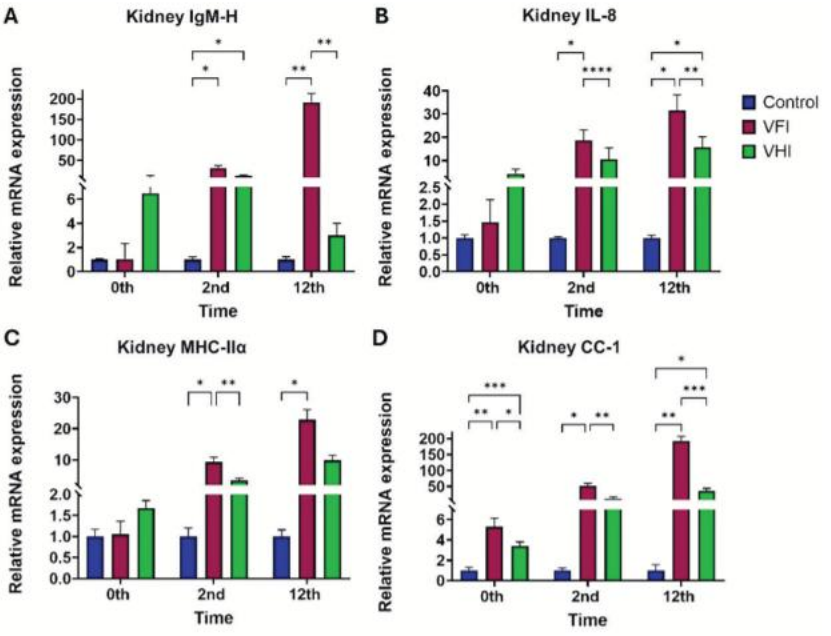


Fig. 147. Relative expression of immune-related genes in the kidney of oscar fish immunized with VFI and VHI at 0, 2, and 12 days post-challenge

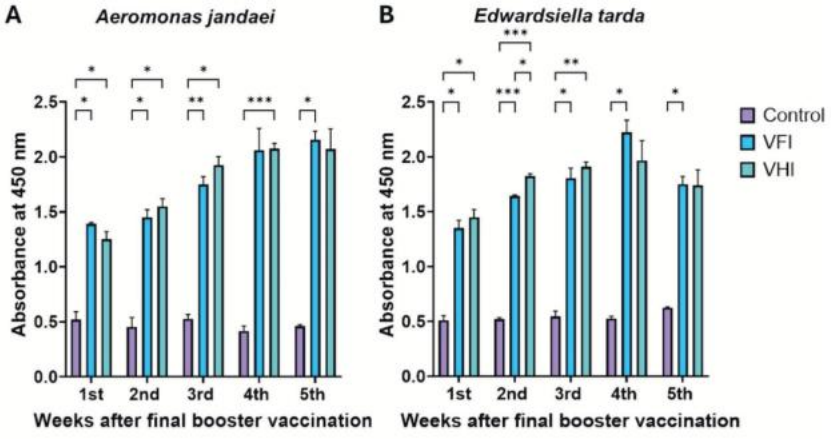


Fig. 148. Specific serum IgM antibody levels in oscar fish immunized with VFI, VHI and control

Workshop/Conference/Seminar/ Symposia/Training/Meeting Organized



Vocational training courses for development of entrepreneurial skills

Three vocational training courses, each for 10 days duration, were conducted in collaboration with ICAR KVK Hailakandi, Assam, under the NEH Scheme at 3 different locations in Hailakandi district of Assam (MHCM Science College, Algapur; Lala FPC; and State Institute of Panchayat and Rural Development) during January 22-31, 2025; February 17-26, 2025, and March 10-19, 2025 to improve the entrepreneurial skills of fish farmers and UG/PG/Ph.D. students. Various topics, namely scientific aquaculture practices, water quality management, pre- and post-stocking management, carp hatchery management, entrepreneurial opportunities in aquaculture, common fish disease and health management, PMMSY benefits, and hands-on demonstration of water quality testing using water testing kits were covered. Moreover, disease reporting using ReportFishDisease app and use of CIFAX for disease prevention were demonstrated.



Hands-on demonstration on water quality parameters

Entrepreneurial skill development in clownfish aquaculture

Three entrepreneurial skill development programmes on clownfish aquaculture were organized at: (i) Rajiv Gandhi Centre for Aquaculture campus, Uppoor, Ramanathapuram, Tamil Nadu during February 19-20, 2025; 25 participants; (ii) Dept. of Marine Sciences camps, Sethupathi Govt Arts and Science College, Ramanathapuram, Tamil Nadu, during February 21-22, 2025; 25 participants; (iii) School of Marine Sciences Alagappa University, Thondi Campus, Ramanathapuram district, Tamil Nadu, during March 08-09, 2025; 50 participants.

Program on clownfish aquaculture

A 'Hands-on learning program on clownfish aquaculture' was organised for SC/ST women (50 beneficiaries) with the funding support of the Department of Science and Technology, Govt. of India and Tamil Nadu State Council for Science and Technology at ICAR-NBFGR & DST Hatchery Facility for Marine Ornamentals, Annamalai University, Parangipettai, Tamil Nadu during March 15-16, 2025.



Participants at School of Marine Sciences Alagappa University, Thondi







Glimpses of the hands-on training programme

Awareness-Cum-Workshop on ReportFishDisease app

An 'Awareness-Cum-Workshop on ReportFishDisease app for strengthening farmer-based fish disease surveillance' was organized under National Surveillance Programme for Aquatic Animal Diseases funded by PMMSY in Barabanki, Uttar Pradesh on June 12, 2025. Major fish diseases and their management measures were explained and the app was demonstrated in the workshop for reporting of fish diseases. A total of 124 fish farmers participated.

Review meeting of North East research program

A review meeting cum workshop on 'Participatory programme on exploration, characterization and conservation of fish germplasm resources and indigenous knowledge in North-Eastern region of India' was organized, in hybrid mode at College of Fisheries, Lembucherra, Agartala, Tripura on July 11, 2025. Progress under 10 completed projects was reviewed with particular emphasis on research outputs in the form of manuscripts. In addition, concept notes for 15 proposed projects for upcoming phase were presented by identified partner institutions.

Workshop on fisheries biotechnology & genetic improvement program in aquaculture

A workshop on 'Fisheries biotechnology & genetic improvement program in aquaculture' was organised to sensitise students and young researchers about current research advancements and tools used in fisheries biotechnology and genetic improvement programs in aquaculture. The program was





Glimpses of the workshop



Participants of NE review meeting

organized in collaboration with Department of Biotechnology, SRM Institute of Science and Technology, Chennai at Chennai on July 16, 2025. Prof. Dr. M. Krishnan, Vice Chancellor, Central University of Tamil Nadu, inaugurated the program, where 350 students and research scholars participated. The workshop culminated with address by Prof. Dr. T. Balasubramanian, Advisor, Chettinad Academy of Research and Education, Chennai.





Glimpses of the workshop

Workshop on NGS data analysis

A workshop on 'NGS data analysis' was organized at ICAR-NBFGR during July 21-23, 2025. The workshop was attended by 21 participants (10 male and 11 female), including scientists, technical officers, and research scholars.

Training on 'Captive Breeding and larval rearing of indigenous ornamental fishes'

A hands-on training programme on 'Captive breeding and larval rearing of indigenous ornamental fishes' was organised under Network Project on Ornamental Fishes of ICAR at PAGR Centre during August 07-12, 2025. A total of 25 participants, including officials from the Department of Fisheries, State Agricultural Universities, students, and entrepreneurs, attended the programme.



Participants of the workshop





Glimpses of the training programme

Annual Review meeting of AINP-AMR in fisheries and livestock

Annual review meeting of 'All India network project on antimicrobial resistance (AINP-AMR) in fisheries and livestock' under INFAAR was held at NASC, New Delhi, during August 20-21, 2025. The review meeting was chaired by Dr. M.L. Jat, Secretary, DARE & DG, ICAR, in the presence of Dr. J. K. Jena, DDG, Fisheries Science; Dr. Raghvendra Bhatta, DDG, Animal Science; Dr. Kajal Chakraborty, Director, ICAR-NBFGR, Lucknow and Mr. Takayuki Hagiwara, FAO-India Representative. The event was attended by officers from Animal Science and Fisheries Divisions of ICAR, representatives from FAO India, and Principal Investigators and Co-Principal Investigators of the network project of 31 partners. In two-days meeting, the AMR data generated by network partners during 2024-25 were reviewed.



Participants of review meeting

Training for Capacity Building and Technology Dissemination for Scheduled Tribes

A training program on 'Capacity building and technology dissemination for fish genetic resource management and livelihood augmentation under Scheduled Tribe Component' was organised during August 24-28, 2025 where, 23 tribal farmers from Jatanbari district, Tripura participated.





A view of the training organised for tribal farmers of Tripura

Review Meeting of ICAR Consortium Research Platform on Genomics

The 9th Annual Review Meeting of ICAR Consortium Research Platform (CRP) on Genomics was held at ICAR-NBFGR, Lucknow on August 28, 2025 under the chairmanship of Dr. J. K. Jena, Coordinator, ICAR CRP on Genomics. During the meeting, presentations were made by participating institutes where each PI highlighted the progress made, key achievements, ongoing activities and plans within their respective domains, which were thoroughly discussed. It was emphasized to prioritize research areas strategically, balancing immediate needs with mid-term and long-term objectives.





Glimpse of the participants

Expert consultation on 'Development of a roadmap for translational genomics in Indian aquaculture'

An Expert Consultation on 'Development of a Roadmap for Translational Genomics in Indian Aquaculture' was organized by ICAR-NBFGR, Lucknow in collaboration with Asian Fisheries Society Indian Branch (AFSIB) on August 29, 2025.The event was inaugurated by Dr. T.R. Sharma, ICAR National Professor-BP Pal Chair, Former DDG (Crop Sciences) & JC Bose National Fellow, as a Chief Guest. The consultation was presided over by Dr J. K. Jena, DDG (Fisheries Science), ICAR, and Chairman, AFSIB. The discussion was held on prioritizing functional and translational genomics, initiating pan-genome projects for key aquaculture species, and adopting





Snapshot of participants

advanced genome editing and selection approaches to address aquaculture challenges. There is need for focused research on ornamental fishes, strengthened inter-institutional collaborations, and enhanced capacity building in genomics and bioinformatics, incorporating artificial intelligence and machine learning for sustainable and competitive aquaculture.

Training on 'Captive breeding and larval rearing of indigenous fishes'

A hands-on training programme on 'Captive breeding and larval rearing of indigenous fishes' was organised under technology dissemination of ICAR-CRP on the Agrobiodiversity programme at PAGR Centre, Kochi during September 8-14, 2025. A total of 24 participants, including students, faculty from colleges, and KVK, participated.

Training Course on 'Cytogenetic and Genotoxicity Biomarkers'

A 10-days hands-on training course on 'Cytogenetic and genotoxicity biomarkers: Principles and practices' was



Participants of the training program



Group photo with the participants

organized by GCR Division of the institute during September 10-19, 2025. The training was focussed on chromosome preparation, their staining and banding as well as on concepts in molecular cytogenetics. The participants were taught on different genotoxicity and cytotoxicity end points along with DNA isolation, quantification and its amplification.

Training on 'Open-source geospatial tools in fisheries resource management'

A training programme on 'Open-source geospatial tools in fisheries resource management' was organised at PAGR Centre, Kochi with the objective of capacity building in open-source geospatial tools for fisheries resource management during September 15-20, 2025. A total of 13 participants (9 female and 4 male) attended the program.





Snapshot of the training programme

Training on 'Tools and methodologies for exploration, assessment and co-management of fish germplasm resources'

A training on 'Tools and methodologies for exploration, assessment and co-management of fish germplasm resources' was conducted during September 22-26, 2025 to enhance the skill in latest techniques on exploration, assessment, and management of fish germplasm resources. A total of 30 participants, including researchers from several universities and institutions, and officials of state fisheries departments from various states, attended the training.

School on Aquatic Animal Epidemiology

A school on 'Aquatic Animal



View of the training

Epidemiology' was organized under National Surveillance Programme for Aquatic Animal Diseases (NSPAAD), funded by Department of Fisheries, Government of India, at ICAR-NBFGR, Lucknow during October 6-10, 2025 involving resource person Professor Kenton L. Morgan, Emeritus Professor of Epidemiology, University of Liverpool, United Kingdom. A total of 20 candidates from 10 organizations/institute including ICAR Fisheries Research Institutes, Central Agricultural Universities, Colleges of Fisheries, and State Fisheries Departments participated.

Training program on 'Marine ornamental fish culture'

A training program on 'Marine ornamental fish culture' was organized with funding support from Department of Tribal Welfare, Government of Tamil Nadu at ICAR-NBFGR & DST Hatchery Facility for Marine Ornamentals, Annamalai University, Parangipettai, Tamil Nadu, during October 15-16, 2025. A total of 25 tribal beneficiaries from Pichavaram region participated.



Snapshot of school participants



Participants of the training program

Training on 'Fish Disease Diagnosis and Management'

A training program on 'Fish disease diagnosis and management' was organised at PAGR Centre, Kochi to enhance technical skills of young researchers and students in aquatic animal health during October 27-31, 2025. A total of 12 participants from various educational and research institutes across the country attended the training.

Training on 'Marine ornamental fish culture'

A training program on 'Marine ornamental fish culture' for the sustainable livelihood promotion through aquaculture practices was organised by PAGR Centre during October 28-29, 2025. A total of 25 participants from tribal communities of Pulicat region in Tiruvallur District, Tamil Nadu participated.

Training on 'Experimental design in aquaculture'

A training program on 'Experimental design in aquaculture' was organized at ICAR-NBFGR, Lucknow during October 28-30, 2025, where 15 candidates (9 male and 6 female) including scientists, technical officers, and research scholars participated.



Snapshot of the training programme



Certificate distribution to participants

Training on 'Fish diseases and their management'

A hands-on training programme on 'Fish diseases and their management' was organized under National Surveillance Program on Aquatic Animal Diseases (NSPAAD) during November 17-21, 2025, for officers of State Fisheries Department. A total of 11 Fisheries officers (8 from Bihar and 3 from Punjab) participated. The officers were apprised on the major diseases affecting finfish, postmortem examination, importance of water quality parameters, role of State Fisheries Departments in strengthening NSPAAD, antimicrobial resistance, biosecurity measures and drugs used in aquaculture, bacterial and virus isolation, and advanced molecular techniques for detection of pathogens.

Training on 'Ichthyotaxonomy: Advances and techniques'

A training program on 'Ichthyotaxonomy: Advances and techniques' was organised at PAGR Centre, Kochi during December 1-6, 2025. The programme provided comprehensive theoretical knowledge and practical skills in both conventional and molecular approaches to ichthyotaxonomy.



Hands-on demonstration to the participants





Glimpses of training programme

A total of 16 participants (12 female and 4 male) from various universities and research organisations across India attended.

Training on 'Fish cell line: development and applications'

A training on 'Fish cell line: development and applications' was organized at ICAR-NBFGR, Lucknow, during December 15-19, 2025, wherein 8 trainees participated. The training focused on hands-on practical sessions on cell line development, characterization, mycoplasma detection, karyotyping, cytotoxicity testing etc.

Important Institutional Meetings

Research Advisory Committee (RAC) Meeting

The 29th RAC meeting of the Institute was held during April 09-10, 2025, under the Chairmanship of Dr. W.S. Lakra, Former Vice Chancellor, ICAR-CIFE, Mumbai and Former Director, ICAR-NBFGR, Lucknow. RAC members, Dr. M.H. Balkhi, Former Dean, Faculty of Fisheries, SKUAS&T, Srinagar (J&K); Dr. A.D. Diwan, Former ADG (Marine Fisheries), ICAR, New Delhi; Dr. G. Gopikrishna, Former Head, Nutrition, Genetics & Biotechnology, ICAR-CIBA, Chennai and Dr. Shubhadeep Ghosh, ADG (Marine Fisheries), ICAR, New Delhi, attended the meeting. The Director, ICAR-NBFGR, Lucknow, welcomed the RAC members and other staff. Dr. Neeraj Sood, Member Secretary, RAC presented the action taken report on the recommendations of previous RAC meeting. The division-wise presentations were made by the respective HoD/SIC.

Institute Research Committee (IRC) Meeting

The 38th Annual Institute Research Council Meeting was



Group photo with the participants





RAC meeting in progress

held during May 21-23, 2025, at ICAR-NBFGR, Lucknow. The Chairman acknowledged the contributions of all members and outlined the institute's key achievements during the previous year like discovery of new fish species, development of the ReportFishDisease mobile app, execution of various ranching programs. The Chairman also highlighted several priority areas for future research, including the utilization of artificial intelligence and germplasm repository to mine superior traits, scaling up of State Fish initiatives, expansion of exploration and conservation aquaculture across different agro-climatic zones, and the integration of climate change impacts, such as dam construction and other anthropogenic pressures on species diversity. This was followed by discussion on major RAC recommendations, presented by Dr. Neeraj Sood, Member Secretary, RAC. In the meeting, presentations were made by PIs for all the ongoing projects as well as for new project proposals.

Institute Management Committee (IMC) Meeting

The 39th and 40th IMC meeting was held on March 27, 2025 and July 25, 2025 respectively. During the meetings, proceedings and action taken report of earlier meetings of the IMC was approved. Besides, the progress report of ICAR-



Glimpses of the meeting





IMC meeting in progress

NBFGR, Lucknow, were presented and works (civil & electrical), procurement of equipment during 2024-25 was evaluated and 2025-26 was prioritized. Statement of expenditure for the year 2025-26 was also presented in the meeting.

Institutional Biosafety Committee (IBSC) Meeting

ICAR-NBFGR conducted 6th IBSC meeting in hybrid mode on June 13, 2025 to review the research projects regarding the implementation of biosafety regulatory framework. The meeting was attended by Dr. Ravindra Kumar, Principal Scientist and Chairman, IBSC; Dr. Bhupendra Narain Singh, Chief Scientist, CSIR-CDRI, Lucknow

and DBT Nominee; Dr. Chandra Bhushan Kumar, Scientist and Member Secretary, ICAR-NBFGR; Dr. Anjali Gupta, Independent Medical Officer and Biosafety Officer; Dr. Reena Arora, Principal Scientist and outside expert, ICAR-NBAGR, Karnal; Dr. Anutosh Paria, Scientist and internal member, ICAR-NBFGR, Lucknow; Dr. L. Mog Chowdhury, Scientist and invitee, GEC Division.

Institutional Animal Ethics Committee (IAEC) Meeting

Two meetings of the IAEC of ICAR-NBFGR were conducted on June 04, 2025, and December 10, 2025, to consider the proposals for experiments on live animals. In both the meetings, the proposals received from the Principal Investigators of different projects were discussed and approved by the committee. In addition, the annual animal house inspection was conducted on December 19, 2025 by Dr. Neelam Bala, Main Nominee, CCSEA.



Snapshot of IBSC meeting



Glimpses of the meetings and animal house inspection

Important Days and Celebrations

Republic Day

Institute celebrated Republic Day on January 26, 2025, with great enthusiasm. Director hoisted the National Flag in the presence of staff members of the institute. In his remarks, he highlighted the achievements of the institute and appreciated the efforts of all staff members. On this occasion, sports and games were organized among the staff and their family members.

International Women's Day

ICAR-NBFGR celebrated International Women's Day 2025 in allegiance to the campaign theme on **'#AccelerateAction'.** Dr. Vindhya Mohindra, Chairperson of Women's Cell, spoke on the necessity and importance of Women's Day and stressed the importance of inspiring and empowering women in every field. Dr. Anjali Gupta, Medical Officer, ICAR-NBFGR addressed the gathering. An extempore competition was also organized for staff and students.

Dr. B.R. Ambedkar Jayanti

ICAR-NBFGR, Lucknow, organized interactive awareness sessions on April 13-14, 2025 in celebration of Dr. B.R. Ambedkar Jayanti, promoting innovation, creativity, and



Republic day address









International Women's day celebration





Dr. B. R. Ambedkar Jayanti celebration

knowledge empowerment among marginalized youth. The program engaged students and educators from Lucknow, Uttar Pradesh and Kawardha, Chhattisgarh.

World Intellectual Property Day with One-Day Workshop on IP Manthan

ICAR-NBFGR celebrated World Intellectual Property Day with a hybrid workshop titled 'IP Manthan: IP awareness and encouraging creativity and innovation' on April 26, 2025. Around 70 researchers and students explored the interface of AI, IPR, and scientific innovation. Expert lectures on AI's impact on copyright and evolving IP regimes sparked vibrant discussions on techno-legal challenges. A focused technical session deliberated on aligning institutional innovations with robust IP strategies to ensure effective commercialization, ownership, and long-term societal impact.



Glimpse of World IP Day

International Yoga Day

The institute observed 11th International Yoga Day on June 21, 2025 as per the guideline of Ministry of AYUSH, Gov. of India with theme of 'Yoga for One Earth, One Health'. Dr. Basdeo Kushwaha, Nodal Officer Yoga, explained the purpose of International Yoga Day celebration and its impact on human health. The Yoga teacher described the benefits of practicing Yoga in daily life in order to maintain body fitness. The staff, students and contractual staff enthusiastically participated and learned various Yogasans and Pranayams.

National Fish Farmer Day



On the occasion of National Fish Farmer Day, ICAR-NBFGR organized a ranching programme of indigenous carp fish seed in Gomti River and awareness programme on sustainable fisheries management at Gaughat, Lucknow on July 10, 2025. Five thousand indigenous carp seed (*Labeo gonius, L. bata, L. calbasu, L. rohita*) were released for promoting conservation, stock enhancement of native fish species and to raise public awareness on sustainable fisheries management. Three fishers have been given appreciation certificate for











National Fish Farmers Day Celebration





their contribution in river fish biodiversity conservation during the programme. A scientist-fishers interaction programme also organized on the occasion. Over 60 fishers, farmers and civil society personnel participated.

Independence Day

Institute celebrated 79th Independence Day with full enthusiasm and joy. Director hoisted the National Flag in the presence of staff and congratulated the staff for the achievements of the institute in enhancing the income of farming community. He stressed to undertake more research work on innovations in climate resilient technology for fish biodiversity conservation and sustainable utilization. Sports







Independence Day celebration

and cultural programme were organized by children of staff members of the Institute.

Vigilance Awareness Week

Vigilance Awareness Week-2025 was observed at the institute during October 28 to November 03, 2025 with the theme specified by the CVC 'Culture of Integrity for Nation's Prosperity'. The week commenced with the introductory remarks of Dr. Neeraj Sood Vigilance Officer, in a specially



convened programme on October 28, 2025 and the Pledge was administered by the Director to all staff to maintain integrity and transparency in the office. Several competitions, including invited lecture and human chain as well as walkathon, were also organized.

World AMR Awareness Week

ICAR-NBFGR celebrated 'World AMR Awareness Week' during November 18-24, 2025, where around 350 students from Government School, Hardoi, Government School Unnao, College of Fisheries, Ratnagiri, Maharashtra, College of Fisheries, Mangaluru and Government PG College, Hardoi were made aware and sensitized about the risks of AMR, public health & hygiene, and judicious use of antimicrobials. Fisheries officers from Punjab and Bihar, as well as 300 fish farmers, assembled for





AMR awareness week celebration

PM Kisan Samman Nidhi through live streaming, were sensitized on AMR.

World Fisheries Day

The institute celebrated World Fisheries Day on November 21, 2025 to highlight the growing significance of aqua-tourism in advancing India's Blue Economy. Awareness was created on the status of global and national fisheries in the context of SDG-14, the current landscape of fisheries education and employment, and the expanding career opportunities emerging through aqua-tourism. Over 80 participants, including students, fish farmers, FFPO representatives, and ICAR-NBFGR staff, attended the programme.

Foundation Day Celebration

The institute commemorated its 42nd Foundation Day on December 12, 2025 with a day-long programme marked by scholarly deliberations, institutional recognitions, stakeholder interactions, and vibrant cultural presentations, highlighting the Bureau's enduring contributions



Awareness program on occasion of World Fisheries Day







ICAR-NBFGR Foundation Day celebration

to aquatic genetic resource management in the country. As part of the observance, dignitaries participated in a plantation drive under the national campaign **''एक पेड़ माँ के नाम''** On the occasion, the Chief Guest and other dignitaries released several institute publications, followed by an Awards Ceremony recognizing outstanding contributions by ICAR–NBFGR staff and collaborators. A MoU was also signed and exchanged between ICAR-NBFGR and TNJFU to strengthen academic and research collaboration. The celebrations were attended by several eminent dignitaries, including NAAS Fellows. In addition, the Bureau organized a Farm Innovators Day with interactions among progressive farmers, FFPO members, and subject-matter experts, along with the distribution of inputs to encourage adoption of innovative and sustainable field practices.

Winners of ICAR-NBFGR 2025 Institutional Awards

1.	Best Scientist	Dr. Mahender Singh
2.	Best Technical Staff	Sh. Vikas Kumar Dr. Ranjan Singh
3.	Best Administrative Staff	Sh. Ram Sakal Chaurasia
4.	Best Research Scholar	Sh. Ashish Sahu
5.	Student Merit Award for 10th Std.	Ms. Tanishka Sahu D/o Dr. Vikash Sahu
6.	Best Fish Farmer Awards	1. Mr. Avanish Singh, Gorakhpur, U.P. 2. Mr. Mohammad Haseeb Khan, Siddharth Nagar, U.P. 3. Mr. T.K Ramesh, Pulicat, T.N.
7.	Appreciation Certificate	Abhinav Matsyyajiwi Sahkari Federation and Fish Farmer Producer Organization

Kisan Diwas

The institute organised awareness programs for farmers on the occasion of Kisan Diwas to mark the birth anniversary of Former Prime Minister of India, Shri Chaudhary Charan Singh ji on December 23, 2025 at ARTU, Chinhat. About 117 participants, including Scheduled Caste (SC) farmers and staff, attended the programme. Importance of fish culture in relation to best management practices was discussed for the enhancing fish productivity.







Kisan Samman Diwas

Extension and Community Outreach



Technology dissemination on captive rearing of marine ornamentals

Dissemination of technology on 'Captive rearing of marine ornamentals for livelihood development of tribal islanders' was organized at Kalpeni island, Lakshadweep on January 4, 2025, wherein, 50 islanders participated.

Mission Navshakti 2.0: Empowering women through ornamental fish farming

ICAR-NBFGR under SCSP initiative organized interactive hands-on trainings in Unnao district on January 10 & January 16-17, 2025 addressing local needs and highlighted market linkage as well as self-reliance. Additionally, 325 rural women were trained in ornamental fish culture and aquarium fabrication across Barabanki, Sitapur, and Unnao districts on January 20, 2025.

Technology dissemination at Pulicat

A technology dissemination program was organized at Pulicat under STC to introduce sustainable aquaculture practices,



Glimpse of the technology dissemination program



Empowering SC women entrepreneurs at KVK Unnao




Technology dissemination at Pulicat

emphasizing cultivation of pearlspot fish, crab fattening, and clownfish farming on January 12, 2025. A total of 155 participants from the tribal community, mostly women from Chenchi Amman Nagar of Pulicat region, attended.

Awareness and capacity building in Nagaland

Institute organized an awareness and capacity-building program at KVK, Dimapur, Nagaland under NEH component on January 24, 2025 to enhance the livelihood of fisherfolk and aquaculture farmers where 250 tribal farmers, including over 100 women, participated. During the programme, National Girl Child Day was also celebrated and emphasis was laid on providing equal opportunities for girls, especially to education, employment and health.

Awareness cum input distribution at Kanyakumari, Tamil Nadu

An awareness cum input distribution program for livelihood development of fisherfolk of Kanyakumari District, Tamil Nadu was organized on January 24, 2025 under SCSP component in collaboration with the College of Fisheries Science, St.




Awareness programme at Nagaland



Distribution of input material to beneficiaries

Devasahayam Institute of Fisheries Science & Technology (DIFST), and Department of Fisheries & Fishermen Welfare, Government of Tamil Nadu. Transportable ice boxes were distributed to 31 fish vendors to support their livelihood.

Capacity building on ornamental fish farming at Mathura

Capacity building cum interaction meet and ornamental fish farming-related input distribution program was organized on January 24, 2025 in collaboration with CoF, DUVASU, Mathura with participation of 50 trainees.

Fish farmer conclave at Malda, West Bengal

Fish farmer conclave on 'Aquaculture for Prosperity: Opportunities and Challenges' was organized on January 28, 2025 in collaboration with KVK, ICAR-CISH, Malda, where over 200 participants (farmers, scientists and industry experts) attended.

Empowering microenterprises through Innovation and Linkages

Under Mission Navshakti 2.0 and the SCSP framework, the Institute facilitated a structured market exposure visit on January 29, 2025 for 51 women from 13 SHGs across 8 villages of Unnao to Ganga Aquarium and Lulu Mall at Lucknow.

Farmers' fair and capacity building at Agartala

The Bureau, in collaboration with the College of Fisheries, Lembucherra, Agartala, and ICAR RC for NEH Regional Centre, Tripura, organized a farmers' fair and capacity-building programme on February 05, 2025 at College of Fisheries, Lembucherra, Tripura, under NEH and STC components to enhance the livelihoods of fisherfolk and aquaculture farmers. Aquaculture related input materials, including quality fish seed, feed, fishing nets, and lime were distributed to the farmers. A total of 300 fish farmers, including 75 women from 5 villages, participated.

Aquagri incubation and market integration

Two days studio training was organized during March 5-6, 2025 to enhance the technical and market skills of 50 women entrepreneurs, followed by an exposure visit to Ganga Aquarium, Lucknow.



Glimpses of Exposure visit



Farmers' fair and capacity building programme at Agartala




Rural women learning aquarium fabrication

Input distribution and awareness programme in IARI, Assam

ICAR-NBFGR conducted farm input distribution and awareness programme on March 12, 2025, under NEH and STC components in collaboration with ICAR-IARI, Assam. Farm inputs, such as fish seed, feed, lime, prophylactic kits, fishing nets and fish carrying containers, were provided to 100 fish farmers. Five progressive farmers were felicitated for their works in the field of aquaculture and fisheries.

Ranching of *Horabagrus obscurus*

As part of conservation efforts, PAGR Centre, Kochi carried out ranching of captive propagated 2000 advanced fingerlings of *Horabagrus obscurus* in Chalakudy River at Vettilapara, Kerala, on May 10, 2025. Additionally, an input distribution event for fishers was organized under STC component, wherein inputs, such as fishing nets, head torch and fish carrier bags, were provided to 20 tribal fishers for livelihood development.




Glimpses of the ranching program in Chalakudy River



Input distribution to tribal fishers at Chalakudy

Viksit Krishi Sankalp Abhiyan

Scientific and technical staff of the institute participated in Mass Awareness programs under Viksit Krishi Sankalp Abhiyan (VKSA-2025) during May 29 to June 12, 2025, where a total of 12588 farmers were sensitized on agriculture related activities.

Awareness-cum-Capacity building programme on National Fish Farmer's Day

An awareness cum capacity-building program was conducted under NEH and STC components on July 10, 2025 in collaboration with TTAADC and State Fisheries Department, Tripura, on the occasion of National Fish Farmer's Day, at Dumboor, Gomati district, Tripura, to empower local fish farming communities. The programme marked the active participation of 300 fishermen and fish farmers. The program was graced by Shri Rajesh Tripura, Hon'ble Executive Member (Fisheries & ARDD) and Shri Sanjoy Manik Tripura, Hon'ble MLA, Karbook, Tripura. Fish seed was ranched in Dumboor reservoir and also aquaculture inputs were distributed among the farmers.

Awareness and technology dissemination program at Pichavaram

An awareness and technology dissemination program was organised at Pichavaram region of Tamil Nadu on September 19, 2025, with the participation of 100 members from Irular (Scheduled Tribe) community. The programme focused on livelihood enhancement through the promotion of sustainable aquaculture practices, improved breeding technologies, and value addition in fisheries-related activities.

Demonstration on use of drone

A demonstration on usage of drone was conducted on September 23, 2025 in



Glimpses of the programme at Dumboor, Tripura



Participants of the programme conducted at Pichavaram

collaboration with the KVK, Katia-II, Sitapur, along with Drone Didi. The programme was organized at fish farmer ponds of Badeila and Bajehra villages in Sitapur district. The program focused on the application of drone technology in aquaculture and agriculture, demonstrating its potential for efficient monitoring, input application, and overall farm management.

Ranching of *Horabagrus brachysoma* in Periyar and Chalakudy River

The PAGR Centre, Kochi distributed 1000 fingerlings of yellow catfish, *Horabagrus brachysoma,* to St. Albert's College, Kochi, which was ranched in the Periyar River on September 26, 2025. A community-based restocking was also initiated by ranching 2500 hatchery-produced fingerlings of *H. brachysoma* through Western Ghats Hornbill Foundation, MES Asmabi College, Kodungallur, for conservation in Chalakudy River Basin.

Awareness-cum-interaction meeting on ReportFishDisease app

An awareness-cum-interaction meeting on ReportFishDisease App was conducted at Kalavoor, Alappuzha, Kerala, on October 15, 2025, benefiting a total of 43 farmers and Sagar Mitras.

Awareness program on 'Save the ocean, save our future' at Lakhshadweep

An awareness program on *'Save the Ocean, Save Our Future'* was organised under STC at two elementary schools on October 21, 2025. A drawing competition on the title, *'Life Below Water'* was conducted, which was participated by 170 children.



Glimpses of community ranching of *Horabagrus brachysoma*



School children participated in the program

Technology dissemination for marine biodiversity conservation and sustainable livelihood

An awareness program on 'Technology Dissemination for Marine biodiversity Conservation and Sustainable Livelihood' was conducted on October 22, 2025 under STC for 100 women beneficiaries. The participants were sensitised with different



Sensitization of participants

technology packages on marine ornamental organisms, developed by ICAR-NBFGR. Five pamphlets in regional language and 4 pamphlets in English, highlighting the importance of conservation of key marine organisms, were distributed to the beneficiaries.

Awareness program on 'Our Island, our ocean, our responsibility'

An awareness program on 'Our Island, Our Ocean, Our Responsibility' was organised under STC at Government Senior Secondary School, Agatti on October 23, 2025. An essay competition on 'Marine Resources of Lakshadweep and Threats Faced' was conducted for students of XII standard.



Participation of students

Hands-on Learning on marine ornamentals

A training program on 'Hands-on Learning on Marine Ornamentals' was conducted from October 24-29, 2025 with participation of 66 women beneficiaries. Key topics covered included water quality management, with hands-on training in water testing using field test kits, and practical exposure to the rearing and maintenance of ornamental shrimps and marine ornamental fishes.



Women beneficiaries participating in the training

Awareness programs on 'Marine biodiversity conservation'

Awareness programmes on 'Marine biodiversity conservation' were organized at Agatti, Lakshadweep for students of class V-XII of Government Senior Basic School and Government Senior Secondary School on October 27, 2025 and for women beneficiaries on November 1, 2025. The programs were attended by around 200 students and 40 women beneficiaries. As part of the outreach initiative, brochures in the regional language



Glimpses of the participants of the programs

highlighting the significance of conserving key marine organisms were distributed to the participants.

Empowering tiger widows in Sundarbans: Extending mission Navshakti

A field-based empathetic system mapping survey was conducted during October 28-31, 2025 across Bally-1, Bally-2, and Kumirmari villages and documented extreme livelihood vulnerability, with interviews of 43 affected women revealing acute economic fragility and limited access to productive assets. Over 425 SC women were trained in aquarium-based and agri-enterprises.

Medical Camp under Janjatiya Gaurav Varsh Pakhwada 2025

The institute organized a medical camp under STC as part of the Janjatiya Gaurav Varsh Pakhwada 2025 at Sonbhadra, Uttar Pradesh on November 4, 2025. A total of 75 tribal men and women attended the camp. Participants received free health check-ups and valuable guidance on health and nutrition.

Supporting livelihood of tribal fish farmers through diversified fish farming

The institute organized a sensitization and capacity development program under STC at Kalimpong, West Bengal, in collaboration with Hemnagar Sundarban Dream, on November



Glimpses of the program



Glimpses of the medical camp at Sonbhadra, Uttar Pradesh





Input distribution to participants at Kalimpong

7, 2025. The programme was envisaged to sensitize and support the tribal farmers of hilly terrain through farming of diversified high value food fishes in small water holdings. A total of 105 fish farmers participated in the programme. In the programme, important aquaculture inputs, such as quality fish seed of high value food fishes, fish feed, fish carrier, weighing machine, net etc., were distributed.

Promoting high-value aquaculture for tribal livelihoods in hill communities

The institute organized a program for promoting livelihood of tribal





Glimpses of the program at Darjeeling

fish farmers of hills through culture of high value food fishes under STC at Takdah, Darjeeling, West Bengal, on November 8, 2025 in collaboration with Hemnagar Sundarban Dream. A total of 74 fish farmers participated in the programme. In the programme, important aquaculture inputs such as quality fish seed of high value food fishes, fish carrier, etc. were distributed among the beneficiaries.

Educational initiatives highlighting the legacy of tribal freedom fighters

An awareness program was organized as part of Janjatiya Gaurav Varsh 2025 under STC at ICAR-NBFGR to commemorate the 150th birth anniversary of the revered tribal leader and freedom fighter, Bhagwan Birsa Munda on November 11, 2025. The program witnessed enthusiastic participation of 490 students from different schools of Uttar Pradesh.

Public awareness campaign at West Kameng, Arunachal Pradesh

The institute organised a public awareness campaign under STC as part of Janjatiya Gaurav Varsh 2025 at Shergaon, West Kameng District, Arunachal Pradesh on November 12, 2025 with 50 participants, including girl students.

Stakeholder meet cum awareness programme in Arunachal Pradesh

The institute organized a stakeholder meeting-cum-awareness program and a tribal fishery-entrepreneurship summit under the STC and NEH as part of Janjatiya Gaurav Varsh 2025 activities, with a special focus on 'Empowering tribal fishers through capacity building, technological demonstration and





Students participating in awareness program



Participants of the program

resource support' at Shergaon, West Kameng District, Arunachal Pradesh, in collaboration with the Department of Fisheries, Government of Arunachal Pradesh, on November 13, 2025. A total of 200 fish farmers and fishers have participated in the program. Aquaculture inputs, including fish seed, fish feed and lime, were distributed to the tribal fishers during the event.

Inauguration of cluster mode rearing unit for clownfish

The cluster mode rearing unit for clownfish was established at Pulicat, Thiruvallur, with the funding support from the Department of Tribal Welfare, Government of Tamil Nadu. This facility was inaugurated by the Honourable Chief Minister of Tamil Nadu on December 6, 2025 (virtually). He also launched the livelihood activities of the tribal community residing at Killai, Pichavaram region of Tamil Nadu.

Awareness cum technology dissemination program

An awareness cum technology dissemination program on 'Community aquaculture of marine ornamentals' was held at Govt. College of Arts and Science, Androth, Lakshadweep, on December 26, 2025.



Participants of the program





New facility of ICAR-NBFGR at Pulicat

Training and Awareness Programme conducted at ARTU, Chinhat

S.N.	Name of Training	Dates	No. of Participants
1	Residential Skill Development Training Programme on 'Inland Aquaculture for Lucknow Mandal fish farmers' (sponsored by Uttar Pradesh State Fisheries)	March 05-07, 2025	25
2	Residential Skill Development Training Programme on 'Inland Aquaculture for Varanasi Mandal fish farmers' (sponsored by Uttar Pradesh State Fisheries)	March 10-12, 2025	20
3	Residential Skill Development Training Programme on 'Inland Aquaculture for Moradabad & Bareilly Mandal fish farmers' (sponsored by Uttar Pradesh State Fisheries)	March 18-20, 2025	25
4	Residential Skill Development Training Programme on 'Inland Aquaculture for Kanpur Mandal fish farmers' (sponsored by Uttar Pradesh State Fisheries)	March 24-26, 2025	25
5	Residential Skill Development Training Programme on 'Inland Aquaculture for Meerut and Saharanpur Mandal fish farmers' (sponsored by Uttar Pradesh State Fisheries)	April 02-04, 2025	25
6	Residential training for farmers of district Sitapur, Uttar Pradesh on 'Freshwater Aquaculture' in collaboration with KVK, Sitapur.	September 22-26, 2025	25
7	'Freshwater Aquaculture' and Aquaculture Equipment/ Input Distribution cum Awareness programme for fish farmers from Uttar Pradesh and Jharkhand	October 27-31, 2025	25
8	'Freshwater Aquaculture' and Aquaculture Equipment/ Input Distribution cum Awareness programme for fish farmers from Barabanki district of Uttar Pradesh	November 17-21, 2025	25
9	'Freshwater Aquaculture' and Aquaculture Equipment/ Input Distribution cum Awareness programme for fish farmers from Jaunpur & Barabanki districts.	December 08-12, 2025	25



Glimpses of various training activities

Live Fish Germplasm Resource Centre



Live fish germplasm resource centre

Farm In-charge: Aditya Kumar

Team members: Rajeev K. Singh, Raghvendra Singh, Monika Gupta, Deva Narayan, Ranjan Singh, Sushil Kumar, Dukhi Shyam Deo

Live Fish Germplasm Resource Centre is a major conservation and research facility of the institute with an aim to conserve, maintain, propagate and utilize valuable fish germplasm through ex-situ conservation. The facility has 32 earthen ponds and 12 concrete nursery tanks, housing over 6000 live fish germplasm of 27 indigenous fish species.

Collection and maintenance

Live specimens of 4 species (*Rita rita*, n=24; *Chitala chitala*, n=20; *Heteropneustes fossilis* n=400; and *Channa marulius*, n=960) were collected from Ganga basin for broodstock development and breeding for its evaluation.



Rita rita specimens



Heteropneutes fossilis specimens

Captive breeding and seed production

The institute produced 685 lakh spawn of 14 species, namely *Labeo rohita, L. calbasu, L. bata, L. gonius, L. catla, Cirrhinus mrigala, Cyprinus carpio, C. rubrofuscus, C. carpio* koi, *Carassius auratus, Ctenopharyngodon idella, Heteropneustes fossilis, Clarias magur* and *Channa striata* and a revenue of Rs. 10,34,000 was generated through sale of fish seeds.

Live germplasm resource centres at other places

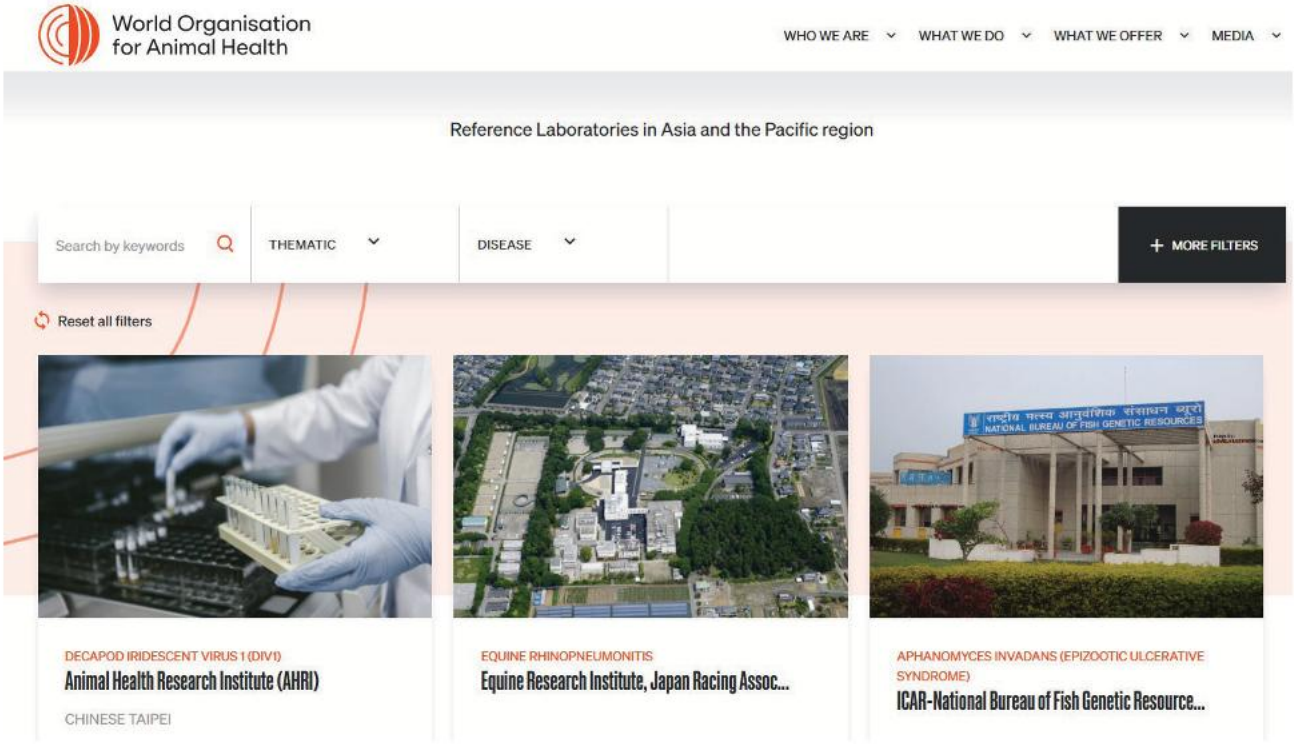
The Institute has developed live germplasm resource centres at the following 7 places for the conservation and livelihood promotion of the local community:

1. Agatti, Lakshadweep
2. College of Fisheries, Lembucherra, Agartala
3. Gauhati University, Assam
4. Kerala University of Fisheries and Ocean Studies, Kochi, Kerala
5. Nagarjuna Sagar, Telangana
6. Pichavaram, Cuddalore, Tamil Nadu
7. Pulicat, Tiruvallur, Tamil Nadu



Rearing of magur in cement tanks

Award and Recognition



WOAH Reference Laboratory for Infection with *Aphanomyces invadans*

- Aquatic Animal Health Laboratory of Exotics and Aquatic Animal Health Division, ICAR-NBFGR has been designated as Reference Laboratory by World Organisation for Animal Health (WOAH) for *Aphanomyces invadans* (Epizootic Ulcerative Syndrome)

Global Recognition: Mission Navshakti Honoured by UN-FAO

- The institute received Global Technical Recognition from the FAO on October 15, 2025 during the World Food Forum 2025 at FAO Headquarters, Rome. The recognition coincided with FAO's 80th anniversary, celebrated under the theme "Hand in Hand for Better Foods and a Better Future.

Matsya Mela Expo

- Second-Best Stall Award at the Matsya Mela Expo as part of the Foundation Day celebrations at ICAR–CMFRI, Kochi held during February 1-3, 2025







Dr. T. T. Ajith Kumar

- Lifetime Achievement Award-2025 by Annamalai University-Marine Biology Alumni Association, Tamil Nadu
- Member, Technical Evaluation Committee (TEC) for Science and Technology in Northeast, constituted by the Department of Biotechnology (DBT)

Dr. P.K. Pradhan

- World Organisation for Animal Health (WOAH) Expert for infection with *Aphanomyces invadans* (Epizootic Ulcerative Syndrome)
- Chairperson, Executive Committee, Fish Health Section (FHS) of Asian Fisheries Society
- National Co-Chair for Aquatic Animal Health session in World Aquaculture 2025 India conference organized by World Aquaculture Society at Hyderabad during November 10-13, 2025
- Chair of Technical Session 'Finfish Health' in Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society, Fish Health Section and ICAR-CIBA, Chennai, during September 23-27, 2025
- Rapporteur for symposium on 'Aquatic Animal Diseases: Emerging Challenges and Preparedness' on the side lines of 14 AFAF held at New Delhi held during February13, 2025
- Rapporteur in Theme 5 (Blue Revolution: Harnessing Science and Technology), Technical Session 2, during XVII Agricultural Science Congress held at G.B. Pant University of Agriculture and Technology during February 20-22, 2025
- Coordinated WAS-APC Student Awards in Aquatic Animal Health in World Aquaculture 2025 India held at Hyderabad by World Aquaculture Society during November 10-13, 2025

Dr. Neeraj Sood

- Member, Executive Committee and Editor, eNewsletter of Fish Health Section (FHS) of Asian Fisheries Society, Malaysia
- Member, Local Advisory Committee of the Regional Science City, Lucknow, a satellite unit of National Science Centre, Delhi

Dr. Achal Singh

- Councillor (2024-26) in Executive Council of Society for Development of Subtropical Horticulture, ICAR-CISH, Lucknow
- Co-chair for technical session on 'Sustainable Fisheries, Legal and Policy Framework' in workshop on 'Awareness to Action: Conserving Fish Diversity for future Generation' organised by ICAR-NBFGR, Lucknow in collaboration with Uttar Pradesh State Biodiversity Board at ICAR-NBFGR, Lucknow on August 13, 2025

Dr. Divya P.R.

- Special Invitee to attend Belt and Road Silver Pomfret International Symposium 2025, hosted by Ningbo University, China, during October 17-19, 2025

Dr. A. Kathirvelpandian

- External Expert for University Research Council of Tamil Nadu Dr. J. Jayalalithaa Fisheries University (TNJFU)

Dr. Poonam Jayant Singh

- Appointed as Scientific Adviser under Section 115 of the Patents Act, 1970 and Rule 103 of the Patents Rules, 2003 (No. CGPDTM-16013/11/2025-CGOFFICE/1013). Group 1: Biotechnology, Biochemistry, Microbiology & Food Technology on September 04, 2025

Dr. Rejani Chandran

- Panellist for workshop on 'Adoption of Climate Resilient Agriculture & Livelihoods by Smallholder Farmers' organised by BIRD, Lucknow on June 5, 2025
- Co-chair for technical session on 'Aquatic Genetic Resources of India: Conservation & Management Strategies' in workshop on 'Awareness to Action: Conserving Fish Diversity for future Generation' organised by ICAR-NBFGR, Lucknow in collaboration with Uttar Pradesh State Biodiversity Board at ICAR-NBFGR, Lucknow on August 13, 2025

Dr. L. Mog Chowdhury

- Best paper presentation award for 'miRNA Profiling from muscle transcriptome of Catla and their association with growth related genes at three growth stages' in 14th Asian Fisheries and Aquaculture Forum (14 AFAF), at New Delhi India during 12-15 February 2025

Dr. Anutosh Paria

- Agriculture Leadership Award from Sundarban Dream, Department of Food Processing Industries & Horticulture, Govt of West Bengal, APEDA, Ministry of Commerce & Industry, ICAR-NBFGR & SBI on January 29, 2025
- Best oral presentation award in Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society, Fish Health Section and ICAR-CIBA, Chennai, during September 23-27, 2025
- Session coordinator for Technical Session IV (Aquatic Animal Disease Diagnostics, Prophylactics and Therapeutics) of Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society, Fish Health Section and ICAR-CIBA, Chennai, during September 23-27, 2025

Dr. Arun Sudhagar S.

- Member of Technical Committee of Rajiv Gandhi Centre for Aquaculture (RGCA), overseeing technical activities of the Domestication of Tiger Shrimp Project (DTSP)

Dr. Chandra Bhushan Kumar

- Best Poster Presentation award on 'Morality of farmed striped catfish *Pangasianodon hypophthalmus* attributed to *Edwardsiella ictaluri* infection in Uttar Pradesh, India' in Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society, Fish Health Section and ICAR-CIBA, Chennai, during September 23-27, 2025
- Session coordinator for Technical Session VIII (Aquatic Animal Epidemiology, Disease Surveillance and Reporting) of Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society, Fish Health Section and ICAR-CIBA, Chennai, during September 23-27, 2025

Dr. Raghvendra Singh

- Certificate of Honour and Appreciation award received on the occasion of Brainstorming session on 'Sustainable development for blue revolution in Uttar Pradesh' organized by College of Fisheries, DUVASU, Mathura, Uttar Pradesh on January 24, 2025
- Certificate of Appreciation by Director ICAR-NBFGR, for significant contributions to institution activities for the year 2024-25 on January 26, 2025

Dr. Rekha M.U.

- Best poster award in International Symposium on Marine Ecosystems Challenges and Opportunities (MECOS 4), organised by ICAR-CMFRI at Kochi during November 04-06, 2025

Mrs. Teena Jayakumar T.K.

- Best oral presentation award in International conference on 'Blue Economy-2025', organised by Alagappa University, Tamil Nadu, during January 20-22, 2025

Dr. Tarachand Kumawat

- वर्ष 2024–2025 के दौरान भाकृअनुप–राष्ट्रीय मत्स्य आनुवंशिक संसाधन ब्यूरो में राजभाषा हिंदी में उत्कृष्ट कार्य करने के लिए राजभाषा विभाग (गृह मंत्रालय, भारत सरकार) के नकद पुरस्कार प्रोत्साहन योजना के अंतर्गत प्रथम पुरस्कार।

Research Projects

Institutional projects

S. No	Project title	Personnel	Period
1.	Development of fish cell lines from prioritized fish species for conservation and *in vitro* applications	Basdeo Kushwaha (PI), Ravindra Kumar, Murali S., A.K. Mishra and Vijay Kumar Singh	April 2023 - March 2026
2.	Development of molecular system for identification of fishes	Mahender Singh (PI), Santosh Kumar, Tanwy Dasmandal and Deva Narayan	April 2023 - March 2026
3.	Part A: Developing adaptive markers in freshwater fishes for temperature stress Part B: Proteome profiling of cultivable freshwater fishes and bioprospecting for bioactive peptides and regulatory factors through integrative approach	Part A: S.K. Srivastava (PI), Poonam Jayant Singh and Akhilesh Kumar Mishra Part B: Poonam Jayant Singh (PI) and S.K. Srivastava	April 2022 - March 2025
4.	Nanofibre and biocomposite development from fish waste resource for circular economy	Poonam Jayant Singh (PI), A.K. Pathak, A. Kathirvelpandian, Mahender Singh, S.K. Srivastava (upto June 2025) and Ravi Kumar, G.T.V. Prabhu (PI) and Senthil Kumar, ICAR-CIRCOT	April 2023 - March 2026
5.	Exploring potential of traditional knowledge associated with aquatic genetic resources for access and benefit sharing under Nagoya protocol and BBNJ for food and agriculture for sustainable empowerment and conservation	Poonam Jayant Singh (PI), Ajey Kumar Pathak, A. Kathirvelpandian and Ravi Kumar	April 2023 - March 2025
6.	Mining and characterization of bioactive compounds for insights into sea anemone ecological adaptation	Murali S. (PI), Ravindra Kumar, Basdeo Kushwaha and A. Kathirvelpandian	April 2022 - March 2025
7.	Development of novel microsatellite markers for genetic and adaptive divergence in natural populations of selected fish species	Rajeev K. Singh (PI), Vindhya Mohindra (upto May 2025) and L. Mog Chowdhury	April 2023 - August 2025
8.	Impact assessment of the technological interventions of ICAR-NBFGR in livelihood development and achieving the SDG goals	**Headquarters**: L. K. Tyagi; Poonam Jayant Singh, Raghvendra Singh; Anutosh Paria, Aditya Kumar, Monika Gupta, Tarachand Kumawat and K.K. Singh **PAGR Centre**, Kochi: A. Kathirvelpandian; T.T. Ajith Kumar; V.S. Basheer, Charan R. and Rekha, M.U.	April 2023 - March 2025
9.	Quantifying meta-structure matrices of biodiversity & ecosystem services for assessment of fish genetic resources. Subproject 1: Western Ghats	V. S. Basheer (PI), Divya P.R. and Charan Ravi	April 2023 - March 2027

10.	Quantifying meta-structure matrices of biodiversity & ecosystem services for assessment of fish genetic resources. (Subproject 2: Ganga River Basin)	Achal Singh (PI), Rejani Chandran, Raghvendra Singh, Tarachand Kumawat and Vikas Kumar	April 2023 - March 2027
11.	Quantifying meta-structure matrices of biodiversity & ecosystem services for the assessment of fish genetic resources. (Sub Project 3: NEH Region)	Rejani Chandran (PI), L. K. Tyagi, Achal Singh, A. K. Pathak, L. Mog Chowdhury, G. Kantharajan and Amit Singh Bisht	April 2023 - March 2027
12.	Fish milt cryopreservation for broodstock development and quality seed production	Santosh Kumar (PI, Hqs), Charan R. (PI, PAGR), Aditya Kumar, Raghvendra Singh, L.K. Tyagi, Monika Gupta, R.S. Sah, V.S. Basheer and A. Kathirvelpandian	April 2023 - March 2025
13.	Genome editing of *Labeo rohita* and *Trichogaster chuna* for enhancement of economic traits	L. Mog Chowdhury (PI), Vindhya Mohindra (till May, 2025), Mahender Singh, Aditya Kumar, Murali S. and Dandadhar Sarma (Gauhati Agricultural University)	April 2023 - March 2026
14.	Fish diversity assessment of Ramsar wetlands of Uttar Pradesh by integrating ecological approaches and stakeholder perception under climate change scenario	Rejani Chandran (PI), Rajeev Kumar Singh, L. K. Tyagi, Achal Singh, A. K. Pathak, Kantharajan G., Amit Singh Bisht and Deva Narayan	April 2023 - March 2026
15.	Assessment of ichthyofaunal diversity and habitat status with traditional knowledge in fisheries along the Subarnarekha River and its tributaries for cataloguing, conservation and management	Ajey K. Pathak (PI), Mahender Singh, Raghvendra Singh, Tarachand Kumawat, Jaspreet Singh, Ravi Kumar and Vikas Kumar	April, 2024 - March 2027
16.	Exploration of ichthyofauna and habitat ecology of the Western Himalayan River Chenab, India	Jaspreet Singh (Pl), Rajeev K Singh, Rejani Chandran, Monika Gupta, Amit Singh Bisht and Deva Narayan	April, 2025 - March 2028
17.	Assessment of exotic fishes' prevalence and their impacts on indigenous fish diversity	Tarachand Kumawat (PI), V. S. Basheer, Sharad K Singh, Achal Singh, Ajey K. Pathak, P. R. Divya, Aditya Kumar, Anutosh Paria, Ranjana Sinha, Ravi Kumar and Vikash Sahu	April 2023 - March 2026
18.	Development of monoclonal antibody-based assay for detecting *Edwardsiella ictaluri* infection in fish	Chandra Bhushan Kumar (PI), Neeraj Sood, Gaurav Rathore and P. K. Pradhan	April 2025 - March 2028
19.	Exploration of the tributaries of Cauvery River for fish species diversity and detailed studies on mahseer in Cauvery	V. S. Basheer (PI), Charan Ravi, Divya P.R. and G. Kantharajan	April 2023 - March 2026
20.	Assessment of coastal fish diversity, vulnerability indicators, and ecosystem services in the Pichavaram mangrove region	A. Kathirvelpandian (PI), T.T. Ajith Kumar, Ajey Kumar Pathak, Poonam Jayant Singh and Kantharajan G.	April 2023 - March 2025
21.	Spatio-temporal profiling of fish diversity and ecological niches of Thamirabarani an east-flowing river in Peninsular India	Kantharajan G. (PI), T.T. Ajith Kumar and A. Kathirvelpandian	April 2025 - March 2027

Institutional corpus funded projects

S. No	Project title	Personnel	Period
1.	Elucidating the role of temperature on immune response and susceptibility of *Pangasianodon hypophthalmus* against infection with *Saprolegnia parasitica*	Chandra Bhushan Kumar (PI), P.K. Pradhan and Neeraj Sood	February 2024 - March 2026
2.	Understanding the association of gut microbiome with *Enterocytozoon hepatopenaei* (EHP) infection in inland saline shrimp culture system	Anutosh Paria (PI), Neeraj Sood and P.K. Pradhan	February 2024 - March 2026
3.	Study of reproductive phenology variation of *Notopterus notopterus* in wild and captive environment	Monika Gupta (PI), Kantharajan G., Raghvendra Singh	February 2024 - March 2026
4.	Ecosystem dynamics and conservation strategies of the sacred rivers: Assessment of physicochemical attributes, fish biodiversity, and human impacts	Tarachand Kumawat (PI), Mahender Singh, Rejani Chandran, Kantharajan G., Jaspreet Singh and Vikash Sahu	February 2024 - March 2026
5.	Physiological insights into the reproductive mechanism of *Clarias dussumieri*, a near-threatened endemic catfish of the Western Ghat	Charan Ravi (PI), Rekha M.U. and Aditya Kumar	February 2024 - March 2026
6.	Development and evaluation of a small-scale prototype of species-specific Recirculatory Aquaculture System	Raghvendra Singh (PI), Aditya Kumar and Monika Gupta	February 2024 - March 2026
7.	Development and evaluation of autogenous inactivated vaccine against *Aeromonas hydrophila* and *Edwardsiella tarda* in oscar fish (*Astronotus ocellatus*)	Arun Sudhagar S. (PI), Anutosh Paria and Rekha M. U.	February 2024 - March 2026
8.	Unravelling the genetic diversity and population structure of *Chromis viridis* in Indian waters	Rekha M.U. (PI), Teena Jayakumar T. K. and Rejani Chandran	February 2024 - March 2026

ICAR-plan fund projects

S. No	Project Title	Scheme	Personnel	Period
1.	Participatory programme on exploration and characterization of fish germplasm resources and indigenous knowledge in the North-Eastern region of India	NEH Component	Rejani Chandran (Nodal Officer), Lalit Kumar Tyagi, Mahender Singh, Ajey Kumar Pathak, Aditya Kumar, Labrechai Mog Chowdhury, Raghvendra Singh, Tarachand Kumawat, G. Kantharajan and Amit Singh Bisht	April 2020 - March 2025

2.	Participatory programme on exploration, characterization, and conservation of fish germplasm resources and indigenous knowledge in North-Eastern region of India	NEH Component	Rejani Chandran (Nodal Officer), Lalit Kumar Tyagi, Ajey Kumar Pathak, Aditya Kumar, Labrechai Mog Chowdhury, Raghvendra Singh, Tarachand Kumawat, Kantharajan G. and Amit Singh Bisht	April 2025 - March 2028
3.	Network Project on Agricultural Bioinformatics and Computational Biology Sub Project: Understanding genomic factors responsible for growth performance in *Clarias magur*	ICAR Plan	Ravindra Kumar (PI), Basdeo Kushwaha, Murali S., Santosh Kumar and Tanwy Dasmandal	July 2020 - March 2026
4.	CRP on Genomics: Structural and functional characterization of *Clarias dussumieri*, *Chitala chitala* and *Catla catla* genomes and transcriptomes	ICAR Plan	J.K. Jena (Coordinator), Vindhya Mohindra (PI till May, 2025), Rajeev K. Singh (PI since June, 2025) Basdeo Kushwaha, L. Mog Chowdhury and Tanwy Dasmandal	April 2023 - March 2026
5.	CRP on Agrobiodiversity: Evaluation of fish germplasm from Indo-Gangetic rivers for their captive breeding, domestication, and conservation aquaculture	ICAR Plan	Aditya Kumar (PI), Santosh Kumar, Raghvendra Singh and Monika Gupta	April 2021 - March 2026
6.	CRP on Agrobiodiversity: Conservation aquaculture of endemic fish species from peninsular rivers through captive propagation and culture evaluation	ICAR Plan	Charan Ravi (PI), V.S. Basheer, T.T. Ajith Kumar and Rekha M.U.	April 2021 - March 2026
7.	All India network project on fish health	ICAR Plan	P. K. Pradhan (PI), Anutosh Paria, Gaurav Rathore and Neeraj Sood	April 2022 - September 2026
8.	CRP on Vaccines and Diagnostics: Development of point- of-care diagnostic kit and vaccine against Tilapia lake virus	ICAR Plan	Anutosh Paria (PI), Neeraj Sood and P.K. Pradhan	January 2023 - March 2026
9.	All India Network project on antimicrobial resistance (AINP-AMR) in fisheries and livestock	ICAR Plan	J. K. Jena (Coordinator), Kajal Chakraborty (Co-coordinator), Gaurav Rathore (PI), Chandra Bhushan Kumar, Anutosh Paria and Vikash Sahu	April 2024 - March 2026
10.	Intellectual property management and transfer/ commercialization of agricultural technology scheme (Up-scaling existing components i.e. Intellectual Property Right)	NAIF	Poonam Jayant Singh (PI), Mahender Singh and Arun Sudhagar S.	January 2022 - March, 2026
11.	Network Project on ornamental fish breeding and culture (NPOFBC)	ICAR Plan	V. S. Basheer (PI), Charan R., Rekha M.U., Monika Gupta, Aditya Kumar and Raghvendra Singh	April 2018 - September 2026

Externally funded projects

S. No	Project tile	Funding	Personnel	Period
1.	National Surveillance Programme for Aquatic Animal Diseases (Phase-II)	Department of Fisheries, Government of India, PMMSY	Coordinator: J.K. Jena, DDG (Fy.Sc.), ICAR Co-coordinators: Uttam Kumar Sarkar and Kajal Chakraborty Neeraj Sood (CPI), P.K. Pradhan, Anutosh Paria, Chandra Bhushan Kumar, Arun Sudhagar S., V.S. Basheer and Gaurav Rathore	July 2022 - March 2027
2.	National Surveillance Programme for Aquatic Animal Diseases - Phase II Sub-project Number 01: Surveillance of freshwater fish and shellfish diseases in Uttar Pradesh	Department of Fisheries, Government of India, PMMSY	P.K. Pradhan (PI), Chandra Bhushan Kumar, Gaurav Rathore and Neeraj Sood	July 2022 - March 2027
3.	National Surveillance Programme for Aquatic Animal Diseases - Phase II Sub-project Number 09: Surveillance of freshwater diseases in Kerala	Department of Fisheries, Government of India, PMMSY	V. S. Basheer (PI) and Arun Sudhagar S.	July 2022 - March 2027
4.	Quantifying agrobiodiversity and ecosystem services in Godavari River basin landscape	Bioversity International	Rajeev K. Singh (PI), L.K. Tyagi, Achal Singh, Rejani Chandran and Kantharajan G.	September 2021 - November 2025
5.	Global warming a potential driver of antimicrobial resistance in aquaculture: An *in-vitro* study in *Aeromonas hydrophila*	NICRA	Gaurav Rathore (PI) and Chandra Bhushan Kumar	January 2022 - March 2025
6.	Novel approaches for disease free health certification in finfish and development of high health shrimp for sustainable aquaculture	NASF	Gaurav Rathore (PI), Neeraj Sood, Chandra Bhushan Kumar	June 2022 - May 2025
7.	Assessment of climate change impact in the waterbodies of Uttar Pradesh and developing climate resilient strategies for sustainable fisheries management	UPCST	Lalit Kumar Tyagi (PI), Kantharajan G., Ajey Kumar Pathak, Santosh Kumar, Rejani Chandran and Tarachand Kumawat	January 2024 - January 2027
8.	Mainstreaming marine ornamental shrimp diversity for actions to enhance livelihood and gender empowerment opportunities among native Lakshadweep communities	CMLRE	T. T. Ajith Kumar (PI) and Rejani Chandran	May 2022 - September 2025
9.	Establishment of Marine Ornamental Species Hub in Pichavaram Region, Tamil Nadu for Sustainable Livelihood Development of Local SC Fisher Folks	DST	T. T. Ajith Kumar (PI) and A. Kathirvelpandian	June 2022 - May 2025

10.	Diving Down the Deep: Exploring the Deep-Sea Ichthyo-Faunal Resources of Indian waters for Sustainable Utilization-A Multidisciplinary Approach	MoES	T.T. Ajith Kumar (Coordinator), A. Kathirvelpandian (PI), Arun Sudhagar S., Ravindra Kumar, Mahender Singh, Murali S. and Kantharajan G.	April 2024 - March, 2026
11.	NNP (Agri-Genomic Repository and Intelligent Analytical System) of ICAR-Indian Agricultural Statistics Research Institute, New Delhi	DBT	Murali S. (PI) and Basdeo Kushwaha	September 2024 - September 2029
12.	Empowering coastal tribal community: Aquaculture and value addition for livelihood development in Pichavaram region, Cuddalore district, Tamil Nadu	Department of Tribal Welfare, Govt. of Tamil Nadu	Divya P. R. (PI) and T.T. Ajith Kumar	March 2025 - March 2027
13.	Molecular characterization and identification of genetic stocks of vulnerable *Wallago attu* (Bloch & Schneider, 1801) from the rivers of central India for its conservation and management implications	DST-SERB-TARE	Rajeev Kumar Singh (Mentor) and Rupesh Kumar Luhariya (PI)	February 2024 -February 2027
14.	Atlas of freshwater bony fish otolith of Uttar Pradesh, India	DST-SERB-NPDF	Rajeev Kumar Singh (Mentor) and Farah Bano (PI)	May 2024 - May 2026

Publications

Research publications

1. **Abhilash, C.P., C. Ravi, K.R. Saikrishnan, S. Varghese, B.L. Chandana, T.T. Ajith Kumar, U.K. Sarkar and V.S. Basheer, 2025.** Captive breeding, embryonic development, and conservation of the endangered catfish, *Horabagrus nigricollaris* (Pethiyagoda & Kottelat 1994): a first report. *Aquaculture International*, 33(2): 121.

2. **Ahirwal, S.K., A.K. Jaiswar, S. Bhushan, M.S. Mogalekar, T. Kumar, J. Singh and K. Sarma, 2025.** Length-weight relationship, relative condition factor and reproductive parameters of *Mystus cavasius* (Hamilton, 1822) in the river Ganga. *Journal of Environmental Biology*, 46(1): 58-65.

3. **Ahirwal, S.K., K. Sarma, T. Kumar, V. Bharti, R. Kumar, J. Singh and S. Raut, 2025.** Insights into biological indices of six indigenous fish species from Bihar, India. *Indian Journal of Fisheries*, 72(3): 177-180.

4. **Bano, F., H. Mishra, G. Kantharajan, S. Kanaujia, R.K. Singh and U.K. Sarkar, 2025.** Unravelling reproductive biology of the striped gourami, *Trichogaster fasciata* (Bloch and Schneider, 1801) with reference to climate change and implications on breeding phenology in Ganges basin, India. *International Journal of Biometeorology*, 69: 1557-1568.

5. **Chandran, R., G. Kantharajan, A.P. Singh, V. Kumar, A.S. Bisht, R.K. Singh and U.K. Sarkar, 2025.** Radiographic revelations: vertebral profiles of key freshwater fish species in India. *Journal of Inland Fisheries Society of India*, 57(3): 317-342.

6. **Chandran, R., G. Kantharajan, R.K. Singh, L.K. Tyagi, A. Singh and U.K. Sarkar, 2025.** Biological parameters of the revalidated cyprinid *Osteobrama dayi*, endemic to the Godavari River, India. *Indian Journal of Fisheries*, 72(4): 136-139.

7. **Chandran, R., N. Saravanane, T.T. Ajith Kumar and U.K. Sarkar, 2025.** Exploring reproductive and population characteristics of magnificent shrimp, *Ancylomenes magnificus* from the Gulf of Mannar, India. *Journal of the Marine Biological Association of the United Kingdom*, 105: e19, 1-12.

8. **Chauhan, N., V. Mohindra, L.M. Chowdhury, A. Paul, A. Kumar, A.K. Singh, M. Imran and J.K. Jena, 2025.** Identification of immune related genes and associated simple sequence repeats from kidney transcriptome of *Cyprinus carpio*, exposed to two different temperature conditions. *Fishery Technology*, 62(3): 357-368.

9. **Chauhan, N., V. Mohindra, L.M. Chowdhury, A. Paul, R. Kumar, M. Imran, A.K. Singh and J.K. Jena, 2025.** Comparative transcriptomics-based analysis of Common Carp (*Cyprinus carpio*) kidney tissues reveals differential immune responses at two temperatures. *Indian Journal of Animal Research*, 59(8): 1341-1348.

10. **Chowdhury, L.M., D.K.B. Mukhim, K. Sarma, D.P. Warbah, D. Sarma, J.K. Jena and V. Mohindra, 2025.** Mitogenome of *Neolissochilus pnar*, the largest cavernicolous species of Mahseer. *Scientific Reports*, 15(1): 8893.

11. **Christo, M and P.R. Divya, 2025.** Pearlspot, *Etroplus suratensis* (Bloch 1790): A commercially important candidate species for aquaculture and livelihoods: A review. *Agricultural Science Digest - A Research Journal*, 6207: 1-10.

12. **Dasmandal, T., D. Sinha, A. Rai, D.C. Mishra and S. Archak, 2025.** Comparative analysis of machine learning models for shortlisting SNPs to facilitate detection of marginal epistasis in GWAS. *International Journal of Data Science and Analytics*, 20(3): 2757-2766.

13. **Dave, C.P., V.K. Yadav, G. Kantharajan, A. Sharma, L. Paul, R. Choudhury, M. Meharoof and M. Sharma, 2025.** Integrated analysis of land use changes, ecosystem service valuation, and carbon

sequestration in the Dimbhe Watershed (2002-2022). *Discover Sustainability*, 6(1): 1072.

14. **Dheeran, P., A.K. Verma, S. Krishnan, K.K. Krishnani, M.H. Chandrakant, A. Paria and M.G. Pratapa, 2025.** Haemato-biochemical changes in epizootic ulcerative syndrome (EUS) infected striped murrel (*Channa striata*) cultured in inland saline water. *Indian Journal of Fisheries*, 72(2): 125-132.

15. **Divya, P. and T.T. Ajith Kumar, 2025.** Invasive surge: swift feast of bellicose alien mussel, *Mytella strigata* in Indian mangroves. *Current Science*, 128(3): 229.

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8. **Rekha, M.U., T.K. Teena Jayakumar, N. Hussna and T.T. Ajith Kumar, 2025.** പ്രേതവലകൾ: തിരമാലകൾക്കു താഴെയുള്ള അദൃശ്യ കൊലയാളികൾ (Malayalam) 4p.
9. **Teena Jayakumar, T.K., N. Hussna, M.U. Rekha and T.T. Ajith Kumar, 2025.** Ghost nets: invisible killers beneath the waves. 4p.
10. **Teena Jayakumar, T.K., M.U. Rekha, C.P. Abhilash and T.T. Ajith Kumar, 2025.** Silent healers of the ocean: protect the sea cucumbers of Lakshadweep. 4p.
11. **Teena Jayakumar, T.K., M.U. Rekha, S. Akash, E.R. Sangamitra and T.T. Ajith Kumar, 2025.** Fragile treasures conserve coral reefs of Lakshadweep. 4p.
12. **Teena Jayakumar, T.K., M.U. Rekha, N. Hussna and T.T. Ajith Kumar, 2025.** Endangered elegance: Protect the Humphead wrasse of Lakshadweep. 4p.

Participation in Seminar/ Symposia/ Workshop/ Training/ Meeting

Dr. Kajal Chakraborty

- Meeting with DDG (Fy.), ICAR, KAB-II, Pusa New Delhi on April 21, 2025 and October 3, 2025
- Meeting for signing MoU between ICAR-NBFGR, Lucknow and Kalyani University, West Bengal on May 19, 2025
- Annual Meet of Vice-Chancellors of Agricultural Universities and Directors' of ICAR Institute on May 20, 2025
- Expert committee meeting on normally traded as commodities (Freshwater, Brackish water and Marine Biological Resources) held at Hyderabad on June 16, 2025
- Review Meeting cum Workshop on Participatory Programme on Exploration and Characterization of Fish Germplasm Resources and Indigenous Knowledge in North-eastern Region of India at College of Fisheries, Lembucherra, Tripura on July 11, 2025
- Second Indian Fisheries Outlook 2025 organized by PFGF, ICAR-CIFRI and College of Fisheries (OUAT) at Berhampur, Odisha on July 13, 2025
- ICAR Foundation Day at NASC, New Delhi during July 14-17, 2025
- Annual review meeting and Advisory board meeting of INFAAR at NASC, New Delhi during August 20-21, 2025
- EDP on 'Leadership Excellence' at NAARM, Hyderabad during September 8-13, 2025
- National Workshop on 'Species Prioritization in Aquaculture and Genetic Improvement' at ICAR-CIFA, Bhubaneswar during September 1-2, 2025
- ICAR Norman Borlaug Award Challenge Project Committee meeting at ICAR-CMFRI, Kochi during September 25-26, 2025
- Bio Connect 3.0 International Life Science and Expo at Trivandrum, Kerala during October 9-10, 2025
- Inaugural Session as Guest of Honour of Training Programme RLBCAU, Datia on October 16, 2025
- MoU signing with ICAR-NBFGR and College of Fisheries, RLBCAU, Jhanshi on October 16, 2025
- MoU signing between ICAR-NBFGR, Lucknow and Rani Lakshmi Bai Central Agricultural University, Jhansi at Jhansi on November 21, 2025
- DBT-BIRAC Joint Selection Committee-Futuristic Marine Research during December 8-10, 2025
- DST Task Force meeting of IRG organized by Anusandhan National Research Foundation (ANRF) DST at IIT Madras held on December 22-23, 2025

Dr. T.T. Ajith Kumar

- Inception cum planning workshop for Management effectiveness on 'Evaluation of Coastal and Marine Protected Areas' organised by Wildlife Institute of India, held at Dehradun on January 24, 2025
- Syllabus Framing Committee Meeting (virtual) on Biodiversity and Animal Taxonomy, organised by Pondicherry University on March 19, 2025
- Meeting of Research Advisory and Monitoring Committee of Zoological Survey of India held at Ranthambore, Rajasthan during April 24-25, 2025 and at Kolkata, West Bengal during September 18-19, 2025
- Meeting of Expert Committee on Biological Resources-Normally Traded as Commodities, organised by the National Biodiversity Authority held at Hyderabad on June 16, 2025

Dr P.K. Pradhan

- Review meeting (virtual) on 'Progress under NSPAAD Phase II' and other fish health issues under the Chairmanship of Secretary, Department of Fisheries, Government of India, on January 10, 2025
- 43rd and 44th meetings of National Committee on Introduction of Exotic Aquatic Species into Indian Waters, held on April 11, 2025 and October 28, 2025, respectively
- Expert Consultation on 'Aquaculture Medicines: Research, Policy and Implementation' held at NASC

under All India Network Project on Fish Health during May 8-9, 2025

- Review meeting on 'Progress under NSPAAD Phase II', organized by Department of Fisheries, Government of India, at ICAR-NBFGR on October 25, 2025
- Observer to 23rd Meeting of Asia Regional Advisory Group on Aquatic Animal Health (AGM 23) (virtual), organized by Network of Aquaculture Centres in Asia-Pacific, during November 24-25, 2025

Dr. Ravindra Kumar

- International Biological Diversity Day and National Workshop on 'प्रकृति तथा सतत विकास के साथ समान्जस्य' organised by UP Biodiversity Board at Indira Gandhi Pratishthan, Lucknow on May 22, 2025
- SMD (Fishery) Meeting (virtual) on 'Review of Aquatic Species Listed under the Wildlife (Protection) Act, 1972 (Amendment, 2022): Proposals for Reclassification and Sustainable Utilization Wildlife Protection Act, 2021' held on Jun 16, 2025
- e-Office training for eOffice eFile users of ICAR Institutes under Fisheries Division/ Agriculture Extension Division/ Agriculture Engineering (incl. IASRI)/ Agriculture Education on July 17, 2025
- Meeting (virtual) for 'Network Project on Agricultural Bioinformatics and Computational Biology' on September 26, 2025 and December 4, 2025
- 'UP Fisheries Investment and Growth Summit 2025: Blue Transformation in Uttar Pradesh' held at ICAR-NBFGR, Lucknow during December17-18, 2025

Dr. Neeraj Sood

- Expert Consultation on 'Aquaculture Medicines: Research, Policy and Implementation', at NASC Complex, ICAR, New Delhi under All India Network Project on Fish Health during May 8-9, 2025 and Coordinated Group III: Disinfectants in Aquaculture
- 33rd meeting of Local Advisory Committee of Regional Science City, Lucknow on August 04, 2025
- First, second, and third meetings (virtual) of Expert Committee for updation of Standard Operating Procedures (SOP) for import of Specific Pathogen Free (SPF) Broodstock of crustaceans and artemia from South East Asian countries on September 15, 17, and 19, 2025, respectively
- Training of Master Trainers on Vigilance Perspectives at ICAR-NAARM, Hyderabad during November 17-19, 2025
- Expert committee meeting (virtual) along with stakeholders regarding the Draft SOP for import of SPF Broodstock of crustaceans and artemia from South East Asian countries on December 1, 2025

Dr. V.S. Basheer

- International workshop on 'Artificial Intelligence and Sustainability Applied in Aquaculture' held at Tainan, Taiwan, implemented under coordination of Asian Productivity Organisation (APO), Tokyo during June 3-6, 2025

Dr. Gaurav Rathore

- Lead panellist in 'Stakeholder Consultation Session on AMR in Fisheries sector' organised by CII-FACE (Confederation of Indian Industry-Food and Agriculture Centre of Excellence) on April 30, 2025

Dr. Lalit Kumar Tyagi

- Scientific Advisory Committee Meeting (virtual) of the KVK, Hardoi on December 16, 2025

Dr. Achal Singh

- Orientation Workshop on Mission Karmayogi (virtual mode) organised by ICAR on February 27, 2025
- Observer (Server) duty for ASRB, New Delhi to conduct CBT for NET-2025 & Preliminary examination for ARS, SMS & STO (T-6)-2025 at GBK Foundation from November 11-13, 2025
- Online meeting to discuss progress of iGOT courses by ICAR employees and preparation of Domain specific courses related to Agriculture and allied sciences for hosting on iGOT Karmayogi Platform under Mission Karmayogi on December 8, 2025

Dr. Poonam Jayant Singh

- NABARD-ICAR-NBFGR Meeting on FPO Formation under Mission Navshakti at NABARD Regional Office, Lucknow on April 21, 2025
- Strategic Interface Meeting: State Fisheries Departments for collaborative fisheries development programmes with State Fisheries Department officials on May 14, 2025

Dr. Rejani Chandran

- Workshop on UGC Regulations 2015 (Prevention, Prohibition, and Redressal of Sexual Harassment of Women Employees and Students in Higher Education Institutions), organized by BBAU, Lucknow held during October 6-7, 2025

Dr. Charan R.

- CRP on Agrobiodiversity Review Meeting at ICAR-NBAIR, Bengaluru on September 12, 2025

Dr. Anutosh Paria

- Meeting to organize Training & Capacity Building Programme for Fishers & Fish Farmers organized by Department of Fisheries, Government of India on July 28, 2025
- International workshop on 'Asia-Pacific Laboratory Proficiency Testing Programme for Aquatic Animal Diseases' organized by Australian Government Department of Agriculture, Fisheries and Forestry (DAFF), Commonwealth Scientific and Industrial Research Organization's Australian Centre for Disease Preparedness (CSIRO-ACDP) in collaboration with Network of Aquaculture Centres in Asia-Pacific (NACA) held at Bangkok, Thailand during August 28-29, 2025

Dr. Chandra Bhushan Kumar

- Regional Training Workshop on 'Antimicrobial Susceptibility Testing for Bacterial Pathogens in Aquatic Animals for Lead Aquatic Animal Health National Laboratories' organised by FAO RAP, in collaboration with NParks and FAO AMR Reference Center in UK, at Singapore during July 14-18, 2025

Dr. Rekha M.U.

- ICAR-sponsored Winter School on 'Genetic and Genomic Tools for Sustainable Aquaculture and Fisheries Management' organised by ICAR-CMFRI at Kochi during January 15-February 04, 2025

Dr. Monika Gupta

- Brainstorming Session (virtual) on 'Managing emerging environmental contaminants in aquaculture and fisheries' by NAAS India on July 18, 2025
- Online Mid-Term Review of XXVII ICAR Regional Committee Meeting at ICAR-CRRI, Cuttack, Odisha on September 12, 2025

Dr. Kantharajan G.

- Workshop on 'Research and Development in Space Technology for Agricultural Transformation by ICAR' at NASC Complex, New Delhi on August 23, 2025

Dr. Jaspreet Singh

- ICAR Sponsored 21 days winter school training programme on 'Ecosystem health monitoring and Fisheries Management in Inland Open Waters' at ICAR-CIFRI, Barrackpore during February, 20 to March 12, 2025

Drs. T.T. Ajith Kumar, Teena Jayakumar T.K.

- International conference on 'Blue Economy-2025', organised by Alagappa University during January 20-22, 2025

Drs. P.K. Pradhan and Neeraj Sood

- Virtual meeting to discuss Veterinary Health Certification (VHC) for Export of Broodstock and PPL of crustaceans from USA to India on April 1, 2025 and April 7, 2025 hosted by Department of Fisheries, Government of India
- Virtual meeting by US team with Coastal Aquaculture Authority & Department of Fisheries, Government of India convened by Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India on April 30, 2025
- Virtual meeting on National Surveillance Programme for Aquatic Animal Diseases before USFDA team at Department of Fisheries, Krishi Bhawan, New Delhi on May 15, 2025
- Meeting to draft National Aquaculture Biosecurity Plan Guidelines at KAB-II, ICAR, New Delhi during August 18-19, 2025

Drs. P.K. Pradhan and Anutosh Paria

- Review meeting of 'All India Network Project on Fish Health' organized by ICAR-CIBA, Chennai at NASC, ICAR, New Delhi on May 07, 2025
- Coordinated meeting for 'Aquatic animal disease management and ReportFishDisease' organized by Department of Fisheries, Government of Meghalaya at Shillong on June 05, 2025

Drs. P.K. Pradhan, Ravindra Kumar, Basdeo Kushwaha

- XVII Agricultural Science Congress (17ASC) organized at G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India during February 20-22, 2025

Drs. Kajal Chakraborty, P.K. Pradhan, Neeraj Sood, Gaurav Rathore, Anutosh Paria, Arun Sudhagar S., Chandra Bhushan Kumar, Dr. Ranjan Singh

- Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society, Fish Health Section and ICAR-CIBA, Chennai, during September 23-27, 2025.

Drs. Kajal Chakraborty, Divya P.R., A. Kathirvelpandian, Teena Jayakumar T. K., Rekha M.U.,

- International Symposium on Marine Ecosystems Challenges and Opportunities (MECOS 4) organized by Marine Biological Association of India at ICAR-CMFRI during November 04-06, 2025.

Drs. U.K. Sarkar, Vindhya Mohindra, P.K. Pradhan, Rajeev K. Singh, Ravindra Kumar, Basdeo Kushwaha, Neeraj Sood, Gaurav Rathore, V.S. Basheer, A. Kathirvelpandian, Rejani Chandran, Charan R., Murali S., Aditya Kumar, Anutosh Paria, L. Mog Chowdhury, Arun Sudhagar S., Chandra Bhushan Kumar, Raghvendra Singh, Monika Gupta, Ranjan Singh

- 14th Asian Fisheries and Aquaculture Forum (14AFAF) organised by Asian Fisheries Society, in collaboration with ICAR at New Delhi, India during February 12-15, 2025

Drs. Rejani Chandran, Santosh Kumar, Aditya Kumar, Raghvendra Singh, Tarachand Kumawat, Monika Gupta, Rekha M.U., Jaspreet Singh, Tanwy Dasmandal, Deva Narayan, Ranjan Singh

- Training programme on 'Cytogenetic and Genotoxicity Biomarkers: Principles and Practices' held at ICAR-NBFGR, Lucknow, during September 10-19, 2025

Drs. Rejani Chandran, Santosh Kumar, Raghvendra Singh and Monika Gupta

- National Seminar on Green Energy for Clean Environment and Sustainable Agriculture organised by the Academy of Natural Resource Conservation and Management (ANRCM), Lucknow at ICAR-NBFGR, Lucknow on April 22, 2025

Drs. Kajal Chakraborty, P.K. Pradhan, V.S. Basheer, Ajey Kumar Pathak, Poonam Jayant Singh, Rejani Chandran, Charan R., Murali S., Aditya Kumar, Tanwy Dasmandal

- World Aquaculture 2025, India, organised by the World Aquaculture Society at Hyderabad during November 10-13, 2025

Drs. Charan R., Murali S., Chandra Bhushan Kumar, Tanwy Dasmandal

- AquaIP-Online Awareness Training Programme on 'Intellectual Property Rights', jointly organised by IPTM, New Delhi, Zonal Technology Management-Agribusiness Incubation Centre, and ICAR-CIFT during January 23-30, 2025

Drs. Chandra Bhushan Kumar, Akhilesh K. Mishra, Shri Vijay K. Singh, Vikas Kumar, Nitish K. Patel

- Workshop on 'NGS Data Analysis' organised at ICAR-NBFGR, Lucknow during July 21-23, 2025

Drs. P.K. Pradhan, Rajeev K. Singh, Ravindra Kumar, Neeraj Sood, Gaurav Rathore, Achal Singh, Ajey Kumar Pathak, Murali S., Labrechai Mog Chowdhury, Chandra Bhushan Kumar, Raghvendra Singh, Tarachand Kumawat, Monika Gupta, Tanwy Dasmandal

- Expert Consultation on 'Development of a Roadmap for Translational Genomics in Indian Aquaculture' organised at ICAR-NBFGR, Lucknow under CRP-Genomics on August 29, 2025

Shri Subhash Chandra

- भाकृअनुप–केंद्रीय मात्स्यिकी शिक्षा संस्थान, मुंबई द्वारा कोलकाता क्षेत्रीय केंद्र में दिनांक 21–22 अप्रैल, 2025 को आयोजित 'विकसित भारत की संकल्पना में राजभाषा प्रबंधन की भूमिका' विषय पर आयोजित राष्ट्रीय संगोष्ठी

Dr. Akhilesh Kumar Mishra

- नई दिल्ली स्थित भारत मंडपम में दिनांक 26.06.2025 को आयोजित राजभाषा विभाग के स्वर्णजयंती समारोह में भाग लिया

Dr. Tarachand Kumawat

- National Conference on "Invasive Alien Fauna: Threats & Challenges" organized by Zoological Survey of India during March 25-26, 2025
- Workshop on "Adoption of Climate Resilient Agriculture & Livelihoods by Small Holder Farmers" organized by Bankers Institute of Rural Development, Lucknow on June 05, 2025
- 'State-level Conference' on the occasion of National Fish Farmers Day organized by Sahakar Bharati Fish Cooperative Cell on July 10, 2025
- Viksit Krishi Exhibition at NASC Complex, PUSA, New Delhi on the 97th ICAR Foundation Day on July 16, 2025
- National Level Inception Workshop for preparation of India's Seventh National Report to the Convention on Biological Diversity (CBD) (online) organized by the Ministry of Environment, Forest & Climate Change, New Delhi on September 19, 2025
- Webinar 'Writing an Effective Policy Brief from Your Research' organized by CABI on September 25, 2025
- Live Broadcast of the Hon'ble Prime Minister's launch of PM Dhan-Dhaanya Krishi Yojana and Dalhan Aatmanirbharta Mission on October 11, 2025
- NAAS Brainstorming Session on 'Regional Priorities in Agriculture and Allied Sciences in the context of Viksit Krishi' on October 17, 2025
- Live Broadcast of the Hon'ble Prime Minister's event of release of 21st instalment of the PM-KISAN Samman Nidhi on November 19, 2025
- NAAS Awareness Programme 'Innovation to Impact: Inspiring Youth Careers in Agriculture and Allied Sectors through Intellectual Property Awareness' on December 11, 2025
- Uttar Pradesh Fisheries Investment & Growth Summit 2025 (Blue Transformation in Uttar Pradesh) organised by the Department of Fisheries, Government of Uttar Pradesh, during December 17-18, 2025
- Live Broadcast of the Viksit Bharat G RAM G information dissemination on Farmers Day on December 23, 2025.

Mr. Satyavir Chaudhary

- 9th International Conference of Asian Special Libraries (ICoASL) on 'Sustainable Development of Libraries through Innovative Technology' at Dr Ram Manohar Lohiya National Law University, Lucknow during May 9-11, 2025
- ILA National Webinar on 'One Nation, One Subscription: Opportunities and Challenges' held at Indian Library Association, New Delhi on June 6, 2025
- Webinar on 'Accelerating Library Services through AI' at IILM University, Gurugram on June 12, 2025
- Dr. H.K. Kaul Memorial Lecture 2025 on 'Libraries in the Age of AI & Big Data' on July 1, 2025
- National webinar on 'AI in Libraries: A catalyst for innovation, discovery and engagement' organized by Indian Library Association, New Delhi on July 16, 2025
- 19th International Conference on Webometrics, Informetrics and Scientometrics (WIS) and 24th COLLNET Meeting 2025 organized by Institute of Economic Growth, Delhi University Campus, IEG Delhi during September 19-21, 2025

Dr. Vikash Sahu

- National Seminar on 'Integrated Farming System (IFS) and Krishi Samriddhi Mela' organized by Dhaanyaganga KVK, Berhampore, West Bengal during January 11-12, 2025
- National Seminar on 'Green Energy for Clean Environment & Sustainable Agriculture' organized by Academy of Natural Resource Conservation and Management (ANRCM) Lucknow on April 22, 2025
- Annual review meeting of INFAAR at NASC, New Delhi during August 20, 2025

Shri Subhash Chandra and Shri Ram Sakal Chaurasia

- राजभाषा विभाग, गृह मंत्रालय, भारत सरकार द्वारा दिनांक 14–15 सितंबर, 2025 को महात्मा मंदिर कन्वेंशन एवं एग्जिबिहिशन सेंटर, गाँधीनगर, गुजरात में आयोजित 'हिंदी दिवस, 2025 और पाँचवें अखिल भारतीय राजभाषा सम्मेलन'

Dr. Akhilesh Kumar Mishra and Shri Ram Sakal Chaurasia

- हैदराबाद स्थित जीएमसी बालयोगी इनडोर स्टेडियम में दिनांक 11.07.2025 को आयोजित राजभाषा विभाग के स्वर्णजयंती समारोह में भाग लिया

All scientific and technical staff

- Viksit Bharat Sankalp Abhiyan (VKSA)-2025 to Gonda and Sitapur districts, Uttar Pradesh during May 29 - June 12, 2025
- Hindi workshop, 'दैनिक जीवन में तनाव प्रबंधन' on June 20, 2025
- Workshop on 'Awareness to Action: Conserving Fish Diversity for Future Generations' organized by ICAR-NBFGR, Lucknow, in collaboration with Uttar Pradesh State Biodiversity Board on August 13, 2025
- Hindi workshop 'राजभाषा त्रैमाषिक हिंदी कार्यशाला' on December 26, 2025

Invited Lectures/Presentation

Dr. Kajal Chakraborty

- Lecture on 'Marine Natural Products: Exploring Chemical Diversity for Nutraceuticals and Therapeutics in Human Health' in Brainstorming Session on 'Marine Nutraceuticals for boosting Bio-Economy in India' organized by NAAS on July 28, 2025
- Endowment Oration talk on 'Advancements and Innovations in Phytochemistry-Therapeutic Translation' organized by Kerala Academy of Sciences at Kollam on December 15, 2025

Dr. P.K. Pradhan

- Oral presentation on 'Aquatic Animal Disease Surveillance in India- A Success Story' at World Aquaculture 2025 India conference organized by the World Aquaculture Society at Hyderabad during November 10-13, 2025
- Invited lecture on 'Preparedness and Emergency Response for Aquatic Animal Diseases' during the 'Viksit Uttar Pradesh @ Vision 2047-Uttar Pradesh's Blue Transformation: UP Fisheries Investment and Growth Summit' organized by Department of Fisheries, Government of Uttar Pradesh during December 17-18, 2025

Dr. Ravindra Kumar

- Invited lecture on 'Fish Genomics in India: Status and Prospects' in Theme 5 (Blue Revolution: Harnessing Science and Technology) Session 2 (Emerging Challenges in Fish Genetics, Health & Nutrition) of XVII Agricultural Science Congress organized at G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India during February 20-22, 2025
- Lecture on 'Sustainable Aquaculture Practices and its Future in Eastern U.P' in 'Farmers-Scientist Interaction Session-cum-Awareness Meet on PMMSY & PM-MKSSY', held at College of Fisheries, ANDUAT, Kumarganj, Ayodhya on July 10, 2025
- Invited lecture on 'NGS data generation and analysis' on November 14, 2025 in the Faculty Development Program (FDP) on 'Interdisciplinary Advances in Bioinformatics and Computational Biology', organized by Department of Bioengineering, Faculty of Engineering, Integral University, Lucknow during November 06-19, 2025
- Talk on 'Measures to enhance fish production' at 'UP Fisheries Investment and Growth Summit 2025: Blue Transformation in Uttar Pradesh' at ICAR-NBFGR on December 18, 2025

Dr. Neeraj Sood

- Presentation on 'Progress under NSPAAD Phase II' in Virtual Meeting on Fish Disease Surveillance programme and other issues related to fish and shellfish disease in fisheries and aquaculture sector organized by Department of Fisheries, Government of India on January 10, 2025
- Lead Presentation on 'Aquatic Animal Disease Surveillance in India' during Symposium on 'Aquatic Animal Diseases: Emerging Challenges and Preparedness' on February 13, 2025 on side-lines of 14th Asian Fisheries and Aquaculture Forum (14AFAF) at the ICAR Convention Center, New Delhi, India during February 12-15, 2025
- Lead Presentation on 'Aquatic Animal Disease Surveillance in India' in Aquatic Animal Epidemiology, Disease Surveillance and Reporting in Diseases in Asian Aquaculture (DAA-12) organised by the Asian Fisheries Society (AFS) and ICAR-CIBA, Chennai, during September 23-27, 2025

Dr. Ajey Kumar Pathak

- Oral presentation on 'Fish Biodiversity and Habitat Assessment of Subarnarekha River Towards Fulfilment of Obligations on Cataloguing, Conservation and Management' in World Aquaculture 2025, India, organised by World Aquaculture Society at Hyderabad during November 10-13, 2025

Dr. Poonam Jayant Singh

- Talk on 'Protecting Ideas, Driving Innovation: The Strategic Importance of IPR' at Govt. Girls Inter College, Hastinapur, Meerut on January 28, 2025
- Oral Presentation (virtual) on 'Building inclusive ecosystem for empowering marginalized rural women in India through

ornamental fisheries-based micro-entrepreneurship through Mission Navshakti' at Asian Institute of Technology, Bangkok, Thailand during October 1-3, 2025

- Oral presentation on 'Mission Navshakti: Advancing rural women's empowerment through ornamental fish farming-based micro-enterprises' in World Aquaculture 2025, India, organised by World Aquaculture Society at Hyderabad, India during November 10-13, 2025

Dr. Rejani Chandran

- Oral presentation on 'Improving fisheries resource management for sustainable utilization and livelihood generation in the NEH region: Status and way forward' in 14th Asian Fisheries and Aquaculture Forum (14AFAF) organised by Asian Fisheries Society, in collaboration with ICAR at New Delhi, India during February 12-15, 2025
- Oral presentation on 'Mapping of water spread dynamics of the Bakhira Wetland, Uttar Pradesh with special reference to fisheries' in World Aquaculture 2025, India, organised by World Aquaculture Society at Hyderabad, India during November 10-13, 2025

Dr. Santosh Kumar

- Online lecture on 'Cryopreservation of carp milt for improving hatchery stocks' in National Training program on Genetic Management of Carp Broodstock for Quality Seed Production' organized by ICAR-CIFA, Bhubaneshwar on August 22, 2025

Dr. Murali S

- Oral presentation on 'A strategic resource for *In Vitro* aquaculture research' in World Aquaculture 2025, India, organised by World Aquaculture Society at Hyderabad, India during November 10-13, 2025
- Invited lecture on 'Decoding fish DNA: The story of genomics in India' organized by UGC–MMTTC, Gauhati University at Department of Zoology, Gauhati University on October 29, 2025

Dr. Anutosh Paria

- Keynote lecture on 'Prevention and Reporting of Fish Diseases' in National Seminar on 'Integrated Farming System (IFS) and Krishi Samriddhi Mela' organized by Dhaanyaganga KVK, Berhampore, West Bengal during January 11-12, 2025
- Oral presentation on 'Effect of benzalkonium chloride on different life stages of Indian major carp, *Labeo rohita* and evaluation of its efficacy in treating *Aeromonas veronii* infection' in 14th Asian Fisheries and Aquaculture Forum (14AFAF) organised by Asian Fisheries Society, in collaboration with ICAR at New Delhi, India during February 12-15, 2025
- Poster presentation on 'Temperature modulates the susceptibility of Nile tilapia to Tilapia lake virus' in Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society (AFS) and ICAR-CIBA, Chennai, during September 23-27, 2025
- Oral presentation on 'Use of benzalkonium chloride as a broad-spectrum therapeutic agent in different life stages of Indian major carp, *Labeo rohita*' in Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society, Fish Health Section and ICAR-CIBA, Chennai, during September 23-27, 2025

Dr. Chandra Bhushan Kumar

- Oral presentation on 'Assessment of antimicrobial resistance in *Aeromonas* species isolated from freshwater fish of Uttar Pradesh, India' in 14th Asian Fisheries and Aquaculture Forum (14AFAF) organised by Asian Fisheries Society, in collaboration with ICAR at New Delhi, India during February 12-15, 2025
- Poster presentation on 'Morality of farmed striped catfish *Pangasianodon hypophthalmus* attributed to *Edwardsiella ictaluri* infection in Uttar Pradesh, India' in Diseases in Asian Aquaculture (DAA-12) organised by Asian Fisheries Society (AFS) and ICAR-CIBA, Chennai, during September 23-27, 2025

Dr. Tanwy Dasmandal

- Oral presentation on 'BACMAP: A bioinformatics platform for analysis and management of BAC resources' in World Aquaculture 2025, India, organised by World Aquaculture Society at Hyderabad, India during November 10-13, 2025

Drs. Raghvendra Singh and Monika Gupta

- Guest speaker in Brainstorming program on 'Sustainable development for blue revolution in Uttar Pradesh' organized by DUVASU Mathura on January 24, 2025

Library and Documentation Unit



ICAR-NBFGR library

The Punyabrata Das Library functions as an extensive repository for literature and scientific knowledge, providing current information on fish diversity, conservation, genetics, health, fisheries, and allied disciplines. The library supports users at institute's headquarters, its centre and unit, while also catering to the needs of students, researchers, and professionals from other institutions, state fisheries departments, universities, and colleges.

Summary Statistics

Additionally, several journals were acquired through complimentary subscriptions and exchange basis.



Books

7936



e-Books

15



Bound Journals

3348



One Nation One Subscription

ICAR-NBFGR has been registered as a member institution under One National One Subscription (ONOS) scheme. The ONOS initiative, launched by the Government of India, is a transformative step towards democratizing access to knowledge and research resources across the country. ONOS provides seamless access to 13,500+ scholarly journals from 30 major international publishers in the fields of Science, Technology, Engineering, Medicine and Social Sciences. It helps users to search and access scholarly resources available under ONOS from multiple publishers.

Plagiarism detection

Library procured iThenticate PG 2.0 software, a widely used plagiarism detection tool to assess the originality of the written content. The software is being used by the scientists of ICAR-NBFGR for checking the research manuscripts and scientific documents before submission for publication or official purposes.

Information and Reference Services

The library functions in a fully automated mode, with operations computerized using KOHA, an open-source library management system. Barcoding of books, periodicals, and other publications has been completed to facilitate automated circulation. Assistance was provided in locating books, journals, and other materials through the Online Public Access Catalogue (OPAC) module of the KOHA library management system, enabling users to conduct efficient search and retrieve relevant information with ease.

Technical Reports and Reprography Services

Library and Documentation Unit extended comprehensive technical support for preparation and publication of departmental reports, manuals, newsletters, research documents and other institutional publications. In addition to documentation support, the unit offered a range of reprographic and document-processing services to meet the day-to-day requirements of staff, researchers, and students. These services included photocopying and printing facilities, as well as comb binding, spiral binding, and lamination services for different types of documents, training materials, and other official records.

Exchange Services

The library continued its exchange partnerships and resource-sharing activities with leading research institutes and developmental organizations. To keep stakeholders updated on the Bureau's activities, the library distributed the ICAR-NBFGR Annual Report 2024 and other publications to a broad range of recipients, including universities, state fisheries departments, Fish Farmers Development Agencies, Krishi Vigyan Kendras, entrepreneurs, and fish farmers.

Promotion/ Joining/ Relieving/ MACP/ Superannuation

Joining/Appointment

Sl. No.	Name of employee	Date of joining
1.	Sh. Karunesh Shukla, Administrative Officer joined after transfer from ICAR-IVRI, Izatnagar	02.01.2025 (F.N.)
2.	Dr. T.T. Ajith Kumar, Head, PAGR Centre, ICAR-NBFGR joined as Director (Acting), ICAR-NBFGR, Lucknow	01.03.2025 (F.N.)
3.	Dr. Kajal Chakraborty, Head, MBFNH Division, ICAR-CMFRI, Kochi, joined as Director, ICAR-NBFGR, Lucknow	07.04.2025 (F.N.)
4.	Dr. Rejani Chandran, Scientist joined as Senior Scientist, ICAR-NBFGR, Lucknow	06.05.2025 (A.N.)
5.	Dr. Ravindra Kumar, Principal Scientist taken over charge of Head (Acting) of GCR Division, ICAR-NBFGR, Lucknow	01.06.2025 (F.N.)
6.	Sh. Manoj Kumar Yadav, Senior Technical Assistant (T-4), joined after transfer from ICAR-CICFR, Bhimtal	01.09.2025 (F.N.)
7.	Dr. Anisha Valsalam joined as Scientist, ICAR-NBFGR, Lucknow	21.10.2025 (F.N.)

Promotion

S. No.	Name of employee	Date of promotion
1.	Dr. Ranjan Singh, Technical Assistant (T-3) promoted to Senior Technical Assistant (T-4) in PB-2 of Rs. 9300-34800+GP of Rs. 4200/- Level-6	18.12.2023
2.	Sh. Anshul Kumar Verma, Technical Assistant (T-3) promoted to Senior Technical Assistant (T-4) in PB-2 of Rs. 9300-34800+GP of Rs. 4200/- Level-6	06.03.2024
3.	Sh. Ramashankar Sah, Assistant Chief Technical Officer (T-7/8) promoted to Chief Technical Officer (T-9) in PB-3 of Rs. 15600-39100 GP Rs. 7600 Level-12	30.08.2024
4.	Sh. Subhash Chandra, Assistant Chief Technical Officer (T-7/8) promoted to Chief Technical Officer (T-9) in PB-3 of Rs. 15600-39100 GP Rs. 7600 Level-12	18.09.2024
5.	Sh. Vikas Kumar, Senior Technical Officer (T-6) promoted to Assistant Chief Technical Officer (T-7/8) in PB-3 of Rs. 15600-39100 GP Rs. 6600 Level-1	17.08.2024

Superannuation

S.No.	Name of employee	Date of Superannuation
1.	Dr. Uttam Kumar Sarkar, Director	28.02.2025
2.	Dr. Vindhya Mohindra, Head, GCR Division	31.05.2025
3.	Dr. Satish Kumar Srivastava, Principal Scientist	30.06.2025
4.	Sh. Ashok Kumar, Multi-tasking Staff	31.12.2025

Research Management



Research Advisory Committee

The 29th Research Advisory Committee (RAC) meeting of ICAR-NBFGR, Lucknow was held during April 09-10, 2025. The composition of the RAC is as under:

Dr. W. S. Lakra Former Vice-Chancellor, ICAR-CIFE, Mumbai and Former Director, ICAR-NBFGR, Lucknow	**Chairman**
Dr. M. H. Balkhi Former Dean, Faculty of Fisheries, Sher-e-Kashmir University of Agricultural Sciences and Technology (Kashmir), Srinagar	**Member**
Dr. A. D. Diwan Former ADG (Marine Fisheries), ICAR, New Delhi	**Member**
Dr. G. Gopikrishna Former Head and Principal Scientist, ICAR-CIBA, Chennai	**Member**
Dr. Shubhadeep Ghosh ADG (Marine Fisheries), ICAR, New Delhi	**Member**
Dr. Kajal Chakraborty Director, ICAR-NBFGR, Lucknow	**Member**
Dr. Neeraj Sood Principal Scientist, ICAR-NBFGR, Lucknow	**Member Secretary**

Institute Management Committee

The 39th and 40th IMC meetings were held on March 27, 2025 and July 25, 2025, respectively, at ICAR-NBFGR, Lucknow with the following committee:

Dr. T.T Ajith Kumar (for 39th IMC)
Chairman & Director (Acting)
ICAR-NBFGR, Lucknow, Uttar Pradesh

Dr. Kajal Chakraborty (for 40th IMC)
Chairman & Director
ICAR-NBFGR, Lucknow, Uttar Pradesh

Dr. Peyush Punia
Principal Scientist
ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut, Uttar Pradesh

Dr. R. S. Patiyal
Principal Scientist
ICAR-Central Institute of Coldwater Fisheries Research
Bhimtal, Uttarakhand

Dr. M. Jayanthi
Principal Scientist
ICAR-Central Institute of Brackishwater Aquaculture
Chennai, Tamil Nadu

Dr. Monica Sodhi
Principal Scientist
ICAR-National Bureau of Animal Genetic Resources
Makrampur Campus, Karnal, Haryana

Sh. Karunesh Shukla
Member Secretary &
Administrative Officer
ICAR-NBFGR, Lucknow, Uttar Pradesh

Institute Research Council

The 38th Annual Institute Research Council (IRC) meeting was held during May 21-23, 2025 at ICAR-NBFGR, Lucknow.

Distinguished Visitors



Visit of Sri George Kurian, Honourable Union Minister of State MoFAH&D, Government of India



Visit of Dr. Himanshu Pathak, Hon'ble DG, ICRISAT & Former Secretary, DARE & DG, ICAR, Dr. J. K. Jena, DDG (Fisheries Science) and Dr. Raghavendra Bhatta, DDG (Animal Science)



Visit of Prof. Dinesh Sharma, Member of Parliament (Rajya Sabha) and Former Deputy Chief Minister of Uttar Pradesh



Visit of Smt. Sushma Kharkhwal, Mayor, Lucknow



Visit of Dr. Sanjay Kumar Nishad, Honourable Minister of Fisheries



Visit of Shri Sagar Mehra, Joint Secretary (Inland Fisheries), Department of Fisheries, Government of India



Visit of Dr. S.P. Kimothi, Member, ASRB



Visit of Dr. P. Shankar, IAS, Secretary, Department of Higher Education, Tamil Nadu to Pichavaram Hatchery Facility of ICAR-NBFGR

S.No.	Dignitary	Visited at	Visit date
1.	Prof. Maruthi Gowda Professor, University of Greenwich, United Kingdom	ICAR-NBFGR, Lucknow	January 01, 2025
2.	Dr. G. Sugumar Former VC, TNJFU, Nagappattinam	PAGR Centre, ICAR-NBFGR, Kochi	February 04, 2026
3.	Sri George Kurian Honourable Union Minister of State MoFAH&D and Minority Affairs, Govt of India	ICAR-NBFGR, Lucknow	February 25, 2025
4.	Dr. Shiv Prasad Kimothi Member, ASRB, New Delhi	ICAR-NBFGR, Lucknow	March 30, 2025
5.	Dr. Jitendra Kumar ADG, NASF, ICAR, New Delhi	ICAR-NBFGR, Lucknow	April 25, 2025
6.	Dr. P. K. Sahoo Director, ICAR-CIFA, Bhubaneswar	ICAR-NBFGR, Lucknow	April 28, 2025
7.	Dr. Sanjay Kumar Nishad Honourable Minister of Fisheries, Government of UP	ICAR-NBFGR, Lucknow	May 22, 2025
8.	Dr. Archana N. Panche Director in charge, MGM University, Maharashtra	ICAR-NBFGR, Lucknow	May 29, 2025
9.	Prof. K. P. Singh VC, MJPRU, Bareilly	ICAR-NBFGR, Lucknow	May 29, 2025
10.	Dr. Abhijit Mitra Animal Husbandry Commissioner, Govt. of India	ICAR-NBFGR, Lucknow	July 21, 2025
11.	Dr. P. Shankar, IAS, Secretary to the Government, Department of Higher Education, Tamil Nadu	Pichavaram Hatchery Facility of ICAR-NBFGR	September 15, 2025
12.	Tmt. J. Innocent Divya, IAS, Managing Director, Tamil Nadu Skill Development Corporation (TNSDC)	Pichavaram Hatchery Facility of ICAR-NBFGR	September 15, 2025
13.	Prof. Dinesh Sharma, Member of Parliament (Rajya Sabha) and Former Deputy Chief Minister of Uttar Pradesh	ICAR-NBFGR, Lucknow	October 11, 2025

14.	Shri Sagar Mehra, Joint Secretary (Inland Fisheries), Department of Fisheries, Government of India	ICAR-NBFGR, Lucknow	October 25, 2025
15.	Smt. Sushma Kharkhwal, Mayor, Lucknow	ICAR-NBFGR, Lucknow	November 19, 2025
16.	Dr. Himanshu Pathak, Hon'ble DG, ICRISAT & Former Secretary, DARE & DG, ICAR, Dr. J. K. Jena, DDG (Fisheries Science) and Dr. Raghavendra Bhatta, DDG (Animal Science)	ICAR-NBFGR, Lucknow	November 27, 2025
17.	Dr. A. G. Ponniah, Former Director, ICAR-NBFGR, Lucknow & ICAR-CIBA, Chennai	PAGR Centre, ICAR-NBFGR, Kochi	December 01, 2025
18.	Dr. N. Felix Vice Chancellor, Tamil Nadu Dr. J. Jayalalithaa Fisheries University	ICAR-NBFGR, Lucknow	December 12, 2025

Swachh Bharat Activities



The institute has been actively progressing the objectives of the *Swachh Bharat Abhiyan* (SBA) by fostering cleanliness and environmental sustainability within the campus and nearby areas, thereby, contributing to the vision of a cleaner and greener India. Since the launch of the mission, the institute has remained committed to supporting and implementing the goals of the SBA through a range of awareness programs and community-oriented activities. During the reporting period, several initiatives were organized to promote personal hygiene, maintain cleanliness across the campus, and enhance public awareness regarding sanitation and environmental stewardship. Activities such as walkathons, sports events, and distribution drives were conducted with a focus on the theme of Swachhta, encouraging active participation and awareness among stakeholders. Alongside the regular monthly activities, the institute also organized 3 dedicated Swachhta campaigns to strengthen awareness of environmental responsibility and reinforce the key objectives of the SBA. A summary of these programs is mentioned below:

- **Swachhta Hi Seva (SHS-2025):** Swachhata Hi Seva program with the tagline '*Swachhotsav*' was organized during September 17 to October 2, 2025 to clean the institute campus and its surrounding areas. These activities are inspired by the vision of the Hon'ble Prime Minister towards cleanliness and are being implemented under the guidance of the Government of India with the aim of making cleanliness everyone's business and making it a habit for them. The cleanliness pledge was administered by the Director. Awareness March




Swachhata Hi Seva program at the institute

was conducted by the staff to promote the importance of cleanliness as part of the *Swachhata Agraha Walk*. A tree plantation drive was carried out for environmental protection. A human chain was formed to show solidarity for cleanliness. Emphasis was laid on wastewater recycling for fisheries in an effort to conserve water. *Shramdaan* was done by all the staff in a collective effort for cleanliness. Community participation was ensured by involving the local community and cleanliness runs were organized to raise awareness. These activities are aimed at achieving SDG Goal 3 (Good Health and Wellbeing) set by the United Nations and strengthening the spirit of mutual brotherhood by encouraging cleanliness as a habit.

- **Swachh Bharat Abhiyan-Special campaign:** As per the directives of ICAR, New Delhi, the Swachhta activities were organised daily during October 2 - 31, 2025 under *Swachh Bharat Abhiyan*-Special Campaign 5.0 at Hqs. Lucknow, ARTU Chinhat centre, PAGR centre Kochi and reports were submitted daily to SMD.
- **Swachhta Pakhwada (SPP_2025):** As per the directives of ICAR, New Delhi, the Swachhta activities were organised daily during December 16 - 31, 2025 under *Swachhta Pakhwada* at Hqs. Lucknow, ARTU Chinhat centre, PAGR centre Kochi and reports were submitted daily to SMD. The program was launched under Hon'ble Prime Minister's vision to make swachhata "everyone's business" and involving all Central Government Ministries and Departments in swachhta related activities. Activities undertaken included administering the Swachhta Pledge, organizing Swachhta Runs, Walks, and Rallies, reviewing and weeding of obsolete office files in accordance with prescribed




Swacchta walk during special campaign 5.0

rules, conducting cleanliness and sanitation drives, promoting the elimination of single-use plastics, encouraging wastewater recycling, carrying out *Shramdaan* initiatives, engaging local communities in awareness activities, celebrating Kisan Diwas, fostering healthy competition through sports events for both women and men, and obtaining signatures from staff members, visitors, and the public during Swachhta awareness campaigns conducted.



Group photograph during *Swachhta* awareness campaign





राजभाषा गतिविधियाँ



संस्थान का राजभाषा अनुभाग, कार्यालयीन कार्यों में राजभाषा हिंदी के प्रभावी एवं व्यापक प्रयोग को प्रोत्साहित करने हेतु निरंतर सक्रिय एवं प्रतिबद्ध रहा है। राजभाषा नीति के सफल कार्यान्वयन तथा हिंदी के प्रगतिशील उपयोग को सुनिश्चित करने के उद्देश्य से अनुभाग द्वारा समय–समय पर विभिन्न योजनाबद्ध गतिविधियाँ, कार्यक्रम एवं जागरूकता संबंधी पहल संचालित की गईं। प्रतिवेदित अवधि के दौरान राजभाषा अनुभाग ने हिंदी के प्रयोग को बढ़ाने, अधिकारियों एवं कर्मचारियों को प्रोत्साहित करने, तथा प्रशासनिक एवं तकनीकी कार्यों में हिंदी के अधिकाधिक उपयोग को सुनिश्चित करने हेतु अनेक महत्वपूर्ण गतिविधियों का आयोजन किया। इसके अतिरिक्त हिंदी कार्यशालाओं, प्रतियोगिताओं, प्रशिक्षण कार्यक्रमों एवं राजभाषा समीक्षा संबंधी कार्यों के माध्यम से कर्मचारियों में हिंदी के प्रति जागरूकता एवं अभिरुचि विकसित करने का निरंतर प्रयास किया गया। वर्ष 2025 के दौरान राजभाषा हिंदी के संवर्धन एवं प्रचार–प्रसार की दिशा में संचालित प्रमुख गतिविधियाँ एवं प्राप्त उपलब्धियाँ निमन्वत हैं:

हिंदी पखवाड़ा समारोह

- भाकृअनुप–राष्ट्रीय मत्स्य आनुवंशिक संसाधन ब्यूरो, लखनऊ में सभी अधिकारियों व कर्मचारियों के बीच सरकारी कामकाज में राजभाषा हिंदी के प्रयोग को बढ़ावा देने तथा अभिरुचि उत्पन्न करने हेतु दिनांक हिंदी दिवस 14 सितंबर से 28 सितंबर, 2025 के दौरान हिन्दी पखवाड़ा का आयोजन किया गया। इस अवधि में अनेक प्रतियोगिताओं, जैसे हिंदी निबंध, कम्प्यूटर पर यूनिकोड में हिंदी टंकण, हिंदी अनुवाद, हिंदी टिप्पण लेखन, स्वरचित हिंदी काव्य पाठ, वाद–विवाद प्रतियोगिता, हिंदी आशुभाषण तथा हिंदी प्रश्नोत्तरी का आयोजन किया गया, जिसमें संस्थान के सभी कार्मिकों ने पूरे उत्साह के साथ सक्रियता से भाग लिया। इसी प्रकार, संस्थान के प्रायद्वीपीय जलीय आनुवंशिक संसाधन केंद्र, कोच्चि में भी दिनांक 22–28 सितम्बर, 2025 के दौरान हिन्दी सप्ताह का आयोजन किया गया, जिसमें हिंदी प्रश्नोत्तरी, हिंदी शब्द लेखन, हिंदी लघु भाषण तथा हिंदी अनुवाद जैसी प्रतियोगिताओं का आयोजन किया गया।


भारत सरकार, राजभाषा विभाग, गृह मंत्रालय
नगर राजभाषा कार्यान्वयन समिति (कार्यालय-3), लखनऊ
भाकृअनुप-भारतीय गन्ना अनुसंधान संस्थान, लखनऊ
क्रमांक : 03 दिनांक : 19 नवम्बर 2025
प्रमाण पत्र
प्रमाणित किया जाता है कि भा.कृ.अनु.प.-राष्ट्रीय मत्स्य आनुवंशिक संसाधन ब्यूरो, लखनऊ ने अद्धैल-सितम्बर 2025 तिमाही अवधि में 'राजभाषा पत्रिका : मत्स्य लोक' हेतु तृतीय स्थान प्राप्त किया।
राजभाषा कार्यान्वयन में इस कार्यालय के अधिकारियों/कर्मचारियों का यह प्रयास अत्यंत सराहनीय है।
(डॉ. मनोज कुमार त्रिपाठी) सचिव, राजभाषा प्रकोष्ठ
(डॉ. दिनेश सिंह) निदेशक


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(डॉ. मनोज कुमार त्रिपाठी) सचिव, राजभाषा प्रकोष्ठ
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हिंदी पखवाड़ा–2025 समापन समारोह में निदेशक डॉ. काजल चक्रबर्ती का संबोधन



हिंदी पखवाड़ा–2025 समापन समारोह में राजभाषा गृह पत्रिका मत्स्य लोक के 14वें अंक का विमोचन



हिंदी पखवाड़ा–2025 समापन समारोह में आमंत्रित कवि श्री हरिमोहन बाजपेयी 'माधव' द्वारा काव्यपाठ



हिंदी पखवाड़ा–2025 समापन समारोह के दौरान हिंदी प्रतियोगिता का पुरस्कार प्राप्त करते संस्थान के वैज्ञानिक डॉ. चन्द्र भूषण कुमार

कार्यक्रम के समापन एवं पुरस्कार वितरण समारोह का आयोजन दिनांक 8 अक्टूबर, 2025 को संस्थान के निदेशक डॉ. काजल चक्रबर्ती की अध्यक्षता में संस्थान के मुख्यालय, लखनऊ में किया गया। प्रभारी, राजभाषा अनुभाग ने हिंदी पखवाड़ा 2025 के दौरान आयोजित विविध कार्यक्रमों पर प्रतिवेदन प्रस्तुत किया। इस अवसर पर आयोजित हिंदी पखवाड़ा के दौरान आयोजित प्रतियोगिताओं में भाग लेने वाले विजयी प्रतिभागियों को निदेशक व समारोह में आमंत्रित अतिथियों के द्वारा प्रमाण पत्र एवं पारितोषिक प्रदान किये गये। कार्यक्रम में संस्थान की राजभाषा पत्रिका 'मत्स्य लोक' के नवीनतम अंक का लोकार्पण भी हुआ। कार्यक्रम में आमंत्रित कविगण अतिथियों सर्वश्री हरिमोहन बाजपेई 'माधव' जी के सुमधुर कंठ से मुक्तक, छंद एवं गजल गायन जबकि प्रमोद द्विवेदी के ओज पूर्ण काव्यपाठ द्वारा सदन सम्मोहित हो उठा। कार्यक्रम में कुल 129 पुरस्कार प्रदान किए गए, प्रमुख रूप से पुरस्कार प्राप्त करने वालों में डॉ. विकास साहू, श्री आशुतोष सिंह, डॉ. मुरली एस, श्रीमती सुनीता कुमारी, श्री रामसकल चौरसिया तथा श्री विक्की कुमार प्रजापति आदि रहे।

हिंदी कार्यशालाओं का आयोजन

संस्थान में सभी कार्मिकों को अपना काम हिंदी में करने को प्रोत्साहित करने और रोजमर्रा के कामकाज में राजभाषा हिंदी के प्रयोग को बढ़ावा देने के लिए प्रत्येक तिमाही में हिंदी कार्यशालाओं का आयोजन किया गया। वर्ष के दौरान निम्नलिखित कार्यशालाओं का आयोजन किया गया :

- दिनांक, 20 मार्च, 2025 को राजभाषा हिंदी कार्यशाला 'राजभाषा कार्यान्वयन में ई–उपकरणों की महत्ता' विषय पर आयोजित की गयी, जिसमें मुख्य वक्ता के रूप में वैज्ञानिक एवं औद्योगिक अनुसंधान परिषद–केन्द्रीय औषधि अनुसंधान संस्थान, लखनऊ के पूर्व उपनिदेशक (राजभाषा) डॉ. विजय नारायण तिवारी जी ने अपना व्याख्यान दिया।
- दिनांक, 20 जून, 2025 को राजभाषा हिंदी कार्यशाला 'दैनिक जीवन में तवाव प्रबंधन' विषय पर आयोजित की गयी, जिसमें मुख्य वक्ता के रूप में वैज्ञानिक एवं औद्योगिक अनुसंधान परिषद–केन्द्रीय औषधि अनुसंधान संस्थान, लखनऊ के पूर्व उपनिदेशक (राजभाषा) डॉ. विजय नारायण तिवारी जी ने अपना व्याख्यान दिया।



दिनांक 20 मार्च, 2025 को आयोजित राजभाषा हिंदी कार्यशाला 'राजभाषा कार्यान्वयन में ई–उपकरणों की महत्ता'



दिनांक 26 दिसम्बर, 2025 को आयोजित राजभाषा हिंदी कार्यशाला 'कार्यालय कार्य में हिंदी की उपयोगिता'

- दिनांक 13 अगस्त, 2025 को 'भावी पीढ़ियों हेतु मत्स्य विविधता संरक्षण' विषय पर उत्तर प्रदेश राज्य जैव विवधता बोर्ड के सहयोग से जागरूकता पहल कार्यशाला आयोजित की गयी।
- दिनांक, 26 दिसम्बर, 2025 को राजभाषा हिंदी कार्यशाला 'कार्यालय कार्य में हिंदी की उपयोगिता' विषय पर आयोजित की गयी जिसमें मुख्य वक्ता के रूप में बाबासाहब भीमराव आंबेडकर केन्द्रीय विश्वविद्यालय, लखनऊ के सहायक आचार्य, डॉ. बलजीत कुमार श्रीवास्तव जी ने अपना व्याख्यान दिया।

नगर राजभाषा कार्यान्वयन समिति पुरस्कार

भारत सरकार, राजभाषा विभाग, गृह मंत्रालय, नगर राजभाषा कार्यान्वयन समिति (कार्यालय–3), भाकृअनुप–भारतीय गन्ना अनुसंधान संस्थान, लखनऊ द्वारा संस्थान को निम्नलिखित पुरस्कार प्रदान किए गए :

- प्रथम छमाही अवधि में राजभाषा में उत्कृष्ट कार्य हेतु सप्तम पुरस्कार।
- प्रथम छमाही अवधि में राजभाषा हिंदी कार्यशाला का सफलता पूर्वक आयोजन करने का पुरस्कार।
- द्वितीय छमाही अवधि में राजभाषा हिंदी कार्यशाला का सफलता पूर्वक आयोजन करने का पुरस्कार।
- द्वितीय छमाही अवधि में राजभाषा में उत्कृष्ट कार्य हेतु अष्टम पुरस्कार।
- संस्थान की राजभाषा गृह पत्रिका मत्स्य लोक (अंक 14, वर्ष 2025) को उत्कृष्टता का तृतीय पुरस्कार।



राजभाषा गृह पत्रिका मत्स्य लोक (अंक 14, वर्ष 2025) की उत्कृष्टता का पुरस्कार प्राप्त करते निदेशक डॉ. काजल चक्रबर्ती

National Fish Museum & Repository



ICAR-National Bureau of Fish Genetic Resources (ICAR-NBFGR), Lucknow, has been designated by the National Biodiversity Authority (NBA), Government of India, as the nodal repository for the transfer of fish genetic resources under Section 39 of the Biological Diversity Act, 2002. In line with this mandate, the institute established the National Fish Museum and Repository to support conservation, research, and knowledge dissemination.

The Aquatic Life Interpretation Centre of the facility is designed to educate visitors about the rich diversity of fish species and aquatic ecosystems, including India's rivers and streams. Its key attractions include a statue of Matsyavatar, an artificial tunnel, scale models of commercially important fish species, and replicas of state fish representing 24 states. Interactive display panels featuring educational videos on sustainable fishing practices further enhance the visitor experience. The National Fish Museum and Repository houses a wide range of biological collections, including voucher specimens, tissues, DNA samples, bacteria, cell lines, and fish milt. These resources are maintained to support research and ensure accessibility for stakeholders. The museum features finfish and shellfish specimens from freshwater, marine, and brackish environments, serving as a valuable resource for students, teachers, researchers, and the general public. A dedicated section showcasing traditional fishing crafts and gear used across the country has also been renovated. In addition, the facility is equipped with a radiographic unit that enables detailed examination of fish vertebrae counts, fin rays, and other osteological characteristics.

The National Fish Museum and Repository has been established to serve research scholars, students, and the general public by providing opportunities to observe diverse fish species and enhance understanding of fish morphology and biodiversity. The preserved specimens support both educational and research activities. Through this initiative, ICAR-NBFGR aims to strengthen India's presence in global fisheries research while promoting sustainable conservation and responsible utilization of priority species through increased



Fishing gear and craft section of the National Fish Museum & Repository

public awareness. The museum operates from 9:00 AM to 4:30 PM, remaining closed on Mondays and public holidays. During the reporting period, a total of 16120 visitors, including school children, university students, and tourists, visited the facility, generating revenue of Rs. 209575 through entry ticket sales. Additionally, several dignitaries visited the museum and commended the institute's efforts in promoting fish conservation through public engagement. On the occasion of the Institute Foundation Day, the facility was opened to the public free of charge to raise awareness about the importance of the fisheries sector.



Prof. (Dr.) N. Felix, Vice Chancellor, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, visiting the National Fish Museum & Repository





Open day celebration at National Fish Museum & Repository for school children

Ganga Aquarium: Citizen-science knowledge hub about aquatic diversity



Ganga Aquarium, housed in the main premises of the institute in Lucknow, Uttar Pradesh, is recognized as one of India's premier public aquarium. In addition to offering recreational and educational experiences, its core mission is to raise public awareness about diversity of ornamental fish species and the need for their conservation. To support learning and encourage environmental stewardship, every display tank is equipped with a digital information panel that presents taxonomic classifications and key biological information. This interpretive feature contributes significantly to enhancing ecological understanding and fostering responsible attitudes toward aquatic ecosystems.

The facility comprises 47 aquaria, exhibiting over 65 fish species representing more than 100 varieties across 30 taxonomic families. The collection includes a wide range of ornamental, food, sport, and medicinal fishes. Exotic ornamental species, including flowerhorn, arowana, Japanese koi carp, discus, oscars, tetras, silver shark, redtail shark and livebearers, like guppies and mollies as well as Indian ornamentals, such as denison barb, pearlspot and pengba, along with key food fishes, like catla, rohu, mrigal, mahseer, and catfishes, are displayed. Each aquarium

is supported by a sophisticated aquatic life support system that mimics natural habitat, ensuring optimal care of the species. There is also a mermaid-themed circular tank at the entrance and adorned with a decorative glass dome and fountain. The aquarium also maintains marine species, such as clownfish, damselfish, wrasses, lionfish, and snowflake eel, in specially developed artificial seawater tanks. The aquarium also functions as a training and outreach centre, regularly visited by participants of various trainings programs, conferences and seminars, farmers, students, women of SHGs of various skill development etc.

Many dignitaries visited the facility during the year. Additionally, the facility welcomed around 7694 visitors and generated ₹1,65,605/- in revenue. The increasing public engagement underscores the aquarium's pivotal role in bridging science, conservation and community awareness.



List of Personnel

As on 31.12.2025

Research Management

Sl. No.	Name	Designation
1.	Dr. Uttam Kumar Sarkar (till 28.02.2025)	Director
2.	Dr. T. T. Ajith Kumar (01.03.2025 to 06.04.2025)	Director (Acting)
3.	Dr. Kajal Chakraborty (since 07.04.2025)	Director

Scientific Staff

Sl. No.	Name	Designation
1.	Dr. T.T. Ajith Kumar	Principal Scientist & Head Centre for Peninsular Aquatic Genetic Resources, Kochi
2.	Dr. Pravata Kumar Pradhan	Principal Scientist & Head Exotics and Aquatic Animal Health Division
3.	Dr. Rajeev Kumar Singh	Principal Scientist & Head Germplasm Exploration, Evaluation and Conservation Division
4.	Dr. Ravindra Kumar	Principal Scientist & Head (Acting) Genomics and Computational Resources Division
5.	Dr. Basdeo Kushwaha	Principal Scientist
6.	Dr. Neeraj Sood	Principal Scientist
7.	Dr. V.S. Basheer	Principal Scientist (PAGR)
8.	Dr. Gaurav Rathore	Principal Scientist
9.	Dr. Sharad Kumar Singh	Principal Scientist & SIC (ARTU, Chinhat)
10.	Dr. Lalit Kumar Tyagi	Principal Scientist
11.	Dr. Achal Singh	Principal Scientist
12.	Dr. Mahender Singh	Principal Scientist
13.	Dr. Ajey Kumar Pathak	Principal Scientist
14.	Dr. (Mrs.) Divya P.R.	Principal Scientist (PAGR)
15.	Dr. A. Kathirvelpandian	Principal Scientist (PAGR)
16.	Dr. Poonam Jayant Singh	Senior Scientist
17.	Dr. Rejani Chandran	Senior Scientist
18.	Dr. Santosh Kumar	Scientist
19.	Dr. Charan R.	Scientist (PAGR)
20.	Dr. Murali S.	Scientist

21.	Dr. Aditya Kumar	Scientist
22.	Dr. Labrechai Mog Chowdhury	Scientist
23.	Dr. Arun Sudhagar S.	Scientist (PAGR)
24.	Dr. Anutosh Paria	Scientist
25.	Dr. Chandra Bhushan Kumar	Scientist
26.	Dr. (Mrs.) Rekha M.U.	Scientist (PAGR)
27.	Dr. Raghvendra Singh	Scientist
28.	Ms. Teena Jayakumar T.K.	Scientist (PAGR)
29.	Dr. Tarachand Kumawat	Scientist
30.	Dr. Monika Gupta	Scientist
31.	Dr. Kantharajan G.	Scientist (PAGR)
32.	Mr. Jaspreet Singh	Scientist
33.	Ms. Tanwy Dasmandal	Scientist
34.	Dr. Anisha Valsalam	Scientist

Technical Staff

Sl. No.	Name	Designation
1.	Shri Prem Chandra	Chief Technical Officer
2.	Shri Ramashankar Sah	Chief Technical Officer
3.	Shri Subhash Chandra	Chief Technical Officer
4.	Dr. Akhilesh Kumar Mishra	Assistant Chief Technical Officer
5.	Dr. Ranjana Sinha	Assistant Chief Technical Officer
6.	Shri Ravi Kumar	Assistant Chief Technical Officer
7.	Shri Sanjay Kumar Singh	Assistant Chief Technical Officer
8.	Shri Amit Singh Bisht	Assistant Chief Technical Officer
9.	Shri Satyavir Chaudhary	Assistant Chief Technical Officer
10.	Shri Vikas Kumar	Assistant Chief Technical Officer
11.	Shri Vijay Kumar Singh	Senior Technical Officer
12.	Shri Deva Narayan	Senior Technical Officer
13.	Shri B. N. Pathak	Technical Officer
14.	Shri Om Prakash	Technical Officer
15.	Shri Rajesh Kumar	Technical Officer
16.	Shri Om Prakash-II	Technical Officer
17.	Dr. Vikash Sahu	Technical Officer

18.	Shri Krishna Kumar Singh	Technical Officer
19.	Dr. Ranjan Singh	Sr. Technical Assistant (T-4)
20.	Shri Anshul Kumar Verma	Sr. Technical Assistant (T-4)
21.	Smt. Ambily M. N.	Sr. Technical Assistant (T-4)
22.	Shri Manoj Kumar Yadav	Sr. Technical Assistant (T-4)
23.	Shri Anil Kumar	Technician (T-1)
24.	Shri Sidhnath	Technician (T-1)
25.	Smt. Raj Kumari	Technician (T-1)
26.	Shri Nitish Kumar Patel	Technician (T-1)
27.	Shri Aman Raj	Technician (T-1)
28.	Shri Ritesh Kumar	Technician (T-1)

Administrative Staff

Sl. No.	Name	Designation
1.	Shri Karunesh Shukla	Administrative Officer
2.	Shri Ashutosh Singh	Finance & Accounts Officer
3.	Shri Ram Sakal	Private Secretary
4.	Shri Pramod Kumar Awasthi	Assistant Administrative Officer
5.	Smt. Kaneez Fatima	Assistant Administrative Officer
6.	Smt. Sunita Kumari	Assistant Administrative Officer
7.	Shri Abhishek Kumar	Assistant Administrative Officer
8.	Shri Sandeep	Personal Assistant
9.	Shri Harivilas	Personal Assistant
10.	Shri Vinay Kumar Srivastava	Assistant
11.	Shri Shreelal Prasad	Assistant
12.	Shri Santosh Kumar Singh	Assistant
13.	Shri Syed Kavish Abbas	Assistant
14.	Shri Rajan Kr. Malhotra	Upper Division Clerk
15.	Shri Vikrant Gupta	Upper Division Clerk
16.	Shri Balram Babu Bajpai	Lower Division Clerk
17.	Shri Anwar Husain	Lower Division Clerk
18.	Shri Sanjay Kumar	Lower Division Clerk
19.	Smt. Seema Devi	Lower Division Clerk

Multi-tasking Staff

Sl. No.	Name	Designation
1.	Shri Dukhi Shyam Deo	Multi-tasking Staff
2.	Shri Indrajit Singh	Multi-tasking Staff
3.	Shri Ashok Kumar	Multi-tasking Staff
4.	Shri Dinesh Kumar	Multi-tasking Staff
5.	Shri Ashok Kumar Awasthi	Multi-tasking Staff
6.	Shri Ram Lakhan	Multi-tasking Staff
7.	Shri Sunit Kumar Srivastava	Multi-tasking Staff
8.	Shri Jai Narain Tiwari	Multi-tasking Staff
9.	Shri Mayank Pratap Singh	Multi-tasking Staff
10.	Shri Sushil Kumar	Multi-tasking Staff
11.	Shri Vicky Kumar Prajapati	Multi-tasking Staff

Linkages



MoU with Mahatma Gandhi Mission University, Chhatrapati Sambhajinagar

The Institute signed following MoUs during the year 2025.

S.N.	Organization	Start of MoU	Expiry of MoU
1.	D. M. College of Science, Dhanamanjuri University, Manipur	13.01.2025	12.01.2030
2.	Hitech Fisheries and Farmer Knowledge Centre, Barabanki, Uttar Pradesh	04.04.2025	03.04.2030
3.	University of Kalyani, West Bengal	19.05.2025	18.05.2030
4.	Mahatma Gandhi Mission University, Chhatrapati Sambhajinagar, Maharashtra	29.05.2025	28.05.2030
5.	Mahatma Jyotiba Phule Rohilkhand University, Bareilly, Uttar Pradesh	29.05.2025	28.05.2030
6.	Manipur University, Canchipur, Imphal, Manipur	04.09.2025	03.09.2028
7.	Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh	21.11.2025	20.11.2028
8.	Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam, Tamil Nadu	12.12.2025	11.12.2028

Human Resource Development Initiatives

The HRD Cell encouraged all staff for attending various training programme for capacity building. The trainings acquired by ICAR-NBFGR staff from other ICAR & Non-ICAR Institute were as follows:

platform to enhance knowledge, skills, and attitudes of officials. ICAR/DARE has formulated and implementing Annual Capacity Building Plan (ACBP) for the year 2025-26 for all categories of employee in behavioural, domain

(ii) Mandatory Course Completion and Comprehensive Assessment framework for APAR linkage on the iGOT Karmayogi Portal. MDOs of ICAR-DARE identified a minimum of 06 courses

A. Physical targets and achievements

S. No.	Category	Total No. of Employee	No. of trainings as per ATP	No. of employees undergone training during Jan-June 2025	No. of employees undergone training during July-Dec. 2025	Total number of employees undergone training during Jan-Dec. 2025	% realization of trainings planned 2025
1	Scientist	34	8	0	1	1	12.5
2	Technical	27	8	4	3	7	87.5
3	Administration & Finance	19	4	0	1	1	25.0
4	Multi Tasking Staff	11	10	0	0	0	0

B. Financial targets and achievements (All employees)

RE (April, 2025-March, 2026) in lakhs			Expenditure (January-December, 2025) in lakhs			% Utilization
Plan	Non-plan	Total	Plan	Non-plan	Total	67.2
5.00	0	5.00	3.36	0	3.36	

C. Mission Karmayogi

National programme for civil Service capacity Building (NPCSCB), Mission Karmayogi was launched by the Government to promote role-based capacity building of civil servants by offering a wide range of learning resources on the iGoT Karmayogi

and functional competencies. As per circular, each regular employee of ICAR-NBFGR attended

(i) At least 26 hours online courses as per identified competencies from i-GOT Karmayogi platform during year 2025-26.

for each employee at each level (Scientist, Technical, Administration, MTS) in domain, functional and behavioural competencies as annual target on the iGOT Karmayogi Platform during 2025-26. Each staff attended 6 training courses linked to APAR with 100 % realization.

Gender Research and Extension



Sensitization of participants on different technology packages on marine ornamental organisms

The institute remains committed to the vision of ICAR Gender Policy by promoting gender equity, inclusivity, equal opportunities in research, capacity building, and institutional development. Recognizing indispensable role of women in fisheries and aquaculture, the institute integrates gender-responsive approaches into its scientific programmes, human resource development initiatives, and outreach activities to support sustainable growth in fisheries sector.

During 2025, institute continued to strengthen women's participation in research, education, and capacity-building activities. The institute maintained a balanced and inclusive academic environment with women researchers and scholars actively contributing to postgraduate and doctoral research programmes. Institute has 34 scientists (25 male and 9 female), 27 technical personnel (24 male and 3 female), and 30 administrative staff (27 male and 3 female). The academic community included 1 male postgraduate student and 19 Ph.D. scholars (11 male and 8 female), while 2 Ph.D. scholars (1 male and 1 female) successfully completed their degrees during the year.

Capacity building and professional development remained a key focus area for the institute. A total of 11 male and 5 female scientists, along with 4 technical personnel, participated in professional training and HRD programmes. Women scientists and staff members were actively involved in these initiatives, reflecting the Bureau's continued commitment to skill enhancement and leadership development.

Special emphasis was placed on empowering women through targeted capacity-building initiatives. The institute conducted about 24 training programmes,

among which 6 were exclusive for women farmers, enhancing their technical knowledge, entrepreneurial skills, and participation in fisheries-based livelihood activities. Under STC initiative, approximately 1,204 male and 1,256 female beneficiaries received training, demonstrating a strong commitment to inclusive outreach and equitable knowledge dissemination.

Bureau also promoted gender-sensitive technology dissemination through initiatives such as captive breeding, seed production, and community-based rearing of marine ornamental shrimps and fishes in Lakshadweep Islands, creating opportunities for community participation and livelihood enhancement. Though no dedicated gender-budget allocation or gender-specific research projects were reported during 2025, the institute actively mainstreamed gender considerations across its extension and capacity-building programmes in line with ICAR's broader policy objectives.

With a strong scientific workforce, active participation of women researchers and students, the Bureau remains committed to further strengthening gender-responsive research, technology dissemination, and capacity-building interventions to contribute towards equitable and gender responsive fisheries and aquaculture systems.

ICAR-NBFGR in Media



Social Media

As part of the ICAR Communication Policy & Strategy, scientific communication and outreach were strengthened through websites, newspapers, and social media. Updates on research achievements, technology developments, conservation initiatives, training programmes, workshops, and stakeholder activities were shared with researchers, policymakers, students, and the public. These initiatives enhanced awareness of fish genetic resources, aquatic biodiversity conservation, sustainable fisheries management, and the institute's broader contributions. The outreach was supported by 109 newspaper publications, 34 highlights on the ICAR website, 45 highlights on the institute's website, and 114 social media posts, including 78 reposts on X, during 2025. These initiatives have enhanced the institute's visibility among scientific communities, policymakers, stakeholders, and the wider public. Further, the institute also connected to around 285 farmers/ stakeholders through WhatsApp groups for technical guidance and farm advisories.

Radio/TV shows

S.N.		Date	Program (Resource person)
1.	DD Hello Kisan, New Delhi	April 16, 2025 06:00 – 07:00 PM	Live Phone-in programme on 'Fish Culture' (Dr. Sharad Kumar Singh)
2.	DD Hello Kisan, New Delhi	April 16, 2025 10:30-11:30 PM	Re-telecast of Programme on 'Fish Culture' (Dr. Sharad Kumar Singh)
3.	DD Hello Kisan, New Delhi	April 17, 2025 10:00-11:00 AM	Re-telecast of Programme on 'Fish Culture' (Dr. Sharad Kumar Singh)
4.	Akashvani	May 17, 2025	'समन्वित मत्स्य पालन की योजना और तैयारी' (Dr. Sharad Kumar Singh)


पीएम धन-धान्य कृषि योजना और दलहन आत्मनिर्भरता मिशन का शुभार

खरी कसौटी ब्यूरो

एनबीएफजीआर ने लिया मत्स्यपालन और पशुपाल में रोगाणुरोधी प्रतिरोध की समीक्षा बैठक में भाग

जन एक्सप्रेस। लखनऊ

रिसर्च पेपर तैयार करने में आड़े नहीं आएगा

एनबीएफजीआर में मनाया गया योग दिवस

Awareness programme at ICAR-NBFGR

एनबीएफजीआर ने अरब सागर में खोजी ईल प्रजाति की मछली



मत्स्य रोगों के प्रभावी इलाज की दिशा में बड़ी पहल : आईसीएआर-एनबीएफजीआर ने 'ऊनिल' तकनीक के लाइसेंस हेतु किया त्रिपक्षीय समझौता

जन एक्सप्रेस | लखनऊ

आईसीएआर-नेशनल ब्यूरो ऑफ फिश जेनेटिक रिसोर्सेज (आईसीएआर-एनबीएफजीआर) ने मीठे पानी की जलकृषि में मत्स्य ऊमाइसेट रोगों के उपचार के लिए विकसित 'ऊनिल' तकनीक के लाइसेंस एवं व्यावसायीकरण हेतु ऐलिस इंडिया लिमिटेड (टाटा उद्यम) तथा एग्रीनोवेट इंडिया लिमिटेड के साथ त्रिपक्षीय समझौता ज्ञापन [illegible] किए। यह

दोनों संस्थानों के प्रतिनिधि मौजूद रहे। आईसीएआर-एनबीएफजीआर के वैज्ञानिक विशेषज्ञता में [illegible] जताने के लिए उद्योग दोनों का आभार व्यक्त किया। [illegible] सहयोग का उद्देश्य 'ऊनिल' लाइसेंस और व्यावस [illegible] व्यावसायीकरण कर वैज्ञानिक नवाचारों को व्यावहारिक समाधान में बदलना है। संस्थान ने इसके आविष्कारकों डॉ. पी. के. प्रधान, डॉ. नीरज सूद, डॉ. गौरव गठैर तथा डॉ. अनुतोष पारिया के योगदान की सराहना की। 'ऊनिल' एक वैज्ञानिक रूप से प्रमाणित, पर्यावरणीय रूप से सुरक्षित, जैव-पुंटीबायोटिक फॉर्मूलेशन है, जिसे विशेष रूप से संवर्धित जलीय जीवों को प्रभावित करने वाले प्रमुख ऊमाइसिट रोगों के प्रभावी प्रबंधन के लिए विकसित किया गया है। ऊमाइसिट रोग, विशेषकर एफ अल्फमेरिटिव सिंड्रोम मैपोलोग्निआ ओमिस, मीं जलकृषि में गंभीर [illegible] का कारण बनते हैं और कई मामलों में मृत्यु दर 100 प्रतिशत तक पहुंच जाती है। आईसीएआर की अखिल भारतीय नेटवर्क परियोजना के अंतर्गत विकसित इस तकनीक ने विभिन्न राज्यों में 400 से अधिक तालाबों पर चार वर्षों तक किए गए क्षेत्र परीक्षणों में 85 प्रतिशत प्रभावित तालाबों में इसके उपयोग के बाद मृत्यु दर की पूर्ण समाप्ति दर्ज की गई, जिससे यह उत्पाद मत्स्य रोग प्रबंधन की दिशा में महत्वपूर्ण उपलब्धि माना जा रहा है। विशेषज्ञों के अनुसार 'ऊनिल' का लाइसेंस एवं व्यावसायीकरण प्रौद्योगिकी के तेज प्रसार, उद्योग भागीदारी को बढ़ावा देने तथा किसानों को सस्ती समाधान उपलब्ध कराने में मछुआरों और जलीय कृषि के नवाचार- यह पहल भारतीय कृषि तकनीकी दृश्य से एक जागरूकता और के निर्माण कार्यक्रम का आयोजन ा को डॉ. उत्तम कुमार

'Research & innovation vital to strengthen fisheries sector'

PIONEER NEWS SERVICE
Lucknow

Union Minister of State for Fisheries, Animal Husbandry and Dairying and Panchayati Raj, Prof SP Singh Baghel, visited Indian Council of Agricultural Research - National Bureau of Fish Genetic Resources (ICAR-NBFGR).

The minister chaired a progress review meeting and held interactions with the institute's scientists and officers. The deliberations focused on critical areas, including conservation of fish genetic resources, cutting-edge research initiatives, integration of modern technologies and strategies for sustainable development of the fisheries sector.

Prof Baghel appreciated scientists for their dedicated work and emphasised that sustained research and innovation are essential to strengthen the fisheries sector, enhance the income of fish farmers and associated communities, and contribute meaningfully to the vision of self-reliant India. ICAR-NBFGR

THE MINISTER CHAIRED A PROGRESS REVIEW MEETING AND HELD INTERACTIONS WITH THE INSTITUTE'S SCIENTISTS AND OFFICERS

Director Dr Kajal Chakraborty delivered a presentation outlining the institute's major activities, achievements and future roadmap. The meeting also included an in-depth discussion on the emerging challenge of Antimicrobial Resistance (AMR) and its likely long-term impact on the fisheries sector.

Prof Baghel also interacted online with women trainees from Jharkhand, ongoing at College of Fisheries Science, Gumla, under SCSP component of ICAR-NBFGR. Prof Baghel described scientific progress in fisheries as a key pillar for revitalising the rural economy and generating substantial new employment opportunities.

नागालैंड में मत्स्यपालकों, मछुआरा के लिए [illegible] सह-क्षमता निर्माण कार्यक्रम का हुआ आयोजन

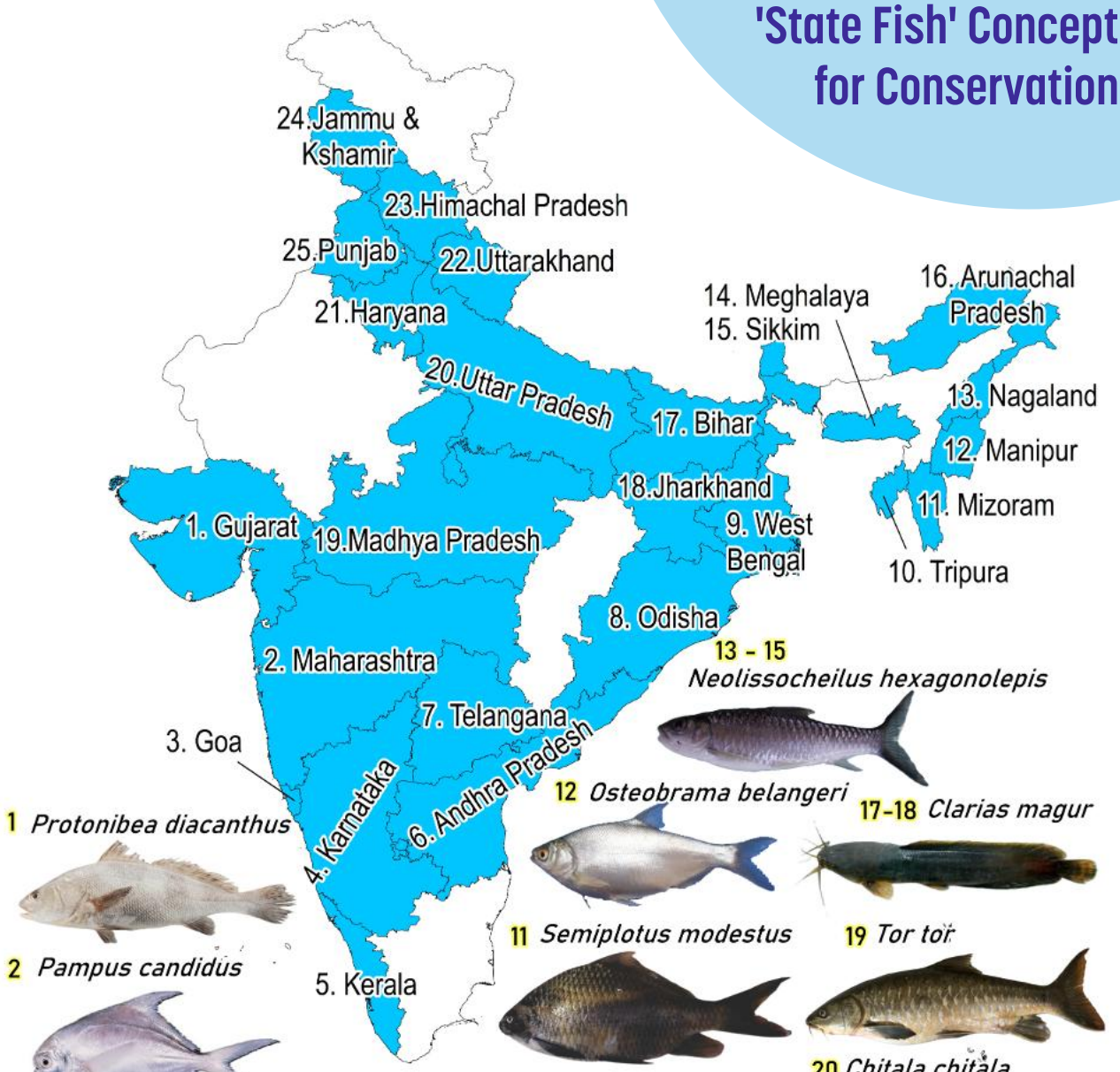
रामकृष्ण मिश्रा/व्यूरो

लखनऊ। आईसीएआर-नेशनल ब्यूरो ऑफ फिश जेनेटिक रिसोर्सेज (आईसीएआर-एनबीएफजीआर), लखनऊ ने नागालैंड में समृद्ध और विविध जलीय आनुवंशिक संसाधन हैं, जिन्हें तलाशने की जरूरत है और जलीय कृषि और मत्स्य पालन के सतत विकास के लिए रणनीतियां तैयार की जानी चाहिए। डॉ. आई. शकुंतला देवी ने कहा कि यह जागरूकता कार्यक्रम एक उत्कृष्ट पहल

दीमापुर, नागालैंड के सहयोग से आयोजित किया गया। कार्यक्रम में सम्मानित अतिथि, डॉ. आई. शकुंतला देवी, डीन, पशु चिकित्सा विज्ञान और पशुपालन महाविद्यालय, जालूकी, डॉ. होमेश्वर कलिता, आईसीएआर नागालैंड क्षेत्रीय केंद्र के प्रमुख, और लोइतिमेंबा, मत्स्य पालन और जलीय संसाधन, नागालैंड के अतिरिक्त निदेशक उपस्थित थे। मुख्य अतिथि डॉ. यू.के. सरकार ने कहा कि

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'State Fish' Concept for Conservation



1 *Protonibea diacanthus*

2 *Pampus candidus*



3 *Mugil cephalus*



4 *Barbodes carnaticus*



5 *Etroplus suratensis*



13 - 15 *Neolissocheilus hexagonolepis*

12 *Osteobrama belangeri*

17-18 *Clarias magur*

11 *Semiplotus modestus*

19 *Tor tor*

20 *Chitala chitala*



6 & 7 *Channa striata*



8 *Tor mahanadicus*



9 *Tenualosa ilisha*



10 *Ompok bimaculatus*



21 *Labeo calbasu*



16, 22-24 *Tor putitora*



25 *Labeo rohita*





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