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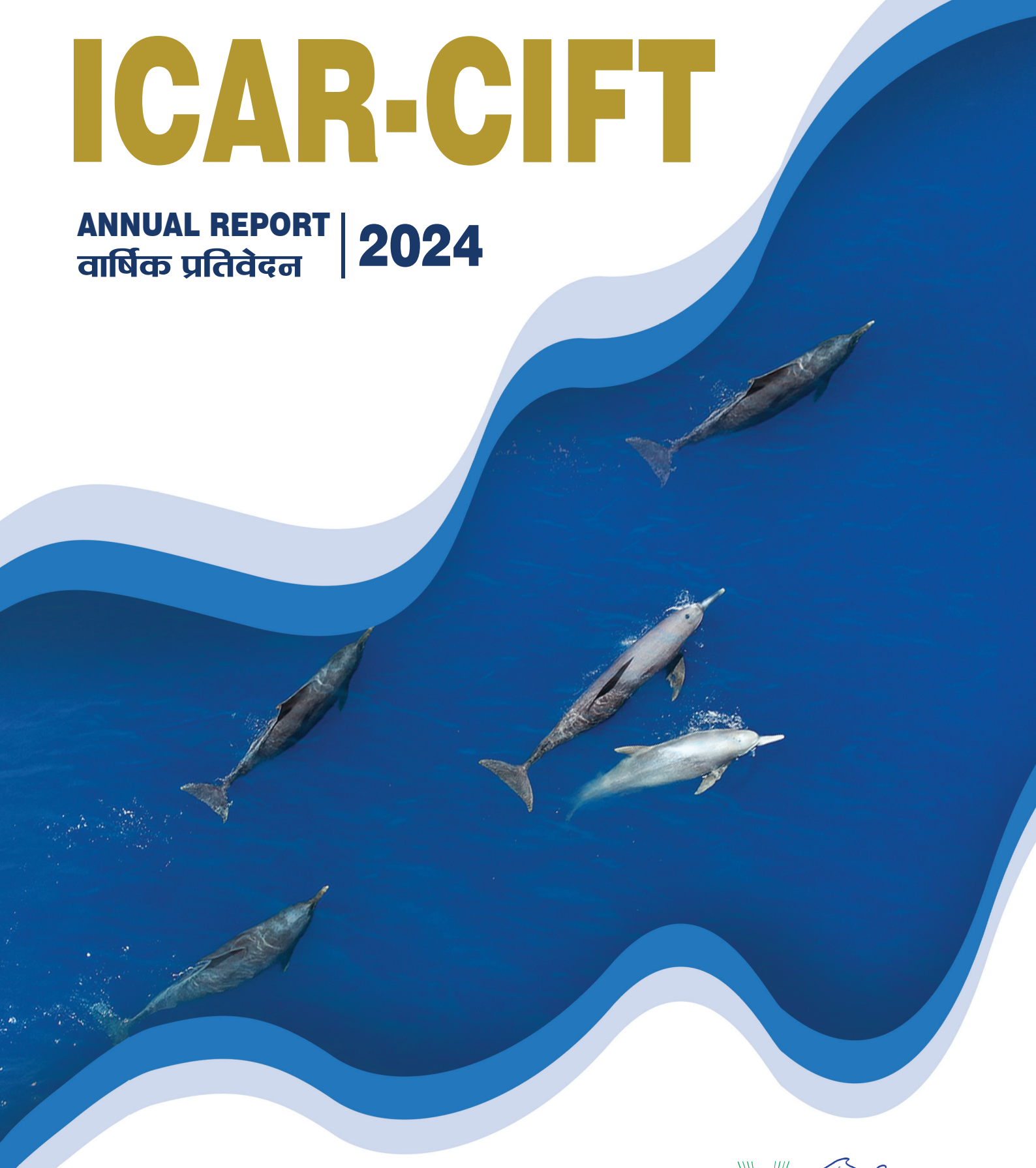

Indian Council of Agricultural Research
Central Institute of Fisheries Technology

Annual Report 2024

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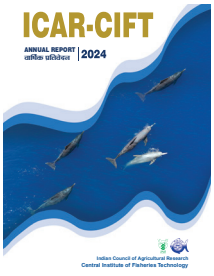

Aerial drone photograph of Indo-Pacific humpback dolphins off Cochin

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निदेशक के डेस्क से

भाकृअनुप-केंद्रीय मात्स्यिकी प्रौद्योगिकी संस्थान, प्रग्रहण और पश्च प्रग्रहण मात्स्यिकी प्रौद्योगिकियों पर केंद्रित अपने अनुसंधान के माध्यम से देश की अर्थव्यवस्था और खाद्य सुरक्षा को आगे बढ़ाने के लिए प्रतिबद्ध है। भाकृअनुप-केमाप्रौसं वार्षिक रिपोर्ट 2024 भारत के मात्स्यिकी क्षेत्र को मजबूत करने के उद्देश्य से अनुसंधान, विस्तार, सहयोग और अन्य प्रमुख पहलों के क्षेत्रों में पिछले वर्ष के दौरान संस्थान की महत्वपूर्ण उपलब्धियों का संक्षिप्त अवलोकन प्रस्तुत करती है।

पिछले वर्ष, संस्थान की अधिदेश-प्रेरित अनुसंधान गतिविधियाँ, 31 संस्थान परियोजनाओं और 30 बाह्य वित्तपोषित परियोजनाओं के माध्यम से की गईं, जिनमें 4 अंतर्राष्ट्रीय सहयोगात्मक कार्यक्रम शामिल हैं। इनके अतिरिक्त, संस्थान ने एक नई अनुसंधान पहल, कॉर्पस फंड परियोजनाएँ शुरू कीं, जो एक वर्ष की अवधि के लिए परिकल्पना की गई हैं, जिसका उद्देश्य विशिष्ट अनुसंधान चुनौतियों के लिए अभिनव समाधान प्रदान करना है। इस पहल के तहत, 10 परियोजनाओं को मंजूरी दी गई। संस्थान ने निजी संस्थानों और विश्वविद्यालयों के साथ कई सहयोगात्मक अनुसंधान समझौते भी किए, जिससे इसकी भागीदारी एवं आउटरीच और मजबूत हुई।

मत्स्यन प्रौद्योगिकी के क्षेत्र में, भाकृअनुप-केमाप्रौसं देश के पूर्वी और पश्चिमी तट पर ईंधन कार्यक्षम सीआईएफटी-

वीएसओबी और सिफ्ट-टेड का परीक्षण और प्रचालन जारी रखा हुआ है। सीआईएफटी-वीएसओबी और अंतर्राष्ट्रीय स्लॉटेड ओटर बोर्ड के तुलनात्मक परीक्षणों से कर्षण और ईंधन की खपत में कोई महत्वपूर्ण अंतर नहीं पाया गया, जिससे स्वदेशी परिकल्पना की दक्षता की पुष्टि हुई। परित्यक्त एफआरपी यानों द्वारा उत्पन्न बढ़ती पर्यावरणीय चिंताओं को संबोधित करते हुए, एफआरपी मलबे से अपसाइकिल उत्पादों के लिए आशाजनक प्रौद्योगिकी विकसित की गई। इसके अलावा, एफआरपी आवरित यानों और केरल की एफआरपी यानों के जीवन चक्र का आकलन उनके पर्यावरणीय प्रभाव का मूल्यांकन करने के लिए किया गया। समुद्री स्तनपायी संरक्षण का समर्थन करने के लिए, देश भर में विभिन्न मत्स्यन पद्धतियों के साथ समुद्री स्तनपायी संपर्क पर एक विस्तृत सर्वेक्षण किया गया और समुद्री स्तनपायी मात्स्यिकी संपर्क को कम करने के लिए स्वदेशी पिंगर्स विकसित किए गए। पर्यावरण के अनुकूल मत्स्यन गतिविधियों को बढ़ावा देने के लिए, जैवविकृत सूत का परीक्षण किया गया और फंदों, क्लोम जाल और एफएडी के निर्माण के लिए उनका उपयोग किया गया।

मत्स्य प्रसंस्करण के क्षेत्र में, संस्थान ने अभिनव मत्स्य उत्पादों के लिए प्रौद्योगिकियों का विकास जारी रखा, जिसमें खाने केलिए तैयार मत्स्य त्वचा स्नैक्स, झींगा स्टिक, भुना हुआ मत्स्य स्टिक, टूना स्नैक्स, मत्स्य टोफू, मत्स्य फ़्लॉस, इंस्टेंट क्लैम सूप मिक्स, आदि शामिल हैं। समुद्री खाद्य प्रसंस्करण इकाइयों का समर्थन करने के लिए, वाणिज्यिक IQF उत्पादों जैसे कि IQF पीडी झींगा, IQF डस्टेड स्क्विड रिंग्स और मैरीनेटेड झींगे की गुणवत्ता और भंडारण अवधि का मूल्यांकन करने के लिए अनुसंधान कार्यक्रम शुरू किए गए। पॉलीलैक्टिक अम्ल-पॉलीब्यूटिलीन सक्सिनेट आधारित जैवविकृत सामग्री, कैरेजेनन आधारित खाद्य संवेष्टन और एथिलीन स्कैवेंजिंग फिल्मों का उपयोग करके शीतित और शुष्कित मत्स्य उत्पादों के संवेष्टन के लिए नए संवेष्टन समाधान विकसित किए गए। मत्स्य अपशिष्ट के पूर्ण उपयोग के लक्ष्य के अनुरूप, पायलट पैमाने पर मत्स्य प्रसंस्करण अपशिष्ट से कोलेजन सांद्रता को सफलतापूर्वक निकाला गया और मत्स्य अपशिष्ट से कई जैव चिकित्सा यौगिक तैयार किए गए। बाजरे के बेहतर उपयोग की दिशा में भारत सरकार के प्रयासों के अनुरूप, संस्थान ने बाजरा-मत्स्य आधारित मूल्य वर्धित उत्पाद विकसित किए हैं, जिनमें बाजरे का पेय पाउडर, समुद्री शैवाल से समृद्ध बाजरे का ग्रेनोला बार, खाने के लिए तैयार कुकीज़ और मत्स्य प्रोटीन के साथ खाने के लिए तैयार बाजरा बॉल शामिल हैं। पश्च प्रग्रहण मात्स्यिकी में अभियांत्रिकी हस्तक्षेपों में शुष्कक सह धूम्र भट्ठी, 40 किलोग्राम क्षमता वाले सौर विद्युत शुष्कक, कार्बन नैनोडॉट्स (सीएनडी) और नैनोकंपोजिट पीसीएम आधारित ऊर्जा कार्यक्षम सौर संकर शुष्कक और मत्स्य के पूर्व प्रसंस्करण के लिए वैक्यूम संसेचन इकाई की संरचना शामिल है।

भाकृअनुप-केमाप्रौसं मत्स्य और मात्स्यिकी उत्पादों की गुणता आश्वासन और प्रबंधन के लिए दिशा-निर्देश तैयार करने में अपने प्रयासों को जारी रखा है। इस दिशा में प्रमुख उपलब्धियों में मत्स्य में हिस्टामाइन सामग्री के लिए त्वरित पता लगाने की पद्धति का विकास, जीसी-एमएस द्वारा एम्बरग्रीस का प्रमाणीकरण, आयन क्रोमैटोग्राफी द्वारा झींगों में मिलाए गए फॉस्फेट का निर्धारण, शुष्क मत्स्य उत्पादों में माइक्रोप्लास्टिक मूल्यांकन और खाने के लिए तैयार मत्स्य उत्पादों का जोखिम मूल्यांकन शामिल है। समुद्री खाद्य से रोगजनकों का पता लगाने, आनुवंशिक लक्षण वर्णन और उनके रोगाणुरोधी प्रतिरोध के मूल्यांकन के लिए त्वरित निदान उपकरणों के विकास के क्षेत्र में काफी अनुसंधान किया गया। *एसिनेटोबैक्टर बाउमानी* का लक्षण वर्णन और इसकी जीन पहचान, क्लेबसिएला न्यूमोनिया में एक उच्च जोखिम वाले क्लोन एसटी37 का संपूर्ण जीनोम विश्लेषण, *शेवेनेला* प्रजाति के विरूद्ध बैक्टीरियोफेज की वियुक्ति अनुसंधान उपलब्धियों में से कुछ हैं। एक कोशिका लाइन प्रयोगशाला स्थापित की गई, और ZnO और CuO नैनोकणों जैसे रोगाणुरोधी पदार्थों के साइटोटॉक्सिक अध्ययन किए गए। संस्थान की प्रमुख गतिविधि के रूप में, *विब्रियो पैराहेमोलिटिकस, वी. वल्नीफिकस, वी. मिमिकस, साल्मोनेला* प्रजाति और *क्लेबसिएला* प्रजाति जैसे रोगजनकों का पता लगाने के लिए समुद्री खाद्य पदार्थों की व्यवस्थित जांच की गई, साथ ही उनके प्रतिजीव प्रतिरोध का आकलन भी किया गया।

जैव रसायन और पोषण में नवाचारों में

फ़्लोरोग्लुसीनॉल कम्पोजिट और कइटोसन आयोडीन कम्पोजिट के साथ ग्राफ्टिंग के माध्यम से कइटोसन के जैव चिकित्सा गुणों को बढ़ाना शामिल था, जिनमें से दोनों में घाव भरने की आशाजनक गतिविधियाँ थीं। सजावटी मत्स्यों में संभावित अनुप्रयोगों के साथ एक समुद्री शैवाल-व्युत्पन्न प्रतिरक्षा बूस्टर (सिरप) विकसित किया गया। ब्लैक सोल्जर फ्लाई मील और डीओइल्ड माइक्टोफिड मील और साइलेज के इन-विट्रो और इन-विवो पाचन क्षमता अध्ययनों ने जलचारा सूत्रीकरण संपोषणीय घटक के रूप में उनकी उपयुक्तता का खुलासा किया। कार्यात्मक खाद्य उत्पादों का विकास और समुद्री शैवाल से जैव अणुओं का निष्कर्षण भाकृअनुप-केमाप्रौसं के प्रमुख क्षेत्र बने हुए हैं। इसके अन्तर्गत, समुद्री शैवाल कोम्बुचा, किण्वित समुद्री शैवाल पेय, उल्वन पॉलीसेकेराइड और समुद्री शैवाल से जैव अणु निष्कर्षण के लिए हरित निष्कर्षण प्रोटोकॉल जैसे विभिन्न उत्पाद विकसित किए गए।

मछुआरों के सामाजिक-आर्थिक परिदृश्य के अनुसंधान के संबंध में, संस्थान ने दो प्रमुख मत्स्य उत्पादन केंद्रों- एर्नाकुलम और कोषिक्कोड से मशीनीकृत क्षेत्र में लगे मछुआरों की दैनिक आय की रूपरेखा का दस्तावेजीकरण किया। मात्स्यिकी क्षेत्र में पश्च प्रग्रहण नुकसान पर किए गए अध्ययनों से पता चला है कि मशीनीकृत ट्रॉल मात्स्यिकी में गर्मियों के मौसम दौरान काफी नुकसान हुआ है। हितधारकों द्वारा प्रौद्योगिकियों को अपनाना संस्थान की बाहरी पहुंच के प्रमुख प्रदर्शन संकेतक के रूप में कार्य करता है। दस चयनित भाकृअनुप-केमाप्रौसं प्रौद्योगिकियों के प्रभाव का आकलन करने के लिए एक व्यापक ढांचा विकसित किया गया, जो मात्स्यिकी क्षेत्र में प्रौद्योगिकी हस्तक्षेपों के व्यापक प्रभाव का मूल्यांकन करने के लिए आंकड़ा-संचालित दृष्टिकोण को सुनिश्चित करता है।

वर्ष 2024 में, संस्थान के वैज्ञानिकों ने विशेषज्ञ समीक्षित पत्रिकाओं में 96 शोध पत्र प्रकाशित किए तथा पेटेंट, कॉपीराइट और औद्योगिक परिकल्पना सहित 16 बौद्धिक संपदा अधिकार दायर किए। भाकृअनुप-केमाप्रौसं को अपने कृषि व्यवसाय उद्भवन इकाई के तहत 15 प्रगतिशील उद्यमियों को पंजीकृत तथा प्रग्रहण और पश्च प्रग्रहण क्षेत्र में 18 प्रौद्योगिकियों का व्यावसायीकरण करके मत्स्य प्रसंस्करण उद्योगों को समर्थन देने पर गर्व है।

संस्थान अंतिम उपयोगकर्ताओं तक ज्ञान और सूचना प्रौद्योगिकी का प्रसार करने में सक्रिय है। वर्ष 2024 में, भाकृअनुप-केमाप्रौसं ने भारत सरकार के विभिन्न प्रमुख कार्यक्रम, प्रौद्योगिकी प्रदर्शन, तदर्थ कार्यक्रम, संगोष्ठियों और अन्य के तहत कई क्षमता निर्माण कार्यक्रम आयोजित किया। यह कार्यक्रम देश के विभिन्न हिस्सों में मछुआरों और उद्यमियों से लेकर किसानों और छात्रों तक के व्यापक हितधारकों तक पहुँच बनाई और उन्हें सशक्त बनाया।

संस्थान की ये उपलब्धियाँ भाकृअनुप-केमाप्रौसं के कर्मचारियों की कड़ी मेहनत, समर्पण और सहयोग का परिणाम हैं। मैं संस्थान के मिशन को आगे बढ़ाने में उनके अथक प्रयासों के लिए सभी कर्मचारियों की हार्दिक सराहना करता हूँ। मैं अनुसंधान सलाहकार समिति द्वारा दिए गए मार्गदर्शन, विषय वस्तु प्रभाग और भारतीय कृषि अनुसंधान परिषद के निरंतर समर्थन के लिए भी आभार व्यक्त करता हूँ। मैं सभी राष्ट्रीय और अंतर्राष्ट्रीय वित्त पोषण एजेंसियों और सहयोगी संगठनों को उनके बहुमूल्य समर्थन के लिए धन्यवाद देता हूँ, जिससे हम पिछले वर्ष अपने लक्ष्यों को पूरा करने में सक्षम हुए।

मुझे पूरी उम्मीद है कि भाकृअनुप-केमाप्रौसं यह वार्षिक रिपोर्ट 2024 देश के मात्स्यिकी क्षेत्र के भविष्य को आकार देने में हितधारकों, पेशेवरों और मात्स्यिकी विकास संगठनों के लिए जानकारी के एक मूल्यवान स्रोत के रूप में काम करेगी।

मैं आने वाले वर्षों में और अधिक फलदायी और उत्पादक वर्षों की आशा करता हूँ।

From the Director's Desk

ICAR-Central Institute of Fisheries Technology remains committed to advancing nation's economy and food security through its focused research on harvest and post-harvest fisheries technologies. ICAR-CIFT Annual Report 2024 presents a concise overview of the significant achievements of the Institute over the past year in the areas of Research, Extension, Collaborations and other key initiatives aimed at strengthening the fisheries sector of India.

In the last year, the mandate driven research activities of the Institute were undertaken through 31 Institute Projects and 30 externally funded projects, including four international collaborative programmes. In addition to these, the Institute launched a new research initiative, Corpus fund Projects, designed for a one-year duration, aimed at delivering innovative solutions to specific research challenges. Under this initiative, 10 projects were sanctioned. The Institute also entered into several collaborative research agreements with private institutions and universities, further strengthening its partnerships and outreach.

In the domain of Fishing Technology, ICAR-CIFT has been continuing the testing and operation of fuel-efficient CIFT-VSOB and CIFT-TED along both the East and West Coast of the country. Comparative trials of CIFT-VSOB and international slotted otter board

revealed no significant difference in drag and fuel consumption, validating the indigenous design's efficiency. While addressing the growing environmental concerns posed by abandoned FRP boats, promising technologies were developed for upcycled products from FRP debris. Further, life cycle assessment of FRP sheathed boats and FRP boats of Kerala was conducted to evaluate their environmental impact. To support marine mammal conservation, a detailed survey on marine mammal interaction with different fishing systems across the country was conducted and indigenous pingers were developed for reducing the marine mammal fishery interaction. In a move to promote ecofriendly fishing activities, biodegradable yarns were tested and used for the fabrication of traps, gill nets and FADs.

In the Fish Processing domain, the Institute continued to develop technologies for innovative fish products that included RTE fish skin snacks, shrimp sticks, roasted fish sticks, tuna snacks, fish tofu, fish floss, instant clam soup mix, among others. To support the seafood processing units, research programmes were initiated to evaluate the quality and shelf life of commercial IQF frozen products such as IQF frozen PD shrimp, IQF dusted squid rings and marinated shrimps. Novel packaging solutions were developed for the packaging of chilled and dried fish products using polylactic acid-polybutylene succinate based biodegradable materials, carrageenan based edible packaging, and ethylene scavenging films. In line with the goal of complete utilization of fishery waste, collagen concentrate was successfully extracted from fish processing waste at pilot scale and several biomedical compounds were prepared from fish waste. In tune with the Government of India's efforts towards improved utilization of millets, the institute has developed millet-fish based value added products including millet beverage powder, millet granola bar enriched with seaweeds, RTE cookies and RTE millet balls with fish protein. The Engineering interventions in post-harvest fisheries included the fabrication of a dryer cum smoking kiln, 40 kg capacity solar electrical dryer, carbon nanodots (CNDs) and nanocomposite PCM based energy efficient solar hybrid dryer, and a vacuum impregnation unit for pre-processing of fish.

ICAR-CIFT continues its efforts in formulating guidelines for quality assurance and management of fish and fishery products. Key achievements in this direction included the development of rapid detection method for histamine content in fish, authentication of Ambergris by GC-MS, determination of added phosphate in shrimp by ion chromatography, microplastic assessment in dried fish products and risk assessment of RTE fish products. Considerable research was undertaken in the area of the development of rapid diagnostic tools for the detection of pathogens from seafood, genetic characterisation, and evaluation of their antimicrobial resistance. Characterisation of *Acinetobacter baumannii* and its gene identification, whole genome analysis of a high-risk clone ST37 in *Klebsiella pneumoniae*, isolation of bacteriophage against *Shewanella* sp. were few of the research achievements. A cell line laboratory was established, and cytotoxic studies of antimicrobials such as ZnO and CuO nanoparticles were carried out. As a key activity of the Institute, systematic screening of seafood was carried out to detect pathogens such as *Vibrio parahaemolyticus, V. vulnificus, V. mimicus, Salmonella* spp., and *Klebsiella* spp., along with assessments of their antibiotic resistance.

Innovations in Biochemistry and Nutrition included enhancement of biomedical properties of chitosan through grafting with phloroglucinol composite and chitosan iodine composites, both of which had promising wound healing activities. A seaweed-derived immune booster (syrup) with potential applications in ornamental fishes was developed. In-vitro and in-vivo digestibility studies of black soldier fly meal and deoiled myctophid meal and silage revealed their suitability as sustainable ingredient in aquafeed formualtions. Development of functional food products and extraction of biomolecules from seaweed remain thrust areas of ICAR-CIFT. In this context, different products such as seaweed kombucha, fermented seaweed drink, Ulvan polysaccharides and green extraction protocols for biomolecule extraction from seaweeds were developed.

Regarding the research on the socioeconomic scenario of the fisherfolks, the Institute documented the daily income profile of fishers engaged in the mechanized sector from two major fish-producing centers—Ernakulam and Kozhikode. Studies on post-harvest loss in fisheries sector indicated significant loss in mechanised trawl fishery and in summer season. Adoption of technologies by the stakeholders serve as key performance indicator of Institute's outreach. A comprehensive framework for assessing the impact of ten selected ICAR-CIFT technologies was developed, which ensures a data-driven approach to evaluate the broader impact of technological interventions on the fisheries sector.

In the year 2024, the scientists of the Institute published 96 research papers in peer reviewed journals and filed 16 Intellectual Property Rights including patents, copyrights

and industrial designs. ICAR-CIFT takes pride in supporting the fish processing industries by registering 15 progressive entrepreneurs under its Agribusiness Incubation unit and by commercializing 18 technologies in the domain of harvest and post-harvest sector.

The institute is vibrant in disseminating the knowledge and information technologies to the end users. In 2024, ICAR-CIFT conducted a numerous capacity building programmes under various flagship progarmmes of Government of India, technology demonstrations, adhoc programmes, seminars and others. These programmes reached and empowered a broad spectrum of stakeholders ranging from fisherfolk and entrepreneurs to farmers and students across various parts of the country.

These achievements of the Institute are the result of the hard work, dedication, and cooperation of the staff of ICAR-CIFT. I extend my heartfelt appreciation to all staff members for their relentless efforts in advancing the Institute's mission. My thanks are also due to the guidance provided by the Research Advisory Committee, the continuous support of the Subject Matter Division and the Indian Council of Agricultural Research. I acknowledge all the national and international funding agencies and collaborating organisations for their valuable support that enabled us to meet our goals in the past year.

I sincerely hope that ICAR-CIFT Annual Report 2024 would serve as a valuable source of information to the stakeholders, professionals and the fisheries developmental organisations in shaping the future of fisheries sector of the country.

I am looking forward to more fruitful and productive years ahead.

महत्वपूर्ण उपलब्धियाँ

- सिफ्ट-वीएसओबी और अंतर्राष्ट्रीय स्लॉटेड ओटर बोर्ड के तुलनात्मक परीक्षणों से पता चला कि दोनों बोर्डों के बीच कर्षण और ईंधन की खपत में कोई महत्वपूर्ण अंतर नहीं है
- रष्ट्रीय मात्स्यकी विकास बोर्ड और एक्सिस बैंक के सहयोग से आंध्र प्रदेश के ट्रॉल प्रचालक के बीच सिफ्ट-टेड को लोकप्रिय बनाया गया
- उत्पादन, प्रचालन और निपटान चरणों को शामिल करते हुए पूरे जीवन चक्र में फाइबर प्रबलित प्लास्टिक (FRP) आवरित यानों और केरल की FRP यानों के जीवन चक्र का मूल्यांकन किया गया
- भाकृअनुप-केमाप्रौसं द्वारा परिकल्पित ऊर्जा कुशल सौर ऊर्जा चालित और पैडल बोट के लिए पर्यावरणीय बोझ का अनुमान लगाया गया
- परित्यक्त मत्स्यन यानों से प्राप्त FRP मलबे से अपसाइकल उत्पादों के लिए प्रौद्योगिकी विकसित की गई
- कोच्चि के 250 ट्रॉल मत्स्यन प्रचालन से समुद्री प्लास्टिक को एकत्र किया गया, छांटा गया और परिमाणीकरण, क्षरण और प्रभाव अध्ययन के लिए मूल्यांकन किया गया
- V_2O_5 नैनो अर्चिन-कार्बन डॉट-पॉलीएनिलिन कम्पोजिट का उपयोग करके निर्मित नाइट्राइट सेंसर ने अलग-अलग लवणता वाले समुद्री जल में नाइट्राइट के प्रति उत्कृष्ट प्रतिक्रिया दिखाई
- ओलेमाइड-नैनो CuO और नैनो कार्बन डॉट-टाइटेनियम ऑक्साइड हाइब्रिड ने जलीय कृषि पॉलीइथाइलीन केज नेट में उत्कृष्ट जैव प्रदूषण प्रतिरोध प्रदर्शित किया
- नैनो CCB (कॉपर-क्रोमियम-बोरॉन) बायोसाइड सांद्रता को जैव क्षरण को रोकने के लिए अनुकूलित किया गया
- अल्पायु क्लैम (*विलोरिटा साइप्रिनोइड्स*) के किशोर पकड़ को कम करने के लिए 30 मिमी के जाल आकार और प्रस्तुति के दो तरीकों की सिफारिश की गई है।
- मत्स्य में प्रचालकों की प्रतिक्रिया को मापने के लिए एक प्रणाली तैयार की गई और एक कार्यशील प्रोटोटाइप विकसित किया गया
- विभिन्न मत्स्यन के पर्यावरण में मत्स्य को आकर्षित करने के लिए हरा एलईडी सबसे पसंदीदा और प्रभावी रंग पाया गया
- पॉलीलैक्टिक अम्ल/पॉलीब्यूटिलीन सक्सिनेट-को-एडिपेट के विभिन्न संयोजनों के साथ आवरण किए और विलायक कास्ट किए गए फिल्मों को शीतित मत्स्य के संवेष्टन के लिए उपयुक्त पाया गया
- एल्गिनेट और मधुमक्खी मोम के साथ नैनो इमल्शन से बना एक खाद्य कोटिंग शुष्क मत्स्य के अनुप्रयोगों के लिए उपयुक्त पाया गया
- खाद्य अनुप्रयोगों के लिए सक्रिय एथिलीन स्कैवेंजिंग फिल्में विकसित की गईं
- जलीय बायोपॉलिमर के रूप में स्क्विड इंक और स्क्विड त्वचा के अर्क को शामिल करके एक कार्यात्मक फिल्म विकसित की गई
- ऊतक पुनर्जनन के लिए मत्स्य के शल्क से प्राप्त हाइड्रॉक्सीएपेटाइट पर आधारित बायोमेडिकल सूत्रीकरण विकसित किए गए
- उन्नत प्रतिउपचायक और रोगाणुरोधी गुणों के साथ सूक्ष्म शैवाल से स्वास्थ्य खाद्य सूत्रीकरण विकसित किए गए
- तिलापिया सुरीमी से झींगा स्टिक के लिए प्रोटोकॉल विकसित किया गया
- लिजार्ड फिश त्वचा से खाने के तैयार मत्स्य स्नैक्स विकसित किए गए
- माइक्रोवेव शुष्क टूयना स्नैक विकसित किए गए
- आणविक भार कइटोसन के साथ गोजातीय जिलेटिन और माल्टोडेक्सट्रिन के संयोजन में मत्स्य तेल ने बेहतर ऑक्सीडेटिव स्थिरता दिखाई
- स्वतः सहसंबद्ध त्रुटि संरचना के तहत एक मजबूत डी-इष्टतम पहले और दूसरे क्रम के मिश्रण प्रतिक्रिया सतह प्रतिगमन मॉडल विकसित किए गए
- भारतीय बांगड़ा, भारतीय सफेद झींगा और भारतीय स्क्विड के संवेदी अपघटन प्रोफ़ाइल का निर्धारण किया गया
- एम्बरग्रीस के प्रमाणीकरण के लिए जीसी एमएस आधारित विश्लेषणात्मक पद्धति विकसित की गई
- मत्स्य में हाइपोक्सैंथिन सामग्री के तेजी से परीक्षण के लिए पद्धति विकसित और मान्य की गई
- झींगों में अतिरिक्त फॉस्फेट के निर्धारण के लिए एक आयन क्रोमैटोग्राफी पद्धति विकसित की गई और मान्य की गई
- बायोएक्टिव फाइटोस्टेरॉल युक्त किण्वित समुद्री शैवाल का एक प्रोबायोटिक न्यूट्रास्युटिकल पेय; पेंटालिनोस्टेरॉल

और टिगोजेनिन तथा डीहाइड्रोस्कॉर्बिक अम्ल विकसित किया गया

- उच्च डीएचए सामग्री का उत्पादन करने में सक्षम थ्रैस्टोचाइट्रिड्स को अलग किया गया
- मत्स्य को बिजली और सौर ऊर्जा से शुष्क करने से माइक्रोप्लास्टिक्स में 60-70% तक कमी आ सकती है
- शुष्क मत्स्य से माइक्रोप्लास्टिक के स्तर को कम करने के तरीके विकसित किए गए
- *ए. बौमानी* (n=11) के लक्षण वर्णन से पता चला कि 100% वियुक्तियों में टाइप ४ फ़िम्ब्रिया और एडहेरेंस (*fim*H) जीन मौजूद थे। बायोफिल्म रेगुलेशन (*bfm*S), आयरन अपडेट (*fyu*A) और एरोबैक्टिन (*iut*A) जीन क्रमशः 81.8% 72.7% और 27.3% वियुक्तियों में पाए गए।
- *ए. बौमानी* के सीजी-एमएलएसटी विश्लेषण से पता चला कि सभी वियुक्तियां एसटी1685 और एसटी 3041 के थे
- *ए. बौमानी* में बेंज़ालकोनियम क्लोराइड और क्लोरहेक्सिडिन के लिए बायोसाइड प्रतिरोधकता सबसे अधिक थी
- क्लेबसिएला न्यूमोनिया में एक उच्च जोखिम वाले क्लोन एसटी37 का संपूर्ण जीनोम विश्लेषण पूरा किया गया
- जलीय पर्यावरण में मैक्रोप्लास्टिक्स में रोगजनकों और रोगाणुरोधी प्रतिरोध जीन पाए गए
- *शेवनेला प्रजाति* के 38 उपभेदों के खिलाफ सक्रिय बैक्टीरियोफेज को कई मेजबान संवर्धन पद्धतियों से अलग किया गया
- *शेवनेला प्रजाति* के खिलाफ सक्रिय रिपोर्टिंग प्रणाली के साथ एक पुनः संयोजक फेज को इकट्ठा किया गया और मूल *शेवनेला* मेजबान प्रजातियों के साथ एक पुनः संयोजक जीवित फेज को पुनर्प्राप्त किया गया।
- *पी. मोनोडॉन* का तेजी से पता लगाने के लिए प्रतिबाधा पर आधारित एक डीएनए बायोसेंसर विकसित किया गया।
- जीवाणुरोधी फोटोडायनामिक निष्क्रियता (aPDI) के लिए एक IoT-आधारित एलईडी लाइट चैंबर प्रणाली को परिकल्प और निर्मित किया गया
- फैंटेल गोल्डफिश फिन (FtGF) और ऑस्कर मत्स्य (OS) कोशिका लाइनों पर ZnO-नैनोपार्टिकल्स की साइटोटॉक्सिसिटी ने मानव और म्यूरिन कोशिका लाइनों की तुलना में ZnO नैनोपार्टिकल्स के लिए उच्च IC50 मूल्य प्रदर्शित किया
- पॉलीइथिलीन ग्लाइकॉल (पीईजी) लेपित CuO-नैनोपार्टिकल्स की जीवाणुरोधी गतिविधि पर कोई प्रभाव नहीं पड़ा, लेकिन इसने साइटोटॉक्सिसिटी को उल्लेखनीय रूप से कम कर दिया
- बायोफिल्म वगर्गीकरण के लिए एक विश्वसनीय और सार्वभौमिक रूप से लागू दृष्टिकोण प्रदान करने के लिए विलुप्ति गुणांक अनुपात के उपयोग से वर्गीकरण सीमा को समायोजित करके विभिन्न तरंग दैर्ध्य में बायो-फिल्म वर्गीकरण के लिए एक नया मानकीकृत सूत्र विकसित किया गया
- ZnO-नैनोपार्टिकल्स के योग के साथ कइटोसन ऑलिगो-सैकेराइड की जीवाणुरोधी गतिविधि में सुधार पाया गया।
- सूक्ष्मजीवों के नियंत्रण से संबंधित अनुप्रयोग के लिए ZnO-नैनोपार्टिकल का चयन करने के लिए न्यूनतम अवरोधक सांद्रता परख सबसे उपयुक्त मानदंड पाया गया, इसके बाद SEM, DLS और λ अधिकतम हैं।
- खुदरा बाज़ार में मीठे पानी की मछलियों में *वी. पैराहेमोलिटिकस* की व्यापकता 51% थी।
- समुद्री खाद्य मूल के विब्रियो वल्नीफिकस वियुक्तियां सेफुरॉक्साइम (93.3%), सेफोटैक्साइम (80%) और सेफैक्लोर (80%) के प्रति अत्यधिक प्रतिरोधी थे।
- समुद्री पर्यावरण से अलग किए गए दो उपभेदों, बैसिलस प्यूमिलस और बी. सबटिलिस में बायोफिल्म-अवरोधक क्षमताएं थीं, जो प्रोबायोटिक उपभेदों के रूप में उपयोग की उनकी क्षमता को दर्शाती हैं।
- झींगा के नमूनों में विब्रियो मिमिकस की व्यापकता 5.71% पाई गई।
- एंटीऑक्सीडेंट, एंटीकैंसर और घाव भरने वाले गुणों वाले कइटोसन फ़्लोरोग्लुसीनॉल मिश्रण का विकास किया गया
- घाव भरने की बेहतर क्षमता वाले कैरेजेनान-इबुप्रोफेन और कइटोसन आयोडीन मिश्रण का विकास किया गया
- कैरोटीनॉयड एस्टर और PUFA से भरपूर झींगा शेल ऑयल के लिए पर्यावरण के अनुकूल निष्कर्षण प्रक्रिया विकसित की गई
- प्रोटीन स्रोत के रूप में SFE अवशेषों और माइक्टोफिड साइलेज से सिल्वर पोम्पानो (ट्रेचिनोटस ब्लोची) के लिए

जलकृषि चारा विकसित किया गया

- *इन विट्रो* और *इन विवो* प्रयोगों से पता चला है कि मत्स्य से प्राप्त पेप्टाइड्स में एंटीऑक्सीडेंट और एंटीहाइपरटेंसिव गुण होते हैं
- समुद्री शैवाल से बायोएक्टिव यौगिक प्राप्त करने के लिए एक निष्कर्षण प्रक्रिया विकसित की गई और एक पेटेंट दायर किया गया
- सजावटी मत्स्यों के रंग प्रतिमान को बढ़ाने वाले समुद्री शैवाल-आधारित (CIFTEQ-समुद्री शैवाल सिरप) विकसित किया गया
- एक सौर-संचालित मत्स्य चारा डिस्पेंसर का परिकल्पन किया गया, और इसके प्रदर्शन का मूल्यांकन किया गया
- सिल्वर बेली मत्स्य का उपयोग करके संकर सौर शुष्कक के प्रदर्शन मूल्यांकन से पता चला कि नमी की मात्रा को 74.40 से 17.70 (% w.b) तक कम करने के लिए 10 घंटे का शुष्कन का समय होता है।
- झींगा का उपयोग करके कार्बन नैनोडॉट्स और नैनोकंपोजिट पीसीएम-आधारित सौर शुष्कक के प्रदर्शन का मूल्यांकन किया गया, जिसमें 14.34% (w.b) की अंतिम नमी सामग्री प्राप्त करने के लिए 7 घंटे शुष्कन का समय सामने आया।
- सौर-इलेक्ट्रिकल संकर शुष्कक विकसित किया गया, और प्रदर्शन मूल्यांकन किया गया
- इलेक्ट्रिक बैकअप के साथ बायोमास-आधारित धूम्र भट्ठी को परिकल्पित और विकसित किया गया।
- मशीनीकृत यान मछुआरों की दैनिक आय एर्नाकुलम और कोषिक्कोड में एकल-दिवसीय और बहु-दिवसीय ट्रॉल मत्स्यन के बीच आय में महत्वपूर्ण असमानता प्रदर्शित हुई। हालांकि, बहु-दिवसीय ट्रॉल श्रेणी के भीतर आय में कोई महत्वपूर्ण अंतर नहीं था
- मोटर चालित मत्स्यन की आय ने छह प्रमुख मत्स्यन केंद्रों में महत्वपूर्ण परिवर्तनशीलता दिखाई, जिसमें 3% मछुआरे प्रतिदिन 500 रुपये से कम कमाते हैं, 10% 1500 रुपये से अधिक कमाते हैं, और अधिकांश (53%) प्रतिदिन 800 रुपये से 1000 रुपये के बीच कमाते हैं
- डिजिटल मत्स्य वेंडिंग पोर्टल और उपभोक्ता व्यवहार विश्लेषण की रूपरेखा तैयार की गई
- ऑनलाइन मत्स्य उपभोक्ताओं की प्लेटफ़ॉर्म पसंद को प्रभावित करने वाले प्रमुख इंट्रा- (उपयोगकर्ता-अनुकूल इंटरफ़ेस) और इंटर-एट्रिब्यूट्स (विविधता) की पहचान की गई
- प्रशिक्षण मॉड्यूल सहित 10 चयनित प्रौद्योगिकियों के प्रभाव मूल्यांकन के लिए एक व्यापक 20-बिंदु प्रमुख प्रदर्शन संकेतक (केपीआई) ढांचा तैयार किया गया और प्रत्येक संकेतक का अनुमान लगाने के लिए कार्यप्रणाली तैयार की गई।
- ट्रॉलिंग परिचालन के लिए टिकाऊ और कम ऊर्जा वाले 35 मीटर और 35.2 मीटर ट्रॉल नेट को परिकल्पित किया गया
- एशियाई हार्ड क्लैम, *मेरेट्रिक्स मेरेट्रिक्स* से प्रोटीन हाइड्रोलाइज़ेट तैयार किए गए और उनकी विशेषता बताई गई
- मत्स्यन जाल के प्रभावी कीटाणुशोधन के लिए एक माइक्रोटिटर प्लेट पद्धति विकसित की गई
- महाराष्ट्र के विशेष संदर्भ में मत्स्य प्रग्रहण और पश्च प्रग्रहण प्रौद्योगिकियां पहलुओं और समस्याओं के शमन उपायों का आकलन किया गया
- महाराष्ट्र के मत्स्य प्रग्रहण और पश्च प्रग्रहण के क्षेत्रों में प्रचलित चुनौतियों का समाधान करने के लिए नवीन प्रौद्योगिकी हस्तक्षेप किया गया
- देश में पहली बार समुद्री स्तनपायी एवं मात्स्यिकी का पारस्परिक प्रभाव का अध्ययन करने के लिए एक ड्रोन-आधारित सर्वेक्षण शुरू किया गया
- देश के विभिन्न तटीय राज्यों में समुद्री स्तनपायी का मात्स्यिकी पर प्रभाव और शमन उपायों का दस्तावेजीकरण किया गया।
- मोती बाजरा (*पेनिसेटम ग्लौकम*), रोहू मत्स्य कीमा, चावल और मक्का के संयोजन के साथ निकाले गए स्नैक्स के लिए प्रोटोकॉल स्थापित किए गए
- पारंपरिक खाद्य रागी मुधे जैसा दिखने वाले लिजार्ड फिश (*सौरिडा टंबिल*) के मांस के साथ खाने के लिए तैयार ताप संसाधित खाद्य, रागी (*एल्यूसिन कोराकाना*) बॉल्स विकसित किए गए
- मत्स्य में लुफेन्यूरॉन, इवरमेक्टिन और प्राजिक्वेंटेल का पता लगाने के लिए एक पद्धति विकसित की गई और तरल क्रोमैटोग्राफी के साथ मिलकर टेंडेम मास स्पेक्ट्रोमेट्री का उपयोग करके इसे मान्य किया गया
- ट्रिपल क्वाड्रुपोल मास स्पेक्ट्रोमेट्री का उपयोग करके चारा मैट्रिसेस में ग्वार गम का उपयोग करके टॉप-ड्रेस्ड इवरमेक्टिन-संयोजित औषधीय चारे की पद्धति का सत्यापन और पुनर्प्राप्ति अध्ययन किया गया
- समुद्री खाद्य की प्रजातियों की पहचान के ऑनसाइट प्रमाणीकरण के लिए एक हैंडहेल्ड पोर्टेबल एनआईआर

डिवाइस आधारित विश्लेषणात्मक पद्धति विकसित की गई

- छह प्रजातियों से संबंधित समुद्री खाद्य प्रजातियों की पहचान के वास्तविक समय प्रमाणीकरण के लिए रैपिड इवेपोरेटिव आयनीकरण मास स्पेक्ट्रोमेट्री (आरईआईएमएस) आधारित विश्लेषणात्मक पद्धति विकसित की गई
- मत्स्य और चिकन में 22 PFAS यौगिकों के एक साथ विश्लेषण के लिए LC-HRMS आधारित विश्लेषणात्मक पद्धति विकसित की गई।
- FSSR और NPOP दिशानिर्देशों के तहत सूचीबद्ध 285 कीटनाशकों के एक साथ निर्धारण के लिए एक विश्लेषणात्मक कार्यप्रवाह विकसित किया गया, जो जलीय कृषि और मुर्गी पालन से संबंधित यौगिकों को लक्षित करता है।
- माइक्रोवेव-आधारित निष्कर्षण पद्धति का उपयोग करके मत्स्य के ऊतकों, मत्स्य खाद्य और शुष्क मत्स्य से माइक्रोप्लास्टिक के निष्कर्षण के लिए एक त्वरित विधि विकसित की गई
- बर्फ में संग्रहीत भारतीय सफेद झींगा, *फेनेरोपेनियस इंडिकस* के मेटाबोलोमिक प्रोफाइलिंग में परिवर्तन के आधार पर K-मूल्य, एक प्रमुख ताजगी संकेतक के लिए एक पूर्वानुमान मॉडल विकसित किया गया
- मेथिसिलिन-प्रतिरोधी और मेथिसिलिन-संवेदनशील *एस. ऑरियस* के संरक्षण के लिए एक उपयोगकर्ता-अनुकूल-उपयोग में तैयार जिलेटिन-संसेचित फिल्टर पेपर स्ट्रिप्स पद्धति विकसित की गई।
- एमआरएसए और एमएसएसए पर सक्रिय दस फेजों को फेनोटाइपिक और जीनोटाइपिक रूप से चिह्नित किया गया। समुद्री खाद्य पदार्थों में एएमआर रोगजनकों के जैव नियंत्रण के लिए 10 लाइटिक बैक्टीरियोफेज युक्त एक एमआरएसए/एमएसएसए फेज सूत्रीकरण विकसित किया गया।
- कोचिन के मत्स्य नमूने *एनीसाकिस* प्रजाति से मुक्त पाए गए।
- एमआरएसए होस्ट और फेज के पांच पूरे जीनोम अनुक्रमण पूरे हो चुके हैं
- विभिन्न संवेष्टन और भंडारण की स्थिति में संग्रहीत भारतीय बांगड़ा का जीवाणुतत्व-संबंधी, रासायनिक और माइक्रोबायोम विश्लेषण पूरा हो गया है
- माइक्रोबायोम विश्लेषण में भारतीय बांगड़ा के खराब होने के लिए जिम्मेदार प्रमुख प्रजातियां *शीवेनेला आर्कटिका, शीवेनेला एक्विमरीना, शीवेनेला बाल्टिका* और *शीवेनेला ग्लेशियलिपिसिकोला* पाई गईं।
- *विब्रियो* प्रजाति, विशेष रूप से *वी. पैराहेमोलिटिकस* और *वी. कोलेरा* के लिए 4°C, -20°C और -80°C पर एक स्ट्रिप-आधारित परिरक्षण पद्धति विकसित की गई।
- पैडिना जिम्नोस्पोरा के जैवमूल्यांकन के लिए बायोरिफाइनरी कार्यप्रवाह की स्थापना की गई
- सरगासम पॉलीसिस्टम का संधारणीय जैवप्रसंस्करण विकसित किया गया
- मत्स्य की गुणवत्ता और ताज़गी के गैर-विनाशकारी मूल्यांकन के लिए एक उपकरण विकसित किया गया
- एर्नाकुलम में एक समुद्री खाद्य प्रसंस्करण संयंत्र में समुद्री खाद्य प्रसंस्करण में अमोनिया/कार्बन डाइऑक्साइड कैस्केड प्रशीतन की स्थापना की गई
- खारे जल के जलीय कृषि खेतों से अलग किए गए *वी. पैराहेमोलिटिकस* के रोगाणुरोधी प्रतिरोध प्रोफ़ाइल ने झींगों के नमूनों और जल के नमूनों के बीच समान प्रतिरोध प्रोफ़ाइल दिखाई, जिसमें एम्पीसिलीन और सेफ़ॉक्सिटिन के प्रति अधिकतम प्रतिरोध था
- समुद्री शैवाल और सोयाबीन की किण्वन प्रक्रिया की पोषण संरचना को बढ़ाने के लिए मानकीकृत किया गया
- किण्वित समुद्री शैवाल-आधारित चारा सूत्रीकरण विकसित किए गए
- भारत में पहली बार जेलीफ़िश के ब्लूम्स से ट्रॉल मत्स्यन के क्षेत्र पर आर्थिक प्रभाव का आकलन किया गया
- गुजरात तट पर जेलीफ़िश की विविधता और वितरण पर एक आधार रेखा बनाई गई
- मत्स्यन गियर परिचालन के लिए रेयान-आधारित बायोडिग्रेडेबल सामग्री विकसित की गई
- SS 316 फ्रेम के साथ जैवविकृत जाल की परिकल्पना की गई और निर्मित किए गए
- ALDFG स्रोतों और गोष्ठ जालों को पुनर्प्राप्त करने के लिए महाराष्ट्र तटरेखा के 720 किमी के साथ तटरेखा सर्वेक्षण और स्कूबा डाइविंग प्रचालन किए गए
- 23 किलोवाट बैटरी पैक और 20 एचपी डीजल इंजन की विशेषता वाली एक श्रृंखला संकर इलेक्ट्रिकल मत्स्यन किट विकसित की गई

Significant Achievements

- Comparative trials of CIFT-VSOB and international slotted otter board revealed no significant difference in drag and fuel consumption between the two boards
- CIFT-TED was popularised among trawl operators of Andhra Pradesh in collaboration with NFDB and Axis Bank
- Life cycle assessment of Fibre Reinforced Plastic (FRP) sheathed boats and FRP boats of Kerala across the entire life cycle encompassing production, operation, and disposal phases were calculated
- Environmental burdens were estimated for energy efficient solar powered and pedal boat designed by ICAR-CIFT
- Technologies were developed for upcycled products from FRP debris sourced from abandoned fishing boats
- Marine plastics from 250 trawl fishing operations off Kochi were collected, sorted, and assessed for quantification, degradation, and impact studies
- Nitrite sensor fabricated using V_2O_5 nano urchin-carbon dot-polyaniline composite showed excellent response to the nitrite in seawater of varying salinities
- Oleamide-nano CuO and nano carbon dot-Titanium oxide hybrid exhibited excellent biofouling resistance in aquaculture polyethylene cagenets developed
- Nano CCB (copper-chromium-boron) biocide concentration was optimised to prevent biodeterioration
- Mesh size of 30 mm and two modes of presentation are recommended for reduction of juvenile catch of clam (*Villorita cyprinoides*)
- A system to measure the optomotor response in fish was designed and a working prototype developed
- Green LED was found to be the most preferred and effective colour for attracting fish across various fishing environments
- Blown and solvent casted films with different combinations of Polylactic acid / Polybutylene succinate-co-adipate were found suitable for packaging of chilled fish
- An edible coating made of nano emulsions with alginate and bee wax was found suitable for dry fish applications
- Developed active ethylene scavenging films for food applications
- Developed a functional film incorporating squid ink and squid skin extracts as aquatic biopolymer
- Developed biomedical formulations based on hydroxyapetite derived from fish scales for tissue regeneration
- Health food formulations were developed from microalgae with enhanced antioxidant and antimicrobial properties
- Protocol developed for shrimp sticks from tilapia surimi
- RTE fish snacks were developed from lizard fish skin
- Microwave dried tuna snack was developed
- Fish oil encapsulated with molecular weight chitosan in combination with bovine gelatin and maltodextrin showed improved oxidative stability
- Developed a robust D-optimal first and second order mixture response surface regression models under auto-correlated error structure
- Sensory decomposition profile of Indian mackerel, Indian white prawn and Indian squid were determined
- GC MS based analytical method was developed for authentication of Ambergris
- Method for rapid testing of hypoxanthine content in fish was developed and validated
- Developed anion chromatography method for the determination of added phosphate in shrimp and validated
- A probiotic nutraceutical drink of fermented seaweed containing bioactive phytosterols; pentalinosterol and tigogenin and dehydroascorbic acid was developed
- Thraustochytrids capable of producing high DHA content was isolated
- Electrical and solar drying of fish can reduce microplastics by 60-70%
- Methods for the reducing the levels of microplastics from dry fish was developed
- Characterization of *A. baumannii* (n=11) revealed that 100% of the isolates possessed type I fimbriae and adherence (*fim*H) gene. Biofilm regulation (*bfm*S), iron update (*fyu*A) and aerobactin (*iut*A) genes were found in 81.8% 72.7%, and 27.3% of the isolates respectively
- cg-MLST analysis of *A. baumannii* revealed that all the isolates belonged to ST1685 and ST3041
- Biocide resistance was highest to benzalkonium chloride and chlorhexidine among the *A. baumannii*
- Whole genome analysis of a high-risk clone ST37 in *Klebsiella pneumoniae* was completed
- Macroplastics in aquatic environments were found to carry pathogens and antimicrobial resistance genes

- Bacteriophages active against 38 strains of *Shewanella* sp., were isolated from multiple host enrichment methods
- A recombinant phage with a reporting system active against *Shewanella* sp. was assembled and a recombinant live phage recovered with the native Shewanella host species.
- A DNA biosensor based on impedimetry was developed for the rapid detection of *P. monodon*
- An IoT-based LED light chamber system for antibacterial photodynamic inactivation (aPDI) was designed and fabricated
- The cytotoxicity of ZnO-Nanoparticles on Fantail goldfish fin (FtGF) and Oscar fish (OS) cell lines exhibited a higher IC50 value for ZnO nanoparticles than human and murine cell lines
- Polyethylene glycol (PEG) coated CuO-Nanoparticles had no impact on antibacterial activity, but it notably reduced cytotoxicity
- To provide a reliable and universally applicable approach for biofilm categorization a new standardized formula for the bio-film classification across different wavelengths was developed by adjusting the categorisation threshold using the extinction coefficient ratio
- The antibacterial activity of chitosan oligo-saccharide was found to improved with the addition of ZnO-Nanoparticles
- Minimum inhibitory concentration assay was found to be the most suitable criteria to select ZnO-Nanoparticle for application related to control of the microorganisms, followed by SEM, DLS and λ max
- The prevalence of *V. parahaemolyticus* in retail freshwater fish was 51%
- *Vibrio vulnificus* isolates of seafood origin was highly resistant to Cefuroxime (93.3%), Cefotaxime (80%) and Cefaclor (80%)
- Two strains, *Bacillus pumilus* and *B. subtilis,* isolated from the marine environment had biofilm-inhibiting capabilities, indicating their potential for use as probiotic strains
- The prevalence of *Vibrio mimicus* in shrimp samples were found to be 5.71%
- Developed chitosan phloroglucinol composite having antioxidant, anticancer and wound healing properties
- Developed carrageenan-ibuprofen and chitosan iodine composite of improved wound healing capacity
- Eco-friendly extraction process was developed for shrimp shell oil rich in carotenoid esters and PUFA
- Aquaculture feed was developed for silver pompano (*Trachinotus blochii*) from SFE residual and myctophid silage as protein source
- *In vitro* and *in vivo* experiments have revealed that fish derived peptides possess antioxidant and antihypertensive properties
- An extraction process was developed for obtaining bioactive compounds from seaweeds and a patent was filed
- Developed a seaweed-based (CIFTEQ-Seaweed syrup) that enhanced color patterns of ornamental fishes
- A solar-powered fish feed dispenser was designed, and its performance evaluated
- The performance evaluation of hybrid solar dryer using silver belly fish revealed a drying time of 10 h to reduce the moisture content from 74.40 to 17.70 (% w.b)
- Performance of carbon nanodots and nanocomposite PCM-based solar dryer evaluated using shrimp revealed 7 h of drying to obtain a final moisture content of 14.34 % (w.b)
- Solar-electrical hybrid dryer was developed, and performance evaluation was conducted
- Biomass-based Smoking Kiln with electric backup was designed and developed
- Daily income of mechanised boat fishers in Ernakulam and Kozhikode demonstrated a significant income disparity between single-day and multi-day trawl fishing. However, income within the multi-day trawl category did not differ significantly
- Motorized fishing income showed significant variability across six key fishing centers with 3% of fishermen earning less than Rs. 500 per day, 10% over Rs. 1500, and the majority (53%) earning between Rs. 800 and Rs. 1000 daily
- Developed frameworks for profiling digital fish vending portals and consumer behaviour analysis
- Identified key intra- (user-friendly interface) and inter-attributes (variety) driving platform choice of online fish consumers
- A comprehensive 20-point Key Performance Indicator (KPI) framework was designed for impact assessment of 10 selected technologies, including training modules, and formulated methodologies for estimating each indicator
- Sustainable and low energy 35 m and 35.2 m trawls were designed for trawling operations
- Prepared and characterized protein hydrolysates from Asiatic hard clam, *Meretrix meretrix*
- A microtiter plate method for effective disinfection of fishing nets was developed
- A drone-based survey to

study marine mammal fishery interaction was initiated for the first time in the country

- Marine mammal interaction and mitigation measures at various coastal states of the country were documented
- Protocols established for extruded snack with a combination of pearl millet (*Pennisetum glaucum*), rohu fish mince, rice and maize
- Developed Ready-to-Eat thermal processed foods, ragi (*Eleusine coracana*) balls with lizard fish (*Saurida tumbil*) meat resembling the traditional food Ragi muddhe
- A method was developed for the detection of Lufenuron, Ivermectin, and Praziquantel in fish and validated using tandem mass spectrometry coupled with liquid chromatography
- Method validation and recovery study of top-dressed Ivermectin-incorporated medicated feed using Guar Gum in feed Matrices using Triple Quadrupole Mass Spectrometry
- A hand held portable NIR device based analytical method was developed for onsite authentication of species identity of seafood
- Rapid Evaporative Ionization Mass Spectrometry (REIMS) based analytical method was developed for real-time authentication of species identity of seafood belonging to six species
- A LC-HRMS based analytical method was developed for simultaneous analysis 22 PFAS compounds in fish and chicken
- An analytical workflow was developed for the simultaneous determination of 285 pesticides listed under the FSSR and NPOP guidelines, targeting compounds relevant to aquaculture and poultry farming
- A rapid method for extraction of microplastic from fish tissue, fish meal, and dry fish was developed using a microwave-assisted extraction method
- A prediction model was developed for the K-value, a key freshness indicator, based on alteration in the metabolomic profiling of ice-stored Indian white shrimp, *Fenneropenaeus indicus*
- Fish samples from Cochin were found to be free from *Anisakis* sp.
- A user-friendly-ready-to-use gelatin-impregnated filter paper strips method was developed for the preservation of Methicillin-Resistant and Methicillin-susceptible *S. aureus*
- Ten phages active on MRSA and MSSA were characterized phenotypically and genotypically. One MRSA/MSSA phage formulation was developed containing 10 lytic bacteriophages for biocontrol of AMR pathogens in seafood
- Five whole genome sequencing of MRSA host and phage have been completed
- Microbiological, chemical and microbiome analysis of Indian Mackerel stored at different packaging and storage condition completed
- The predominant species responsible for spoilage of Indian Mackeral was found to be *Shewanella arctica, S.aquimarina, S. baltica* and *S.glacialipiscicola* in microbiome analysis
- A strip-based preservation method for *Vibrio spp.*, specifically *V. parahaemolyticus* and *V. cholerae,* at 4°C, -20°C, and -80°C were developed
- Biorefinery workflow for biovalorisation of *Padina gymnospora* was established
- Sustainable bioprocessing of *Sargassum polycystum* was developed
- A device for non-destructive evaluation of fish quality and freshness was developed
- Established ammonia/carbon dioxide cascade refrigeration in seafood processing at a seafood processing plant in Ernakulam
- Antimicrobial resistance profile of *V. parahaemolyticus* isolated from brackish water aquaculture farms showed similar resistance profiles between shrimp samples and water samples, with maximum resistance towards ampicillin and cefoxitin
- Fermentation process of seaweed and soybean was standardised to enhance the nutritional composition
- Fermented seaweed-based feed formulations were developed
- Assessed of economic impact to trawl fishing sector by jellyfish blooms for the first time in India
- Created a baseline on jellyfish diversity and distribution along the Gujarat coast
- Developed rayon-based biodegradable materials for fishing gear operations
- Designed and fabricated biodegradable traps with SS 316 frame
- Shoreline surveys and scuba diving operations along 720 km of the Maharashtra coastline conducted for ALDFG sources and recovering ghost nets
- A series hybrid electrical fishing kit featuring 23 kW battery pack and 20 HP diesel engine was developed

The Institute

The ICAR-Central Institute of Fisheries Technology (named at the time of inception as Central Fisheries Technology Research Station) was set-up following the recommendation of a high power committee constituted by the Ministry of Food and Agriculture, Government of India. It started functioning at Kochi on 29th April, 1957 under the Department of Agriculture of the then Ministry of Food and Agriculture with a small nucleus of staff for research work in fishing craft and gear. Other Divisions soon followed. The administrative control of the Institute was brought under the Indian Council of Agricultural Research on 01 October, 1967.

Vision

To facilitate sustainable harvesting and total utilization of fishery resources through innovations in harvest and post-harvest technologies.

Overview

The Institute is the only national centre in the country where research in all disciplines relating to fishing and fish processing is undertaken. Research Centres function at Visakhapatnam (Andhra Pradesh), Veraval (Gujarat) and Mumbai (Maharashtra).

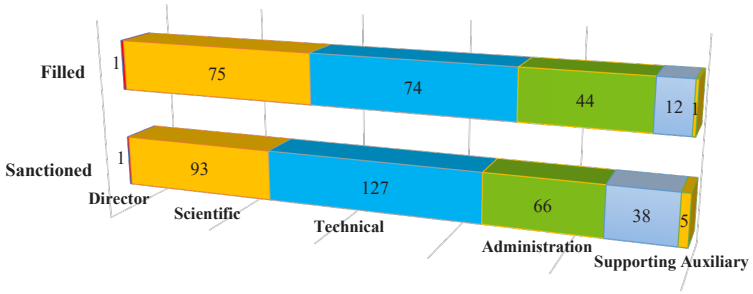
Mission

Ensure responsible harvesting of fishery resources through eco-friendly, energy efficient and economical means; ensure total utilization of the harvested fish through appropriate processing, value addition, packaging and waste utilization; ensure food safety and nutritional security to the consumer and minimize carbon and water foot print per unit volume; and to ensure equitable benefits to the stakeholders, across the value chain.

Mandate

- Basic and strategic research in fishing and processing, bioactive compounds and food safety.
- Design and develop energy efficient fishing systems for responsible fishing and sustainable management.
- Development of implements and machinery for fishing and fish processing.
- Consultancy services, human resource development through skill development, training, education and extension.

Staff Position

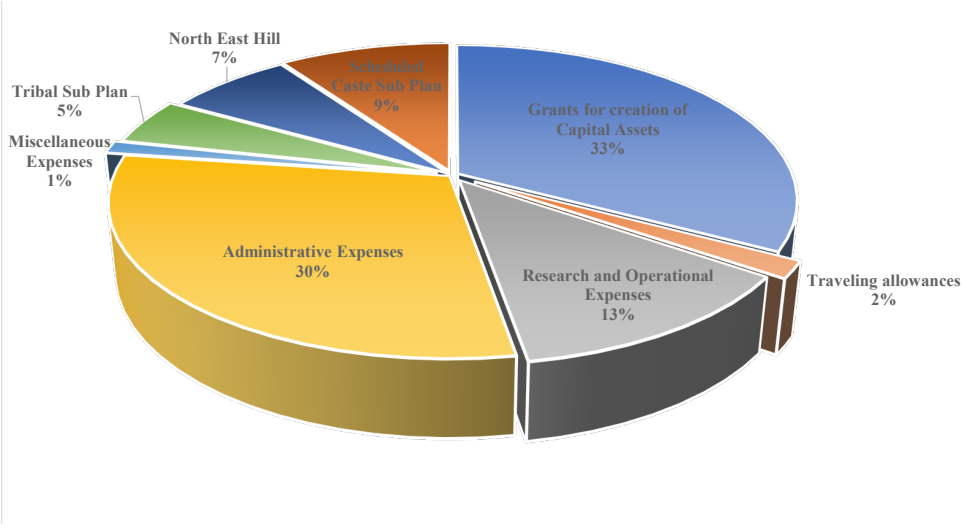


ICAR-CIFT has a total staff strength of 330. Of the total staff, 28.5% are scientific personal, 38.5% technical, 20 % administrative, 11.5% supporting staff and the rest auxiliary staff. Of the sanctioned positions in different categories, 81% of the scientific, 58% of the technical, 67% of the administrative, 32% of supporting and 20% of the auxiliary staff are in position.

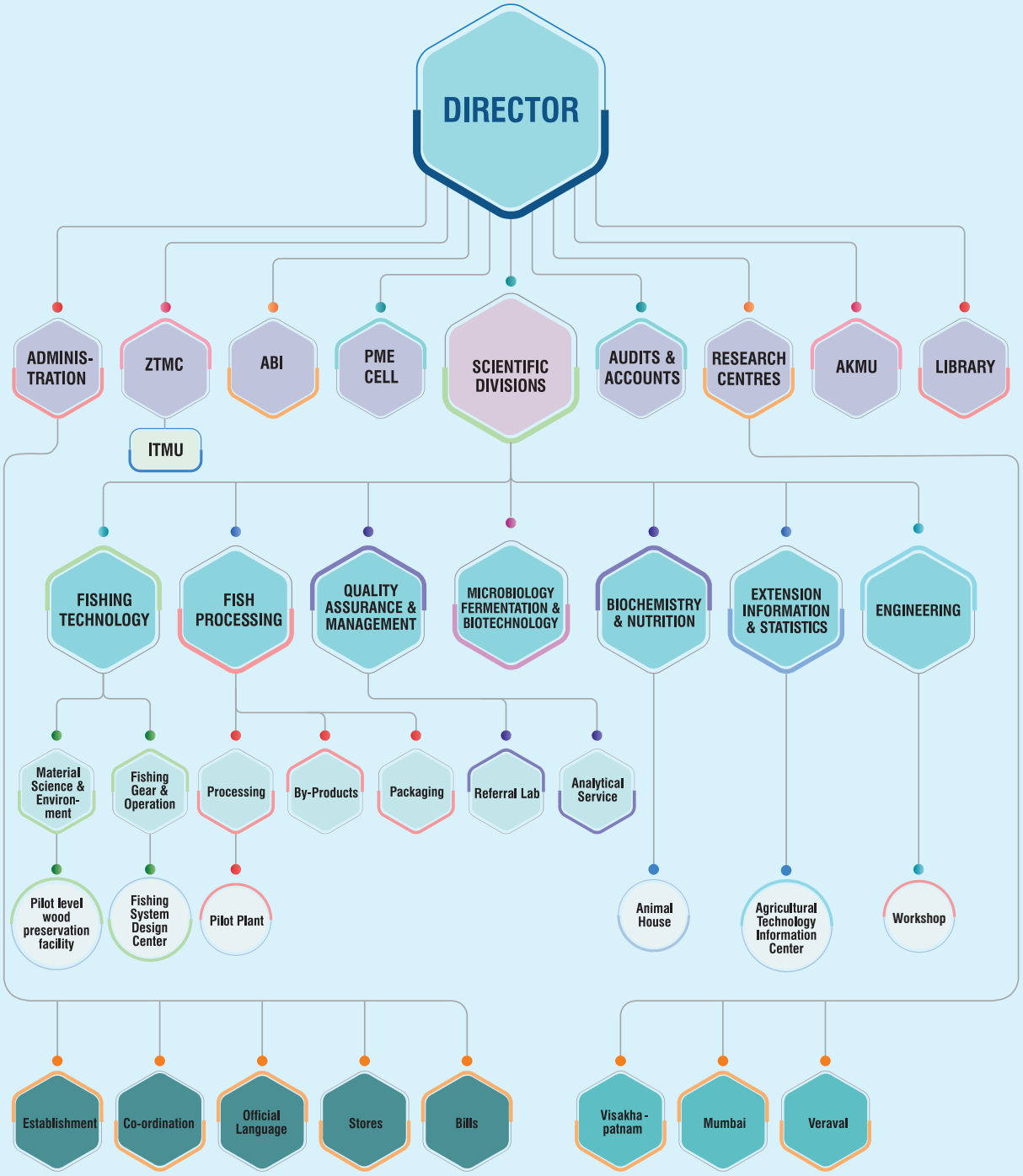
Budget Allocation and Expenditure

During the reporting period of 2024-25, ICAR-CIFT effectively utilized the allocated budget fund of rupees 6286.09 Lakhs, achieving a 100% utilization rate.

Head wise budget allocation for the year- 2024-25



***** *Excluding Estt. Charges and Pension Benefits*


DIRECTOR
ADMINIS-TRATION
ZTMC
ITMU
ABI
PME CELL
SCIENTIFIC DIVISIONS
AUDITS & ACCOUNTS
RESEARCH CENTRES
AKMU
LIBRARY
FISHING TECHNOLOGY
FISH PROCESSING
QUALITY ASSURANCE & MANAGEMENT
MICROBIOLOGY FERMENTATION & BIOTECHNOLOGY
BIOCHEMISTRY & NUTRITION
EXTENSION INFORMATION & STATISTICS
ENGINEERING
Material Science & Environ-ment
Fishing Gear & Operation
Processing
By-Products
Packaging
Referral Lab
Analytical Service
Pilot level wood preservation facility
Fishing System Design Center
Pilot Plant
Animal House
Agricultural Technology Information Center
Workshop
Establishment
Co-ordination
Official Language
Stores
Bills
Visakha-patnam
Mumbai
Veraval

Fishing Technology Division

Institute Projects

1. Investigations on sustainable, productive and safe fishing technologies
2. Investigations on environmental burdens associated with selected small scale fishing systems and value-added fishery product of India using Life cycle assessment (LCA) approach
3. Fishing material debris assessment and studies on its degradation and aquatic fauna intakes
4. Development of nano sensors for precision aquaculture and technologies to protect fishing materials
5. Designing responsible fishing Systems: Integrating fish morphology and behavioural responses to fishing stimuli

Most Significant Achievements

Comparative trials of CIFT-VSOB and international slotted otter board revealed there is no significant difference in drag and fuel consumption between the two boards

CIFT- TED was popularised among trawl operators of Andhra Pradesh in collaboration with NFDB and Axis bank

Environmental burdens associated with selected small scale fishing systems were estimatedo

Life cycle assessment of Fibre Reinforced Plastic (FRP) sheathed boats and FRP boats of Kerala across the entire life cycle encompassing production, operation, and disposal phases were calculated

Environmental burdens were estimated for energy efficient solar powered and pedal boat designed by ICAR-CIFT

Technologies were developed for upcycled products from FRP debris sourced from abandoned fishing boats

Marine Plastics from 250 trawl fishing operations off Kochi were collected, sorted, and assessed for quantification, degradation, and impact studies

Nitrite sensor fabricated using V_2O_5 nano urchin-carbon dot – polyaniline composite showed excellent response to the nitrite in the seawater of varying salinities

Oleamide – nano CuO and nano carbon dot – titanium oxide hybrid exhibited excellent biofouling resistance in aquaculture polyethylene cagenets

Nano CCB (copper –chromium-boron) biocide concentration was optimised to prevent biodeterioration

Mesh size of 30 mm and two modes of presentation are recommended for reduction of juvenile catch of clam *(Villorita cyprinoides)* was optimised

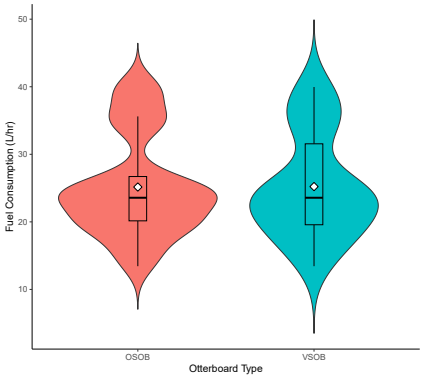
A system to measure the optomotor response in fish was designed and a working prototype was developed

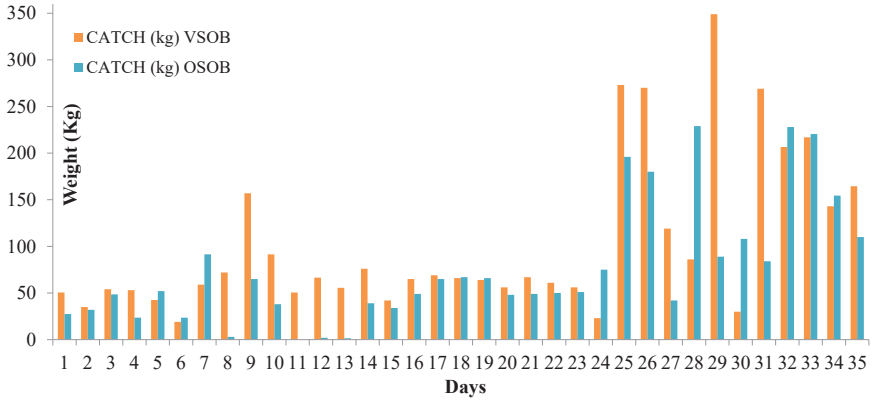
Green LED (2 Watt) was found to be most preferred and effective colour for attracting fish across various fishing environments

CHIEF FINDINGS

1. Investigations on sustainable, productive and safe fishing technologies

Field trials of CIFT-VSOB with international slotted otter boards





Comparison of fuel consumption and catch between the two types of otter boards

A comparative trial between CIFT-VSOB and international Oval slotted otter board (OSOB), based on 35 paired hauls, revealed that performance VSOB is on par with the counterpart in fuel saving, trawl opening and catch.

Fabrication of stainless steel VSOB

VSOB fabricated with stainless steel

A pair of stainless steel VSOB, each weighing 100kg were fabricated using stainless steel 304 grade. Field trials revealed that average drag, fuel consumption and trawl openings were similar compared to mild steel VSOB.

Frontline demonstration of CIFT-TED

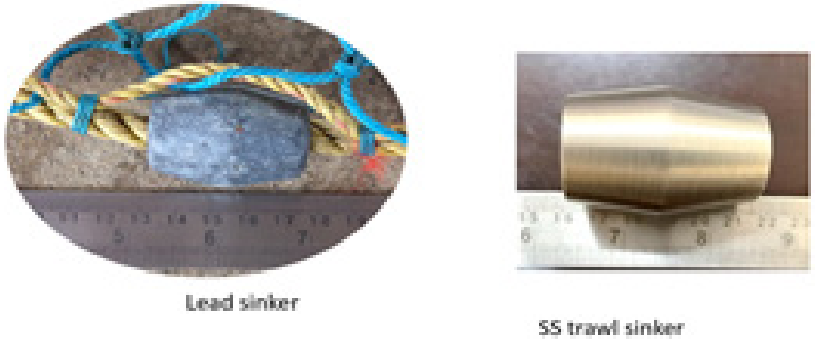
TED fabrication at CIFT

A total of 31 TEDs of grid sizes 48"x41" and 40"x36" were fabricated and distributed to various maritime states through the NETFISH and field trials were conducted onboard commercial trawlers to create awareness among fishers.

85 TEDs were procured utilising NFDB/ Axis bank CSR fund and distributed among trawl operators in Andhra Pradesh

Field trails of stainless steel (SS) trawl sinkers

Trawl net fitted with SS sinkers was field tested in comparison with lead sinkers for the past 10 months onboard CIFT research vessel RV MK-II. There was no change for the prototype SS sinkers unlike the lead sinkers, which showed clear wear and tear.



Sinkers after 9 months of fishing trials

2. Investigation on environmental burdens associated with selected small-scale fishing systems, value added fishery product/aquaculture system of India using LCA approach

Life cycle assessment of FRP boats

LCA for two distinct boat categories; FRP sheathed boats (7-year lifespan) and FRP boats (30-year lifespan) from 10 boat building yards of Kerala were conducted. While the 7-meter FRP boat exhibited an annual Global Warming Potential of 35 kg CO_2-Equivalent, a similar-sized FRP sheathed boat recorded 63 kg CO_2-Equivalent (180% high) annually.

LCA systems were generated for FRP sheathed boat landfill, FRP sheathed boat open burning, FRP boat landfill and FRP boat open burning. Comparing the environmental impacts of open burning and incineration of FRP boats revealed differences. Landfilling exhibited a marginally lower Global Warming Potential (GWP 100 years) with 35.51 kg CO_2-Equivalent compared to 38.26 kg CO_2-Equivalent for open burning. Despite the higher material content in FRP boats, the cumulative environmental impacts over their lifespan are comparatively lower.

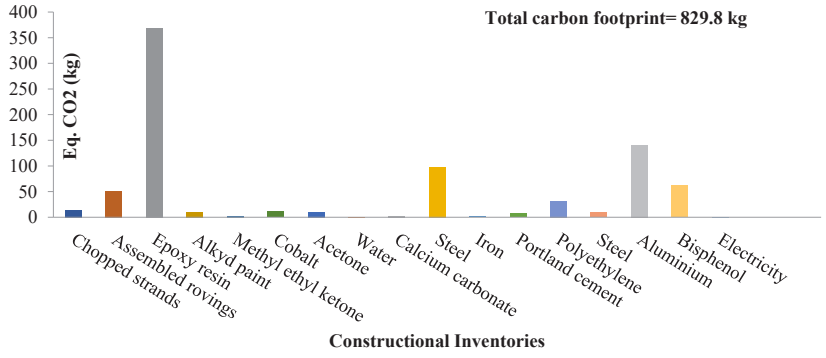
Life cycle assessment of motorized boats along Visakhapatnam coast revealed that the global warming potential of 15 m FRP boats are almost three and half times greater than the 7 m FRP boats. This contrast is due to the difference in quantity of resin used during boat construction..

Comparison of environment impacts due to earthen pond and bio-floc culture of selected species

Preliminary studies on environmental burden due to two different aquaculture system (earthen pond and bio-floc culture) were compared and found that bio-floc aquaculture system have more (166%) footprint than extensive system. The one harvest cycle of *Litopenaeus vannamei* (white leg shrimp) was system boundary.

Carbon footprint of ICAR-CIFT developed sun boat and pedal boat

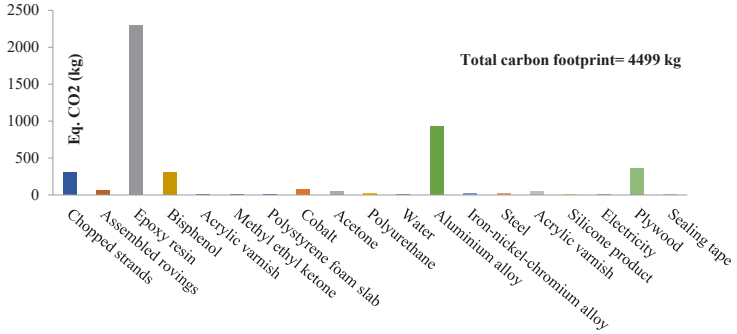
829 kg of CO_2 Equivalent is being emitted for construction of 3 m long pedal boat. Out of all inputs resin contributed maximum carbon footprint (64%). However, the sun boats use about 4.5 tonne CO_2 equivalent for construction



Constructional carbon footprint of pedal boat

Impact category	Unit	Biofloc tanks	Earthen pond	Feed (42% protein)
Abiotic depletion	kg Sb eq	1.13E-03	4.60E-04	3.96E-03
Acidification	kg SO_2 eq	1.75E+02	1.05E+02	5.08E-03
Eutrophication	kg PO_4 eq	7.94E+00	4.76E+00	2.97E-03
FW aquatic ecotoxicity	kg 1,4-DB eq	3.51E+01	2.12E+01	3.63E-01
Global warming	**kg CO_2 eq**	**1.49E+04**	**8.94E+03**	**1.20E+00**
Human toxicity	kg 1,4-DB eq	4.95E+03	2.97E+03	9.03E-01
Marine aquatic ecotoxicity	kg 1,4-DB eq	2.19E+07	1.31E+07	5.71E-01
Ozone layer depletion	kg CFC-11 eq	3.12E+00	1.93E+00	6.46E+00
Terrestrial ecotoxicity	kg 1,4-DB eq	3.98E+01	2.39E+01	8.32E-02

Global warming potential of two aquaculture systems



Constructional carbon footprint of sun boat

3. Fishing material debris assessment and studies on its degradation and aquatic fauna intakes

Quantification of marine litter from abandoned FRP fishing boats

Comprehensive evaluation of marine litter in coastal zones, with a specific focus on Fiberglass Reinforced Plastic (FRP) debris originating from abandoned fishing boats were carried out. Twenty-three beach landing centers of Kerala were surveyed and the findings revealed that about 572 abandoned boats were observed in which majority (423 nos), were within the size class of 6 to 10 meters. The estimated plastic debris from these boats were nearly 45000 kg. Fishing-related plastics excluding FRP debris, constitute 48% by weight of the total polymeric litter in the high-water line (HWL) of the marine environment, originated mainly from fishing gears including ropes, twines, fishing nets/ webbing and floats/buoys. Other plastics contribute 34% to the total polymeric litter. However, inclusion of FRP debris to the total polymeric litter, leads to a notable increase in the overall percentage, raising it to 66% by weight. Size distribution of FRP debris, ranged from abandoned whole boats to microparticles present in the marine environment. These underscores the importance of considering FRP debris from abandoned fishing boats in the litter management strategies.

Abandoned fishing boats in the selected landing centres of Kerala

Upcycled products from abandoned FRP fishing boats

Improper disposal of FRP, whether through open burning or abandonment, can lead to harmful gas emissions, release of toxic substances, and the proliferation of microplastics, all contributing to coastal pollution. A sustainable approach was initiated to address this issue by repurposing FRP debris from derelict fishing boats into upcycled products. The waste FRP was pulverized and sorted into different size fractions.

A durable and long-lasting FRP-reinforced composite material was developed by incorporating FRP powder into cement. The material was then used to make prototype planter pots, wall panels, and other landscaping elements. Compression tests showed that incorporating up to 25% FRP increased the strength of the composite.

Conversion of thermosetting plastic into thermoplastic from FRP waste

The thermosetting plastic was coverted into thermoplastic, thus ensuring a closed looped product. Polypropylene (PP) which is the identified matrix, where powdered FRP (debris) of 15%, which may act as a filler/mineral mix.

Product developed by upcycling FRP debris from abandoned fishing boats

Assessment of plastic litter during fishing operations of research vessel

Plastic litter obtained during trawl operations conducted aboard the research vessel of ICAR-CIFT over the period from October 2023 to December, 2024, with more than 130 fishing operations over a depth of 10-40 meters were assessed. The predominant contributors to plastics, both in terms of quantity and weight, were single-use carry bags closely followed by plastic bottles, particularly those made of polyethylene terephthalate (PET), and packaging covers.

ALDFG collected during trawl operation

Plastic litter from Chinese dipnets from Vembanad estuary

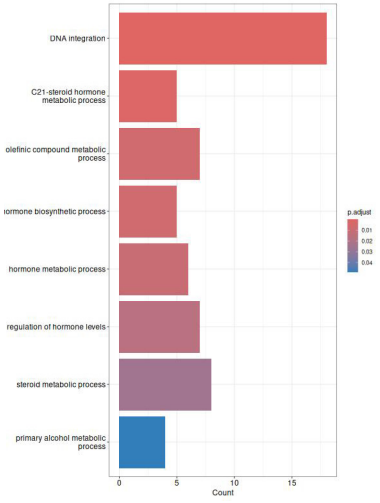
Plastics collected from Chinese dipnet at Munambam

The occurrence of plastic litter in Chinese dipnets was estimated using both primary and secondary data sources. A total of 24 Chinese dipnet operators were selected for data collection, with 13 numbers from Munambam and 11 numbers from Vypin. Fishermen were provided with separate litter collection bags to store litter encountered during daily fishing activities. These litter

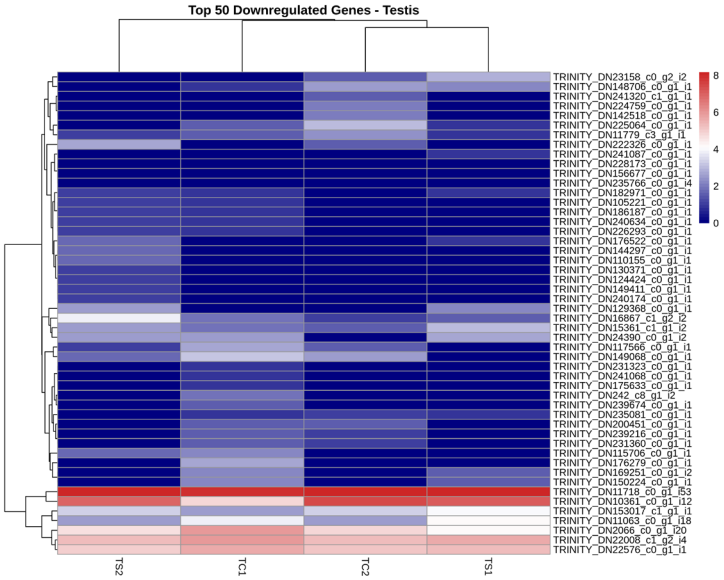
bags were then collected, and the litter was sun dried. Sorted and classified by giving litter codes as per UNEP guidelines. The percentage contribution of each plastic category was estimated using statistical tools, and total plastic litter was quantified and expressed as grams per hour of fishing operation. The average litter occurrence in Chinese dip nets was 45.05±0.86 g/h/net, and the fishing related plastics were rarely encountered (1.68%) of the total litter. Single use plastic covers contribute to the major share of 31.3% followed by plastic bottles (17.7%).

Transcriptomic alterations in the gonads of *Oreochromis niloticus* following dietary microplastic exposure

The impact of dietary microplastic (MP) exposure on the gonadal transcriptome of *Oreochromis niloticus* through a controlled experimental approach was determined. RNA sequencing of the testis and ovary were performed, yielding high-quality paired-end reads (21.79–32.98 million reads per sample, Q30 > 95%). Differential gene expression analysis identified 2,000 differentially expressed genes (DEGs) ($p < 0.05$), with 696 genes upregulated and 1,304 downregulated in ovaries, and 1,074 upregulated and 562 downregulated in testes. KEGG pathway enrichment analysis revealed significant dysregulation of key biological pathways, including steroid biosynthesis, apoptosis, oxidative stress response, and immune signaling, suggesting microplastic-induced endocrine disruption and reproductive dysfunction. These findings contribute to a growing body of evidence on the adverse biological effects of MPs in aquatic organisms, particularly concerning reproductive health.



Gene ontology (GO) analysis of testes following microplastic exposure

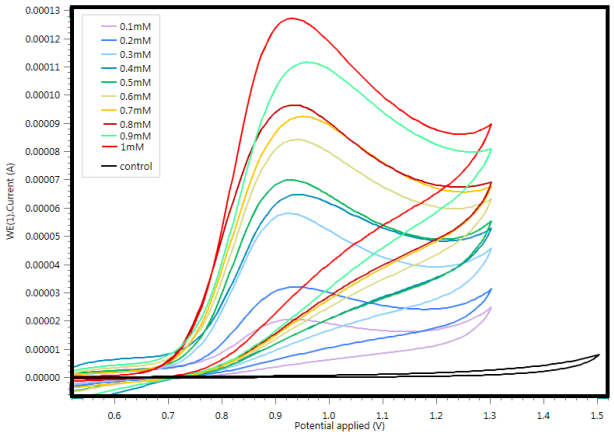


Heat map depicting differentially expressed genes in the testes of O. niloticus following MP exposure

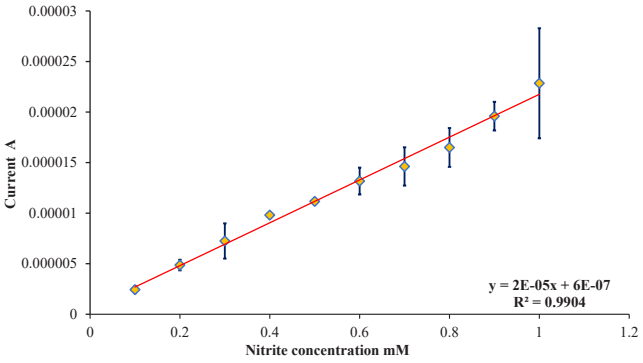
Development of nano sensors for precision aquaculture and technologies to protect fishing materials

Development of a seawater nitrite sensor

An electrochemical nitrite sensor was developed by modifying glassy carbon electrode (GCE). A combination of *in-situ* synthesized polyaniline, carbon dot and nano vanadium pentoxide composite, was attached to the glassy GCE to sense nitrite in 3.5% NaCl. Cyclic voltammogram of the modified GCE exhibited a peak at 0.9V with a peak current of the order 10^{-5} with nitrite analyte. The sensor exhibited a linear range of detection from 0.1 mM to 1mM with R^2 0.99 and LOD 0.05mM. V2O5@PANI CD modified GCE exhibited selectivity, repeatability and stability with a degradation of 20.5%. Sensing was also obtained for spiked sea water samples.



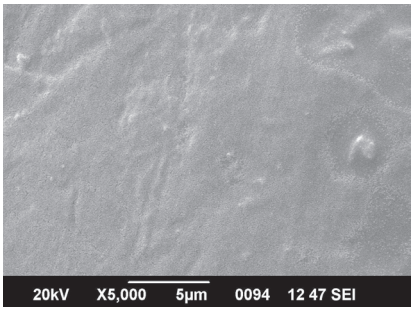
Cyclic voltammogram of nitrite under varied concentrations



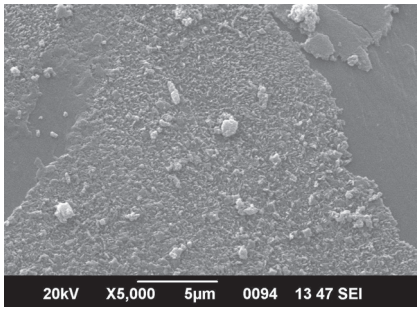
Current vs nitrite concentrations response in cyclic voltammetry

Oleamide-nano CuO as biocide against biofouling in aquaculture cage nets

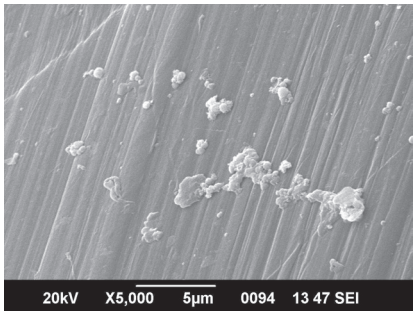
Biofouling is a significant challenge in submerged aquaculture cage nets and can be managed using biocides of inorganic, organic or in combination of both. The difficulty in applying the biocides over non-polar polyethylene was overcome by surface modification using polyaniline and organo silane compounds. The biofouling inhibition efficiency of nano copper oxide and oleamide coating on both polyaniline and 3-glycidyloxypropyl trimethoxysilane (silane) coated polyethylene was evaluated for its use as a coating in aquaculture cage net. In silane coated PE, CuO interacted with Si-O bonds, while the amide N-H group of oleamide interacted with C-O-C bonds in the silane. In PANI-coated PE, both biocides strongly interacted with the quinoid moiety of PANI. The treated surfaces exhibited uniformly formed morphologies, and wettability studies showed that the introduction of oleamide made the surface more hydrophobic. The optimum concentration of Nano CuO and oleamide in silane surface modified PE aquaculture cage net exposed in the estuarine environment for maximum biofouling inhibition were determined. Oleamide and nano CuO synergistically influenced to deter the micro and macro foulers in aquaculture cage nets



PE-Silane



PE-Silane CuO-Oleamide

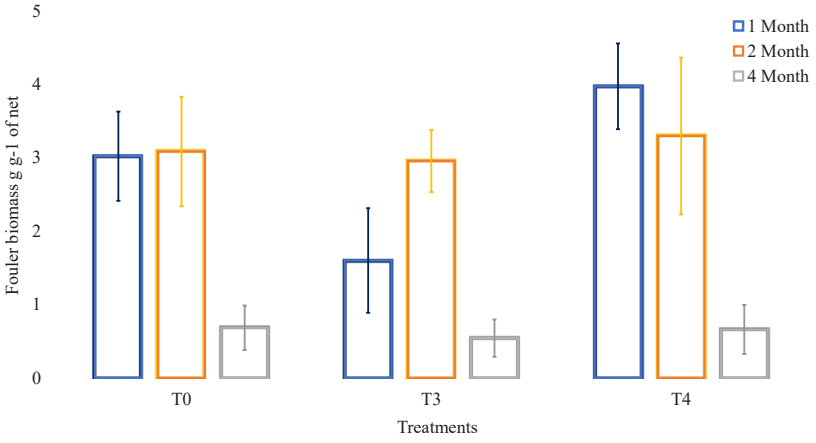


PE-PANI CuO-Oleamide

Scanning electron micrographs of PE-Silane, PE-silane-CuO-Oleamide, and PE-PANI-CuO-oleamide, treated aquaculture cagenets

Carbon dot-TiO_2 composite for biofouling prevention in aquaculture cage nets

A nano carbon dot–titanium dioxide (CD-TiO2) composite was synthesised to investigate its photocatalytic activity-based biocidal effects against biofouling organisms in aquaculture cage nets. CD-TiO2 composite was synthesised by interaction of Ti-O-Ti with the conjugated C=C bonds of CDs. The non polar polyethylene aquaculture cage net surface was modified by in situ synthesized polyaniline. The biocide treated aquaculture cage net exposed in the estuarine environment showed biofouling resistance for a period of 4 months. The CD-TiO2 composite is highlighted as a potential sustainable and eco-friendly biocide to combat biofouling in aquaculture cage nets



Accumulation of biofouling organisms in aquaculture cagenets during 4 months exposure in marine environments. T0 is untreated PE, T3 and T4 are varying concentration of CD-TiO2

Biofouling resistance of nano CCB treated wood

Wood samples treated with Chromated Copper Borate (CCB) and nano-CCB and exposed to the marine environment demonstrated that CCB-treated panels experienced a reduction in weight after marine exposure. Both untreated and nano-CCB-treated panels exhibited a slight increase in weight under the same conditions. Furthermore, the average water absorption rate revealed that conventional CCB-treated panels had a lower absorption rate (34.06%) compared to nano-CCB-treated (78.97%) and untreated panels (91.74%). CCB-treated panels revealed a reduction in both the diversity and abundance of fouling organisms, whereas untreated panels exhibited higher diversity and abundance of fouling communities. The diversity of fouling organisms on nano-CCB-treated panels showed a downward distribution trend, with the distribution and abundance of organisms decreasing with increasing water depth.

Fouling organisms in untreated wood

Designing responsible fishing systems: integrating fish morphology and behavioral responses to fishing stimuli

Standardisation of mesh size for clam dredging

Morphology of the black clams (*Villorita cyprinoides*), using morphometer was determined to find the optimum mesh size at different angles of entry for an estimated MLS of 20 mm. Fall through experiments conducted including experimental dredging, revealed that 30 mm mesh size, and two modes of presentation were found to be ideal for maximum escapement of the clams.

Experimental dredging for clam in the Vembanad estuary

System to measure optomotor response in fish

A system to measure the optomotor response in fish was designed and working prototype developed. The setup which includes two distinct layers; one with a tank that can hold water and the other a moving striated layer, which can be rotated at different speeds to record the movement of retina of fish. Knowledge of the optomotor response of different species of fish is an important input for designing and optimizing gear systems with minimal disruptions in the existing fishing practices.

Effect of colour on capture efficiency of traps

Field trial was conducted to test fish capture efficiency using traps of different colours; white, red, green, and black. Black-coloured traps recorded the highest retention, followed by green, indicating colour plays a role in fish attraction or retention. Despite black webbing showing lower physical strength, compared to others, it outperformed other colors in catch efficiency, suggesting visibility or camouflage influences catch rates. Water quality parameters remained within typical ranges, with no

Underwater studies for capture efficiency of traps

extreme variations that could have impacted trial results, and the major species captured were mud crabs, Scatophagus and pearl spots.

Different coloured LED lights (Red, Green, White, and Blue) were tested in traps to enhance efficiency. Green light shows the highest effectiveness in operations conducted along the Gulf of Mannar. These findings are consistent with global studies, which also highlight green as a preferred and effective colour for attracting fish across various fishing environments.

Indigenous pingers for reducing marine mammal-fishery interaction

Pingers emit ultrasonic pings ranging from 50kHz to 120kHz. These high-frequency signals serve as alarms, alerting dolphins to the presence of fishing nets. Normally, the imported pingers cost around Rs. 12,000-15,000/Pinger. A pinger was designed and developed for reducing the marine mammal fishery interaction. Using Onshape, a cloud-based software, the CAD of the pinger was developed. The acoustic properties of the new device were tested at National Institute of Ocean Technology, Chennai.

Testing pinger at National Institute of Ocean Technology (NIOT), Chennai

Fish Processing Division

Institute Projects

1. Valorisation of marine and agro waste for development of green packaging materials
2. SMART PACK: Development and characterization of smart packaging films for enhancing quality and shelf life of fishery products
3. Technological interventions in value addition and advanced processing techniques for fish and shell fish
4. ViVal Waste: Repurposing fish processing residues for tapping vital value
5. Ingenious processing and value addition approaches for preservation and diversification of fishery Products
6. Development of efficient statistical and reliability tools for fish products
7. Development of food and industrial products from secondary raw materials of aquatic origin

Most Significant Achievements

Blown and solvent casted films with different combinations of Polylactic acid /Polybutylene succinate-co-adipate were found suitable for packaging of chilled fish

An edible coating made of nano emulsions of alginate and bee wax was found suitable for dry fish applications

Developed active ethylene scavenging films for food applications

Developed a functional film incorporating squid ink and squid skin extracts as aquatic biopolymer

Developed biomedical formulations based on hydroxyapetite derived from fish scales for tissue regeneration

Health food formulations were developed from microalgae with enhanced antioxidant and antimicrobial properties

Protocol developed for shrimp sticks from tilapia surimi

RTE fish snacks were developed from lizard fish skin

Microwave dried tuna snack was developed

Oxidative stability of fish was enhanced by encapsulation with chitosan in combination with bovine gelatin and maltodextrin

Developed a robust D-optimal first and second order mixture response surface regression models under auto-correlated error structure

CHIEF FINDINGS

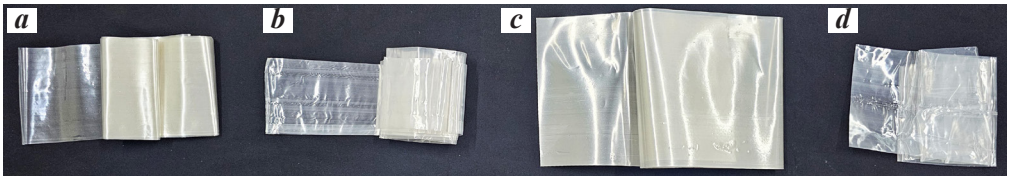
1. Valorisation of marine and agro waste for development of green packaging materials

Development of carrageenan-based edible packaging films enriched with pomelo peel flour

Pomelo peel is rich in natural compounds like cellulose, flavonoids, essential oils, and pectin, and thus holds great potential for creating high-value edible films. Carrageenan and pomelo peel flour based edible films prepared by solvent casting had values of colour parameters (L*, a*, and b*) were 8.13, -0.40, and -1.73 for carrageenan (C) films while it was 29.19, -0.18, and 2.46 for carrageenan films incorporated with pomelo peel flour (C-PPF). The transmittance (%) was 93.85 for carrageenan films, which decreased to 86.66 upon pomelo peel flour addition. The gloss value measured at 60° was 32.1 for C films and 6.6 for C-PPF films.

Development of biodegradable PLA-PBS blend films

PLA-PBS blend films combine the biodegradability of polylactic acid (PLA) with the flexibility and toughness of polybutylene succinate (PBS), resulting in environmentally friendly packaging materials that offer improved mechanical properties and broader application potential compared to individual biopolymers. A PLA and PBS based film was developed with polyethylene glycol (PEG) as the plasticizer. The thickness of pure PLA and PBS films was 43 µm and 88 µm, which was 116 µm in PLA-PBS blend films. The tensile strength of native PLA film was 297 kgf/cm2, which increased to 456.2 kgf/cm2 in PLA-PBS blend films. The percentage elongation was 3.3 for native PLA films, which decreased to 2.6 in PLA-PBS blend films. The addition of PBS improved the mechanical properties and % transmittance of PLA films while the 60° gloss value decreased.



Different combinations of PLA-PBS blend films(a)50:50, (b) 60:40, (c) 70:30, (d) 80:20

Development of PLA-PBSA combination films for packaging of chilled fish

Biopolymer films were developed using PLA and Polybutylene succinate-co-adipate (PBSA) at various combinations. The combination films were used for storage of cage reared seabass fish (*Lates calcarifer*). The samples had a shelf life of 25 days based on the microbiological and quality indicators, their prime condition being 19 days in the different packaging materials.

Chitosan-Alginate films for packaging of tuna chunks

Different molecular weight chitosan such as low (1%) (LMWC), medium (2%) (MMWC), and high (1%) (HMWC) followed by alginate solution loaded with eucalyptus essential oil films were used as wrappers of tuna chunks. The mesophilic and psychrophilic count of tuna chunks wrapped LMWC, MMWC, and HMWC increased from the initial level of 3.69±0.00 log cfu/g to 7.12±0.007, 7.69±0.00, 7.89±0.009 log cfu/g on 12th day of storage, whereas control samples exceeded the acceptable limit of 7 log cfu/g on the 8th day of storage. Similarly, the biochemical parameters showed that the wraps had a promising preservative effect on tuna chunks during 12 days of storage.

Tuna chunks wrapped with chitosan-alginate film

Development of edible food coatings and films with active ingredients for dried fish

Effect of alginate-beewax coating on dried laminated Bombay duck was studied under accelerated storage condition. Dried fishes both coated and uncoated were packed in laminated pouches and stored under 28°C/64° RH and 37°C/97° RH conditions. Based on Q10 method, an average shelf life of 6.7 months was noted in control samples while it was 8.4 months in the coated samples.

Alginate-beewax coated laminated Bombay duck

Heavy metal analysis of biodegradable palm trays

The presence of heavy metals; lead, cadmium, arsenic and chromium in palm trays revealed the presence of chromium at 23.31 mg/Kg while lead, arsenic and cadmium were below detection level. Though cadmium was present in the sample, the level was well below the regulation (94/62/EC-100mg/Kg).

2. SMART PACK: Development and characterization of smart packaging films for enhancing quality and shelf life of fishery products

Development of active ethylene scavenging films for food applications

Active ethylene scavenging films were developed to extend the shelf life of fruits and vegetables by scavenging ethylene, which accelerates ripening. The films were produced by solvent casting using low molecular weight chitosan as a base material with various active agents for ethylene absorption and glycerol was used as a plasticizer. The active agents tested include activated charcoal, halloysite nanoclay, bentonite nanoclay, titanium dioxide (TiO2) photocatalyst nanopowder, and potassium permanganate (KMNO4) at 1 % concentration. The thickness of the chitosan films varied significantly depending on the active agent used. The thickness of the control chitosan film (C) was 72 µm and activated charcoal incorporation produced the thickest film (C-AC) (165 µm).

Nano-chitosan film with functionality

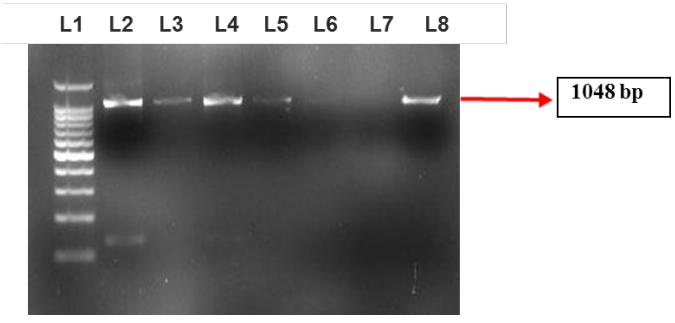
Chitosan (2%) was exposed to thermal treatment for 3h and evaluated its electro-physical properties. Particle size of 103.6 nm and zeta potential of 34.2 mV was observed for the chitosan and the film developed has no distinguishing peaks in the UV-VIS range.

Development of functional film of aquatic biopolymer origin using RSM

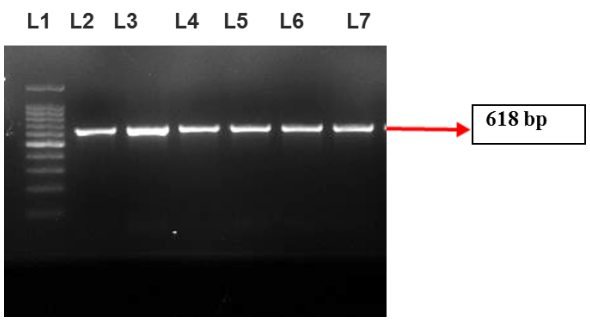
RSM based combination was developed for developing biobased packaging material incorporating squid ink and squid skin extracts. Squid skin and skin skin extract was characterized for its functionality and the optimum level of its incorporation in the films was assessed for exerting antimicrobial and antioxidant properties.

Antimicrobial activity of nano-chitosan against food borne pathogen and specific spoilage bacteria from fish source

A total of 10 fresh fish was procured from local fish market and enumeration of bacteria (APC, Pseudomonas and H_2S forming bacterial counts) were carried out. APC counts ranged from $\log_{10}$ 2.3 CFU gm-1 to $\log_{10}$ 5.69 CFU gm-1. Similarly, Pseudomonas counts ranged from $\log_{10}$ 2.0 CFU gm-1 to $\log_{10}$ 5.23 CFU gm^{-1}. Also, H_2S forming bacterial counts ranged from $\log_{10}$ 2.3 CFU gm^{-1} to $\log_{10}$ 5.66 CFU gm^{-1}. Tentatively, 20 Pseudomonas and 20 H_2S forming bacteria were purified and identified employing genus specific primers. Further, studies on inhibition of spoilage bacteria by employing nano-chitosan gel and its antimicrobial activity on different food borne pathogens is under progress.



PCR for the detection of Shewanella **sp.** *(Lane 1 - 1kb ladder, Lane 2 to 8 isolated DNA from suspected colonies)*

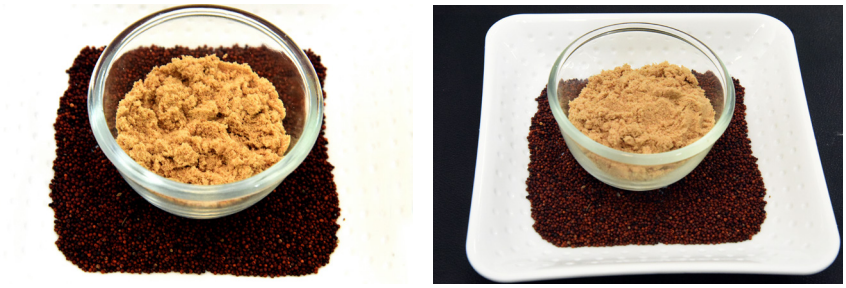


PCR for the detection of Pseudomonas **sp.** *(Lane 1 - 1kb ladder, Lane 2 to 8 isolated DNA from suspected colonies)*

3. Technological interventions in value addition and advanced processing techniques for fish and shell fish

Optimized drying technique for finger millet-based instant beverage powder

Freeze drying (FD) of finger millet (*Eleusine coracana*)-based instant beverage powder resulted in higher protein and calcium content compared to oven drying (OD). FD also improved flow properties with a lower Carr Index and higher porosity, while OD had better wettability.



Oven dried and freeze dried finger millet-based beverage powder

Optimization of anticaking agents for improved stability of finger millet-based instant beverage powder

The addition of anticaking agents in millet based beverage powder improved flowability, with calcium stearate and tricalcium phosphate showing free-flowing characteristics compared to the control. Porosity increased with anticaking agents. Water solubility and wettability also improved, while hygroscopicity was lowest in tricalcium phosphate and highest in the control.

Mathematical modelling of thin-layer drying of marinated anchovy in pilot-scale hot-air assisted continuous infrared dryer

The drying behaviour of raw and marinated anchovy (*Stolephorus indicus*) in a hot-air-assisted infrared dryer using four spice combinations was determined. Marination significantly influenced moisture reduction and drying rates. Different mathematical models best described each marination state, and moisture diffusivity values varied accordingly.

Raw & marinated anchovy dried in a hot-air assisted continuous infrared dryer

Nutritional quality and shelf life of unconventional crab species, *Charybdis smithii*, during iced storage

Male crabs of *Charybdis smithii* had higher moisture and protein content, while females exhibited greater lipid, carbohydrate, and mineral levels. Spoilage indicators revealed that female crabs showed a slightly faster deterioration rate.

Male and female crab, Charybdis smithii

Optimized process for hot-smoked pangasius fillets

A standardized process for hot-smoked pangasius (*Pangasius hypophthalmus*) fillets was developed, involving brining, steam cooking, smoking, and drying, resulting in a product with high protein and low moisture, while maintaining quality and safety within acceptable limits.

Frying kinetics and suitability of fish tofu in curries

Fish tofu was prepared using pink perch (*Nemipterus japonicus*) meat and subjected to kinetic studies under deep fat frying (DF) and air frying (AF), with predictive modelling carried out based on kinetic data. Colour changes were more pronounced with increased frying time, especially in AF samples. Sensory analysis indicated that air-fried fish tofu had higher acceptance for use in curries compared to deep-fried tofu.

Quality evaluation of freeze-dried brown shrimp

Freeze drying of brown shrimp (*Metapenaeus dobsonii*) significantly reduced moisture content while increasing protein, fat, and ash levels. TMA, TVB-N, FFA, and TBA values slightly increased and microbiological quality remained within acceptable limits. Textural properties like hardness and chewiness decreased, while colour parameters and sensory acceptability improved, making the freeze-dried shrimp a viable product.

Development of banana blossom added fish floss from marine cat fish

Fish floss made from marine cat fish (*Picofollis dussumieri*) was enriched with banana blossom to evaluate its nutritional and sensory qualities. As banana blossom content increased, protein and fat decreased, while fibre and carbohydrate levels increased, improving texture and acceptability.

Development of salt-dried fish roe flakes

A standardized process was developed to prepare salt-dried roe flakes from Rohu fish roe, using salt for curing before drying. Yield of dried flakes varied from 12 to 16%. The rehydration rate of dried flakes increased with the addition of salt.

Preparation of chutney powder using fish roe flakes

Salt-dried fish roe flake was used for chutney powder development. However, sensory evaluation showed low acceptability, suggesting the need for modification by incorporating a small amount of shrimp to enhance flavour.

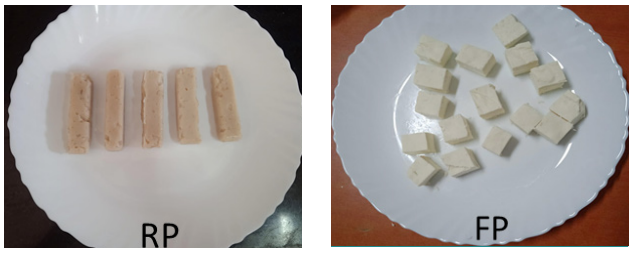
Preparation of Ready-to-Cook manchow clam soup mix

Instant manchow soup mix, prepared using dried and steam-cooked clam (*Meretrix meretrix*) meat, had high protein content and excellent organoleptic qualities. The steam-cooked variant showed better reconstitution properties and nutritional value.

Reconstituted manchow clam soup mix & Ready-to-Serve manchow clam Soup

Development of fish-fortified paneer

A paneer substitute (RP) and a milk-based fish-fortified paneer (FP) were developed. The products were protein-rich and lower in fat and calories than commercial paneer, making them healthier alternatives.



Paneer substitute (RP) and milk-based fish-fortified paneer (FP)

Development of shelf-stable dry fish pickles

Fish pickles from dried Mackerel and dried Croaker were standardized with a six-month shelf life. Moisture reduction was higher in the Croaker pickle than in the Mackerel pickle, while biochemical and microbial parameters remained within safe limits. The pickles had good sensory acceptance throughout storage.

Foxtail millet-based granola bar enriched with seaweed

A granola bar with foxtail millet (*Setaria italica*) enriched with red seaweed, *Kappaphycus alvarezii,* was formulated. The combined use of foxtail millet with seaweed improved the nutritional quality of the final product.with higher hardness value compared to the control.

Seaweed incorporated foxtail millet granola bar

Development of fish ham incorporated with liquid smoke

Fish ham was developed using pink perch and tuna chunks with liquid smoke incorporation. Liquid smoke improved microbiological stability by reducing total plate count and psychrotrophic bacteria during chilled storage.

Liquid smoke incorporated fish ham slices

4. ViVal Waste: Repurposing fish processing residues for tapping vital value

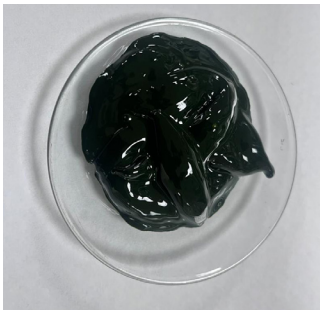
Adaptable hydrogels for dental remineralization

A comparative study on the remineralization potential of an adaptable hydrogel incorporating natural nano-hydroxyapatite derived from fish scale demonstrated a superior effect in enhancing remineralization compared to fluoride toothpaste.

Extraction of bioactive compounds from *Nannochloropsis gaditana*

To extract bioactive compounds from microalgae, *N. gaditana,* using various cell disruption techniques, different treatment methods were employed, followed by enzymatic hydrolysis and drying of the extract. The extraction yield varied across treatments, with enzymatic treatment showing the highest yield, while other methods produced comparable results. The extract contained varying levels of total phenolic compounds, and antioxidant activity differed based on the treatment method employed.

Biofermentation of microalgae



Biofermentation of the microalgae, *N. gaditana* was done using *Lactobacillus plantarum* NCIM 2374 strain. Based on several experiments, the optimum conditions for the fermentation process of *N. gaditana* was standardised. Conditions under equi-correlated error structure was derived and validated.

5. Ingenious processing and value addition approaches for preservation and diversification of fishery products

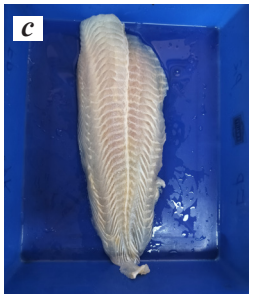
Evaluation of quality and stability of IQF dusted shrimp under frozen storage conditions

IQF dusted squid rings were stored under two temperatures, 2°C and 12°C to facilitate quality evaluation of samples under conventional as well as accelerated conditions. The TBA value indicating oxidative changes were more pronounced during storage at 12°C compared other storage conditions. Sensorial acceptance was observed till 13th day for sample stored at 2°C and the squid rings stored at 12°C got rejected on 6th day coinciding with the microbial limits.

IQF dusted squid ring

Comparison of quality of farmed indian and imported catfish, Basa

Comparison of the quality of locally cultured and imported Basa (*Pangasius* sp.) revealed moisture content to be significantly lower for Indian basa (76.9%) compared to imported basa (86.8%) whereas fat content was in the reverse order. Higher fat and protein content were observed for farmed indian basa. Peroxide value, FFA and TBARS values were higher in farmed indian basa. Higher lightness value (L*) and lower a* and b* value was observed for imported basa. Instrumental textural parameters, especially hardness and chewiness were better for Indian farmed Basa.



a. Indian farmed basa fish

b. Indian basa fish fillet

c. Imported basa fish fillet

Evaluation of quality and stability of marinated shrimp

Marinated IQF shrimps (*Penaeus vannamei*) subjected to chill storage under two temperatures revealed increasing moisture under both conditions. Initial pH of the sample remained constant up to 8th day and thereafter decreased. Initial K value of marinated sample was 17.30% and reached rejection limit on 13th day (60.51%) during chilled storage whereas 12oC stored sample reached the rejection limit on 5th day (60.80%) coinciding with the microbial limit.

Development of dehydrated tuna snack

A dehydrated fish meat snack from tuna was prepared by drying marinated tuna meat in a microwave dryer. Microwave drying at increased power and heating temperature (60°C) resulted in rapid removal of moisture content thereby increasing the drying rate and reducing drying time. It was also observed that increasing microwave power level resulted in higher hardness in dried tuna chunks. The flavor of microwave dried tuna was less intense than sun dried tuna or tuna dried using electrical dryer.

Dehydrated tuna snack

Shrimp sticks from tilapia surimi

A standard protocol was developed for production of shrimp sticks from tilapia surimi by utilizing shrimp paste (*Metapenaeus monoceros*). Shrimp sticks were prepared using commercial shrimp paste (STc) as well as prepared shrimp paste (STp). The storage stability of the product under chilled conditions (4°C) were evaluated. Sensory scores of STp and STc exhibited significant decrease by the end of storage period. The microbial analysis revealed spoilage of STp on day 11 and spoilage of STc on 15th day of storage. The current approach marks sustainability concerns by utilizing lesser-known shrimp species and potential aquaculture species like tilapia

Shrimp stick with prepared shrimp paste

Shrimp stick with commercial shrimp paste

Development and shelf-life evaluation of fish loaves/tofu

Tilapia mince was utilised for the preparation of fish loaves with a combination of corn flour and tapioca flour. Studies based on RSM with 11 independent trials revealed composition levels of 59.77%, 28.45% and 11.77% of fish mince, corn flour and tapioca starch, respectively was found to be optimum with a sensorial acceptance of 8.7. The textural profile of the optimized product indicated a hardness value of 55.84N, 2.13 mm springiness and 61.49 Nmm chewiness.

6. Development of efficient statistical and reliability tools for fish products

Robust response surface designs for product/process optimization under auto-correlated error structure

Developed a robust D-optimal first and second order mixture response surface regression models when the error terms of a process optimization of a mixture experimental design for the development of value-added fish-based products are auto-correlated. The rotatability and D-optimality conditions for first and second order mixture response surface regression models under auto-correlated error structure were derived. The D-optimality conditions for first and second order mixture response surface regression models under auto-correlated errors were derived.

The D-optimality condition was obtained by maximizing $D = |X'V^{-1}X|$ which is a variance-covariance matrix under auto-correlated errors. The information matrix for a given design X under auto- correlated error structure can be written as $\sigma^{-2}X'V^{-1}X$ and its determinant is given by det $\det^{f()}(X_1'V^{-1}X_1)\sigma^{-2}$ The D-optimality of auto-correlated error structure is obtained from

$$D = \frac{1}{(1-\rho^2)} \det\{\text{diag}(D_1,\cdots,D_i,\cdots D_v,D_{12},\cdots,D_{ij},\cdots,D_{(q-1)q})\}$$

where, $D_i = \sum_{u=1}^{n} x_{iu}^2 + \rho^2 \sum_{u=2}^{n-1} x_{iu}^2 - 2\rho \sum_{u=1}^{n-1} x_{iu}x_{i(u+1)}$, $\forall\, i = 1,2,\cdots q$ and

$$D_{ij} = \sum_{u=1}^{n} x_{iu}^2 x_{ju}^2 + \rho^2 \sum_{u=2}^{n-1} x_{iu}^2 x_{ju}^2 - 2\rho \sum_{u=1}^{n-1} x_{iu}x_{i(u+1)}x_{ju}x_{j(u+1)}, \forall\, i \neq j = 1,2,\cdots,q$$

7. Development of food and industrial products from secondary raw materials of aquatic origin

Collagen concentrate from fish processing discards

The collagen concentrate was prepared in pilot scale using seafood waste containing head, skin and bone after shredding and subjected to screw press. The yield of collagen concentrate was 24%. The average protein content in the concentrate was 38% while the ash content was 43%.

Mixed waste under processing

Drying of collagen concentrate

Collagen concentrate powder

Fish oil encapsulates with low and medium molecular weight chitosan and added polymers

The potential of low and medium molecular weight chitosan (LMCH and MMCH) in combination with bovine gelatin and maltodextrin as a wall material for encapsulation of sardine fish oil by spray drying was evaluated. The encapsulation efficacy of fish oil encapsulates varied from 53.26% to 82.06%. The flowability of the encapsulates were superior with the lowest Carr's index and Hausner ratio for the encapsulates prepared with medium molecular weight chitosan with improved oxidative stability as indicated by a lower thiobarbituric acid values.

Development of tuna red meat pockets

A ready-to-eat snack, tuna red meat pocket, that combines the high nutritional value of tuna red meat with a crunchy exterior wrap offering convenience with a protein content of 14.04% was developed.

The process of preparation of tuna red meat pockets was standardized using microwave and vacuum dried red meat taken from Skipjack tuna. The composition revealed that the product contained moisture, fat, ash and carbohydrate content of 19.20±0.41%, 21.87±0.11%, 4.06±0.06% and 40.83±0.18% respectively. Organoleptically tuna red meat pockets made from microwave dried was more acceptable with respect to taste and flavor than the products preprepared with vacuum dried.

Tuna red meat pockets

Quality Assurance and Management Division

Institute Projects

1. Method development, validation and technological interventions for assuring safety of fish and fishery products
2. Development of rapid testing platforms for quality assessment of seafood
3. Valorization of seaweed resources for functional food, nutraceutical, cosmeceutical, biomedical, and bioremediation applications
4. Production of polyunsaturated fatty acids (PUFAs) from heterotrophic eukaryotes: A biotechnological approach

Most Significant Achievements

Sensory decomposition profile of Indian Mackerel, Indian white prawn and Indian squid were determined

GC MS based analytical method was developed for authentication of Ambergris

Method for rapid testing of hypoxanthine content in fish was developed and validated

Developed an ion chromatography method for the determination of added phosphate in shrimp and validated

A probiotic nutraceutical drink of fermented seaweed containing bioactive phytosterols; pentalinosterol and tigogenin and dehydroascorbic acid was developed

Thraustochytrids capable of producing high DHA content was isolated

Electrical and solar drying of fish was found to reduce microplastics by 60-70%

Methods for the reducing the levels of microplastic from dry fish was developed

CHIEF FINDINGS

1. Method development, validation and technological interventions for assuring safety of fish and fishery products

Risk assessment of ready to eat fish products

Risk assessment of 26 ready to eat fish based snacks including fish based mixture, prawn based mixture, fish based cookies etc. and ready to eat fish based products including retorted mussel curry, stuffed mussels, mussel meat roast and dried prawn chutney revealed the absence of *E. coli,* Salmonella, *Staphylococcus aureus, Vibrio cholerae* and *Listeria monocytogenes* in the samples.

Assessment of micro and nanoplastics in seafood

Dry fish samples (200 Nos) collected from different parts of the country assessed for the presence of micro/nano plastics revealed that majority of these plastics fell within the 1-100 µm category, constituting 60-80% of the total microplastics, while particles ranging from 100-1000 µm accounted for 15-30%. Additionally, a small proportion were nanoplastics (<10%).

Risk assessment of bacterial pathogens from fish and fish products

Fish and fishery products samples procured from retail markets of Cochin had Aerobic Plate Count in the range of 2.40-5.38 log CFU/g. *L. monocytogenes* was present in 3.48% of the processed seafood samples, while Salmonella was found in 1.33% of samples.

Analytical method development for authentication of Ambergris

A GC-MS profiling method was optimized to analyze suspected Ambergris samples. A generic extraction method was optimized for extracting these suspected Ambergris samples. The approach identified untargeted compounds, which were prominent markers of plant resins including Abietic acid, Isopimaral, Pimaric acid, Palustric acid, Longipinene, Ingenol, Glycidal Palmitate, Hexadecanoic acid-2-hydroxy(1-hydroxy methyl) ethyl ester and Longifolene indicating that the samples were not Ambergris.

Sensory profiling of Indian white prawn, Indian mackerel (*Rastrelliger kanagurta*) and Indian squid during decomposition

Decomposition studies of Indian white prawn (*Penaeus indicus*), Indian mackerel (*Rastrelliger kanagurta*) and Indian squid (*Loligo duvaucelii*) carried out to profile the sensory characteristics during decomposition under chilled condition. The studies established seven levels for characterizing sensory profile to determine the freshness level of Indian white prawn, Indian mackerel and Indian squid.

Fresh squid

Decomposed squid

Decomposition study of Indian squid, Loligo duvaucelii: Fresh squid - Level 1 and Decomposed squid - Level 7

2. Development of rapid testing platforms for quality assessment of seafood

Rapid testing of hypoxanthine content in fish

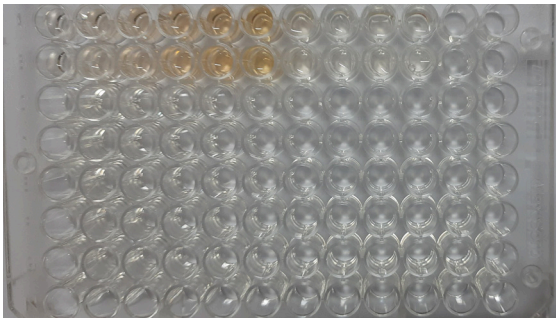
Developed a method for rapid testing of hypoxanthine content in fish and validated the method.

Colorimetric array for testing freshness of fish

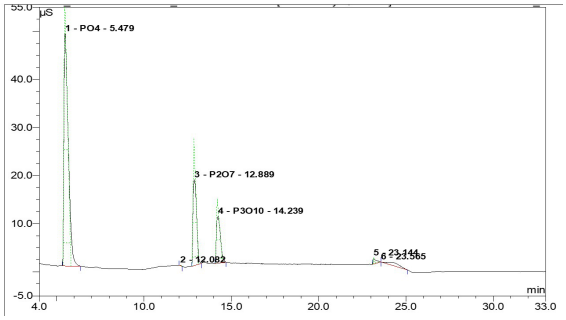
Developed a paper based colorimetric array for determining freshness of fish rapidly based on the content of TMA. Spoilage level of fish can be determined colorimetrically.

Development of platform for rapid detection of phosphate content

Ion chromatography based instrument method was optimized for the determination of added phosphate in shrimp which includes orthophosphate, pyrophosphate and polyphosphate in shrimp.



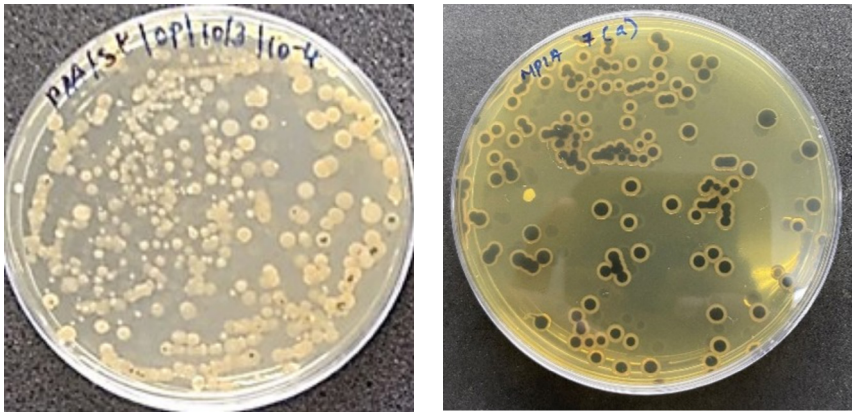
Rapid test for hypoxanthine content in fish



Chromatogram of method for detection of added phosphate (orthophosphate, pyrophosphate and polyphosphate) in shrimp

Formulation of media for enumeration of H_2S producing spoilage bacteria

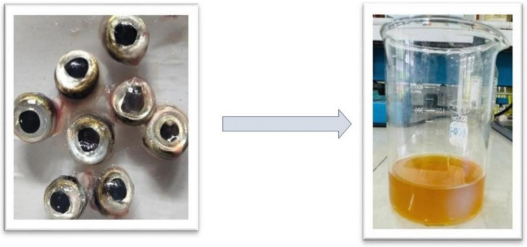
Enrichment medium was formulated with the incorporation of Trimethylamine N-oxide dehydrate in Shewanella Enrichment Broth (SEB) for the isolation of H_2S-producing spoilage bacteria from fresh fish. Modified peptone agar was formulated with improved selectivity and was found to be more efficient than peptone iron agar for the enumeration of H_2S-producing spoilage bacteria. Both the media were useful for the enumeration and isolation of H_2S-producing spoilage bacteria from fresh fish.



Enumeration of H_2S producing spoilage bacteria in Peptone Iron Agar and Modified Peptone Iron Agar

Antimicrobial activity of carbon nanodots synthesized from sardine fish eye

The antimicrobial activity of sardine fish eye-derived CNDs was assessed against various bacterial strains. Among the tested microorganisms, *S. aureus* and *V. cholerae* exhibited notable susceptibility to CNDs, with inhibition zones of 35 mm and 34 mm, respectively.



Carbon nanodots prepared from Sardine fish eye

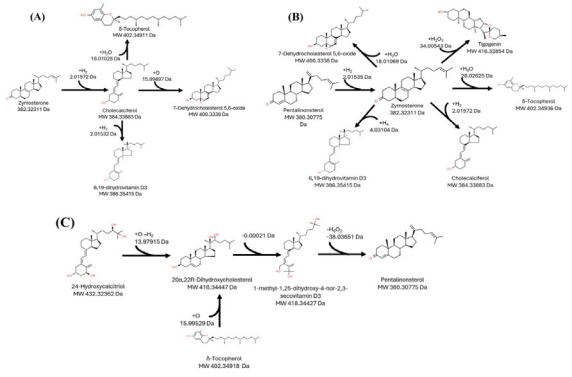
3. Valorization of seaweed resources for functional food, nutraceutical, cosmeceutical, biomedical, and bioremediation applications

Antimicrobial compounds from seaweed-associated epiphytic bacteria

Epiphytic bacteria were isolated from brown seaweed *Sargassum* sp. from the Vizhinjam coast of Kerala. Antimicrobial compounds such as Prodigiosin and analogs were isolated and characterized from a novel strain that belonged to *Vibrio gazogenes* clade. The Prodigiosin extract demonstrated excellent antibacterial activity against various gram positive and gram negative bacteria.

Probiotic nutraceutical drink of fermented seaweed

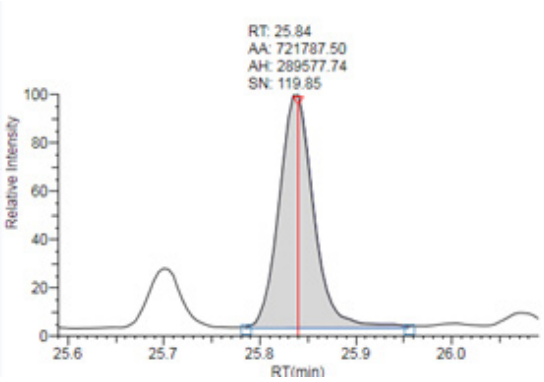
Brown seaweed (*Turbinaria* sp.) was fermented using a consortium of lactic acid bacteria, acetic acid bacteria, and yeast to produce a probiotic nutraceutical drink formulation. Besides polyphenols and flavonoids, the nutraceutical drink contained seaweed-specific phytosterols and dehydroascorbic acid.



Prominent phytosterol compounds identified in the nutraceutical drink through molecular networking for three major clusters A, B, and C

Multiresidue analytical method for seaweed dietary supplements

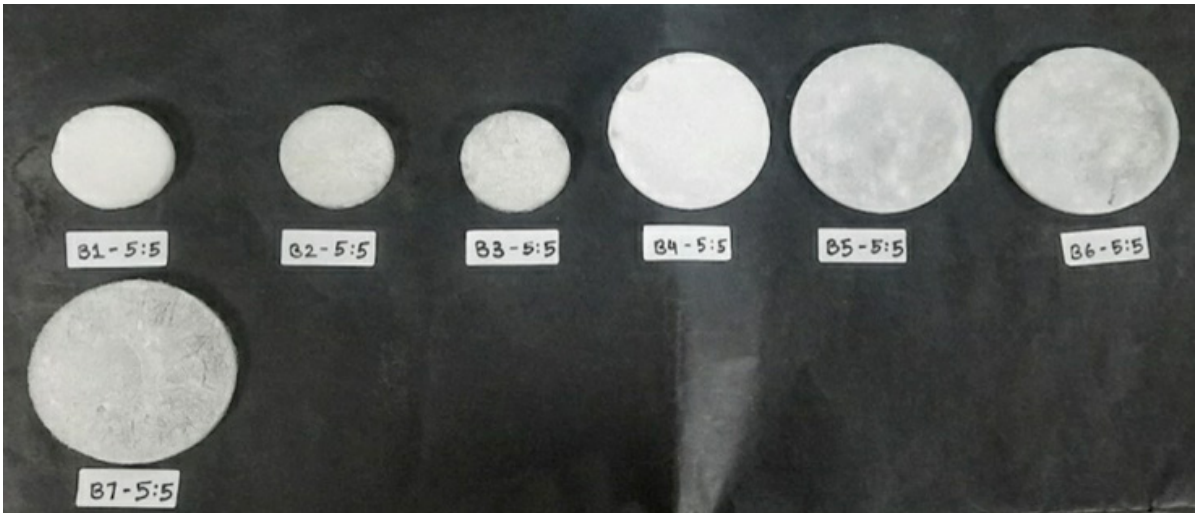
A multiresidue analytical method was developed to analyze polyaromatic hydrocarbons, flame retardants, polychlorinated biphenyls, organochlorine pesticides, and agricultural pesticides. The method can be used to evaluate the safety of commercial seaweed supplements in a high-throughput manner. A rapid sample preparation method was developed using pass through SPE cartridge cleanup. The LOQ of the method was 0.005 mg/Kg.



Chromatogram of Benzo(a)pyrene analysed in seaweed based nutraceutical products

Ulvan and functionalized ulvan from *Ulva lactuca*

Ulvan polysaccharides were isolated from green seaweed *Ulva lactuca*. Further the polysaccharides were grafted with gelatin to achieve superior mechanical stability, bioactivity, and biocompatibility of Ulvan while improving gelatin's water solubility and functional properties. This hybrid material exhibits excellent antioxidant, antimicrobial, and immunomodulatory effects, making it highly promising for biomedical applications, including wound healing, drug delivery, and tissue engineering.

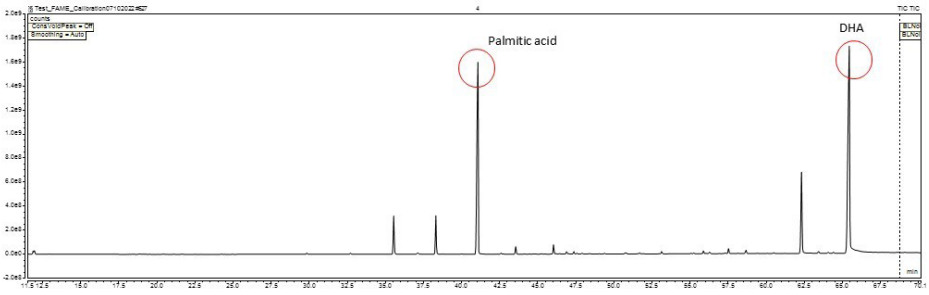


Gelatin grafted ulvan scaffolds for biomedical applications

4. Production of poly unsaturated fatty acids (PUFAs) from heterotrophic eukaryotes: A biotechnological approach

Biomass production and total lipid content of heterotrophic thraustochytrids from the marine environment

Four morphologically and culturally distinct isolates of Thraustochytrids (Ku4, Ku5, Ku6, and Ku10) isolated from the marine environment were identified as *Schizochytrium* sp. and *Aurantiochytrium* sp. based on 18S rRNA sequencing. The biomass production of the Thraustochytrid isolates were in the range of 7.74 to 20.06 g/L in GY media. Highest biomass production was found in Ku5 and lowest in Ku10. The fatty acid profile of the isolates comprised mainly of saturated fatty acids dominated by palmitic acid, and among long-chain unsaturated fatty acids, DHA was the highest.



Chromatogram showing the fatty acid profile of Thraustochytrid

Optimization of culture conditions for enhanced DHA production using selected Thraustochytrid

For the enhanced production of DHA optimization of culture conditions including pH, salinity and temperature were carried out using RSM. The increased production of DHA (59.7%) was observed in the identified species of Thraustochytrid *Aurantiochytrium* sp.

Microbiology Fermentation and Biotechnology Division

Institute Projects

1. Diagnostic development of important pathogens, emerging AMR and other pathogens in aquatic environment and seafood
2. Virulence and antibiotic resistance profiling of seafood borne pathogens and development of control measures

Most Significant Achievements

Characterization of *A. baumannii* (n=11) revealed that 100% of the isolates possessed type I fimbriae and adherence (*fim*H) gene. Biofilm regulation (*bfm*S), iron update (*fyu*A) and aerobactin (*iut*A) genes were found in 81.8% 72.7%, and 27.3% of the isolates respectively.

cg-MLST analysis of *A. baumannii* revealed that all the isolates belonged to ST1685 and ST3041

Biocide resistant was highest to benzalkonium chloride and chlorhexidine among the *A. baumannii*

Whole Genome Analysis of a high-risk clone ST37 in *Klebsiella pneumoniae* was completed

Macroplastics in aquatic environments were found to carry pathogens and antimicrobial resistance genes

Bacteriophages active against 38 strains of *Shewanella sp.,* were isolated from multiple host enrichment methods

A recombinant phage with a reporting system active against *Shewanella sp.* was assembled and a recombinant live phage recovered with the native Shewanella host species

A DNA biosensor based on impedimetry was developed for the rapid detection of *P. monodon*

An IoT-based LED light chamber system for antibacterial photodynamic inactivation (aPDI) was designed and fabricated

The cytotoxicity of ZnO-Nanoparticles on fantail goldfish fin (FtGF) and Oscar fish (OS) cell lines exhibited a higher IC_{50} value for ZnO nanoparticles than human and murine cell lines

Polyethylene glycol (PEG) coated CuO-Nanoparticles had no impact on antibacterial activity, but it notably reduced cytotoxicity

To provide a reliable and universally applicable approach for biofilm categorization a new standardized formula for the bio-film classification across different wavelengths was developed by adjusting the categorisation threshold using the extinction coefficient ratio

The antibacterial activity of chitosan oligosaccharide improved with the addition of ZnO-Nanoparticles.

Minimum inhibitory concentration assay was found to be the most suitable criteria to select ZnO-nanoparticle for application related to control of the microorganisms, followed by SEM, DLS and λ max.

The prevalence of *V. parahaemolyticus* in retail freshwater fish was 51%.

Vibrio vulnificus isolates of seafood origin was highly resistant to Cefuroxime (93.3%), Cefotaxime (80%) and Cefaclor (80%).

Two strains, *Bacillus pumilus* and *B. subtilis*, isolated from the marine environment had biofilm-inhibiting capabilities, indicating their potential for use as probiotic strains.

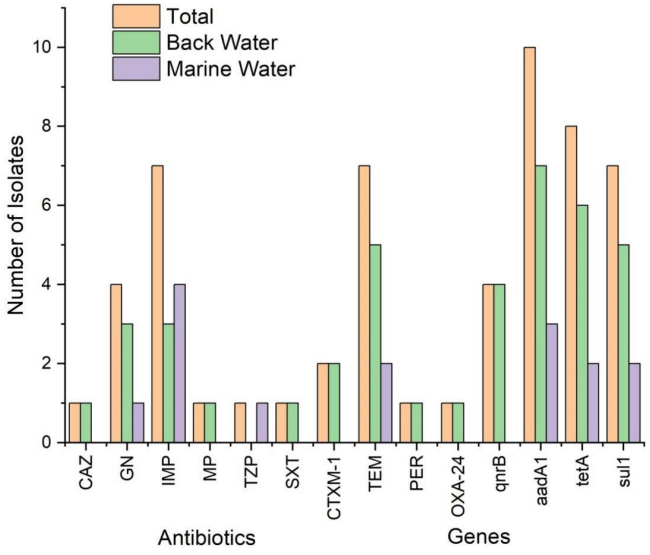
The prevalence of *Vibrio mimicus* in shrimp samples were found to be 5.71%.

CHIEF FINDINGS

1. Diagnostic development of important pathogens, emerging AMR and other pathogens in aquatic environment and seafood

Evaluation of virulence, biofilmforming and biocide resistance potential and Multi Locus Sequence Typing (MLST) of *A. baumannii*

Eleven *A. baumannii* identified in the BD Phoenix automated system (BD, USA) from the seafood samples (n=103) evaluated for its virulence, biofilm forming capacity, biocide resistance. Virulence gene identified were type 1 fimbriae and adherence (*fim*H) (100%), followed by biofilm regulation (*bfm*S) (81.8%), iron update (*fyu*A) (72.7%), and aerobactin (*iut*A) (27.3%). All the isolates exhibited a strong biofilm production (100%). Biocide resistance was highest to benzalkonium chloride and chlorhexidine, with MIC level ranging from 16 to 64 µg/mL and 16 to 32 µg/mL, respectively. The lowest values for MIC_{50} and MIC_{90} were found in chlorhexidine (8 and 16 µg/mL, respectively), and the highest values were found in benzalkonium chloride (32 and 64 µg/mL). The cg-MLST analysis using the Oxford scheme identified two new sequence types (STs), ST1685 and ST3041.



Phenotypic and genotypic resistance gene pattern of A. baumannii isolates

WGS analysis of a high-risk clone ST37 in *Klebsiella pneumoniae*

Whole-genome sequences (WGS) of a *K. pneumoniae* isolate was analyzed for antibiotic resistance genes (ARGs) and sequence types (ST). The results showed the presence of ARGs for aminoglycosides acetyltransferase, (*aac*(3)-IId), efflux pump for fluoroquinolones (*oqx*A,and *oqx*B), and fosfomycin resistance genes (*fos*A5, *fos*A6) and had the uncommon serotype of *K. pneumoniae* O3b with the high-risk clone ST37, which is the first report from India on fish.

Isolation and characterization of *P. aeruginosa* isolates

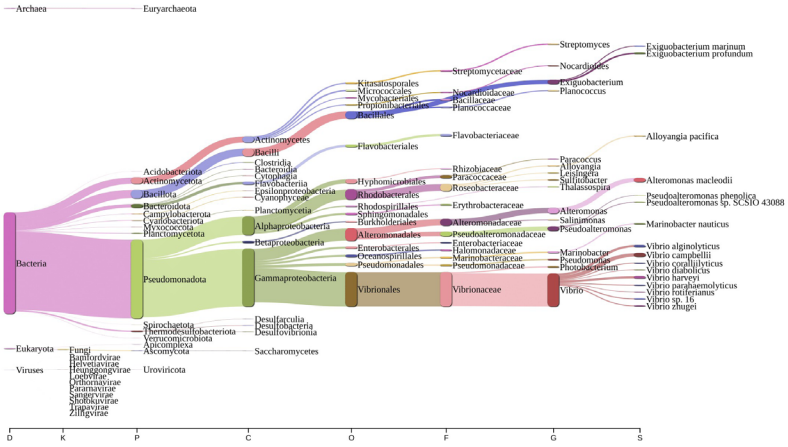
Twenty four *P. aeruginosa* identified from shrimp, fish, water and sediments sample showed presence of ESBL-genes and its variants (*bla*CTX-M-gp1, *bla*CTX-M-gp2, *bla*TEM and blaSHV), *Amp*C, β-lactamases (*bla*CMY-2), plasmid-mediated quinolone (PMQR) and fluoroquinolone resistance genes; *qnr*B, *Oqx*A and *Oqx*B and non-ESBL genes, chloramphenicol (*cml*A) encoding a multidrug efflux pump, sulphonamide resistance gene (*sul2*), the dihydropteroate synthase enzyme, and gene encoding tetracycline resistance (*Tet*A). Multiple drug resistance (MDR) was found in 31.06% of the isolates and 93.33% had a Multiple Antibiotic Resistance (MAR) index ranging from 0.36 to 0.4.

Detection of herpesviruses from the fish and aquatic environment

A total of 51 fish samples and water were screened for the presence of cyprinid herpesvirus2. Cyprinid herpesvirus2 was present in 73% of the samples.

Macroplastics as carriers of pathogens and AMR

The role of macroplastics in the dissemination of AMR in aquatic environments were studied. The analysis of microbial communities colonizing plastic surfaces revealed a high prevalence of pathogenic bacteria, *Vibrio alginolyticus, Vibrio parahaemolyticus, Vibrio vulnificus,* and *Vibrio harveyi,* emphasizing the role of macroplastics as potential vectors for disease transmission. Virus belonging to Paranavirae, Orthornavirae, Trapavirae, and Zilhgvirae, that are known to infect a wide range of hosts, including marine organisms were also detected on plastic surfaces. Antibiotic resistance genes (ARG) profiling confirmed that macroplastics harbor a higher abundance of ARGs associated with resistance to beta-lactams, lincosamides, tetracyclines, amphenicols, and aminoglycosides, compared to inanimate objects, indicating that plastics can serve as reservoirs and vectors for AMR dissemination in aquatic ecosystems. These findings emphasize the role of plastic pollution in promoting the spread of AMR genes and potential pathogens in marine and coastal ecosystems.



Sankey network diagram showing the taxonomic distribution of microbial communities on plastic surfaces, highlighting the prevalence of pathogenic bacteria (Vibrio, Pseudomonas and Aeromonas) and virus belonging to families (Paranavirae, Orthornavirae, Trapavirae, and Zilhgvirae).

AMR in *Vibrio* sp. from shrimp gut of white gut syndrome

A total 49 *Vibrio spp.* isolates from the gut and 37 isolates from the hepatopancreas of white-gut affected shrimp were tested for antibiotic susceptibility. *Vibrio* spp. isolated from shrimp hepatopancreas showed greater resistance towards ampicillin (94.6%), cefoxitin (54%), ciprofloxacin (48.7%) and cefotaxime (35%). *Vibrio* spp. isolated from shrimp gut showed higher resistance towards ampicillin (77.6%) but relatively lower level of resistance towards ciprofloxacin (24.5%), cefotaxime (18.4%) and cefoxitin (14.3%) compared to the isolates from the hepatopancreas.

Genetic characteristics of MRSA for seafood

Whole genome data of 5 MRSA isolates revealed that the MRSA belonged to Sequence type ST6, ST6, ST8, ST39 and STNew. All the genome contained 2188 orthologous genes and 2 to 8 were genes found to be unique to their respective genome.

The expression profile of *V. cholerae*

The expression profiles of *tox*R and *ctx*AB genes in *V. cholerae* isolate displayed upregulation with relative fold changes of 1.60 and 1.4 respectively, whereas *omp*U gene showed downregulation with a relative fold change of -1.77.

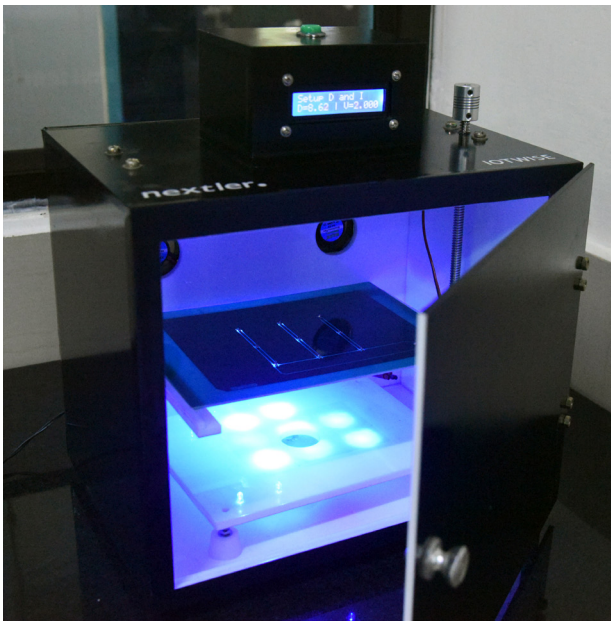
Molecular characterisation of *L. monocytogenes*

Five strains of *Listeria monocytogenes* were found to carry virulence genes such as internalin (*inl*A, *inl*C, *inl*J), phosphatidy-linositol phospholipase C (*plc*A), β-hemolysin (*hly*A), virulence regulator (*prf*A), *act*A, and *iap*. All the isolates belonged to serotypes 1/2a and 3a. Antibiotic susceptibility test revealed that all isolates were resistant to penicillin, cephalothin, methicillin, and cefotaxime.

2. Virulence and antibiotic resistance profiling of seafood borne pathogens and development of control measures

Photodynamic inactivation for water treatment

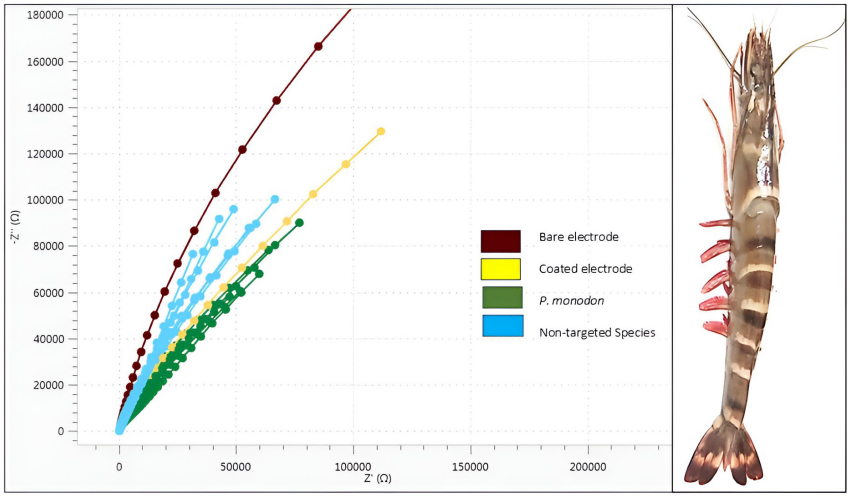
An IoT-based LED light chamber system was designed to conduct experiments based on antibacterial inactivation using photosensitiser. The device can read irradiance in mW/cm2, wavelength in nm, temperature in °C and height in cm. The Internet of Things (IoT)-based LED light chamber system comprises enclosed light chamber, illumination holder, height-adjustable unit, temperature regulation unit, plurality of sensors, microcontroller, display unit, and web platform. An initial study with low levels of *Moringa oleifera* extract, as a photosensitizer, significantly reduced the bacterial load of methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa* in water



IoT-based LED light chamber system for antibacterial photodynamic inactivation

Development of DNA biosensor for rapid detection of *Penaeus monodon*

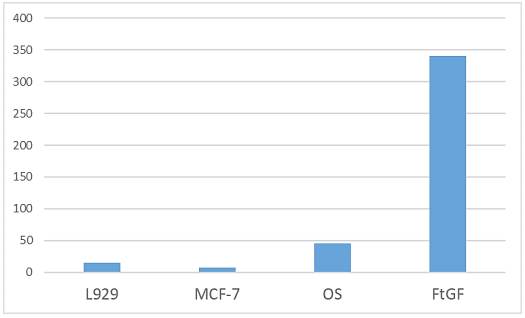
A DNA biosensor based on impedimetry was developed for the rapid detection of fradulence and authentication of *P. monodon*. Specificity of the sensor was determined against a variety of seafood species, including shrimps, fishes, and cephalopods. Notably, none of the species tested exhibited any cross-reactivity. Consistent results were obtained when assessing *P. monodon* species that had undergone various seafood processing treatments, such as cooking, frying, freezing, and canning. The identical frequency range observed for these processed *P. monodon* samples underscores the robustness of the sensor in accurately identifying the species across diverse culinary preparations and processing methods. The validation process that involved testing the developed sensors using 60 commercial shrimp products were also conducted. All the products had similar sensor readings to those of raw shrimp, further affirming the accuracy of the validation results.



Electrochemical impedance spectroscopy for detection of P. monodon

Cytotoxicity of ZnO-Nanoparticles in fish cell lines

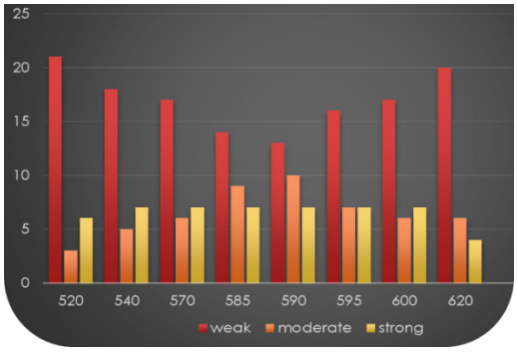
The toxicity of ZnO nanoparticels on two fish cell lines viz., Fantail goldfish fin (FtGF) cell line and spleen cell lines from Oscar fish (OS) were compared with existing standard mammalian cell lines viz., MCF-7 and L929. The study revealed that the both fish cell lines exhibited a higher IC_{50} value for ZnO nanoparticles compared to human and murine cell lines.



IC_{50} values for the fish and mammalian cell lines

Harmonizing biofilm measurements by extinction coefficient ratio adjustment

To provide a reliable and universally applicable approach for biofilm categorisation, capable of unifying the results across studies, a new standardized formula for the biofilm classification across different wavelengths was developed by adjusting the categorisation threshold using the extinction coefficient ratio (Rλ) i.e., ODC adjusted = ODCλ * Rλ; ODC is Optical Density Control



Categorisation of biofilms at different wavelengths

Phages active against *Shewanella* sp., isolated from Indian Mackerel

Bacteriophages active against 38 strains of *Shewanella* spp., were isolated employing multiple host enrichment methods. TEM analysis revealed that all the phages had Siphoviridae like morphology, long tail, icosahedral head. One step growth curve analysis revealed that phages exhibited a latent period of 30–40 minutes and a burst size of 120–150 phages per cell. Phages was shown to be thermally stable between -80ºC and 60ºC. At 50ºC, the phage titre decreased by approximately 5 log compared to the initial titre, and the phages were completely inactivated at 70ºC. Genome analysis of *Shewanella* phage revealed that they belonged to *Yushan virus*.

Developing a field level rapid reporter phage kit for detection of spoilage in finfish

A recombinant phage active against *Shewanella sp.* was assembled and a recombinant live phage was recovered with the native *Shewanella* host species with a reporting system from the genomic DNA data of *Yushan virus*. This study will provide the base for the developing a kit for detection of spoilage of fish mediated through *Shewanella sp.*

Antibiotic resistance profiling of *Vibrio vulnificus*

Fifteen *Vibrio vulnificus* strains from seafood and aquaculture sources were screened for antibiotic resistance with 12 antibiotics. All the isolates displayed resistance to ampicillin and penicillin, while 93.3% of the isolates were resistant to cefuroxime, 80% of the isolates were resistant to both cefotaxime and cefaclor. 46.7% of the isolates showed intermediate resistance to imipenem and 13.3% of the isolates were resistant to amikacin.

Antibiotic resistance profiling of *V. mimicus*

Antibiotic susceptibility testing of seven *V. mimicus* isolated from shrimp farms demonstrated high resistance to ampicillin (100%), cefotaxime (57%), and cefepime (28%), whereas complete susceptibility was observed for chloramphenicol, imipenem, ciprofloxacin, and tetracycline.

Biochemistry and Nutrition Division

Institute Projects

1. A Green Technology Approach on Isolation, Purification and Product Development from marine biomolecules
2. Establishing nutritional and bio-functional potential of selected fishery products through in vitro/in vivo digestibility studies

Most Significant Achievements

Developed chitosan phloroglucinol composite having antioxidant, anticancer and wound healing properties

Carrageenan-ibuprofen and chitosan iodine composite showed improved wound healing capacity

Eco-friendly extraction process was developed for shrimp shell oil rich in carotenoid esters and PUFA

Aquaculture feed was developed for silver pompano (*Trachinotus blochii*) from SFE residual and myctophid silage as protein source

In vitro and *in vivo* experiments revealed that fish derived peptides possess antioxidant and antihypertensive properties

Developed ready-to-use seaweed-based health supplement/immune boosters for ornamental fishes

An extraction process was developed for obtaining bioactive compounds from seaweeds and a patent was filed

Self-assembled mediated chitosan-based hydrogel having promising biomedical applications was synthesized

Ready-to-use seaweed-based health supplement/immune boosters for ornamental fishes was developed

In vitro digestion kinetics indicated that the use of squalene as carrier agent enhanced the sustained release of vitamin D3

An *in vivo* study on replacement of fish meal with myctophid silage revealed improvement in growth parameters and growth indices in silver pompano fingerlings

CHIEF FINDINGS

1. A Green Technology Approach on Isolation, Purification and Product Development from marine biomolecules

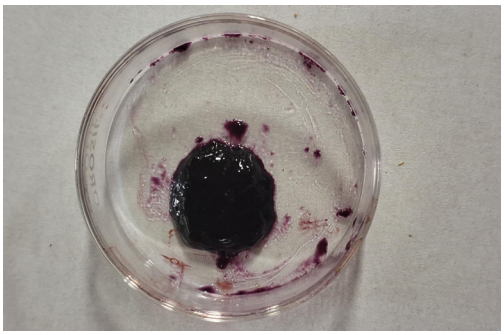
In vitro wound healing and anti-cancer properties of chitosan phloroglucinol Composite

A chitosan-phloroglucinol composite was successfully synthesized and characterized, demonstrating significant antioxidant activity, anticancer properties, cytotoxicity and wound healing properties. Structural analysis confirmed molecular interactions and hydrogen bonding within the composite. Antioxidant studies revealed enhanced free radical scavenging activity, while in vitro anticancer assays on MCF-7 breast cancer cells indicated strong apoptotic effects and inhibited cell migration. The cytotoxicity analysis in the L929 cell line demonstrated a reduced toxicity profile compared to phloroglucinol alone, highlighting its potential as a safer alternative. Evaluation of wound healing properties using scratch assay showed promising results in promoting cell migration. These findings highlight the potential of the composite as a promising therapeutic candidate, paving the way for further clinical investigations.

Nutrient profiling of selected fish species

A detailed study was conducted on proximate composition and fatty acid profiles of five fish species (*Epinephelus diacanthus, Johnius glaucus, Scatophagus argus, Alepes djedaba* and *Stolephorus commersonnii*) from the Kerala coast. Key findings revealed that *Scatophagus argus* had the highest protein and fat content, whereas *Stolephorus commersonnii* displayed the highest moisture and DHA levels, along with significant polyunsaturated fatty acids (PUFA). Additionally, *Scatophagus argus* recorded the highest EPA content. The study offers critical insights into the nutritional profiles of these species, aiding dietary recommendations.

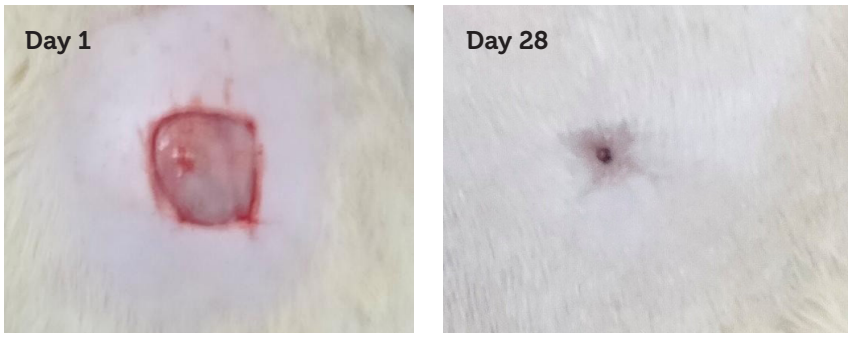
Development of chitosan-iodine composites



A chitosan-iodine composite was successfully prepared, contributing to advancements in bioactive material research. The wound-healing effect of the composite was analyzed in albino rats, yielding satisfying results that confirm its potential wound-healing activity.

Development of carrageenan-ibuprofen composite

A carrageenan-ibuprofen composite was developed and characterized. Cytotoxic studies revealed that the composite exhibited dose-dependent cytotoxicity and demonstrated greater biocompatibility compared to its individual components. *In vivo* studies conducted on albino rats demonstrated significant wound-healing potential of the composite, showing enhanced tissue regeneration and accelerated healing.



Wound healing progression in Wistar albino rats treated with carrageenan-ibuprofen composite

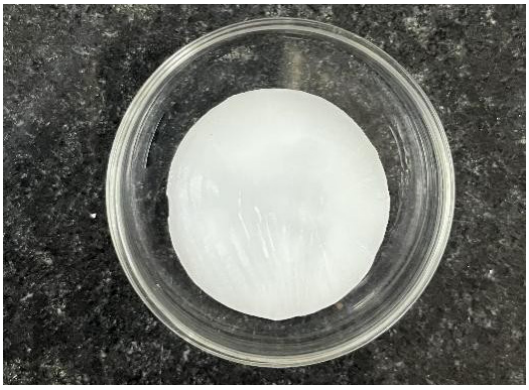
Biovalorization of shrimp shell waste

A methodology has been optimized for the production of oil from processing waste of Metapenaeus dobsoni by supercritical fluid extraction. The maximum extraction was achieved within the first hour (74 %). The oil extracted was found to have high amount of EPA and DHA with co-extracted pigments.

Development of self assembled chitosan based hydrogels

A systematic study has been carried out to explore the designing of self-assembled based hydrogel from marine polysaccharides for biomedical applications. Accordingly, it was observed that pH significantly influences the self-assembly formation and textural properties.

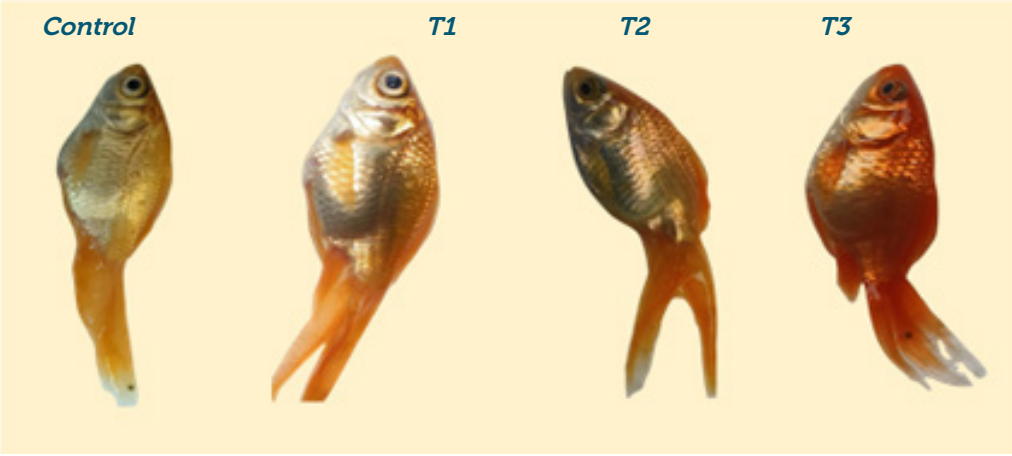
The influence of pH on the self-assembly formation was studied in detail. it was observed that pH significantly influenced the texture and water absorption properties of the hydrogels.



Self assembled chitosan based hydrogels

Seaweed-based health supplement/immune boosters for ornamental fishes

Seaweed based syrup was tested in ornamental fishes such as Goldfish (*Carassius auratus*), Koi carp (*Cyprinus rubrofuscus*) and guppy (*Poecilia reticulate*) for a period of 60 days. Syrup supplemented twice a week has recorded significantly higher growth and enhanced colour pattern among all the species. In addition, the seaweed syrup supplemented thrice a week showed increased disease resistance against various bacteria pathogens in fish. Similarly, expression of pro and anti-inflammatory genes (IL 1β, IL 8, TNF-α, and Lysozyme) were upregulated which indicates the efficacy of the syrup in enhancing the immunity of fish. The developed seaweed based syrup were able to boost the growth, colour and immunity in ornamental fishes.



Control: without seaweed syrup, T1: 5 ml seaweed syrup 1 dose per week
T2: 5 ml seaweed syrup 2 dose per week, T3: 5 ml seaweed syrup 3 dose per week

2. Establishing nutritional and bio-functional potential of selected fishery products through in vitro/in vivo digestibility studies

A method was developed to quantify astaxanthin from crustacean sources. The various extraction processes yielded astaxanthin ranging from 5mg/100g to 17mg/100g

Catechin-chitosan conjugate with significant antioxidant and antimicrobial was successfully synthesized

A stable delivery system was designed for vitamin D3 using squalene as the delivery vehicle

Binary blend of polysaccharide and protein was employed for the simultaneous encapsulation of Vitamin D3

In vitro dry matter and crude protein digestibility of fishmeal and black solider fly meals was studied. *In vitro* studies of fishmeal revealed crude protein digestibility compared to the black solider meal. The study revealed that the feed contained 75% Myctophid silage and 25% fishmeal, had more advantages with respect to growth parameters and body indices.

In vitro digestibility of the fish bioactive peptides

In vitro comparative analysis of the digestibility of various molecular weight fractions (>10 kDa, 3 to 10 kDa , <3 kDa) peptides along with the crude fish protein hydrolysate was studied. The highest digestibility was found after the intestinal phase in all the fractions. Peptides smaller than 3 kDa show better digestibility throughout both gastric and intestinal phases, offering them suitable for higher absorption and biological activity in dietary and therapeutic contexts.

In vitro and *in vivo* antioxidant and antihyperlipidemic potential of low molecular weight peptides

The *in vitro* antioxidant and antihypertensive properties of *Priacanthus hamrur* skin protein hydrolysates revealed highest Angiotensin-converting enzyme (ACE) inhibitory activity at 2 mg/ml

protein level. *In vitro* antioxidative potential of the hydrolysate measure using ABTS, DPPH and hydroxyl radical scavenging activity significantly ($p<0.05$) increased with increasing protein levels. *In vivo* studies revealed the antioxidative and antihyperlipidemic potential of low molecular weight bioactive peptides (<3 kDa) in high fat-fed (HFD) Wistar rats. Bioactive peptide supplementation in HFD-fed groups significantly improve weight gain in a dose-dependent manner for 64.09% (low), 61.01% (medium), and 56.60% (high dose) respectively, suggesting a protective role against diet-induced weight gain.

In vivo protein digestibility study on a fish model

A study was conducted to compare the dry matter and crude protein digestibility of fishmeal and black solider fly meal. The result revealed that fishmeal was found to have higher dry matter and crude protein digestibility compared to the black solider meal. Further, among the black solider fly meal, feeding source was found to have greater influence on the digestibility factor of the meals.

In vitro release study of vitamin D3 using squalene as the delivery vehicle

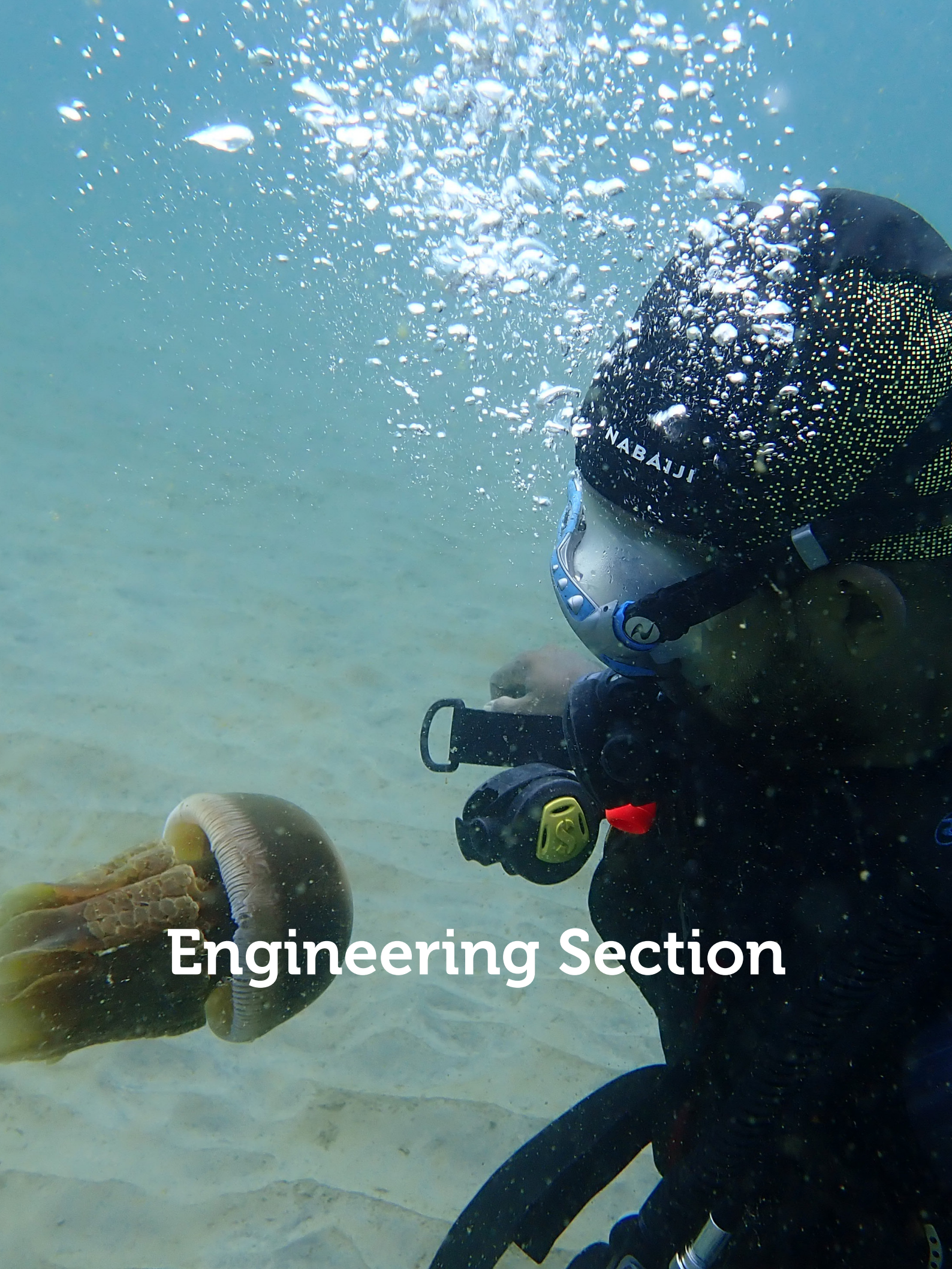
A stable delivery system was designed for vitamin D3 using squalene as the delivery vehicle. A binary blend of polysaccharide and protein was employed for the simultaneous encapsulation of Vitamin D3. The encapsulated formulations exhibited better zeta potential and particle size. In vitro digestion kinetics indicated that the use of squalene as carrier agent resulted in the sustained release of vitamin D3.

In vivo study on effect of de-oiled myctophid meal on fish model

The effect of de-oiled myctophid meal-based diet on growth and physio-metabolic changes in Silver Pompano fingerlings were studied. The study showed that the feed with 50% Myctophid meal and 50% fishmeal, had more advantages with respect to growth parameters and body indices.

In vivo study on effect of myctophid based silage on fish model

In vivo study was conducted to evaluate the effect of myctophid based silage in the diet of Silver Pompano fingerlings. The study revealed that the best combination for incorporation of mycotophid silage into feed was 75% Myctophid silage and 25% fishmeal, with best advantages with respect to growth parameters and body indices.



Engineering Section

Institute Projects

1. Engineering interventions in the post-harvest sector
2. Carbon nanodots and nanocomposite PCM based energy efficient solar dryer
3. Design and Development of indigenous tools and technologies for the post harvest fisheries sector

Most Significant Achievements

A solar-powered fish feed dispenser was designed, and its performance evaluated.

The performance evaluation of hybrid solar dryer using silver belly fish revealed a drying time of 10 h to reduce the moisture content from 74.40 to 17.70 (% w.b).

Performance of carbon nanodots and nanocomposite PCM-based solar dryer evaluated using shrimp revealed 7 h of drying to obtain a final moisture content of 14.34 % (w.b)

Solar-electrical hybrid dryer (40kg) was developed, and performance evaluation was conducted.

Biomass-based smoking kiln with electric backup was designed and developed

CHIEF FINDINGS

1. Engineering interventions in the post-harvest sector

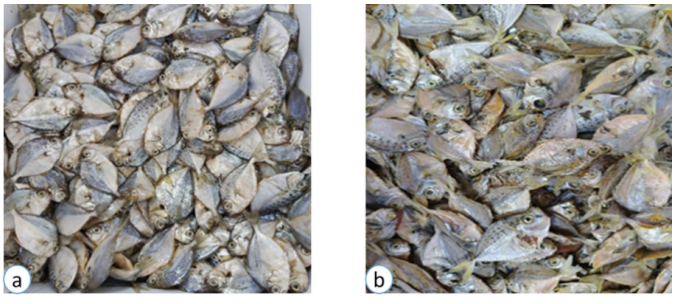
Improved design and performance evaluation of solar-powered fish feed dispenser

A solar-powered automatic fish feed dispenser was developed, and its performance was evaluated. The equipment could dispense feed in a fish farm of up to 1500 m^2 and could spread 10 kg of feed in 5 minutes.

Solar-powered fish feed dispenser

Performance evaluation of a hybrid solar-electrical dryer(20kg)

The performance of solar-electrical hybrid dryer was evaluated using silver belly fish and found that the drying time of 10 h was required to reduce the moisture content from 74.40 to 17.70 (% w.b). The dried silver belly samples were estimated to have a rehydration ratio of 1.53. An average drying rate of 0.2821 (g/g solids/h) was observed.



Silver belly fish (a) before and (b) after drying

2. Carbon nanodots and nanocomposite PCM based energy efficient solar dryer

Performance evaluation of carbon nanodots (CNDs) and nanocomposite PCM based energy efficient solar hybrid dryer

Solar dryer was developed with a flat plate collector having CNDs coated absorber plate and thermal energy storage having graphene nanoparticles and paraffin wax nanocomposite material (TES). During experiments, the average ambient temperature and solar radiation were observed as 36.2°C and 668 W/m^2, respectively. Also, the maximum drying chamber temperature was recorded as 53.4°C at an air velocity of 1.4 m/s. Drying of shrimp (*Metapenaeus dobsoni*) with the TES unit took 7 h and reached a final moisture content of 14.34 % (w.b).

3. Design and development of indigenous tools and technologies for the post harvest fisheries sector

Development and performance evaluation of a solar-electric hybrid dryer (40 kg)

Designed a solar-electrical dryer of 40 kg capacity for drying fish and fishery products. The dryer consists of 4 tray holders with 10 trays in each holder. The double-glazed solar flat plate air collector was tested at three air flow rates, and observed maximum outlet air temperature of 64°C. The performance evaluation of the dryer was carried out using shrimp samples. It was observed that the dryer required 4h for complete drying of shrimp with the final moisture of 12.68% (w.b). The shrinkage of samples upon drying was observed as 21.97%, and the rehydration ratio was 2.46.

40 kg solar-electrical hybrid dryer

Design of the prototype of vacuum impregnation unit

The vacuum impregnation unit prototype was designed to enhance the efficiency of the impregnation process, allowing for deeper penetration of salts and marinades into fish so that the time of soaking can be reduced. The process flow involves preparing the material, applying a vacuum to remove air, introducing the impregnation liquid, maintaining pressure for optimal penetration, and then gradually returning to atmospheric pressure.

Design of the prototype of the solar-electrical hybrid blancher

A steam blancher attached to a solar parabolic trough collector has been developed. Usually, a steam blancher uses electricity to produce steam. To reduce electricity consumption, a solar-electrical hybrid blancher was developed by incorporating solar thermal collectors to the system.

Design of fish meat bone separator

A belt and drum-based design for meat bone separation of fish has been completed. In this advanced design, two drums were used to increase the contact area between the belt and drum, ensuring higher meat separation efficiency and yield. The designed meat bone separator will have a 1.2-1.5 hp motor and a drum with a diameter of 200 mm.

Development and performance evaluation of solar-infrared hybrid dryer for fish and fishery products

An IR dryer was incorporated with a flat plate solar collector for the development of a solar–infrared hybrid dryer. IR drying combined with hot air assistance can save 20% of drying time to obtail the same amount of residual moisture as compared to IR drying alone.

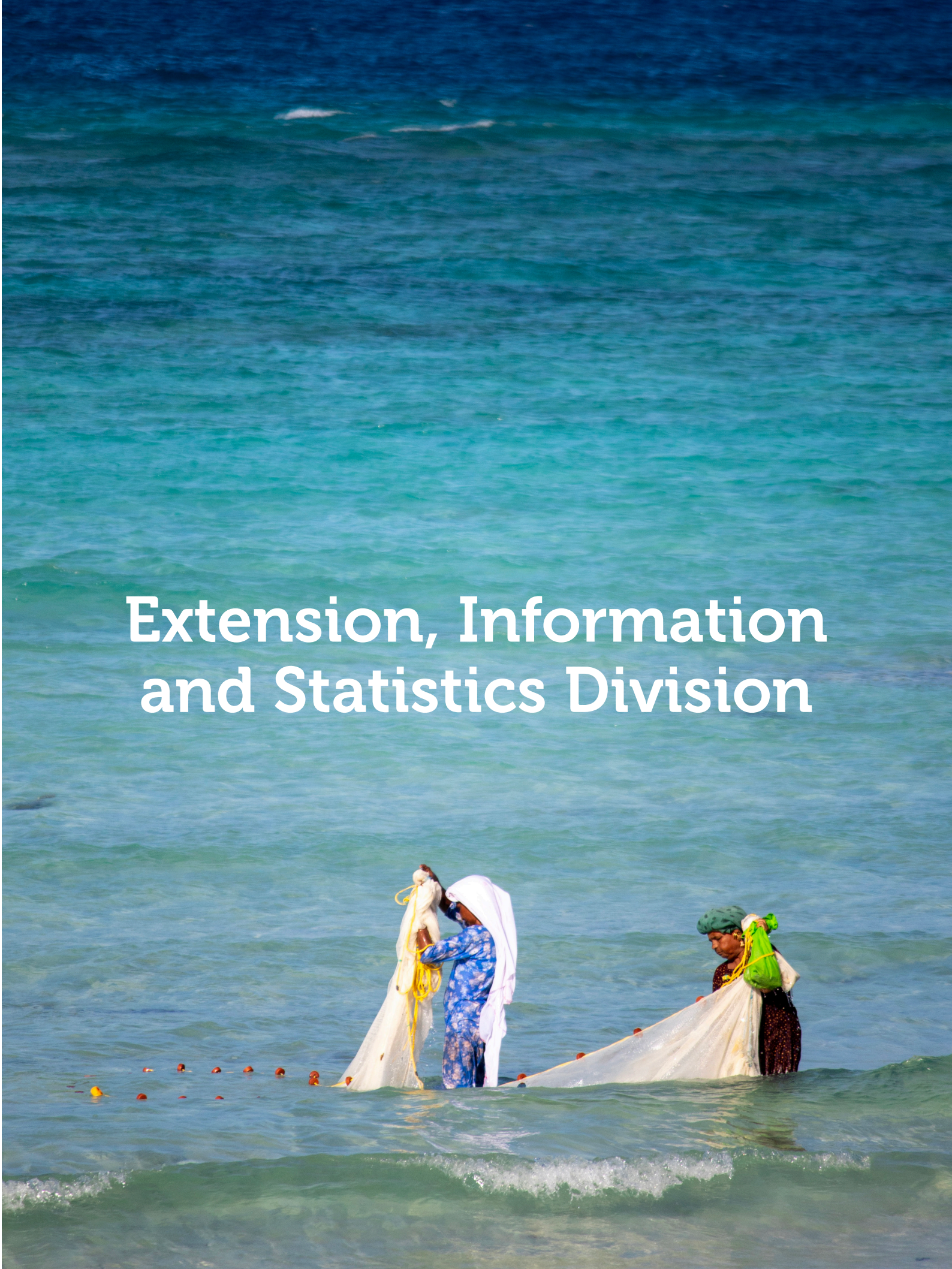
Design and development of a fish descaling and cutting machine

The fish post-harvest processing operations include scale removal, de-heading, belly-flapping, and also cutting whole fish into steaks or fillets. Most of these operations are usually carried out by hand, and this has several disadvantages, like more time consumption, hygiene issues, etc. The proposed system is conveyor-based which consists of three stages: descaling, cutting of head, tail and belly region, and cutting or filleting.

Design and development of smoking kiln

A smoking kiln cum dryer of 20 kg capacity was designed and developed. It uses a biomass furnace and an auxiliary electric heating coil, allowing it to function as both a smoking kiln and a biomass dryer. The kiln features a furnace for hot smoke, a filter to remove ash particles and polyaromatic hydrocarbons (PAH), and a cross-flow system for even smoking without manual turning. Kiln has an insulated, heat-resistant chamber made of PUF sheets with SS304 inside and powder-coated GI outside. Computational Fluid Dynamics (CFD) was employed to optimize a fish smoking chamber design by analyzing key factors such as chamber geometry, smoke inlet positioning, heater placement, and blower systems.

Extension, Information and Statistics Division



Institute Projects

1. Modelling economic risks in fisheries and mitigation strategies
2. A study of digital fish marketing ecosystem in India
3. Assessment of post- harvest losses in the fish value chain
4. Impact assessment of ICAR-CIFT Technologies

Most Significant Achievements

Daily income of mechanised boat fishers in Ernakulam and Kozhikode demonstrated a significant income disparity between single-day and multi-day trawl fishing. However, income within the multi-day trawl category did not differ significantly

Motorized fishing income showed significant variability across six key fishing centers with 3% of fishermen earning less than Rs. 500 per day, 10% over Rs. 1500, and the majority (53%) earning between Rs. 800 and Rs. 1000 daily

Developed frameworks for profiling digital fish vending portals and consumer behaviour analysis

Identified key intra- (user-friendly interface) and inter-attributes (variety) driving platform choice of online fish consumers

A comprehensive 20-point Key Performance Indicator (KPI) framework was designed for impact assessment of 10 selected technologies, including training modules, and formulated methodologies for estimating each indicator

Identified key digital platform drivers of online fish marketing as product variety, usability, and convenience driven consumer preference

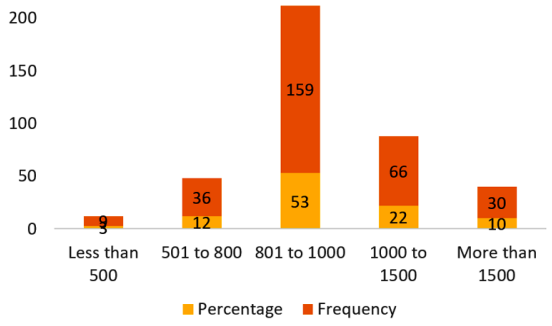
Uncovered critical barriers of online fish vending as high pricing, limited price comparison tools, and sensory trust issues hindering adoption.

CHIEF FINDINGS

Modelling economic risks in fisheries and mitigation strategies

Estimation of mean level of income from fishing

Daily income of fishers engaged in mechanized sector was recorded from two key fish producing centres, Ernakulam and Kozhikode, from a representative sample. The income of fishermen engaged in single day fishing was found to be significantly different from income of fishermen engaged in multiday fishing in the trawl sector ($p<0.05$). However, the income of fishermen engaged in 2-4 day fishing and 4-7 day fishing did not vary significantly. On an average, there were 25 fishing days in a month assuming absence of extreme events. The loss of annual fishing days was 20 to 22 days on an average in marine fisheries sector in Kerala.



Daily income of fisherman operating motorised boats

Centre	Type of fishing	Mean income in Rs. (S.E.)	Range (Rs.)	Sample size
Ernakulam	Trawl-single day	1267.5 (25.56)	(1005, 2500)	100
	Trawl-multiday 2 to 4 days	2469.6 (15.8)	(1230, 2640)	
	Trawl-multiday 4 to 7 days	2656.7 (23.7)	(1550, 3250)	
	Gillnets	2760.7 (12.3)	(2550, 3155)	20
	Ringseine	1860.2 (7.67)	(1600, 2050)	30
	Liners	3150.0 (4.54)	(3000, 3650)	2
Kozhikode	Trawl- Single day	987.5 (19.3)	(875, 1200)	120
	Trawl - multiday 2 to 4 days	2140.6 (10.2)	(2000, 2500)	
	Ringseine	1850.3 (11.2)	(1800, 2000)	30

Secondary data of daily earning of fishers was collected from Matsyafed for a sample of 300 motorised boats on fishing trips and revenue generated at Chellanam, Munambam, Njarakkal, Nayarambalam, Chaliyam and Beypore. Around 3% fishermen have reported their income to be less than Rs. 500 per day whereas 10% of fishers earned more than Majority of the fishermen operate their boats for 251 to 300 days for fishing and on an average the extreme event triggers were resulting loss of an average of 25 to 30 fishing days in an year.

The average daily income from fishing in artisanal sector from a sample of 25 fishers operating along Ernakulam coast was found to range between Rs.200 and Rs. 1000 a day during peak season.

For the inland sector, the average monthly income was computed from a sample of fishers from reservoir fishing system of Meenkara and Aliyar and backwater fishing system at Pulicat and Vembanad lake respectively.

Type of fisheries	State	Centres	Monthly income(Rs.)
Reservoir	Kerala	Meenkara	12,436
	Tamil Nadu	Aliyar	12,940
Lagoon/ Backwaters	Kerala	Vembanad	15,430
	Tamil Nadu	Pulicat	9,650

Reservoir fishers who were licensed to fish in the reservoir have organized themselves as society and avail soft loans from the Society for undertaking repair of nets and replacement of fishing equipment. However, no compensation was made available to them when fishing days are lost due to strong winds.

Mean income of fishers from marketing of fish

Both the price and demand for fish are consistently rising in the domestic and international markets. Generally, in fisheries sector, marketing is carried out by women. From representative sample in Ernakulam district of fish vendors and market agents from wholesale, retail and roadside marketing and also live fish marketing, the daily income was assessed.

Present status of insurance coverage for fisherfolk in selected states

At present, the insurance system for marine fishers cover the accidents and loss of life during fishing operations. Currently, insurance companies in India are offering traditional insurance (indemnity) and parametric (index-based) insurance to agriculture, crops and livestock and suitable insurance products based on sound statistical models for fishing related economic loss is absent.

Parametric (or index-based) solutions cover the likelihood that a pre-set event will occur, rather than compensating for actual damage experienced; thus, the parametric insurance is considered as a quick compensation, and it does not cover entire damage. Since parametric insurance is triggered by specific weather parameters (e.g., wind speed, rainfall) rather than traditional loss assessments, payouts can be made quickly after an event occurs. This provides immediate financial relief.

Assessing economic risks and loss in marine and inland fisheries

Economic losses can be attributed to a variety of risk factors, like overfishing, occurrence of natural disasters, climate change, pollution, habitat degradation (e.g., coral reefs, mangroves), invasive species (inland waters), market fluctuations, regulatory changes, Illegal, Unreported, and Unregulated (IUU) fishing threatening economic viability, technological changes, supply chain disruptions (eg. Trade barriers), fish diseases and parasites (eg. outbreaks threaten aquaculture operations), labour issues. Many of these risk factors do not totally disrupt the operations and fishers have been able to handle them with the help of a well streamlined framework involving agencies. The occurrence of extreme events like cyclones, storms, winds, flooding which affect the fishing operations. Recently the likelihood of extreme events have increased and fishers are prone to economic risks due to the trigger of such events. Database on fish production will be mapped on the database for extreme climatic events which led to the restriction in fishing to evolve insights for assessing the economic risks. Database on extreme climatic events which has impacted Fisheries was constructed.

2. A study of digital fish marketing ecosystem in India

Digital market profiling

Analysis of digital fish vending firms in Cochin, Mumbai, and Vizag identified diverse fish offerings and flexible payment options as key strengths, but elevated prices compared to local shops and supply chain disruptions, such as seasonal fishing bans, posed notable challenges, guiding strategies for online fish retail. High operational costs (e.g., cold storage, electricity in Vizag) and poor online marketing knowledge hindered scalability. In Cochin, prices were nearly double local rates, a significant grey area.

Consumer behaviour insights

Survey revealed consumers split evenly between online platforms and local shops for fish purchases, with a majority of their monthly fish bought online, driven by convenience and user-friendly interfaces, though high costs and inability to assess freshness pushed some toward traditional markets.

The choice experiment showed preferences tilting toward platforms with superior usability and variety, though secondary factors like delivery and pricing refined choices, indicating a split between convenience-seekers and skeptics.

Digital literacy and perceptions

Consumers in Ernakulam universally recognized online platforms, excelling in navigation and preferring digital payments, but struggled with price comparisons; they valued pre-cut fish and convenience highly, yet perceived risks in higher prices and unavailability of local fish species, shaping platform trust. Awareness of digital platforms was universal (100%), with 88% adept at navigation and species selection, and 91% familiar with payment methods. However, only 38% could compare prices, and 29% lacked order-tracking knowledge, indicating gaps in advanced tool usage.

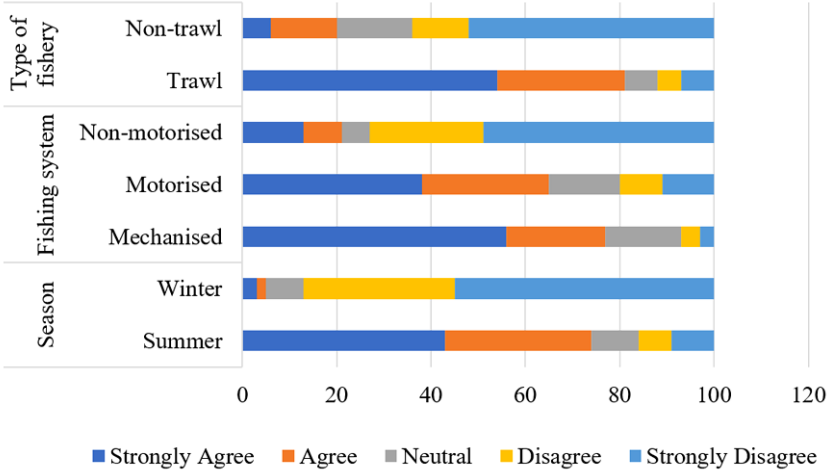
Retailer coping strategies

Vendors addressed supply chain issues and competition through cold chain logistics, diverse sales platforms like mobile apps, and improved delivery systems, with diverse offerings, quality assurance, and reliable logistics emerging as essential for sustaining digital fish markets

3. Assessment of post-harvest losses in the fish value chain

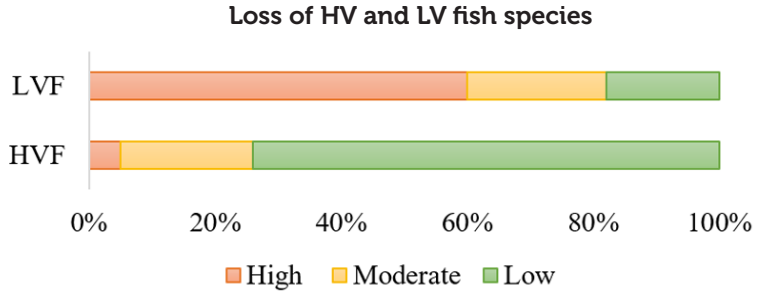
Qualitative loss assessment in fish using IFLAM

The post-harvest loss assessment in fish was carried out using Informal Fish Loss Assessment Method (IFLAM) that include Key Informant Information (KII) method and Likert's Scale Analysis at four levels viz., fishermen, wholesalers, retailers and fish vendors in Ernakulam District, Kerala. From the KII results, it was revealed that the post-harvest loss in fish was high in mechanised trawl fishery and in summer season. This was responded by more than 50 per cent of key informants. It was revealed from the KII analysis that the improper handling and bycatch & discards were the major causes for PHL in fish at fishing harbour level. Delay in selling, improper handling and lack of cold storage facilities were the major reason for the post-harvest losses in fish at market levels.



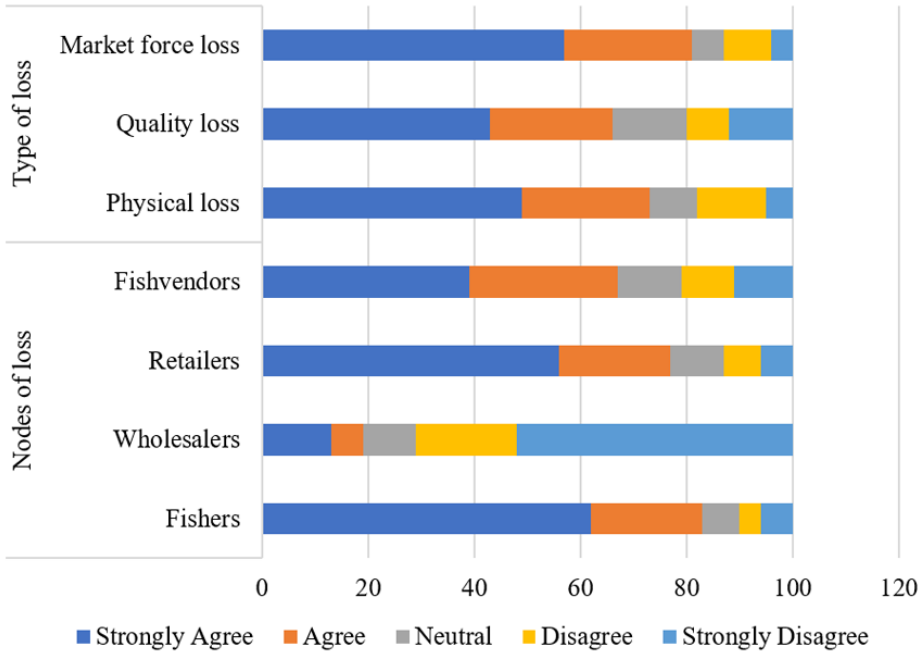
Results of Key Informants Interview on magnitude of post-harvest losses in fish

It was observed that the post-harvest loss in fish was comparatively high in low value fishes (LVF) with more than 60 per cent of the Key Informants' responding to the statement related to species differentials.



Species differentials in post-harvest losses in fish

The Likert's analysis on post-harvest loss in fish revealed that the post-harvest loss in fish was high at fishers (fishermen) and retailers level followed by fish vendors level. Among the losses, market force loss was the major loss reported compared to physical and quality loss.



Perceived post-harvest loss in fish at various nodes

IFLAM data collection at Munambam

QLAM data collection at Kochi

Assessment of post harvest losses using Questionnaire based Loss Assessment Method (QLAM)

The quantitative assessment of PHL using QLAM showed that the physical loss, quality loss and market force loss was high at the nodes viz., fishermen and retailer. The results showed that the physical loss is the prominent type of loss at the fishermen and wholesaler levels, the quality loss and market force were contributed for high PHL at retailer level and the market force loss and quality loss were the types of losses at fish vendors' level. The average total economic loss in monetary terms was Rs. 38,757 per trip, Rs. 23,430 per day, Rs. 28,341 per day and Rs. 4,532 per day at fishermen, wholesaler, retailer and fish vendors nodes respectively.

Total economic loss of fish at selected nodes in Kerala

(in Rs.)

Nodes/ stages	PL	QL	MFL	TEL
Fishermen (per trip)	16,543	10,389	11,825	38,757
Wholesaler (per day)	9,967	5,423	8,040	23,430
Retailer (per day)	8,903	9,874	9,564	28,341
Fish vendors (per day)	567	1,890	2,075	4,532

PL – Physical loss, QL – Quality loss, MFL – Market Force Loss, TEL – Total Economic Loss

Post-harvest loss inequality curve and inequality index

The post-harvest loss inequality curve (PLIC) and post-harvest loss inequality index (PLII) were estimated using the cumulative post-harvest loss with respect to cumulative fish production on particular species and respondents separately for the fishers, wholesalers, retailers and fish vendors. The high inequality and low post-harvest loss between species/respondents and states implied necessity for species specific state-level interventions for effective post-harvest management in fish. The relationship between PLIC and PLII with that of income inequality of the respondent revealed that there was positive correlation between the post-harvest loss and income levels.

4. Impact assessment of ICAR-CIFT technologies

Framework development for impact assessment of CIFT technologies and training interventions

A comprehensive framework was developed to assess the impact of ten selected ICAR-CIFT technologies and associated training programs. For each technology, a methodology was formulated to evaluate 20 Key Performance Indicators (KPIs) covering technical, economic, social, and environmental dimensions. The framework facilitates real-time impact monitoring by capturing relevant cost components, measurable benefits, and comparative performance between adopters and non-adopters. The assessment also aimed to quantify the contribution of these technologies in terms of income and employment generation, providing empirical evidence on their effectiveness and scalability across different user segments. This framework ensures a data-driven approach to understanding the broader impact of technological interventions on the fisheries sector and informs future policy and scaling decisions under ICAR-CIFT mandates.

Structure of fish processing industry in India

The structure of fish processing industry in India was assessed by using the data from Annual Survey of Industries (ASI). The partial productivity aspects of the fish value addition firms in terms of the capital productivity and labour productivity were estimated. The total factor productivity of the fish processing industry was estimated by using LP methods and the correlates of the TFP growth was identified.

A primary survey of the fish processing industries in India was carried out to examine the constraints faced by the industry.

Visakhapatnam Research Centre of ICAR-CIFT

Institute Projects

1. Development of Smart Trawls Systems for the North East maritime states of India
2. Interventions for ensuring diversity and quality of products from aquatic resources of East Coast through innovative technologies

Most Significant Achievements

Sustainable and low energy 35 m and 35.2 m trawls were designed for trawling operations

Prepared and characterized protein hydrolysates from Asiatic hard clam, *Meretrix meretrix*

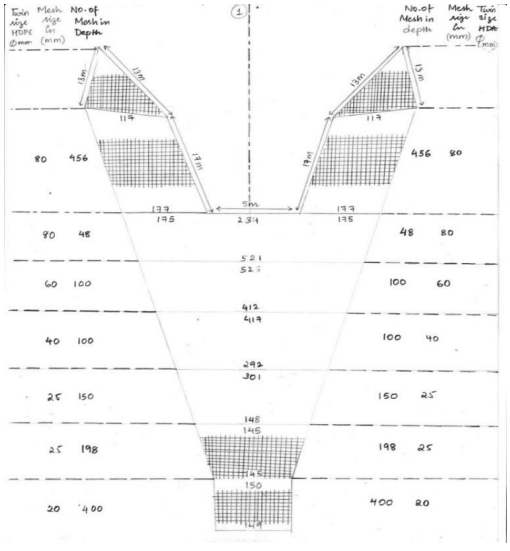
A microtiter plate method for effective disinfection of fishing nets was developed

CHIEF FINDINGS

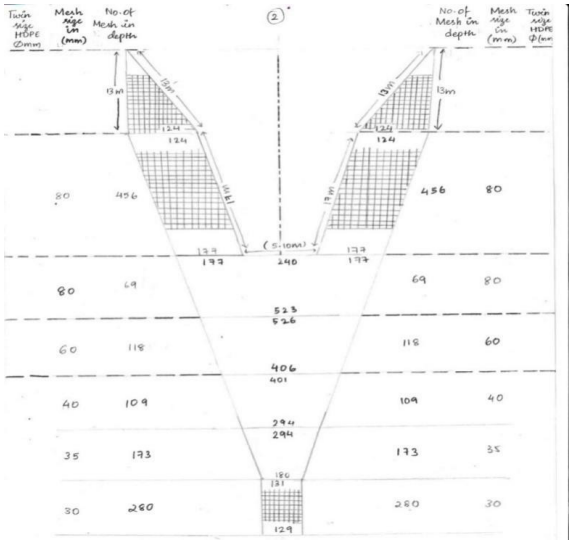
1. Development of Smart Trawls Systems for the North East maritime states of India

Design of a sustainable and low-energy trawls

Based on the survey and analysis of the existing trawl designs of Andhra Pradesh, new 35 m trawl with 20 mm square mesh cod end and 35.2 m trawl with 30 mm square mesh cod end were developed to improve efficiency and sustainability. Key features of the trawls includes square mesh attachments in the wings, throat, and belly, allowing for better water flow and reduced bycatch, complete square mesh cod-end tapering from 80 mm to 20 mm to ensure the escape of juvenile fish and non-target species, use of lightweight materials for reduced drag and lower energy consumption, buoyant natural materials for floats, such as wood and cork and sisal ropes and vertical slotted otter doors to enhance operational efficiency.



35m sustainable and low energy trawl with 20 mm square mesh cod end



35.2m sustainable and low energy trawl with 30 mm square mesh cod end

Evaluation of sisal fibre for ropes in trawl nets

Key mechanical parameters of the sisal fibre were analyzed to determine its suitability as a core material for the development of biodegradable ropes. The break load of the sisal fibre was 12.34±3.36 N. The elongation percentage was found to be 2.62±0.52%, indicating the fibre's ability to stretch before failure. While sisal is known for its rigidity and lower elongation properties compared to synthetic fibres, its elongation is sufficient when combined with flexible biodegradable plastics to improve the elasticity and durability of the final rope.

2. Interventions for ensuring diversity and quality of products from aquatic resources of East Coast through innovative technologies

Shelf life assessment of phosphate treated and frozen stored *P. vannamei* shrimp

Quality assessment of IQF P. vannmei shrimp stored in a commercial cold store over a period of 18 months was carried out. Major quality changes observed between phosphate treated and control samples were associated with thawing loss, cook loss, color and texture. Hardness and chewiness values of phosphate treated shrimp were higher than that of non-treated shrimp. Non phosphate treated shrimps exhibited higher thaw loss and cooking loss than treated shrimp. Throughout 18 months of storage, color and appearance of treated sample were better than control samples in case of raw shrimp where as it was vice-versa for the cooked shrimps. The overall acceptability of shrimp reduced from an initial score of 9 to 6.85 and 6 after 18 months frozen storage period, respectively for phosphate treated and control samples.

Control shrimp after 18 months frozen storage

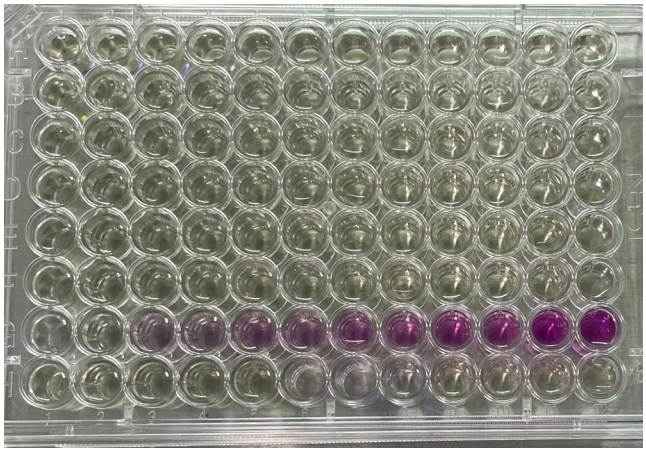
Phosphate treated shrimp after 18 months frozen storage

Control shrimp after cooking

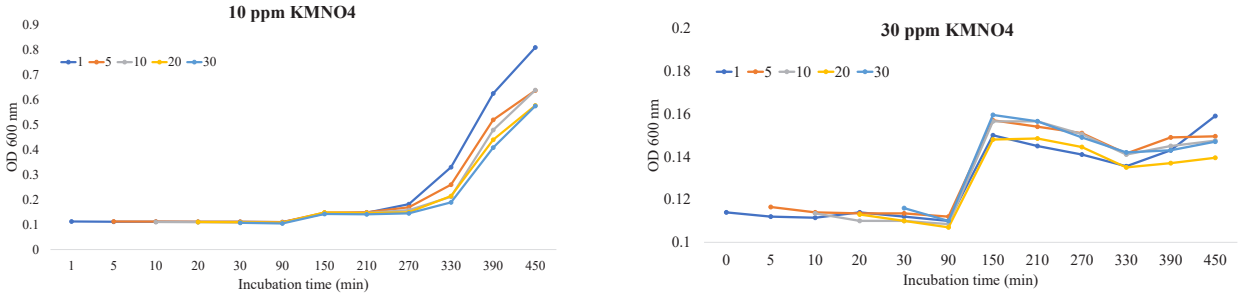
Phosphate treated shrimp after cooking

Process standardization of microtiter plate disinfection method for fishing nets

The concentration and exposure time of disinfecting fishing nets with $KMnO_4$ were standardized by a microplate titer method. Five concentrations of $KMnO_4$ and five exposure times were tested on sterile nylon thread spiked with *Vibrio parahaemolyticus* type culture (ATCC 17802), cocktail of 20 *V. parahaemolyticus* isolated from white gut disease affected shrimp, and cocktail of 20 antimicrobial resistant *E. coli* isolated from shrimp farms and fish farms. Disinfection of nylon nets with $KMnO_4$ eliminated *V. parahaemolyticus* and AMR *E. coli*. Moreover, $KMnO_4$ treatment resulted in minimal changes in the physical attribute of nylon even after 10 days of soaking, indicating that the use of $KMNO_4$ does not cause severe damage to the fishing net.



Microtiter plate method



Effect of different concentrations of potassium permanganate and dipping time on V. parahaemolyticus cocktail

Preparation of shrimp paste from small sized *P. vannamei*

Shrimp paste was prepared from small sized *P. vannamei* shrimp using salt, protease enzyme and/or fermented fish. Fermentation was done for a period of three weeks. Quality of laboratory prepared and commercially available shrimp pastes were compared. Commercial shrimp paste has lower protein content as compared to laboratory prepared shrimp paste. Total aerobic count of one of the commercial samples was dominated by *Bacillus* sp. and had higher yeast and mould counts which is beyond the maximum limit of 500 cfu/g for fermented products. Yeast and mould were not detected in the study and total bacterial count was in the range of $1x10^5$cfu/g to $4.2x10^6$cfu/g.

Biochemical and microbial quality of shrimp paste prepared from small sized P. vannamei

Parameters	Commercial shrimp paste	Control	T1	T2	T3
Protein (%)	10.10	16.10	19.90	24.74	24.97
pH	6.19	7.55	7.58	6.71	7.20
TBARS (mg MDA/kg)	0.66	0.70	0.33	0.60	0.39
L*	23.39	49.16	22.98	24.67	50.30
Total aerobic plate count (cfu/g)	$2.9x10^3$	$2.34x10^5$	$1x10^5$	$8.1x10^5$	$4.2x10^6$
Yeast and mold count (cfu/g)	$3x10^4$	Nil	Nil	Nil	Nil

Control: homogenized shrimp and 10% salt; T1: homogenized shrimp, 10% salt and 0.5% protease; T2: homogenized shrimp, 10% salt and 0.05% (w/w) fermented fish and T3: homogenized shrimp, 10% salt and 0.1% (w/w) fermented fish

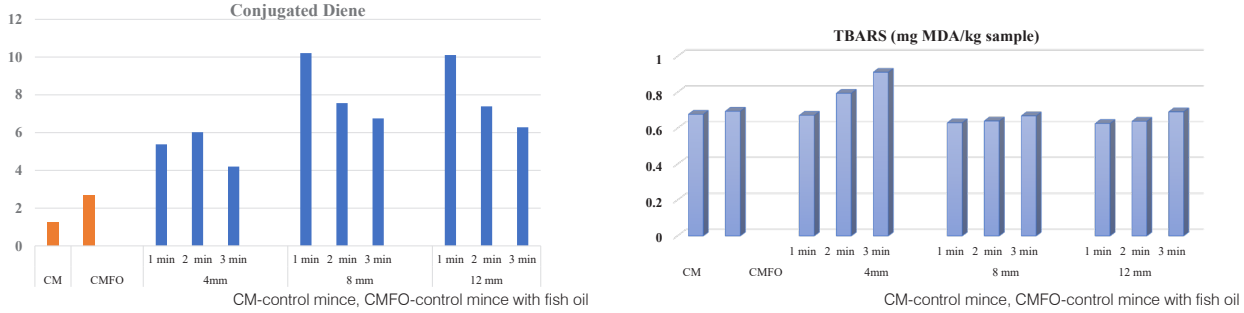
Preparation and characterization of protein hydrolysates from *M. meretrix*

Protein hydrolysates were prepared from *M. meretrix* using three different commercial enzymes (trypsin, papain and flavoenzyme) and the nutritional and functional properties of the hydrolysates were compared. Trypsin produced more soluble peptides followed by flavoenzyme and papain. Accordingly, the functional properties such as foaming capacity, emulsifying activity and antioxidant activities also showed a similar trend. Hence, trypsin enzyme was selected for preparing more biologically active hydrolysates from *M. meretrix*.

Clam protein hydrolysate

Effect of UV-C radiation on the lipid oxidation of fish oil

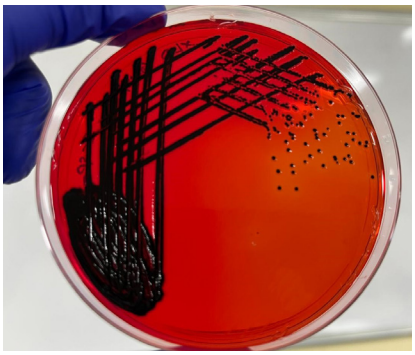
The effect of different UV-C on the lipid oxidation in fish oil-fish mince model system was evaluated. Fish oil emulsion prepared with washed tilapia mince was subjected to UV-C radiation at different thickness level and time of exposure. The dosage of UV-C radiation was kept constant as 0.402 mw/cm2. UV-C treatment accelerated the lipid oxidation in fish mince-fish oil emulsion. The primary lipid oxidation indices such as peroxide value and conjugated dienes increased as the thickness of



Effects of UV-C treatment on primary and secondary lipid oxidation of fish oil-fish mince emulsion

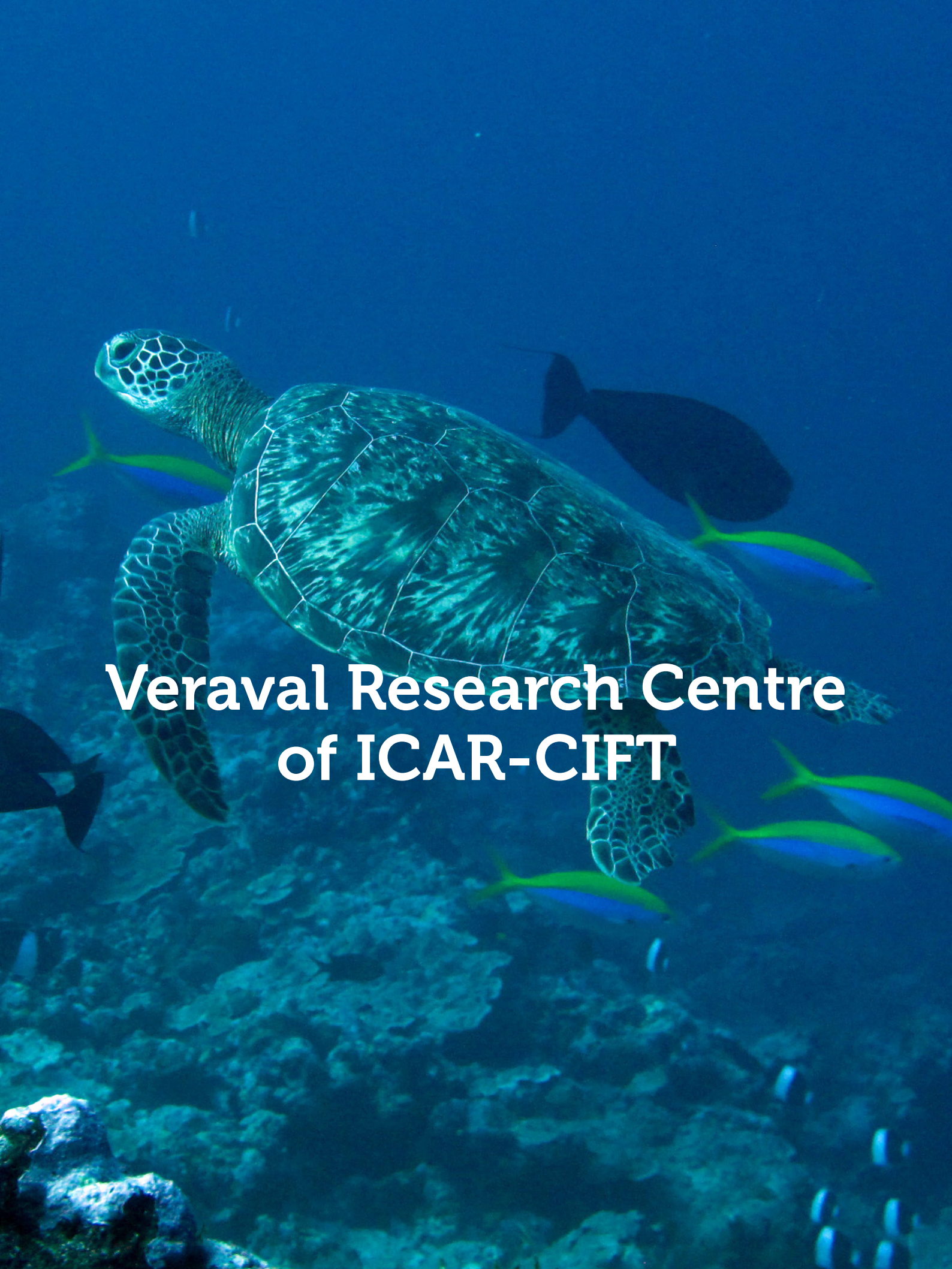
emulsion increased. In contrast, the secondary oxidation indices such as TBARS and Anisidine value showed a reduction with an increase in the thickness of fish mince. The results showed that the thickness of the emulsion had a major influence on lipid oxidation than the time of exposure as marked variation in lipid oxidation indices was noticed between different thickness levels.

Incidence of *Salmonella spp.,* in retail fish markets of Visakhapatnam



Salmonella* spp., *on Xylose Lysine Deoxycholate Agar

Incidence of *Salmonella* spp., in fish and shrimps from retail fishes of Visakhapatnam, Andhra Pradesh were evaluated. Out of the 60 fish samples collected from different retail markets, three samples were positive for *Salmonella spp.,* and the incidence of Salmonella in retail fishes was 2.2%.



Veraval Research Centre of ICAR-CIFT

Institute Projects

1. Harvest and post-harvest interventions in marine resources available along Saurashtra coast

Most Significant Achievements

Risk assessment of toxic heavy metals were determined in commercially important fishes of the Saurashtra coast

Cold extraction process using 4% NaOH at normal temperatures was found to be optimal for producing high-quality chitin and chitosan from squid pen waste

Engraved catfish (*Nemapteryx caelata*) with 2% liquid smoke maintained overall quality for up to 50 days when stored at (2±1°C)

Ozone treatment extended the shelf life of mackerel by 7 days under chilled storage

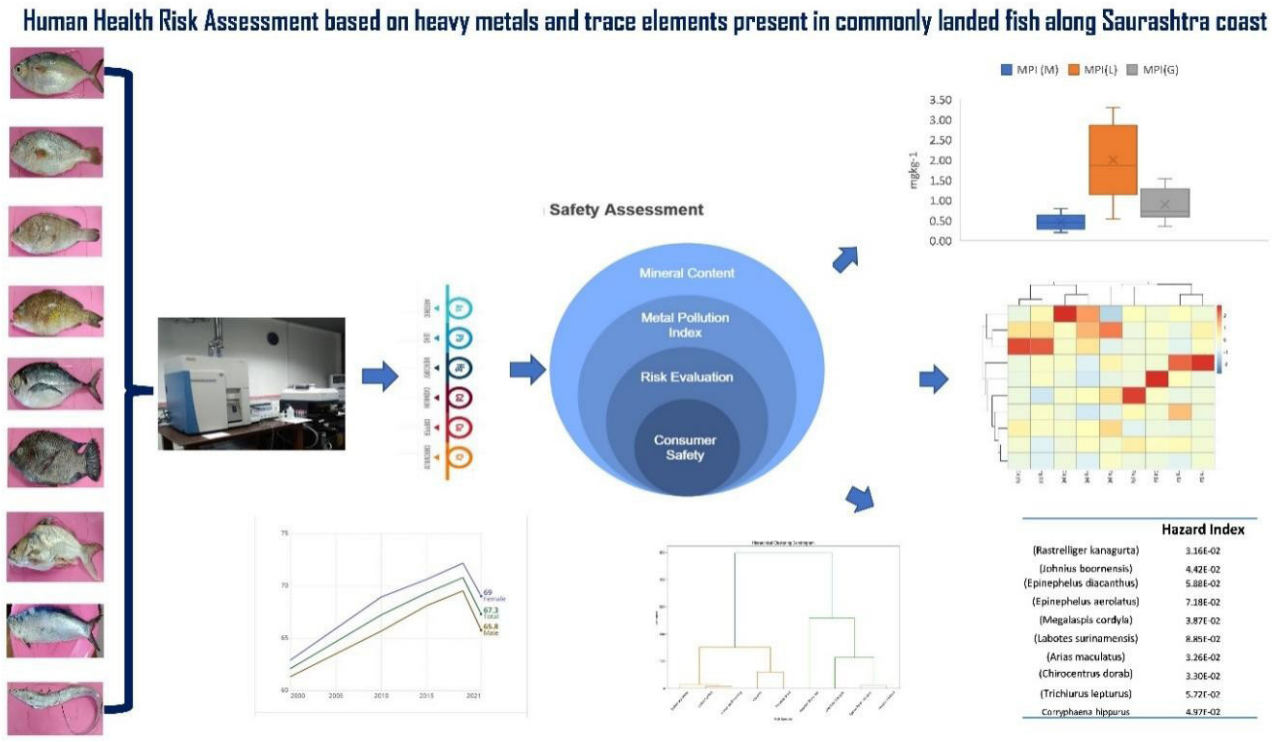
Bycatch of purpleback flying squid (*Sthenoteuthis oualaniensis*) in the deep-sea tuna gillnet fishery of the northwest coast of India was estimated

CHIEF FINDINGS

Harvest and post-harvest interventions in marine resources available along Saurashtra coast

Heavy metals in fish

Hazard Quotient, Hazard Index, and Metal Pollution Index of locally available fishes were within the safe limits, and there is no potential carcinogenic and non-carcinogenic risk associated with the heavy metals and trace minerals present in commonly landed fish species along the Saurashtra coast.



Extraction of β-chitin from squid pen

The protocol for the extraction of β-chitin from squid pen was standardised. The cold extraction method using 4% NaOH concentration at room temperature for longer deproteinisation was found to be optimal for producing high-quality chitin and chitosan. Longer incubation times at lower temperatures allow for effective removal of proteins and minimise degradation of the chitin molecule, resulting in high-quality chitin. Use of lesser amount of chemicals and no use of heat energy in the extraction process makes it more economic.

Hot extraction

Cold extraction

β-Chitosan in food coating application

Beta chitosan was used as chitosan-glaze in frozen squid tubes for enhancing the quality of the product. Optimisation using RSM was done, and the accelerated quality analysis has been carried out. Maximum uptake of chitosan glaze was noticed at 0.6% concentration, and the coated product was observed to have good quality and shelf life.

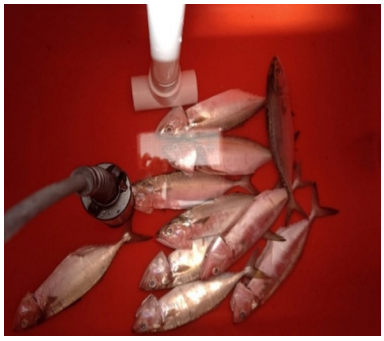
Liquid-smoked sausage prepared from Marine Engraved Catfish (*Nemapteryx caelata*)

Incorporation of liquid smoke at a 2% level significantly improved the physicochemical properties of sausage prepared from Marine Engraved Catfish (*Nemapteryx caelata*) by imparting antioxidant and antimicrobial properties and by influencing the textural attributes.

Sausage with liquid smoke (LS) content retained good-to-better sensory attributes upto day 60 compared to control (day 50) under chill storage in PA casing packed in LDPE pouches. The total viable count of control and LS sausages reached the limit of acceptability on the 40th day and on the 50th day of storage, and the psychrophilic bacterial count of control and LS sausages reached the limit of acceptability by the 50th and 60th days, respectively.

Process parameters for ozone treatment in fish

The effect of ozone on the quality of mackerel was studied. Ozone was given by an ozone generator at a rate of 5 g ozone/h into a closed container having 30 L water. Ozone treatment extended the shelf life of mackerel for 7 days under chilled storage.



Biochemical characteristics of fish meal

Fishmeal samples analyzed for proximate composition and quality assessment revealed moisture (%), protein (%), lipid (%) and ash (%) content of 8.64±0.33, 51.23±4.73, 7.95±0.91 and 23.34±1.04, respectively. FFA, PV, TVBN, TMA and sodium chloride were 3.67±0.01 (as % oleic acid), 7.18±0.05 (m.Eq.O2/kg fat), 77.38±13.13 (mg/100g), 20.28±9.83 (mg/100g) and 3.26±0.43 %, respectively.

Food loss assessment in gillnets by puffer fish depredation

Food loss from the small-scale gillnet operated off Saurashtra coast has been assessed and 10-15% food loss has been recorded due to depredation by puffer fish.

Food loss due to depredation by puffer fish

Mumbai Research Centre of ICAR-CIFT

Institute Projects

1. Assessment of fish harvest and post-harvest technological aspects and mitigation measures for problems with special reference to Maharashtra
2. Innovative technology interventions to address challenges prevalent in fish harvest and post-harvest sectors of Maharashtra

Most Significant Achievements

A solar drying-based method was developed for preparing Sooka soda from *Metapenaeus monoceros*, with improved nutritional quality, higher protein content, and longer shelf life

Experimental trials of square mesh and double cod-end dolnets significantly reduced bycatch mortality in Karanja Creek, alongside technology dissemination to local Scheduled Caste fishers

Taxonomic, morphometric, and nutrient profiling of 45 fish/shellfish species off Maharastra coast were completed

Systematic mapping of fishing methods across eight coastal sites in Maharashtra highlighted eco-friendly gear adoption and key operational challenges like high fuel cost, gear inefficiency, and bycatch, emphasizing the need for policy and technological upgrades

CHIEF FINDINGS

1. Assessment of fish harvest and post-harvest technological aspects and mitigation measures for problems with special reference to Maharashtra

Standardised method for preparation of *Sooka soda*

A method was standardised for preparing Sooka soda from *Metapenaeus monoceros* using a solar dryer resulting in higher protein content, lower salt concentration, and better acceptability than commercial samples. Nutritional profiling and storage studies showed a 11-month shelf life at room temperature, compared to 7 months for market samples. The methodology was established, and the product underwent drying, nutritional analysis, and storage studies, confirming its superior quality and extended shelf life.

Sooka soda

Documentation of fishing techniques and associated challenges in fishing sector of selected sites in Maharashtra

A detailed study across eight sites in Maharashtra found that fishing methods and gear vary widely, with a trend towards eco-friendly materials like fiber-reinforced polymer. However, issues such as high fuel costs, excessive bycatch with dolnets, and low efficiency in gill nets were noted. The study highlights the need for better technology and smarter policies to make fishing more sustainable and effective.

Experimental trials of modified dolnets to reduce bycatch percentage and mortality rate of unintentional catch

Experimental trials of square mesh and double cod-end dolnets in Karanja Creek, Raigad district reduced bycatch mortality. A three-day training session at Kalote reservoir introduced these modified dolnets and framed gill nets to 15 Scheduled Caste trainees, in collaboration with Khumari Commune International Trust.

The project investigates indigenous inland fishing crafts and gears across Maharashtra, focusing on regions such as Marathwada, Western Maharashtra, and Vidarbha. Field visits to rivers like the Lendi, Krishna, Bhogawati, and Wainganga revealed a diverse range of traditional crafts including coracles, dugout canoes, thermocol rafts, and flat-bottomed boats, made from locally available materials like bamboo, wood, thermocol, and recycled plastic. Fishing gears such as gill nets, cast nets, drag nets, traps, and hooks are crafted using nylon, cotton thread, coir, bamboo, and jute, reflecting region-specific adaptations to local water conditions. Commonly targeted species include Catla, Rohu, Tilapia, *Channa spp., Mystus* spp., *Wallago attu,* and prawns. Challenges identified in reservoir fishing include the unsuitability of traditional crafts in deep waters, gear inefficiency in high-flow or stratified zones, sudden dam water releases, and lack of standard fishing infrastructure. To address these issues, biodegradable Fish Aggregating Devices (FADs) were introduced, made from bamboo, coir rope, jute bags filled with stones, coconut leaves, shells, and cotton strips. These eco-friendly structures mimic natural habitats, attract fish to deeper zones, improve catch efficiency, reduce ghost fishing, and offer a cost-effective, sustainable solution that supports traditional fishing practices in inland reservoirs.

2. Innovative technology interventions to address challenges prevalent in fish harvest and post-harvest sectors of Maharashtra

Taxonomic identification and morphometric measurements of fish/ shellfish along the Maharashtra Coast

During the period from June 2024 to March 2025, 45 species of fish/ shellfish collected from 6 landing centers in Mumbai, Thane and Raigad districts of Maharashtra viz. Sasoon dock, Versova, Bhaucha dhakka, Vashi Gaon, Karanja Jetty and, Diwale Jetty were taxonomically identified, morphometrically measured and analyzed for proximate composition, amino acid profiling, mineral profiling and free fatty acid profile.

The fish and shellfish species analyzed exhibited wide variation in body dimensions and weights, ranging from 1.44 cm to 28.6 cm in width and 14.28 g to 1670 g in weight. Larger species like *Arius arius, Sphyraena putnamae*, and

Euthynnus affinis were among the heaviest, exceeding 900 g. In contrast, small pelagic and demersal species such as *Coilia dussumieri, Engraulis albidus,* and *Metapenaeus brevicornis* had significantly lower weights, below 20 g. This diverse range in size and weight highlights the varied morphological and ecological traits of marine resources along the studied coast. Mincing yields among the evaluated fish and shellfish species ranged from 22.63% to 83.54%. The lowest yield was observed in *Arius arius* (22.63%), while the highest was in *Coilia dussumieri* (83.54%), indicating significant variation based on body composition and texture.

SN: *Arius arius*
CN: Speratasinghala/ Treadfin sea catfish
LN: Shingada
Code: A-14/06

SN: *Tenulosatoli*
CN: Toli shad
LN: Bhingi
Code: C-26/06

SN: *Mugil cephalus*
CN: Striped grey mullet / Flathead grey mullet
LN: Bouy
Code: E-30/07

SN: *Needlescales queenfish*
CN: Scombroidestol
LN: Fala
Code: B-14/06

SN: *Urocangerlepturus*
CN: Slender conger
LN: Vam
Code: D-26/06

SN: *Alectis indica*
CN: Indian threadfish
LN: Chand
Code: A-20/08

SN: *Megalopescyprinoides*
CN: Indo pacific tarpon
LN: Vadashi
Code: C-14/06

SN: *Lutjanus argentimaculatus*
CN: Mangrove red snapper
LN: Tam
Code: E-26/06

SN: *Caranx ignobilis*
CN: Giant trevally
LN: Narba
Code: B-20/0

SN: *Polydactylesmullani*
CN: Arabian blackspot treadfin
LN: Sawala
Code: D-14/06

SN: *Scatophagus argus*
CN: Spotted scat
LN: Vada
Code: A-30/07

SN: *Sphyraena putnamae*
CN: Sawtooth barracuda
LN: Barracuda
Code: C-20/08

SN: *Sauridatumbil*
CN: Greater lizardfish
LN: Chorbombil
Code: E-14/06

SN: *Lactariuslactarius*
CN: White fish / False trevally
LN: Saundala
Code: B-30/07

SN: *Chirocentrusnudus*
CN: Whitefin wolf-herring
LN: Karli
Code: D-20/08

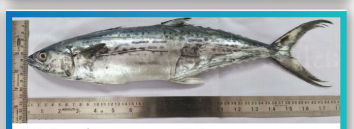
SN: *Lates calcarifer*
CN: Asian sea bass
LN: Jitada
Code: A-26/06

SN: *Sardinella aurita*
CN: Round sardinella
LN: Kateri
Code: C-30/07

SN: *Otolithoidesbiauritus*
CN: Bronze croaker
LN: Kota
Code: E-20/08

SN: *Acanthopgrusberda*
CN: Picnic seabream/ Goldsilk seabream
LN: Chawari
Code: B-26/06

SN: *Sillagociliata*
CN: Ladyfish / Silver sillago
LN: Muddushya
Code: D-30/07



SN: *Scomberomorus guttatus*
CN: Indo pacific king mackerel/ king fish
LN: Surmai
Code: A-18/09

SN: *Parastromateusniger*
CN: Black pomfret
LN: Halwa
Code: B-18/09

SN: *Scomberoideslysan*
CN: Doublespotted queenfish
LN: Falai
Code: D-30/09

SN: *Rhizoprionodonacutus*
CN: Milk shark
LN: Mushi
Code: A-03/12

SN: *Dasyatis ushiei orMyliobatoidei*
CN: Cow Stingray or Stingray
LN: Pakat
Code: C-18/09

SN: *Terapon puta*
CN: Silver croaker
LN: Navanda / Navari
Code: E-30/09

SN: *Fenneropenaeus indicus*
CN: Indian white prawns
LN: White prawns
Code: B-03/12

SN: *Euthynnusaffinis*
CN: Mackerel Tuna or Little Tuna
LN: Kupa
Code: D-18/09

SN: *Carangoides malabaricus*
CN: Malabar trevally
LN: Khapi
Code: A-07/11

SN: *Harpadonnehereus*
CN: Bombay Duck
LN: Bombil
Code: C-03/12

SN: *Acanthopagrus latus*
CN: Black sea bream
LN: Karkara
Code: E-18/09

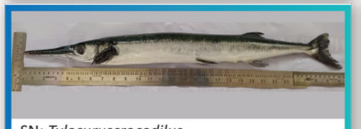
SN: *Otolithesruber*
CN: Croaker
LN: Dhoma
Code: B-07/11

SN: *Uroteuthisduvaucelii*
CN: Indian squid
LN: Makul
Code: D-03/12

SN: *Elagatisbipinnulata*
CN: Japanese amberjack
LN: Mungus
Code: A-30/09

SN: *Coilia dussumieri*
CN: Golden anchovy
LN: Mandeli
Code: C-07/11

SN: *Pampus chinensis*
CN: Chinese pomfret
LN: Khapri
Code: E-03/12



SN: *Tylosuruscrocodilus*
CN: Needlescaled queenfish
LN: Tolka
Code: B-30/09

SN: *Acanthopagrusberda*
CN: Goldsilk seabream
LN: Shitka
Code: D-07/11

SN: *Rastrelligerkanagurta*
CN: Indian mackerel
LN: Bangda
Code: A-24/01

SN: *Megalaspiscordyla*
CN: Torpedo scad
LN: Kath bangda
Code: C-30/09

SN: *Cynoglossusmacrostomus*
CN: Malabar tongue sole
LN: Lepa
Code: E-07/11

SN: *Nemipterus japonicus*
CN: Pink perch
LN: Rani masa
Code: B-24/01

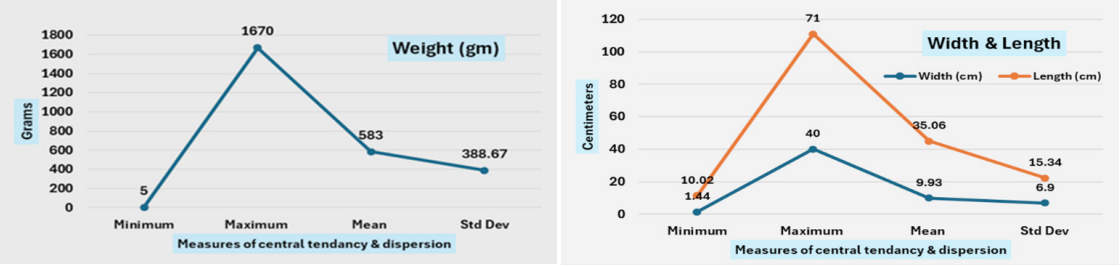
SN: *Sardinella longiceps*
CN: Indian oil sardine
LN: Tarli
Code: C-24/01

SN: *Engraulis albidus*
CN: White anchovy
LN: Modaka
Code: D-24/01

SN: *Fenneropenaeus chinensis*
CN: Chinese fleshy prawn
LN: Lal jhinga
Code: E-24/01

Taxonomic and morphometric measurements details of collected fish/ shellfish species

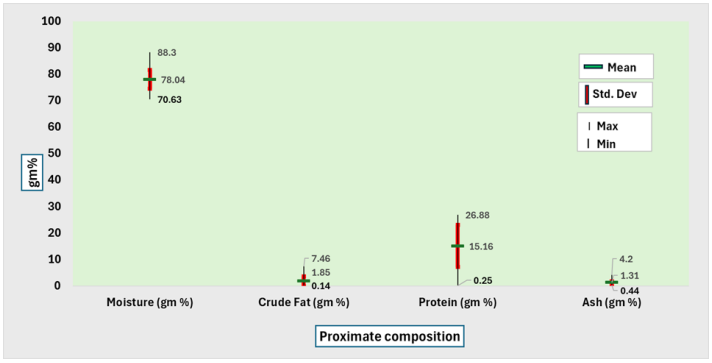
The samples measured exhibited a very wide range in weight, from a minimum of 5 grams to a maximum of 1670 grams. The average weight of the samples was 583 grams



Morphometric measurements of 45 fish/shellfish species

Determination of proximate composition of fish/shellfish along the Maharashtra Coast

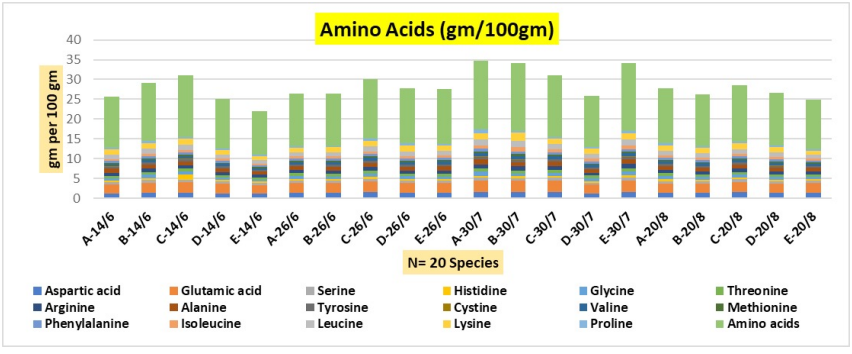
Proximate composition of fish/ shellfish species revealed a moisture content averaging around 78% with a notable spread, ranging from about 70.6% to 88.3%. The crude fat content was relatively low, with an average of 1.85%. However, there's a very wide range, from almost negligible fat (0.14%) to a higher value of 7.46%, suggesting significant variability in fat content. The protein content was moderate, averaging 15.16% with a very large spread, ranging from very low (0.25%) to quite high (26.88%). The ash content was low, averaging 1.31% showing some variability ranging from 0.44% to 4.2%.



Proximate composition of fish/shellfish species

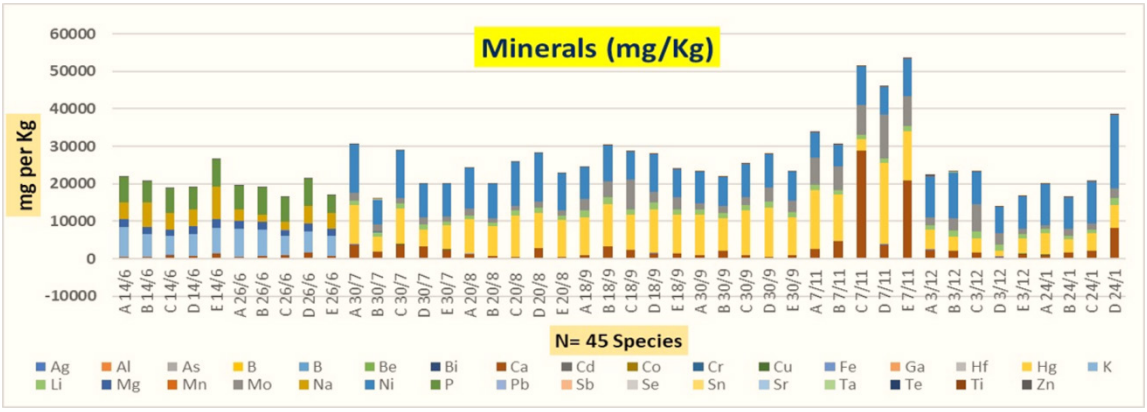
Amino acid profile of fish/ shellfish along the Maharashtra Coast

Amino acid profile of fish/shellfish revealed a total amino acid content ranging from approximately 25 gm/100gm to 35 gm/100gm. Aspartic acid and glutamic acid appear to be consistently among the most abundant amino acids across almost all species. Leucine, Alanine, and glycine also seem to contribute significantly to the total amino acid profile in many samples.



Amino acid profile of fish/shellfish species

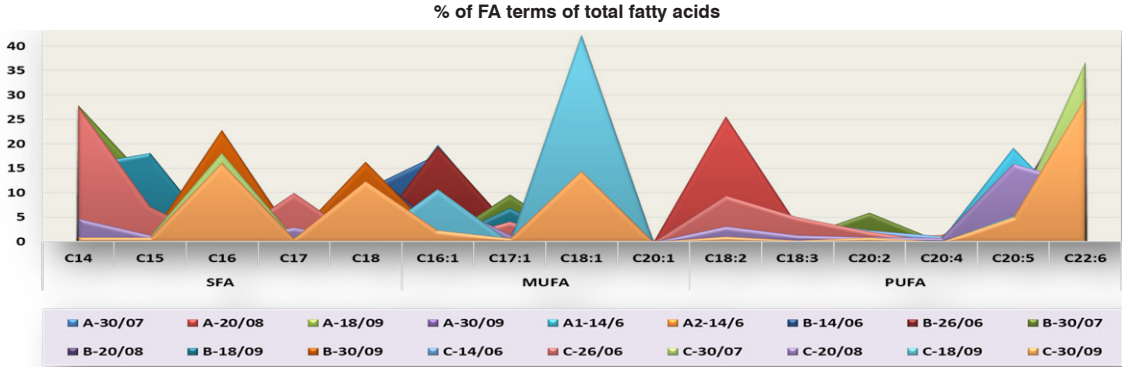
Mineral profile of fish/ shellfish along the Maharashtra Coast



Minerals profile of 45 fish/shellfish species

Mineral profile of fish/shellfish revealed high content of calcium (Ca), magnesium (Mg), potassium (K), sodium (Na) and phosphorus (P) in all the species. Calcium content ranged from 255.5 to 28903 mg/Kg. Magnesium content ranged from 963.3 to 2407 mg/Kg. Potassium content ranged from 1569 to 21744 mg/Kg. Sodium content ranged from 1003 to 8756 mg/g. Phosphorus ranged from 4747 to 19564 mg/Kg. Iron content ranged from 17.24 to 182.8 mg/Kg. Content of zinc was ranging from 13.65 to 341.3 mg/Kg. Manganese was in the range of 0.94 to 7.3 mg/Kg. Content of cadmium exceeded the acceptable level in one sample at a level of 1.37 mg/Kg and in others it was in the range of 0.033 to 0.26 mg/Kg. Presence of mercury was detected in 3 samples and exceeded the acceptable limit in 2 samples (0.74 and 1.02 mg/Kg). Lead was not detected in any of the samples.

Fatty acid composition of fish/shellfish along the Maharashtra Coast

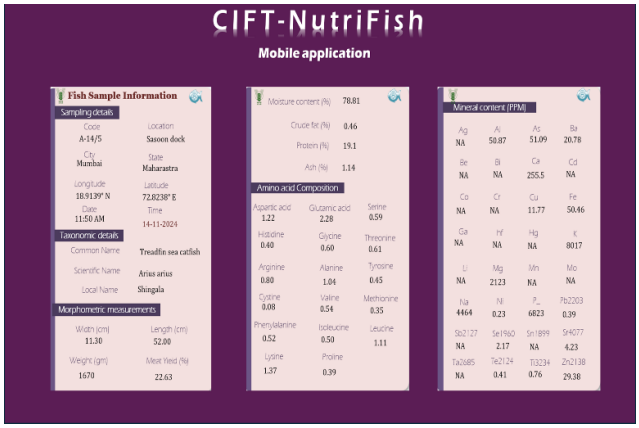


Fatty acid composition of fish/shellfish species

Fatty acid composition varied significantly between different samples. Some samples have a very distinct fatty acid profile compared to others. The sample represented by the turquoise line (A1-14/6) is overwhelmingly dominated by C18:1, while others have a more balanced distribution.

Development of database of nutrient composition of fish and shellfish occurring along the Maharashtra Coast

The draft of CIFT-NutriFish mobile/ web-based Application is ready for development database on nutritional composition of fish and shellfish occurring along Maharashtra coast.



CIFT- NutriFish mobile / web-based Application

Microbial quality of seafood products sold in Maharastra

The Total Plate Count of 35 seafood products from local markets across Maharashtra, including Vashi, Panvel, Kharghar, and Pune ranged from 3.39×10^5 to 2.56×10^7 cfu/g. While, Staphylococcus and Salmonella were not detected in any samples, *V. parahaemolyticus* was present in four samples.

Externally Funded Projects

International Projects

1. Future refrigeration India-INDEE+(Indo-Norwegian)
2. Establishing value chain for fish: ensuring the nutritional security of vulnerable groups and developing a sustainable model (Worldfish)
3. Transforming Agri-food Systems in South Asia (TAFSSA) (One CG IDTs of International Rice Research Institute (IRRI))
4. Detection of zoonotic parasite *Anisakis* spp. through molecular tools: An emerging public health concern (Indio-ASEAN)

National Projects

5. NAIF-Zonal Technology Management & Agribusiness Incubation Center (*given in page: 161*)
6. All India Network Project on Fish Health
7. All India Network Project on AMR (FS2)
8. All India Network Project on AMR (FS5)
9. Production systems, Agribusiness and Institutions, component- 1 Impact of Agricultural Technology-Fishery Technology
10. Development of millet based novel ready To Eat-RTE smart functional foods fortified with fish protein and lipid for entrepreneurship development in the state of Kerala
11. STI Hub for Socio-economic Empowerment of SC Community of Union Territory of Puducherry through Technology-Assisted Fish Farming Fish Processing and Value Addition
12. Developing a biorefinery workflow for high value nutraceuticals from seaweed by green chemistry approach
13. Establishing comprehensive targeted and untargeted analytical workflows for risk assessment of residues, emerging contaminants, and antimicrobial-resistant bacteria in retail fish and fish products
14. Micro-and nano-plastics as emerging food contaminants: Establishing validated methodologies and understanding the prevalence in different food matrices
15. The pilot scale implementation of Smart packing technology: fish freshness indicator at field level to enhance domestic fish consumption
16. The pilot scale demonstration of Seaweed based feed production for fish and shrimps
17. Marine mammal stock assessment in India
18. Development and popularization of fuel-efficient long-lasting otter board for greening the trawl fishing sector of India
19. National surveillance Programme for Aquatic Animal Diseases – Phase II
20. Development of biodegradable fishing nets for combating plastic pollution in Maharashtra State
21. Assessment of Abandoned, Lost and Discarded Fishing Gears (ALDFG) along the Maharashtra Coast and exploration of possible solutions for creating circular economy from retrieved fishing gears
22. Study on alternate fuel and energy systems for fishing vessels in Maharashtra
23. A detailed Foodomics study for food authentication and exploration of nutraceutical potential
24. Deployment and maintenance of Wave Rider Buoy off Veraval and development of Jellyfish and sardine advisories
25. Matrix specific phage formulations for the bio-control of enterotoxigenic Methicillin sensitive and resistant *Staphylococcus aureus* of safety concern
26. Development of portable fish freshness assessment sensor

27. Lipidomics and vibrational spectroscopy based chemoinformatics for comprehensive assessment of quality in seafood supply chain
28. Unravelling the true microbiome of finfish and shellfish during spoilage: Towards the development of rapid detection kit for fish spoilage
29. Marine fishery in kerala: A study on evolution of policy, cost and earnings of fishing units and income of fisher households
30. Harnessing climate finance for financial inclusion of small-scale fish processors: empowering women in fisheries

1. Future Refrigeration India: INDEE+

In a move aimed at transforming seafood processing, the CO_2 cascade refrigeration system, developed through a collaboration between ICAR-CIFT Kochi and NTNU-Norway, was commissioned at the identified seafood industry, Kochi. This technology promises to elevate India's seafood exports while championing environmental sustainability. It can freeze octopus and cuttlefish at an incredibly low temperature of -43°C, ensuring high efficiency and minimal environmental impact. This research initiative aligns with India's efforts to reduce greenhouse gas emissions, as outlined in its nationally determined contributions (NDC). It is also expected that the CO_2-based IQF freezer will set new benchmarks in seafood processing.

Compressor rack installed at an identified seafood industry, Cochin

2. Establishing value chain for fish: ensuring the nutritional security of vulnerable groups and developing a sustainable model

Survey on the demographic and household characteristics was conducted to provide a foundation for understanding the community's fish consumption patterns and nutritional requirements. When fish consumption pattern was assessed, weekly consumption patterns was found to be most common, with 42.1% consuming fish 2–3 times a week, and 43.6% consumed it once in a week. This reflects the significance of fish as a source of nutrition and its cultural importance in rural diets. In terms of species preference, Rohu emerged as the most preferred fresh fish, chosen by 46.6% of respondents followed by Catla and Common Carp. The study also explored dried fish consumption in the region, meal preferences and preparation techniques, spending patterns on fish, potential for value-added fish products.

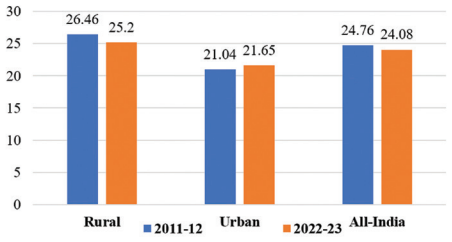
Additionally, aspects such as nutritional awareness existing nutritional gaps, and socioeconomic implications were studied to analyse the interplay between socioeconomic factors and fish consumption patterns. Promoting sustainable fish farming and value addition can simultaneously address nutritional gaps and create economic opportunities for rural communities. Over all, the study provides a comprehensive understanding of fish consumption patterns and nutritional challenges, offering actionable recommendations for policymakers, market players, and community stakeholders to improve health outcomes and livelihoods.

3. Transforming Agri-food Systems in South Asia (TAFSSA)

Fish consumption pattern of Indian households

Based on the NSSO data of 2022-23, the share of households consuming fish was 26.46 percent in rural areas and 21.04 percent in urban areas in 2011-12, and 25.2 per cent in rural areas and 21.65 per cent in urban areas in 2022-23. There was wide variation among states in the proportion of population who consume fish.

The average per capita quantity of fish consumed per household (Kg) per year was about 3.67 kg, which was marginally higher than that emerged during the previous survey years (2011-12).



Household fish consumption behaviour in Kerala

A survey was conducted in the households of Kerala, from three districts of Ernakulam, Kottayam and Idukki to understand the household fish consumption behaviour and its determinants.

Also analysed the sources of fish purchase; accessibility and adaptation; perception of fish price, quality, accessibility options; perception on fish quality and safety; food safety in fish consumption; environmental interaction and sustainability; and traceability in the fish value chain and the dimensionalities in fish consumption.

4. Detection of zoonotic parasite *Anisakis* spp. through molecular tools: An emerging public health concern

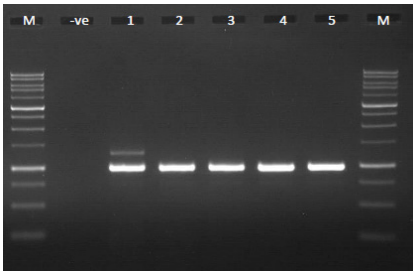
Visit of Malaysian and Indonesian partners of the project

Malaysian Lead PI, Dr. Kua Beng Chu (15th – 21st December 2024), Indonesian Lead PI, Dr. Dewi Syahidah (16th February to 1st March 2025) and Malaysian Co-PI Dr. Masazurah Rahim (16th – 23rd February 2025) visited ICAR-CIFT as part of exchange of knowledge.

Detection of zoonotic parasite *Anisakis* spp.

A total of 517 fish samples procured from fish landing centers and markets around Kochi screened for the presence of *Anisakis sp.* revealed that none of the samples were positive.

In collaborative work with one of the ASEAN partners in the project, thirty samples of scad, *Decapterus spp.* purchased from Malaysian Fisheries Development Authority (LKIM) landing site in Kuala Perlis, Perlis, Malaysia were screened for presence of Anisakis larvae. 11 Anisakid larvae obtained were washed, extracted DNA and its region of rDNA was amplified. The larvae were identified as *Anisakis typica* and were assigned Accession numbers HF911524, MZ895793, and ON188805 in the GenBank .

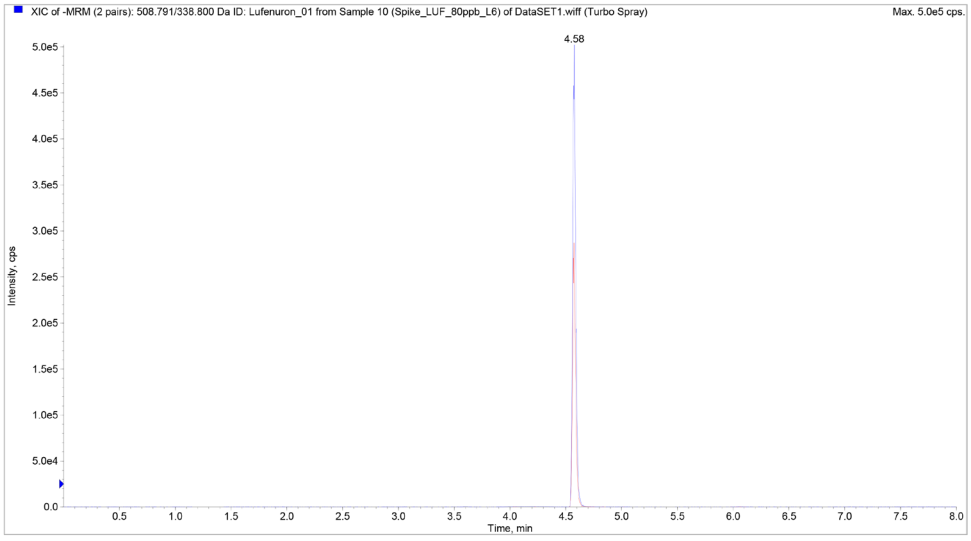


Agarose gel electrophoresis for detection of Anisakis spp.

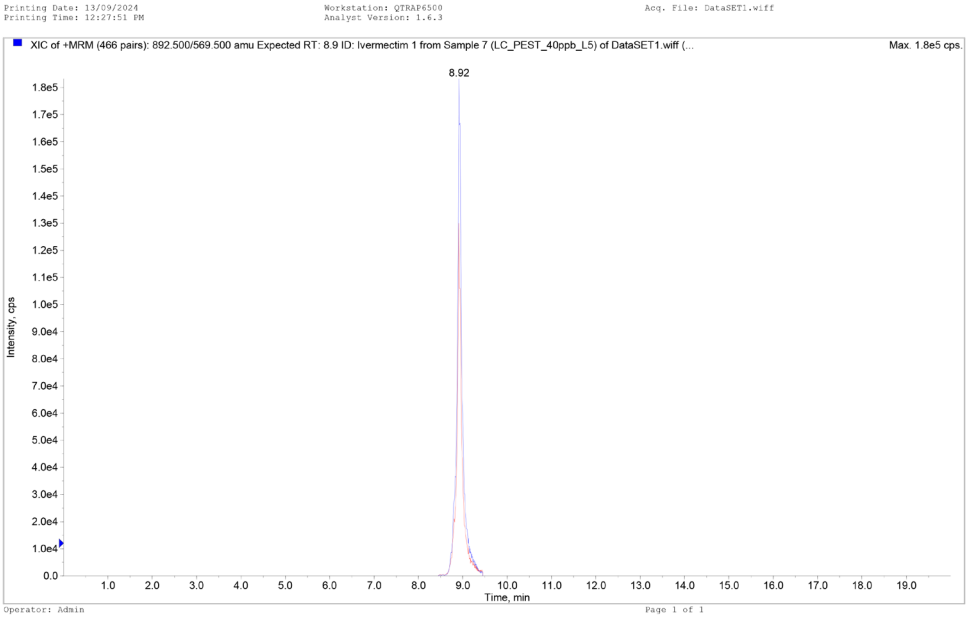
6. All India Network Project on Fish Health

Validation of Lufenuron, Praziquantel and Ivermectin analysis in fish using Liquid Chromatography-Tandem Mass Spectrometry

Residue analysis of Lufenuron, Praziquantel and Ivermectin in fish matrix was developed using QuEChERS and QTRAP Liquid chromatography tandem mass spectrometry (LC-MS/MS). EU 2021/808 requirements were followed in the optimization and validation of the developed extraction process. Linear calibration curves of correlation coefficients r≥ 0.99, were obtained for the method that exhibits good stability and accuracy.



Extracted ion chromatogram (XIC) of Praziquantel (80 µg/kg) concentration from fish



Extracted ion chromatogram (XIC) of spiked Ivermectin (40 µg/kg)

Analyte	Recovery (%, n=18)	Inter-day RSD (%, n=18)
Ivermectin	95.36±3.83	4.02
Praziquantel	94.30±2.61	2.77
Lufenuron	97.07± 3.65	5.05

Method recovery, precision and reproducibility of analytes at 100 µg kg-1 spiked level

Optimization of top-dressed Ivermectin incorporated medicated feed using Guar Gum: Method validation in fish and recovery study in feed matrices via Triple Quadrupole Mass Spectrometry

The preparation of ivermectin-medicated feed was optimized by dissolving ivermectin in dimethyl sulfoxide (DMSO) and applying it to the feed using 0.5% w/v guar gum as a wet binder. The recovery and stability of ivermectin from the feed were assessed using a validated analytical method based on QTRAP mass spectrometry, developed following the QuEChERS AOAC protocol. LC-MS/MS determination was carried out for the determination of ivermectin in feeds, showing a retention time of 8.82 min with a recovery of 95.36±3.83.

Evaluation of various drug residues in fish samples

Estimation of different drug residues such as Clotrimazole, Lufenuron, Praziquantel. Ivermectin, Enrofloxacin (as sum of Enrofloxacin and ciprofloxacin) and Oxolinic acid in samples provided by project partnering centers under All India Network project on Fish Health were extracted and analyzed using 4000 QTRAP mass spectrometry. Sample extraction, method development/standardization for estimation of drug residues and LC-MS/MS data integration were carried out at ICAR-CIFT, Cochin. Using QTRAP mass spectrometry, a total of 2251 treated samples, including internal organs, were extracted and examined. The results of the experimental samples were sent to the respective institutes for further analysis.

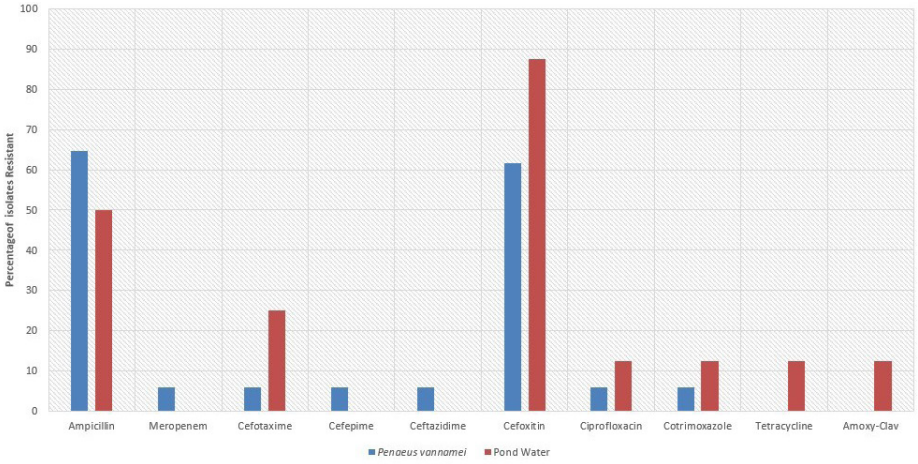
7. All India network project on AMR (FS2)

Antimicrobial Resistance of *V. parahaemolyticus* in shrimp farms

A total of 38 samples of farmed *P. vannamei* shrimp and 28 samples of pond water collected from the brackish water aquaculture shrimp farms of East Godavari and West Godavari districts of Andhra Pradesh were analysed. *V. parahaemolyticus* isolates from the farmed shrimp showed maximum resistance towards ampicillin (65%) and cefoxitin (62%) but relatively lower resistance towards cefepime (6%), cefotaxime (6%), cefoxitin (6%), ceftazidime (6%), ciprofloxacin (6%), cotrimoxazole (6%) and meropenem (6%). On the other hand, *V. parahaemolyticus* isolates from pond water showed resistance mostly towards cefoxitin (88%) ampicillin (50%), cefotaxime (25%) but lower resistance towards amoxycillin-clavulanic acid (13%) ciprofloxacin (13%), cotrimoxazole (13%) and tetracycline (13%).

Antimicrobial Resistance of *E. coli* in shrimp farms

E. coli isolated from shrimp showed resistance towards Amoxycillin-Clavulanic acid and Staphylococci isolated from shrimp showed resistance towards Penicillin. *E. coli* isolated from pond water showed resistance mainly towards Amoxycillin-Clavulanic acid and to a lesser extent towards Ampicillin, Cefotaxime, Ceftriaxone, Cefoxitin, Chloramphenicol, Nalidixic acid. Staphylococci isolated from pond water showed resistance mainly towards Penicillin, Erythromycin, to a lesser extent towards Ciprofloxacin, Co-trimoxazole and Linezolid.



Resistance profile of V. parahaemolyticus isolated from P. vannamei shrimp and pond water

8. All India Network Project on AMR (FS5)

Surveillance for AMR in aquaculture farms

A total of 38 farm samples were collected, including 4 from Ernakulam, 25 from Thrissur, and 9 from Alappuzha. A total of 86 bacteria that were isolated, consisting of 27 *E. coli,* 24 *Staphylococcus aureus*, 19 coagulase-negative Staphylococcus (CONS) isolates, and 16 *Vibrio* species were screened for antimicrobial resistance. Twelve *E. coli* isolates were identified MDR, exhibiting resistance to amoxicillin/ clavulanic acid, aztreonam, imipenem, cefoxitin, ceftazidime, ceftriaxone, cefotaxime, cefpodoxime, cefepime, and chloramphenicol. *S. aureus* isolates exhibited resistance to penicillin G, erythromycin, cefoxitin, tetracycline, linezolid, and oxacillin. CONS isolates displayed resistance to penicillin G, erythromycin, cefoxitin, linezolid, chloramphenicol, and tetracycline. *Vibrio* species exhibited resistance only to cefoxitin.

Strip-based preservation method for Vibrio species

Developed a strip-based preservation method for *Vibrio spp.,* specifically *V. parahaemolyticus* and *V. cholerae* for storage of cultures at 4°C, -20°C, and -80°C.

9. Production systems, Agribusiness and Institutions, component- 1 Impact of Agricultural Technology- Fishery Technology

Structure of dried fish industry in India

Average gross value added (GVA), capital, labor, labor productivity (LP), and capital-labor ratio (K/L) of dried fish industry for the years 2010-11 and 2015-16 were analysed. The GVA for sun-drying fish enterprises decreased, whereas that for artificial dehydration enterprises showed a substantial increase.

Summary statistics of informal dried fish-related enterprises (mean values, at constant 2010-11 price)

Dried fish		GVA (Rs)	Capital (Rs)	Labor (number)	LP (Rs/ laborer/ month)	K/L (Rs/ laborer)
Sun-drying Fish	2010-11	11,305	1,16,260	2.58	3,557	44,165
	2015-16	6,509	75,062	2.61	4,233	55,643
Artificial dehydration of fish and seafood	2010-11	16,955	4,14,400	4.0	4,239	1,03,600
	2015-16	3,64,874	2,74,933	27.0	13,535	10,678

Source: Estimated from the 73rd (2015-16) round of the Unincorporated Non-agricultural Enterprises (excluding Construction) survey, NSSO. The GVA and capital were calculated based on the last 30 days of the survey.

Organization of dried fish-making units

Analysed the structure of dried fish making units in India by using primary data collected from Andhra Pradesh, Maharashtra, Kerala and Gujarat. The major variables of analysis were the sizer of the fish process units, labour participation and gender dimension, processing aspects and adoption of good management practices, hygienic handling and pre-processing of fish, quality assurance and certification, marking and supply chain management, and constraints.

10. Development of millet based novel ready To Eat-RTE smart functional foods fortified with fish protein and lipid for entrepreneurship development in the state of Kerala

Development of RTE functional food using millet and fish

Developed protein-enriched Aqua millet cookies using little millet (*Panicum sumatrense*) flour and lizard fish meat (*Saurida tumbil*), masking the millet's nutty flavor, and balancing the fishy taste with the addition of spices.

Aqua millet cookies

Developed RTE protein-enriched ragi (*Eleusine coracana*) balls incorporated with lizard fish meat (*Saurida tumbil*) in retort pouches by thermal processing. The total process time for the ragi balls with 10% fish was 37 minutes, while for those without fish, it was 40 minutes, showing a significant variation.

Developed millet and fish based RTE extruded products using Sorghum (*Sorghum vulgare*) and rohu (*Labeo rohita*) fish meat.

Developed a gluten-free granola bar using foxtail millet (*Setaria italica*) and seaweed powder (*Kappaphycus alvarezii*), which enhanced the texture compared to the control samples.

Millet and fish based RTE extruded products

RTE protein-enriched ragi balls

11. STI Hub for socio-economic Empowerment of SC community of Union Territory of Puducherry through Technology-assisted fish farming, fish processing and value addition

Technical guidance to establish STI HUB and training on fish processing and value addition

Successfully established the STI-HUB to conduct training programmes on fish processing and value addition

STI-HUB
Trained nearly 60 Beneficiaries from the SC fisher community

Training programme conducted for the beneficiaries from SC fisher community

12. Developing a biorefinery workflow for high value nutraceuticals from seaweed by green chemistry approach

Ultrasound assisted extraction protocol for recovering potent bioactives from brown seaweed, *Padina gymnospora*

The ultrasonic assisted extraction of Padina gymnospora was carried out to find the optimal conditions for extraction using RSM (Response Surface Methodology) by varying the sample to solvent ratio and extraction time as the input variables, resulting in 10 runs. A second order response surface regression model was developed as a function of sample to solvent ratio and extraction time and the optimum extraction condition was obtained by desirability function. Based on the developed model and the predicted values of response variables, such as highest yield, total phenolic content, antioxidant activity (TAA), FRAP, an extraction condition was optimized using desirability function approach. The corresponding desirability score was 0.482. Further, to verify the results, a validation study was conducted at optimum condition of X1 and X2 and found to be in line with the optimum condition.

Enzyme assisted extraction for recovering fucoidan rich extracts

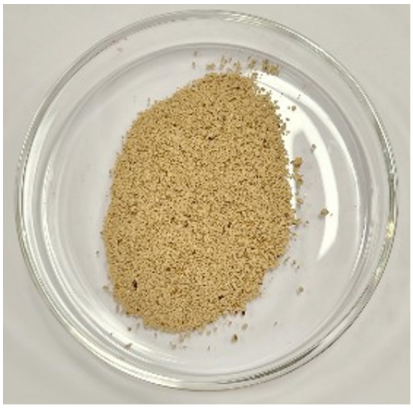
A greener extraction protocol was optimised for recovering fucoidan rich extracts from *Sargassum polycystum* by following individual and combination use of enzymes. Biochemical characterization of the extracts obtained by different treatments indicated that combined use of enzymes outperformed the individual enzymatic process. The suitability of the optimized method was also confirmed by multivariate optimization method which indicated the highest desirability score of 0.95 for the combination treatment.

Green extraction method for extracting sodium alginate from *Padina gymnospora*

An eco-friendly protocol was developed for extraction of alginate from the residues left after greener extraction process. The extracted alginate exhibited properties similar to that of commercial grade alginate.

Sub critical extraction protocol for obtaining fucoidan from brown seaweeds

A preliminary trial was carried out to extract fucoidan from *Sargassum polycystum* by subcritical extraction process. These extraction conditions employed ensure that the water remains in a sub-critical state, which is ideal for extracting fucoidan while minimizing the degradation of its bioactive properties. Sub-critical extraction of *S. polycystum* under the specified conditions yielded 5 % of fucoidan.



Extracted Fucoidan

Subcritical extraction of potent biopolymers from red algae

A preliminary study has carried out to extract carrageenan and agar from red algae using subcritical water. The zeta potential analysis indicated that the extracted polymer had excellent stability.

Process protocols were developed for the production of seaweed based nanocellulose

An eco-friendly extraction process was validated for obtaining nano cellulose from the residue left after enzymatic extraction. Yield of nanocellulose varied from 42.93 to 52.96 %. The findings of the study indicates that strength and type of acid are critical in the extraction of nanocellulose from seaweed biomass.

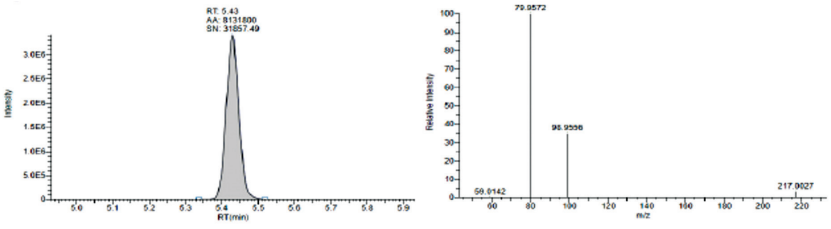
Seaweed biopolymer based pickering emulsion system

A stable pickering emulsion system was designed and validated for delivery of marine lipophilic compounds using nanocellulose extracted from brown algae.

13. Establishing comprehensive targeted and untargeted analytical workflows for risk assessment of residues, emerging contaminants, and antimicrobial resistant bacteria in retail fish and fish products

Development of a targeted analytical method for the analysis of PFAS in fish using HRMS

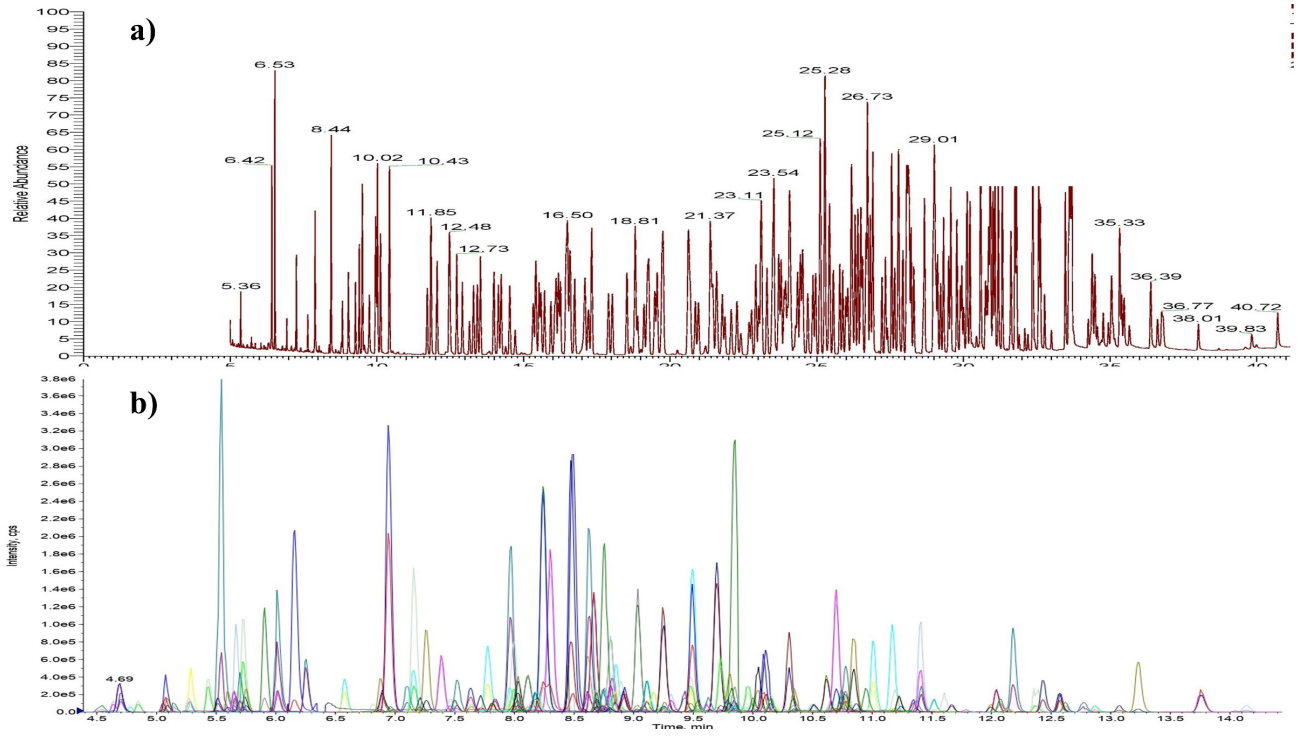
A targeted approach using high-resolution mass spectrometry (HRMS) was developed to analyze 22 PFAS compounds. Thermo Scientific Q-Orbitrap Exploris 120 HRMS system was employed in the analysis of PFAS. The method was successfully validated in terms of specificity, sensitivity, accuracy, precision, recovery, matrix effect, and stability.



Chromatogram and spectra of a representative PFAS compound analysed in fish

Development and optimization of targeted analytical workflows for the analysis of Pesticide residues in chicken using LC-MS/MS and GC-MS/MS

An analytical workflow was developed for the simultaneous determination of 285 pesticides listed under the FSSR and NPOP guidelines, targeting compounds relevant to aquaculture and poultry farming. This protocol enables the simultaneous extraction of both GC-amenable and LC-amenable compounds. Analytical determinations were performed using either gas chromatography-tandem mass spectrometry (GC-MS/MS) or liquid chromatography-tandem mass spectrometry (LC-MS/MS). The developed analytical method was validated for the detection and quantification of 144 pesticides in fish using LC-MS/MS and 192 pesticides in chicken using GC-MS/MS, demonstrating their applicability for multi residue pesticide analysis in complex food matrices.



Representative chromatogram for (a) Multiresidue GC-amenable pesticides, and (b) Multiresidue LC-amenable pesticides

14. Micro-and nano-plastics as emerging food contaminants: Establishing validated Methodologies and understanding the prevalence in different food matrices

Microwave assisted extraction method for analysis of microplastic

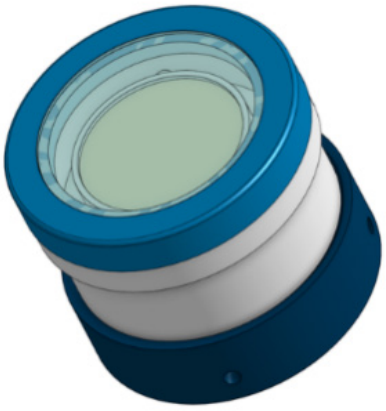
A rapid method for extraction of microplastic from fish tissue, fish meal, and dry fish was developed using a microwave-assisted extraction method. The extraction time was only 30 min as compared to 72 h extraction in traditional methods. Digestion efficiency and plastic recovery were calculated gravimetrically using standard protocols. The optimized protocol provided 90 % digestion efficiency and recovery

15. Pilot scale implementation of smart packaging technology fish freshness indicator at field level to enhance domestic fish consumption

Efficiency of commercial HDPE ice boxes in retaining ice during fish transportation

The time taken for melting of ice packed at different levels in commercial HDPE ice boxes were determined. When the ice box was completely filled with flake ice, it can be used for transportation up to 100h, whereas it can be used only up to 53h if half-filled and 77 h if ice box is filled upto 3/4 level.

Designing freshness indicator holder for ice box



A specialized device that serves as a container for securely housing the freshness indicator was designed and developed. This innovative holder is specifically designed to be affixed to insulated ice boxes, in a manner that prevents direct contact with the fish products while allowing it to interact with the gases emitted during the natural degradation process of the fish. Key features of this design is its ability to facilitate the observation of colour change in the freshness indicator from the exterior of the holder, which provides a convenient and practical means for fish handlers and consumers to monitor the freshness of the fish without the need to open the container. The real-time visual feedback offered by the indicator through the holder serves as an effective and user-friendly tool in ensuring the quality and safety of the stored fish. A design copyright for the freshness indicating device to be used in ice boxes for assessing freshness during transportation of fish was obtained.

16. The Pilot Scale Demonstration of Seaweed Based Feed Production for Fish and Shrimps

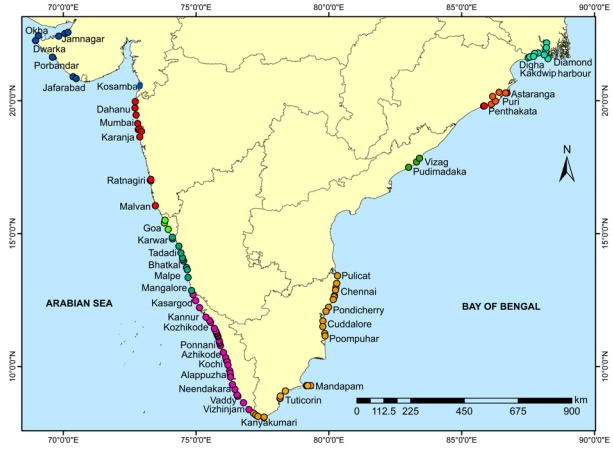
Preparation of seaweed based aquafeed

Growth performance of advance fingerlings of *Labeo rohita* was assessed by replacement of fish meal with seaweed silage. The trial was conducted over 75 days, and fish fed with a 5% seaweed-based diet showed better growth performance. On the basis of availability, Sargassum, was the suitable species to incorporate into the aquafeed. Ensilation and fermentation of seaweed is a better way of incorporation into aqua feed. 5% replacement of fishmeal with seaweed gave similar results in terms of growth and survival.

17. Marine mammal stock assessment in India

Documentation of mammal conservation

Survey was conducted along the coasts of India to assess the extent of marine mammal interactions with various fishing systems and document existing mitigation measures across coastal states. The study covered 117 harbors and landing centers, gathering detailed information on fishing practices and conservation efforts. The use of pingers was reported in the southern states, while marine mammal worship was observed in various locations across Gujarat and West Bengal.



Map showing the details of survey locations

Data collection in progress

View of whale skeleton worshipped at Machh Mata temple, Valsad District Gujarat

Drone-based survey conducted to investigate marine mammal interactions

A pioneering drone-based survey was conducted to investigate marine mammal and fishery interactions, the first initiative of its kind in the country. This innovative approach enhances marine mammal conservation by overcoming the limitations of traditional survey methods, which are often constrained by time, cost, and the difficulty of monitoring elusive species across vast ocean areas. Drones provide a more efficient, non-invasive, and cost-effective solution for collecting comprehensive data.

Drone view of pod of humpback dolphins

The interaction of coastal dolphins with trawl fisheries off Kochi was studied, focusing on three broad behavioral states: traveling, socializing, and foraging. Observations indicated that traveling was the most prevalent activity, followed by socializing and foraging.

Travelling *Socializing* *Foraging*

18. Development and popularization of fuel-efficient long-lasting otter boards for greening the trawl fishing sector in India

Popularisation of CIFT V - form double slotted otter board (VSOB)

CIFT V - form double slotted otter board (VSOB) field trials of newly developed otter boards have revealed reduction in diesel consumption by 1-2 liters per hour of trawling, depending on sea conditions, translating into significant cost savings for trawler operators. The use of IS2062 grade B steel was found to prevent corrosion and doubles the lifespan of the otter boards, offering long-term durability and reliability. With lower diesel consumption, trawlers emit fewer greenhouse gases, contributing to the fight against climate change. Adopting these responsible fishing techniques can significantly reduce the fishing industry's carbon footprint. Additionally, the reduction in fuel costs and the extended lifespan of the boards provide considerable economic advantages to the fishing communities, enhancing their livelihoods and promoting sustainable development.

Trawlers in Kerala, Karnataka, and Tamil Nadu have already adopted the CIFT-VSOB, reaping its benefits. Encouraged by this success, PMMSY has funded a project through NFDB to popularize the technology in all states of India, ensuring that more fishing communities can experience the advantages of this innovation. More than 55 pairs of otter boards have been distributed throughout the Indian coast. Fishermen who have switched to the new otter boards have shared positive feedback. By reducing diesel consumption, extending equipment lifespan, and lowering greenhouse gas emissions, these otter boards represent a significant advancement towards eco-friendly and economically viable fishing. As more trawlers adopt this technology, the fishing industry in India moves closer to achieving a sustainable future.

Technology popularisation in different States

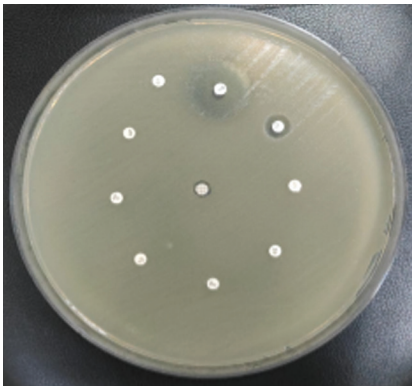
19. National surveillance programme for aquatic animal diseases - Phase II

Active surveillance of aquatic animal diseases

As part of a comprehensive disease surveillance initiative, shrimp samples were collected from 203 aquaculture farms across Tamil Nadu, Odisha, Karnataka, and Kerala in collaboration with Marine Products Export Development Authority. These samples were screened for viral and bacterial pathogens, including WSSV, EHP, AHPND, IHHNV, TSV, YHD. Among the analyzed samples, 4 samples from Ernakulam, Kerala and 17 from Nagapattinam, Tamil Nadu, were tested positive for WSSV, while all remaining samples were negative for the targeted pathogens, indicating a localized disease prevalence requiring vigilant monitoring.

Passive surveillance of aquatic animal diseases

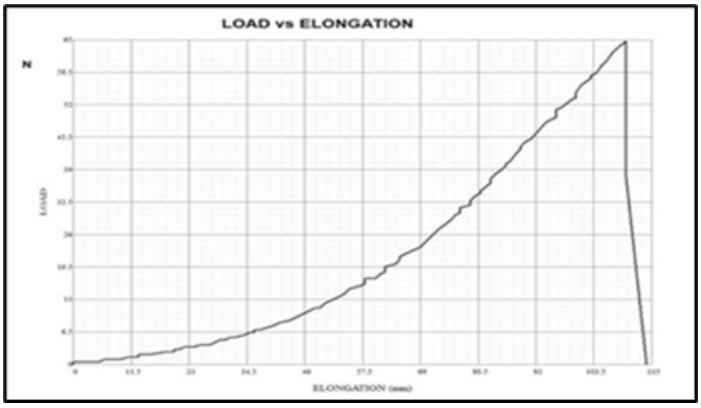
Albino Oscar fish exhibiting clinical symptoms of hemorrhages, ascites etc. were screened for the presence of pathogens. Infectious Spleen and Kidney Necrosis Virus (ISKNV), Viral Nervous Necrosis (VNN), Spring Viremia of Carp Virus (SVCV), TiPV, (TiLV), Red Sea Bream Iridovirus (RSIV), and Koi Herpesvirus (KHV) could not be detected in the samples. *Aeromonas spp.* was isolated from the infected fish and antimicrobial susceptibility testing revealed that the isolates exhibited resistance to ciprofloxacin, colistin, streptomycin, gentamicin, ampicillin, nalidixic acid, penicillin, oxacillin and erythromycin. The isolates were resistant to six classes of antibiotics including fluoroquinolones, polymyxins, aminoglycosides, beta-lactams, quinolones, and macrolides.



20. Development of biodegradable fishing nets for combating plastic pollution in Maharashtra State

Evaluation of physical and mechanical properties of biodegradable rayon-based fishing yarns for development of sustainable gear

Two biodegradable rayon-based fishing yarns, 2-ply (0.085 mm) and 3-ply (0.1 mm), as foundational materials for eco-friendly fishing gear was developed. The 2-ply yarn had a linear density of 457.591 tex and tensile strength of 83.71±7.63 N (wet) and 122.98±5.38 N (dry), while the 3-ply yarn had a linear density of 667.998 tex and tensile strength of 148.83±6.62 N (wet) and 194.85±4.78 N (dry), indicating their strong potential for sustainable aquatic applications.



Determination of tensile strength of rayon based fishing yarn

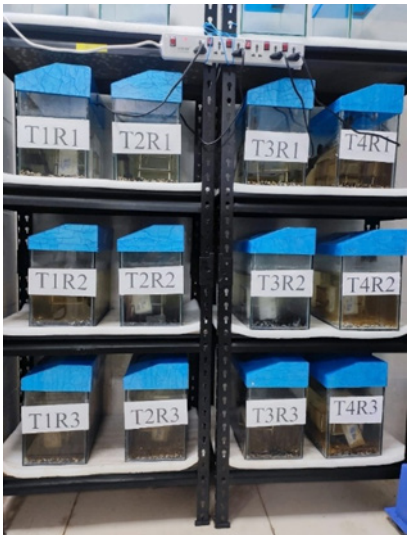
Performance assessment of 2-Ply rayon-based biodegradable gill net: Impact of water absorption on structural integrity

A biodegradable gill net made from 2-ply rayon yarn (0.085 mm) showed increased weight after immersion from 2.87 kg to 4.47 kg due to water absorption. This absorption led to noticeable shrinkage and twisting in the mesh, reducing its size and creating curls, which impaired its performance as a fishing barrier. These findings suggest the need for material improvements to enhance water resistance and stability in biodegradable nets.

Biodegradable gill net

Environmental drivers of rayon yarn biodegradability

An aquarium experiment examined rayon yarn biodegradability under various environmental conditions. Higher temperatures (32°C), slightly acidic pH (6.5), and higher salinity (35 ppt) accelerated degradation, while neutral or basic pH, freshwater, and lower temperatures slowed it. This demonstrates the strong influence of temperature, pH, and salinity on the degradation of yarn.

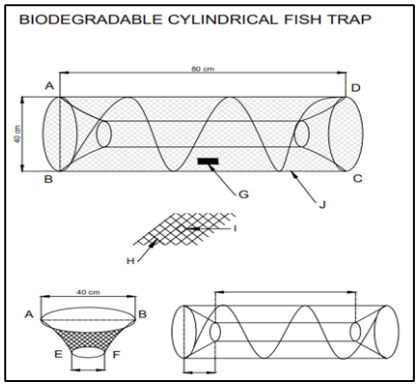


Indoor aquarium tank experiment setup

Design of biodegradable traps

Biodegradable fish and crab traps with rayon-based material were designed using AutoCAD. The traps were tested in brackish and freshwater and it was found that these traps were effective and showed promise in reducing environmental impact.

Biodegradable fish trap



Biodegradable cylindrical fish trap design

Design of biodegradable FADs

Biodegradable Fish Aggregating Devices (FADs) made from rayon was developed to replace plastic FADs and reduce marine pollution. These eco-friendly FADs were designed to attract fish and degrade naturally over time. Fabricated using rayon yarns, natural fiber ropes, and biodegradable floats, they maintain structural integrity for up to 45–60 days, sufficient to attract pelagic species without persisting as marine debris. Preliminary results show comparable aggregation efficiency to plastic FADs.These biodegradable FADs offer a viable solution for sustainable fisheries, aligning with global initiatives to eliminate plastic waste and promote environmentally responsible fishing practices.

21. Assessment of Abandoned, Lost and Discarded Fishing Gears (ALDFG) along the Maharashtra coast and exploration of possible solutions for creating circular economy from retrieved fishing gears

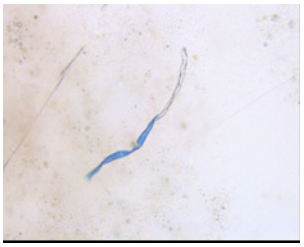
Assessment of ALDFG and microplastic contamination along coastline of Maharashtra

Ghost net from Malvan

Fishing lines from Malvan

Ghost net from Ratnagiri

Surveys at locations including Juhu, Versova, Alibag, Tarkarli, and Ratnagiri revealed key data on ALDFG distribution, with scuba diving in Tarkarli recovering about 3 kg of ghost nets. Screening of microplastic contamination in 22 fish and shellfish species from various locations revealed that microplastics were detected in 10 out of 22 species. Microplastics were found predominantly in gut, gill, and tissue samples, with fibers being the most common type.



Microplastic from fish

Trawling for identification of ALDFG and ghost net hotspots along the Maharashtra coast

Trawl operations were conducted to pinpoint hotspots of Abandoned, Lost, or Discarded Fishing Gear (ALDFG) and ghost nets. Trawl operation in Ratnagiri revealed the presence of ALDFG while that in Alibag yielded ghost nets.

22. Study on alternate fuel and energy systems for fishing vessels in Maharashtra

Alternate fuel and energy systems for fishing vessels in Maharashtra

Two innovative boat prototypes were developed to promote sustainable fishing. A 9.9 HP LPG-retrofitted boat, launched on August 13, 2024, by Dr. Atul Patne, Commissioner of Fisheries, Maharashtra, successfully completed its field trials at Sassoon Dock, Mumbai. This vessel demonstrated immediate improvements in fuel efficiency and reduced emissions. A series hybrid electric fishing boat was fabricated featuring a 20 HP electric outboard motor and a 23 kW lithium-ion battery pack, supported by a 12 kVA diesel generator and a 48V/300Ah battery system, with a 10 kW electric propulsion motor for continuous operation.

Series hybrid electric boat - 20 HP

9.9 HP LPG-retrofitted boat

23. A detailed Foodomics study for food authentication and exploration of nutraceutical potential

Real-time species authentication of shrimp using machine learning and mass spectrometry

Ion mobility-rapid evaporative ionization mass spectrometry (IM-REIMS) mass spectral fingerprint library for commercially important shrimp were developed comprehensively. The analytical method has great potential for use in seafood authentication. A spectral database for three shrimp species, *P. monodon, F. indicus* and *L. vannamei,* were created using ion mobility-REIMS-QToF. This database enabled the development of machine-learning models for species identity prediction, with the gradient boosting machine (GBM) model achieving 100% accuracy in validation.

On-site non-destructive authentication of species identity of commercially important shrimps

A portable hand-held NIR device-based analytical method was developed for on-site authentication of the species identity of commercially important shrimps in a non-destructive manner. Using machine learning technique a Support Vector Machine-Linear (SVM-L) model was developed which could predict the species identity with over 99% accuracy.

Handheld portable NIR device for on field non-destructive quality evaluation of seafood

24. Deployment and maintenance of Wave Rider Buoy off Veraval coast and development of jellyfish and sardine advisories

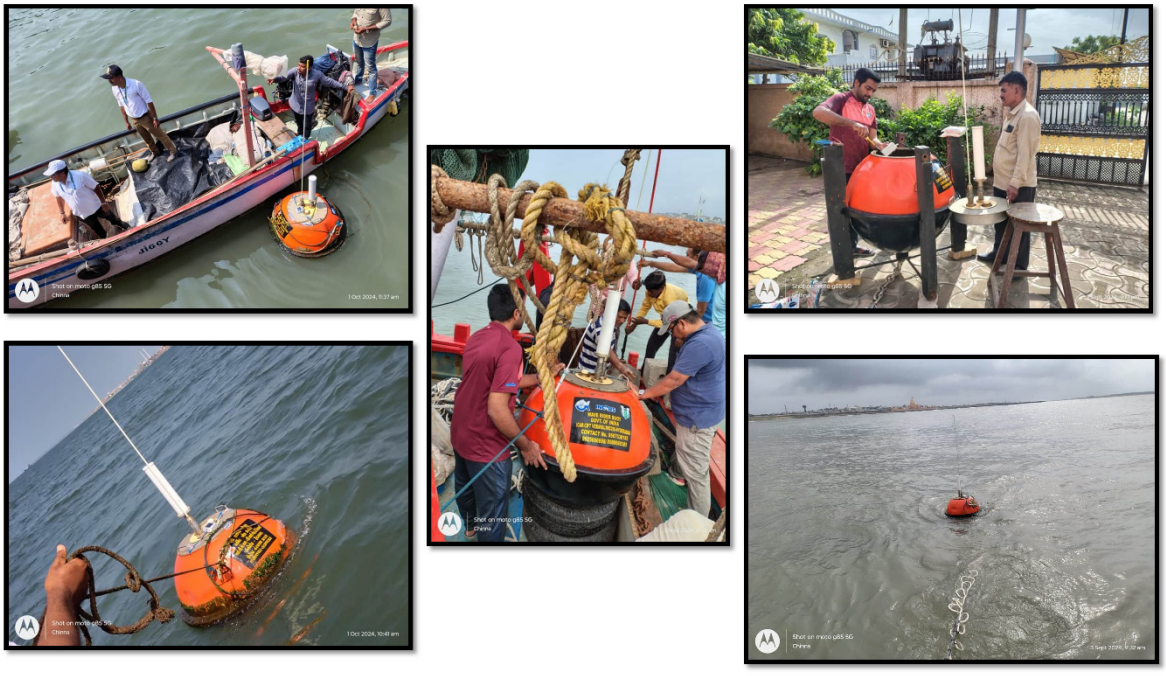
Habitat suitability modelling for jellyfish, *Catostylus perezi*, along the Gulf of Kutch

Habitat suitability modelling for jellyfish, *Catostylus perezi*, was developed. Key parameters that influence the jellyfish distribution were found to be sea surface temperature, salinity, Chl-a, Total Suspended Matter (TSM) and silicate

Suitable condition for jellyfish aggregations

(n=24)	Temperature (°C)	Salinity (ppt)	Chl-a (µg/L)	TSM (mg/l)	Silicate (µmol/L)
Min	22.00	35.00	1.75	112.00	0.21
Max	31.00	39.00	3.83	1423.00	1.25
Avg	26.64	37.00	2.83	525.71	0.72

Onboard jellyfish survey along the Gulf of Kutch, Gujarat.



Repair and re-deployment of WAMAN buoy off-Somnath

25. Matrix specific phage formulations for the bio-control of enterotoxigenic Methicillin sensitive and resistant *Staphylococcus aureus* of safety concern

Genome analysis of broad host range phages

The genome sequencing and analysis of four broad host range phages viz., φCIFT_MFB_MRSA13, φCIFT_MFB_MRSA21, φCIFT_MFB_MRSA29 and φCIFT_MFB_MRSA16 isolated from sewages revealed that phages were dsDNA viruses belonging to *Herelleviridae*, and genus *Silviavirus* with genome size ranging from 140944 -141318 bp.

The genomes sequences of φCIFT_MFB_MRSA12 (Genbank: PQ311674), φCIFT_MFB_MRSA28 (Genbank: PV017447) and φCIFT_MFB_MRSA32 (Genbank: PV017448) has been submitted in the NCBI database.

The SRA files of Staphylococcus Phage are CIFT_MFB_MRSA21 (SRX27120351), Staphylococcus Phage CIFT_MFB_MRSA16 (SRX27111579), Staphylococcus Phage CIFT_MFB_A13 (SRX27106161), Staphylococcus Phage CIFT_MFB_RSA32 (SRX25663236), Staphylococcus Phage CIFT_MFB_MRSA28 (SRX25663235), Staphylococcus Phage CIFT_MFB_MRSA12 (SRX25506783).

Five whole genomes analysis of MRSA host viz., MRSA12, MRSA32, MRSA28, MRSA21 and MRSA29 used as a host in the phage study were completed.

Thermal and pH stability of phages

Thermal stability studies of four phages viz., φCIFT_MFB_MRSA13, φCIFT_MFB_MRSA21, φCIFT_MFB_MRSA29 and φCIFT_MFB_MRSA16 at a temperature range of -20°C to 60°C revealed that phages were stable at lower temperatures (-20°C, 4°C), and the phage titre decreased with an increase in temperature. The phages φCIFT_MFB_MRSA5, φCIFT_MFB_MRSA12 and φCIFT_MFB_MRSA8 were found to be stable even at 60°C. Stability studies of the phages φCIFT_MFB_MRSA13, φCIFT_MFB_MRSA21, φCIFT_MFB_MRSA29 and φCIFT_MFB_MRSA16 at a pH range of 3-12 indicated that the optimum stability was observed at a pH range of 7-8 and the phages were viable at a pH range of 3-10. The phages exhibited myoviral morphology with 80-90 nm diameter, and a tail 210-290 nm diameter. The phages efficiently disrupted the biofilm as indicated by the reduction in OD.

Phage formulation for the biocontrol of *S. aureus*

One Phage formulation with 10 broad spectrum lytic bacteriophages was developed for the biocontrol of MRSA and MSSA prevalent in aquaculture settings and seafood.

26. Development of Portable Fish Freshness Assessment Sensor

Development of fish freshness sensor and validation study

The portable fish freshness sensor consists of a Raspberry-Pi micro-computer, a camera module, a liquid crystal display, a portable power platform and a 3D printed outer cover. An algorithm was developed to execute the testing of samples in the trained deep-learning model. The validation results for Indian Mackerel, GIF tilapia and Sardine showed that the portable device predicted the "days after fish was caught" and "remaining shelf-life (days)" and classified the freshness level of fish into "Extremely Fresh, Fresh or Spoiled" with a prediction accuracy about 74-83.21%.

27. Lipidomics and vibrational spectroscopy based chemoinformatics for comprehensive assessment of quality in seafood supply chain

Evaluation of metabolomic alterations in ice-Stored Indian white shrimp using LC-HRMS

During ice storage, the tissue of Indian white shrimp was profiled for endogenous metabolites based on liquid chromatography-High resolution mass spectrometry (LC-HRMS) and for K value using HPLC. The metabolic profiles of shrimp muscle changed depending on storage time. Fifty-five key metabolites were identified through variables important for prediction (VIP) values, including amino acids, lysophospholipids, sterol derivatives, bile acid derivatives, and nucleic acid-related compounds. A multivariate regression model (R_2=0.995) was constructed using the K-value and annotated metabolites to predict the storage time. This approach highlights metabolomics as a reliable and efficient tool for evaluating shrimp freshness during storage.

28. Unravelling the true microbiome of finfish and shellfish during spoilage: Towards the development of rapid detection kit for fish spoilage

Microbiome analysis of Indian Mackerel

Indian Mackerel (*Rastrelliger kanagurta*) was packed under air and vacuum condition and stored in chilled, semi-chilled and abused temperature. Vacuum packed mackerel stored under chilled condition extended shelf life up to 6 days more than that of air packed mackerel. Likewise, under semi-chilled condition, there was an extended shelf life of about 8 days by vacuum packed mackerel than air packed one. A total of 141 bacterial isolates representing spoilage of Indian mackerel was isolated and stored. The predominant species responsible for spoilage of Indian Mackeral was found to be *Shewanella arctica, S. aquimarina, S. baltica* and *S. glacialipiscicola* in microbiome analysis.

29. Marine fishery in Kerala: A Study on evolution of policy, cost and earnings of fishing units and income of fisher households

Data collection from fishers on cost and earnings

Collected high frequency data, that records cost and earning of every fishing trip is collected, from 15 harbours/ landing centres. Primary data was collected from Chellanam fishing village for analysing the village economies and the class structure of the village.

30. Harnessing climate finance for financial inclusion of small-scale fish processors: empowering women in fisheries

The project is being undertaken in collaboration with the Sabaragamuwa University, Sri Lanka. The project has been initiated and field work is in progress among women fish processors across Trivandrum, Kollam, and Ernakulam districts of Kerala's West Coast.

Institute Building Activity

Collaboration with Other Institutes

International Institutions

- Bay of Bengal Programme (BOBP)
- Borlaug Institute for South Asia (BISA), New Delhi
- CODEX Alimentarius Commission, Rome
- Food and Agriculture organization, Rome
- Green Climate Fund (GCF), South Korea
- Interdisciplinary Centre of Marine and Environmental Research (CIIMAR), University of Porto, Portugal
- International Maritime Organization, UK
- International Rice Research Institute, Philippines
- Joint Institute for Food Safety and Applied Nutrition (JIFSAN)
- Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Potsdam, Germany
- National Oceanic and Atmospheric Administration (NOAA), Washington, D.C., USA
- Norwegian University of Science and Technology (NTNU), Norway
- Seafood HACCP Alliance & National Fisheries Institute, USA
- United States Food and Drug Administration (USFDA)
- University of Arts London, UK
- University of Bradford, UK
- University of California, US
- University of Cambridge, UK
- University of Edinburgh, UK
- University of Liverpool, UK
- University of Plymouth, UK
- University of Southampton, UK
- WFC, Malaysia
- World organization for Animal Health, France
- World Wildlife Fund (WWF), India

National Institutions

- ARAI (Automobile Research Association of India), Pune
- Assam University, Silchar, Assam
- Bank of India, Hyderabad
- BARC- Babha Atomic Research Centre, Mumbai
- Bharat Petroleum Corporation Limited (BPCL)
- Birla Institute of Technology and Science (BITS), Pilani
- Board of Radiation and Isotope Technology, Navi Mumbai
- Bureau of Indian Standards (BIS), New Delhi
- C-CAMP, Bengaluru
- Central Institute of Fisheries Nautical and Engineering Training (CIFNET), Cochin

- Central Institute of Petrochemical Engineering and technology, CIPET-IPT, Cochin
- Centre for Peninsular Aquatic Genetic Resources of ICAR- NBFGR, Cochin
- Cochin Shipyard Limited (CSL), Cochin
- Coconut Development Board, Cochin
- CSIR-Indian Institute of Toxicological Research, Lucknow
- CSIR-National Institute for Interdisciplinary Science and Technology (NIIST)
- Department of Biotechnology, New Delhi
- Entrepreneurship Development Institute (EDII) of India, Ahmedabad
- Export Inspection Agency (EIA), Mumbai, Veraval and Porbandar
- Export Inspection Council (EIC), New Delhi
- Fishery Survey of India (FSI), Mumbai and Cochin
- Food Safety and Standards Authority of India (FSSAI), New Delhi
- Guwahati Medical College and Hospital, Guwahati
- ICAR- Central Institute of Brackishwater Aquaculture, Chennai
- ICAR- Central Institute of Temperate Horticulture, Lucknow
- ICAR-Central Institute of Fisheries Education, Mumbai
- ICAR- Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh
- ICAR- National Dairy Research Institute, Karnal, Haryana
- ICAR- National Institute of Veterinary Epidemiology and Disease Informatics, Bengaluru
- ICAR Research Complex for NEH Region, Meghalaya
- ICAR-Central Institute for Research on Cotton Technology, Maharashtra
- ICAR-Central Institute of Fisheries Education, Mumbai
- ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar
- ICAR-Central Marine Fisheries Research Institute, Cochin and Veraval
- ICAR- Directorate of Medicinal and Aromatic Plants Research, Anand
- ICAR-Indian Agricultural Research Institute, Delhi
- ICAR-National Bureau of Fish Genetic Resources, Uttar Pradesh
- ICAR-National Institute of Animal Nutrition and Physiology, Bangalore
- ICAR-National Research Centre for Grapes, Pune, Maharashtra
- ICAR-National Rice Research Institute, Cuttack
- ICMR-National Institute of Epidemiology, Chennai
- ICMR-National Institute of Virology, Alappuzha Unit, Kerala
- Indian Council of Medical Research, New Delhi
- Indian Institute of Science, Bangaluru
- Indian Institute of Technology, Delhi
- Indian Institute of Technology, Hyderabad
- Indian Institute of Technology, Madras
- Indian Institute of Technology, Gandhinagar
- Indian National Center for Ocean Information Services (INCOIS), Hyderabad
- Institute of Chemical Technology, Mumbai
- Krishi Vigyan Kendra (KVK), Lakshadweep
- Krishi Vigyan Kendra, (KVK), Kumarakom, Kerala
- Krishi Vigyan Kendra, (KVK), Wayanad

- Marine Products Export Development Authority (MPEDA), Cochin, Mumbai, Veraval and Porbandar
- National Bank for Agriculture and Rural Development (NABARD), Mumbai
- National Center for Cell Science, Pune, Maharashtra
- National Fisheries Development Board (NFDB), Hyderabad
- National Institute of Agricultural Economics and Policy Research, New Delhi
- National Institute of Animal Biotechnology, Hyderabad.
- National Institute of Fisheries Post Harvest Technology and Training (NIPHATT), Kochi
- National Institute of Food Technology, Entrepreneurship and Management (NIFTEM), Tamil Nadu
- Naval Physical and Oceanographic Laboratory (NPOL), Kerala
- National Centre For Cell Science (NCCS), Pune, Maharashtra,
- Network for Fish Quality Management and Sustainable Fishing (NETFISH), MPEDA
- National Institute of Fisheries Post Harvest Technology and Training (NIFPHET)
- Petronet LNG, Kochi
- Raja Ramanna Center for Advanced Technologies, Indore, Madhya Pradesh
- Rajiv Gandhi Centre for Aquaculture (RGCA), Ernakulam
- Rajiv Gandhi Science and Technology, Maharashtra
- SASMIRA (The Synthetic and Art Silk Mills' Research Association), Worli, Mumbai
- Seafood Exporters Association, FSSAI, Mumbai
- Silchar Medical College, Silchar, Assam
- Steel Authority of India Limited (SAIL), Maharashtra
- The Synthetic & Art Silk Mills' Research Association (SASMIRA), Ministry of Textiles, Govt of India
- Udyabhansinhji Regional Institute of Cooperative Management, Gandhinagar

State Departments

- Agency for Development of Aquaculture Kerala (ADAK), Kerala
- BMC (Brihanmumbai Municipal Corporation)
- Department of Fisheries, Andhra Pradesh
- Department of Fisheries, Arunachal Pradesh
- Department of Fisheries, Diu, Gujarat
- Department of Fisheries, Goa
- Department of Fisheries, Gujarat
- Department of Fisheries, Himachal Pradesh
- Department of Fisheries, Himachal Pradesh
- Department of Fisheries, Jharkhand
- Department of Fisheries, Kerala
- Department of Fisheries, Maharastra
- Department of Fisheries, Odisha
- Department of Fisheries, Puducherry
- Department of Fisheries, Tamil Nadu
- Department of Fisheries, Uttarkhand
- Department of Forestry, Tamil Nadu
- District Youth Fishers Welfare Association, Visakhapatnam

- Goa Energy Development Agency (GEDA), Goa
- Government of Odisha
- I-Hub, Gujarat Government Enterprise
- Kerala Antimicrobial Resistance State Action Plan (KARSAP), Thiruvananthapuram, Kerala
- Kerala Pollution Control Board, Thiruvananthapuram, Kerala
- Kerala state Coastal Area Development Corporation (KSCADC), Thiruvananthapuram, Kerala
- Kerala State Co-Operative Federation For Fisheries Development Ltd. (Matsyafed), Kerala
- Kerala State Planning Board
- Kerala Water Authority (KWA)
- Maharashtra State Rural Livelihood Mission (MSRLM), Maharashtra
- Maharashtra Tourism Development Corporation (MTDC).
- Mangrove Foundation, Department of Forest, Maharashtra State
- Meat Products of India, Kerala
- Mumbai Port Authority (MbPA), Sassoon Dock, Colaba, Mumbai
- Perunthalaivar Kamaraj Krishi Vigyan Kendra (PKKVK), Puducherry
- Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla
- Society for Assistance to Fisherwomen (SAF), Kerala
- State Food Laboratory, Ernakulam
- State Institute of Fisheries Technology, Kakinada, Andhra Pradesh
- State Laboratory for Livestock, Marine and Agri Product (SLMAP), Ernakulam
- State Referral Institute for Water Quality (SRI), Nettoor, Ernakulam
- Centre for Water Resources Development and Management (CWRDM), Calicut
- Tribal Development Office, Ernakulam

Universities/ Colleges

- Andhra University, Visakhapatnam
- Anjuman I Islam's Abdul Azim Khatkhatay Secondary School, Vashi, Navi Mumbai
- Annamalai University, Chidambaram, Tamil Nadu
- Assam Agriculture University, Johat, Assam
- Azim Premji University, Bangalore
- Birsa Agricultural University, Ranchi, Jharkhand
- Bullayya College, Visakhapatnam
- Catholicate College, Pathanamthitta
- Central Agricultural University Imphal, Manipur
- Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh
- Christ College, Rajkot, Gujarat
- Cochin University of Science and Technology, Kochi, Kerala
- College of Fisheries Science, St. Devasahayam Institute of Fisheries Science & Technology, Kanyakumari, Tamil Nadu
- College of Fisheries Science, Veraval
- College of Fisheries, AAU Raha
- College of Fisheries, NAU, Navsar, Gujarat
- College of Fisheries, Ratnagiri, Maharashtra

- College of Horticulture, Kerala Agricultural University, Vellanikkara, Thrissur, Kochi.
- College of Veterinary and Animal Sciences, Thrissur, Kerala
- Department of Dairy Microbiology, KVASU, Kerala.
- Department of Fish Pathology and Health Management, Fisheries College and Research Institute, Thoothukudi
- Department of Fisheries Science, Alagappa University, Karaikudi, Tamil Nadu
- SD College, Alappuzha
- Dr. J Jayalalithaa Fisheries University, Nagapattinam, Tamil Nadu
- Dr. Rajendra Prasad Central Agriculture University, Pusa, Bihar
- Dr. V.S. Krishna Govt. PG college GADVASU, Visakhapatnam, Andhra Pradesh
- Gandhi Institute of Technology and Management (GITAM), Andhra Pradesh
- Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand
- Guru Angad Dev Veterinary Animal Science University, Ludhiana, Punjab
- Indira Gandhi Krishi Vishwavidyalaya (IGKV), Chhatisgarh
- Jawaharlal Nehru Krishi Vishwavidyalaya (JNKVV), Jabalpur, MP
- JSA College of Agriculture and Technology, Cuddalore
- Junagadh Agricultural University, Junagadh, Gujarat
- Kamdhenu University, Gandhi Nagar, Gujarat
- Karnataka Veterinary, Animal and Fisheries Sciences University (KVAFSU), Bidar, Karnataka
- Karunya Institute of Technology and Science, Coimbatore
- KCEAFT, Thavanoor
- Kendriya Vidyalaya, Mankhurd, Mumbai, Maharashtra
- Kendriya Vidyalaya, ONGC, Panvel, Navi Mumbai, Maharashtra
- Kerala University of Fisheries and Ocean Studies (KUFOS), Panangad, Kerala
- KVK, Myrada, Tamil Nadu
- KVK, Tindivanam, Tamil Nadu
- Mahendra College of Engineering, Namakkal, Tamil Nadu
- Motilal Jhunjhunwala college of Arts, Science & Commerce, Vashi, Navi Mumbai, Maharashtra
- Muthoot Institute of Technology and Science, Puthencruz,
- Navi Mumbai Municipal secondary school, Vashi, Navi Mumbai, Maharashtra
- Odisha University of Agriculture & Technology (OUAT), Bhubaneswar, Odisha
- Postgraduate Institute of Fisheries Education and Research, Rajpur (Nava), Madhya Pradesh
- Pushpagiri Research Centre, Tiruvalla
- Sainath Hindi High school and Jr. College, Navi Mumbai, Maharashtra
- Saint Gits College of Engineering, Kottukulam, Kerala
- SCMS School of Technology and Management, Kochi
- Sethypathy Govt. College of Arts, Ramanathapuram, Tamil Nadu.
- Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST), Jammu
- SIES College of Arts, Science & Commerce (Autonomous), Sion (West), Mumbai
- Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh
- SRM Institute of Science and Technology, Chennai, Tamil Nadu
- St. Xavier's College, Mumbai
- Tamil Nadu Agricultural University (TNAU), Coimbatore
- University of Agricultural Sciences, Karnataka

- University of Calicut, Malappuram
- Veterinary College, Bengaluru, Karnataka
- Veterinary College, Hassan, Karnataka

Other agencies

- Anandi, NGO, Ahmedabad, Gujarat
- Bhimrao Matsya Udyog Seva Sahkari Mandali, Veraval
- Bureau of Indian Standards (BIS)
- CDB Institute of Technology, Aluva
- Cheredev Macchimar Sevabhavi Santha, Ghansoli, Navi Mumbai, Maharashtra
- Coir Board, Kochi, Kerala
- Haritha Farmer's Club, Perumbalam, Alappuzha
- ICICI Foundation
- Indian Coast Guard, Veraval and Porbandar
- Kerala State Coastal Area Development Corporation (KSCADC), Thiruvananthapuram
- Kerala Water Authority, Ernakulam
- Koparkhairane Macchimar Seva Bhavi Sanstha, Koparkhairane, Navi Mumbai, Maharashtra
- Korampadam Service & Co-Operative (KSC) Bank Limited, Kothad, Ernakulam
- Koratty, Service Coop Bank
- Mahavir Machchhimar Sahkari Mandali Ltd. Mangrol
- Mariaai Macchimar co.op. Society, Vashi Gaon, Navi Mumbai, Maharashtra
- Marine National Park (MNP), Jamnagar, Gujarat
- MP Ensystems, Goa
- Mumbai Port Authority
- NABARD, Regional office, Gujarat
- National Accreditation board for Testing and Calibration Laboratories (NABL)
- National Cooperative Development Corporation (NCDC), Ahmedabad, Gujarat
- National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Sonpat, Haryana
- Plastoconomy Foundation NGO, Thane, Maharashtra
- RGCA, MPEDA, Mayiladurai, Tamil Nadu
- Sagar Manthan Machhimar Utthan Mandal, Veraval
- Sagari Seema Manch and Sahakar Bharati, Navi Mumbai.
- Snehakuja Trust, Kasarkod, Kerala
- State Institute of Fisheries Technology, Kakinada
- Wildlife Trust of India (WTI), Noida, Uttar Pradesh

Private Sector

- 1977 Palani Taluk Cooperative Society, Palani, Tamil Nadu
- A. Selvan, Thoothukudi
- ABAD Fisheries Pvt. Ltd., Ernakulam
- Agro Three Star Pvt. Ltd., Alappuzha;

- Amarsagar Seafoods Pvt. Ltd., Porbandar
- Aquasync Innovations Pvt Ltd
- AVT Natural Products Limited, Aluva
- Blooming Boon, Ernakulam
- Capt Steel Eqpt. & Furniture, Ernakulam;
- Cherthala Block Krishisree Sangam, Alappuzha
- Cochin Food Tech Pvt. Ltd., Cochin;
- Dellmarc, Thrissur;
- Drupagaya Foods, Mangalam PO, Alappuzha
- Eloi Enterprises 19/470A, Arthunkal PO, Cherthala, Alappuzha
- Epicure Innovative LLP, Cheranalloor
- Garden Reach Shipbuilders & Engineers Limited, Kolkata
- Garware Technical Fibres Limited, Pune, Maharashtra
- Gaumco Multipurpose Co-operative Society Ltd.
- Global Food Processing Technologies and Exporters, Kottayam
- Heal, Ponnurunni society, Vytilla, Ernakulam
- HM Engineering and Contracting, Ratnagiri, Maharashtra
- Home Green Foods Pvt. Ltd., Kanjirapally
- Horeb Business Enterprise, Mizoram
- Indian Marine Ingredients Association, Tiruvalla
- Jamna Sagar Export, Jafarabad
- Kitchen Mate, Ernakulam
- KOHLER Power India Pvt. Ltd., Maharashtra
- Kraftwork Solar Pvt. Ltd., , Ernakulam;
- Mahavir Machchhimar Sahakari Mandali Ltd., Gujarat
- Mizala Biovet India (OPC) Private Ltd., Madhya Pradesh
- Muthoot Institute of Technology and Science (MITS), Kochi
- Navalt Electric Boats
- Origin labs
- Pallipuram Service Co-operative Bank Ltd. No. 760
- Parayil Bio Farm Pvt. Ltd., Ernakulam
- Peruvannamuzhy SC/ST Fishermen Co-operative Society Ltd., Kozhikode
- Poondi Govindapuram Grama Ikya Sangham
- Puakai Agriaqua, Rajahmundry
- Rumpot Snacks, Kollam
- Sadhav Offshore Engineering Company, Mumbai
- Samudra seafoods, Kollam
- SASMIRA, Mumbai
- Sudheesh A., Malappuram
- Suresh Stephan, Trivandrum
- SWM metals, Alappuzha;
- Tomson Enterprises, Idukki
- Trophic Biosystems Pvt. Ltd., Ernakulam

- United Kireeti, Visakhapatnam
- Universal Green Foods Pvt. Ltd., Kanjirapally
- Upper Sribadam Trout Rearing Co-operative Society Limited,
- WTI, TATA Chemicals

Extension and Development Agencies

- Assistant Commissioner of Fisheries Office, Nagpur, Maharashtra
- Beypur Matsya Vyavasaaya vividhodesa vikasana kshema sahakarana sangham, Beypore, Kozhikode
- Bhaisahab Mahila Bachat Gat Buddhanagar, Pen, Raigad, Maharashtra
- Bharathidasan Freshwater Fish Farmers Producer Company Limited (BFFFPCL), Puducherry
- Bharathimanaco Society, Dimapur, Nagaland
- Cheppanam clam fishers
- Dweep Shree SHG Lakshadweep
- Fisheries co-operative societies in Maharashtra
- Fisheries development Officer, Khalapur, Raigad dist., Maharashtra
- ICAR- KVK, Kottayam
- Karanja Machimaar VKS society, Uran, Raigad, Maharashtra
- Keradhanyam Farmer Producer Organization Limited
- KVK, Kodinar, Gujarat
- KVK, Sipahijala, Tripura
- Local Women Self Help Groups in Maharashtra
- Mariaai Macchimaar co-op. society, Vashi
- National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana
- Panchayat office and SHG of Navagaon of Alibaugh, Raigad, Maharashtra
- Pancsheel Mahila Bachat Gat, Bhimanagar, Vavoshi, Khalapur, Raigad, Maharashtra
- Plan@Earth (NGO), Aluva
- Pragati fishermen co-op. society, Sassoon Dock, Colaba, Mumbai
- Ramabai Mahila Bachat Gat, Umbarde, Pen, Raigad, Maharshtra
- Savitri Mahila Bachat Gat, Umbarde, Pen, Raigad, Maharshtra
- Savitribai Phule Mahila Bachat gat' Wadkhal, Pen, Raigad, Maharashtra
- Shirvanje Aadivasi Vyavasayik Co-operative Society, Shirvanje, Shahapur, Rural Thane, Maharashtra
- Stakeholders Meet on 'Value Chain Nutrition' under World Fish Project (WFC-ICAR W3) in Wayanad
- Sujatha Swayamsahayata Mahila Bachat Gat, Buddhanagar, Pen, Raigad, Maharashtra
- The Dalit Indian Chamber of Commerce and Industry (DICCI), Maharashtra
- Velur Anappara Inland- Fishermen Welfare Society, Atholy, Kozhikode

Technology Management

ICAR – CIFT Technologies

SL.No.	Title of the Technology	Lead Developer	Associate developers
1	Microwave convective dryer	Dr. Alfiya P. V.	Dr. Rejesh G.K. Dr. Murali S. Dr. Aniesrani Delfiya D.S. Dr. Manoj P. Samuel
2	CIFT-SUN BOAT: A solar-power driven craft for inland fishing	Dr. M.V. Baiju	Nil
3	Chlorophyll-collagen peptide cosmetic cream/ lotion and effervescent tablets	Dr. Binsi P. K.	Dr. Laly S. J. Mr. Ezhil Nilavan Dr. Parvathy U.
4	Collagen supplements for pet nutrition	Dr. Binsi P. K.	Dr. Jeyakumari A. Dr. Zynudheen A. A.
5	Seaweed-based soluble, edible and functional sachet	Dr. Jesmi Debbarma	Dr. Viji P. Dr. Sreejith S. Dr. B. Madhusudana Rao
6	Quantifying and assessing the environmental impact of abandoned FRP fishing boats in marine waters	Dr. Manju Lekshmi N.	Dr. P. Muhammed Ashraf Dr. Leela Edwin Mr. Sreejith S. K.
7	Nanotechnology-based antifouling formulation for cage aquaculture	Dr. Manju Lekshmi N.	Dr. P. Muhammed Ashraf
8	Solar-gasifier hybrid dryer	Dr. Murali. S	Dr. Aniesrani Delfiya D.S. Dr. Alfiya. P.V. Dr. Manoj P. Samuel Dr. George Ninan
9	Solar-LPG hybrid dryer	Dr. Murali. S	Dr. Aniesrani Delfiya D.S. Dr. Alfiya. P.V. Dr. Manoj P. Samuel
10	Mobile (SMS) alert system for the dryer users	Dr. Murali. S	Dr. Aniesrani Delfiya D.S. Dr. Alfiya. P.V. Dr. Manoj P. Samuel
11	Cell lines from fin (FtGF) and gill (FtGG) in Fantail goldfish (Carassius auratus)	Dr. T. Raja Swaminathan	Dr. A. Dharmaratnam Dr. N. S. Raj Dr. V. S. Basheer Dr. N. Sood Dr. P. K. Pradhan
12	Cold restructured fish sausage using high pressure technology	Dr. Sarika K.	Dr. Bindu J. Dr. S. K. Panda Dr. C. N. Ravishankar Dr. G. Venkateshwarlu

13	Reforming Agricultural Extension System in India	Dr. Suresh. A.	Dr. Sajesh Dr. R.N. Padaria Dr. A.K. Mohanty
14	Microwave-Vacuum drying for high-value dried seafoods	Dr. Viji, P.	Dr. Madhusudana Rao B. Dr. Jesmi Debbarma Dr. Ravishankar C. N.

Incubates registered at Agribusiness Incubation Centre

Sl. No	Name of Incubatee/Entrepreneur	Technology/Service taken	Date of registration
1.	Madambukattil Food Products Pvt. Ltd., Ernakulam, Kerala Mr. Praveed M.R.	Shelf stable fruit & vegetable drink	18th January 2024
2.	Vayalar Sea Food Enterprises, North Paravoor, Kerala Mr. Stalin Sabu	Dry fish	3rd February 2024
3.	ABAD Foods Pvt. Ltd., Ernakulam, Kerala Mr. Faraz Javeed	Fish Protein Hydrolysate based Foliar spray	29th April 2024
4.	Pawternity Essentials Private Limited, Kodungallur,Kerala Mr. Sreeraj P.S.	Pet feed	1st May 2024
5.	Seaweedz Energy, Telangana Mr. Hari Rama Raju	CIFTEQ® Seaweed Aqua Booster – Fish feed supplement	16th May 2024
6.	Sunsharp Biotech Private Limited, Telangana Mr. Mohan Vijaya Krishna	Collagen peptide from fish skin	16th May 2024
7.	Dr. Raja Muthuramalingam, Tamil Nadu	Lab facilities, Mentorship	22nd May 2024
8.	Fudcy Foods, Ernakulam, Kerala Mr. Antony P.J.	RTE Shelf stable Tapioca with chicken and fish	11th June 2024
9.	Kizhi Foods Venture LLP, Tamil Nadu Mr. Gijo George	Dry fish	12th June 2024
10.	Y Biotech, Idukki, Kerala Mr. Benit Danie Biju	Spirulina algae-based biscuits	14th July 2024
11.	Vgo Nutro LLP, Kollam, Kerala Ms. Meenu B.	Pilot Plant facility	23rd July 2024
12.	Dhi Research Solutions, Ernakulam, Kerala Mr. Jiswin Joseph	Data and sample collection for projects	25th September 2024
13.	Ann Marine International (P) Ltd., Ernakulam, Kerala Mr. Wilson Joseph	Fish handling, value addition and vaccuum packaging	7th October 2024
14.	Fish Eye, Ernakulam, Kerala Mr. Muhammed Sherief P.S.	Manufacture of Turtle Excluder Device (TED)	23rd October 2024
15.	Mr. Nidheesh P.A., Ernakulam, Kerala	Dry fish	1st November 2024

Intellectual property rights (Granted/ Filed)

PATENTS				
Sl. No	Title of Innovation	Application/ Registration No.	Date of application filing	Innovators/ Authors/ Contributors
1.	A Nucleotide Probe for Authentication of Penaeus monodon Shrimp and Development of Biosensor System Thereof	202411016922	08.03.2024	1. Dr. Lidiya Wilwet 2. Dr. Toms C. Joseph 3. Dr. Muhamed Ashraf P.
2.	Seaweed-Based Packaging Material and a Method for its Preparation	202411040787	25.05.2024	1. Dr. Jesmi Debbarma 2. Dr. Viji Pankyamma 3. Dr. Sreejith Sasidharan 4. Dr. B. Madhusudana Rao
3.	A Feed Distributor System and a Method Thereof	202411067987	09.09.2024	1. Dr. Aniesrani Delfiya D.S. 2. Dr. S. Murali 3. Dr. George Ninan
4.	A Solar Dryer	202411070879	19.09.2024	1. Dr. Aniesrani Delfiya D.S. 2. Dr. Murali S. 3. Dr. Neethu K.C. 4. Dr. Muhamed Ashraf P.
5.	An Apparatus for Rearing Aquatic Species	202411082738	29.10.2024	1. Dr. Tejpal C.S. 2. Dr. Lekshmi R.G. Kumar 3. Dr. Elavarasan K. 4. Dr. Sanal Ebeneezar
6.	An IoT-Based System for Antibacterial Photodynamic Inactivation and Method Thereof	202411083309	30.10.2024	1. Dr. Toms C. Joseph 2. Ms. Megha C. 3. Mr. Stafan Alex Alexander 4. Dr. Anupama T. K. 5. Dr. Remya S.
7.	Nanofibers and a Process for their Preparation	202411090199	20.11.2024	1. Dr. Binsi P.K. 2. Dr. Sobi K. Chacko 3. Dr. Raneesh B. 5. Dr. Nebu George Thomas
8.	A System and a Corresponding Method for Waterless Live Transportation of Aquatic Species	202411097351	10.12.2024	1. Dr. U. Parvathy 2. Mr. Vishnu R. Nair 3. Mr. Jithin J.T. 4. Dr. B. Madhusudana Rao 5. Dr. S. Murali 6. Dr. Binsi P.K. 7. Dr. Sathish Kumar K.
9.	A Process for Preparation of Pigment-Doped Zinc Oxide Particles	202411100444	18.12.2024	1. Dr. Visnuvinayagam Sivam 2. Ms. Teena George 3. Dr. Murugadas V. 4. Dr. Toms C. Joseph 5. Dr. Anandan R. 6. Dr. G.K. Sivaraman 7. Dr. Raja Swaminathan T. 8. Dr. George Ninan

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Sl. No	**Title**	**Application No:**	**Registration No:**	**Date of Filing**	**Date of Registration**	**Authors**
1.	Customised Database on Shrimp Processing Waste from Organised Shrimp Processing Sector in India	18664/2021-CO/SW	SW-18716/2024	08.08.2021	07.05.2024	1. Dr. Joshy C.G. 2. Ms. Lizbeth Roshin, 3. Dr. Zynudheen A. A. 4. Dr. Elavarasan K. 5. Dr. George Ninan. 6. Dr. Ashok Kumar K. 7. Dr. Ravishankar C.N.
2.	Recurrent Neural Network-Based Regression Analysis for Fish Freshness Grading in Genetically Improved Farmed Tilapia	23263/2023-CO/SW	SW-18154/2024	31.08.2023	25.01.2024	1. Dr. S. Murali 2. Ms. B. Sreelekshmi 3. Ms. P.R. Reshma 4. Dr. D. S. Aniesrani Delfiya 5. Dr. V. Murugadas 6. Dr. P.K. Binsi 7. Dr. George Ninan

INDUSTRIAL DESIGNS					
Sl. No	**Title of Design**	**Application No:**	**Date of Filing**	**Date of Grant**	**Inventors**
1.	Freshness Indicating Device	396148-001	26.09.2023	22.03.2024	1. Dr. Mohan C.O. 2. Dr. Remya S. 3. Dr. Pankaj Kishore 4. Mr. Ananthu Prasad 5. Dr. Bindu J.
2.	Solar Gasifier Hybrid Dryer	402040-001	13.12.2023	19.04.2024	1. Dr. Murali. S 2. Dr. Aniesrani Delfiya D.S. 3. Dr. Alfiya P.V. 4. Dr. Manoj P. Samuel 5. Dr. George Ninan
3.	Food Powder Compacting Unit	419484-001	10.06.2024		1. Dr. Parvathy U. 2. Ms. Meenu B. 3. Mr. Jithin T.J. 4. Dr. Sarika K. 5. Dr. Binsi P.K. 6. Dr. J. Bindu
4.	Stackable Shelving System	422432-001	05.07.2024	19.09.24	1. Dr. Parvathy U. 2. Mr. Vishnu R. Nair 3. Mr. Jithin T.J. 4. Dr. Madhusudana Rao 5. Dr. Sathish Kumar K. 6. Dr. Binsi P.K. 7. Dr. S. Murali
5.	Two-Dimensional Simulator for Live Fish Transportation	438320-001	25.11.2024		1. Dr. Parvathy U. 2. Mr. Vishnu R. Nair 3. Mr. Jithin T.J. 4. Dr. Murali S. 5. Dr. Binsi P.K. 6. Dr. Sathish Kumar K.

Technology Transfer/Professional Service Functions

Commercialization of technologies

Total Revenue Generated : Rs. 23,53,932

Sl. No	Technology Transfer	Date of Agreement signing	Name of the Client
1	Hygienic fish handling and packaging	29th February 2024	My Azli Ventures LLP, Bangalore
2	Fish marination	20th March 2024	Eloi Enterprise, Alappuzha
3	Development of thermally processed fishery products and Technical assistance for setting up the canning or retort processing unit	20th March 2024	Mahesra Royal Food (OPC) Pvt. Ltd., Gujarat
4	Ready to serve frozen products	29th April 2024	Kings Infra Ventures Ltd., Kochi
5	CIFTEQ® Seaweed Aqua Booster – Fish Feed Supplement	29th April 2024	Seaweedz Energy Pvt Ltd., Telangana
6	Fish Protein Hydrolysate based Foliar spray"	29th April 2024	Abad Fisheries Pvt. Ltd., Ernakulam
7	Dry fish processing and establishment of a Solar-Electric Hybrid Dryer	3rd May 2024	Homely Dry Fish, Kochi
8	Production of collagen-based nutraceutical chew sticks for pets	10th May 2024	Mr. Sreeraj P.S., Kodungallur
9	RTE Shelf stable Tapioca with chicken and fish	11th June 2024	Fudcy Foods, Ernakulam
10	Dry fish processing know-how and establishment of a SOLAR-TUNNEL DRYER (100 kg capacity)	12th June 2024	Kizhi Foods Venture LLP, Tamil Nadu
11	Dry fish Processing	2nd July 2024	Vayalar Seafood, Ernakulam
12	Microcrystalline hydroxyapatite	16th August 2024	Sparktiv Ingredients LLP, Karnataka
13	Chitin and chitosan from silkworm pupae	29th August 2024	Ecogenie Biotech, Karnataka
14	Spirulina based cookies	7th October 2024	Spicon Bio, Kottayam
15	Fish handling, value addition and vacuum packaging	7th October 2024	Ann Marine International Pvt. Ltd., Ernakulam
16	Solar Hybrid Dryer	15th October 2024	DRYSSA, Tirur
17	Fish and shrimp pickles	18th November 2024	Nature Harvest International, Tamil Nadu
18	Mechano-Chemo-Enzymatic Shrimp shell Biorefinery Technology	19th November 2024	NPM Associates, Tamil Nadu
19	Bulk manufacture of chitosan from shrimp/ crab shell chitin	25th November 2024	Reachem Laboratory Chemicals Private Limited, Chennai

20	Enzymatically derived shrimp protein hydrolysate from shrimp shell waste	18th December 2024	Siri Aquatic Feeds Pvt. Ltd., Andhra Pradesh
21	Shrimp amino acid through sugar mediated in-situ fermentation	30th December 2024	Pimenta Revitalizing Technologies Pvt. Ltd., Idukki

Agreements signed for the transfer of machinery under Swatchhta Action Plan

Sl. No	Machine Transfer	Date of Agreement signing	Name of the Client
1	Machinery for the establishment of manure production unit	16th May 2024	Mr. Godwin S Fernandez, Thiruvananthapuram
2	Machinery for the establishment of manure production unit	5th August 2024	State Seed Farm, Okkal

Consultancy

Total Revenue Generated : Rs. 9,00,000

Sl. No	Consultancy	Date of Agreement signing	Name of the Client
1	Verification study of histamine and sulfite kit for RAFT approval	22nd February 2024	Biosystems Diagnostics Pvt. Ltd., Tamil Nadu
2	37.3 LOA Tuna Long liner	14th March 2024	Stressed Asset Reconstruction and Development, Tamil Nadu
3	NABL accreditation process - Analytical Labs in Thiruvananthapuram, Kozhikkode and Ernakulam	10th May 2024	Office of the Commissioner of Food Safety, Thiruvananthapuram
4	NABL accredited Food Testing Laboratory	1st August 2024	ICAR - Central Institute for Women in Agriculture (ICAR - CIWA), Odisha

Contract research

Total Revenue Generated : Rs. 1,00,000

Sl. No	Contract Research	Date of Agreement signing	Name of the Client
1	Support for assessment post-harvest losses	2nd July 2024	National Productivity Council, Delhi

Collaborative research

Sl. No	Collaborative Research	Date of Agreement signing	Name of the Client
1	Development of indigenous dolphin pingers and Field/lab trails with pingers and optimization of design	19th February 2024	Muthoot Institute of Technology and Science (MITS), Kochi
2	Development of molecular biology kits for authentication of fish and fishery products	1st March 2024	Origin Diagnostics and Research, Kollam
3	Core shell nano composite fibre 0embranes of PCL-Dopamine properties for bone regeneration	15th April 2024	Catholicate College, Pathanamthitta and Pushpagiri Research Centre, Tiruvalla
4	JIPMP MoA : A mild surfactant assisted green protocol for the isolation of biocompatible soft tissue collagen fibres	18th April 2024	Pushpagiri Research Centre, Tiruvalla
5	Undertake studies/projects /programmes for protecting the sustainability of the fisheries sector	3rd May 2024	Indian Marine Ingredients Association, Tiruvalla
6	Development of mushroom-based food products	3rd June 2024	SCMS School of Technology &Management, Kochi
7	Develop test kits for the determination of foodborne pathogens and to develop food safety guidance	23rd July 2024	Merck Life Science Private Limited, Mumbai
8	IoT based LED light chamber system for antibacterial photodynamic treatment	29th August 2024	Nextler Innovations Pvt. Ltd., Thiruvananthapuram
9	For Joint R&D projects and Training	6th September 2024	Gandhi Institute of Technology and Management (GITAM), Andhra Pradesh
10	Development of Centre of Excellence for Food Authenticity Research	22nd October 2024	Waters India Pvt. Ltd., Bangalore

Agreement with Farmer Producer Organisations

Sl. No	Technology Support	Date of Agreement signing	Name of the Client
1	Support to fisheries FPO with the support of NABARD	21st June 2024	National Bank for Agriculture and Rural Development (NABARD), Maharashtra
2	Fish feed, plant growth enhancer and self-digesting manure from fish waste	26th September 2024	Bharathidasan Freshwater Fish Farmers Producer Company Limited (BFFFPCL), Puducherry
3	Value addition and product development in the fisheries sector	1st November 2024	Clam Kerala Farmer Producer Company Ltd., Mavelikkara
4	Value addition and product development in the fisheries sector	1st November 2024	Chirayinkeezhu Farmer Producer Company Ltd., Thiruvananthapuram

5	Value addition and product development in the fisheries sector	1st November 2024	Masters Farmer Producer Company Ltd., Kollam
6	Value addition and product development in the fisheries sector	1st November 2024	Chittumala Farmer Producer Company Ltd., Kollam
7	Value addition and product development in the fisheries sector	1st November 2024	Muthukulam Agroland Farmer Producer Company Ltd., Alappuzha
8	Value addition and product development in the fisheries sector	1st November 2024	Bharat Farmers Producers Mutually Aided Cooperative Society Ltd., Andhra Pradesh
9	Value addition and product development in the fisheries sector	1st November 2024	Maha Matsyanarayana Fish Farmers Producers Organization, Andhra Pradesh

Contract service

Total Revenue Generated : Rs. 1,60,000

Sl. No	Contract Service	Period of Service	Name of the Client
1	PCR Test Kits - KHP, EUS, SVCV, TiLV	February 2024	Agency for Development of Aquaculture (ADAK)
2	Accreditation of Microbiological lab	February 2024	Kerala Wate r Authority
3	Inspection of cold storage Facility	August 2024	Kerala State Warehousing Corporation
4	Internal auditing of Genome Lab	September 2024	Genome Lab, KLDB, Thiruvananthapuram

Workshops/Seminars/Conferences

Sl. No	Title of the programme	No. of participants	Date and venue
1.	USFDA-CIFT Seafood decomposition training Fig 9, 10, 11	48	29-01-2024 to 30-01-2024 and 02-02-2024 to 03-02-2024, ICAR-CIFT, Cochin
2.	Workshop on Entrepreneurship Development on Aqua millet – Fish & millet-based Products, Funded by DST, New Delhi	15	24-04-2024, ICAR-CIFT, Cochin
3.	Sustainable Transformation in Seafood Industry	20	02-05-2024, ICAR-CIFT, Cochin
4.	Webinar on Emergency for Unexpected Food Safety Challenges (Fig 12)	200	07-06-2024 Online
5.	High-end workshop (Karyashala) on "Business avenues in Fish Processing and Value Addition" organised under Accelerate Vigyan Scheme of DST SERB, New Delhi	26	21-07-2024 to 31-07-2024, ICAR-CIFT, Cochin
6.	Workshop on innovative solutions for fish waste utilization jointly organized by MRC, ICAR CIFT and NCDC, Regional Office, Pune, Maharashtra	25	22-07-2024, Mumbai Research Centre, ICAR-CIFT
7.	Farmers Meet	100	31-08-2024 State Seed Farm, Okkal
8.	National Seminar on Aqua Food Excellence: Innovations in Post-Harvest Fisheries	106	02-09-2024 to 04-09-2024, ICAR-CIFT, Cochin
9.	Workshop on Microbial composting for stakeholders under SAP	22	26-09-2024, ICAR-CIFT, Cochin
10.	Workshop on Strategies for Managing FRP debris from coastal environment	40	30-09-2024, ICAR-CIFT, Cochin
11.	Workshop on Waste to wealth: Shredding of Marine litters & Recycling options	25	30-09-2024, Mumbai Research Centre, ICAR-CIFT
12.	Workshop for popularisation of 'V' form double slotted otter board to fishermen of different fishing harbour of Tamil Nadu and Puducherry, followed by on-board demonstration	50	07-10-2024, Chennai Fishing Harbour, Tamil Nadu
13.	Workshop cum awareness programme "CIFT V-Form Double Slotted Otter Board" (GP-1)	100	08-10-2024, Visakhapatnam Research Centre of ICAR-CIFT

14.	Workshop on V-Form Double slotted otter board at Alibag, Raigad district of Maharashtra	30	15-10-2024, Fishermen Cooperative Society, Alibag, Raigad, Maharashtra
15.	31st Swadeshi Science Congress, organized by Swadeshi Science Movement Kerala, Vijnana Bharati in association with ICAR-Central Institute of Fisheries Technology, Kochi	200	07-11-2024 to 09-11-2024, ICAR-CIFT, Cochin
16.	Workshop on World Fisheries Day and "Students Interaction cum Brainstorming Programme" for students from the Kerala University of Fisheries and Ocean Studies (KUFOS)	60	21-11-2024, ICAR-CIFT, Cochin
17.	Workshop on Millet and Fish based Extruded and baked products	22	29-11-2024, ICAR-CIFT, Cochin
18.	High-end workshop on Analytical Advances, Opportunities, and Challenges in Marine biomolecules	52	Fisheries College & Research Institute, TNJFU, Thoothukudi

Training/Awareness Programmes Organised

Sl. No	Subject	No. of beneficiaries	Date and venue
1	Hands on training on fish disease diagnosis and its management	20	01-01-2024 to 12-01-2024 ICAR-CIFT, Cochin
2	e-ITEC programme on Quality assurance of Fish and Fishery products	16	08-01-2024 to 19-01-2024, Online mode
3	Hands-on training on advanced microbiological techniques - FSSAI-Softel	15	08-01-2024, ICAR-CIFT, Cochin
4	Familiarization of deep-sea gill netting	5	17-01-2024 to 19-01-2024, Veraval, Gujarat
5	Hands-on training on Microbiological and Biochemical analysis of fish and fishery products	20	21-01-2024 to 25-01-2025, Veraval, Gujarat
6	Responsible inland Fishing through sustainable fish harvesting practices (GP-2)	25	22-01-2024 to 24-01-2024, Regional Fisheries Training Institute, Amaranga, Kamrup Dist, Assam
7	Entrepreneurship development in Assam through Hygienic fish drying and Value Addition programme (GP-3)	25	22-01-2024 to 24-01-2024, Regional Fisheries Training Institute, Amaranga, Kamrup Dist, Assam
8	Orientation on fishing gear and bycatch reduction devices	20	24-01-2024 to 30-01-2024, ICAR-CIFT, Cochin
9	Training program on Hygienic handling and drying of fish and shellfish for entrepreneur from Alibaug, Raigad	1	27-01-2024 to 29-01-2024, Mumbai Research Centre, ICAR-CIFT
10	Advanced training on analysis of residues, contaminants and toxins in fish and fish products - FSSAI-Softel	18	29-01-2024 to 02-02-2024, ICAR-CIFT, Cochin
11	Inland fisheries sustainable fishing practices (GP-4)	25	30-01-2024 to 01-02-2024, Directorate of Fisheries, Katla, Aizawl, Mizoram
12	Value addition and hygienic handling of fish for increasing domestic consumption and promoting small scale entrepreneurship in Mizoram (GP-5)	25	30-01-2024 to 01-02-2024 Directorate of Fisheries, Katla, Aizawl, Mizoram
13	HACCP training	9	05-02-2024 to 06-02-2024, ICAR-CIFT, Cochin
14	Hygienic handling and value addition of fish and fishery products (GP-6)	25	05-02-2024 to 07-05-2024, College of Fisheries, Kawardha, Chhattisgarh
15	Intervention of new responsible inland fish harvesting techniques	25	05-02-2024 to 07-05-2024, College of Fisheries, Kawardha, Chhattisgarh
16	Training on opinion Formation, FSS Regulation, and Integrated Assessment - FSSAI-Softel	19	07-02-2024 to 08-02-2024, ICAR-CIFT, Cochin
17	Input distribution programme cum stakeholder meeting	60	13-02-2024, Beypur, Kozhikode, Kerala
18	Preparation of dried and convenient shelf stable products (GP-7)	20	19-02-2024 to 21-02-2024, Gunipudi village, Nakkapalli Mandal, Anakapalli Dist-, Andhra Pradesh

19	Pre-processing and drying of fish	22	27-02-2024 to 28-02-2024, ICAR-CIFT, Cochin
20	Detection of Salmonella as per USFDA method	5	04-03-2024 to 08-03-2024, Visakhapatnam Research Centre of ICAR-CIFT
21	Fabrication and repair of nets used cages	15	21-03-2024 to 22-03-2024, VP Island, Kodungallur, Kerala
22	Entrepreneurship opportunities in fisheries sector	55	25-03-2024 to 27-03-2024, Alagappa University, Karaikudi, Tamil Nadu
23	Bacteria of public health interest	15	01-04-2024 to 05-04-2024, ICAR-CIFT, Cochin
24	Hands-on training on Enumeration of somatic coliphages and RT-PCR analysis of seafood borne pathogens	1	01-04-2024 to 05-04-2024, ICAR-CIFT, Cochin
25	Quality Assurance in fish & shellfish handling for staff of Matsyafed	15	16-04-2024 to 19-04-2024, ICAR-CIFT, Cochin
26	Quality Assurance in fish & shellfish handling for staff of Matsyafed	12	18-04-2024 to 19-04-2024, ICAR-CIFT, Cochin
27	Technology demonstration and popularization of V form double slotted otter board at Ratnagiri in Maharashtra	20	11-05-2024, Ratnagiri , Maharashtra
28	Technology demonstration and polularisation of V form double slotted otter board at Bhaucha dhakka in Maharashtra	25	17-05-2024, Bhaucha dhakka , Maharashtra
29	Fabrication and operation of CIFT-VSOB	32	20-05-2024, Malpe, Karnataka
30	Fabrication and operation of CIFT-VSOB	43	20-05-2024, Karwar, Karnataka
31	Onboard technology demonstration and training program for V form double slotted otter board at Rawas Jetty, Alibag in Maharashtra	20	20-05-2024, Rawas, Alibag, Raigad , Maharashtra
32	Fabrication and operation of CIFT-VSOB	38	22-05-2024, Vasco, Goa
33	Demonstration and popularization program of V form double slotted at Sindhudurg, Maharashtra	20	22-05-2024, Sindhudurg , Maharashtra
34	Training programme on fish processing, value addition and waste utilization	9	28-05-2024 to 30-05-2024, ICAR-CIFT, Cochin
35	Distribution of marine litter booths and conducted an awareness programme to beat plastic pollution under Jnanodhya sabha, Kochi on relation with world environmental day	100	05-06-2024, Edakochi , Cochin
36	Hands-on training on Development of various value-added fishery products in connection with World Food Safety Day 2024	20	07-06-2024, Mumbai Research Centre,, ICAR-CIFT
37	Filth Analysis	5	12-07-2024, Visakhapatnam Research Centre of ICAR-CIFT

38	Microbiological analysis of the water samples and documentation as Per IS 15185-2016	17	17-07-2024 to 19-07-2024 ICAR-CIFT, Cochin
39	Awareness program on NABL Accreditation and its benefits	20	19-07-2024 Veraval,Gujarat
40	In-Plant training for 4th year B.F. Sc students of College of Fisheries AAU Raha under Student READY programme	29	06-08-2024 to 27-09-2024, ICAR-CIFT, Cochin
41	Preparation of fish pickle, dried shrimp pickle and value-added products	10	06-08-2024 to 08-08-2024, Visakhapatnam Research Centre of ICAR-CIFT
42	In-Plant training programme for the Final year B.F.Sc. students of College of Fisheries Science & Research Centre, Etawah, Uttar Pradesh	7	12-08-2024 to 12-10-2024, ICAR-CIFT, Veraval Research Centre of ICAR-CIFT
43	In-Plant training programme for the Final year B.F.Sc. students of College of Fisheries (RPCAU), Dholi, Bihar	20	21-08-2024 to 20-09-2024, Veraval Research Centre of ICAR-CIFT
44	Pre-processing and drying of fish	5	22-08-2024 to 23-08-2024, ICAR-CIFT, Cochin
45	Advance Microbiology, Molecular Biology and cell Culture Techniques in Food Safety	24	01-10-2024 to 10-10-2024, ICAR-CIFT, Cochin
46	Off-campus Online Collaborative Training Programme on "New Paradigms in Fisheries Extension System" sponsored by National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Ministry of Agriculture and Farmers' Welfare, Government of India	50	07-10-2024 to 09-10-2024, ICAR-CIFT, Cochin
47	Pre-processing and drying of fish for Kizhifoods, Tiruppur	4	08-10-2024, ICAR-CIFT, Cochin
48	Awareness program on benefits of VSOB at Pondicherry fishing harbour with association of Deputy Director of Fisheries and Fishermen association	20	08-10-2024, ICAR-CIFT, Cochin
49	Training programme on pre-processing and drying of fish	20	15-10-2024 to 16-10-2024, ICAR-CIFT, Cochin
50	Awareness programme for local fishermen regarding benefits of Wave Rider buoy installed in the Veraval coast by Veraval RC of ICAR-CIFT under INCOIS project	20	23-10-2024, Veraval Research Centre, ICAR-CIFT
51	Training cum demonstration programme on fish processing, value addition and waste utilization	10	28-10-2024 to 30-10-2024, ICAR-CIFT, Cochin
52	Training on Microbiological analysis of food and water samples and documentation as per NABL requirement for the staff of the Regional Analytical Laboratory under NABL consultancy	12	28-10-2024 to 30-10-2024, ICAR-CIFT, Cochin

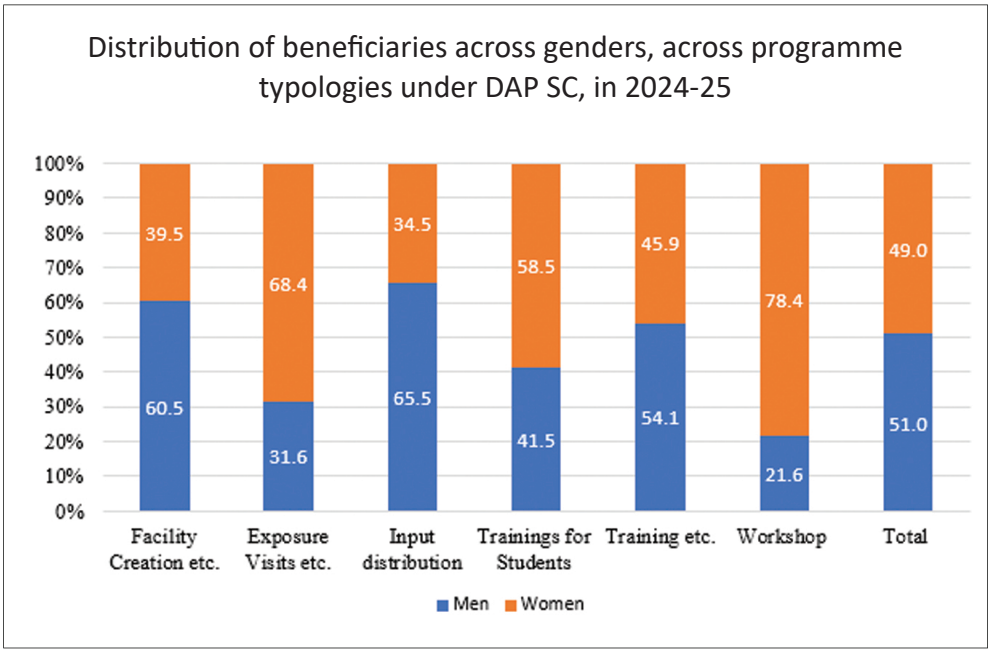
53	In-plant cum Hands on training in Fish Processing Value Addition and Waste Utilization for MVSc & Ph D. Students of KVASU, Thrissur	6	12-11-2024 to 14-11-2024, ICAR-CIFT, Cochin
54	Review workshop and technical presentation on EV Kits for fishing vessels for the suppliers of EV Kits for fishing Vessels across India in collaboration with ARAI Pune in Hybrid mode	7	13-11-2024, Mumbai Research Centre, ICAR-CIFT
55	In-plant training programme for KCEAFT, B. Tech (Agr. Engg.) students, Thavanoor	38	18-11-2024 to 13-12-2024, ICAR-CIFT, Cochin
56	In-plant Training -2024 to B .Tech (Agri. Engg), KCEAEFT, KAU	50	18-11-2024 to 13-12-2024, ICAR-CIFT, Cochin
57	TSP training conducted for ST students on the Exposure visit to the CIFT Processing technologies from the GTHS Javadhu Hills	46	19-11-2024 to 21-11-2024, Javadhu Hills, Tamil Nadu
58	Awareness program on Antimicrobial resistance: Silent pandemic as part of WAAW celebration 2024	205	21-11-2024, KUFOS, Panangad, Kochi
59	Workshop on Hygienic handling and Value addition Fish and Shellfish on the occasion of World Fisheries Day 2024	20	22-11-2024, Mumbai Research Centre,, ICAR-CIFT
60	Hands-on training programme on Analysis of Proximate composition and quality parameters of Fishmeal	1	25-11-2024 to 29-11-2024 , Veraval Research Centre of ICAR-CIFT
61	Awareness program on Antimicrobial resistance: Silent pandemic as part of WAAW celebration 2024	100	27-11-2024, Gregorian Public School, Maradu, Cochin
62	Preparation of Ready-to-Cook and Value-Added Seafood Products (GP-8)	11	27-11-2024 to 29-11-2024, Visakhapatnam Research Centre, ICAR-CIFT
63	A training program on AMR Pathogens and Their Mitigation from a One-Health Point of View	20	02-12-2024 to 07-12-2024, ICAR-CIFT, Cochin
64	Training program on Preparation of Value-added products from fish and shellfish for Entrepreneurs from Alibaug, Raigsd, Maharashtra	2	03-12-2024 to 05-12-2024, Mumbai Research Centre, ICAR-CIFT
65	Augmenting Safety of Fish and Fishery Products Through Microbiological Testing (GP-9)	12	16-12-2024 to 20-12-2024, Visakhapatnam Research Centre , ICAR-CIFT
66	Training programme on Fish Processing and Value Addition for Fish Farmers in Himachal Pradesh, under the aegis of the Department of Fisheries, Himachal Pradesh.	27	17-12-2024 to 18-12-2024, Himachal Pradesh
67	Entrepreneurship Opportunities in Marine Fisheries	50	26-12-2024 to 28-12-2024, Ramanathapuram, Tamil Nadu
68	Training was provided to the students of Aditya Birla HS School on preparation of silage from fish waste	20	26-12-2024, Veraval, Gujarat

Scheduled Caste Sub-Plan (SCSP) / Development Action Plan for Scheduled Castes (DAPSC)

Under the Development Action Plan for Scheduled Castes (DAPSC)/ Scheduled Caste Sub- Plan (SCSP), a total of 63 programmes were conducted with a total of number of direct beneficiaries of 2112 consisting of 1078 men (51%) and 1034 women (49%). The total activities were carried out under 6 typologies: (1) Facility creation/ value chain creation/FIGs/ SHGs/ other implementation activities; (2) Exposure visits/training programme/ awareness programmes; (3) Input distribution programmes (without training); (4) Trainings for students (Graduate and Post Graduate); (5) Training/awareness programme/ capacity building of SC community members with input distribution and (6) Workshop. A summary table of the programmes is provided in Table 1.

Summary of DAPSC/SCSP programmes and number of beneficiaries

Sl No	Typology of the programme	No of programmes/ activities	Number of beneficiaries		
			Men	Women	Total
1	Facility creation/Value chain creation/FIGs/ SHGs/ Other implementation activities	9	150	198	348
2	Exposure visits/ Training programme/ awareness programme	14	111	240	351
3	Input distribution programmes (without training)	8	365	192	557
4	Trainings for students (Graduate and Post Graduate)	16	160	226	386
5	Training /awareness programme/ capacity building of SC community members with input distribution	15	281	238	519
6	Workshop	1	11	40	51
	Total	**63**	**1078**	**1034**	**2112**



Facility creation/Value chain creation/FIGs/ SHGs/ other implementation activities under SCSP

Sl No.	Title of the program/Activity	Location	Beneficiaries		
			Men	Women	Total
1.	Improving the livelihood and safety of small-scale fisher folk in Chellanam fishing village	Chellanam-Kandakadavu Fishermen Welfare and Development Co-operative Society Kochi, Kerala	50	10	60
2.	Aquafood tourism development: Technological approaches in Kadamakkudi Panchayat	Kadamakkudi Ernakulam, Kerala	2	10	10
3.	Sustainable management of black clam (V. cyprinoids) in Panangad backwater and its utilisation for food security through better processing practices	Cheppanam, Panangad, Ernakulam, Kerala	14	6	20
4.	Value chain creation through cluster approach for small irrigation-based reservoir fisheries and aquaculture	Palani, Dindigul district, Tamil Nadu	27	7	34
5.	Establishment of a facility of Mini fish processing unit	Njarakkal and Elamkunnapuzha of Vypeen block Ernakulam, Kerala	3	12	15
6.	Establishment of a Mini-Fish Processing unit for value addition	Visakhapatnam, Andhra Pradesh	5	10	15
7.	Multipurpose drying facility for rehabilitation and livelihood security of hearing and speech impaired member of SC community	Wayanad district, Kerala	4	7	11
8.	Multipurpose drying facility for rehabilitation and livelihood security of hearing and speech impaired member of SC community, at Kannur	Kannur district, Kerala	15	6	21
9.	Establishment of processing cum development unit at KVK Kodinar for the benefits of SC community trained by Veraval RC of ICAR-CIFT	KVK Kodinar, Gujarat	30	30	60

Exposure visits/Training programme/awareness programme under SCSP

Sl No.	Title of the Programme	Location/venue	Beneficiaries		
			Men	Women	Total
1.	Livelihood improvement of SC fishers in Mumbai through distribution of equipment for fishing	Vadgaonpan, Ahilyanagar, Maharashtra	101	51	152
2.	Advanced fishing technologies for responsible fisheries	Mumbai Research Centre of ICAR-CIFT	9	7	16
3.	Advanced fishing technologies for responsible fisheries	Vadgaonpan, Ahilyangar, Mumbai	18	7	25
4.	Advanced fishing technologies for responsible fisheries	Vadgaonpan, Ahilyangar, Mumbai	101	51	152
5.	Distribution of fishing nets and ice box	Vadanappalli	0	52	52
6.	Marine fish harvesting systems of Andhra Pradesh	Visakhapatnam Centre of ICAR-CIFT	7	8	15
7.	Organising distribution function of insulated ice box	Palluruthy, Ernakulam Kerala	115	10	125
8.	Clam ranching	Cheppanam, Panangad belongs Kumbalam panchayat, Palluruthy block.	14	6	20

Trainings for Students (Graduate and Post Graduate)

Sl No.	Title of the programme	Location/venue	Beneficiaries		
			Male	Female	Total
1.	Advances in fishing gear materials	ICAR-CIFT, Cochin	13	4	17
2.	Microbiological testing as per ISO methods for food Laboratories	ICAR- CIFT, Cochin	12	13	25
3.	Orientation on responsible fishing and Bycatch Reduction Device	ICAR-CIFT, Cochin	2	6	8
4.	Onboard training cum orientation programme on trawl fishing	Onboard Research vessel Matsyakumari II, of ICAR-CIFT, Cochin	20	40	60
5.	Fish oil extraction, characterization and application	ICAR-CIFT, Cochin	7	8	15
6.	Extraction & characterization of marine biomolecules	ICAR-CIFT, Cochin	6	9	15
7.	Green extraction techniques for marine bioactive compounds	ICAR-CIFT, Cochin	7	6	13
8.	Hands-on training on aqua-feed formulation	ICAR-CIFT, Cochin	1	10	11

9.	Emerging trends in food processing: innovation, technology, and sustainability	ICAR-CIFT, Cochin	9	20	29
10.	HACCP concepts	ICAR-CIFT, Cochin	17	10	27
11.	Entrepreneurship opportunities in marine fisheries	Sethupathy Govt. Arts College, Ramanathapuram, Tamil Nadu	36	37	73
12.	Advanced fishing technologies for responsible fisheries	Mumbai RC of ICAR-CIFT	9	7	16
13.	Biochemical and sensory quality evaluation of seafood	Visakhapatnam RC of ICAR-CIFT	4	11	15
14.	Augmenting safety of fish and fish products through microbiological testing	Visakhapatnam RC of ICAR-CIFT	3	10	13
15.	Advance microbiology, molecular biology and cell culture techniques in food safety	ICAR-CIFT, Cochin	9	15	24
16.	AMR pathogens of public health	ICAR-CIFT, Cochin	5	20	25

Training /awareness programme/capacity building of SC community members with input distribution

Sl No.	Title of the program	Location/venue	Beneficiaries		
			Men	Women	Total
1.	Awareness cum demonstration programme on "Empowering Scheduled Caste communities through harvest and post-harvest technology intervention	Khopoli village of Raigad District, Maharashtra	13	17	30
2.	Awareness programme on "Technological advances in fishing, safety at sea & marine plastic mitigation measures"	Chellanam-Kandakadav Fishermen Welfare and Development Co-operative Society, Kerala	10	0	10
3.	'Training cum demonstration programme on 'Quality upgradation of value added fishery products'	Agriculture Producer Organization, an FPO at Cherpu, Thrissur, Kerala	8	12	20
4.	Awareness programme on 'Responsible fishing and Input distribution programme'	Palluruthy Block Panchayat, Kerala	100	30	130
5.	Skill development programme on harvest and post-harvest technologies for inland fisher women	Fisherwomen from Kattikunnu, Vaikom, Kerala	0	42	42
6.	Best aquaculture management & hygiene & handling on value addition of fish and fishery products	Village Vavoshi, Khalapur, District- Raigad, Maharashtra	15	15	30

7.	Best aquaculture management & hygiene & handling on value addition of fish and fishery products	Fish Farmer Training Centre, Shalimar, Ranchi, Jharkhand	14	24	38
8.	Best aquaculture practices & value addition of fish and fishery products	Beed, Taluka-Khalapur, Raigad, Maharashtra	10	21	31
9.	Skill Enhancement training programme on 'Sustainable and eco friendly fishery methods'	Madhavpur, Gujarat	30	0	30
10.	Skill enhancement training programme on "Development of value-added fish products"	Veraval RC of ICAR-CIFT	0	30	30
11.	Skill enhancement training programme on Development of Value-added Fish products	KVK Kodinar, Gujarat	0	30	30
12.	Skill enhancement training programme on "Development of value-added fish products"	KVK Kodinar, Gujarat	30	0	30
13.	Skill enhancement training programme on "Development of value-added fish products"	Centre of Excellence (COE) in Aquaculture, Ukai , Kamdhenu University, Gujarat	30	0	30
14.	Sustainable practices for marine fish harvesting	Visakhapatnam RC of ICAR-CIFT	15	0	15
15.	Training cum input distribution programme on "Responsible clam fishing & scientific practice of clam processing"	Eloor Anappara Ulnadan Matysa Thozhilali Vikasana Kshema Sahakarana Sangham at Atholi, Kozhikode, Kerala	6	17	23

Workshop for Graduate and Post Graduate students

Sl No.	Title of the program	Location/venue	Beneficiaries		
			Men	Women	Total
1.	High end workshop on "Analytical advances, opportunities, and challenges in marine biomolecules"	Fisheries College & Research Institute, TNJFU, Thoothukudi, Tamil Nadu	11	40	51

Tribal Sub Plan (TSP) / Development Action Plan for Scheduled Tribes (DAPST)

Under the Tribal Sub Plan (TSP), a series of impactful training, capacity-building, and infrastructure development programs were undertaken to empower tribal communities across various states of India.

A three-day field-level training-cum-demonstration program on "Preparation of Value-Added Products from Fish and Shellfish" was organized during February 2024 at Jamunamarthur, Jawadhu Hills, in collaboration with KVK-Thiruvannamalai. The program witnessed active participation from 85 tribal beneficiaries and 75 food science students from FHSS-Jamunamarthur (under Society for Rural Development). Hands-on demonstrations included the preparation of fish balls, fingers, cutlets, pickles, shrimp batter products, dried fish, and fish amino acids.

A three-day skill development program on value-added fish and shellfish products was held from during February 2024, in collaboration with College of Fisheries, MPUAT, Udaipur. Sixty tribal fisherfolk from DIA Reservoir participated and were trained in making ready-to-eat/cook fish and shrimp products. A special session

A three-day training was conducted at MYRADA Training Center, Arepalayam (near Talamalai Reserve Forest), during February 2024 in partnership with KVK MYRADA. Sixty tribal participants took part in the program where participants learned to prepare and package value-added fish products like fish balls, fingers, pickles, soup powder, and fish amino acids, which were marketed through local outlets.

on fish waste utilization and silage preparation was also conducted. Participants received useful items like cast nets, gill nets, and iceboxes. A Mini Processing Unit was set up at the college to support ongoing training and production.

During March 2024, ICAR-CIFT conducted a landmark training program—the first of its kind in Nicobar—in association with the Directorate of Fisheries, A&N Administration. The program trained 34 participants in preparing fish-based value-added products like cutlets, pickles, chutney powder, and dry fish. Demonstration of fish pre-processing and hygienic drying was also done using a solar cum electric backup dryer, which was also installed as part of a newly established Mini Processing Unit for the tribal community.

A three-day training program during March 2024 was organized in collaboration with KVK-Nilgiris at Kallampalayam Tribal Village, Thengumarahada (Tiger Reserve Forest). Seventy-four tribal participants were trained in preparing fish cutlets, fingers, chutney powder, and pickles using fish from Bhavani Sagar Dam. The sessions also focused on hygienic processing and local marketing near tourist hotspots. A mini fish processing unit was established to support tribal entrepreneurship and value addition in the region.

A one-day training-cum-demonstration on "Advances in Harvest and Post-Harvest Technologies" was conducted during March 2024 at Chulliyar Reservoir, which provided hands-on sessions on preparing fish pickle from Rohu and cutlets from Tilapia, covering hygienic handling and packing to 54 participants (34 women and 20 men). Fishing inputs like gill nets and iceboxes were also distributed.

Skill Development in Pangasius Value Addition was conducted during December 2024 at Kochi for Bhil and Pavara tribal fishermen from Nandurbar, Maharashtra, on hygienic handling and packaging.

Mini Fish Processing Units (MFPUs) were set up to strengthen fish processing and training infrastructure at Sher-e-Kashmir University of Agricultural Sciences, Rangil, Kashmir, College of Fisheries, MPUAT, Udaipur, Rajasthan, KVKs at Idukki (Kerala), Thiruvannamalai (T.N.), Lakshadweep and ICAR-CIFT, Kochi

Distribution of coracles and insulated ice boxes were done to support field demonstrations and upcoming training programs at KVKs at Thiruvannamalai, Ooty, MYRADA-Sathyamangalam, Krishnagiri and Directorate of Fisheries, A&N Islands (Port Blair).

Horizontal deep freezers for tribal training support were provided to enhance training, processing, and storage facilities across institutes and tribal societies under CoF, Ranchi (Jharkhand); CoF, Udaipur (Rajasthan), KVKs of Thiruvannamalai, Idukki, Ooty, MYRADA-Erode, Lakshadweep and Tribal societies of Jamunamarathur, Thandrampattu

These initiatives aim to enhance fish quality, strengthen value addition, and promote sustainable livelihoods among tribal fishing communities.

North Eastern Hill (NEH) Programme

Under the North East Scheme, a total of 26 programmes were conducted across Assam, Mizoram, and Tripura, focusing on skill development, sustainable fishing, value-added fish products, and public health, with approximately 1700 beneficiaries across various programs.

Programmes/Activities	Number of Programmes	Number of beneficiaries
Training programmes	9	270
Demonstrations	9	500
Input distribution	8	1000

The institute conducted 9 training programs, engaging 270 fishermen, fish farmers, and women beneficiaries in Assam, Mizoram, and Tripura. In Kamrup, Assam, during 22–24 January 2024, two programs were conducted at the Regional Fisheries Training Institute, in collaboration with the Department of Fisheries, Assam for the benefit of 50 participants. Twenty five fishermen from Amtala, Rajupukhuri, and other areas were trained in sustainable inland fishing techniques, emphasizing innovative harvesting and craft use. Twenty five participants from multiple Districts were trained in hygienic fish handling, solar drying, and value-added products like fish fingers, cutlets, and pickles, with training manuals released.

In Aizawl, Mizoram, from 30 January to 1 February 2024, two programs were organised at the Directorate of Fisheries, in collaboration with the Department of Fisheries, Mizoram and 25 participants were trained on sustainable fishing gears like gillnets and foldable traps and anoher 25 were trained on value-added products and solar drying, with manuals released.

In South Tripura, from 6–8 February 2024, a program organised in association with ICAR-KVK, trained 25 participants from nine villages, including Baikhora and Muhuripur, in hygienic shidal production, with a diverse group of 13 males and 12 females from Bengali, Reang, and Chakma communities.

In Dhemaji, Assam, on 19–20 August 2024, a joint program was conducted with ICAR-IARI Assam at Gogamukh and 40 participants were trained in hygienic handling, formalin detection, and value-added products like fish pickles and balls. A workshop was organised at Guwahati, Assam, on 21 August 2024 at the Directorate of Fisheries, addressing formaldehyde adulteration, training officials in formalin test kit use, distributing kits for field surveys, and discussing enforcement strategies. In Nalbari, Assam, from 22-23 August 2024 a two-day program was conducted in association with the Mindora Foundation and 35 women were trained in Dangardi Village on "Hygienic fish handling and quality improvement" including hands-on training in fish pickle, cutlets, and bites, and a small-scale fish processing unit was established.

In Sipahijala, Tripura, from 19–21 December 2024, a three-day training program was conduced in association with Krishi Vigyan Kendra (KVK) and 25 fish farmers from Ashok Colony and Latiacherra were trained in value-added products like prawn pickle and fish fingers, and waste management, providing equipment like food processors and sealers to establish a community fish processing center.

Essential inputs to support training and entrepreneurship, including solar hybrid dryer to ICAR-IARI, Assam, FRP fishing canoes to Rupnagar Farm, FISHFED Society, Guwahati, and in Kamrup, Assam, cast nets, gill net webs, PVC accessories, galvanized iron rods, HDPE nylon webbings, hooks/lines, solar fish dryer, electric fryer, meat mincer, hand-operated sealers, weighing balances, mixer grinder, ice boxes, gas stove, and insulated fish bags were distributed. In Aizawl, Mizoram, inputs included cast nets, gill net webs, PVC accessories, galvanized iron rods, HDPE nylon webbings, hooks/lines, electric fryer, meat mincer, sealers, weighing balances, mixer grinder, ice boxes, gas stove, and insulated fish bags were distributed.

The activities enhanced skills of around 1000 participants, promoted entrepreneurship through new mini fish processing units in Nalbari and Sipahijala, supported sustainable fishing and waste management, improved public health via formalin detection, and strengthened local fisheries infrastructure with inputs like FRP canoes and processing equipment. ICAR-CIFT's efforts in 2024 significantly advanced fisheries development in the NE region, empowering communities and supporting rural livelihoods for future growth.

Exhibitions Participated

Sl. No.	Name of the Exhibitions	Organizers	Date (Duration)
1.	'Matsya Pranee Samavesh Odisha (MPSO)-Multiplying farmer's income through fisheries and animal husbandary'	Fisheries and ARD Department, Govt. of Odisha	16.02.24 to 18.02.24
2.	Fisheries Summer Meet 2024	Dept. of Fisheries, Krishi Bhawan, New Delhi	10.07.24
3.	ICAR Foundatiaon Day	ICAR	16.07.24 to 17.07.24
4.	38th National Convention of Environmental Engineers	Institute of Engineering, Kochi	23.08.24 to 24 .08.24
5.	Okkal Farm Fest 2024	Jilla Panchayat, Ernakulam	31.08.24
6.	State level Agriculture Exhibition	Kudumbashree Kerala Mission	12.09.24 to 14.09.24
7.	World Food Expo 2024	Ministry of Food Processing Industries	19.09.24 to 22.09.24
8.	Marine Science Expo	Marine Campus, CUSAT	25.09.24 to 27.09.24
9.	65th Kisan Mela	RARAS, Anakapalle	13.12.24

Television/Radio talks

Sl. No.	Name	Topic	Broadcasted by	Date
1	Dr. U. Sreedhar, SIC & Principal Scientist	Samudramlo Plastic Kalushyam - Matsya Sampada Pai Savallu, Prabhavalu	All India Radio, Visakhapatnam	09.11.2024
2	Dr B. Madhusudana Rao, Principal Scientist	Antimicrobial resistance in food producing animals: Implications for human and animal health	All India Radio, Visakhapatnam	20.11.2024
3	Dr. K. Ahamed Basha, Scientist	Importance of probiotics in Aquaculture	All India Radio, Visakhapatnam	12.12.2024

Invited Talks

Dr. George Ninan

- Fisheries for Food Security and Sustainable Livelihood/ Societal Applications of Marine Sciences, MARICON 2024 International Conference on Frontiers in Marine Sciences at Cochin on 10-04-2024
- Fishery enterprises and start-ups in the Indian context, Rural India Business Conclave, Kalpa Agri Start up at ICAR-CPCRI, Kasargod on 15-12-24
- Agribusiness Incubation – Lessons learnt and way forward, RISE UP Start-up Conclave at ICAR-IISR, Calicut on 19-02-25
- Commercialization of Science, Technology and Academic Scholarship, International Learners Summit at CUSAT, Cochin on 21-02-2025
- Scope for Start-ups in Fisheries and Aquaculture Sector, Fisheries Start Up Conclave 2.0, DoF, AHD at Hyderabad on 08-3-2025

Dr. M. P. Remesan

- Tapping island fishery resources, chintan shivir consultative workshop for enhancing seafood exports at Bangaram Island, UT of Lakshadweep, 10-11, May 2024.
- Sustainable harvest and utilization of mesopelagic resources - National Workshop on "Exploring the Possibilities for Harvest and Utilization of Mesopelagic Fishes in the Indian EEZ,"at CMFRI, Mangaluru, 24 May 2024.
- CIFT initiatives for greening the trawl sector in India –during 31 Swadeshi Science Congress at Cochin, 7-9, November, 2024.
- Fishing crafts and gears used in Indian marine fishery- Training Programme on Survey Methodology for Field Data Collection, FCSA App and Taxonomy for Species Identification at CMFRI Cochin on 20 July 2024.

Dr. Zynudheen A. A.

- Development of agricultural inputs from fish derived rest raw materials' at state seed farm during Okkal farm fest, Kerala 28-08-2024 to 31-08-2024 2024

Dr. Nikita Goapl

- Keynote Speaker on Gender in fisheries and aquaculture economics research for Inclusive and Resilient Aquatic Food Systems at the 21st biennial International Institute of Fisheries Economics and Trade (IIFET) Conference held at Penang, Malaysia from 15-19 July 2024.
- Invited Panelist of Regenerative Aquaculture: Economics and Policy Panel Discussion, at the 21st biennial International Institute of Fisheries Economics and Trade (IIFET) Conference held at Penang, Malaysia from 15-19 July 2024.
- Invited Speaker of the Session Empowering Women, Youth, Smallholder Farmers, Fishers and
- Tribal communities for Food Security, Nutrition and Health, at the International Conference on 'Hunger Free World: Prof. M.S. Swaminathan's Vision for an Evergreen Revolution' held from August 7-8, 2024, at MSSRF, Chennai.
- Invited speaker at the AFS-UPV International webinar on the topic "The GAFS Story", 27 August 2024
- Moderator of the Session on The Economic Worlds of Dried Fish, at the 21st biennial International Institute of Fisheries Economics and Trade (IIFET) Conference held at Penang, Malaysia from 15-19 July 2024.

Dr. V. Geethalakshmi

- Workshop in 'Marine fish stock assessment' during 18 to 22 March, 2024 held at FSI, Cochin

Dr. T. Raja Swaminathan

- Prevalence of Infectious Spleen and Kidney Necrosis Virus (ISKNV) in farmed ornamental fish in Kerala, India, VIROCON-2024, International conference on "Emerging Viruses: Pandemic & Biosecurity Perspectives" DRDE, Gwalior, 11 November 2024.
- Status of finfish cell lines available in India and the prospects of employing them for studying viral aetiology in the Asia Pacific: Scientific and Legal issues, AQUAMAP25, International Workshop on Aquaculture Medicine & Aquatic Animal Health Management in Asia-Pacific: Status, Constraints and Way forward at Cochin, 16 January 2025.

Dr. B. Madhusudana Rao

- Antimicrobial resistance & alternatives to antibiotics in aquaculture, India-EU Tripartite AMR Project meeting on 'Antimicrobial Resistance and private sector engagement in India' organized by FAO-RAP, Bangkok; FAO-India; FSSAI

and MPEDA at Visakhapatnam, 11.07.2024
- Marine & Inland Aqua Value-addition & Market Scope, Seminar on Entrepreneurship and Empowerment in Aqua Industry being organized by Andhra Chamber of Commerce (ACC) Vijayawada Chapter, 27-03-2024.

Dr. U. Sreedhar

- Harmonizing Sustainability and Efficiency: Innovations in Fish Harvesting at Technical Session on Innovations in Fish Harvest and Post Harvest Technology (Theme VIII),13th Indian Fisheries and Aquaculture Forum 23.02.2024
- ICAR-CIFT's Top Cutting-Edge Technologies for the Food Industry, Industry Symposium on Food Processing organized by GITAM – Technology Enabling Centre at GITAM Deemed to be University, Visakhapatnam,23.05.2024
- Importance of Biological Oceanography in Indian waters, at NIO, Cochin on 18.07.2024

Dr. L. Narasimha Murthy

- Value addition, entrepreneurship & marketing opportunities in Fisheries, National webinar on 'Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PMMKSSY)

Dr. Suresh A.

- Role of Fisheries in Food Security and Economic Growth, International Conference on Synergizing Eco Interventions for Achieving SDGs during 5th March to 7th March 2025, Amrita Vishwa Vidyapeetham Kochi Campus on 5-03-2025
- Ecosystem services of Wetlands aligning with Circular Economy Concept, Workshop on Sustainable Wetland Management on December 4-5, 2024, Kollam, Kerala.
- Challenges and opportunities for sustainable livelihoods in small scale fisheries, Regional Training Course on Code of Conduct for Responsible Fisheries (CCRF) and Ecosystem Approach to Fisheries Management (EAFM), under the Bay of Bengal Large Marine Ecosystem (BOBLME) Project" 24 Nov 2024, Alappuzha, Kerala.
- Environment and Development: Envisioning a sustainable path for agriculture and farmers' welfare, workshop "Addressing Emerging Issues in Sustainable Agriculture organised by Department of Agricultural Economics, College of Agriculture, Vellankkara, Thrissur on 14th March 2025, KAU, Vellanikkara.
- Leveraging Ecosystem Services for Sustainable Development: Evidences and Policies, National Workshop on Advances in Ecosystem Services Management: Assessment, Valuation, and Enhancement School of Environmental Studies, Thunchath Ezhuthachan Malayalam University, Malappuram during 26-28th February 2024
- Fisheries for meeting the sustainable development goals: The case of India in the session : Socio-Economic Impacts and Opportunities in Fisheries, International fisheries science congress and expo 12-14 January 2024 KUFOS, 13th January.

Dr. Sajeev M.V.

- Scaling up Climate Smart Technologies for Building Farmers' Resilience: A Pathway Perspective. KAU-CORTEVA International Plant Science Symposium, AICSA 2024 at College of Agriculture, Vellayani, 19-01-2024.
- Scaling up Climate Smart Technologies: An extension pathway perspective. New Paradigms in Fisheries Extension System, MANAGE, Hyderabad, 09-10-2024

Dr. Pe. Jeyya Jeyanthi

- Economics for viable entrepreneurship in marine products, Webinar on Entrepreneurship opportunities in marine products, Fisheries College and Research Institute, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Thoothukudi, Tamil Nadu, 06.04.2024.
- Post-harvest losses in fish: An economic perspective, National seminar on 'Next Generations technology for sustainable fisheries, Alagappa University, Karaikudi, Tamil Nadu, 19.04.2024.
- Economic analysis and environmental trade-offs in fisheries with LCA perspective, MANAGE spoonsored training programme on Life Cycle Assessment in Aquaculture systems to promote sustainable fish production goals, College of Fisheries Science, St. Devasahayam Institute of Fisheries Science & Technology, Kanyakumari, 08.08. 2024

Dr. K. A. Martin Xavier

- "Micro and nanoplastics in seafood: a growing threat to food safety and public health", POLYMERA 2024Z International Conference on Recent Advances

in Polymer Science: Synthesis, Processing and Applications" at Kharagpur, 04-12-2024

Dr. Prajith K. K.

- Sustainable inland fishing methods in the workshop "Scope on development of fisheries and value-added products: at Kuttampuzha, Ernakulam organized by ICAR-CIFT in association with All India Radio Cochin on 15 February 2024.

Dr. Manju Lekshmi N.

- Plastic Litter and Its Impacts on the Mangrove Ecosystem on World Mangrove Day, Kerala University of Fisheries and Ocean Studies (KUFOS), Payyanur, Kerala 26 July 2024.
- Issues of marine litter in pollution response seminar of coast guard on 22- 23 August, 2024.

Dr. Parvathy U.

- Revolutionizing fish processing: Innovations in Product Development Technologies, Tri Sea Fisheries Summit 2024, at Coastal Peace and Development. Kottar Diocese Campus, Nagarcoil, 14th June 2024

Dr. Remya S.

- Packaging, Labelling, and Branding for Agribusiness' on 5th June 2024 during the five-day training program on 'Agribusiness Incubation for Promoting Agripreneurship through Startups,' organized by ICAR-Directorate of Onion and Garlic Research, Pune, and the National Institute of Agricultural Extension Management (MANAGE), Hyderabad, from 4th to 8th June 2024.
- From Catch to Consumer: Marketing Strategies and Value Enhancement for Domestic Fisheries' during the Orientation Program for PFCS to strengthen as FFPOs under PMMSY, organized by NCDC at the Awareness Hall, Fisheries Complex, Ernakulam, on 15.06.2024

Dr. Elavarasan K.

- Fish Waste Utilization: Key for sustainability in Fish Processing Sector. Webinar Series. College of Fish Nutrition and Food Technology, TNJFU Madhavaram Campus, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Tamil Nadu. 26-11-2024.

Dr. Pankaj Kishore

- "Advanced microbiological techniques for detection of food-borne pathogens", National workshop on "Food Safety: The Role of Surveillance, Detection and Control System Advances" at Food Safety Referral Laboratory, ICAR- Indian Institute of Horticultural Research, Bengaluru, 20-02-2024

Dr. Ranjit Kumar Nadella

- Measurement Uncertainty and Inter Laboratory Comparison-Microbiology Training held at National Food Laboratory, Chennai, 21.01.2025 to 23.01.2025

Dr. Murugadas V.

- Bacteriophages: isolation, identification and characterization on Mar 21, 2024 Department of Microbiology, Dr. Moopens Medical College, Wayanad.
- Antimicrobial resistance in seafood borne and aquatic animal pathogens: detection and interpretation guidelines in the National Webinar on "Emergence and Spread of Antimicrobial resistance in aquaculture" on 27. 03. 2024 at TNJFU, Tamil Nadu.

Dr Murali S.

- Revolutionizing Post Harvest Fisheries with Cutting-edge Engineering Solutions, National Webinar entitled "Engineering Interventions in Fisheries and Aquaculture" organized by Tamil Nadu Dr. J. Jayalalithaa Fisheries University (TNJFU), Nagapattinam, 29.01.2024
- Engineering technologies from CIFT for fish processing and value addition, Training programme on Advances in Fish Harvest and Post-Harvest Technologies Organized by ICAR-CIFT in Collaboration with ATARI, Umiam, Meghalaya for Subject Matter Specialists of KVKs of NEH, 12-16 February 2024

Dr. Aniesrani Delfiya

- Pre-processing and drying of fish, jointly organized by ICAR-CIFT, Cochin and Dept. of Fisheries, Andaman and Nicobar Administration at Campbell Bay, 01.03.2024

Dr. V.Chandrasekar

- Regression Analysis: Simple and Multiple Regression Using R. during the 5 days SCSP-sponsored training cum workshop on "Basic Econometric Tools and Techniques in Data Analytics" conducted from January 29th to February 2nd 2024, by ICAR-CIFT, Cochin, in collaboration with Pondicherry University.
- Data Visualization for Data Science. during 5 days SCSP-sponsored training cum workshop on "Basic Econometric Tools and Techniques in Data Analytics" conducted from January 29th to February 2nd

2024, by ICAR-CIFT, Cochin, in collaboration with Pondicherry University.
- ICT in Agricultural Extension Management in the online webinar organized by the Centre for on 29th October 2024.

Dr. Ahamed Basha,

- Marine Plastic Pollution: Implications for Human and Aquatic Animal Health at Fishery Survey of India, Visakhapatnam, 21.11.2024

Dr. G. Kamei, Scientist

- Business opportunities in value addition of fish, at the Outreach Campaign across NE states Head Quarters; Directorate of Fisheries, Imphal, Manipur on 12.12.2024

Dr. Ashish Kumar Jha

- Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PM-MKSSY) during the NCDC program organized at Veraval on 07.11.2024.
- Opportunities for Fisheries Cooperatives', Vaikunth Mehta National Institute of Cooperative Management, Pune, 23.12.2024.

Dr. Rehana Raj

- Utilization of fish waste for developing high value products, One day training program on Innovative solutions for fish waste utilization jointly organized by MRC, ICAR CIFT and NCDC, Regional Office, Pune, Maharashtra at MRC, ICAR CIFT, Vashi on 22-07-2024
- Value addition opportunities in fish processing sector, One day training program on Innovative Solutions for fish waste utilization jointly organized by MRC, ICAR CIFT and NCDC, Regional Office, Pune, Maharashtra at MRC, ICAR CIFT, Vashi on 22-07-2024

Dr. Abhay Kumar

- Value addition of fish and fisheries product, Training cum demonstration programme under Schedule caste sub plan (SCSP) for fish farmers from Medninagar, District Palamau, Jharkhand, 05.03.2024.
- Best Aquaculture practices and Value addition of fisheries product, Training cum demonstration programme under Schedule caste sub plan (SCSP) for fish farmers from Lesliganj, District Palamau, Jharkhand, 08.03.2024
- Seafood Safety & Quality Problems to the technologists in Seafood Processing Industries from Gujarat during APE visit dated 11.07.2024 to 12.07.2024.
- Principal of aquaculture and Fish health management to the fish farmers, Training and demonstration program on 'Best aquaculture practice & Value addition of fish and fisheries product' held at Vavoshi, Taluka-Khalapur, District-Maharashtra under SCSP plan, 19.12.2024 to 21.12.2024

Shri. Shravan Kumar Sharma

- Life Cycle Assessment of Fishing Nets in International Summit on LCA in Textiles conducted by SASMIRA 09.01.2025 & 10.01.2025
- Issues of Marine litter and solnutions, Fishery Survey of India (FSI), Mumbai, on 05.06.2024.
- Advanced Fishing Technology for Responsible Fisheries, SIES College of Arts, Science and Commerce (Empowered Autonomous), Sion, Mumbai, on 11.07.2024.
- Advanced Fishing Technologies for Responsible Fisheries, at R.S. More College, Gobindpur, Dhanbad, Jharkhand under Binod Bihari Mahto Koyalanchal University, Dhanbad, 07.12.2024.

Shri. Bhuneswar

- Business opportunities in value addition of fish, at Outreach Campaign across NE states Head Quarters; Directorate of Fisheries and Aquatic Resources, Kohima Nagaland on 11.12.2024, Directorate of Fisheries, Govt of Mizoram on 13.12.2024 and Department of Fisheries, Gangtok Sikkim on 16.12.2024

Human Resource Development Cell

Training & Capacity Building Activities

In 2024, the Human Resource Development (HRD) Cell of ICAR-Central Institute of Fisheries Technology (CIFT), Kochi, convened multiple times to deliberate on and make decisions regarding the training requirements of staff. Individual capacity-building requests from employees across all categories were processed for approval. Additionally, necessary approvals were obtained from the competent authority to facilitate the participation of staff members specifically nominated by the Secretary, DARE and DG, ICAR and the HRM Division of ICAR in various training programmes. As per the recommendations of the HRD Cell, CIFT staff participated in 20 training programmes throughout the year. The HRD Cell ensures that all employees update their training records in the ICAR-ERP system upon completion of the training. A Training Needs Assessment was conducted, and the Annual Training Plan (ATP) for Scientific, Technical, Administrative, and Skilled Support Staff was developed for 2024.

Additionally, an impact assessment of training programmes attended during 2022–23 was conducted and submitted to the Council.

A two-day workshop on 'Research to Manuscript: Leveraging AI in Academic Writing' was organized by the HRD Cell of ICAR-CIFT, Kochi during 07-08 February, 2024.

The HRD Cell also organized a talk on "7 Steps to Peaceful Financial Life" for the staff of ICAR-CIFT on July 18, 2024.

Participation of staff in Training Programmes

Scientific Staff

Sl. No	Name(s) of Participant(s)	Training Attended	Organizer	Place & Date
1.	Dr. Murugadas, V.	Refresher training for NABL assessors	NABL	19th January 2024, Cochin
2.	Dr. Visnuvinayagam S.	Hands-on training workshop on "Nanotechnology in diagnostics"	CSIR-Center for Cellular and Molecular Biology	29th January to 2nd February 2024, Hyderabad
3.	Shri. Ezhil Nilavan	Training workshop on "Molecular Cloning and Protein Expression"	CSIR-Centre for Cellular and Molecular Biology	1–16th July, 2024, Hyderabad
4.	Dr. Suresh A.	Training programme on "Entrepreneurship and Sustainable Livelihood Models for Rural Communities"	National Institute of Rural Development and Panchayati Raj	26-30th August 2024, Hyderabad
5.	Dr. K. Ahamed Basha	Hands-on training programme on Bioinformatic tools and techniques	ICAR-CIBA	2-7th September 2024, Chennai

6.	Shri. Gattu Rudrappa	Hands-on training programme on Bioinformatic tools and techniques	ICAR-CIBA	2-7th September 2024, Chennai
7.	Dr. Chinnadurai S.	Ecosystem Modelling and Ecosystem Service Analysis in Coastal Ecology	ICAR-CCARI	23-27th September 2024, Goa
8.	Dr. Pankaj Kishore	Workshop on "Antimicrobial resistance and private sector engagement in India"	AMR program team at the Food and Agriculture Organization (Regional office and country office in India), in collaboration with the Food Safety and Standards Authority of India, National Food Laboratory, Chennai and Marine Products Export Development Authority	25th September 2024, Cochin
9.	Dr. Ranjith Kumar Nadella	Workshop on "Antimicrobial resistance and private sector engagement in India"	AMR program team at the Food and Agriculture Organization (Regional office and country office in India), in collaboration with Food Safety and Standards Authority of India, National Food Laboratory, Chennai and Marine Products Export Development Authority	25th September 2024, Cochin
10.	Dr. Greeshma S. S.	Workshop on "Antimicrobial resistance and private sector engagement in India"	AMR program team at the Food and Agriculture Organization (Regional office and country office in India), in collaboration with Food Safety and Standards Authority of India, National Food Laboratory, Chennai and Marine Products Export Development Authority	25th September 2024, Cochin
11.	Shri. Ezhil Nilavan S.	Workshop on "Antimicrobial resistance and private sector engagement in India"	AMR program team at the Food and Agriculture Organization (Regional office and country office in India), in collaboration with the Food Safety and Standards Authority of India, National Food Laboratory, Chennai and Marine Products Export Development Authority	25th September 2024, Cochin
12.	Dr. Murugadas V.	INSA Visiting Fellowship training	NIAB, Hyderabad	26th September 2024 to 25th October 2024, Hyderabad

13.	Dr. Greeshma S. S.	Antimicrobial Susceptibility testing and WHONET software for data management of AMR	ICAR-NBFGR and FAO	15-17th October 2024, Lucknow
14.	Dr. Murugadas V.	Hands-on International workshop on utilising microbiome and genomic resources for understanding & mitigating antimicrobial resistance in one health context	FAO Reference Centre for Antimicrobial Resistance and Aquaculture Biosecurity at Nitte University, Mangalore, India, in collaboration with the Indian Council of Agricultural Research at Mangalore	18-22nd November, 2024, Mangalore
15.	Dr. Remya S.	NABL Assessors' Training Course on ISO/IEC 17025:2017	NABL	09-13th December 2024, Mumbai

Technical Staff

Sl. No	Name(s) of Participant(s)	Training Attended	Organizer	Place & Date
1.	Dr. Dhiju Das P. H.	Shipboard Fellowship-2024 training on the International Bottom Trawl Survey (IBTS) cruise	Partnership for Observation of the Global Ocean. (POGO)	15th Feb 2024 to 30th Nov 2024
2.	Dr. Vineetha Das	Hands-on Workshop on "Integrated OMICS" (Genomics, Proteomics and Bioinformatics)	NCBS-TIFR	6-10th May 2024, Bengaluru
3.	Dr. Dhiju Das P. H.	Training program on Data Visualization using R"	ICAR-NAARM	04-08th March 2024, Hyderabad
4.	Dr. Dhiju Das P. H.	Online National Capacity Building Program on "Life Cycle Assessment (LCA) Systems to Promote Sustainable Fish Production Goals"	National Institute of Agricultural Extension Management (MANAGE), Hyderabad, and the College of Fisheries Science, Kanyakumari,	(Online) August 07 -09th August 2024
5.	Mr. Bejawada Chanikya Naidu	Ecosystem Modelling and Ecosystem Service Analysis in Coastal Ecology	ICAR-CCARI	23-27th September 2024, Goa
6.	Mr. Naveen	One day J-Gate & CeRA Regional Training and Awareness programme	Kerala Agricultural University	16th October 2024, Thrissur

Administrative Staff

Sl. No	Name(s) of Participant(s)	Training Attended	Organizer	Place & Date
1.	Smt. Sobha K. S.	Online Training Course/ Workshop on Right to Information - Public Information Officers (RTI-PIO)	ISTM	20-22nd May, 2024, New Delhi
2.	Smt. Surya G.	Residential Training Programme on Public Procurement for Government Officers	Arun Jaitley National Institute of Financial Management (AJNIFM)	13-18th May 2024, Faridabad
3.	Mr. Anish T. V.	Pre-Examination Training (Online) for Limited Departmental Competitive Examination	ICAR-National Institute of Abiotic Stress Management	21st August 2024 to 06th September 2024, Baramati
4.	Ms. Bhavyamol C. G.	Pre-Examination Training (Online) for Limited Departmental Competitive Examination	ICAR-National Institute of Abiotic Stress Management	21st August 2024 to 06th September 2024, Baramati

Talk on "7 Steps to Peaceful Financial Life" 18/07/2024

The Human Resource Development Cell of ICAR-Central Institute of Fisheries Technology, Kochi organized a talk on "7 Steps to Peaceful Financial Life" for the staff of ICAR-CIFT on July 18, 2024. The programme commenced with the ICAR song. Dr. George Ninan, Director, ICAR-CIFT delivered the presidential address emphasizing the importance of financial literacy for the betterment of both personal and professional life. The resource person and the guest, Shri. Nikhil Gopalakrishnan, CEO-Pentad Securities, Kochi gave an insightful talk on achieving financial stability. He elaborated on practical steps and strategies for financial management, the importance of need-want analysis, family budgeting, etc. During the talk, he also emphasized the importance of planning, disciplined spending, and strategic investing to achieve financial peace and security. There was active discussion after the talk with participation from the audience. Dr. Remya S., Senior Scientist & Nodal Officer, HRD Cell, ICAR-CIFT Kochi welcomed the audience and introduced the resource person. Mrs. Priya E. R., Scientist & Co-Nodal Officer, HRD cell, ICAR-CIFT proposed the vote of thanks. The program concluded with the national anthem.

Shri. Nikhil Gopalakrishnan, CEO-Pentad Securities, Kochi is delivering the talk

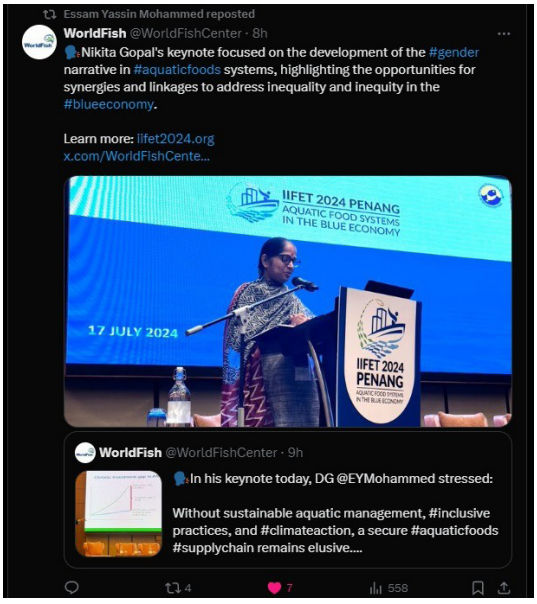
Visits/Training Abroad

Visit to University of Southampton

Dr. Nikita Gopal, Dr. Madhu V.R., Dr. Sandhya K.M., Dr. Rejula K., and Sreejith S. Kumar attended the funded Global Challenge Research Fund workshop to build The Marine Resource Nexus Network from 11-15 March 2024

Dr. Nikita Gopal

Attended the 21st Biennial International Institute of Fisheries Economics and Trade (IIFET) Conference followed by the IDRC AQUADAPT Peer Learning workshop, both organized by WorldFish held at Malaysia, 11-24 July 2024. Attended and facilitated the Pre-Conference Workshop, integrating gender into Fisheries and Aquaculture Economics and Trade Research. Delivered key note on gender in fisheries and aquaculture economics research for inclusive and resilient aquatic food systems.



The key note posted on worldfish's x platform and reposted by DG, WorldFish

Dr. Nikita Gopal

Visited Iloilo, Philippines during 8 November – 2 December 2024 on the invitation of University of Philippines Visayas (UPV) Foundation Incorporated, Iloilo, Philippines and the Asian Institute of Technology, Bangkok, Thailand. During the visit the gender analysis component for the project "Making nature-based climate solutions (NbCS) in aquaculture in Southeast Asia monitoring more gender-responsive: What gets measured gets done" was developed. Discussions were held on gender analysis framework specific to seaweed farming in Philippines . Visit was undertaken to San Dionisio district, in the northern part of Iloilo, for attending the stakeholder meeting in which around 20 farmers attended. Visit was also undertaken to the seaweed farms at Barangay Sua and Barangay Tiabas and observed the farming and harvesting activities and interacted with the farmers.

Dr. Muhamed Ashraf P. visited South Korea for attending and presenting a paper on "Enhancing biofouling resistance in organo silane - coated poly ethylene aquaculture cage net with nano carbon dot (Cuo/TiO2)composite material" in the 3rd GloFouling R&D forum and exhibition on Biofouling prevention and management for maritime industries, at Busan, South Korea, from 4 - 8 November 2024

Dr. Tejpal, C S.

Attended International Institute of Fisheries Economic and Trade (IIFET)-2024 conference held at Penang, Malaysia during 15-19 July 2024 and participated in discussion meeting on ICAR-WorldFish collaborative project under Window3.

ZONAL TECHNOLOGY MANAGEMENT & AGRIBUSINESS INCUBATION CENTRE

The Zonal Technology Management and Agribusiness Incubation (ZTM-ABI) Centre at ICAR-CIFT serves as a dynamic platform for the swift commercialization of technologies, enhancing public-private collaborations through a structured network connecting R&D organizations, businesses, and financial entities. The Centre is committed to fostering innovation in products, processes, and business models, thus driving the development of competitive enterprises within the fishing industry. It provides an array of proactive, value-added business services to its registered incubatees, including technology transfer, contract research, consultancy, and contract services, along with office space, access to a licensed, state-of-the-art pilot-level production facility, on-site guidance, and tailored training programs aimed at launching technology-driven businesses.

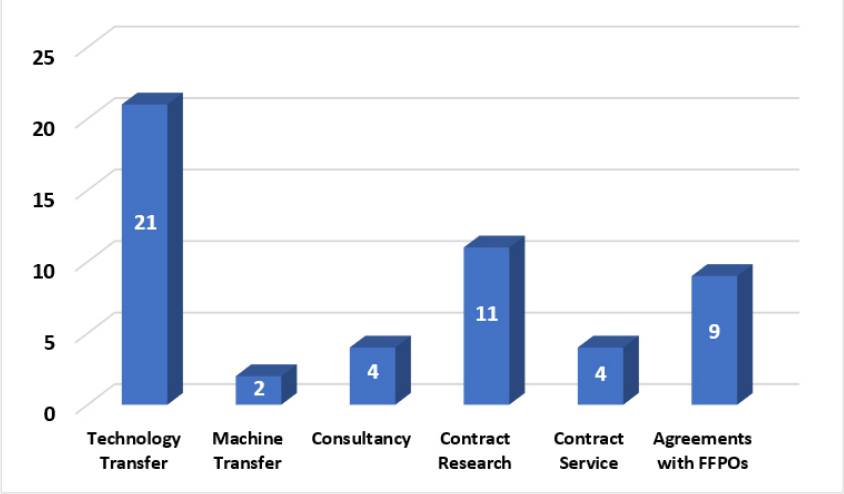
The Incubation Centre boasts multi-tenant infrastructure facilities ideal for establishing a corporate-level office for direct incubatees at the Institute's location. Its direct incubation services are designed to assist clients through their initial growth phases. The Centre actively organizes Business Meets and industry-interface programs to engage entrepreneurs, selecting promising business ideas for incubation. Registered incubatees have the opportunity to consult with scientists and business experts as needed, helping them refine product formulations and develop effective business strategies. Overall, the ZTM-ABI Centre at ICAR-CIFT is dedicated to nurturing innovation and entrepreneurship in the fishing industry by providing a comprehensive suite of business services and support.

INCUBATEE REGISTRATION

In 2024, the ZTM-ABI Centre registered 16 entrepreneurs for its business incubation services. The Centre provides support to a broad spectrum of clients, ranging from nascent startups needing basic technology assistance and training, to mature businesses looking for R&D support to diversify their products. Below is a list of clients who registered for various technologies at the Centre over the year:

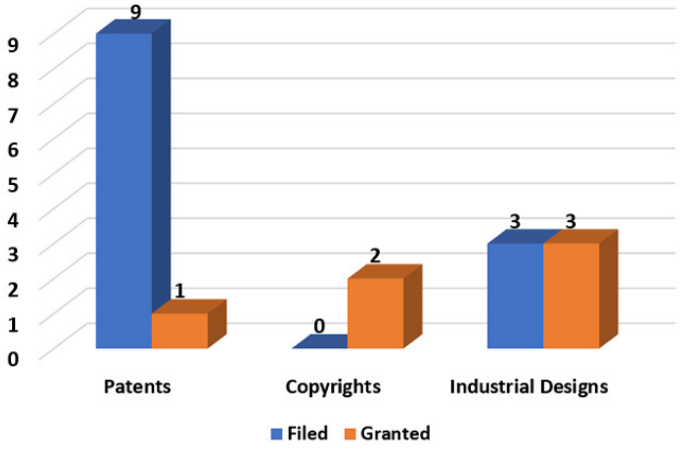
TECHNOLOGY TRANSFER AND PROFESSIONAL SERVICE FUNCTIONS

ICAR-CIFT has achieved notable progress in creating a range of technologies across various sectors, including energy-efficient fishing vessels, innovative gear designs, advanced processing and preservation methods, smart packaging solutions, value-added products and by-products, cost-effective food processing equipment, and healthcare/ aquaceutical products. The chart below details the technology commercialization projects and professional services (such as Consultancy, Contract Research (Sponsored / Collaborative / Grant-in-Aid), and Contract Services) carried out by the ZTM-ABI Centre in 2024.



INTELLECTUAL PROPERTY RIGHTS

Intellectual Property Rights play a critical role in safeguarding the research output of institutes, promoting innovation, and creating a more vibrant and sustainable research ecosystem. During 2024, the ZTM-ABI Centre has facilitated the filing of 9 patents and 3 industrial designs for ICAR-CIFT. The institute was awarded 1 patent, 2 copyrights, and 3 industrial designs.

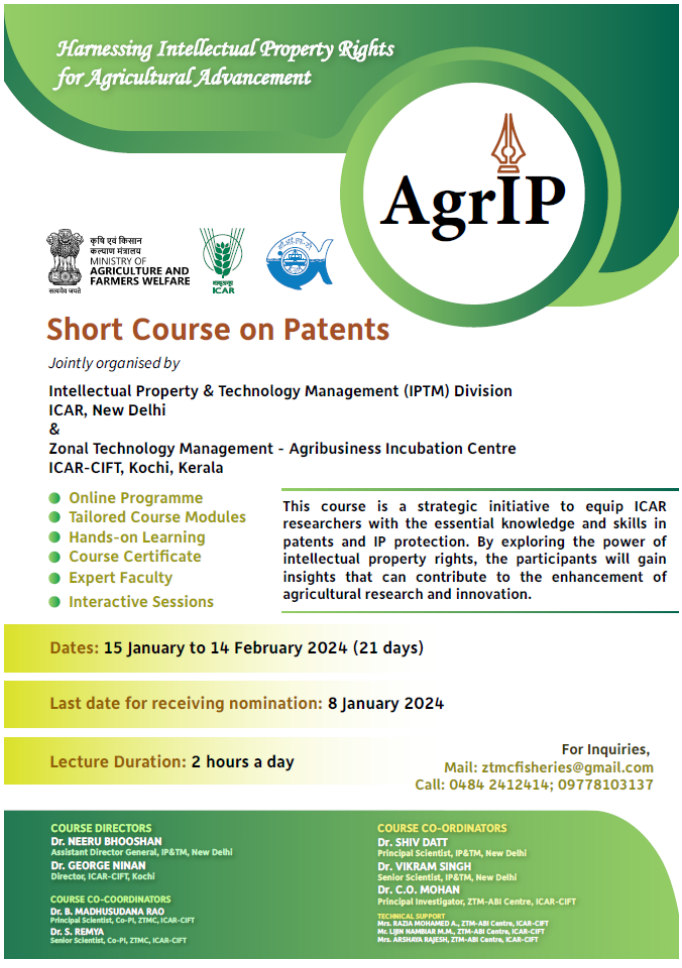


AgrIP – A Short Course on Patents in Agriculture

The Zonal Technology Management–Agribusiness Incubation (ZTM-ABI) Centre of ICAR-CIFT, Kochi, in collaboration with the IP&TM Unit of ICAR, New Delhi, organized a 21-day short course titled AgrIP from January 15 to February 15, 2024. The course brought together 172 researchers from 58 ICAR institutes to build capacity in intellectual property (IP) management in agriculture.

Inaugurated by Dr. J.K. Jena, DDG (Fisheries), ICAR, the program featured 16 expert-led sessions and a panel discussion, covering topics from patent drafting, prior art searches, and filing procedures. It also addressed biotechnology patents and the impact of digital technologies and cybersecurity on IP rights. Practical training was provided in patent drafting, prior art searches, and filing procedures. The open-book assessment highlighted the active involvement and enthusiasm of participants. The panel discussion with experts facilitated active engagement and knowledge exchange.

The course concluded with a Valedictory function on February 15, 2024, chaired by Dr. Himanshu Pathak, Secretary (DARE) and Director General, ICAR. The online format enabled effective capacity building, fostering collaboration across geographic boundaries.



AquaBiz Summit 2024

The Zonal Technology Management – Agribusiness Incubation (ZTM-ABI) Centre of ICAR-CIFT, Kochi organized AquaBiz Summit 2024 on 20th March 2024 at Radisson Blu, Kochi. The event brought together around 200 participants, including entrepreneurs, researchers, policymakers, and funding agencies, with the shared goal of promoting entrepreneurship in the fisheries sector.

The summit was inaugurated by Shri. Dodda Venkata Swamy, IAS, Chairman, MPEDA, who lauded ICAR-CIFT's role in supporting fisheries-based enterprises. The event featured presentations on advanced technologies developed by ICAR Fisheries Research Institutes, including ICAR-CIFT, whose Divisional Heads introduced their innovations. Technologies from other ICAR institutes were presented by respective ITMU In-charges.

Talks from representatives of organizations such as Kerala Startup Mission, Kerala Grameen Bank, FSSAI, MSME, and KIED added value to the discussions Dr. C.O. Mohan, Principal Investigator of the ZTM-ABI Centre, provided an overview of the Centre's activities at ICAR-CIFT, Kochi. An exhibition of ICAR fisheries technologies and incubatee products from ICAR-CIFT was also organized, providing a comprehensive overview of innovation in the sector.

World Intellectual Property Day

A seminar titled "IP and the SDGs: Building our Common Future with Innovation and Creativity" was organized by the Zonal Technology Management – Agribusiness Incubation Centre on April 30, 2024, at the ICAR – Central Institute of Fisheries Technology (ICAR-CIFT), Kochi. The event saw active participation from 112 attendees, including researchers, technical staff, and scholars from the ICAR-CIFT headquarters and its three regional research centers.

The seminar featured sessions by two IP experts: Adv. Rubina Afzal, Associate Partner at Legacy Partners, Kochi, and Mr. Rakesh C.R., Patent Consultant, Thrissur, Kerala. Both experts discussed the role of intellectual property (IP) in driving innovation aligned with the Sustainable Development Goals (SDGs).

The seminar provided valuable insights into the strategic role of intellectual property in advancing sustainable development and fostering innovation. Participants gained a deeper understanding of how IP can be leveraged to address societal challenges and promote technological progress. The discussions also highlighted the complexities of the IP prosecution process, emphasizing the need for informed strategies in securing and commercializing innovations in a competitive market.

DST-SERB Karyashala

ICAR-CIFT commenced the DST SERB-sponsored KARYASHALA (High-End Workshop) titled "Business Avenues in Food Processing and Value Addition" on July 23, 2024, under the Accelerate Vigyan Scheme. The program was jointly organized by the Fish Processing Division and the Zonal Technology Management & Agribusiness Incubation (ZTM-ABI) Centre of ICAR-CIFT.

The workshop was designed to provide hands-on training to postgraduate and doctoral students in both conventional and advanced techniques of fish processing and preservation. A total of 25 participants from across India were selected for the program.

The initiative aimed to impart practical skills in the development of value-added fishery products and to encourage entrepreneurship and business development in the fisheries sector. The workshop was inaugurated by Dr. R. Dinesh, Director, ICAR-IISR, Kozhikode.

As part of the event, two Memoranda of Agreement (MoA) were signed with clients of ICAR-CIFT. The first, with Merck Life Science Private Limited, Mumbai, outlines a collaborative research initiative focused on enhancing the scientific skills of ICAR-CIFT's staff and students. The second MoA was signed with VgoNutro LLP, a student startup founded in September 2023 by Ms. Meenu B., a PhD scholar at ICAR-CIFT.

Entrepreneurs Meet

The Zonal Technology Management – Agribusiness Incubation (ZTM-ABI) Centre of ICAR-CIFT organized an Entrepreneurs' Meet on November 1, 2024, at the Kodungallur Municipal Town Hall, coinciding with the inauguration of the Fish Farmer Producer Organization (FFPO), BLUE PEARL. The event brought together 90 participants, including entrepreneurs, fishers, and fisherwomen.

The program featured informative sessions by representatives from key institutions including the District Industries Office, Department of Fisheries, Bank of India, State Bank of India, and the Society for Assistance to Fisherwomen (SAF). These sessions provided valuable insights into various support schemes and initiatives tailored for fisheries-based enterprises. The ZTM-ABI Centre introduced its Agri-Business Incubation Unit and highlighted successful entrepreneurial ventures built on ICAR-CIFT technologies.

The event also marked a significant milestone with the signing of Memoranda of Agreement (MoA) between ICAR-CIFT and selected Fish Farmer Producer Organizations from Kerala and Andhra Pradesh. The MoA exchange was conducted in the presence of Shri George Kurian, Hon'ble Minister of State for Fisheries, Animal Husbandry & Dairying, and Minority Affairs, Government of India, adding prominence and credibility to the initiative.

Awards and Recognitions

Smt. Vineetha Das, Technical Officer, Microbiology, Fermentation and Biotechnology Division, ICAR-CIFT was awarded PhD for the Thesis "Diversity of Actinobacteria in aquatic environment from Kochi and genome guided metabolomics profiling of *Streptomyces murinus* THV12" from the Faculty of Sciences, Cochin University of Science and Technology (CUSAT) under the Guidance of Dr. Toms C. Joseph, Principal Scientist, Microbiology, Fermentation and Biotechnology Division & I/C PME cell, ICAR-CIFT, Cochin and Co-Guide Dr. K. V. Lalitha, Principal Scientist (Retd), ICAR-CIFT, Cochin

Mr. Shaheer P., Senior Scientific Officer, Orange Health Diagnostic Laboratory, Bangalore was awarded PhD for the Thesis "Quorum quenching mediated attenuation of Vibrio harveyi virulence by Bacillus species in *Penaeus monodon* post larvae" from the Faculty of Sciences, Cochin University of Science and Technology (CUSAT) under the Guidance of Dr. K. V. Lalitha, Principal Scientist (Retd), ICAR-CIFT and Co-Guide Dr. Toms C Joseph, Principal Scientist, Microbiology, Fermentation and Biotechnology Division & I/C PME cell, ICAR-CIFT, Cochin

Mr. Rithin Joseph, Research Scholar, Fishing Technology Division, ICAR-CIFT was awarded PhD for the Thesis "Cetacean interaction with major fishing systems of India and effect of Acoustic Deterrent Devices (ADD) in selected coastal fisheries" from the Faculty of Marine Sciences, Cochin University of Science and Technology (CUSAT) under the guidance of Dr. Leela Edwin, Principal Scientist & Director Acting (Retd.), Fishing Technology Division, ICAR-CIFT, Cochin

Smt. Souda V. P., Research Scholar, Fishing Technology Division, ICAR-CIFT was awarded PhD for the Thesis"Optical characteristics of chromophoric dissolved organic matter and satellite retrieval along coastal waters off Kochi, South eastern Arabian sea" from the Faculty of Marine Sciences, Cochin University of Science and Technology (CUSAT) under the guidance of Dr. Muhamed Ashraf P., Principal Scientist, Fishing Technology Division, ICAR-CIFT, Cochin

Mr. Muneeb Hamza K. H., Research Scholar, Microbiology, Fermentation and Biotechnology, ICAR-CIFT was awarded PhD for the Thesis "Occurrence and characteristics of methicillin-resistant Staphylococci in farm-raised fishes and commercial fish outlets: A wet lab and genome-based study" from the Faculty of Sciences, Cochin University of Science and Technology (CUSAT) under the Guidance of Dr. Mukteswar Prasad Mothadaka, Emeritus Scientist, Visakhapatnam Research Centre of ICAR-CIFT

Smt. Jean Mary Joy, Research Scholar, Biochemistry and Nutrition Division, ICAR-CIFT awarded PhD for the Thesis "Biofunctional properties of gelatin, gelatin hydrolysate and gelatin peptide fraction from skin of *Katsuwonus pelamis*: Development of encapsulated chitosan-coated gelatin peptide liposomes for nutraceutical applications" from the Faculty of Marine Sciences, Cochin University of Science and Technology (CUSAT) under the Guidance of Dr. Suseela Mathew, Principal Scientist, Head (retd), Biochemistry and Nutrition Division, ICAR-CIFT, Cochin

Mr. Amruth P., Research Scholar, Biochemistry and Nutrition Division, ICAR-CIFT was awarded PhD for the Thesis "Evaluation of the techno-functional and bioactive properties of κ- carrageenan based composite films for applications in wound dressing" from the Faculty of Marine Sciences, Cochin University of Science and Technology (CUSAT) under the Guidance of Dr. Suseela Mathew, Principal Scientist, Head (retd), Biochemistry and Nutrition Division, ICAR-CIFT, Cochin

Mr. B. Manikantha, Research Scholar, Visakhapatnam Research Centre of ICAR-CIFT was awarded PhD for the Thesis "Genomic characterization and infectivity potential of coliphages lytic against antimicrobial resistant *Escherichia coli* and vibriophages against luminescent Vibrios" from the Department of Biotechnology and FST, Faculty of Science, GITAM Deemed to be University, Visakhapatnam under the Guidance of Dr. B. Madhusudana Rao, Principal Scientist, Visakhapatnam Research Centre of ICAR-CIFT

Dr. Murali S., Scientist, Engineering Section, ICAR-CIFT, Cochin received the Kerala State Young Scientist Award for the year 2023 and the Chief Minister's Gold medal, certificate and cash prize were presented by the Hon'ble Chief Minister of Kerala, Shri. Pinarayi Vijayan, during the 36th Kerala Science Congress on 9th Feb 2024 at Government College, Kasargod

Dr. Chinnadurai S. received Dr. M. S. Swaminathan award for outstanding doctoral research in Agricultural and Allied Science (Animal and Fisheries Science) in the AIASA National Award-2023 (All India Agricultural Student Association) on the occasion of 8th National Youth Convention, held on 22-23 August, 2024 at Institute of Agricultural Science, BHU, Varanasi, UP


All India Agricultural Students Association (AIASA)
(Registered Society under Societies Registration Act, 1860)
Regd. Office: A/G-4, National Societies Block, NASC Complex, New Delhi-12
www.aiasa.org.in

The Governing Board of AIASA confers its National Award

Dr. M.S. Swaminathan Award for Outstanding Doctoral Research in Agricultural and Allied Sciences-2023
(Animal and Fisheries Sciences)

(On all India nomination basis)
to
Dr. S. Chinnadurai

Scientist, ICAR-Central Institute of Fisheries Technology, Gujarat for his academic excellence and working on Studies on development of optimum depuration protocols for commercially important edible bivalves of India. His research and teaching interests in Fisheries make substantial contributions to both academic literature and practical applications for farmers. The award is presented on the occasion of 8th National Youth Convention "New Prospectives for Sustainable Agriculture & Livelihood Security" (NYC-NPSALS) on 22nd-23rd August, 2024 jointly organized by Institute of Agricultural Sciences, BHU; All India Agricultural Students Association and Indian Council of Agricultural Research at Banaras Hindu University, Varanasi.

Prof. (Dr.) R. B. Singh
Chairman Jury &
Former HE Chancellor, CAU-Imphal

Mr. V. Ramvilas Paswhan
National President, AIASA &
Co-Chairperson, NYC-2024

Dr. M. S. Swaminathan award certificate

Dr. Toms C. Joseph, Principal Scientist, MFB Division received Best paper award for the paper titled "Novel bioremediation strains of aerobic heterotrophic nitrifying and denitrifying bacteria belonging to *Priestia* spp. for ammonia and nitrite oxidation in aquaculture farms" during the 13th Indian Fisheries & Aquaculture Forum jointly organized by ICAR-Central Inland Fisheries Research Institute, Barrackpore, the Inland Fisheries Society of India, the Asian Fisheries Society Indian Branch and the Department of Fisheries, Government of West Bengal. from 23-25 February, 2024, held at Kolkata

Dr. G. K. Sivaraman, Principal Scientist, MFB Division received Best Oral Presentation Award in the 7th Annual Convention of Association of Meat Scientists and Technologists (AMST) and the National Conference (AMSTCON 2024) jointly organized by Karnataka Veterinary, Animal and Fisheries Sciences University, Veterinary College, Bengaluru and Association of Meat Scientists and Technologists (AMST) from 21st to 23rd November, 2024 at Veterinary College, Bangalore

Dr. G. K. Sivaraman, Principal Scientist, MFB Division received, Best Poster Presentation Award in the 7th Annual Convention of Association of Meat Scientists and Technologists (AMST) and the National Conference (AMSTCON 2024) jointly organized by Karnataka Veterinary, Animal and Fisheries Sciences University, Veterinary College, Bengaluru and Association of Meat Scientists and Technologists (AMST) and from 21st to 23rd November, 2024 at Veterinary College, Bangalore

Dr B. Madhusudana Rao, Principal Scientist, Visakhapatnam Research Centre of ICAR-CIFT received the 'Certificate of Professional Distinction' awarded by Dr Lankapalli Bullayya College during the Golden Jubilee Finale of the college on 03-03-2024

Dr. A Suresh, Principal Scientist, EIS Division received Dr. R. T. Doshi Certificate of Honour for the best paper "Marine fisheries insurance in india: Retrospect and prospect in the context of climate change", published in Agricultural Economics Research Association (India) in the year 2023.

Dr. Sandhya K.M., Senior Scientist, Fishing Technology Division, received Best Oral Presentation Award in Hindi (Online session) during two day Scientific Workshop on "Role of inland Fisheries and aquaculture in achieving sustainable development goals" organized by ICAR-CIFRI, Barrackpore during 12-13th September 2024

Dr. Parvathy U., Senior Scientist, Fish Processing Division received Best Oral Presentation award for the paper entitled "A novel approach for waterless transportation of whiteleg shrimp" in the 31st Swadeshi Science Congress, jointly organized by Swadeshi Science Movement Kerala and ICAR-CIFT, during 7-9th November, 2024 at ICAR-CIFT, Cochin

Dr. Sarika K, Scientist, Fish Processing Division, received Best Oral Presentation award for the paper entitled "Enhancing Structural and Functional Quality of Fish Mince through Enzyme mediated High-Pressure Processing (HPP)" in the National Science Symposium 2024 on Recent trends on Science and Technology, organized by Christ college, Rajkot, Gujarat on 04th February, 2024 at Rajkot

Dr. Martin Xavier K.A, Senior Scientist, QAM Division received Best paper award for the paper entitled "Characteristics of chitin nanomaterials produced via surface esterification of chitin using maleic acid hydrolysis assisted with steam explosion" in the International Fisheries and expo 2024 jointly organized by Kerala University of Fisheries and Ocean studies and College of Fisheries Alumini association, Panangad, Kochi on January 12-14, 2024.

Dr. Greeshma. S. S, Scientist, MFB Division received Best oral presentation award for the paper entitled "Genetic diversity of Salmonella Paratyphi B isolated from seafood in Cochin, Kerala" in "MARICON" International conference organized by CUSAT during 8th to 10th April, 2024

Mr. Anas K. K., Scientist, B and N Division received best poster award for the paper entitled

"Elucidating the fatty acid, amino acid and macro element profiling of brown seaweeds for utilization in functional food and feed formulations" at the 31st Swadeshi Science Congress held on 7th to 9th November 2024 at ICAR-CIFT, Cochin

Dr. Rehana Raj, Scientist, Mumbai Research Centre of ICAR-CIFT received best poster award for the paper entitled "Shelf life and quality of rohu head (*Labeo rohita*) using electron beam irradiation: A 60-day refrigeration study" at ICFoST 2024 organized by AFSTI Mumbai Chapter, and Springer Nature at D.Y Patil Deemed University, School of Medicine, Nerul from 19th to 21st December 2024

Dr Neethu K.C, Scientist, Engineeering Section received Best Oral Presentation Award for the paper titled "Mathematical modeling of drying characteristics of squid rings blanched under different conditions", at the 31st Swadeshi Science Congress held on 7th to 9th November 2024 at CIFT, Cochin

Mr. Hrishikesh P. Young Professional, FT Division received Best oral presentation award for the paper titled "Onboard observations on the abundance of marine mammals in the fishing grounds off Kochi, Kerala, India" at the National Seminar on Microbial Interactions in Aquatic Systems and Ecological Sustainability MIASES- 2024 held at MES college Ponnani, Kerala on November 20-21, 2024.

Ms. Haritha M.A., Young Professional, Fishing Technology Division, received Dr. K. Ravindran Memorial Award in the session of Fisheries Science for her oral presentation for paper titled "Bioaccumulation of microplastics derived from boat building FRP on *Oreochromis niloticus* (Nile Tilapia)" authored by Haritha M.A., Jelva Hussan., Madhu V.R., and Manju Lekshmi N., in the 31st Swadeshi Science Congress, held on 7-9 November, 2024, at ICAR- CIFT, Cochin

Dr. T. Raja Swaminathan, Principal Scientist and Head, MFB Division was conferred with Fellowship of the Indian Virological Society in recognition of the contributions to Aquatic Virology during the year 2024

Dr. T. Raja Swaminathan, Principal Scientist and Head, MFB Division was selected as Editorial Board Member, Scientific Reports, published by Springer's Nature Portfolio, the publishers of Nature since November 2024.

Dr. Murugadas Vaiyapuri, Senior Scientist, MFB Division was awarded the INSA Visiting Scientist Fellowship at National Institute of Animal Biotechnology, Hyderabad

Dr. Rehana Raj, Scientist receiving best poster award at ICFoST 2024

Priority setting, Monitoring and Evaluation Cell

The Priority setting, Monitoring and Evaluation (PME) Cell of ICAR-CIFT functioned during the year 2024, primarily with the following objectives.

Priority setting, Monitoring and Evaluation of Institute Research Projects.

PME Cell monitored and evaluated the research projects in the identified research priorities of the Institute and evaluated the projects twice in the year through conduct of meetings of Project Monitoring and Evaluation Committee of the Institute. The projects initiated during April 2024 and those to be completed by March 2024 were evaluated and graded. RPP I, RPP II and RPP III of ongoing Institute projects including. Documentation of 39 projects were done. Additionally, necessary documentation of 10 Corpus Funded projects were also done.

Externally funded projects

A total of 30 proposals for external funding were routed through the Cell after ascertaining that they fall under the mandate and priority research areas of the Institute. In addition, 5 collaborative proposals were also routed.

Submission of Monthly, Quarterly and Half yearly Reports

Monthly reports on the important activities of the Institute and significant research findings were compiled and sent to ICAR regularly for inclusion in the ICAR monthly report to the Cabinet Secretariat// PMOs Office. Quarterly reports on Output Outcome Frame Work document (OOF) and six-monthly reports on the targets and achievements of the Institute, comprising both research and financial aspects were regularly furnished to the Council. Inputs requested from the council on various points are collected, processed as per the formats given and submitted to the council from time to time. Other kind of weekly, monthly reports are also furnished as per instructions provided. Reports to DARE/ICAR like DARE Report, ICAR Reporter, ICAR News etc. were also furnished.

Institute Research Council: The Institute Research Council (IRC) meeting was convened during 24-28th June 2024, to review the progress achieved in the ongoing research projects of the Institute during 2024-25 and to discuss the research project proposals for the year 2024-25. The Institute Research Project Document for the year 2024-25 was compiled and brought out for discussion at the meeting. The House discussed in detail the 21 ongoing research projects, 11 completed projects including 3 young Scientist projects and 7 new projects.

Verification of CAS Reports of Scientists: The PME Cell verified and scrutinized Career Advance Scheme Reports submitted by Nine Scientists for their promotion and the reports submitted to the Director.

Participation of Staff/ Research Fellows in Conference/Seminar/ Symposia: The PME Cell monitored & ensured the participation of staff members and other research scholars in various conferences/ seminars/symposia as per the mandate of the Institute and theme of the programmes.

Publication of the Scientific Papers and maintenance of database:

Facilitated processing and approval for about 164 publications of/ from the Institute viz., research papers, popular articles, books, brochures, leaflets, pamphlets, seminar/conference abstracts etc. The research papers and popular/technical articles meant for publication in journals and for presentation in Symposia/ Seminars were arranged for review and for plagiarism clearance and recommended for decision/ approval by Director.

Parliament/Lok Sabha questions/ Requests

Cell arranged to give replies to the Lok Sabha/Rajya Sabha questions/ requests from MP/MLA/Minster etc. on priority basis.

Database on all ICAR funded and externally funded projects (completed and on-going), publications, technologies developed, patents, consultancies.

Maintained database of projects and publications of the Institute viz., research papers, popular articles, books, brochures, leaflets, pamphlets, seminar/conference abstracts etc.

Knowledge Management activities of the Institute

Facilitated the Knowledge Management activities of the Institute. Publications, technologies, data etc. were uploaded in the KRISHI portal of ICAR and updated regularly.

Other Technical Matters:

The Cell continued to answer queries on various technical matters received from other organizations and individuals. The queries received by the PME Cell in, as well as from the feedback option in the Institute Website were attended to. Further, materials for various publications like ICAR News/ICAR Reporter, Agrinews, Fishing Chimes, MPEDA Newsletter, Seafood News, Aqua International, Sea Queen, ICAR Web page etc. were forwarded regularly for publication.

The publicity related and extension-oriented activities of the Institute are being regularly presented in the monthly meetings of the Inter Media Publicity Co-ordination Committee of Ministry of Information and Broadcasting, Govt. of India.

Agricultural Knowledge Management Unit (AKMU)

The Agricultural Knowledge Management Unit (AKMU) at ICAR-CIFT plays a pivotal role in meeting the institute's ICT needs by providing and maintaining internet, email, video conferencing, and other computer-related facilities. AKMU ensures seamless internet connectivity for approximately 350 systems through LAN and wi-Fi access for nearly 300 users. The institute is currently connected via a 1000 Mbps leased line under the National Knowledge Network (NKN) provided by the Government of India, along with a 20 Mbps ILL from BSNL, ensuring uninterrupted ICT services for employees. AKMU also manages the Local Area Network (LAN) and provides Wi-Fi access across all divisions and conference halls.

Website and social media management

AKMU was responsible for managing the ICAR-CIFT website (https://cift.res.in/), which serves as an interface between the institute and end users by highlighting research activities and achievements. The website was regularly updated with information on training programs, recruitment notices, tenders, and other official circulars to maintain transparency. Additionally, AKMU facilitates online meetings through platforms such as Google Meet, WebEx, Microsoft Teams, and Zoom. The AKMU also manages the institute's official social media accounts, including Facebook, Twitter, Instagram, YouTube, and WhatsApp, to disseminate technologies, information and activities to the public.

Support to stakeholders

AKMU provides real-time responses to queries received from farmers, students, entrepreneurs, researchers, and others in the agricultural and allied sectors via e-Krishi Manch, a public interface platform developed by ICAR. It also contributes to the ICAR Knowledge Management (KM) Portal by updating details of institute higher authorities, sophisticated analytical instrumentation facilities, and financial transaction information.

Institute Activities

AKMU assisted in the successful implementation of ICAR MIS & FMS, PIMS, e-HRMS, SPARROW, and e-Office by providing technical and training support.

- Maintains the Aadhaar Enabled Biometric Attendance System (AEBAS) for staff attendance.
- AKMU also supports the IT equipment procurement.
- Ensures cybersecurity through K7 Enterprise Security, protecting against malware threats and external intrusions.
- AKMU continues to strengthen the institute's ICT infrastructure, ensuring fast and safe network, efficient knowledge dissemination and digital transformation.

Official Language Section

Vishwa Hindi Diwas 2024

Vishwa Hindi Diwas was celebrated at the Institute on 10th January 2024. On this occasion, the Director gave a message in which he urged everyone to disseminate the results of our research work through Hindi language so as to reach the masses. On the occasion of Vishwa Hindi Diwas 2024, an exhibition of the Institute's publications was organized in which all the Hindi publications of the Institute were displayed. This exhibition was inaugurated by the Director, Dr. George Ninan in the presence of the Division Heads of the Institute, after which the staff of the Institute registered their presence in the exhibition.

Official Language Workshop on 'Conversational Hindi'

Official Language Workshop on 'Conversational Hindi' was organized on 15.03.2024 for Supporting staff and Lower Division Clerks of the Institute. It was inaugurated by Smt. Ponnamma Radhakrishnan, Administrative Officer of ICAR-CIFT. The workshop was led by Dr. Santosh Alex, Chief Technical Officer. 4 Supporting staff and 4 Administrative Clerks participated in it.

Workshop on Official Language Implementation

An Official Language Workshop on Official Language Implementation was organized on 07.06.2024 for the administrative staff of the Institute. The workshop commenced with the inaugural address by Shri M.N. Vinod Kumar, Head of Office-in-charge. Dr. P. Shankar, Assistant Chief Technical Officer, was the faculty of the workshop. In this workshop Official Language Rules 1976 and the documents of Section 3 (3) were discussed in detail. After discussing the nature of work of each employee, information was given about noting and drafting in Hindi. Information about e-Office 7.3.9 along with the translation system available in it was also given. A total of 6 upper and lower division clerks were participated in this workshop.

Hindi Workshop for newly appointed technical staff

A Hindi Workshop was organized in the seminar hall on 22-08-2024 for seven newly appointed technical staff members of the institute. This workshop was conducted by Assistant Chief Technical Officer Dr. P. Shankar. In this workshop, information was given regarding Official Language Rules, Official Language Act, Official Language Resolution and the use of Hindi in language regions A, B and C of India and its percentage, incentive scheme etc. The participants present were encouraged to try to write their work diary in Hindi.

Administrative Workshop on Official Language Implementation

An Official Language Workshop on Official Language implementation was organized on 12.11.2024 for the administrative staff of the Institute. The workshop commenced with the inaugural address of Dr. George Ninan, Director. Dr. Santosh Alex, Chief Technical Officer, was the faculty of the workshop. Information was given about the Official Language Rules 1976 and Section 3 (3) documents in this workshop. A total of 9 Administrative Assistants participated in it.

Hindi Pakhwada 2024 celebrated at ICAR-CIFT

Hindi Pakhwada was celebrated with enthusiasm by Indian Council of Agricultural Research-Central Institute of Fisheries Technology, Cochin during 14-30 September.

Hindi Pakhwada Valedictory cerebration was organized on the afternoon of 30th September, 2024, in which Chief Administrative Officer Shri Mahesh B. Khubdikar welcomed the gathering. He recalled the first Hindi speech of the late Hon'ble Prime Minister Shri Atal Bihari Vajpayee Ji at the United Nations and urged everyone to take inspiration from the Hindi speeches given by the current Prime Minister Shri Narendra Modi Ji on every platform. In his presidential address, Director Dr. George Ninan expressed satisfaction over the implementation of Official Language Hindi in the Institute. On this auspicious occasion, the Director urged the member staff to use Hindi as much as possible in their daily work. The Chief Guest at the Valedictory cerebration Dr. Jessy Joseph C., Deputy Director (Official Language) (Retd.), ICAR-CIFT, Kochi requested all categories of employees of the Institute to include Official Language Hindi in their work.

Address by Dr. Jessy Joseph C during the Hindi Pakhwada 2024

During the program, the Chief Guest Dr. Jessy Joseph C. gave away prizes to the winners of Hindi Pakhwada 2024 competitions held in the Institute from 19.09.2024 to 27.09.2024 and Director Dr. George Ninan distributed certificates to three employees under the incentive scheme for their best efforts in working in Hindi. The Director and chief guest presented this year's trophy of Best Official Language Implementation Division 2024 of the Institute to Head, Quality Assurance Management Division Dr. Zynuddin A.A. A cultural program was organized in the valedictory cerebration and Assistant Chief Technical Officer Dr. P. Shankar announced the competition winners and Chief Technical Officer Dr. Santosh Alex expressed his gratitude to everyone.

Receiving of the Trophy by HoD, Quality Assurance Management Division

Singing by Dr. G. Rudrappa

Official Language prizes to ICAR-CIFT, Kochi

ICAR-Central Institute of Fisheries Technology, Kochi was honoured with the Official Language Rolling Trophy for the best implementation of the Official Language Policy of the Government of India for 2022-23 by the Kochi Town Official Language Implementation Committee. Shri Mahesh B. Khubdikar, Chief Administrative Officer and Dr. Santosh Alex, Chief Technical Officer received the Official Language Trophy and certificate during the award distribution ceremony of Kochi TOLIC from Smt. Preeti Garg, IRS, Principal Chief Commissioner of Income Tax, Kerala & Chairperson, Town Official Language Implementation Committee, Kochi held on 23.10.2024.

'Jaladhi 2022', the Hindi science journal of the Central Institute of Fisheries Technology, published during the year 2022-23, has been awarded the Rolling Trophy of Best Journal of Kochi Town Official Language Implementation Committee. Shri Mahesh B. Khubdikar, Chief Administrative Officer, Dr. Santosh Alex, Chief Technical Officer, and Dr. P. Shankar, Assistant Chief Technical Officer received the Rolling Trophy of Best Journal and certificate during the award distribution ceremony of Kochi TOLIC from Shri Shankar Prasad, IRS, Commissioner of Income Tax (Admn & TPS), Kochi held on 23.10.2024.

Participation of Meetings/Workshop

The first half-yearly meeting of Kochi Town Official Language Implementation Committee for the financial year 2024-25 was held online on May 28, 2024. Director Dr. George Ninan and Dr. P. Shankar, Assistant Chief Technical Officer attended the meeting.

Dr. Santosh Alex, Chief Technical Officer and Dr. P. Shankar, Assistant Chief Technical Officer participated in Hindi Diwas 2024 and the 4th Joint Hindi Celebrations was inaugurated by Shri Nityanand Rai, Hon'ble Minister of State for Home Affairs, Department of Official Language, Ministry of Home Affairs, Government of India on 14th and 15th September 2024 at Bharat Mandapam, New Delhi.

The second half yearly meeting of Kochi Town Official Language Implementation Committee (Office) for the financial year 2024-25 was attended by Dr. George Ninan, Director, ICAR-CIFT, Dr. Santosh Alex, Chief Technical Officer and Dr. P. Shankar, Assistant Chief Technical Officer. The meeting was held on 17.12.2024 through online platform (C-DOT Meet) under the chairmanship of Smt. Preeti Garg, IRS, Principal Chief Commissioner of Income Tax, Kerala, Kochi.

Library

The CIFT Library is dedicated to meeting the information needs of the research community of the Institute and focuses on implementing innovative information services to enhance user experience and support research activities. It leverages advanced technologies such as digital repositories, remote access etc. to improve the accessibility and discoverability of research resources. Efforts are also made to preserve and digitize rare and valuable scientific literature, ensuring its long-term availability for future reference. Furthermore, the library continuously updates its collection with the latest publications and research outputs to keep pace with emerging trends and developments in the scientific field.

Library Collection

The total number of books in the collection is 12,996 this year. The online databases viz., ASFA (Aquatic Science and Fisheries Abstracts), Indian Standards and Questel patent database for prior art search have also been subscribed during the year.

KOHA Library Management System

The Library is using KOHA Library Management Software. The Online Public Access Catalogue (OPAC) enables the users to search the library collection efficiently by author, title, subject, and with related keywords. Users can also check the availability of resources, renew borrowed items, and place reservations through the OPAC. The system provides real-time updates on the status of resources, ensuring transparency and convenience for users. KOHA facilitates streamlined cataloging, circulation, and acquisition processes, improving overall library management and user satisfaction. The library regularly updates the catalog to include new additions and ensures that the system remains user-friendly and accessible both on and off-campus.

Digital Repository of CIFT

Digitization of CIFT publications and archiving them in the open digital repository is a key initiative of the library. At present, the CIFT digital repository houses 6,465 digital documents, including research papers, technical reports, conference proceedings, and other scholarly resources.

CeRA (Consortium of e-Resources on Agriculture)

More than 2,000 online journals are available through CeRA (Consortium of e-Resources on Agriculture), providing extensive access to scholarly literature in the field of agriculture. The library also facilitates the Document Delivery Request (DDR) feature through J-GateNext@CeRA, enabling members to request and obtain copies of research articles that may not be directly accessible, thereby supporting the research needs of the scientific community.

MyLOFT mobile/web application has been subscribed to facilitate remote access to library subscribed premium e-resources to the users.

Institutional Membership

CIFT library is a member of IAMSLIC (The International Association of Aquatic and Marine Science Libraries and Information Centers) and is part of the inter-library loan program, with more than 90 member libraries from more than 25 countries offering materials to other member libraries via interlibrary loan and document delivery.

The Library is also an institutional member of the DELNET-Developing Library Network, which coordinates with other regional, national, and international networks and libraries for the exchange of information and documents.

CIFT Library had become an Institutional member of the Current Science Association since September 2016.

Plagiarism Checking

The library offers plagiarism-checking services using iThenticate to its members. During the period, text similarity in 645 research articles was checked, and similarity score reports were generated, indicating the percentage of similarity. This year, the library has also subscribed to iThenticate's AI detection tool to enhance the accuracy of content analysis and identify AI-generated text, ensuring the authenticity and originality of research outputs.

ASFA Input Centre

The library in association with NIO, Goa continued to act as a National Input Centre of ASFA (Aquatic Science and Fisheries Abstracts) database.

Events & Celebrations

1. Workshop on Turtle Excluder Device (TED)

A specialized workshop on Turtle Excluder Device (TED) was organized from 19th to 25th February 2024 at ICAR-CIFT, Cochin, in collaboration with the Marine Products Export Development Authority (MPEDA) and the National Oceanic and Atmospheric Administration (NOAA), USA. The workshop included intensive technical sessions, practical hands-on training, and onboard demonstrations of TED in fishing vessels. Distinguished experts such as Mr. Jared Milton, Mr. Jeff Gearhart, and Mr. Kendal Falana from NOAA shared valuable insights and participated in interactive discussions with Indian stakeholders and researchers.

Participants and resource persons of the workshop

2. World Fisheries Day Celebrations

Smt. Chinnama during the event

World Fisheries Day was commemorated on 21st November 2024 at ICAR-CIFT Headquarters and Research Centres. The celebrations included a range of activities such as interactive sessions with students, community outreach with fisherfolk, and talks by domain experts. A special felicitation was held for Smt. Chinnama Joseph, a veteran fisherwoman, in recognition of her lifetime contributions to the sector. Programmes also included awareness drives, value-addition training, and stakeholder consultations to promote sustainable fisheries.

3. Visit under ASEAN-India Research Collaboration

As part of the ASEAN-India Research Collaboration initiative, Dr. Kua Beng Chu, Deputy Director of the Fisheries Research Institute, Malaysia, visited ICAR-CIFT, Cochin The visit supported collaborative efforts under an ANRF-funded project aimed at developing gender-responsive monitoring tools in seaweed farming. During the visit, extensive discussions and field-level evaluations were carried out to shape a comprehensive gender analysis framework.

Dr. Kua Beng Chu screening of fishes for the presence of Anisakis spp.

4. World Antimicrobial Resistance Awareness Week (WAAW)

The WAAW was observed from 18th to 24th November 2024 across Headquarters and Research Centres. The week-long celebration included awareness programmes targeting school and college students, multilingual brochure distribution, expert lectures, quizzes, and competitions to promote the judicious use of antimicrobials. The initiative reinforced ICAR-CIFT's efforts to contribute to global AMR mitigation through awareness and education.

5. Sustainable Refrigeration Technology Demonstration under INDEE+ Project

ICAR-CIFT partnered with NTNU, SINTEF, IIT-Madras, IISc, and BITS-Pilani for implementing eco-friendly CO2-NH3 cascade refrigeration systems. A demonstration at M/s Bellfoods was inaugurated by the Ambassador of Norway. ICAR-CIFT signed MoUs to collect performance data, promoting green technologies in seafood processing.

6. Swachhata Hi Seva & Gandhi Jayanti Observations

To honor Mahatma Gandhi's vision for cleanliness and community service, ICAR-CIFT and its regional centres actively participated in the 'Swachhata Hi Seva' campaign. Events included mass cleanliness drives, tree plantation programmes, and Swachhata pledges. Staff, students, and their families engaged with full enthusiasm, demonstrating collective responsibility toward a cleaner environment.

7. Celebration of 76th Republic Day

At ICAR-CIFT Headquarters and research centers, flag hoisting ceremonies were conducted to commemorate the 76th Republic day. On the occasion, the Director ICAR-CIFT and the Scientist–in -charge (SICs)of research centers addressed the staff.

8. Foundation Day Celebrations

The 67th Foundation Day of ICAR-CIFT was celebrated with great fervor and pride. Activities included scientific competitions for students, open house visits to laboratories, exhibitions showcasing research innovations, and the felicitation of retired staff and fisheries entrepreneurs. Eminent dignitaries from fisheries institutions and industry graced the occasion, highlighting the Institute's legacy and ongoing contributions.

9. Visits and Dignitary Interactions

Several dignitaries and officials visited ICAR-CIFT during the year, including Shri A. Babu, IAS (AP Secretariat), Dr. P.E. Shingare (BSKKV, Dapoli), and representatives from the Royal Norwegian Embassy in India. These visits facilitated rich dialogue on sustainable seafood technologies, collaborative research, and policy alignment in the fisheries sector.

10. World Environment Day & World Ocean Day

These important global observances were marked through a series of lectures, awareness campaigns, and beach cleaning drives in partnership with the Ministry of Earth Sciences (MoES), National Institute of Oceanography (NIO), and Andhra University. Staff and students actively participated, emphasizing the Institute's dedication to environmental conservation and ocean health.

11. International Women's Day

ICAR-CIFT celebrated International Women's Day by honoring the achievements of women in fisheries and public service. The programme featured motivational speeches, cultural performances, and an open forum highlighting women's roles in shaping resilient aquatic food systems

12. Independence Day Celebration

ICAR-CIFT and its research centers celebrated the 78th Independence Day of India, with a flag hoisting ceremony and a recitation of the Panch pran Pledge

13. Participation in local events and festivals

ICAR-CIFT maintained strong community engagement through participation in local seafood festivals, SHG (self-help group) interactions, and traditional celebrations such as Onam. These events served as important platforms to share knowledge and promote value-added fishery products.

14. Educational tours and Outreach

Throughout the year, ICAR-CIFT hosted numerous educational tours by students from universities, colleges, and schools. These visits included presentations, demonstrations of laboratory equipment, and interactive sessions on fisheries research, providing valuable exposure to the next generation of researchers.

15. Launch of LPG-Retrofitted Suzuki 9.9 HP Petrol Engines

ICAR-CIFT, in collaboration with the Department of Fisheries, Maharashtra, launched the LPG-retrofitted Suzuki 9.9 HP petrol engines on National Space Day (13 August 2024) at Sassoon Dock, Colaba, Maharashtra. The event was held in the presence of the Commissioner of Fisheries, Maharashtra. This initiative marks a significant step toward promoting clean and energy-efficient alternatives for the artisanal fishing sector.

Launching of LPG retrofitted Petrol engines

16. 10th International Day of Yoga celebrations

10th International Day of Yoga was celebrated at ICAR-CIFT headquarters and in its three research centres. At headquarters, Dr. M P Remesan, Director (i/c), ICAR-CIFT formally inaugurated the function. Sri. Acharya S. Rajendran (DNYS), Sree Yogadarshan-Yoga Centres, Thripunithura, Kochi, was the chief guest for the programme. He delivered a talk on the importance of yoga in our daily life followed by a practical session based on the Common Yoga Protocol by AYUSH. Sri Rajendran demonstrated basic asanass and breathing techniques which can be practised daily to improve health and mental wellness. Dr. Prajith K K, Senior Scientist & Nodal officer, IDY, proposed vote of thanks.

At Veraval research centre Dr. Ashish Kumar Jha, Scientist In-Charge, welcomed and briefed about the programme. Shri. Abhay Thakar, Sanskrit University, Veraval was the expert for the programme. He demonstrated different asanas of Yoga. Dr. S. Chinnadurai, Scientist & Nodal Officer, International Yoga Day Celebrations, proposed the vote of thanks.

At the Mumbai research centre, Dr. Abhay Kumar, scientist offered welcome address. Shri. Madhu Nair, 'Yoga Vidya Niketan', Vashi, Navi Mumbai lead the session.

At Vishakhapatnam research centre, the programme was inaugurated by Dr U Sreedhar, PS & Scientist-in-Charge. Ms. M. Lakshmi Shailja, MA (Yoga) was the resource person. She explained the importance of yoga in daily life and demonstrated the basic yoga asanas in the practical session. Shri Bhuneshwar, Senior Technical Officer proposed vote of thanks.

17. Stakeholder Meetings and Technical Workshops

Various stakeholder consultations and technical workshops were held to assess regional research needs and identify focus areas in fisheries R&D. Inputs gathered were documented and are being used to inform strategic planning and new project development.

18. ICAR-Inter Zonal Sports Tournament 2023 at Jodhpur, Rajasthan

In the ICAR Inter-Zonal Sports Tournament 2023, the winners of the ICAR South Zone meet participated organised at ICAR-Central Arid Zone Research Institute (CAZRI), Jodhpur, Rajasthan during 14-17 October, 2024. Dr. Pe. Jeyya Jeyanthi won gold in long Jump and bronze in 100 metre race, Shri. Rajasaravanan won silver in Carroms (Singles) and gold in Carroms (mixed doubles) with Smt. Tessy Francis.

Winners of ICAR-Inter Zonal Sports Tournament at Jodhpur

Recreation Club

ICAR-CIFT Recreation Club strives to play role in bringing together all the members of the CIFT family to common platform by organizing programmes. Welfare of the staff was taken care both physically and mentally to equip them to contribute to the Institute in a stress-free working environment.

The following were the programmes the club have strategized and conducted to meet its societal obligations during the period.

- Recreation Club celebrated New Year 2024 in CIFT by greeting and welcoming the staff on 01st of January 2024 in the front lobby of this institute.
- CIFT Recreation Club in association with Kottakkal Arya Vaidyashala conducted a free medical check-up camp for staff members on 9th January, 2024 in the Institute.
- As part of World Blood Donor Day on 14th June, 2024, CIFT Recreation Club in association with IMA Voluntary Donor Blood Bank, Ernakulam conducted Blood Donation Campaign in which 7 CIFT staff members donated blood.
- CIFT Recreation Club conducted a class on National Pension System (NPS) in association with HDFC Pension Management Company Limited on 09.08.2024 for the benefit of all staff members of CIFT.

- During the year 2024, the Onam Celebration of ICAR-CIFT, Cochin was held on 11th September, 2024. The celebrations included a Pookkalam in the portico of the Institute followed by Onam Sadhya organized by the Canteen Committee .

Other activities

- CIFT Recreation Club gave financial support to Smt. Sudha Preman, Skilled worker at ABI for her Husband's Liver Cancer treatment for which club collected Rs.1,43,000/- from the staff members of CIFT.
- Club bid farewell to five of its members who had completed their long career in CIFT. As a token of appreciation, gratitude, love and respect farewell meetings were organized and mementos were handed over to them.

Representation In Committees

Dr. George Ninan

Chairman

- Committee for formulation of standard operating procedures/ guidelines for the deployment of LPG kit retrofitted on fishing vessels, Department of Fisheries, GOI
- Nodal Authority for approval of standardized deep sea fishing vessels, Design and specification. Department of Fisheries, MoFAH&D, GoI.
- Expert Committee for the preparation of SOPs/Guidelines for deployment of LPG kit retrofitted on OBMs. Department of Fisheries, MoFAH&D, GoI.
- Committee for suggesting measures to ensure sustainable use of fishery resources for fishmeal and oil production, constituted by MPEDA.

Member

- Committee of the State Level Agency for Export Development of Aquaculture & Fisheries (SAEDAF).
- Scientific Panel on Fish and Fisheries Products (SP-10) FSSAI, India
- Board of Directors of Lakshadweep Development Corporation Ltd, India
- Technical Committee, MPEDA.
- Standardization cell, Department of Fisheries, MoFAH&D, GoI.

Empaneled commercial expert

- Techno-economic assessment committee in commercializing technologies of NARS, Agrinnovate India Limited

Principal Member

- FAD 15, Bureau of Indian Standards, BIS, India

Dr. M.P. Remesan

Chairman

- BIS, 22nd meeting of Textile Materials for Marine/Fishing Purposes Sectional Committee, TXD 18 held on 17 January 2025.

Member

- Expert Committee on preparation of guidelines for management of purse seine/ ring seine fishing in the India Territorial waters and EEZ.

Dr. Zynudheen A. A.

Chairman

- Chairman- committee for development of standard for fish oil for feed purpose

Member

- FAD 12 of BIS (Bureau of Indian Standard) Fish and fisheries products
- Assessment Panel of Experts for export of fish and fishery products

Dr. Bindu J.

Chairman

- Technical Committee- 31st Swadeshi Science Congress 7-9 November 2024, jointly organized by the Swadeshi Science Movement Kerala and the ICAR-Central Institute of Fisheries Technology.

Dr. T. Raja Swaminathan

Expert panel member

- Evaluation of proposals received in the theme Water testing and disease diagnosis kits during the International Conclave on NextGen Technologies in the Seafood Sector, The Marine Products Export Development Authority, GOI

Expert Member of Subject Expert Committee

- Expert Member of Subject Expert Committee (SEC) in subject area of Biosciences and Biotechnology for the selection of "Innovation in Science Pursuit for Inspired Research (INSPIRE)" Fellow

DBT Nominee

- Institutional Biosafety Committee (IBSC) constituted at National Ayurveda Research Institute for Panchakarma, Kerala
- Institutional Biosafety Committee (IBSC) constituted at ICAR Central Marine Fisheries Research Institute, Kerala

External Member

- Institutional Biosafety Committee (IBSC) constituted at ICAR National Bureau of Fish Genetic Resources, Lucknow, Uttar Pradesh

Nominated member

- Institute Management Committee, ICAR Central Marine Fisheries Research Institute, Kerala

Dr. Nikita Gopal

Chair

- Gender in Aquaculture & Fisheries Section of the Asian Fisheries Society
- Asian Fisheries Social Science Research Network

Secretary

- Society of Fisheries Technologists (India)

Member

- Steering Committee, Global Network for capacity building to

increase access of small-scale fisheries to financial services (CAFI SSF Network)

- Scientific Advisory Committee (SAC) of KVK, Ernakulam

Dr. Toms C. Joseph

Secretary

- 31st Swadeshi Science Congress, 7-9 November 2024.

External expert

- Institutional Biosafety Committee (IBSC) of the Peninsular Aquatic Genetic Resources (PAGR) Centre of the ICAR-NBFGR, Kochi

Member

- Institutional Biosafety committee (IBSC) of National Centre for Aquatic Animal Health, Cochin University of Science and Technology
- Faculty Board of studies in Ocean Science and Technology, Kerala University of Fisheries and Ocean Studies.

Dr. L. Narasimha Murthy

- Domain Expert, Recruitment Fair: Unlocking Opportunities in the Thriving Aquaculture Sector, ICAR-CIFE, Mumbai, 18.12.2024.

Dr. Suresh A.

Member

- Governing Council and Member of Senate of Kerala University of Fisheries and Ocean Studies, Panangadu, Ernakulam.
- Standing Committee of Governing Council of KUFOS on Planning, Development and Research
- Board of Studies of UG Degree Programme in the faculty of Agri Business Management (ABM), of University of Agricultural Sciences, Bangalore
- Sub-committee of GC of KUFOS to revise the statute of KUFOS in accordance with the Amended Act

Dr. U. Sreedhar

Member

- RAC member of CMLRE, Ernakulam

Dr. B. Madhusudana Rao

Member

- Representing Bureau of Indian Standards (BIS), participated (virtually) in the ISO TC 34/ SC 9/AHG 5, ad-hoc group for Brainstorming on Antimicrobial Resistance of International Organization for Standardization (ISO), Technical Committee on Food products, Sub-committee on Microbiology on 13.03.2024 (3rd meting), 15.05.2024 (4th meeting), 18.09.2024 (5th meeting) and 11.11.2024 (6th meeting).
- ISO TC 34/SC 9/AHG 5, ad-hoc group for Brainstorming on Antimicrobial Resistance, International Organization for Standardization (ISO), Technical Committee on Food products, Sub-committee on Microbiology.
- FAD-15, Food Hygiene, Safety Management and Other systems, Sectional Committee, Food & Agriculture Department, Bureau of Indian Standards (BIS), Government of India.
- Working Group-1, Brainstorming on AMR in food products, FAD-31, Food Microbiology Sectional Committee, Bureau of Indian Standards (BIS), Government of India.
- Board of Studies (BOS), Department of Food Nutrition and Dietetics, Andhra University
- Board of Studies in Microbiology, Andhra University, Visakhapatnam
- Executive Committee member, Rajiv Gandhi Centre for Aquaculture (RGCA), Marine Products Export Development Authority (MPEDA)
- Assessment panel of Experts, Export Inspection Council
- Auditor, SHAPHARI-Certification of Hatcheries, Marine Products Export Development Authority (MPEDA), Cochin, Ministry of Commerce and Industry, Government of India

As Auditor

- Under the SHAPHARI Certification scheme of MPEDA for conducting the Surveillance audit of Marine hatcheries at Visakhapatnam

Dr. Madhu V. R.

Chief Editor

- Journal Fishery Technology

Member

- Member of the Committee for revalidation of potential fishery resources in Indian EEZ
- Member of technical committee to develop framework/ mechanism for carbon market in fisheries and aquaculture sector

Dr. Sajeev M. V.

Member

- Scientific Advisory Committee, KVK Kottayam
- Scientific Advisory Committee, KVK Thrissur

Dr. M. V. Baiju

Member

- For formulation of Standard Operating Procedures/guidelines for the deployment of LPG kit retrofitted on fishing vessels, Ministry of Fisheries, GOI

- Member of Nodal Authority for the deep-sea fishing vessel design under PMMSY scheme of Department of Fisheries, Govt. of India.

Dr. Murugadas V.

External Expert

- 28th Meeting of Scientific Panel on Fish & Fisheries Products of FSSAI (SP-10) held at ICAR-CIFT, Cochin during 9th and 10th January 2024.

Dr. S. Visnuvinayagam

Member

- Committee for the technical evaluation of ELISA Kit in MPEDA, Cochin
- Member, Institute Biosafety Committee member for ICAR-CMFRI, Ernakulam

Dr. Prajith K. K.

Member

- Member in the committee for the preparation of document for NOAA-US under Marine mammal Stock assessment in Idia Project

Dr. Niladri S Chatterji

Member

- Pesticide Residues Analysis Sectional Committee, FAD27, BIS India

Sandhya K.M.

Member

- Member of BIS committee, TXD 18 (Textile Materials for Marine/ Fishing Purposes Sectional Committee)

Dr. Laly S.J.

Member

- Sectional Committee, FAD 28 of BIS (Bureau of Indian Standard) Test Methods for Food Products
- Aquaculture training working group of Seafood HACCP Alliance, Association of Food and Drug Officials, USA
- Standardization cell of Ministry of Fisheries, Animal Husbandry and Dairying Department of Fisheries, Government of India
- Assessment panel of Experts, Export Inspection Council

External expert

- Scientific panel of FSSAI for fish and fishery products

Dr. Martin Xavier K. A.

Member

- Assessment panel of Experts, Export Inspection Council

Dr. Parvathy U.

Member

- Evaluation of proposals for the International conclave on NextGen Technologies on the seafood sector by MPEDA
- Amendment in technology development for specific value-added marine products (TDSVMP) guidelines of MPEDA

Dr. Viji P

Member

- Assessment panel of Experts, Export Inspection Council

Dr. Jesmi Debbarma

Member

- Assessment panel of Experts, Export Inspection Council

Dr. Pankaj Kishore

Member

- Food Microbiology Sectional Committee, FAD 31 of BIS, New Delhi

Member of BIS representative

- ISO/TC 34/SC 9/AHG 6 "Commercial sterility testing"
- ISO/TC 34/SC 9/WG 3 "Method Validation"
- ISO/TC 34/SC 9/WG 8 "Preparation of test samples, initial suspension and decimal dilutions"
- ISO/TC 34/SC 9/WG 30 "Qualitative determination of staphylococcal enterotoxins"

Dr. Anupama T. K.

Member

- Assessment Panel of Experts, Export Inspection Council
- Women's Cell of ICAR-CIFT
- Committee for ISO Certification of ICAR-CIFT

Dr. Manju Lekshmi N.

Member

- Representative member for GLOLITTER project of IMO-FAO & National Regulatory Framework Dealing with SBMPL and its Inclusion in Existing National Waste Management Legislation and Policies.

Dr. Ranjit Kumar Nadella

Alternate Member

- Food Microbiology Sectional Committee Sectional Committee-FAD31, BIS, New Delhi
- Assessment panel of Experts, Export Inspection Council

Dr. Elavarasan K.

Member

- Committee for fixing the uniform norms for capacity fixation in connection with lifting of moratorium on registration of fish meal and fish oil units under MPEDA.

Dr. Greeshma S. S.

Member

- Assessment panel of Experts, Export Inspection Council

Shri. Sreejith S.

Member

- Assessment Panel of Experts, Export Inspection Council

Dr. Sarika K

Member

- Assessment Panel of Experts, Export Inspection Council

Dr. Ahamed Basha

Member

- Assessment Panel of Experts, Export Inspection Council

As Auditor

- Under the SHAPHARI Certification scheme of MPEDA for conducting the Surveillance audit of Marine hatcheries at Visakhapatnam

Dr. Murali S.

Expert Member

- A committee for scrutiny of technologies in connection with the National Conclave on Next-Generation Technologies in Fisheries, MPEDA, 30th August 2024.

Smt. Priya E. R.

Member

- Pesticide Residues Analysis Sectional Committee, FAD27, BIS India
- Seafood HACCP Alliance segment one update workgroup, Association of Food and Drug Officials, USA
- Fisheries Export Promotion Cell, India
- Assessment Panel of Experts, Export Inspection Council
- Financial Evaluation committee, MPEDA

Dr. Devananda Uchoi

- Assessment panel of Experts, Export Inspection Council

Dr. Rehana Raj

Mentor

- 8th COHORT Startup team, ICAR-CIRCOT R-ABI Startup incubates

Shri. Shravan Kumar Sharma

Member

- Purchase committee for Department of Fisheries Maharashtra for procurement of Fishing Vessels and engines.

Important Institute Committees

Quinquennial Review Team (QRT)

Chairman: **Dr. K. S. M. S. Raghava Rao, Director, CSIR-CFTRI.**

Members:

1. Dr. B. Sundaramoorthy, Dean (I/c), Prof. & Head, Dr. MGR Fisheries College & Research Centre, TNJFU, Nagapattinam
2. Dr. K. C. Dora, Former Dean, Dpt. of Fish Processing Technology, KBAFS, Kolkata (WB)
3. Dr. Udey S. Annapure, Prof. & Head, Institute of Chemical Technology, Mumbai
4. Dr. V. R. Joshi, Former Prof. & Head, College of Fisheries, Ratnagiri
5. Dr. N. Bhaskar, Advisor, FSSAI

Member Secretary: Dr. Satyen Kumar Panda, Principal Scientist, QAM Division, ICAR-CIFT, Kochi

Research Advisory Committee (RAC)

Chairman: **Dr. G. Sukumar, Vice Chancellor, TNFU**

Members:

1. Dr. E. Vivekanandan, Former Principal Scientist, CMFRI, Cochin.
2. Dr. K.C. Dora, Former Dean College of Fisheries, WBUAFS.
3. Dr. G. Bhanuprakash Reddy, Scientist-G & Head, ICMR-National Institute of Nutrition.
4. Dr. B. Ganesh Kumar, Principal Scientist, Agribusiness Management Division, ICAR-NAARM.
5. Assistant Director General (M.Fy.), KAB-II, Pusa, New Delhi.
6. Director, ICAR-CIFT, Cochin.

Member Secretary: Dr. V. Murugadas, Senior Scientist, ICAR-CIFT, Cochin.

Institute Management Committee (IMC)

Chairman: **Dr. George Ninan, Director, ICAR-CIFT**

Members:

1. Shri P. I. Sheik Pareeth, MD, Kerala State Coastal Area Development Corporation Ltd.
2. Director of Fisheries, Dept. of Fisheries, Govt. of Goa.
3. Dean, Fisheries Sciences, Junagadh Agricultural University, Veraval,
4. Shri Seshan T. S., Thayattuparambil House, Kochambalam, Nayarambalam P. O., Ernakulam-682509
5. Dr. P. Shanmuganandam, Rajesh Nagar, 158 Mettupatti P.O., Madurai- 625 502.
6. Dr. E.M. Abdussamad, PS & Head-in-charge, Finfish Fisheries Division, ICAR-CMFRI, Cochin.

7. Dr. K.S. Sobhana, Scientist-in-Charge, Library and Documentation Centre, CMFRI, Kochi.
8. Dr. Rupam Sharma, Principal Scientist, CIFE, Mumbai.
9. Dr. Pravata K. Pradhan, Principal Scientist, NBFGR, Lucknow.
10. Assistant Director General (M. Fy.), ICAR, KAB-II, Pusa, New Delhi - 12
11. Senior Finance and Administrative Officer, ICAR-CMFRI, Cochin

Member Secretary: Senior Administrative Officer, ICAR-CIFT, Kochi

Priority Setting, Monitoring & Evaluation Committee (PMC)

Chairman: **Dr. George Ninan, Director, ICAR-CIFT**

Members:

1. Head, Fishing Technology, ICAR-CIFT
2. Head, Fish Processing, ICAR-CIFT
3. Head, Biochemistry & Nutrition, ICAR-CIFT
4. Head, Quality Assurance & Management, ICAR-CIFT
5. Head, Microbiology, Fermentation and Biotechnology, ICAR-CIFT
6. Head, Extension, Information & Statistics, ICAR-CIFT
7. In-Charge Engineering, ICAR-CIFT

Member Secretary: In-Charge, PME cell, ICAR-CIFT

Grievance Cell

Chairman: **Dr. George Ninan, Director, ICAR-CIFT**

Members:

1. Dr. Zynudheen A.A., Principal Scientist & HOD, FP Div., ICAR-CIFT
2. Administrative Officer & Head of Office (i/c), ICAR-CIFT
3. Senior Finance & Accounts Officer, ICAR-CIFT
4. Dr. Ashalatha S., Principal Scientist, EIS Div., ICAR-CIFT
5. Dr. Dhiju Das P.H., Senior Technical Assistant, ICAR-CIFT
6. Smt. Sobha K.S., UDC, ICAR-CIFT
7. Smt. Mary Vineetha P.T., SSS, ICAR-CIFT.

Member Secretary: Asst. Administrative Officer (Cdn.), ICAR-CIFT, Cochin

Institute Joint Staff Council (IJSC)

Chairman: **Dr. George Ninan, Director, ICAR-CIFT**

Members (Official Side):

1. Dr. Bindu. J., Principal Scientist & HOD, FP Div., ICAR-CIFT
2. Dr. Remesan. M.P, Principal Scientist & HOD, FT Div., ICAR-CIFT
3. Dr. Nikita Gopal, Principal Scientist & HOD (A), EIS Div., ICAR-CIFT
4. Dr. R. Anandan, Principal Scientist & HOD, B&N Dvn., ICAR-CIFT
5. Head of Accounts, ICAR-CIFT

Secretary (Official Side): Head of Administration, ICAR-CIFT

Members (Staff Side):

1. Shri. Vinod. G., Tech. Asst., ICAR-CIFT
2. Shri. P. Mani, Assistant, ICAR-CIFT
3. Shri. P. N. Nikhil Das, LDC, ICAR-CIFT
4. Shri. Kedar Meher, SSS, VRC of ICAR-CIFT
5. Shri. Rajhavan P., SSS, ICAR-CIFT

Secretary (Staff Side): Shri. Vipin Kumar. V., Tech. Officer ICAR-CIFT.

List of on-going research projects

Institute Projects

Sl.No	Name of Project	Principal Investigator	Co-Investigators/ Project Associates*
1.	Investigations on sustainable, productive and safe fishing technologies	Dr. M. P. Remesan	Dr. Baiju M. V. Dr. Madhu, V. R. Dr. Sandhya K. M. Dr Prajith, K. K. Mr. Paras Nath Jha Dr. Renjith R. K.
2.	Investigations on environmental burdens associated with selected small scale fishing systems and value-added fishery product of India using Life cycle assessment (LCA) approach	Mr. Paras Nath Jha	Dr. George Ninan Dr. Raghu Prakash R. Dr. M. V. Baiju Dr. Sandhya K. M. Dr. Sreejith S. Dr. Manju Lekshmi N. Dr. Renjith R. K. Mr. Satish Kumar K. Mr. Shravan Kumar S.
3.	Fishing material debris assessment and studies on its degradation and aquatic fauna intakes	Dr. Manju Lekshmi N.	Dr. Muhamed Ashraf P. Dr. Toms C. Joseph Dr. Sreedhar U. Dr. Madhu V. R. Dr. M. V. Baiju Dr. Sandhya K. M. Dr. Laly S. J. Mr. Paras Nath Jha Dr. Chinnadurai S. Mr. Gaihiamngam Kamei
4.	Development of nano sensors for precision aquaculture and technologies to protect fishing materials	Dr. Muhamed Ashraf P.	Dr. Sandhya K. M. Dr. Manju Lekshmi N. Dr. Chinnadurai S. Dr. Binsi P. K.
5.	Designing responsible fishing systems: Integrating morphology and behavioural responses to fishing stimuli	Dr. Madhu V. R.	Dr. Prajith K. K. Dr. Renjith R. K. Mr. Paras Nath Jha Dr. Chinnadurai S. Dr. Tejpal C. S.
6.	Valorization of marine and agro waste for development of green packaging materials	Dr. Bindu J.	Dr. Remya S. Mr. Sreejith S. Dr. Sarika K. Dr. Satish Kumar K. Dr. Sreelakshmi K. R. Dr. Priya E. R. Dr. Renuka V. Dr. Toms C. Joseph Dr. Jesmi Debbarma

7.	"SMART PACK: Development and characterization of smart packaging films for enhancing quality and shelf life of fishery products"	Dr. C. O. Mohan	Dr. C. G. Joshy Dr. Visnuvinayagam Dr. Elavarasn K. Dr. Remya S. Dr. Sreelakshmi K. R. Dr. Pankaj Kishore Dr. Ranjith Kumar Nadella
8.	Technological interventions in value addition and advanced processing techniques for fish and shell fish	Dr. Remya S.	Dr. George Ninan Dr. Bindu J. Dr. Joshy C. G. Dr. C. O. Mohan Dr. Toms C. Joseph Dr. Viji P. Dr. Jesmi Debbarma Dr. Pankaj Kishore Dr. Parvathy U. Mr. Ezhil Nilavan Dr. Sreepriya Prakasan Dr. Sarika K Dr. Neethu K. C. Dr. Rehana Raj Dr. Sreejith S. Dr. Satish Kumar Dr. Sreelakshmi K. R.
9.	ViVal Waste: Repurposing fish processing residues for tapping vital value	Dr. Binsi P. K.	Dr. Zynudheen A. A. Dr. Muhammed Ashraf P. Dr. Toms C. Joseph Dr. Madhusudana Rao Dr. Sajeev M. V. Dr. Viji P. Dr. C. G. Joshy Dr. Jeyakumari A. Dr. Laly S. J. Dr. Martin Xavier K. A. Dr. Parvathy U. Dr. Elavarasn K. Dr. Muthulakshmi T. Mr. Ezhil Nilavan Dr. Aniesrani Delfiya Dr. Sreepriya Prakasan Dr. Niladri Sekhar Chatterjee Mr. Anas K. K.
10.	Ingenious Processing and Value Addition Approaches for Preservation and Diversification of Fishery Products	Dr. Parvathy U.	Dr. Bindu J. Dr. Zynudheen A. A. Dr. C. O. Mohan Dr. Sreelakshmi K. R. Dr. Sreepriya Prakasan Dr. Joshy C. G. Dr. Jeyakumari A. Dr. Anupama T. K. Dr. V. Chandrasekar Dr. Sarika K.

11.	Development of food and Industrial products from secondary raw materials of aquatic origin	Dr Jeyakumari A.	Dr. Zynudheen A. A. Dr. Femeena Hassan Dr. Asha K. K. Dr. Binsi P. K. Dr. Elavarasn K. Dr. Martin Xavier K. A. Dr. Sreepriya Prakasan
12.	Development of efficient statistical and reliability tools for fish products	Dr. C. G. Joshy	Dr. Zynudheen A. A. Dr. C. O. Mohan Dr. Binsi P. K. Dr. Parvathy U. Dr. Elavarasn K. Dr. Geethalaksmi V.
13.	Method development, validation and technological interventions for assuring safety of fish and fishery products	Dr. Zynudheen A. A	Dr. Femeena Hassan Dr. Niladri S. Chatterji Dr. Laly S. J. Dr. Martin Xavier Dr. Pankaj Kishore Dr. Renjith K Nadella Dr. Devanand Uchoi Smt. Priya E. R.
14.	Development of rapid testing platforms for quality assessment of seafood	Dr. Laly S. J.	Dr. Femeena Hassan Dr. Muhammed Ashraf Dr. Martin Xavier Dr. Renjith K. Nadella Dr. Devanand Uchoi Smt. Priya E. R.
15.	Valorization of seaweed resources for functional food, nutraceutical, cosmeceutical, biomedical, and bioremediation applications	Dr. Niladri Sekhar Chatterjee	Dr. Asha K. K. Dr. Devananda Uchoi Dr. Minimol V. A. Dr. Anisarani Delfiya Dr. Rehana Raj Dr. Greeshma S. S. Dr. Jesmi Devbarma Dr. Ahamed Basha Dr. Ashish Kumar Jha
16.	Production of poly unsaturated fatty acids (PUFAs) from heterotrophic eukaryotes: A biotechnological approach	Dr. Anupama T. K.	Dr. Toms C. Joseph Dr. Lekshmi R. G. Kumar
17.	Development of Marine biorefinery based on tuna processing waste - A greener approach.	Dr. Lekshi	R. G. Kumar

18.	Diagnostic development of important pathogens, emerging AMR and other pathogens in aquatic environment and seafood	Dr. G. K. Sivaraman	Dr. Raja Swaminathan T. Dr. Toms C. Joseph Dr. R. Anandan Dr. Madhusudhana Rao B. Dr. Visnuvinayagam S. Dr. Murugadas V. Dr. Anupama T. Dr. Minimol. V. A. Dr. Greeshma S. S. Smt. Muthulakshmi. T. Mr. Ezhil Nilavan S. Shri. Rudrappa Gattu Dr. Abhay Kumar Dr. K. Ahamad Basha Dr. Arun Sudhakar
19.	Virulence and Antibiotic Resistance Profiling of Seafood Borne Pathogens and Development of Control Measures	Dr. S. Visnuvinayagam	Dr. Raja Swaminathan T. Dr. Toms C. Joseph Dr. R. Anandan Dr. Madhusudhana Rao Dr. Visnuvinayagam S. Dr. Murugadas V. Dr. Abhay Kuar Dr. Anupama T. K. Dr. Minimol, V. A. Dr. Greeshma S. S. Dr. K. Ahmed Basha Smt. Muthulakshmi T. Mr. Ezhil Nilavan S. Mr. Rudrappa G. Dr. Arun Sudhakar
20.	A green technology approach on isolation, purification and product development from marine biomolecules	Dr. R. Anandan	Dr. Suseela Mathew (Retired) Dr. Asha K. K. Dr. Niladri Sekhar Chatterjee Dr. Renuka V. Dr. Tejpal C. S. Dr Lekshmi R. G. Kumar Mr. Anas K. K.
21.	Establishing nutritional and bio-functional potential of selected fishery products through in vitro/in vivo digestibility studies	Dr. Renuka V.	Dr. Anandan R. Dr. Tejpal C. S. Dr. Lekshmi R. G. Kumar Dr. Ashish Kumar Jha Mr. Anas K. K.
22	Engineering interventions in post-harvest sector	Dr. Murali S.	Dr. Neethu K. C. Dr. Aniesrani Delfiya D. S. Dr. Lekshmi R. G. Kumar
23	Carbon nanodots and nanocomposite PCM based energy efficient solar dryer	Dr. Aniesrani Delfiya D. S.	Dr. Murali S. Dr. Neethu K. C.
24	Design and Development of indigenous tools and technologies for the post harvest fisheries sector	Dr. Murali S.	Dr. Neethu K. C. Dr. Aniesrani Delfiya D. S Dr. Femeena Hassan Dr. Sreelakshmi K. R.

25.	Modelling economic risks in fisheries and mitigation strategies	Dr. V. Geethalakshmi	Dr. Nikita Gopal Dr. A. Suresh Dr. Pe Jeyya Jeyanthi Dr. V. Chandrasekar Dr. K. Rejula
26.	A study of digital fish marketing ecosystem in India	Mr. Sajeev M. V.	Dr. C. G. Joshy Dr. Abhay Kumar Dr. Jesmi Debbarma
27.	Assessment of post- harvest losses in the fish value chain	Dr. Pe. Jeyya Jeyanthi	Dr. Nikita Gopal Dr. Geethalakshmi V. Dr. Ashaletha S. Dr. V. Chandrasekar Dr. K. Rejula Mrs. Muthulakshmi. T. Dr. Viji P.
28.	Impact assessment of ICAR-CIFT Technologies	Dr. V. Chandrasekar	Dr. Nikita Gopal Dr. A. Suresh Dr. V. Geethalakshmi Dr. Pe. Jeyya Jeyanthi Dr. K. Rejula
29.	Development of Smart trawl systems for the North East maritime states of India	Dr. U. Sreedhar,	Dr. R. Raghu Prakash Mr. G. Kamei
30.	Interventions for ensuring diversity and quality of products from aquatic resources of East Coast through innovative technologies	Dr. Viji P.	Dr. B. Madhusudana Rao Dr. Jesmi Debbarma Dr K. Ahamed Basha
31.	Harvest and post-harvest interventions in marine resources available along the Saurashtra coast	Dr. Ashish Kumar Jha	Shri. Sreejith S. Dr. Sarika K. Dr. Devanand Uchoi Dr. Chinnadurai S.
32.	Assessment of fish harvest and post-harvest technological aspects and mitigation measures for problems with special reference to Maharashtra.	Dr. Asha K. K.	Dr. L. Narasimha Murthy Dr. Abhay Kumar Dr. Greeshma S. S. Dr. Rehana Raj Shri. Shravan Kumar Sharma
33.	Innovative technology interventions to address challenges prevalent in fish harvest and post-harvest sectors of Maharashtra	Dr. Asha K. K.	Dr. L. Narasimha Murthy Dr. Abhay Kumar Dr. Greeshma S. S. Dr. Rehana Raj Shri. Shravan Kumar Sharma

Externally funded projects

International Projects

Sl.No	Name of Project	Principal Investigator	Co-Investigators/ Project Associates*
1.	FRI-INDEE+ Indo-Norwegian project	Dr. George Ninan	Dr. Manoj P. Samuel Dr. Murali S. Dr. Baiju M. V. Dr. Jeyakumari A. Dr. Arun B. S.*
2.	Establishing value chain for fish: ensuring the nutritional security of vulnerable groups and developing a sustainable model	Dr. George Ninan	Dr. Niladri Sekhar Chatterjee
3.	"Transforming Agri-food Systems in South Asia (TAFSSA)	Dr. A. Suresh	Dr. Pe Jeyya Jeyanthi Dr. Rejula. K. Dr. Rajesh. I. D.*
4.	Detection of zoonotic parasite *Anisakis* spp. through molecular tools: An emerging public health concern	Dr. T. Raja Swaminathan	Dr. Kua Beng Chu Dr. Masazurah A. Rahim from Malaysia Dr. Dewi Syahidah from Indonesia Ms. Anitha Antony*

National Projects

Sl.No	Name of Project	Principal Investigator	Co-Investigators/ Project Associates*
Indian Council of Agricultural Research			
1.	NAIF-Zonal Technology Management	Dr. C. O. Mohan	Dr. B. Madhusudana Rao Dr. Remya S. Ms. Razia Mohamed A.* Mr. Lijin Nambiar M. M.*
2.	NAIF-Agribusiness Incubation (ABI-NAIF)	Dr. C. O. Mohan	Dr. Parvathy U. Mr. Sreejith S. Ms. Arshaya Rajesh* Mr. Mohammed Safuwan T. A.*
3.	All India Network Project on Fish Health	Dr. Ranjit Kumar Nadella	Dr. Niladri Sekhar Chatterjee
4.	All India Network Project on Antimicrobial Resistance (AINP-AMR)	Dr B. Madhusudana Rao	Dr. K. Ahamed Basha Mr. M. Vijaya Kumar* Ms. N. Alekhya*
5.	All India Network Project on AMR for fisheries and livestock	Dr. Murughadas V.	Mr. Vishnu Dr. Ezhil Nilavan Dr. Madhukumar A. Dr. Neethu K. R.

6.	ICAR-NIAP Network project on "Production systems, Agribusiness and Institutions", component- 1 "Impact of Agricultural Technology- Fishery Technology"	Dr. A. Suresh	Dr. V. Geethalekshmi Dr. S. Ashaletha Dr. V. Chandrasekar Dr. Elavarasan K. Dr. Sreepriya Prakasan Dr. S. Murali Mr. S. Sreejith Dr. Viji P. Dr. Rehana Raj
Department of Science and Technology (DST)			
7.	Development of millet based novel ready To Eat-RTE smart functional foods fortified with fish protein and lipid for entrepreneurship development in the state of Kerala	Dr. Bindu J.	Dr. C. O. Mohan Dr. Remya S. Dr. Elavarasan K Mrs. Drishya K.* Ms. Lekshmi S.*
8.	STI Hub for Socio-economic Empowerment of SC Community of Union Territory of Puducherry through Technology-Assisted Fish Farming Fish Processing and Value Addition (DST) (NIT, Puducherry)		Dr. Sathish kumar
9.	Developing a biorefinery workflow for high value nutraceuticals from seaweed by green chemistry approach	Dr. Lekshmi R. G. Kumar	Dr. Niladri Sekhar Chatterjee Dr. Suseela Mathew (Rtd.)
Food Safety and Standards Authority of India (FSSAI)			
10	Establishing comprehensive targeted and untargeted analytical workflows for risk assessment of residues, emerging contaminants, and antimicrobial-resistant bacteria in retail fish and fish products	Dr. Niladri Sekhar Chatterjee	Dr. Pankaj Kishore Dr. Ranjit Kumar Nadella Ms. Priya E. R.
11	Micro-and nano-plastics as emerging food contaminants: Establishing validated Methodologies and understanding the prevalence in different food matrices	Dr. Niladri Sekhar Chatterjee (CC-PI)	-
National Fisheries Development Board (NFDB)			
12.	The pilot scale implementation of "Smart packing technology: fish freshness indicator" at field level to enhance domestic fish consumption	Dr. C. O. Mohan	Dr. Remya S.
13.	The pilot scale demonstration of Seaweed based feed production for fish and shrimps	Dr. Ashish Kumar Jha	Shri. Sreejith S.
Pradhan Manthri Matsya Sampada Yojana (PMMSY)			
14.	Marine mammal stock assessment in India	Dr. Prajith K. K.	Mr. Paras Nath Jha Dr. Rithin Joseph* Mr. Hrishikesh P.* Mr. Immanuel Shaji*
15.	Development and popularization of fuel-efficient long-lasting otter board for greening the trawl fishing sector of India	Dr. M. P. Remesan	Dr. Raghu Prakash R. Mr. Paras Nath Jha Dr. Chinnadurai S. Mr. Shravankumar Sharma Mr. Gaihiamngam Kamei

16.	National surveillance Programme for Aquatic Animal Diseases – Phase II	Dr. Toms C. Joseph	Dr. Murugadas V. Mr. Ezhil Nilavan
Department of Fisheries, Maharashtra State			
17.	Development of Biodegradable Fishing Nets for combating Plastic Pollution in Maharashtra State	Mr. Shravan Kumar Sharma	Dr. Sandhya K. M. Mr. Paras Nath Jha
18.	Assessment of Abandoned, Lost and Discarded Fishing Gears (ALDFG) along the Maharashtra Coast and exploration of possible solutions for creating circular economy from retrieved fishing gears	Mr. Shravan Kumar Sharma	Dr. Asha K. K. Dr. Manju Lekshmi
19.	Study on alternate fuel and energy systems for fishing vessels in Maharashtra	Mr. Shravan Kumar Sharma	Dr. M. V. Baiju Mr. Paras Nath Jha
National Agricultural Science Fund (NASF)			
20.	A detailed Foodomics study for food authentication and exploration of nutraceutical potential	Dr. Niladri Sekhar Chatterjee	Dr. Satyen Kumar Panda Dr. Pankaj Kishore Dr. Minimol V. A.
Indian National Center for Ocean Information Services (INCOIS)			
21.	Deployment and maintenance of Wave Rider Buoy off Veraval and development of Jellyfish and sardine advisories	Dr. Madhu V. R.	Dr. Chinnadurai S.
Board of Reseach in Nuclear Sciences (BRNS)			
22.	Matrix specific phage formulations for the bio-control of enterotoxigenic Methicillin sensitive and resistant Staphylococcus aureus of safety concern	Dr. Murugadas Vaiyapuri	Dr. B. Madhusudana Rao Dr. Visnuvinayagam Sivam Dr. Vandan Nagar Dr. Shashidhar R.
Ministy of Food Processing (MoFPI)			
23.	Development of portable fish freshness assessment sensor	Dr. George Ninan	Dr. Murali S. Dr. Anierani Delfiya D. S. Smt. Alfiya P. V. Dr. Murugadas V. Dr. Binsi P. K. Dr. Manoj P. Samuel
Kerala State Council for Science, Technology and Environment (KSCSTE)			
24.	Lipidomics and vibrational spectroscopy based chemoinformatics for comprehensive assessment of quality in seafood supply chain	Dr. Niladri Sekhar Chatterjee	--
Department of Biotechnology			
25.	Development of a sustainable aqua feed with docosahexaenoic acid rich *Aurantiochytrium* sps. as an alternative to fish oil for enhancing Silver pompano nutrition	Dr. K. A. Martin Xavier	Ms. Pooja Kishore*

26.	Unravelling the true microbiome of finfish and shellfish during spoilage: Towards the development of rapid detection kit for fish spoilage	Dr. Murugadas Vaiyapuri	Dr. Toms C. Joseph Dr. B. Madhusudana Rao Dr. Visnuvinayagam S. Dr. Remya P. Dr. Ahamad K. Basha Dr. Preenanka R.* Ms. Chigilipalli Himabindu*
Kerala State Planning Board			
27.	Marine fishery in Kerala: A Study on Evolution of Policy, Cost and Earnings of Fishing Units and Income of Fisher Households	Dr. A. Suresh	Dr. Nikita Gopal Dr. Madhu. V. R. Dr. Sajeev M. V. Ms. Neethu Mol Jacob* Mr. Vijay Kiran*
Bay of Bengal Programme			
28.	Harnessing Climate Finance for Financial Inclusion of Small-Scale Fish Processors: Empowering Women in Fisheries	Dr. Nikita Gopal	Dr. J. Bindu Dr. Sajeev M. V. Dr. V. Geethalekshmi Snr. Prof. D. Achini M. De Silva Ms. BMRL Basnayake Ms. Sulochana Senevirathne

List of personnel in ICAR-CIFT

Managerial Personnel

Director: Dr. George Ninan

Heads of Division

Fishing Technology Division	:	Dr. M. P.Remesan, Principal Scientist
Quality Assurance and Management	:	Dr. A. A. Zynudheen, Principal Scientist
Biochemistry and Nutrition Division	:	Dr. R. Anandan, Principal Scientist
Fish Processing Division	:	Dr. J. Bindu, Principal Scientist
Microbiology, Fermentation & Biotechnology	:	Dr. Raja Swaminathan, Principal Scientist
Extension Information & Statistics Division	:	Dr. Nikita Gopal, Principal Scientist
Visakhapatnam Research Centre	:	Dr. U. Sreedhar, Principal Scientist
Mumbai Research Centre	:	Dr. K.K. Asha, Principal Scientist
Veraval Research Centre	:	Dr. Ashish Kumar Jha, Senior Scientist
Chief Administrative Officer	:	Shri Mahesh B. Khubdikar
Chief Finance & Accounts Office	:	Shri P. P. Anilkumar

HEADQUARTERS, COCHIN

SCIENTIFIC PERSONNEL

Principal Scientist

1. Dr. Manoj P. Samuel (Deputation)
2. Dr. V. Geethalakshmi
3. Dr. P. Muhamed Ashraf
4. Dr. Ashaletha S.
5. Dr. Femeena Hassan
6. Dr. Toms C. Joseph
7. Dr. Suresh A.
8. Dr. G.K. Sivaraman
9. Dr. V.R.Madhu
10. Dr. Satyen Kumar Panda (Deputation)
11. Dr. Sajeev M.V.
12. Dr. C.O. Mohan
13. Dr. Pe. Jeyya Jeyanthi

Senior Scientist

1. Dr. M.V. Baiju
2. Dr. Binsi P.K.
3. Dr. V. Chandrasekhar
4. Dr. C. G Joshy
5. Dr. V. Murugadas
6. Dr. A. Jeyakumari
7. Dr. Visnuvinayagam S.
8. Dr. Prajith K. K.
9. Dr. Niladri Sekhar Chatterjee
10. Dr. Sandhya K.M.
11. Dr. Remya S.
12. Dr. Laly S.J.
13. Dr. V. Renuka
14. Dr. Martin Xavier
15. Dr. Parvathy U.
16. Dr. Manju Lekshmi N.
17. Dr. Pankaj Kishore
18. Dr. Anupama T.K.

Scientist

1. Dr. Ranjith Kumar Nadella
2. Shri. Sreejith S.
3. Dr. Elavarasan Krishnamoorthy
4. Dr. Rejula K.
5. Dr. Renjith R.K.
6. Dr. Sarika K.
7. Dr. Tejpal C.S.
8. Dr. Greeshma S.S.
9. Shri Paras Nath Jha
10. Smt. Muthulakshmi T.
11. Dr. Sreelakshmi K. R.
12. Smt. Priya E. R.
13. Dr. Lekshmi R. G. Kumar
14. Dr. Minimol V.A.
15. Dr. Murali S.
16. Dr. Neethu K. C.
17. Shri Sathish Kumar K.
18. Dr. Aniesrani Delfiya D. S.
19. Dr. N. Rajendra Naik
20. Shri Anas K. K.
21. Shri Ezhil Nilavan S.
22. Dr. Sreepriya Prakashan
23. Shri Gattu Rudhrappa

TECHNICAL PERSONNEL

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3. Dr. T. V. Bhaskaran
4. Smt M. Rekha
5. Dr. Santhosh Alex
6. Smt. K.K. Kala
7. Shri Sibasis Guha
8. Shri P.S. Babu

Assistant Chief Technical Officer

1. Dr. P. Shankar
2. Dr. Ancy Sebastian

Senior Technical Officer

1. Smt P. K. Geetha
2. Smt. N. Lekha
3. Smt. Bindu Joseph
4. Smt. N.C. Shyla
5. Shri Naveen
6. Shri Bejawada Chanikya Naidu

Technical Officer

1. Shri C. Subash Chandran Nair
2. Shri Sajith K. Jose
3. Shri P. V. Sajeevan
4. Smt. P. A. Jaya
5. Shri V. K. Siddique
6. Shri G. Gopakumar
7. Shri K. S. Babu
8. Shri T. P. Saju
9. Shri P. D. Padmaraj
10. Shri P. S. Sunil Kumar
11. Shri N. Sunil
12. Shri C. K. Suresh
13. Dr. Aneesh P. A.
14. Shri. Noby Varghese K. A.
15. Shri Vipin Kumar V.
16. Smt. Vineetha Das
17. Shri T. Jijoy

Senior Technical Assistant

1. Smt. Susmitha V.
2. Smt. Sruthi P.
3. Shri Rahul Ravindran
4. Smt. Prinetha U. P.
5. Shri Rakesh M. Raghavan
6. Dr. Dhiju Das P.H.
7. Smt. Megha G.
8. Shri K. C. Anish Kumar

Technical Assistant

1. Shri Vinod G.
2. Shri Ajith V. Chellappan
3. Smt. Anu Mary Jose
4. Smt. Archana G.
5. Smt. P. J. Mary
6. Shri P. Suresh
7. Smt. Reshmi K.
8. Shri Sreejith V. N.
9. Shri Ajeesh K.

Senior Technician

1. Shri M. T. Udayakumar

Technician

1. Miss. Arya S. Raj
2. Shri Dipin Kishnan
3. Shri Saran Raj P. R.
4. Smt. Sruthi T.
5. Shri V. Deepak Vin
6. Shri K. R. Rajasaravanan
7. Shri A. Vinod
8. Smt. M. G. Soudamini

ADMINISTRATIVE PERSONNEL

Chief Technical Officer

1. Smt. Ponnamma Radhakrishnan

Finance & Accounts Officer

1. Smt. Sreedevi M. R.

Assistant Administrative Officer

1. Shri M. N. Vinodh Kumar
2. Smt. V. K. Raji
3. Smt. K. Renuka
4. Smt. Surya G.
5. Smt. Akhila N. R.

Private Secretary

1. Shri R. D. Goswami
2. Smt. Anitha K. John

Assistant

1. Smt. A. R. Raji
2. Shri P. Mani
3. Smt. Jaya Das
4. Smt E. Jyothilekshmy
5. Smt. P. R. Mini
6. Shri Santhosh Mohan
7. Smt. Shiji John
8. Shri P. G. David
9. Shri T. D. Bijoy
10. Shri Abhishek Maurya
11. Shri Gokul Krishnan P.
12. Ms. Namrata
13. Ms. Khushboo

Upper Division Clerk

1. Smt. Subin George
2. Smt. Suni Surendran
3. Shri Deu Umesh Aroskar
4. Shri Rajeev P.
5. Shri Gouri Sankar Sahoo

Lower Division Clerk

1. Shri Subeesh S. S.
2. Shri Anish T. V.
3. Smt. Bhavyamol C. G.
4. Shri K. S. Ajith
5. Shri K. Thinakaran
6. Shri P. N. Nikhil Das

SUPPORTING PERSONNEL

1. Smt. P. T. Mary Vinitha
2. Shri Sachida Nanda Dash
3. Shri P. Raghavan
4. Shri T. M. Balan

VISAKHAPATNAM RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

1. Dr. R. Raghu Prakash
2. Dr. B. Madhusudana Rao

Senior Scientist

1. Dr. P. Viji
2. Dr. Jesmi Debbarma

Scientist

1. Shri. Gaihiamngam Kamei
2. Shri. Kusunur Ahamed Basha

TECHNICAL PERSONNEL

Senior Technical Officer

1. Shri Bhuneshwar

Technical Officer

1. Shri Himansu Sekhar Bag
2. Smt. Tessy Francis
3. Shri Medidi Prasanna Kumar

Technician

1. Shri Sanyasi Ganik
2. Shri Sushil Kumar Mehar
3. Shri Lalit Oram

ADMINISTRATIVE PERSONNEL

Upper Division Clerk

1. Shri Amit Vengraj
2. Shri Ramesh Mirdha

Lower Division Clerk

1. Shri M. Sreevishnu Prabhakara Rao
2. Smt. Nalla Naveena

SUPPORTING PERSONNEL

1. Shri Triloknath Banchor
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VERAVAL RESEARCH CENTRE

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Sr. Technician

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Technical Assistant

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3. Shri P. Ramakrishna

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4. Shri Sunil Kishan Jethwa

Auxiliary Staff

1. Smt. Veena Shreedhar Narkar

MUMBAI RESEARCH CENTRE

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Scientist

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2. Dr. Rehana Raj
3. Shri Shravan Kumar Sharma

TECHNICAL PERSONNEL

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2. Smt Thriveni Gopal Adiga

Technical Officer

1. Smt. Priyanka Ajay Nakhawa

Senior Technical Assistant

1. Shri Thulsiram A. Waghmare

ADMINISTRATIVE PERSONNEL

Assistant Administrative Officer

1. Shri K. Das

Assistant

1. Shri Sachin Kumar

SUPPORTING PERSONNEL

1. Smt. Priyanka P. Bait

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