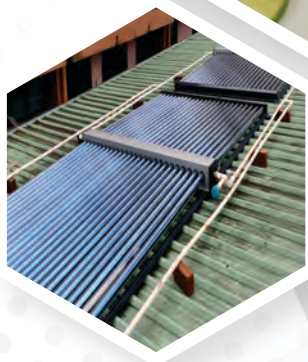


ICAR - CIFT



ANNUAL REPORT 2022



ICAR- CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY

(DARE, Ministry of Agriculture & Farmer's Welfare, Govt. of India)

Willingdon Island, Matsyapuri P. O., Kochi - 682029, Kerala, India

ISO/IEC 17025 : 2017 NABL ACCREDITED & ISO 9001 : 2015 CERTIFIED



ICAR- CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY
KOCHI

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निदेशक के डेस्क से

अनुसंधान और विकास एक सतत प्रक्रिया है, जिसे नवादेश और हितधारक की जरूरतों को ध्यान में रखते हुए परीक्षण किया जाना चाहिए। मुझे आपके सामने आईसीएआर-सेंट्रल इंस्टीट्यूट ऑफ फिशरीज टेक्नोलॉजी, कोचीन की वार्षिक रिपोर्ट 2022 प्रस्तुत करते हुए खुशी हो रही है। संस्थान ने अनुसंधान, विस्तार और अन्य संबंधित गतिविधियों को पूरी दिलचस्पी के साथ और हितधारकों के लाभ के लिए आने का अपना प्रयास जारी रखा।

भाकृअनुप- केंद्रीय मात्स्यिकी प्रौद्योगिकी संस्थान, कोचीन देश भर में मत्स्रज के पैदावार और पशु पैदावार के बाद की तकनीक के क्षेत्र में अनुसंधान और विस्तार के लिए समर्पित एक संस्थान है। विभिन्न हितधारकों, जैसे छोटे उद्यमियों, मछुआरों और निर्यातकों की प्रौद्योगिकी जरूरतें अलग-अलग हैं, और संस्थान विभिन्न लोगों की विशिष्ट आवश्यकताओं को संबोधित करने में विशेष संचि लेता है। मत्स्य पालन देश के आर्थिक विकास में योगदान देने वाले कुछ तेजी से बढ़ते उभरते क्षेत्रों में से एक है। दुनिया भर में मत्स्य पालन क्षेत्र उन्नत प्रौद्योगिकियों के साथ तेज गति से विविधीकरण कर रहा है, और बढ़ती आबादी की मांगों को पूरा करते हुए उचित संरक्षण उपायों और टिकाऊ प्रथाओं के साथ विकास की निगरानी करना अनुसंधान संस्थानों का काम है।

यह वार्षिक रिपोर्ट जनवरी से दिसंबर 2022 की अवधि के दौरान संस्थान की गतिविधियों और उपलब्धियों पर प्रकाश डालती है। प्रौद्योगिकियां हितधारकों के लिए महत्वपूर्ण उपलब्धि हैं, और प्रत्यक्ष या अप्रत्यक्ष रूप से नस्लतमंदों को हस्तांतरित की जाती हैं। इस अवधि के दौरान प्रौद्योगिकियों का हस्तांतरण हुआ है, तथा परामर्श परियोजनाओं, सहयोगात्मक अनुसंधान, अनुबंध सेवा और अनुबंध अनुसंधान के माध्यम से संबोधित किया गया है। वैज्ञानिक उपलब्धियों को पांडुलिपियों के रूप में अंतर्राष्ट्रीय और राष्ट्रीय दोनों सहकर्म-समीक्षित पत्रिकाओं में प्रकाशित किया जाता है, और संस्थानों के वैज्ञानिकों ने विभिन्न वैज्ञानिक मंचों पर अच्छी संख्या में विचार-विमर्श में भाग लिया है।

प्रशंसा और पुरस्कार अच्छे प्रदर्शन का अभिन्न अंग हैं, तथा संस्थान के वैज्ञानिकों ने कई पुरस्कार और मान्यताएँ प्राप्त की। इस क्षेत्र में उनके योगदान के लिए दो वैज्ञानिकों को सर्वश्रेष्ठ भारतीय मत्स्य वैज्ञानिक पुरस्कार मिला। पीएचडी में किए गए शोध की गुणवत्ता के लिए तीन वैज्ञानिकों ने पद्म श्री डॉ. वी. जी. झिंगरन पुरस्कार जीता। युवा वैज्ञानिक नए विकासशील क्षेत्रों में योगदान देते हैं, और चार वैज्ञानिकों के योगदान ने उन्हें युवा वैज्ञानिकों का पुरस्कार दिलाया। कई सर्वश्रेष्ठ मौखिक और पोस्टर प्रस्तुति पुरस्कार भी, हैं जो वास्तव में युवा दिमागों को क्षेत्र में कुछ असाधारण प्रदर्शन करने के लिए प्रेरित करते हैं।



जहां तक अनुसंधान की बात है, इस अवधि के दौरान संस्थान द्वारा वित्त पोषित 31 परियोजनाएं और 26 बाह्य वित्त पोषित परियोजनाएं संचालित थीं। बाहरी फंडिंग MoFPI, ICAR, DST, NFDB, MPEDA, BRANS, NASF, INCOIS, PMMSY और केरल सरकार जैसे विभिन्न संगठनों द्वारा प्रदान की जाती है। जबकि नॉर्वेजियन यूनिवर्सिटी ऑफ साइंस एंड टेक्नोलॉजी, रॉयल एकेडमी ऑफ इंजीनियरिंग-यूके, ESRC-UK और वर्ल्डफिश विदेशी एजेंसियां हैं, जो परियोजनाओं को वित्त पोषित करती हैं।

केंद्रीय मात्स्यिकी प्रौद्योगिकी संस्थान मछली की कटाई और कटाई के बाद की तकनीक में अनुसंधान गतिविधियों के लिए प्रतिबद्ध है, और इस वर्ष मछली पकड़ने की तकनीक क्षेत्र में कुछ दिलचस्प शोध हुए, जिसमें NOAA, USA की तकनीकी सलाह के साथ केमाप्रौ सं-टेड का विकास और फाइन-ट्यूनिंग शामिल है, और वी फॉर्म ओटर बोर्ड का अनुकूलन सम्मिलित है। इनका संरक्षण उपायों और ईंधन दक्षता के माध्यम से देश की मत्स्य पालन पर दीर्घकालिक प्रभाव पड़ेगा, जिससे ईंधन संरक्षण होगा। सहायक उपकरण के संबंध में केरल की रिंग सीन मत्स्य पालन का संकलन और दस्तावेज़ीकरण, सुरक्षा/स्थिरता उपायों को शामिल करके छोटे पैमाने पर मछली पकड़ने वाले जहाजों के मौजूदा डिजाइनों का अनुकूलन, छोटे पैमाने पर मछली पकड़ने के क्षेत्र में ऊर्जा उपयोग/कार्बन उत्सर्जन का दस्तावेज़ीकरण, और लघु-स्तरीय मत्स्य पालन के लिए दिशानिर्देशों/सलाहों का विकास रिपोर्ट के तहत अवधि के दौरान किए गए शोध के कुछ दिलचस्प क्षेत्र हैं।

प्रसंस्करण पक्ष पर, संस्थान न केवल घरेलू बाजार के लिए बल्कि मूल्य वर्धित मछली उत्पादों के निर्यात के लिए मछली उत्पादों के विकास पर भी ध्यान केंद्रित करता है। विकसित किए गए कुछ नए उत्पादों और प्रौद्योगिकियों में नमकीन पानी में थर्मल स्नैप से संसाधित मछली स्टेक, बाजरा के आटे और समुद्री शैवाल पाउडर के साथ शामिल ग्लूटेन-मुक्त ब्रेड स्टिक, मछली बायोएक्टिव का उपयोग करनेवाला डिजाइनर भोजन, घरेलू बाजार के लिए मछली-आधारित सुविधानक समुद्री भोजन उत्पाद, बायोडिग्रेडेबल समुद्री शैवाल-आधारित फिल्म, सूखी मछली के लिए खाद्य कोटिंग, एक्सट्रैक्टेड ब्लो फिल्म, और आवश्यक तेल के साथ शामिल पीएलए-आधारित रोगाणुरोधी बायोप्लास्टिक्स शामिल हैं। मछली और मत्स्य उत्पादों के लिए स्मार्ट सांकेतिक पैकेजिंग भी विकासात्मक चरण में है। मानव जाति द्वारा उपयोग के लिए मछली के अपशिष्टों से उत्पाद विकसित करना एक अन्य महत्वपूर्ण क्षेत्र है, और चिटोसिन के विभिन्न ग्रेडों के लिए प्रौद्योगिकी से चिटोसिन और संबंधित उप-उत्पादों के अनुप्रयोग में वृद्धि होने की उम्मीद है। पौधों के विकास को बढ़ावा देने वाले के स्नैप में झींगा और मछली से तैयार पत्ते पर स्नैप का उपयोग आशाजनक परिणाम दिखाता है, और आने वाले वर्षों में इसका व्यवसायीकरण किया जा सकता है। मछली और मछली उत्पादों में विभिन्न प्रदूषकों का पता लगाने के लिए खराब होने वाले विभिन्न मेटाबोलाइट्स और बहु-अवशेष प्रोटोकॉल के लिए डिटेक्शन किट का विकास गुणवत्ता आश्वासन पक्ष पर कुछ आशाजनक शोध हैं। ताजी मछलियों में खराब होने के सूचकांकों के गठन और खराब होने के दौरान बुनियादी डेटा का विकास भी महत्व का एक क्षेत्र है, जिस पर संस्थान ध्यान केंद्रित कर रहा है। खाद्य जनित रोगजनकों के खिलाफ जीवाणुरोधी गतिविधि दिखाने वाली मछली की त्वचा से तैयार कार्बन डॉट्स की गुणवत्तापूर्ण अनुप्रयोगों के लिए जांच की गई है। मछली प्रसंस्करण और मछली विपणन के लिए मशीनरी का अनुसंधान और विकास अन्य महत्वपूर्ण क्षेत्र हैं जहां सीआईएफटी के योगदान को अच्छी तरह से मान्यता प्राप्त है।

मछली के एपिडर्मल बलगम की जीवाणुरोधी गतिविधि, माइक्रोबियल उपभेदों की माध्यमिक मेटाबोलाइट प्रोफाइलिंग, जलीय कृषि फार्मों के रख-रखाव के लिए रोगाणुओं के अनुप्रयोग और रोगजनक रोगाणुओं के बीच एएमआर के मूल्यांकन के लिए एक उच्च-रिज़ोल्यूशन दृष्टिकोण के विकास में गतिविधियां भी महत्व रखती हैं। कार्यात्मक खाद्य निर्माणों के लिए बायोएक्टिव पेप्टाइड्स के साथ इनकैप्सुलेटेड बायो-पॉलिमर लेपित नैनोलिपोसोम का विकास, मछली के तेल का उत्पादन, और चिकित्सा और खाद्य अनुप्रयोगों के लिए स्क्वैलीन-आधारित पिकरिंग इमल्शन भी संस्थान में प्रगति कर रहे कुछ अग्रणी अनुसंधान हैं। संस्थान स्तर पर विकसित प्रक्रियाओं की सफलता के लिए हितधारकों द्वारा प्रौद्योगिकियों को अपनाना प्राथमिक आवश्यकता है। प्रौद्योगिकी विकास प्रक्रिया की बुनियादी बातों का समर्थन करने के लिए तकनीकी नवाचारों और अपनाने में परिवर्तन के कारण वर्षों में प्रौद्योगिकियों और आजीविका परिवर्तन के प्रभाव का भी अध्ययन किया जाता है।

किसी भी संस्थान में अनुसंधान एवं विकास प्रक्रिया हितधारकों के सहयोग से आगे बढ़ती है और जहां तक प्रौद्योगिकी चाहने वालों का सवाल है, आईसीएआर-सीआईएफटी ने हमेशा से देने और लेने की नीति बनाए रखी है। हितधारकों और उद्योग से प्राप्त समर्थन को ईमानदारी से स्वीकार किया जाता है, और हमें उम्मीद है कि संस्थान की गतिविधियों में उनका निरंतर समर्थन मिलता रहेगा।

भाकृअनुप के विषय वस्तु प्रभाग द्वारा दिए गए समर्थन को कृतज्ञतापूर्वक स्वीकार किया जाता है।

संस्थान के वैज्ञानिकों और कर्मचारियों के प्रयास विशेष उल्लेख के पात्र हैं, और मैं इसके कार्यक्षेत्र के सभी क्षेत्रों में उनके योगदान को ईमानदारी से स्वीकार करता हूं।

जोर्ज नैनान
निदेशक

FROM THE DIRECTOR'S DESK

Research and development are a continuous process that needs to be tested against the mandate and stakeholder needs in mind. I am delighted to present the Annual Report 2022 of the ICAR-Central Institute of Fisheries Technology, Cochin before you. The institute undertook the research, extension, and other related activities with earnest interest and continued its endeavor to take the output for the benefit of the stakeholders.

It is known that ICAR-Central Institute of Fisheries Technology, Cochin is an institute dedicated to research and extension in the field of harvest and post-harvest technology of fish, across the Country. The technology needs of different stakeholders viz., small entrepreneurs, fishermen, and exporters, differ and the institute takes special interest in addressing the specific requirements of different people. Fisheries is one of the few fast-growing sunrise sectors contributing to the economic development of the Country. The fisheries sector across the globe is diversifying at a faster pace with advanced technologies and it is for the research institutes to keep check of the developments with appropriate conservation measures and sustainable practices while meeting the demands of the growing population.

This Annual Report 2022, highlights the activities and achievements of the institute during the period from January to December 2022. The technologies are important take aways for the stakeholders and are transferred to the needy, either directly or indirectly. During this period 22 technologies transfers have taken place and are addressed through Consultancy Projects, Collaborative Research, Contract Service, and Contract Research. The scientific achievements are published as manuscripts, in both International and National peer-reviewed journals and the scientists of the institutes participated in a good number of deliberations in different scientific fora.

Laurels and awards are part and parcel of good performance and a number of awards and recognition came in the way of the scientists of the institute. Two of the scientists received the Best Indian Fisheries Scientists award for their contributions to the field. Three of the scientists bagged the Padma Shri Dr. V. G. Jhingran award, for the quality of the research done in the Ph.D. programme. The young scientists contribute to the newly developing areas and the contributions of four of the scientists fetched them the young scientists' awards. There are also a number of best oral and poster presentation awards which in fact motivates young minds to perform something extraordinary in the field.



As far as research is concerned, there were 31 projects funded by the institute and 26 externally funded projects, operated in the institute during the period. The external funding is provided by different organizations like MoFPI, ICAR, DST, NFDB, MPEDA, BRANS, NASF, INCOIS, PMMSY, and Govt of Kerala while the Norwegian University of Science and Technology, Royal Academy of Engineering-UK, ESRC-UK and WorldFish are the foreign agencies funded the projects.

ICAR-CIFT is committed to research activities in harvest and post-harvest technology of fish and the year witnessed some interesting research in the fishing technology sector including the development and fine-tuning of CIFT-TED with the technical advice from NOAA, USA, and the development and optimization of V form otter board. These will have a long-term impact on the fisheries of the country through conservation measures and fuel efficiency leading to fuel conservation. Compilation and documentation of the ring seine fishery of Kerala with respect to the accessories, optimization of the existing designs of small-scale fishing vessels by incorporating safety/stability measures, documentation of energy use/carbon emission in the small-scale fishing sector and development of guidelines/advisories for the small-scale fishery are some of the interesting areas of research carried out during the period under report.

On the processing side, the institute focuses on the development of products from fish not only for the domestic market but also for the export of value-added fish products. Some of the new products and technologies developed include thermally processed fish steaks in brine, gluten-free bread sticks incorporated with millet flour and seaweed powder, designer food utilizing fish bioactive, fish-based convenience seafood products for the domestic market, biodegradable seaweed-based films, edible coating for dried fish, extruded blown films and PLA-based antimicrobial bioplastics incorporated with essential oil. Smart indicative packaging for fish and fishery products is also in the developmental stages. Developing products from fish wastes for use by mankind is another important area and technology for different grades of chitosan is expected to increase the application of chitosan and related byproducts. The application of foliar spray prepared from shrimp, and fish as plant growth promoters show promising results and could be commercialised in the coming years. The development of detection kits for various metabolites of spoilage and multi-residue protocols for the detection of different pollutants in fish and fish products are some of the promising research on the quality assurance side. The development of basic data on the formation of spoilage indices in fresh fish and during spoilage is also an area of importance that the institute is focusing. The carbon dots prepared from fish skin showing anti-bacterial activity against foodborne pathogens is been investigated for quality applications. Research and development of machinery for fish processing and fish marketing are other important areas where ICAR-CIFT 's contribution is well recognized.

The activities in the development of a high-through put approach for evaluating the antibacterial activity of fish epidermal mucus, secondary metabolite profiling of microbial strains, application of microbes for maintenance of aquaculture farms, and AMR among the pathogenic microbes also assume significance. Development of encapsulated bio-polymer coated nanoliposome with bioactive peptides for functional food formulations, production of fish oil, and squalene-based pickering emulsions for medical and food applications are also some of the frontier research progressing in the institute. The adoption of technologies by stakeholders is the primary requirement for the success of the processes developed at the institute level. The impact of technologies and livelihood alteration over the years due to changes in technological innovations and adoption are also studied to support the basics of the technology development process.

The R&D process in any institute progress with the support of the stakeholders and ICAR-CIFT always maintained a give-and-take policy as far as technology seekers are concerned. The support received from the stakeholders and industry is sincerely acknowledged and we hope to get their continued support in the activities of the institute.

The support given by the Subject Matter Division of ICAR is gratefully acknowledged.

The efforts of the scientists and the staff of the institute deserve special mention and I sincerely acknowledge their contributions in all spheres of its mandate.

George Ninan
Director

सबसे महत्वपूर्ण उपलब्धियाँ

- ▶ तटीय राज्यों में महत्वपूर्ण ईंधन दक्षता के साथ वी फॉर्म दोहरे स्लोटेड ओटर बोर्ड का लोकप्रियकरण किया गया।
- ▶ प्रदूषण को दूर करने की दृष्टि से समुद्री जल में पारे का पता लगाने के लिए एक सेंसर विकसित किया गया।
- ▶ मछली पकड़ने के लिए एक कारीगरी एल्यूमीनियम मिश्र धातु डोंगी को अभिकल्पित और निर्माण किया, और इसे क्षेत्र परीक्षण के लिए पषसी अनुसूचित जनजाति जलाशय मत्स्य सहकारिता समिति, कन्नूर, केरल में मछुआरों को सौंपा गया।
- ▶ A 2:1 नैनो $\text{CuO}:\text{nano TiO}_2$ लेपित पी ई ने मुहाने में बेहतर प्रदर्शन किया। जिसमें नैनोमेटेरियल्स शामिल पिंजरे जाल के जैव प्रतिरोध के संदर्भ में बेहतर प्रदर्शन किया गया।
- ▶ लिनियर स्वीप वोल्टामेट्री और इलेक्ट्रोकेमिकल इंपिडेन्स स्पेक्ट्रोस्कोपी द्वारा विद्युत रासायनिक अध्ययन से यह पता चला कि 0.05% नैनो सिलिका लेपित एपॉक्सी रेजिन अधिक भार ने उत्कृष्ट संक्षारण प्रतिरोध प्रदर्शित किया।
- ▶ मछली की त्वचा प्रबलित बिस्फेनॉल एपॉक्सी रेसिन लेपित स्टील से कार्बन डॉट्स ने उच्चतम ध्व्वीकरण प्रतिरोध और सबसे कम संक्षारण वर्तमान घनत्व दिखाया।
- ▶ नियामक प्राधिकरणों के लाभ के लिए गियर, क्राफ्ट और इंजन हॉर्सपावर के संबंध में रिंग सीन और बीच सीन फिशरी के विकास पर एक दस्तावेज संकलित किया गया।
- ▶ कैटोमोर्फा एसपी से विकसित हरी समुद्री शैवाल पैकेजिंग फिल्म कम तापमान पर सीलिंग गुणों का प्रदर्शन किया।
- ▶ उच्च चिपचिपापन कैटोसन (5100 cP 73-77 DDA) लॉबस्टर शेल अपशिष्ट से उत्पन्न किया गया था।
- ▶ भारत से मछली और मत्स्य उत्पादों के निर्यात पर कोविड -19 के प्रभाव का पता लगाने के लिए समय श्रृंखला मॉडल विकसित किए गए।
- ▶ समुद्री शैवाल और बाजरा निगमित मूल्य वर्धित उत्पादों ने अच्छी स्वीकार्यता विकसित की।
- ▶ ताजा मछली की गुणवत्ता का आकलन करने के लिए एक गैर विनाशकारी और लागत प्रभावी वेब आधारित प्रणाली को अभिकल्पित और विकसित किया गया। फिशक्यू चेक, विकसित वेब आधारित प्रणाली को भारतीय तेल सारडीन के लिए रियल टाइम आंकड़ों के साथ मान्य किया गया।
- ▶ इंटरनेट समर्थित वेब प्रयोग का उपयोग करके झींगा की ताजगी का आकलन करने के लिए एक संशोधित डीमेरिट स्कोर आधारित झींगा गुणवत्ता सूचकांक विकसित किया गया।
- ▶ झींगा, मछली और कटलमत्स्य से तैयार फोलियार स्प्रे में कैल्शियम, फास्फोरस और पोटेशियम का उच्च स्तर होता है। सूखे/नमकीन मछली उत्पादों के लिए खाद्य सुरक्षा और मानक विनियमों के अनुपालन के लिए पर्ण स्प्रे के क्षेत्र अनुप्रयोग अध्ययन ने वृद्धि प्रदर्शन दिखाया।
- ▶ जलकृषि उत्पाद एवं खेत पर्यावरण में सालमोनल्ला की उपस्थिति 24.5% प्रतिशत पाया गया।
- ▶ व्यावसायिक रूप से महत्वपूर्ण स्क्वीड प्रजातियों के लिए प्रजाति प्रमाणीकरण प्रोटोकॉल, जैसे यूरोटुथिस एडुलिस, यूरोटुथिस डुवासेली और यूरोटुथिस सिंगालेंसिस को आणविक विधियों द्वारा अनुकूलित किया गया था।
- ▶ जीसी-एमएस/एमएस का उपयोग करते हुए सभी 16 यूएसईपीए-सूचीबद्ध पीएच और 32 पीसीबी के एक साथ विश्लेषण के लिए एक बहु-अवशेष विधि विकसित की गई थी।
- ▶ जीसी-एमएस/एमएस का उपयोग करते हुए सभी 16 यूएसईपीए-सूचीबद्ध पीएच और 32 पीसीबी के एक साथ विश्लेषण के लिए एक बहु-अवशेष विधि विकसित की गई थी।
- ▶ इंडियन मैकेरल और सीबास के हिमीकृत संचयन के दौरान हाइपोक्सैथिन प्रमुख न्यूक्लियोटाइड अवनत उत्पाद पाया गया।
- ▶ मिल्कफिश और पर्ल स्पॉट के हिमीकृत संचयन के दौरान इनोसिन को प्रमुख न्यूक्लियोटाइड अवनत उत्पाद के रूप में पाया गया।
- ▶ झींगों की 4 प्रजातियों में कुल फॉस्फोरस सामग्री का प्राकृतिक स्तर, जैसे कि पेनेयस सेमीसुलकेटस, पेनियस इंडिकस, मेटापेनियस मोनोसेरोस, और पेनियस मोनोडॉन, FSSR (2011) की अनुशंसित सीमा के साथ-साथ एडिटिव्स की यूरोपीय संघ की सीमा से अधिक पाया गया।
- ▶ मछली की त्वचा से तैयार कार्बन डॉट्स (सीडी) ने विब्रियो, एस्चेरिचिया, साल्मोनेला, लिस्टरिया, मॉर्गनेला, यर्सिनिया, एरोमोनास, स्टैफिलोकोकस, क्लेबसिएला और स्यूडोमोनास के जेनेरा के खिलाफ जीव-रोधी गतिविधि दिखाई।
- ▶ मत्स्य अधिचर्मिक म्यूकस की जीवाणुरोधी गतिविधि के मूल्यांकन के लिए उच्च-थ्रूपुट दृष्टिकोण को अनुकूलित किया गया था।

- ▶ ऑनलाइन बाजारों से 100 समुद्री खाद्य नमूनों की सूक्ष्मजीवविज्ञानी गुणवत्ता ने वी. पैराहॉ मोलिटिकस, एस. ऑरियस, एमआरएसए, ई. कोलाई, और साल्मोनेला के प्रसार को ऑनलाइन समुद्री भोजन बाजारों से 17%, 19.7%, 2%, 59% और 4% क्रमशः दिखाया।
- ▶ स्ट्रेप्टोमैसेस मूरिनस THV12 की माध्यमिक मेटाबोलाइट प्रोफाइलिंग से एक्टिनोमाइसिन डी, एक्टिनोमाइसिन X05, पेंटासाइसिन, डेस्फेरियोक्सामाइन ई और सिनाबार एमाइड ए जैसे यौगिकों का पता चला।
- ▶ विषमपोषी नाइट्रिफाइंग और डेनाइट्रीफाइंग जीवाणु जो उच्च दक्षता पर अमोनिया को हटा सकते हैं, जलकृषि तालाबों से अलग किए गए थे।
- ▶ अन्य जीवाणुरोधी एजेंटों जैसे H_2O_2 , कैटोसन, एस्कॉर्बिक एसिड और सिट्रिक एसिड के साथ कार्बन डॉट्स ने ई. कोली के खिलाफ एक सहक्रियाशील प्रभाव दिखाया।
- ▶ चार माइक्रोएल्लल प्रजातियां जैसे, नन्नोक्लोरोप्सिस ओकुलता, डुनालिएला सलीना, इसोक्रिसिस गालबाना, और क्लोरेला वल्गेरिस में ESKAP करोगजनकों के खिलाफ संभावित रोगाणुरोधी गतिविधि थी।
- ▶ भारतीय मैकेरल के खराब होने वाले माइक्रोफ्लोरा की पहचान शेवनेला एसपी., स्यूडोमोनास एसपी., वैगोकोकस एसपी., ब्रेकोथ्रिक्स एसपी., और एरोमोनास एसपी. के रूप में की गई थी, और स्ट्रेन को उनकी खराब होने की क्षमता के लिए चिह्नित किया गया था।
- ▶ सोल-जेल विधि द्वारा तैयार कॉपर ऑक्साइड नैनोपार्टिकल्स (CuO-NPs) की यूवी-स्पेक्ट्रा और डायनेमिक लाइट स्कैटरिंग तकनीक द्वारा पुष्टि की गई।
- ▶ समुद्री भोजन और जलीय पर्यावरण से वी. मिमिकस, वी. वल्लिकस, और वी. एल्लिनोलिटिकस की सरल और तेजी से पहचान के लिए एक पद्धति को अनुकूलित किया गया था।
- ▶ कार्यात्मक खाद्य योगों के लिए बायोएक्टिव पेप्टाइड्स के साथ एनकैप्सुलेटेड बायो-पॉलीमर लेपित नैनोलिपोसोम विकसित किया।
- ▶ कैटोसन-जिलेटिन प्रोटीन हाइड्रोलाइजेट (सीएचआई-जीपीएच) नैनो कॉम्प्लेक्स और मछली के तेल का उपयोग करके उत्पादित पिकरिंग इमल्शन उत्पादित किया गया।
- ▶ कुट्टनाड एग्रोइकोसिस्टम्स की मीठे पानी की मछलियों में दूषित अवशेषों की निगरानी पर डेटाबेस शुरू किया गया।
- ▶ स्व-इकट्टे कैटोसन के उत्पादन के लिए एक विधि विकसित की गई है।
- ▶ स्व-इकट्टे कैटोसन का उपयोग करके स्ववालेन-आधारित पिकरिंग इमल्शन का विकास किया गया।
- ▶ झींगा सुखाने के लिए 10 किलो सौर-विद्युत हाइब्रिड ड्रायर का विकास और निष्पादन मूल्यांकन किया गया।
- ▶ केरल में बंदरगाहों, थोक बाजारों और खुदरा बाजारों में एफएओ की अनौपचारिक मछली हानि आकलन पद्धति (आईएफएलएएम) का उपयोग करके मछली में पशु पैदावार के बाद के नुकसान का गुणात्मक मूल्यांकन करने का प्रयास किया गया है।
- ▶ कम नमक वाली टूना के टुकड़े तैयार किए गए और संचयन के दौरान उनकी गुणवत्ता का मूल्यांकन किया गया।
- ▶ छिलके रहित छोटे आकार के पी. वन्नामेई को सुखाने के लिए एक पूर्व-प्रसंस्करण प्रोटोकॉल विकसित किया।
- ▶ स्थानीय बाजारों में सूखी मछली के भौतिक-रासायनिक गुणों का मूल्यांकन किया गया।
- ▶ हिमीकृत संचयन के दौरान झींगा की गुणवत्ता पर एंजाइम-सहायता छीलने के प्रभावों का मूल्यांकन किया गया।
- ▶ परासरण-निर्जलीकरण तकनीक द्वारा कम नमी वाली मछली के बुरादे के लिए प्रौद्योगिकी का मानकीकरण किया गया।
- ▶ ई. कोलाई और एरोमोनास एसपीपी पर वनस्पति तेलों की जीवाणुरोधी गतिविधि का अध्ययन किया गया।
- ▶ खुदरा बाजारों की मछली और शेलफिश में लिस्टेरिया एसपीपी की घटना का विश्लेषण किया गया।
- ▶ ई. कोलाई और एरोमोनास एसपीपी में एंटीबायोटिक-प्रतिरोधी जीन (एआरजी) की रूपरेखा तैयार की गई।
- ▶ झींगा मैट्रिक्स में क्लोरैम्फेनिकॉल आकलन के लिए LCMS/MS विधि विकसित और मानकीकृत।
- ▶ शुष्क कैटफ्रिश धूम्रपान करने के लिए पूर्व-उपचार स्थितियों को अनुकूलित किया जाता है।
- ▶ आम एंटीबायोटिक दवाओं के उच्चतम प्रतिरोध के साथ बहुदवा-प्रतिरोधी ई. कोलाई को मछली से अलग किया गया था।
- ▶ स्क्वीड पेन से β -कैटिन के लिए निष्कर्षण प्रोटोकॉल अनुकूलित किया गया था।
- ▶ रेनबो ट्राउट के मामले में संतरे के छिलके के अर्क ने शैल्य जीवन का मामूली विस्तार दिखाया।
- ▶ क्षेत्रीय रूप से 'खुबे' कहे जाने वाले अनादरा ग्रानोसा (ब्लड क्लैम) का मूल्य संवर्धन किया गया, और यह व्यावसायीकरण के लिए तैयार है।

MOST SIGNIFICANT ACHIEVEMENTS

- Popularization of 'V' form double-slotted otter board with significant fuel efficiency was carried out along the coastal states.
- Developed a sensor to detect mercury in sea water with a view to address pollution.
- Designed and constructed an Aluminium alloy canoe for artisanal fishing and handed it over to fishers at Pazhassi Scheduled Tribe Reservoir Fisheries Cooperative Society, Kannur, Kerala for field trials.
- A 2:1 nano CuO: nano TiO₂ coated PE exhibited better performance in the estuary with reference to biofouling resistance of nanomaterials incorporated cage nets.
- Electrochemical studies by Linear sweep voltammetry and electrochemical impedance spectroscopy revealed that 0.05% nano silica-coated epoxy resin over lead exhibited excellent corrosion resistance.
- Carbon dots from fish skin-reinforced bisphenol epoxy resin-coated steel showed the highest polarization resistance and lowest corrosion current density.
- Compiled a document on the development and evolution of the ring seine and beach seine fishery, with respect to the gear, craft and engine horsepower for the benefit of regulatory authorities.
- Green seaweed packaging film developed from *Chaetomorpha* sp. exhibited sealing properties at lower temperatures.
- High viscosity chitosan (5110 cP and 73-77 DDA) was produced from lobster shell waste.
- Developed time series models to see the effect of COVID-19 on the export of fish and fishery products from India.
- The seaweed and millet-incorporated value-added products developed good acceptability.
- A non-destructive and cost-effective web-based system was designed and developed to assess the quality of fresh fish - FISHQCheQ. The developed web-based system was validated with real-time data for Indian oil sardines.
- Developed a Modified Demerit Score Based Shrimp Quality Index (SQI) to Assess the freshness of shrimp using Internet Assisted Web Application.
- Foliar spray prepared from shrimp, fish, and cuttlefish contained high levels of calcium, phosphorus and potassium. Field application studies of foliar spray showed enhanced growth performances for compliance to Food Safety and Standard Regulations for dried/salted fish products.
- The prevalence of *Salmonella* was found to be around 24.5% in aquacultured products and farm environment.
- Species authentication protocols for commercially important squid species namely *Uroteuthis edulis*, *Uroteuthis duvacei* and *Uroteuthis singhalensis* by molecular methods were optimized.
- A multi-residue method was developed for simultaneous analysis of all 16 USEPA-listed PAHs and 32 PCBs using GC-MS/MS.
- Hypoxanthine was found to be the major nucleotide degradation product during the iced storage of Indian mackerel and seabass.
- Inosine was detected as the major nucleotide degradation product during the iced storage of milkfish and pearl spot.
- Natural level of total phosphorous content in 4 species of shrimps namely *Penaeus semisulcatus*, *Penaeus indicus*, *Metapenaeus monoceros* and *Penaeus monodon* was found to be higher than the recommended limit of FSSR (2011) as well as the EU limit of additives.
- Carbon dots (CD) prepared from fish skin showed anti-bacterial activity against genera of *Vibrio*, *Escherichia*, *Salmonella*, *Listeria*, *Morganella*, *Yersinia*, *Aeromonas*, *Staphylococcus*, *Klebsiella* and *Pseudomonas*.
- High-throughput approach for evaluating the antibacterial activity of fish epidermal mucus was optimized.

- Microbiological quality of 100 seafood samples from the online markets showed the prevalence of *V. parahaemolyticus*, *S. aureus*, MRSA, *E. coli*, and *Salmonella* from online seafood markets were 17%, 19.7%, 2%, 59% and 4%, respectively.
- Secondary metabolite profiling of *Streptomyces murinus* THV12 revealed compounds such as actinomycin D, actinomycin X08, pentamycin, desferrioxamine E and cinnabar amide A
- Heterotrophic nitrifying and denitrifying bacteria that can remove ammonia at high efficiency were isolated from aquaculture ponds.
- Carbon dots along with other antibacterial agents such as H₂O₂, chitosan, ascorbic acid, and citric acid, showed a synergetic effect against *E. coli*.
- Four microalgal species viz., *Nannochloropsis oculata*, *Dunaliella salina*, *Isochrysis galbana* and *Chlorella vulgaris* had potential antimicrobial activity against ESKAPE pathogens.
- The spoilage microflora of the Indian Mackerel were identified as *Shewanella* sp., *Pseudomonas* sp., *Vagococcus* sp., *Brochothrix* sp. and *Aeromonas* sp. and the strains were characterized for their spoilage potential.
- Copper Oxide Nanoparticles (CuO-NPs) prepared by sol-gel method were confirmed by UV-Spectra and Dynamic light scattering technique.
- A methodology was optimized for the simple and rapid detection of *V. mimicus*, *V. vulnificus* and *V. alginolyticus* from seafood and aquatic environment.
- Developed encapsulated bio-polymer coated nanoliposome with bioactive peptides for functional food formulations.
- Produced pickering emulsions using chitosan-gelatin protein hydrolysate (CHI-GPH) nano complexes and fish oil.
- Database on surveillance of contaminant residues in the freshwater fishes of Kuttanad agroecosystems was initiated.
- A method has been developed for the production of self-assembled chitosan.
- Development of squalene-based pickering emulsions using self-assembled chitosan.
- Developed and conducted a performance evaluation of a 10 kg solar-electrical hybrid dryer for shrimp drying.
- Qualitative assessment of post-harvest losses in fish has been attempted using FAO's Informal Fish Loss Assessment Method (IFLAM) at harbours, wholesale markets and retail markets in Kerala.
- Low salt dried tuna chunks were prepared and evaluated their quality during storage.
- Developed a pre-processing protocol for drying shell-less small-sized *P. vannamei*.
- Physicochemical qualities of dried fish in local markets were evaluated.
- Effects of enzyme-assisted peeling on the quality of shrimp during frozen storage were evaluated.
- Standardized the technology for low moisture fish fillets by osmotic-dehydration technique.
- Antibacterial activity of plant oils on *E. coli* and *Aeromonas* spp. was studied.
- Incidence of *Listeria* spp. in fish and shellfish of retail markets was analyzed.
- Profiling of Antibiotic-resistant genes (ARGs) in *E. coli* and *Aeromonas* spp. was carried out.
- LCMS/MS method developed and standardized for chloramphenicol estimation in shrimp matrix.
- The pre-treatment conditions for smoking Arid catfishes are optimized.
- Multidrug-resistant *E. coli* with the highest resistance to common antibiotics was isolated from fish.
- The extraction protocol for β -chitin from the squid pen was optimized.
- Orange peel extract showed a marginal extension of shelf life in the case of Rainbow trout.
- Value addition of *Anadara granosa* (Blood clam) regionally termed as 'Khube' was carried out and is ready for commercialisation.



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 1st 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).

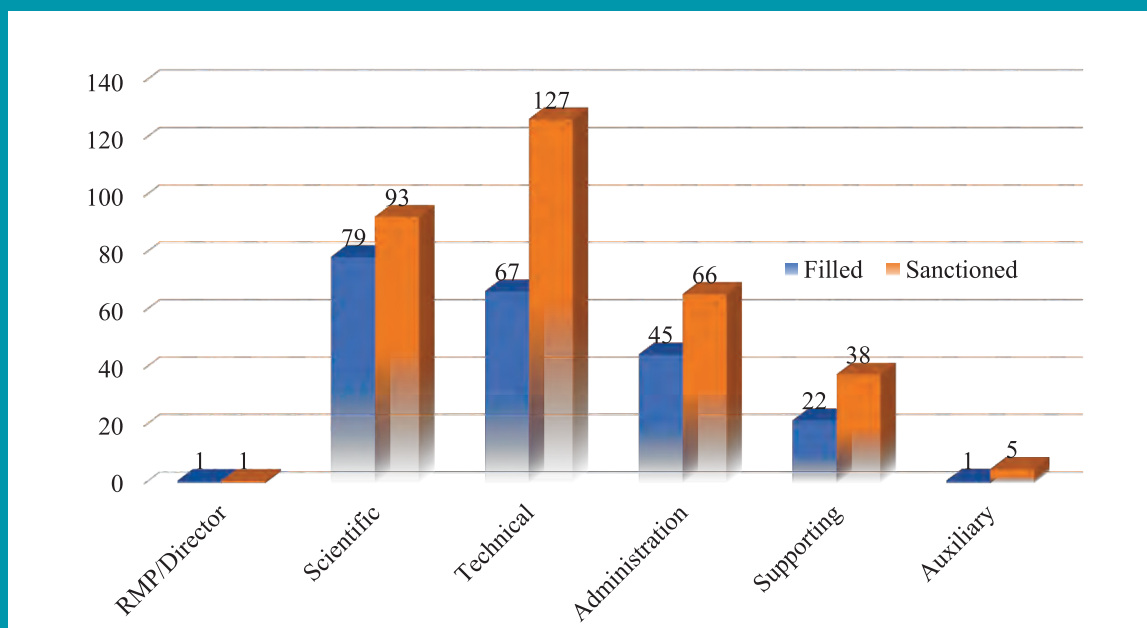
Mission

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.

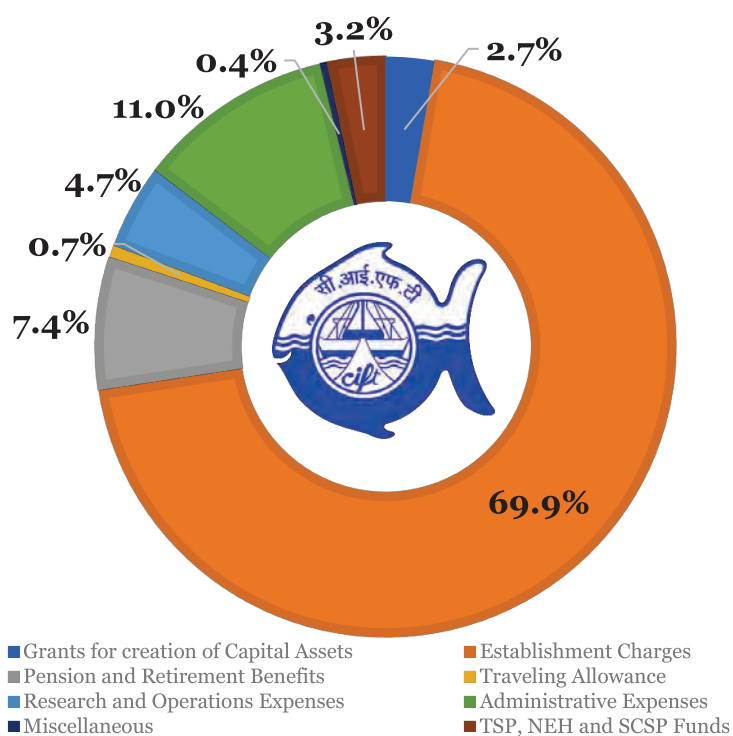
Staff Position



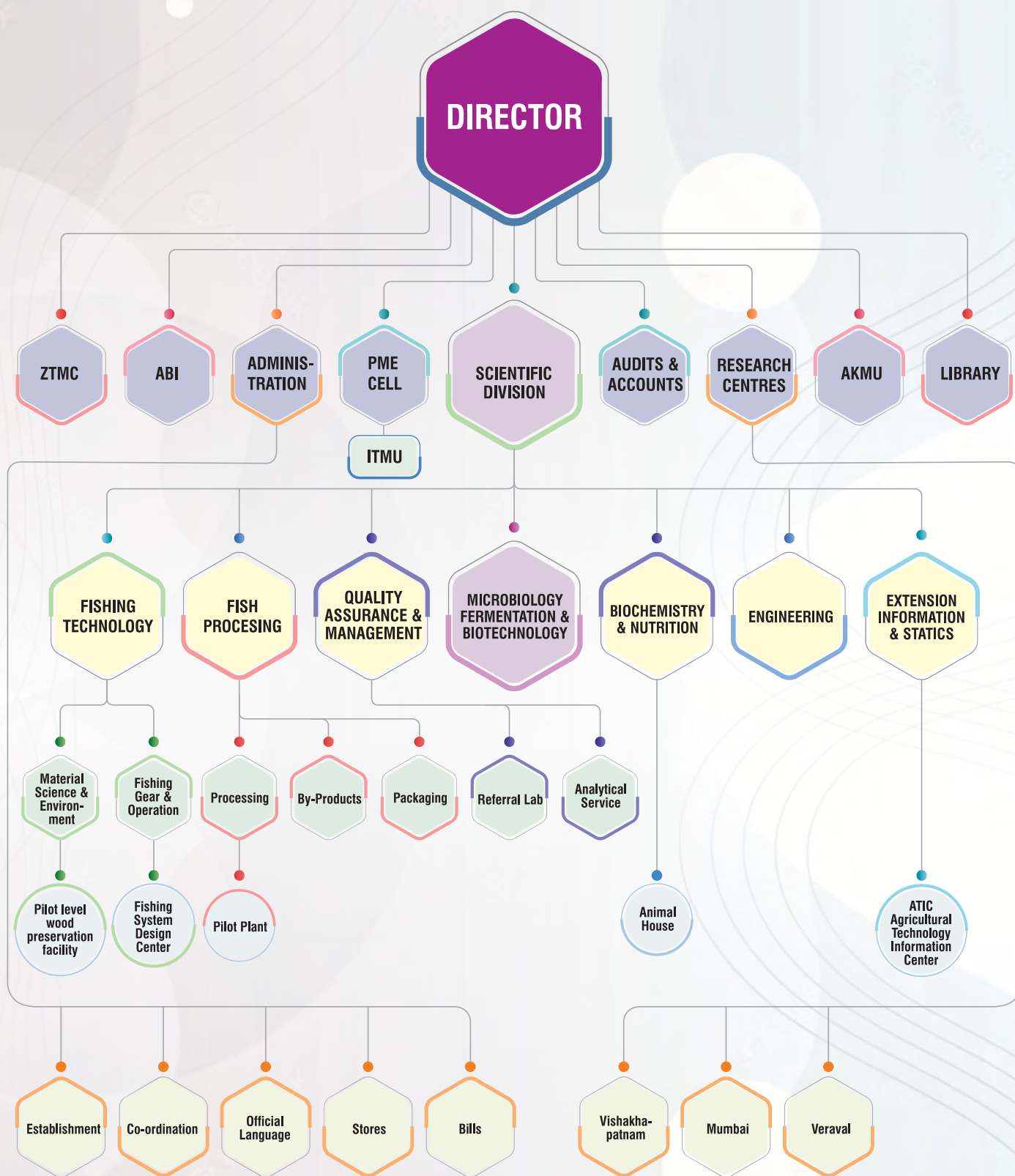
ICAR_CIFT has a total staff strength of 330. Of the total staff, 28.5% are scientific personal, 38.5% technical, 20 % administrative, 11.5% supporting staff and the rest auxiliary staff. Of the sanctioned positions in different categories, 85% of the scientific, 53% of the technical, 68% of the administrative, 58% of supporting and 20% of the auxiliary staff are in position.

Budget Allocation and Expenditure

During the reporting period of 2022-23, ICAR-CIFT effectively utilized the allocated budget fund of Rupees 5302.73 lakhs, achieving a 100% utilization



Head wise budget allocation for the year- 2022-23



FISHING TECHNOLOGY



|| Institute Projects

- ◆ Studies on resource and energy conservation in trawl systems
- ◆ Technological interventions for improvement of the fishing system in selected water bodies of India
- ◆ Improved technologies for the protection of materials in marine environment
- ◆ Studies on fish behaviour as an input for developing responsible fishing systems
- ◆ Development of nano sensors for precision aquaculture and technologies to protect fishing materials
- ◆ Investigation on environmental burdens associated with selected small-scale fishing systems, and value-added fishery product/ aqua culture system of India using Life Cycle Assessment (LCA) approach
- ◆ Studies on fishing operations and energy use for formulation of guidelines for selected small-scale marine fisheries of India

Most Significant Achievements

- ◆ Popularization of 'V' form double-slotted otter board saving about 200 liters of diesel per fishing trip of 10 days
- ◆ Developed a sensor to detect mercury in seawater
- ◆ Designed and constructed an aluminium alloy canoe for artisanal fishing and handed it over to fishers at Pazhassi Scheduled Tribe Reservoir Fisheries Cooperative Society, Kannur, Kerala for field trials
- ◆ 2:1 nano CuO: nano TiO₂ coated PE exhibited better performance in the estuary biofouling resistance in nanomaterials incorporated aquaculture cage nets
- ◆ Electrochemical studies by linear sweep voltammetry and electrochemical impedance spectroscopy revealed that the 0.05% nano silica-coated epoxy resin over lead exhibited excellent corrosion resistance
- ◆ Carbon dots from fish skin-reinforced bisphenol epoxy resin-coated steel showed the highest polarization resistance and lowest corrosion current density
- ◆ Compiled a document on the development and evolution of the ring seine and beach seine fishery, with respect to the craft, gear and engine horsepower for the benefit of regulatory authorities

Chief Findings

1 Studies on Resource and Energy Conservation in Trawl Systems

Principal Investigator : Dr. M. P. Remesan

Model testing of trawl gear

Model testing of trawl gear initiated at IIT, Kharagpur

Dive evaluation of fine-tuned CIFT-TED

Dive evaluation of fine-tuned CIFT-TED was carried out onboard NOAA research vessel MV Caretta in the Gulf of Mexico, Panama City, Florida, USA during 10-22, June 2022. Fine adjustments were carried out through underwater footage and materials are under fabrication for trials in Kerala in association with MPEDA.

Popularization of 'V' form double slotted otter board along Gujarat coast

As part of technology transfer and popularisation, a pair of V-form double-slotted otter boards were handed over to a commercial trawler for extensive field trials. According to the stakeholders, the ICAR- CIFT developed 'V' form double-slotted otter board saves about 200 liters of diesel for a fishing trip of 10 days. This account for a reduced diesel use is Rs 21200/- per trip, which turns out to be a net saving of Rs 5.3 lakhs for 25 fishing trips undertaken in a year. The carbon emission avoided due to fuel saving is about 15t Co₂ equ. per year.

Popularization of 'V' form double-slotted otter board in Goa

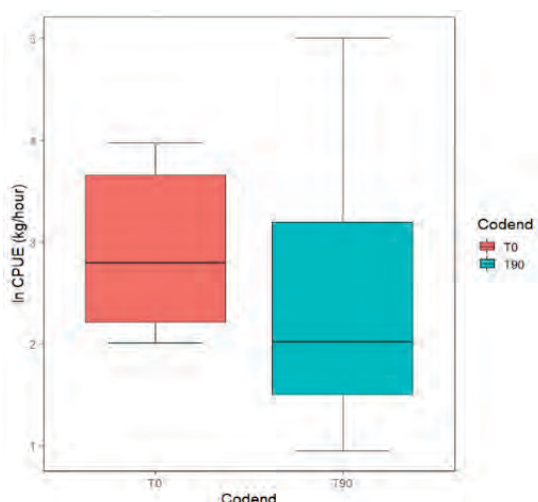
As part of ICAR-CIFT's Azadi Ka Amrit Mahotsav V-form double slotted otter boards, each weighing 160kg, were introduced for trawling in Goa in association with local trawl boat owners' association. The results of the preliminary trials were encouraging and the diesel savings per trip and economic benefits of the trials are being worked out to introduce the same in other places in association with ICAR-CCARI, Goa.

|| Trawl nets of Kozhikode coast

Varieties of trawl designs viz *meenvala*, *choodanvala*, *chemmenvala*, *kilivala*, deep water net (*thelivala*) etc. are operational in the District. The use of SS chains instead of iron chains in the foot rope of a small trawl net was recorded. Recycling of used fishing nets was observed during the study.

|| Comparison of T0 and T90 codends

Trials onboard MK-II revealed that the average CPUE in the T0 and T90 codends was 24.3 kg/h and 26.5 kg/h, respectively and the mean catches were not significantly different (Kruskal-Wallis rank sum test, Chi-squared = 1.651, P=0.19). The major species caught in the T0 coded was *Uroteuthis duvauceli* with a mean CPUE of 5.13 kg/h, followed by catch of sharks (4a16 kg/h) and *Fenneropenaeus indicus* (0.03 kg/h). In the case of T90 coded, the three major species caught were silver biddies (9.79 kg/h), *Metapenaeus monoceros* and *Rastrelliger kanagurta* (1.77 kg/h).



2 Technological interventions for improvement of the fishing system in selected inland water bodies of India

Principal Investigator : Dr. Sandhya K. M.

|| Documentation of fishing systems in selected reservoirs of India

Documented the design and technical details of fishing systems in Kangsabati reservoir (West Bengal); Panchet reservoir (Jharkhand) and Hirakud reservoir (Odisha). Indigenous wooden boats (7m L_{OA} , breadth 1.95m) and Inflated tyre tubes were used as crafts in shallow regions. Gillnets with mesh sizes (50mm-290mm) were common. PA monofilament gillnets (0.16-0.3mm dia) of mesh depth 25-140 number were used targeting mainly Indian Major Carps and *Tilapia niloticus*. Other gears include cast nets, dragnets, traps like fyke nets (Gogu), and plunge baskets (Polui). In the Panchet reservoir (Jharkhand), monofilament gillnets with mesh sizes varying from 20mm to 150mm (0.16-.23mm dia) were used.

In Hirakud reservoir (Odisha) most of the crafts were non-motorized wooden boats. The length of the crafts varied from 5 to 10m and the breadth from 0.5 to 1.5m and operated with single manpower targeting multi species such as tilapia, catfishes, and exotic and Indian major carp. The major gear used was a monofilament gillnet with a 40 mm mesh size of lengths up to 100-500m. Small meshed HDPE gillnets (mesh size 4mm) were also used to catch miscellaneous species. Multifilament (20mm) and monofilament cast nets (8-10mm) were being operated at the siphoning gate of Hirakud dam.

|| Design development and fabrication of aluminium alloy canoe for artisanal fishing

Designed and fabricated aluminium alloy canoe (Material: aluminium- magnesium alloy 5083-marine grade, L_{OA} - 4.5 m, breadth 0.9 m and depth 0.3 m) for artisanal fishing. The aluminium alloy canoe was handed over to fishers at Pazhassi Scheduled Tribe Reservoir Fisheries Co-operative Society, Kannur, Kerala for field trials. The aluminium alloy offered low weight, low corrosion, least maintenance and is recyclable.



Aluminium alloy canoe under operation

|| Field trials using Hemispherical Fish Trap in the Vembanad estuary

Hemi-spherical fish traps were designed and fabricated with galvanized iron. Field trials were undertaken using hemi spherical fish traps for a period of three months (may to august 2022). Ten traps were operated around the open cage aquaculture farm at Cheppanam fishing village, Vembanad backwater, Kerala. Month-wise CPUE indicated maximum CPUE for traps and the near-cage trap recorded the highest catch during August (0.074kg/day) and lowest during May in (0.01kg/day). While the traps operated away from the cages showed a maximum CPUE/ trap in the month of august (0.035kg/ day).



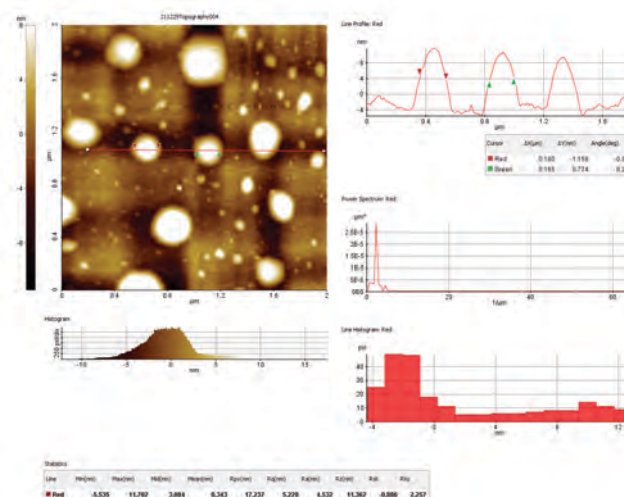
View of fully rigged HSFT ready for installation

3 Improved technologies for protection of materials in marine environment

Principal Investigator: Dr. P. Muhamed Ashraf

Synthesized colored carbon dot using microwave which exhibited a slight change in colour of the fluorescence as well as increased conductivity which is linearly related to concentration. There was also a blue shift from 220 to 203 nm. in UV-Vis analysis.

A multicoloured nanocarbon dot was prepared from prawn shells through a microwave-assisted synthesis method. Prawn shell carbon dot was exposed to a microwave reaction (RT to 70°C for 4 minutes) and the results showed that there was a slight colour change in the fluorescence. The conductivity of CD increased from 155 Mho to 194 Mho after microwave irradiation. UV Vis spectrophotometric evaluation showed a blue shift from 220 nm to 203 nm after microwaving. The conductivity increase was linearly related to the increase in concentration. FTIR studies revealed that the CH_3 , $C=O$, $C-O$ and hydrogen bonding peaks were missing compared to the original CD. This implies that the prepared CD can be used for different sensor applications and its evaluation is in progress.



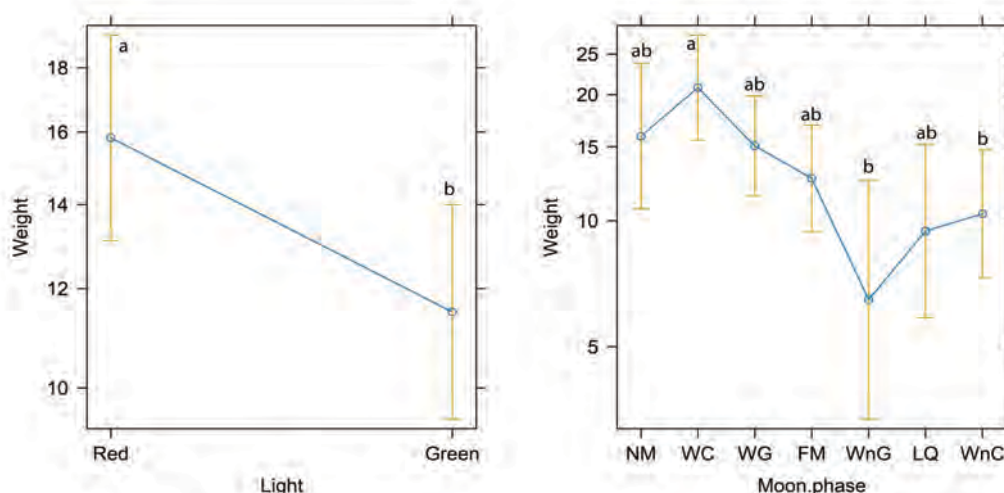
Atomic force micrographs of microwave exposed carbon dot and b) FTIR spectra of microwaved carbon dot and control CD

4 Studies on fish behaviour as an input for developing responsible fishing systems

Principal Investigator : Dr. Madhu V. R.

Light as stimuli in pokkali fields

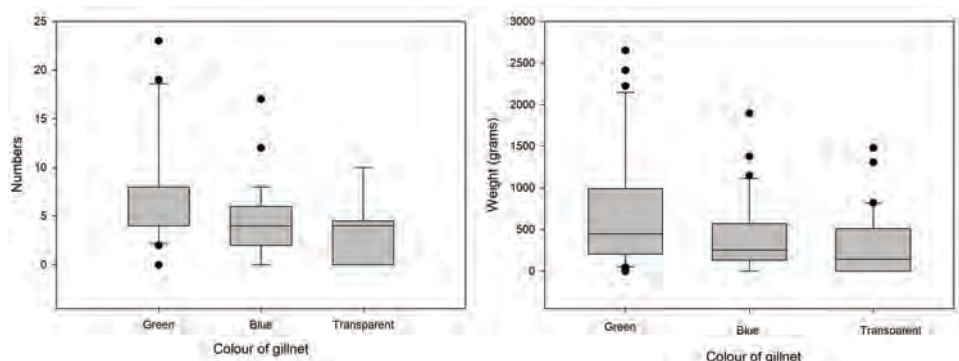
Studies using red and green light as stimuli in pokkali fields showed that for *M. dobsonii* and *M. monoceros*, the red colour was most effective. However, in the case of *P. indicus*, there was no significant difference due to the effect of the colour of the light used in the filtration unit.



A significant difference was noticed in the catches of *M. monoceros* in the red and green coloured light used in the filtration unit. The phase of the moon was also found to significantly affect the catch rates in the filtration units.

|| Different coloured gillnets in Vembanad lake

The study conducted to compare the catch efficiency and species profile of transparent gillnets with blue and green-coloured webbing, demonstrated a considerable increase in CPUE for green-coloured gillnets compared to blue and transparent gillnets. Significantly higher catches of *Horabagrus brachysoma* and *Etroplus suratensis* were obtained with the green gillnets than with the control (transparent nets).



5 Development of nanosensors for precision aquaculture and technologies to protect fishing materials

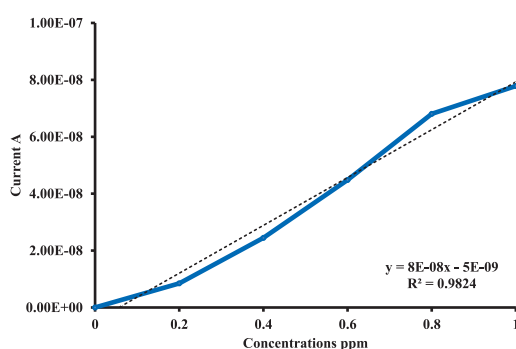
Principal Investigator: Dr. P. Muhamed Ashraf

|| Development of sensors for the detection of heavy metals

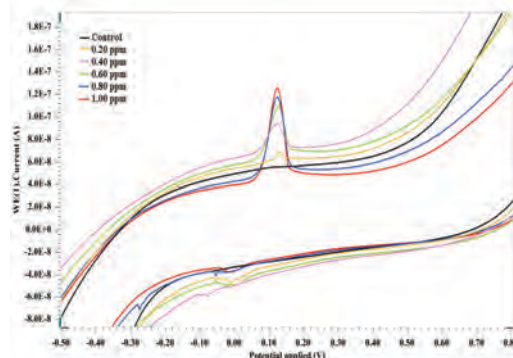
Developed a hydrogel composite by incorporating carbon dot (CD) carboxymethyl chitosan (CMC) and 3-sulfopropylmethacrylate as a cross linking agent for testing mercury in the saline water environment. Mercury sensing was done using cyclic voltammetry and electrochemical impedance spectroscopy and their response with R^2 was around 96 to 98%.

|| Biofouling resistance in nanomaterials incorporated aquaculture cage nets

Nanocarbon dot, nano TiO_2 , and nano CuO treatment over silane-coated aquaculture cage net showed positive results. The optimised silane concentration to modify the surface of polyethylene with varied concentrations of nano carbon dot from the fish eye, nano CuO and TiO_2 coated over silane-coated polyethylene indicated that a concentration of 2:1 nano CuO : nano TiO_2 coated PE exhibited better performance after three-month of exposure to the estuary.



Variation of current with concentration of mercury (ppm) in 3.5% NaCl electrolyte



Cyclic voltammetry curve of varied concentrations of mercury (ppm) in 3.5% NaCl

|| Minimize the corrosion of lead sinkers during fishing operations

A study to reduce the aberration and leaching of lead from lead sinkers during fishing operations by providing an epoxy coating was undertaken. Varied concentrations of nano silicon dioxide (hydrophilic) were reinforced in the Bisphenol A epoxy polymer and these were coated over lead panels. Electrochemical studies by Linear sweep voltammetry and electrochemical impedance spectroscopy revealed that the 0.05% nano silica-coated epoxy resin over lead exhibited excellent corrosion resistance.



SiO₂- epoxy coated sinkers

|| Comparative evaluation of carbon dot reinforced different epoxy polymers to coat boat-building steel

Two types of carbon dots were synthesized viz. natural and P doped from fish skin and their chemical characteristics were analysed using spectroscopic techniques. The two carbon dots individually within varied concentrations were incorporated in bisphenol A epoxy polymer. Linear sweep voltammetric data revealed that 0.05% CD-reinforced bisphenol epoxy resin-coated steel showed the highest polarization resistance and lowest corrosion current density.

|| Developed standard specifications of webbings for selected fishing gears

As a preliminary step for developing standards of webbings, monofilament twines and webbings of gillnets of commercial mesh sizes from different manufacturers were collected and analyzed for twine and mesh break load as per ISO standards. Monofilament twines of different diameters (0.16, 0.2, 0.23, 0.25, and 0.3mm) and mesh sizes exhibited a loss of 4.19% to 18.39% in break load as the diameter of the twines increased. No significant variation in a reduction in break load of different mesh sizes having the same diameter was observed.

|| Eco-toxicity assessment of nano biocides used for preservation of coconut wood in the aquatic environment

Coconut wood was treated with biocides 0.02% nano copper oxide and 0.02% nano copper oxide with polyaniline (PANI) through the immersion method revealed that there was a significant difference in MoR values ($P < 0.05$). The degree of change in biodegradation after 200 days of exposure showed a 50% of strength reduction in all the treatments. Comparatively light attack was found on CCB followed by nano CuO + PANI treated samples. From these results, it was found that CCB has a wide applicability in preventing biodeterioration, but the larger molecules have a great tendency to leach out in the environment creating the issues like bioaccumulation and magnification. Hence, a new study was designed to develop a nano-based CCB to prevent biodeterioration in the marine environment.

|| Impact of nano composites on fouling and boring communities

Fouling and boring organisms identified from the Cochin estuary for the last six months were dominated by *Mytilus strigata* followed by Barnacles (*Amphibalanus*

amphitrite) and *Mytella spp.*, which were present throughout the year with high density in post-monsoon and lower density during monsoon. The occurrence of wood-boring isopods wood-boring (Cirolina genus) was confined to post-monsoon and pre-monsoon seasons with varying densities. Rapid colonization of *Mytella spp.* played a crucial role in the elimination of these isopods.

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

Principal Investigator: Mr. Paras Nath Jha

A baseline survey was carried out for documenting small-scale fishing gear mostly on gillnets and trammel nets operated in selected inland fishing centers around Vembanad Lake (Valanthakkad and Cheppanam). Information was collected on the material and chemical compositions of 7-m FRP fishing boats. Retrieval of ALDFG as evidence of ghost fishing was conducted through bottom trawl surveys at a depth range of 33-34 m from onboard R. V. Matsyakumari-II from Off Cochin waters. A total of 3.45 kg of lost gears/accessories were retrieved from different locations. A comprehensive survey was conducted to assess energy consumption and carbon emissions along various coastal states of India.



Field level data collection at Chandrabhaga, Odisha

7 Studies on fishing operations and energy use for formulation of guidelines for selected small-scale fisheries of India

Principal Investigator: Dr. Leela Edwin

The major aim of the project is to document the major fishing gears and craft designs and also to formulate guidelines for sustainable fishery from the small-scale fishing sector in India. A total of 38 designs of gill net have been documented from the states of Kerala (12), Tamil Nadu (08), Karnataka (14) and Goa (04). Gillnet units showed great variation in the structural and operational aspects along each state. A survey was conducted and documented the typical shore-seine and boat seines in India and the prospects of these operations. A review was made and published on the beach seine fishery of India which gives an overview of designs, catch composition, prospects, issues, and guidelines for the beach seine operations in India. The study highlights the technical improvements and the introduction of measures for the reduction of juvenile catches will lead to better sustainability and the management of the beach seine fishery in India.

Similarly, compiled a document on the development and evolution of the ring seine fishery of Kerala, with respect to the craft, gear and engine horsepower in the past thirty years.

Also, the existing designs of small-scale fishing vessels from selected centres were analysed, and optimized the small-scale vessel designs by incorporating safety/stability measures. Documented the energy use/carbon emission in the small-scale fishing sector. Guidelines/advisories prepared for small-scale fishery and communicated to different State Govt. for effective implementation mainly on the operation/design and disposal of gillnets, beach seines, safety, energy use, line fishing, and disposal of fishing materials etc. in the small-scale fishing sector. Database on small-scale gillnet/seine fishery and energy use profiling can form the basis of further research/policy formulation in reducing fuel consumption in fishing. These guidelines and advisories would be useful for the Department of Fisheries of all state Govt, Fisheries Universities and other stakeholders.





FISH PROCESSING

|| Institute Projects

- ◆ Valorisation of marine and agro waste for development of green packaging materials
- ◆ SMART PACK: Development and characterization of smart packaging films for enhancing quality and shelf life of fishery products
- ◆ Development and validation of biomedical and cosmetic products from secondary fishery raw materials
- ◆ Development of soft computing systems in fisheries technology for technology dissemination and policy formulation
- ◆ Process development and scaling up of production of different molecular weight chitosan with different degree of de-acetylation and evaluation of their applications
- ◆ Technological interventions in value addition and advanced processing techniques for fish and shell fish
- ◆ Interventions in processing and preservation of commercial and unconventional fishery resources

Most Significant Achievements

- ◆ Green seaweed packaging film developed from *Chaetomorpha sp.* exhibited sealing properties at lower temperature
- ◆ High viscosity chitosan (5110 cP and 73-77 DDA) was produced from lobster shell waste
- ◆ Developed time series models to see the effect of COVID-19 on the export of fish and fishery products from India
- ◆ Development of seaweed and millet incorporated value added products
- ◆ A non-destructive and cost-effective web-based system has been designed and developed to assess the quality of fresh fish - FISHQCheQ. The developed web-based system was validated with real time data of Indian oil sardine
- ◆ Developed a Modified Demerit Score Based Shrimp Quality Index (SQI) to assess the freshness of shrimp using internet assisted web application

Chief Findings

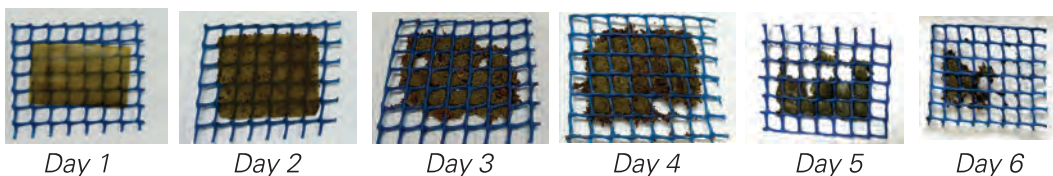
1 Valorisation of marine and agro waste for development of green packaging materials

Principal Investigator: Dr. Bindu J.

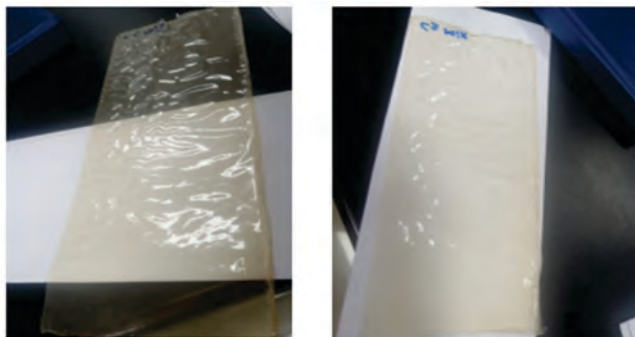
Bio degradability of seaweed-based films

A qualitative study of the bio degradability of the seaweed films to observe the degradation as a function of burial time in the compost soil indicated changes after 6 days and complete decomposition after 12 days.

Development of a sodium alginate-based chitosan gelatin film



Different molecular weight chitosan was utilized to produce chitosan gelatin alginate films. The study showed that low molecular weight chitosan (LMW) had good compatibility with gelatin and sodium alginate compared to medium molecular weight chitosan.



Low molecular weight chitosan gelatin alginate films

||| Edible coating for dried fish

A lipid polysaccharide solution was developed using bees wax and other active ingredients for coating applications for the shelf-life extension of dried fish.

||| Development of extruded blown films

Different combinations of PLA, PBAT, and calcium carbonate (filler) were carried out to develop blown films. PEG was used as a plasticizer and kept as standard. PLA:PBAT film combinations exhibited lower tensile strength. PLA with calcium carbonate filler exhibited higher tensile strength.

||| Performance evaluation of PLA-based antimicrobial bioplastics

Poly(lactic acid) (PLA) based antimicrobial films incorporated with lemon grass essential oil (LEO) and peppermint essential oil (PEO) were used for vacuum packaging of skipjack tuna (*Katsuwonus pelamis*) meat during chilled storage. Tuna was vacuum packed in different films namely Native PLA, PLA-LEO, PLA-PEO and polyester polyethylene (PEST-PE) laminate. In addition, one batch of tuna meat was aerobically packed in native PLA films (PLA-AP) and the quality was compared with vacuum-packed tuna meat in PLA films (PLA-VP). On the 12th day of storage, the total mesophilic and psychrotrophic bacterial counts crossed the value of 7 log cfu/g in aerobically packed tuna meat in PLA films (PLA-AP) and the psychrotrophic bacterial count crossed the value of 7 log cfu/g in PLA-VP. There were no significant differences in the bacterial quality of tuna meat vacuum-packed in PLA and PEST-PE films. Tuna meat vacuum-packed in antimicrobial PLA films displayed better microbial shelf life and sensory quality compared to meat packed in native PLA and PEST-PE.

||| Shelf-life evaluation of frozen red snapper steaks

Shelf-life evaluation of red snapper packed in clear PLA, opaque PLA, palm sheath and HDPE trays were evaluated for a period of 7 months. The trays did not exhibit any deformity or loss in shape. However, the PLA trays were brittle and could be broken off at the edges by using pressure from -1 to about 4 and b* from 4 to 11. The initial pH was 5.7 which increased slightly. The parameters like TVBN, pH, instrumental colour, total plate count, psychrophilic count etc. was determined and the parameters were found to be well within the limits after 10 months of storage.

To screen the potential migrants from 2 different BOPP films, a known surface of the packaging material was put in contact with 40ml of 10% ethanol for 6h at 70°C and the migrants extracted. An aliquot of the resulting solution was viewed in UV-vis spectra and the absorption range were set as 200-800 nm with a sampling interval of 1.0nm. Ethanol as a



Migration studies of biodegradable food packaging materials

reference blank. High-intensity absorbance was observed in the range of 390-500nm and 957nm for both the BOPP films.

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

Principal Investigator: Dr. C. O. Mohan

|| Packaging for reducing biogenic amine formation

The combined effect of *Lactobacillus spp.* and active packaging on the formation of biogenic amines and the shelf-life of Indian Mackerel (*Rastrelliger kanagurta*) was evaluated under chilled storage conditions. The highest rate of histamine formation was observed for control air-packed samples and the least was observed for samples treated with *Lactobacillus spp.* followed by the combination of *L. acidophilus* and oxygen scavenger and oxygen scavenger packs. A shelf life of 8 days was observed for control air-packed mackerel whereas it was 16 days for samples with oxygen scavenger. Treating with *L. acidophilus* resulted in enhancing the shelf life by up to 22 days with and without oxygen scavenger.



Headless-cleaned Indian mackerel packed with active packaging system

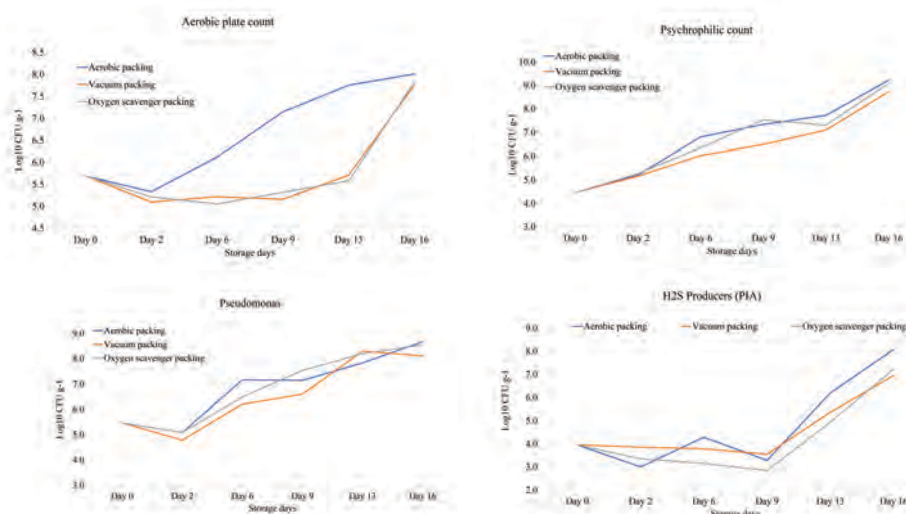
|| Novel packaging for dry fish

The effect of drying and active packaging on the dried Catfish (Siluriformes) *Proeutropiichthys taakree* quality was evaluated. The samples dried to a moisture content of 6.39% and showed a crude protein content of 59.37%, fat content of 21.2% and ash content of 12.41% with an energy supplement of 458.19 k.cal. The dried samples were packed in laminated pouches with and without oxygen scavenger and monitored the quality for up to 6 months. The moisture content of the sample was less than 10% and samples showed a progressive increase in TVBN, TMAN and lipid oxidation. However, the values for control samples were observed to be higher than the samples with oxygen scavenger. The initial light creamy white colour turned off-white to yellowish for the control sample by the end of 6 months and it was the off-white colour for samples packed with oxygen scavenger.

The influence of caffeic acid and reduced oxygen atmosphere on the quality of dried Indian carplet (*Amblypharyngodon mola*) was evaluated. The least increase in volatile compounds were observed for samples packed with oxygen scavenger followed by samples treated with caffeic acid. Lipid oxidation and hydrolysis were reduced in the samples treated with caffeic acid.

Reduced oxygen atmosphere for chill storage

The effect of a reduced oxygen atmosphere on the quality and shelf life of white snapper under chilled storage conditions indicated that the TVBN and TMAN values exceeded the prescribed limit on the 13th day for vacuum packs and O₂ scavenger packs. The control samples were acceptable up to 7 to 8 days compared to 11 to 12 days for reduced oxygen atmosphere packed samples.

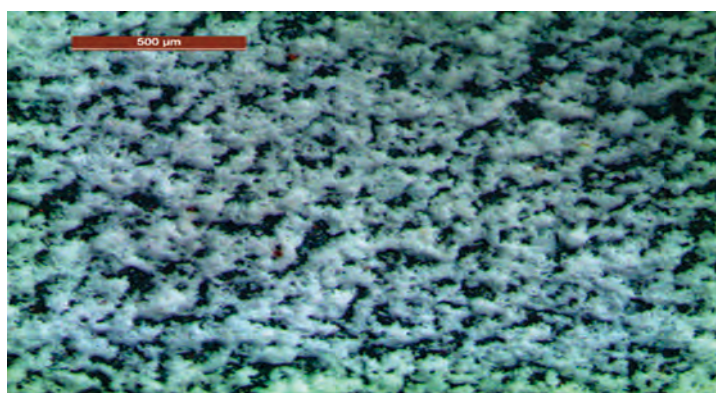


3 Development and validation of biomedical and cosmetic products from secondary fishery raw materials

Principal Investigator: Dr. P. K. Binsi

Nano carbon dot- collagen peptide-hydroxyapatite composite for bone regeneration

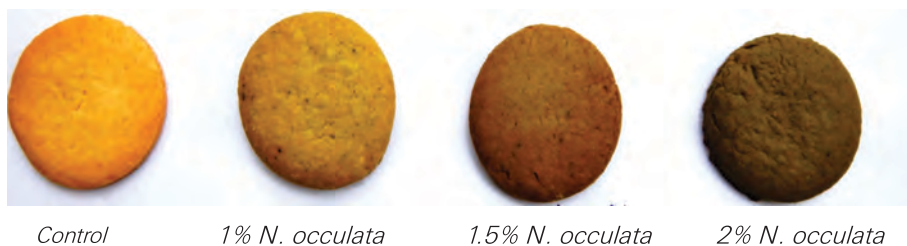
A Carbon dot-collagen peptide-hydroxyapatite composite was synthesized following a two step process. UV-Vis spectra, FTIR, and electrochemical impedance spectral studies confirmed the formation of the tricomposite. The composite was coated over titanium and steel (304) implants for bone regeneration studies. The composites exhibited good adherence over the steel and titanium substrate. The composite coated titanium showed the lowest corrosion current density and the highest polarization resistance, implying improved corrosion resistance and prevention of electron interaction between the SBF electrolyte and the metal due to coating. Hydroxyapatite acted as an insulation barrier in the composite.



Coated titanium implant

|| Marine microalgae incorporated Cookies

The addition of microalgae (*Nannochloropsis occulata*) increased the protein content and total phenolic content of cookies. Antioxidant activities of cookies as measured by DPPH and ABTS assays were higher for microalgae-fortified cookies. There were no major variations between the amino acid contents of control cookies and cookies with different concentrations of microalgae. Microalgae-fortified cookies showed higher content of the fatty acids than the control cookies and the amount of fatty acids slightly increased with increasing concentration of microalgae.



|| Collagen peptide fortified fish soup cubes

A base soup mix was optimized by RSM using standard protocols and were incorporated with fish scale derived commercial collagen peptide at different levels. The developed collagen peptide fortified soup samples were characterized for its nutritional, flow and sensory parameters. The force parameters required for compressing the soup cubes were standardised considering textural and rehydration properties of the samples. Further, the cubes were packed in metallized polyester packets under air and vacuum packing.



Collagen peptide fortified fish soup cubes

|| Sulphated polysaccharide from Rainbow trout waste

The sulphated polysaccharide was extracted from the visceral mass and head waste of rainbow trout. The extracted compound was further subjected to structural characterization. The purity of the isolated compound was confirmed by UV-VIS spectra, FTIR and SDS PAGE analysis and comparing against the standard compound.

|| Antibacterial and antioxidant collagen peptide tea infusion

The MIC and MBC of hot and cold collagen peptide tea infusion were studied for their antimicrobial properties against *Salmonella typhimurium*, *Vibrio cholera*, *Listeria monocytogenes*, *Escherichia coli* and *Staphylococcus aureus*. The highest inhibition was observed against *Vibrio cholera* and the highest bactericidal activity was observed against the pathogenic bacteria *Salmonella typhimurium* and *V. cholera*.

4 Development of Soft Computing Systems in Fisheries Technology for Technology Dissemination and Policy Formulation

Principal Investigator: Dr. Joshy C. G.

Time series models to study the COVID-19 effect on seafood export

Developed time series models to see the effect of COVID-19 on the export of fish and fishery products from India. The model parameters were estimated by Box-Jenkins method. Based on the developed model, for almost all commodities, the forecasted value was greater than the actual value. Therefore, it was concluded that there was an impact on export. And also, in some months, the expected price was lesser than the actual price. This was reduced due to port closures, loss of access to cold storage, cessation of shipping and air freight, lack of fish catch, market, and supply chain due to the COVID-19 lockdown concluding that the commodities were affected by COVID-19.

Designing and development of web-based SQI

Designed and developed web-based Shrimp Quality Index (SQI) system to assess the quality or grade of freshness of shrimp. The quality assessment system was based on the physical evaluation of the general characteristics of fresh shrimp such as shell appearance, shell meat adherence, meat appearance, meat texture, meat color and odour, assigned using Delphi method. Based on the user input, evaluated the quality index score of the shrimp in the range 0 to 1 by using the calculate function defined in JavaScript. The design and development of the application were achieved using Hyper Text Markup Language (HTML), Cascading Style Sheet (CSS) and Bootstrap framework.

5 Process development and scaling up of production of different molecular weight chitosan with different degree of de-acetylation and evaluation of their applications

Principal Investigator: Dr. Elavarasan K.

High Viscosity chitosan from lobster shell

High viscosity chitosan (5110 cP and 73-77 DDA) was produced from lobster shell waste. The mechanical properties of films produced using chitosan from lobster shell waste decreased with the increase in the duration of deacetylation from 24 to 96 h. For higher mechanical properties 24 h of deacetylation is preferable. Along with gelatin, a better sealing property was exhibited by the lobster shell chitosan.



Lobster shell



Lobster chitosan



Chitosan film

Improved drying of chitosan

Generally, chitosan is dried by sun drying and it is a time-consuming process. An improved drying process of chitosan is needed for the industry to speed up the drying process without affecting its properties. The research was focused to determine the drying time and to assess the properties of chitosan under various drying methods. Chitosan was prepared from chitin and subjected to different drying methods viz., microwave, Infrared, electrical drying, vacuum drying, and sun drying. The lowest drying time (30-35min) was achieved for chitosan dried under 1000 watts under Infrared drying than sundried one (120 min). Viscosity of the chitosan

varied from 953 cP-1856 cP. The degree of deacetylation was not affected by the drying method. The highest L^* value (74.70), lower a^* (2.02) and b^* (16.42) values were obtained for sundried chitosan. The highest water binding and fat binding capacity were observed for chitosan dried under the microwave. Microwave and Infrared drying processes are recommended to reduce the drying time of chitosan and to improve functional properties.

Effect of drying of shrimp head waste on chitosan properties

Chitin and chitosan was produced from dried shrimp head waste. The degree of deacetylation was not affected by the drying temperature. But the viscosity of chitosan was drastically reduced (3-4 folds) by drying practice irrespective of the temperature employed during drying of shrimp head waste. The chitosan produced from fresh shrimp head waste had higher viscosity and average molecular weight compared to the one produced from dried shrimp head waste. The yield of chitin and chitosan was found to be enhanced by drying shrimp head waste.

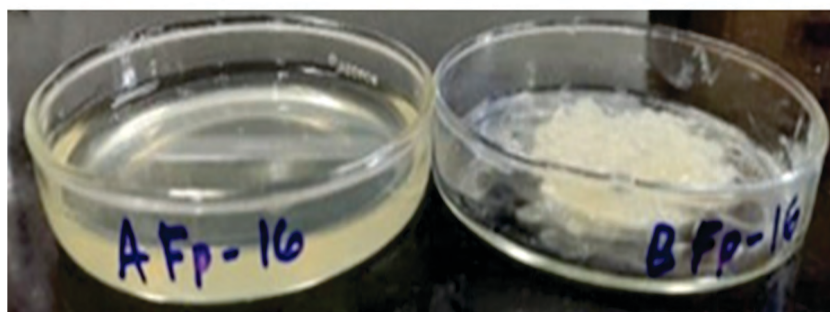


Dried shrimp shell waste for the preparation of chitosan at different temperature

Enzyme derived chitooligosaccharides production

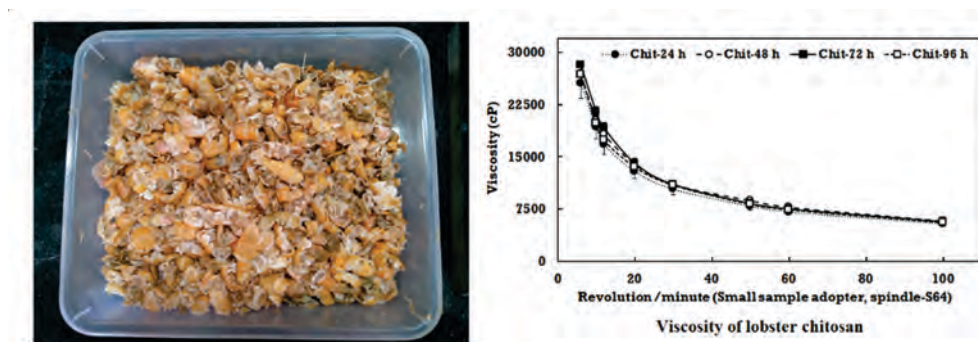
The change in mass balance during enzymatic hydrolysis of chitosan for the production of chitooligosaccharides was established. Two different enzymes namely pepsin and Proase FP were used along with the control. The study revealed that the Protease-FP enzymes were effective in producing chitooligosaccharides.

The mechanical properties of films produced using chitosan from lobster shell waste decreased with the increase in the duration of deacetylation from 24 to 96h. For higher mechanical properties 24 h of deacetylation is preferable.



Drying practice of shrimp shell waste influence the molecular properties of chitosan

Method of drying chitosan influences the functional properties of chitosan. The infrared and microwave drying method is preferable over traditional-open sun drying in terms of improved functionalities.



Protease-FP was more efficient than papain in producing chitooligosaccharides

6 Technological interventions in value addition and advanced processing techniques for fish and shellfish

Principal Investigator: Dr. Remya S.

Development of protocols for value addition of GIFT tilapia

Process parameters for developing thermal processed Genetically Improved Farmed Tilapia (GIFT- *Oreochromis niloticus*) steaks in brine medium were optimized. All the products from different treatment combinations were found to be commercially sterile. Products from treatments, exhibiting higher sensory acceptability were selected as optimum.

Development of gluten-free (GF) bread sticks incorporated with underutilized proso millet flour and seaweed powder

The demand for gluten-free (GF) food products is on the rise due to the pathological conditions associated with gluten ingestion. Breadsticks/soup sticks were developed from conventional refined wheat flour, Oat flour and Oat flour incorporated with proso millet flour and seaweed powder and their nutritional, textural, and sensory properties were compared. There was an increase in the hardness of Oat bread sticks with the increase in the percentage of proso millet flour.



Gluten-free bread sticks

Development of seaweed incorporated fish ball

Seaweed (*Padina tetrastomatica*) at different levels were incorporated with fish ball prepared using pink perch and its biochemical, physical and sensory attributes including fatty acid and amino acid profile were monitored. With the increase in seaweed levels, both DHA and EPA level increased in fish balls. A decrease in L* and b* values and an increase in a* value were observed for seaweed-incorporated fish balls. A slight increase in hardness and springiness was observed for seaweed-incorporated fish balls.

Development of seaweed incorporated fish soup

Different types of seaweed soups were prepared and their proximate composition, antioxidant properties and sensory properties were evaluated. Seaweed soup had significantly lower protein content as compared with seaweed-incorporated fish soup. Seaweed soup incorporated with grilled fish chunks exhibited significantly higher total phenolic content and the lowest total phenolic content was found in the soup prepared with only seaweed. It was observed that the addition of fish sauce did not affect the sensory properties of the soup.



Seaweed fish soup

Effect of thawing on the quality of brown shrimp

The effect of microwave thawing, atmospheric temperature thawing, water thawing and refrigerated thawing on the rate of thawing and quality changes in brown shrimp (*Metapenaeus dobsonii*) showed the highest cooking loss in atmospheric thawing. Microwave thawing resulted in least values for TMA-N and indole content whereas TBARS value was highest compared to other thawing methods. Better texture, particularly hardness and chewiness were observed in microwave thawing compared to other thawing methods.

Utilization of elongate mud skipper

A preliminary study was carried out to evaluate the nutritional and physico-chemical quality of elongate mud skipper (*Pseudapocryptes elongates*), an unconventional fishery resource of the Andhra Pradesh coast. The culture of *P. elongates* is reported in the West Godavari and Krishna Districts of Andhra Pradesh along with paddy and is treated as a delicacy among the people of these Districts. Sensory evaluation of the cooked fish indicated soft fleshed dark meat with a unique flavor.

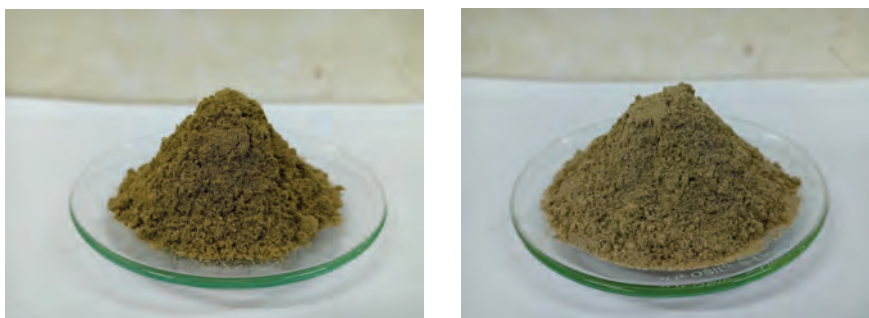
Analysis of the nutritional composition of unconventional mussel species, *Mytella strigata* (American brackish water mussel)

The nutritional profile of *M. strigata* collected from Cochin backwaters during the monsoon season was analysed. The average moisture, protein, ash, fat and carbohydrate content obtained were $84.13 \pm 0.33\%$, $10.40 \pm 0.21\%$, $1.7 \pm 0.03\%$, $1.7 \pm 0.03\%$, 4.48 ± 0.53 mg/100mg respectively. The average cholesterol content observed was 117.35 ± 0.75 mg/100g and crude fibre content was 0.02 ± 0.01 g/100g. The composition of saturated fatty acid content (31.17%) was higher than the mono unsaturated fatty acids and polyunsaturated fatty acids in which palmitic acid (C16:0) constitutes the highest percentage. Glutamic acid, lysine and aspartic acid were the predominant amino acids in the sample. Further, it was found that the

black mussel, *M. strigata* is a good source of minerals such as P and K. The level of heavy metals studied was below the limits prescribed in the standards.

Development of fish protein powder from fresh water fishes

Fish protein powder was prepared from two small sized freshwater fishes, mola (*Amblypharyngodon mola*) and minnow (*Salmostoma sp.*). Mola fish powder had higher fat content and ash content than minnow fish powder. Minnow powder was lighter with high L* value compared to mola powder.



Mola and Minnow fish powder

Development of protein cube as a designer food utilizing fish bioactive

The formulation of protein cubes for the target groups by utilizing fish protein and plant protein sources was carried out. For fish protein, pink perch fish mince was taken and soya was utilized as a plant protein source. The product had white colour and soft texture. The added fish protein enhanced the total protein of the product. The product can be used in various recipes in cooked or fried form with/ without the curry.



Protein cubes with fish protein

Tilapia-based convenience seafood products for the domestic market

Tilapia, an emerging aquaculture species, is less explored with regard to its value-addition options. Standardization of process protocols for fish momos from Tilapia and its quality evaluation under chilled conditions were carried out. Protein content was observed more in steamed momos in comparison to fried momos. Chilled storage studies indicated that steamed momos had longer shelf life compared to fried momos.

Development of shredded fish or fish floss for nutritional and functional applications

Fish floss was produced from two low-value fish species Ariid cat fish (*Arius dussumieri*) and Triggerfish (*Canthidermis maculate*), which are abundantly available on the Gujarat coast.

Analysis on the quality of initial raw materials and pre-trials were carried out to determine the appropriate steaming time and hot drying time for the preparation of fish floss. Fish floss produced from Triggerfish (*Canthidermis maculata*) had better textural and sensory characteristics compared to floss product from Ariid catfish (*Arius dussumieri*). Trials performed in hot drying optimization for fish floss preparation revealed more fluffy texture, rancid and burnt odour for products prepared from Ariid catfish.

7 Interventions in processing and preservation of commercial and unconventional fishery resources

Principal Investigator: Dr. George Ninan

Extraction of high-quality protein from Trigger fish

High quality protein was extracted from triggerfish (*Odonus niger*) with different washing processes. The protein powder was incorporated into extruded products at different levels as a functional additive and analysed its product characteristics. Nutritional profiling of Asiatic hard clam, *Meretrix meretrix* was completed and developed protein powder from the clam.



Odonus niger (Rüppell, 1836)

Snack food from shrimp

The protocol for preparation of ready-to-eat dried prawn mixture was standardized and storage studies under room conditions were evaluated and the technology was transferred to entrepreneurs.





|| Improved technology for fish pickle

Sous vide technology was integrated in the preparation of pickled fish products which reduced the salt and vinegar concentration to half of the conventional pickle. The microbiological parameters indicated 25 weeks shelf life for sous-vide packed samples against 17 weeks for conventional samples, under ambient storage conditions.

|| Benefit-risk ratio of RTE sardine

The benefit-risk ratio of ready-to-eat(RTE) sardine in different oil viz olive oil, rice bran oil and sunflower oil was evaluated with respect to essential fatty acid, calorie value, lipid oxidation and biogenic amines. RTE sardine processed in olive oil had more health benefits followed by sunflower oil and rice bran oil.





Quality Assurance and Management

III Institute Projects

- ◆ Enhancing Utilization of rest raw materials of aquatic origin for feed, Agricultural and Industrial product development
- ◆ Ensuring safety of fish and fishery products: Framework for validating regulatory specifications
- ◆ Development of rapid testing platforms for quality assessment of seafood

III Most Significant Achievements

- ◆ Foliar spray prepared from shrimp, fish and cuttle fish contained high levels of calcium, phosphorus and potassium. Field application studies of foliar spray showed enhanced growth performances for compliances to Food Safety and Standard Regulations for dried/salted fish products

- ◆ The prevalence of *Salmonella* was found to be around 24.5% in aquacultured products and farm environment
- ◆ Method development and optimization of multi-residue antibiotics in sediment samples using Liquid chromatography QTRAP mass spectrometry was conducted
- ◆ Species authentication of commercially important squid species namely *Uroteuthis edulis*, *Uroteuthis duvacei* and *Uroteuthis singhalensis* by molecular methods was optimized
- ◆ A multiresidue method was developed for simultaneous analysis of all 16 USEPA listed PAHs and 32 PCBs using GC-MS/MS
- ◆ Hypoxanthine was found to be the major nucleotide degradation product during the iced storage of Indian mackerel and Seabass
- ◆ Inosine was detected as the major nucleotide degradation product during the iced storage of milk fish and pearl spot
- ◆ Natural level of total phosphorous content in 4 species of shrimps namely *Penaeus semisulcatus*, *Penaeus indicus*, *Metapenaeus monoceros*, and *Penaeus monodon* was found to be higher than the recommended limit of FSSR (2011) as well as EU limit of additives
- ◆ Carbon dots (CD) prepared from fish skin showed anti-bacterial activity against genera of *Vibrio*, *Escherichia*, *Salmonella*, *Listeria*, *Morganella*, *Yersenia*, *Aeromonas*, *Staphylococcus*, *Klebsiella* and *Pseudomonas*

Chief Findings

1 Enhancing utilization of rest raw materials of aquatic origin for feed, agricultural and industrial product development

Principal Investigator: Dr. Zynudheen A.A.

Development of feed from fish waste

Five different feed formulations were prepared with various ingredients as per standard protocol. Proximate composition, physical properties and microbial quality analysis were carried out. The aerobic Plate Count of the feeds was found to be within the range of 10^2 - 10^6 cfu/g and pathogenic bacteria were not detected in the samples. The products were found to have a floating period of one hour and good staking properties.

Development of edible products from prawn shell protein

The proximate composition of the prawn shell, shell protein solution and spray dried powder was evaluated. The protein content was found to be 8.9% in the shell protein solution,



Shri. P. Prasad, Minister of Agriculture, Govt. of Kerala inaugurating CIFT fish manure unit at KVK Kottayam

whereas it was 57.2% after spray drying. The functional properties of spray-dried shrimp shell protein powder prepared from *Metapenaeus dobsoni* were analysed.

Development and quality evaluation of foliar spray from fish and shell fish waste

Hydrolysis of protein from prawn shell was carried out by using papain enzyme. Optimized foliar spray preparation from fish and shellfish waste by RSM. Elemental profiling of foliar spray prepared from shrimp, fish and cuttle fish indicated high levels of calcium, phosphorus and potassium in all the samples.

Performance evaluation of foliar spray

Performance evaluation of the fish-derived foliar application of fertilizers viz., anchovy waste peptide and moringa leaf powder on the growth and flowering characteristics of marigold were done.

The field experiment on the efficacy of the application of prawn shell-derived foliar spray on tomato (Arka) and maize was conducted in the red loamy soil in Karnataka in seven different combinations with two control plots with urea. The study indicated enhanced leaf numbers, leave blade area and height in the treated plant @ 17.5 ml /litre. A similar observation was made in the maize variety also.



Fish-derived fertilizer

Chitooligosaccharides prepared from crab shell waste

Chitooligosaccharides were produced from the crab shell waste using acid hydrolysis method. COS was formed after acid hydrolysis of chitosan, which was characterized by Thin Layer Chromatography (TLC) using glucosamine as a standard.

2 Ensuring safety of fish and fishery products: Framework for validating Regulatory specifications

Principal Investigator: Dr. Satyen Kumar Panda

Compliance to Food Safety and Standard Regulations for dried/salted fish products

A set of twenty-three fish samples were collected from different markets of Navi Mumbai and evaluated the quality and safety as per FSSR (2011). The water activity and sand content of the samples were in compliance with FSSR requirements. The salt content was below the FSSR

limit of 12% in all the samples. About 19.05% of the samples exceeded the aerobic plate count limit of 5 log CFU/g and 38.1% of samples exceeded the yeast and mould count of 2 log CFU/g. The cadmium content of above 1 mg/Kg was detected in dried cuttlefish sample (1.76 mg/Kg) and lead was detected in 9.52% of samples (0.2 to 0.52 mg/Kg). The presence of mercury was detected above 1 mg/Kg in the *Acetes* sample (1.049 mg/Kg).

|| FSSR compliance of Fish Pickles

Fish pickle samples collected from different locations in India – Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Pondicherry, Andhra Pradesh, Telangana, Kolkata, Haryana and Manipur were analyzed for compliance with Food Safety Standards Regulations (FSSR 2011). The non-compliance was observed for various parameters such as pH, APC, permitted class II preservatives, yeast and mold count and heavy metals. Many of the samples were found to have labeling issues with respect to the use of preservatives as well as improper labeling.



Samples collected from different locations in India

|| Compliance with Food Safety and Standard Regulations for powdered fish products

Edible Fish Powder (Fish Chutney Powder) collected from different retail shops was evaluated for compliance to FSSR requirements for microbiological specifications and contaminants. In all the samples, heavy metals were much below the prescribed limit. The samples showed non-compliance to the food hygiene criteria as per FSSR.

|| Risk assessment of unregulated products: Marinated Fish

The present study was initiated as there is no specific vertical standard for the low shelf life-of ready-to-cook marinated fish products in FSSR. The marinated samples included shrimp, mackerel, tilapia, Japanese thread fin bream, silver belly, anchovy and sardine. Ready-to-fry marinated fish and shrimp samples were collected and evaluated for biochemical quality and microbial safety. The samples included marinated tuna chunks, shrimp, sardine, mackerel, grey snapper, anchovy, tilapia and threadfin bream. More sampling is carried out, which may necessitate the fixation of separate standards for this product category.

|| Compliance to Food Safety and Standard Regulations for Fermented Fish Products

Assessed the content of pesticide residues, heavy metals and histamine in puthishidal and phasashidal samples collected from Tripura. Detected the presence of persistent organic pollutants, heavy metals namely lead & cadmium and histamine content above the maximum limit (400 mg/kg) set by FSSR in puthishidal and phasashidal samples.

|| Species authentication of squid species

In response to multiple EU rejections on mislabeling of squid species exported from India, protocols were developed for the authentication of commercially important squid species by



molecular methods. Molecular identification of squid species namely *Uroteuthis edulis*, *Uroteuthis duvaceli* and *Uroteuthis singhalensis* was optimized. Identification of different squid species was carried out using universal primers for invertebrates. The PCR method was optimized and Sanger sequencing was done for amplified products (777 bp). A novel primer (269 bp) was designed from COI using NCBI Reference Sequence: NC_027729.1, NC_017746.1, MN347019.1 and NC_028189.1 for identification and differentiation of squid species.

|| Monitoring of antibiotic residues in aquaculture fish and shrimp samples

The aquacultured fish and shrimp from different parts of Kerala were analysed for the presence of nitrofurans metabolites, chloramphenicol, and multiclass antibiotics for a comprehensive risk assessment. Five samples contained metabolite of Furazolidone (AOZ) at concentrations more than the decision limit. Chloramphenicol was detected in two samples at concentrations more than the decision limit. None of the samples were tested positive for multiclass antibiotics.

|| Optimization of microwave-assisted derivatization of nitrofurans metabolites

The microwave assisted derivatization time with 2-NBA in nitrofurans metabolite analysis in fish and fish products was 17 h. Microwave assistance for rapid derivatization of nitrofurans metabolites to bring down the overall sample preparation time to less than 5 h was evaluated.

|| Analytical method development for analysis of PAHs and PCBs in fish feed

Fish meal and oils in fish feed could be a possible source of PAHs and PCBs. Presence of PAHs and PCBs in the fish feed may affect the growth and performance of aquaculture fish and shrimp. A multi-residue method is being developed for simultaneous analysis of all 16 USEPA-listed PAHs and 32 PCBs using GC-MS/MS.

|| Method validation of an analytical method for simultaneous analysis of chloramphenicol and nitrofurans metabolites in fish and shrimp

The method adopted microwave derivatization which reduced the analysis time from two days to only 3-4h. Further the method was validated as per the new method validation guidelines of EC 808/2021. A regression coefficient of 0.99 for all the target analytes was achieved using matrix-fortified standards and internal standard based calibration. In the case of nitrofurans metabolites, the recovery experiments were carried out at 0.25, 0.5, and 0.75 ng/g spiking levels, considering the revised RPA of 0.5 ppb. The recovery values were within 90 to 110%. Similarly, for Chloramphenicol the recovery experiments were carried out at 0.075, 0.15, and 0.225 ng/g spiking levels; considering the revised RPA of 0.15 ppb. The recoveries were satisfactory within the range of 90 to 110%.

|| Validation of rapid food testing kits: GeneUP System, ELISA Kits, MERCK GDS kits

GeneUP System (bioMérieux) was verified as per ISO 16140-3: 2021 for the detection of *Listeria monocytogenes* and *Salmonella* in fish and fish products. Implementation verification was carried out in Raw and ready-to-cook fish and seafood (unprocessed) as per protocol 3 of ISO 16140-3. Confirmation was carried out in ALOA for *Listeria monocytogenes* and VITEK 2 Compact for *Salmonella*.

ELISA Kits manufactured by Mizola Biovet are being validated for quantitative estimation of chloramphenicol and nitrofurans metabolites (AOZ, AMOZ, AHD and SEM). The validation protocol stipulated by EC regulation 808/2021 for screening methods was used as per the new Reference Points for Action guideline EC regulation 1871/2019.

MERCK GDS kits are being verified for applicability in fish and fish products as per ISO protocols 1 & 3 of 16140-3 for detection of *Escherichia coli* O157, *Listeria monocytogenes* and *Salmonella*. *Salmonella* GDS kits are verified for use in fish and fish products as the eLOD50 was found to be within the acceptability criteria given in the ISO standard.

3 Development of rapid testing platforms for quality assessment of seafood

Principal Investigator: Dr. Laly S. J.

|| Determination of background levels of biochemical indices of quality in commercially important species

Four commercially important fishes namely Indian mackerel, milkfish, pearl spot and seabass were collected in fresh conditions and evaluated for accumulation of hypoxanthine, a nucleotide degradation product as a quality index during low temperature storage. In the case of Indian mackerel and seabass, the content of hypoxanthine was more prominent than inosine throughout the storage period. The content of inosine was more prominent than hypoxanthine throughout the ice storage period of milkfish and pearl spot.



|| Formation of nucleotide degradation products during storage of Indian mackerel and oil sardine at 25°C and 37°C

In case of Mackerel, hypoxanthine accumulated more than inosine at 37°C storage within 4.5 hours while at 25°C storage, inosine accumulated more than hypoxanthine within 4.5 hours. In the case of sardine, inosine accumulated more than hypoxanthine at both temperatures of storage within 4.5 hours.

|| Enumeration of spoilage bacterial flora in fish and fishery products

Enumeration of spoilage bacteria (*Pseudomonas sp.*) showed an increasing trend during iced storage of Indian mackerel, milkfish, pearl spot and seabass. However, H_2S forming *Schewenella sp.* was not present.

|| Screening of phosphate in wild caught shrimps

Eight different species of wild-caught shrimps viz., *Metapenaeus dobsoni*, *Penaeus semisulcatus*, *Parapenaeus stylifera*, *Penaeus indicus*, *Metapenaeus monoceros*, *Penaeus monodon*, *Heterocarpus gibbosus*, and *Macrobrachium rosenbergii* -were collected from different landing centers/markets of Kerala and the baseline screening of phosphate content was done using ICP-OES. Total Phosphorous content in 4 species of shrimps - *Penaeus semisulcatus*, *Penaeus indicus*, *Metapenaeus monoceros* and *Penaeus monodon* - was found to be higher than the recommended FSSR 2011 limit as well as EU limit of additives.

|| Antibacterial activity of carbon dots prepared from fish skin

Carbon dots (CD) prepared from fish skin showed anti-bacterial activity against genera of *Vibrio*, *Escherichia*, *Salmonella*, *Listeria*, *Morganella*, *Yersenia*, *Aeromonas*, *Staphylococcus*, *Klebsiella* and *Pseudomonas*.





Microbiology, Fermentation and Biotechnology

|| Institute Projects

- ◆ Biotechnological approaches for utilization of aquatic microbial resources and their products
- ◆ Virulence and antibiotic resistance profiling of seafood-borne pathogens and development of control measures

|| Most Significant Achievements

- ◆ High-throughput approach for evaluating the antibacterial activity of fish epidermal mucus was optimized
- ◆ Microbiological quality of 100 seafood samples from the online markets was analyzed and the prevalence of *V. parahaemolyticus*, *S. aureus*, *MRSA*, *E. coli* and *Salmonella* from online seafood markets were 17%, 19.7%, 2%, 59% and 4%, respectively
- ◆ Secondary metabolite profiling of *Streptomyces murinus* THV12 revealed compounds such as actinomycin D, actinomycin X08, pentamycin, desferrioxamine E and cinnabaramide A
- ◆ Heterotrophic nitrifying and denitrifying bacteria that can remove ammonia at high efficiency were isolated from aquaculture ponds

- ◆ Carbon dot along with other antibacterial agents such as H₂O₂, chitosan, ascorbic acid, and citric acid, showed a synergetic effect against *E. coli*
- ◆ Four microalgal species viz., *Nannochloropsis oculata*, *Dunaliella salina*, *Isochrysis galbana* and *Chlorella vulgaris* had potential antimicrobial activity against ESKAPE pathogens
- ◆ The spoilage microflora of the Indian mackerel were identified as *Shewanella sp.*, *Pseudomonas sp.*, *Vagococcus sp.*, *Brochothrix sp.*, and *Aeromonas sp.* and the strains were characterized for their spoilage potential
- ◆ Copper Oxide Nanoparticles (CuO-NPs) prepared by sol-gel method were confirmed by UV-Spectra and Dynamic light scattering technique
- ◆ A methodology was optimized for the simple and rapid detection of *V. mimicus*, *V. vulnificus* and *V. alginolyticus* from seafood and aquatic environment

Chief Findings

1 Biotechnological approaches for utilization of aquatic microbial resources and their products

Principal Investigator: Dr. Toms C. Joseph

Genomics and metabolomics of *Streptomyces murinus*

The genomics and the metabolomics of a mangrove-derived *Streptomyces murinus* THV12 strain were carried out. Whole genome sequencing of the *Streptomyces* strain generated a consensus sequence of 8,363,247 bp with 107 contigs and 7345 protein-coding genes. There were 47 secondary metabolite biosynthetic gene clusters (smBGC) which represented 17.9% of 8.3 Mb genome. The smBGCs belonged to the metabolite categories; PKS, NRPS, ectoine, lassopeptides, lantipeptides, melanin, siderophores, terpenes and other putative products. The strain showed broad-spectrum antimicrobial activity with a zone of inhibition up to 30 mm against most of the pathogens tested. The secondary metabolite profiling of the crude extracts from the fermentation broth of *Streptomyces murinus* THV12 revealed compounds such as actinomycin D, actinomycin X0δ, pentamycin, desferrioxamine E and cinnabaramide A by MS/MS analysis. Apart from that nearly 32 compounds belonging to different chemical scaffolds such as cyclic and linear peptides, bacterial alkaloids, linear polyketides, and terpenoids were also secreted when cultivated under OSMAC (One Strain Many Compounds) approach.

Cost-effective production of probiotic *Bacillus* strains by solid-state fermentation

Production of *Bacillus* strains was standardized on a wheat bran-based media. Maximum production was obtained at 48h and sporulation was induced by cations. The wheat bran media was able to produce 10¹⁰ spores/g.

Heterotrophic nitrifying and denitrifying bacteria from aquaculture sediments

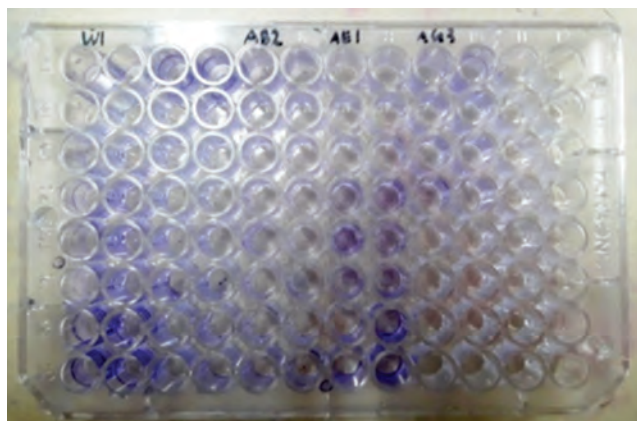
Forty two bacteria isolated from aquaculture ponds were screened for their ability to utilize ammonia and nitrate at different time intervals. Three bacterial strains that belong to *Bacillus sp.* with maximum ammonium and nitrate utilization were further screened under different pH, temperature and salinity. The strains were able to remove ammonia between pH 7 and 8.5 and at temperatures between 25°C and 35°C.

High-through put approach for evaluating the antibacterial activity of fish epidermal mucus

A modified optical density reduction method was optimized to screen the fish epidermal mucus (FEM) for antimicrobial activity within eight hours. The collected FEM was tested against five pathogens that included *S. aureus*, *E. coli*, *Salmonella*, *P. aeruginosa* and *V. cholerae*. It was concluded that the high throughput method is a low-cost, rapid, and solvent-free method that can be used for the initial screening of FEM against multiple pathogens.



Collection of Fish Epidermal Mucus



Biofilm

Antimicrobial activity of Carbon dots and its composite

Carbon dots in combination with other antibacterial agents such as H_2O_2 , chitosan, ascorbic acid, and citric acid had synergistic antibacterial activity against *E. coli*. Carbon dot and silver nanoparticle were effective against Suphamethaxole-Trimethoprim (SXT) resistant bacteria with MIC range of 50-150 µg/ml for carbon dot and 4-16 µg/ml for silver nano particle.

Microbiological quality of the various seafood species available in online markets

A total of 100 seafood samples purchased from high-rated online fish purchase app from the urban area of Cochin were analyzed for microbiological quality. The *fecal streptococci* were present in 89% the samples analyzed while *V. cholerae* contamination were found in 5.1 % of the samples. Twenty-nine samples were positive for cefotaxime-resistant *E. coli*. Totally 65 cefotaxime-resistant *E. coli* were obtained from 65 samples and resistance level was Augmentin (98%), Cefpodoxime (84%), Ceftazidime (60%), Aztreonam (58%), Ciprofloxacin (44%), Ceftriaxone (26%), Amikacin (26%), Cefoxitin (22%), Gentamicin (14%), Tobramycin (6%), Levofloxacin (18%), Gatifloxacin (14%), Nalidixic acid (28%), Norfloxacin (10%), Ofloxacin (10%), Co-trimoxazole (22%) and Nitrofurantoin (50%).

Micro flora associated with Indian Mackerel spoilage

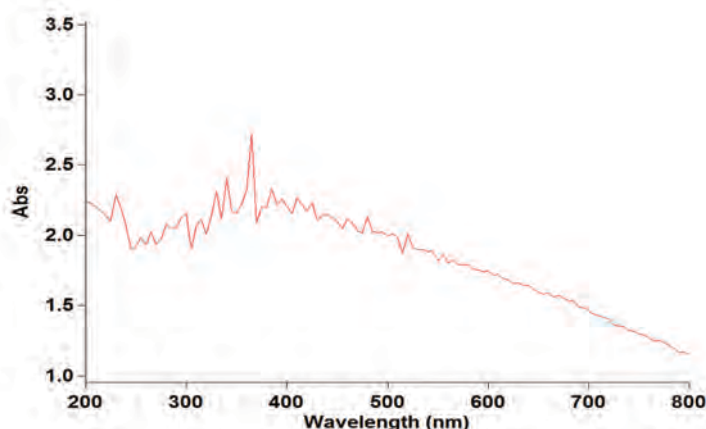
The spoilage microflora of the Indian Mackerel were identified as *Shewanella sp.*, *Pseudomonas sp.*, *Vagococcus sp.*, *Brochothrix sp.*, *Aeromonas sp.* etc. The ERIC PCR analysis of the isolates revealed they are diverse among the species identified.

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

Principal Investigator: Dr. S. Visnuvinayagam

Preparation and characterization of CuO-NP

The application of Cupric Oxide Nanoparticles (CuO-NPs) in food is getting more attention among researchers owing to its better antibacterial activity. CuO-NPs were synthesized using the sol-gel technique and were further characterized using UV-Spectroscopy, dynamic light scattering technique and scanning electron microscope.



UV-Visible Spectra for the CuO-Nanoparticle

Modified method for detection of *V. mimicus*, *V. vulnificus* and *V. alginolyticus* from seafood and aquatic environment

A method was developed for the detection of three species of pathogenic vibrios from seafood and the aquatic environment by the inclusion of a specialized media during the isolation step for the selection of the *Vibrio sp.* to be isolated. This extra step was found to improve the detection of the pathogenic species from these matrices.

Biofilm-producing *Escherichia coli* in Vembanad lake

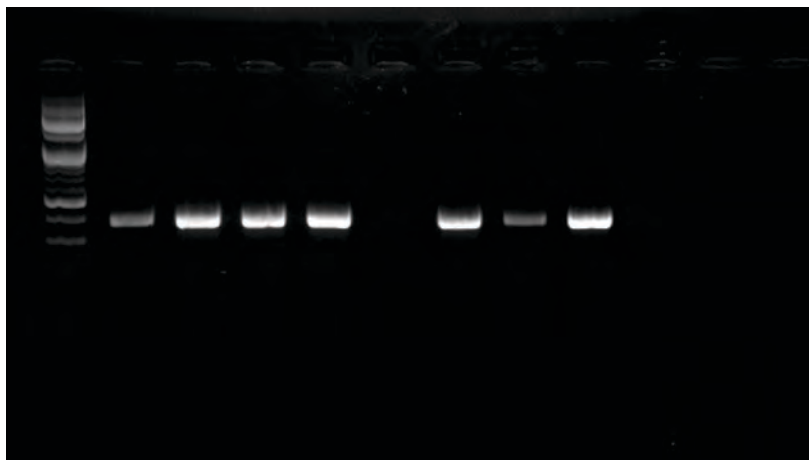
A total of 102 *E. coli* isolates from 34 water samples from Ernakulam, Kottayam, and Alappuzha regions assessed for the biofilm-producing ability revealed 64, 17, 12 and 3 weak, moderate, strong, and very strong biofilm producers, respectively.

Screening of SXT-resistant bacterial isolates in seafood samples

SXT is representative of a family of conjugative-transposon-like mobile genetic elements that encode multiple antibiotic-resistance genes. A total of 16 SXT-resistant bacterial isolates were recovered from 60 seafood samples procured through online markets, Cochin. The SXT integrase gene of the conjugative transposable element was detected in one isolate (*Providencia rettgeri*).

|| Occurrence of *V. mimicus* in seafood samples

The overall incidence of *V. mimicus* in the seafood samples of the Cochin region was 4% of 97 samples screened. Virulence-associated and toxin-regulatory genes; *ctxA*, *toxR* and *tcpA* genes were not present in any of the strains studied.



PCR image of *V. mimicus*

|| Co-resistance of ESBL *E. coli* to biocides

Fifty ESBL-producing *E. coli* strains were evaluated for their biocide's resistance and found that there was a high level of resistance to Cetylpyridinium chloride (>85.0 %) followed by Hexa-decyl trimethyl ammonium bromide (44.0 %), Cetrимide (44.0 %) and Benzalkonium chloride (25.0 %) with the minimum inhibitory concentration (MIC) of 256 µg/ml.

|| Level of ESBL producers in the seafood samples

Out of 21 fish samples collected from the fish market screened for ESBL-producing *E. coli*, 13 samples were positive for ESBL *E. coli* (6) and *K. pneumoniae* (7), and 4 were potential carbapenemase producers (3 *E. coli* & 1 *K. pneumoniae*). These isolates were screened for the ESBLs (CTX-M groups, OXA and AmpC) and non-ESBL genes (aminoglycosides, fluoroquinolones, sulphonamides and macrolides).

|| *E. coli* AMR genes of Sasthamkotta lake

E. coli identified from Sasthamkotta lake screened for the Antimicrobial Resistance Genes (ARGs) genes i.e., *blactxmgp1*, *blactxmgp-2*, *blactxmgp-9*, *blashv*, and *blatem* revealed that all the 23 isolates did not harbour the above ARGs.





Biochemistry & Nutrition

|| Institute Projects

- ◆ A green technology approach on isolation, purification and product development from marine biomolecules
- ◆ Evaluation of anti- nutritional factors (ANFs) /secondary metabolites in fish feed and feed ingredients
- ◆ Valorization of seaweed resources for functional food, nutraceutical, cosmeceutical, biomedical, and bioremediation applications
- ◆ Novel bio-molecules for food and nutraceutical applications from marine resources

Most Significant Achievements

- ◆ Development of encapsulated bio-polymer coated nanoliposome with bioactive peptides for functional food formulations
- ◆ Production of pickering emulsions using chitosan-gelatin protein hydrolysate (CHI-GPH) nano complexes and fish oil
- ◆ Database on surveillance of contaminant residues in the freshwater fishes of Kuttanad agroecosystems
- ◆ A method was developed for production of self-assembled chitosan
- ◆ Development of squalene-based pickering emulsions using self-assembled chitosan

Chief Findings

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

Principal Investigator: Dr. R. Anandan

Encapsulation of bio-polymer coated nanoliposome with bioactive peptides: Assessment of physicochemical, rheological, bioactive and stability properties

A methodology developed for the preparation of nanoliposomes coated with biopolymer for the delivery of bioactive peptides. The particle size of nanoliposomes was smaller at neutral pH and larger at high basic and acidic conditions, seeming to be pH dependent. The biopolymer-coated nanoliposomes strengthened the stability and functionality of the bioactive peptides prepared from gelatin for nutraceutical and pharmaceutical applications.



Bio-polymer coated nanoliposome with bioactive peptides

Production of pickering emulsions using chitosan-gelatin protein hydrolysate (CHI-GPH) nano complexes and fish oil

A methodology was developed for the preparation and stabilization of pickering emulsions using chitosan-gelatin protein hydrolysate (CHI-GPH) nano complexes and fish oil. The UV-Vis absorption spectra of CHI-GPH nano complexes indicated the presence of peptide bonds and



non-aromatic amino acids in the polypeptide chain of the protein. The droplet size of pickering emulsions increased from pH 3 to 12 and was in the range of 0.36 to 2.68 (CH-GPH-FO) and 0.37 to 0.63 (CH-GPH-VO), respectively. The creaming index of CH-GPH-FO and CH-GPH-VO were found to be in the range of 23.4 to 28.3 % and 32.7 to 39.1 %, respectively. The encapsulation efficiency of pickering emulsions (CH-GPH-FO & CH-GPH-VO) was found to be $96.4 \pm 1.84\%$ & $98.7 \pm 2.14\%$ whereas loading capacity was $55.3 \pm 1.73\%$ & $57.5 \pm 1.54\%$, respectively.

|| Isolation and characterization of novel bio-molecules from marine sources for food and nutraceutical applications

The nutritional composition of fresh and steamed dried *Anadara granosa* (Blood clam) regionally called 'Khube' was determined. Moisture content was 80.74% and 8.23%, Crude protein content was 11.3% and 66.19%; Crude fat content was 1.54% and 7.21% and Ash content was 1.54% and 7.21%; for fresh and steamed dried powder of blood clam, respectively. Inductively Coupled Plasma (ICP) analysis of fresh blood clams determined Fe content to range from 5.8 to 9.5 mg/100 g.

|| Exploration of the mechanisms/ molecular basis of action of marine nutrients and bioactive molecules

A process was optimized for the extraction of gelatin from the fish processing and further hydrolysed by proteolytic enzymes. The morphological characterization of hydrolysates, their physicochemical properties, technofunctional and rheological parameters of their biopotential and safety are being screened.

|| Risk assessment of pesticides and contaminants in an environmental metabolomics approach

The investigation was done on surveillance of contaminant residues in the freshwater fishes of Kuttanad agroecosystems. About 18 compounds were detected from the fish samples collected from Kuttanad agroecosystems. The majority of the compounds detected were either pesticides or PAH (Polyaromatic Hydrocarbons). Deltamethrin, Fipronil, Flubendiamide, etc were detected more frequently in the fish samples tested.

|| Process for self-assembled chitosan

Self-assembled chitosan was tailored by modifying the pH. The visual observation of the solution indicated that when the pH was modulated towards the alkaline range, macroscopic precipitation happened indicating self-assembly. The self-assembled chitosan has turned out to be an effective pickering emulsion stabilizer.

2 Evaluation of anti-nutritional factors (ANFs) /secondary metabolites in fish feed and feed ingredients

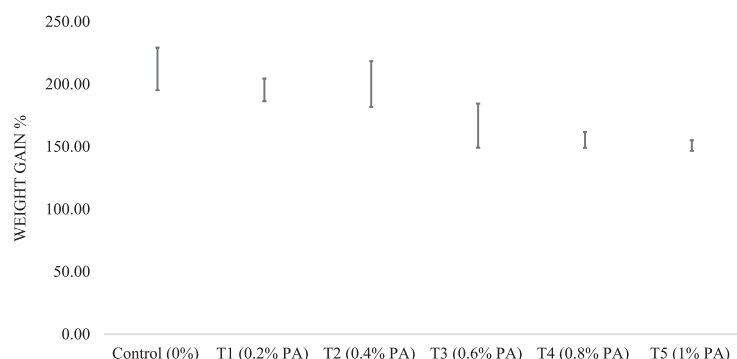
Principal Investigator: Dr. Tejpal C. S.

|| The permissible limit of phytic acid in the aquafeed

The influence of lower level of dietary phytic on growth performance in *Oreochromis niloticus* revealed that dietary supplementation of phytic acid at a lower level (above 0.5%) in the diet has shown a negative impact on growth performance. The fishes fed with phytic acid were found to excrete a higher quantity of faecal matter compared to the control group. The presence of phytic acid levels in the diet up to 0.5% will not negatively impact the growth performance of tilapia fingerlings. The outcome of the study would act as baseline data for the aquaculture sector.

III The permissible limit of tannic acid in the aquafeed

Tannic acid is an anti-nutritional factor present in plant-based aquafeed ingredients. The study was conducted to assess the negative impact of lower levels of dietary tannic acid in the diet on growth performance in *Oreochromis niloticus* fingerlings. Based on the 90 days feeding trial, the dietary supplementation of tannic acid in the diet had shown a negative impact on growth. The outcome of the study would act as a baseline data for the aquaculture sector.



Influence of lower-level Tannic acid supplementation on weight gain % of tilapia fingerlings

III Replacement of fishmeal by black soldier fly meal for the production of *Etroplus suratensis*

Preliminary study on to replacement of fishmeal by using black soldier fly in the diet of *Etroplus suratensis* fingerlings was carried out. Initial study showed positive results and feeding trials are planned to be done to find out the optimum level of replacement with regard to the growth parameters.

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

Principal Investigator: Dr. Niladri Sekhar Chatterjee

III Development of methodology for iodine measurement

The ICP-MS-based analytical method was developed to measure Iodine in seaweed.

III Development of seaweed nutraceutical supplement

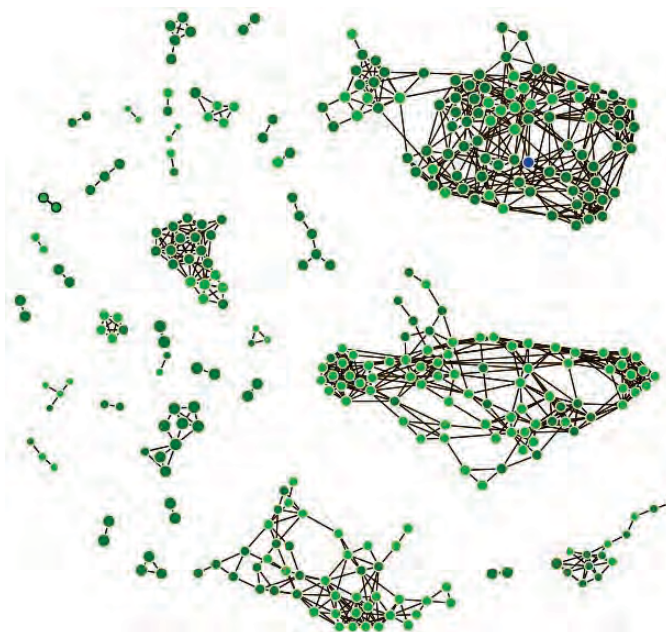
A nutraceutical supplement from seaweed was developed using fermentation techniques as a source of Vitamin D3, Fucoxanthin, and Iodine.

III Biochemical Analysis of brown sea weeds

Comparative biochemical analysis of a supercritical fluid extract of four brown seaweeds revealed that *Padina tetrastomatica* is the best source of Fucoxanthin and Fucosterols.

|| Deep metabolomic profiling of five brown seaweed species

Completed using high resolution mass spectrometry based chemoinformatics. More than 2000 secondary metabolites were putatively identified using natural product molecular networking. Metabolite identities were confirmed with ms/ms fragment and its networking with closely related compounds. Chemoinformatics models were developed to distinguish different brown seaweed species.



Molecular network of secondary metabolites in brown seaweed

4 Novel bio-molecules for food and nutraceutical applications from marine resources

Principal Investigator: Dr. K. K. Asha

The project operated with the basic objective of Isolation and characterization of novel bio-molecules from marine sources for use in food and nutraceutical applications and exploration of the mechanisms/ molecular basis of action of marine nutrients and bioactive molecules and to develop applications for the marine biopolymers in nutraceuticals formulations and in the biomedical field. The chief findings of the project are given below:

|| Utilization of shark liver for diverse applications

Squalene-rich oil from Bramble shark (*Echinorhinus brucus*) liver was extracted using supercritical CO₂ and the composition of one gram of liver oil included squalene-665.53 mg, total fatty acid-63.54 mg, DHA-15.26 mg, EPA- 3.88 mg & arachidonic acid-3.22mg, vitamin A & D-45.33 µg and 24.96 µg.

|| Comprehensive utilization of tuna fish bone powder

Deep yellowish fat (oil) of yield-15.68% with a high content of vitamins A and D was extracted from tuna fish bone powder by supercritical fluid extraction (SFE) using CO₂. Fishbone powder residue after SFE had a high content of calcium and potassium.

|| High-quality edible fish protein powder for nutraceutical applications

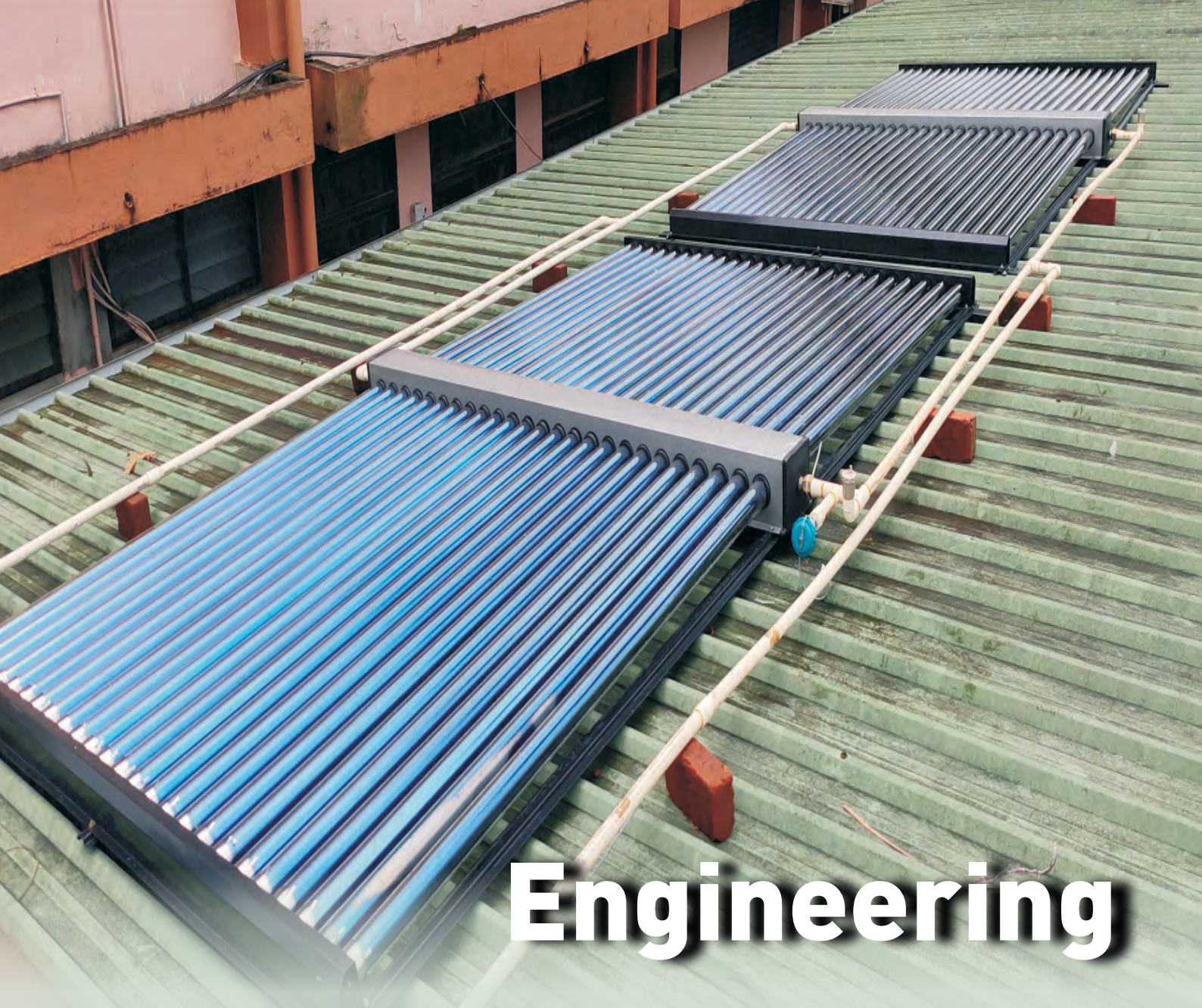
Prior to protein isolation from *Nemipterus japonicus* defatting was done using SFE. High-quality edible fish protein powder with good functional properties was extracted by isoelectric solubilization and isoelectric precipitation. The superior emulsifying ability

indicated that it can be used as a good food-grade protein emulsifier for preparing stable delivery systems.

||| Characterization of gelatin extracted from Bigeye tuna (*Thunnus obesus*) skin

Gelatin yield obtained from tuna skin waste was 8.42% and had relatively high hydrophobic amino acids and imino acids content which can form a thermo-reversible gel. Molecular weight patterns of tuna skin and porcine gelatins showed all three major bands β , $\alpha 1$ and $\alpha 2$ with MW distribution range of 120-200 kDa. 200 kDa band is β component and two 120 kDa bands are $\alpha 1$ and $\alpha 2$ components. Gelatin exhibited interfacial functional properties such as foaming, emulsifying and water-holding capacities and can be utilized in functional and food formulations, as a bio material in bio medical and tissue engineering applications





Engineering

|| Institute Projects

- ◆ Engineering interventions in the post-harvest sector

|| Most Significant Achievements

- ◆ Development and performance evaluation of a 10 kg solar-electrical hybrid dryer for shrimp drying

Chief Findings

1 Engineering interventions in post-harvest sector

Principal Investigator: Dr. George Ninan

Design and development of solar-electrical hybrid dryer

A solar-electrical hybrid dryer of 10kg capacity was designed and developed for the drying of shrimps under controlled conditions. The dryer consists of a drying chamber with a total drying area of 1.6 m², a solar air collector, an electric heating coil, a blower, exhaust fans, temperature sensors, and control panels. The materials used for the fabrication of the dryer were stainless steel (SS 304) for cabinet and drying trays, galvanized iron for the frame, MS angle frame support, polyurethane foam and aluminum foil for insulation, and fiber boards for outer covering and structure. This dryer was designed to utilize solar energy for drying shrimp in sunshine hours and was supplemented with a 750 W electric heating coil to operate in low sunshine hours. The drying chamber attained the highest temperature of 47°C and 60°C when operated on solar and solar-electrical hybrid modes, respectively. The moisture content of the fresh shrimp reduced by 80% in 5.5 hours in hybrid mode and the shrinkage of the shrimp was 20.45%. The rehydration ratio of 2.36 of the dried shrimps indicated that minimal structural damage occurred in the product during drying. The overall heat energy supplied through the solar collector for drying was 24 MJ. The drying efficiency of the solar-electrical hybrid dryer was found to be 53.85%. The cost of the dryer was estimated to be Rs.62000/- and the payback period was calculated as 1.42 years.



Solar-electrical hybrid dryer (10 kg capacity)

|| Fabrication of a trolley-based solar-electrical dryer of 40 kg capacity

A design for a trolley-based solar-electrical dryer of 40 kg capacity was finalized. The dryer consisted of 40 trays with each tray charge of 1 to 1.5 kg. In this dryer, a tray holder (10 trays) can be carried to the drying chamber with the help of trolleys. Paraffin wax-based phase change material (PCM) was used as a thermal energy storage system to store the excess energy during peak sunshine hours and further usage during off-sunshine hours.

|| Development of flake ice machine

The proposed machine consists of a water spray system, drum, moving blade assembly, motor, and the components of a basic refrigeration system. The intended system produces ice by spraying water onto the refrigerated drum, which can be scraped off as sub-cooled flakes. The refrigerant temperature is maintained in the range of -20°C to -25°C . The fabrication work of the flake ice machine is being carried out.

|| Improved design of solar fish feed dispenser cum aerator

Automatic fish feeders being developed consisted of a solar panel and battery which collect and store the energy required for the operation of the feeder machine. They consist of timing circuitry to keep track of time and a trigger or switch to activate the dispensing mechanism employing a motor. It also consists of two stepper motors which are battery-powered and have a remote control for moving the feeder machine within the water. The feeding time and feeding interval is set using a keypad and display provided in the feeder machine. The feeder is controlled by an Arduino micro controller. A paddle wheel and motor arrangement is provided to facilitate better movement of the system in water for aquaculture ponds, besides serving the purpose of aeration.



Improved design of solar-powered fish feed dispenser cum aerator

|| Thermal performance enhancement of flat plate collector using carbon nanodots (CNDs) derived from fish scale

The enhancement of thermal efficiency of a solar flat plate air collector using CNDs application synthesized from Rohu (*Labeo rohita*) fish scale by using the hydrothermal method was done. The thermal efficiency of the FPC was tested with various concentrations of CNDs coating at a different mass flow rate of air and the results were compared with black paint-coated surface (control). Fourier transform infrared spectroscopic studies of absorber plate coating

revealed that the CNDs interacted with the black paint surface through phenolic OH, C=O, and NH mainly by hydrogen bonding. Overall, the CNDs coating on the absorber surface enhanced the thermal efficiency of the collector by 19.84% over the black paint-coated surface. The air temperature at the outlet of FPC ranged between 55-65°C which can be used for the drying of food materials in the solar dryer.



Experimental setup of the performance evaluation study

Performance evaluation of pilot-scale hot air-assisted continuous infrared dryer

Drying characteristics of small (6 mm thickness) clam (*Villorita cyprinoides*) in the pilot-scale hot air-assisted continuous infrared dryer were studied at the infrared intensity of 3,000 W/m², IR source to sample distance of 10 cm, drying temperature of 65°C, and air velocity of 1.5 m/s. The total drying time of 4.5 h was recorded to reduce the moisture content of the clam from 79.35 to 9.25 %wb with the shrinkage and rehydration ratio of 22.07% and 2.74, respectively.



Clam drying process in pilot-scale hot air-assisted continuous infrared dryer



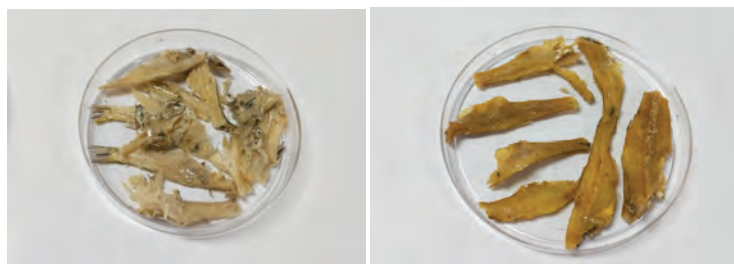
(a) Fresh clam (b) dried clam (c) Rehydrated clam

The drying of anchovies was carried out in the hot air-assisted pilot-scale infrared dryer at the full loading capacity of the dryer. Marination of anchovies was done before drying. The drying operations were carried out at the infrared intensity of 3000 W/m^2 and 60°C hot air inlet temperature. The moisture content of the fresh anchovies was reduced from 82.5% (w.b.) to 6.93% and 6.61% (w.b.) in three hours in the pilot scale infrared dryer for raw and marinated and dried anchovies respectively.

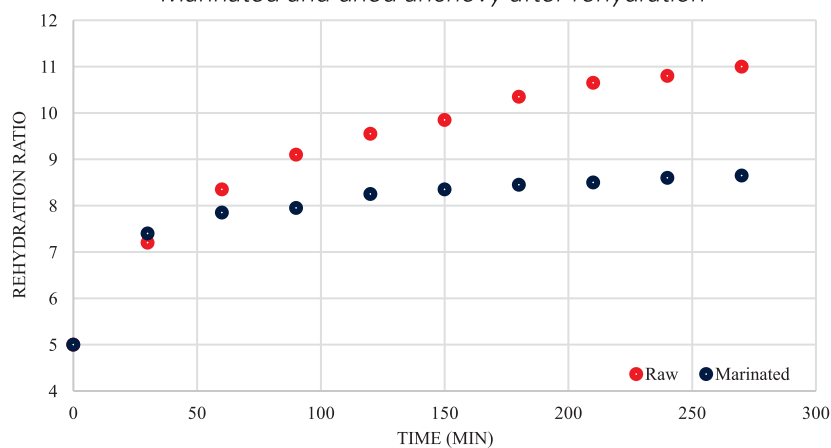
The drying of blanched squid rings was carried out in the forced convection hot air-assisted pilot-scale infrared dryer. Marination was done before drying. The drying operations were carried out at the infrared intensity of 3000 W/m^2 and 60°C hot air inlet temperature. The moisture content of the squid rings was reduced from 85.5% (w.b.) to 7% (w.b.) in three hours in the pilot scale infra-red dryer for both raw and marinated and dried squid rings.



Pilot-scale hot air-assisted continuous infrared dryer for drying marinated anchovy

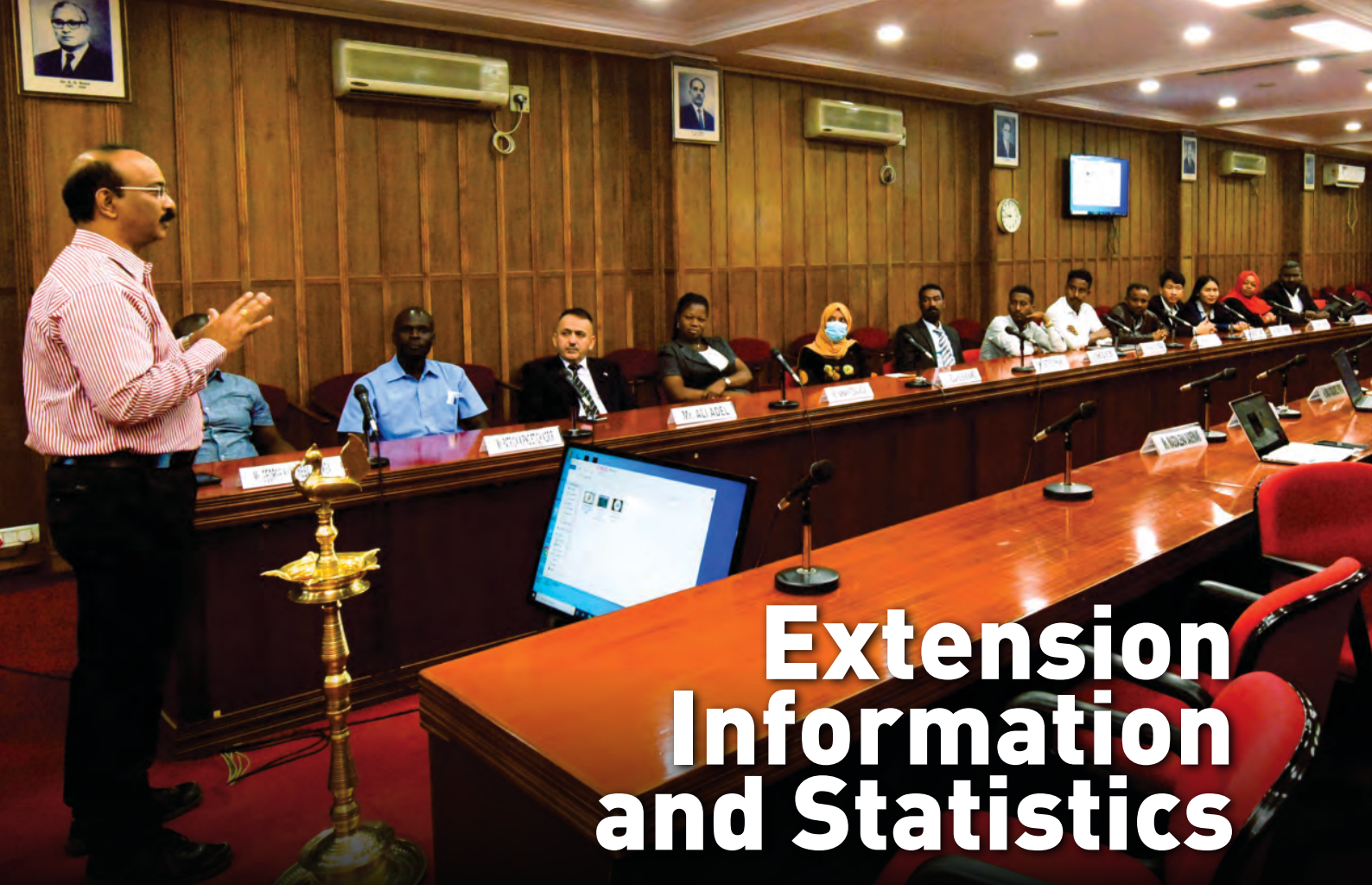


Marinated and dried anchovy after rehydration



Rehydration ratio of squid rings dried at pilot scale infrared dryer





III Institute Projects

- ◆ A study on the entrepreneurship ecosystem in fisheries and the cybernetics of Women Initiated Enterprises in Fisheries (WIEF) in selected coastal states of India
- ◆ An assessment of extension system in marine fisheries sector of Kerala
- ◆ Impact assessment of ICAR-CIFT Technologies
- ◆ Assessment of post-harvest losses in the fish value chain
- ◆ A study of digital fish marketing ecosystem in India
- ◆ Assessing input and service delivery system for marine fisheries in Kerala
- ◆ Evolving SMART EDP Module for livelihood security of small-scale fisher folk through fish-preneurship
- ◆ Occupational structure, labour productivity and labour migration in the fisheries sector

III Most Significant Achievements

- ◆ Qualitative assessment of post-harvest losses in fish has been attempted using FAO's Informal Fish Loss Assessment Method (IFLAM) at harbours, wholesale markets, and retail markets in Kerala

Chief Findings

1 A study on the entrepreneurship ecosystem in fisheries and the cybernetics of Women Initiated Enterprises in Fisheries (WIEF) in selected coastal states of India

Principal Investigator: Dr. Ashaletha S.

Among women from coastal villages of Kerala having an entrepreneurial intention, 28% of the respondents exhibited good entrepreneurial potential based on their personal attributes while 76% looked upon their family outlook. Among the 72 women, only 38% seemed to possess entrepreneurial attributes at a personal level namely, passion, vision, resilience and flexibility. This means the majority of those who initiate enterprises can be termed as only necessity entrepreneurs. Among respondents, 76% reported a supportive family outlook for women starting an income-generating venture. But on interaction, they reported taking a criticizing and unsupportive role in later stages, owing to the 'inconveniences' created for others by the absence of women at home.

Perceived Support of Meso Ecosystem Factors by women with entrepreneurial intentions in Kerala, 74% possessed a good social network, but support was never for business/career, 74% possessed a good social network, but support was never for business/career Only 5% referred Local success models. About 66% of them are aware of the state government schemes but only 22% have accessed it for their benefit. Only a very low level of entrepreneurs approached (5%) local institutional support for the ventures.

As far as perceived support of Macro ecosystem factors by women with entrepreneurial intentions in Kerala, only 40% are aware of the national policy framework and 46% are aware of the central govt schemes but nobody accessed them. About 18% of the respondents are aware of the R&D activities while 18% received appropriate training from limited sources. About 8% have ideas about the legislative framework on limited items and 86% of them are aware of the grants from State departments but they were not keen to take bank loans for their entrepreneurship.

Awareness regarding the legal framework with respect to starting enterprises was also poor, only a few know about the sanctions needed by the Pollution control board and FSSAI certificate in principle. Regarding financial support, 86% know about grants and subsidies, but from only Kudumbasree and SAF of the State Dept of Fisheries. Nobody was interested in availing of Loans, even with the liberal subsidy, from Nationalised bank (a case study in which a group dropped the idea of starting an enterprise hearing about the linkage to a bank, where the group withdrew from availing a scheme having 80% grant support and 10% bank loan).





|| Cybernetics

Two groups were formed at the field level in Kerala, at Udayamperur in Ernakulam District and another in Vaikom, Kottayam District to study the action regulation factors at personal, interpersonal and social levels in women-led fishery enterprises. The initial two steps are documented with the Udayamperur group. The regulatory systems, their structures, constraints, possibilities and controls. In this study, Autonomous Agency Theory (AAT) which is a viable system theory was used as a guideline and testing. It was proven to be true as the two women groups, organized under the project were autonomous inside, but for the success, viability to get adapt to the environment was necessary, which was lacking in one group and that group perished. The other one is still in the process of enterprise setting.

2 An Assessment of Extension System in Marine Fisheries Sector of Kerala

Principal Investigator: Dr. Sajesh V. K.

Thematic analysis of the interaction with marine fishermen in various districts of the Kerala system identified major themes like extension inadequacy, the need for complementary inputs and incentives, the need for an innovation system perspective and an enabling environment.

Assessment of perceived role performance of fisheries extension personnel pointed out that performance was high with respect to traditional roles like awareness generation, implementation of schemes, conducting training and demonstration programmes etc. The perceived performance of other roles like promotion of ICTs, feedback and demanding policy, market linkage activities, group-based extension etc was yet to be improved.

Major facilitating factors of the role performance of extension personnel were 1) increased policy focus on the fisheries sector in general and fisheries extension in particular 2) increased financial allocation) allocation of para professional extension workers etc. Multiple roles and responsibilities, and unfilled vacancies of fisheries extension personnel were identified as major hindering factors.

Comparison of various agencies in the fisheries sector across various dimensions in the SERVQUAL index namely access, assurance, empathy reliability, responsiveness, tangibles and timeliness etc shows that Matsyafed had a higher score in all dimensions as it is involved in extension plus the sort of activities like the provision of inputs, credits, subsidies, insurance etc.

3 Impact assessment of ICAR-CIFT Technologies

Principal Investigator: Dr. V. Chandrasekar

|| Analysis of the impact of technologies developed by ICAR-CIFT

Fish waste utilisation was one of the promising technologies developed by ICAR-CIFT and used extensively for manufacturing chitin. Various preliminary work was carried out such as literature collection, development of survey questionnaire, validation, data collection etc. Chitin units from Kerala were covered (Ernakulam, Alappuzha and Kollam Districts). The six coastal states are also to be covered, in total information from about 16 chitin production units will be collected to study its overall economic impact in terms of income generation and job creation.

The main parameter of the study was the economics of operation of the chitin production technology - inputs usage, the cost involved, the quantity of output, market price information, financial aspects etc. Similarly initiated the research work related to the impact of deep sea fishing vessel design developed by ICAR-CIFT. Economic and financial analyses were carried out for the chitin production technology and data were collected from the chitin production unit situated at Kerala. The average annual operational cost comes to around 87.5 lakhs per unit. The average annual return is 181.94 lakhs per unit and the net profit obtained was about 64.69 lakhs per unit. B:C ratio (1.55), NPV (166 lakhs), and IRR (22%) was observed.

|| Chitin production technologies

Chitin production technology impact in the fisheries economy was estimated using the economic surplus model which showed 11,356 Crores, out of which 42.5% and 57.5% were due to the change in the consumer and producer surplus respectively.

|| CIFT training programmes

The study covered the impact of numerous training programme organized by ICAR-CIFT during the past five years, from 2017 to 2022. The academic database of the beneficiaries of the training program categories under four broad categories was compiled viz., international (AARDO, ITEC), national & regional (PMMSY, SCSP, TSP, NEH, HACCP). The online questionnaire was prepared (English/Regional languages) to collect data information using Google form link to the participants mobile number and their mail ID. Mainly the impact of training on livelihood generation in terms of income and employment generation was targeted.

4 Assessment of post-harvest losses in the fish value chain

Principal Investigator: Dr. Pe. Jeyya Jeyanthi

|| Assessment of post-harvest losses

The assessment of post-harvest losses was carried out in three stages viz., harbour, wholesale market and retail market. The loss assessment using qualitative methods has been extensively used to explore information on the types, causes, frequency, seasonality of loss, and loss differentials in fish species at the three stages. In addition to that the perception of key informants on post-harvest losses of fish was also carried out as part of the assessment. The qualitative method follows the FAO methodology of the Informal Fish Loss Assessment Method (IFLAM). IFLAM comprises of various methods viz., secondary sources, observation, Key Informants Interview (KII) and participatory rural appraisal (PRA). These four methods were attempted in this present study. Fishers, boat owners, commission agents, fish workers, and sellers at wholesale and retail markets were the key informants. The sample framework for the Questionnaire Loss Assessment Method (QLAM) in the four states viz., Kerala, Gujarat, Tamil Nadu and Andhra Pradesh have been designed.



Observation method



Key informant-fish workers



Key informant-sellers



Key informant-boat owner & Key informant-commission Participatory rural Fishers agents appraisal method



5 A study of digital fish marketing ecosystem in India

Principal Investigator: Dr. Sajeed M. V.

|| Evaluation of digital fish vending firms

Fifteen digital fish vending firms from Cochin, Mumbai and Vizag were selected and a study of their profile were with respect to their choice of platforms, digital marketing components used, payment and delivery options, business hours, variety of fish, inventory of products, seasonal availability and price trends have been undertaken.

Eight attributes were identified as digital purchase and consumption behaviour, choice and preference of digital markets, portal selection and patronage, intra and inter-attribute choices, knowledge in using digital tools for fish purchase, 'Risk-benefit' perception in using digital platforms for fish purchase, factors influencing digital fish purchase and attitude towards the digital fish purchase and consumption were identified for consumer behaviour study of fish consumers.

A review of important drivers and barriers of online fish purchase was done and the study revealed factors like sensory perception, convenience perception, availability of favourite fish, price, health beliefs, safety, and quality concerns as determinants of online fish purchase.

Risk-benefit perception and consumer knowledge were identified as important factors in the online consumer decision-making process. Convenience issues (such as fish preparation, quality evaluation, and fish species) have been reported as an important driver to online fish consumption. Frozen fish are treated as "non-fresh" "bad quality" "tasteless" "watery" and "boring". Other attributes like price and convenience also have an impact on fish consumption attitude formation. Due to complex preparation and cooking procedures, fish is also treated as an inconvenient food item by many.

Trust and knowledge about the quality of food (fish) were suggested to be of importance for consumer's attitudes and consumption when food is perceived to be risky and cause negative consequences for themselves or their family.

6 Assessing input and service delivery system for marine fisheries in Kerala

Principal Investigator: Dr. A. Suresh

|| Credit delivery in marine fisheries

The continued dominance of informal credit in marine fisheries was investigated on the basis of the risks in marine fisheries, risk-sharing mechanisms and capital and market tying relationships. The repayment to the auctioneer lender included elements of pure interest, risk premium and an element of market imperfection. The results had implications for the joint development of credit and insurance markets. There was a qualitative difference b/w trawlers and artisanal fishers in credit constraints. The requirement for loans for daily needs was high for trawls than for artisanal fishers. Also, multiple ownership of vessels was an issue in the case of trawl fishers.

|| Insurance in marine fisheries

The artisanal fisheries had insurance due to the intervention of Matsyafed. However, the trawl fisheries were not getting the insurance. Insurance was perceived as another expenditure, than as a risk-spreading mechanism. The economic activity of fishing was highly dependent on probability and associated with significant economic stakes. A behaviour akin to a lottery was inbuilt into it. Therefore, anticipate success in further staying in the fishing ground even if a weather warning was there. The institutional inertia in devising suitable insurance products was the major lacuna.

|| Awareness and adoption of safety measures

Fishing is considered one of the riskiest professions in the world the awareness and adoption of safety measures by fishermen were studied. The fishermen know about the safety equipment but lack knowledge about the communication system, particularly trawl fishers. Communication facility becomes quite important during natural calamities. Non-adoption of the safety equipment was mainly due to high cost (89%), and unsuitability of the equipment to the working condition at sea (80%). One key constraint was that the fisherfolk had a poor belief in the effectiveness of the safety and communication system in vogue. The coping mechanisms adopted during the time of disasters were also studied.

|| Gender difference and fish vendor's access to inputs and services

Women faced significant differences with respect to access to inputs and services in fish vending. The Average quantity of fish purchased was 137 kg by men and 27 kg by women fish vendors. The modernization in fish vending had affected women's access to fish, ice, and credit and their ability to acquire and sell fish of the desired quality, relatively badly. Also, those with low capital bases were being displaced. The analysis indicated deliberation of policy to mainstream women fish vendors, in view of their instrumental value in fisher households and equity in access to livelihood.

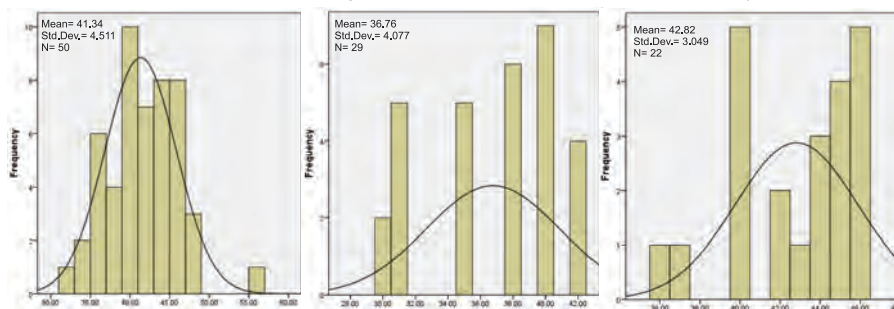
Still, 58% continued in the profession as it was their traditional occupation. The vendors faced constraints in access to fish, storage of fish, access to ice, infrastructure, transportation facilities and capital. About 41% of fish vendors had capital invested less than Rs.5000/-; 15% about Rs.5000-10000/-; 10% about Rs.10000-25000/-. At a higher level, about 14% invested between Rs.1-5lakhs and 3% between Rs.5-10lakhs. The study analyzed in detail the economic and social issues faced by fish vendors and their relations with the dominant policies and institutions; and suggested policy measures.

7 Evolving SMART EDP Module for livelihood security of small-scale fisher folk through fish-preneurship

Principal Investigator: Dr. A. K. Mohanty

|| Fishpreneurship behaviour of the respondents on the basis of socio-personal and psycho-personal attributes: A state wise analysis

The experimental respondents along with some more respondents influenced by the entrepreneurial activities of the targeted group spreading over three states namely Ernakulam in Kerala (50 nos.), Vizag in Andhra Pradesh (29 nos.) and Veraval in Gujarat (22 nos.) were considered. It was observed that Education was the only attribute that played an important role in governing the entrepreneurial behavior in all three states with positive significance in Ernakulam (1.53) and Vizag (0.53) and negative significance in Veraval (-2.73). In the case of Ernakulam (Kerala) and Vizag (Andhra Pradesh) socio-personal attributes like occupation, annual income, entrepreneurial experience, information-seeking behaviour, and awareness about development schemes were the common attributes significantly influencing the entrepreneurial behaviour of the population. Besides, the only attribute 'extension contact' was found to be more effective with significant influence on entrepreneurial behavior in case of Vizag (Andhra Pradesh) and Veraval (Gujarat).



Entrepreneurial behavior in (a) Kerala, (b) Visakhapatnam, (c) Veraval



Similarly, it was observed that psycho-personal characteristics like innovativeness (INNOV), Proactiveness (PROAC), self-confidence (SCON), risk-taking ability (RITA), decision-making ability (DIMA), economic motivation (ECMO), achievement motivation (ACHMO), technology orientation (TEORN) and resourcefulness (RESO) were found to have significant correlation with entrepreneurial behavior in one or other among the three states w.r.t. age, education and annual income.

8 Occupational structure, labour productivity and labour migration in the fisheries sector

Principal Investigator: Dr. Nikita Gopal

|| Availability, type and pattern of employment in the fisheries sector

Women labour in fish harvesting: Through purposively sampled case studies and using the Social Relations Analysis (SRA) framework study was carried out on women engaged on diverse fishing activities. Fish harvesting by women is much more wide-spread than recognised and recorded. Diverse and seasonal value priorities are assigned when carrying out this activity like engaging in a livelihood, socialising with fellow women as they travel and fish together, earning incomes for their households and also producing food that their family needs.

Labour in ring seine fishery: The impact of technological transformation on social relations in the ring seine fishery of Kerala, India was studied. Since the mid-1980s when the ring seine was first introduced to enable small-scale fishers to compete with mechanised trawlers, these fishing units have expanded both in terms of numbers and in size. Changes in processing, distribution, and trade have reworked women's economic roles and position in the fishery, and questions about long-term profitability and sustainability have necessitated interventions in governance at various levels

|| Inter-state migration in the fisheries sector

Migrant labour in fishing: Neo-classical, network and relative deprivation theories were used to assess the inter-state migration to the fishing sector. There is demand for migrant labour due to shortage in availability of local labour and the diminished native labour force is a combined outcome of the retirement of the senior fishers and lack of interest of the younger men in fishing. Many migrants were not exposed to trawl fisheries previously and have come due to inter-personal linkages in source and destination (network). The migration of fishermen may be voluntary or involuntary and can be an individual decision. There several drivers like economic, social, environmental, political, historical and demographic factors that may attribute to the migration of fishermen to other places. There are no written contracts and the labour are free to shift between boards when better working terms are offered.

|| Impact of selected macro policies on labour incomes in the sector

A cross-sectional study was undertaken to assess OSH related issues and awareness 102 randomly selected trawler workers and owners from fishing trawlers operating in Ernakulam, Kerala from small, medium and large trawlers. The type of accidents, injuries and illnesses occurring among fishers along with the fishing pattern and other relevant information were explored. The associations of physical and psychosocial work conditions with safety and health outcomes, eg, injuries, illnesses and job satisfaction were examined using logistic regression. The lack of awareness about the OSH conditions in fishing was apparent through the study and this is driven by the inadequacy and unavailability of data on occupational conditions aboard fishing vessels.





Visakhapatnam Research Centre

||| Institute Projects

- ◆ Development of Smart Trawls Systems for the North East maritime states of India
- ◆ Augmenting value and safety of wild and farmed fish of the East Coast through technological approaches
- ◆ Fishing technological interventions for sustainable marine ecosystem service along the east coast of India

||| Most Significant Achievements

- ◆ Low salt dried tuna chunks were prepared and evaluated its quality during storage
- ◆ Developed a pre-processing protocol for drying shell-less small-sized *P. vannamei*
- ◆ Physicochemical qualities of dried fishes of local markets were evaluated
- ◆ Effects of enzyme-assisted peeling on quality of shrimp during frozen storage were analysed
- ◆ Standardized the technology for low moisture fish fillet by osmotic-dehydration technique
- ◆ Antibacterial activity of plant oils on *E. coli* and *Aeromonas spp.* was studied
- ◆ Incidence of *Listeria spp.* in fish and shellfish of retail markets was analysed
- ◆ Antibiotic-resistant genes (ARGs) in *E. coli* and *Aeromonas spp.* were profiled

Chief Findings

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

Principal Investigator: Dr. U. Sreedhar

Andhra Pradesh coast was predominantly occupied by trawlers. The trawlers operating along the Andhra coast were of two kinds, the smaller trawlers (sorra and royya) having an L_{OA} of 9.75-10.0 m and the bigger trawlers (Sona boats) with an L_{OA} of >13.m.

Variants of fish trawls operate off the Andhra Pradesh coast

About 1802 mechanised trawlers operate trawl nets along the Andhra Pradesh coast. The commercial trawls were operated from trawlers ranging in size from 13.1 to 28 m L_{OA} at depths ranging from 20 to 150 m. large mesh trawls ranging from 80 m to 150m targeting exclusively pomfret, ribbon fishes, and cuttlefishes were the most common types. 28-47 m two-seam fish trawls target for ribbonfish, upenoids, sciaenids, lizard fishes and nemipterids. Pomfrets are mostly targeted by 95 m two-seam trawl. Only one type of cuttlefish trawl viz., 39 m two seam trawl was found in operation. Two types of shrimp trawls made of four and six seams were in operation.

2 Augmenting value and safety of wild and farmed fish of the East Coast through technological approaches

Principal Investigator: Dr. B. Madhusudana Rao

Physicochemical and microbial quality of dried tuna chunks

Boneless tuna chunks were salted with 7 and 12% salt and treated with spice mix (chilli powder -1% (w/w) and turmeric powder-0.5% (w/w) and dried. Moisture content, salt content and water activity of the samples varied from 20-22%, 17-18% and 0.703-0.711. Initial TPC was 3.54 and 3.2 $\log_{10}$ cfu/g, respectively for control and treated sample, which increased to 4.04 and 3.94 $\log_{10}$ cfu/g after two months storage. Counts of total *coliforms*, *faecal coliforms* and *E. coli* were less than 3 MPN/g. Coagulase positive *Staphylococcus* was less than 20 cfu/g immediately after drying. Increase in *Staphylococcus* count was observed in control sample after two months. Yeast and mould count were also higher with control (20 cfu/g) than spice treated sample (3 cfu/g). H_2S forming bacteria and halophiles were less than 3 cfu/g in both the samples after 2 months.



Spice treated and dried Tuna chunks

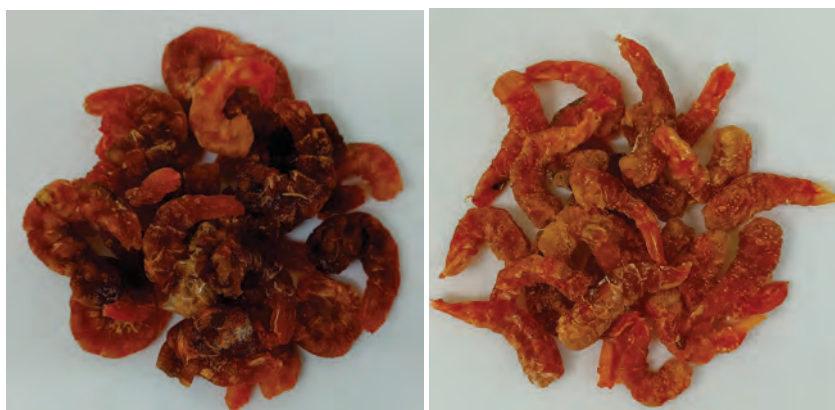


Control -Dried Tuna chunks

Pre-processing protocol for drying peeled shrimp

Standardisation of post-blanch peeling process for dried shrimp: a process for peeling after blanching in brine containing citric acid) was standardized. The redness value of post-peeled shrimp was higher (a^* 24-25) than pre-peeled shrimp (a^* 21-22). The study revealed that peeling shrimp before drying, especially after the blanching process improves the physicochemical properties of dried shrimp.

Effects of post-blanch peeling on storage quality of dried shrimp: The colour, appearance and rehydration properties of post-blanch peeled shrimp were better than pre-blanch peeled shrimp. There were no significant variations between the biochemical and microbial quality parameters of pre-blanch peeled and post-blanch peeled shrimp after 105 days of storage.



Shrimp peeled before blanching

Shrimp peeled after blanching

Effect of herb-spice combination on the quality of dried fish

Brine salted (20% salt) Indian drift fish (*A. indica*) was marinated with 1) ginger-garlic paste in 1:1 ratio @5% of fish weight (T1), 2) ginger-pudina paste (1:2 ratio @5% of fish weight) and dried to a moisture content of approximately 30%. The control sample was rejected due to fungal infestation after 105 days. The TPC and fungal counts of Ginger-garlic and Ginger pudina-treated dried fish were acceptable after 130 days of storage. The microbial counts of ginger-pudina-treated fishes were lower than ginger-garlic-treated fish, but the color and appearance of latter was more acceptable than the former.

Physicochemical quality of dried fish from local markets of Visakhapatnam

Different dried fish samples from 3 local markets ($n=23$) of Visakhapatnam district were analysed for its physical qualities such as moisture, water activity, salt content and acid-insoluble ash. Forty-eight percent of the sample had more than 40% moisture. Fifty-seven percent of samples had more than 1% and above salt content. Among the salted fishes, 27% had 12-15% salt content and 73% had less than 15-17% salt content. The water activity of all samples was less than 0.78, but nearly 50% of the sample showed Water activity (a_w) between 0.73-0.75.

Low moisture fillet from Tilapia by osmo-dehydration technique

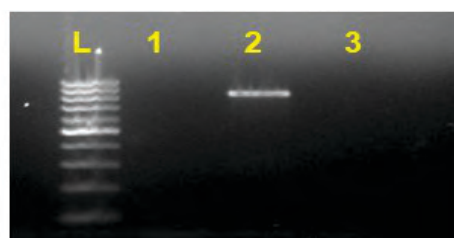
A number of experiments were conducted to reduce the moisture content of tilapia fillets by osmo-dehydration followed by a partial drying technique. Among the different combinations of salt and glycerol used, dip treatment in osmotic solution of 10% salt and 30-40% glycerol was found effective in reducing moisture content. Osmo-dehydration in 10% salt and 40% glycerol solution for 2, 3 and 4 h followed by drying at 40°C for 30 min reduced the moisture content from 83% in raw fish to 55% (4 h treatment followed by drying for 30 min). The treatments reduced water activity from 0.99 to 0.927. Osmo-dehydration in 10% salt and 30% glycerol followed by 1 h drying was able to reduce the moisture content of fillet up to 66%.

Distribution of non-wild type (NWT) isolates of *E. coli* and *Aeromonas spp.*: NWT *E. coli* was relatively higher when tested against Ciprofloxacin (62%), Trimethoprim-Sulfamethoxazole (54%), Enrofloxacin (25%) and Tetracycline (20%). NWT *Aeromonas spp.* were higher against Chloramphenicol (34%), Trimethoprim-Sulfamethoxazole (24%) and Tetracycline (18%). Wild Type (WT) strains of *E. coli* (80%) and *Aeromonas spp.* (82%) appear to be relatively higher in the farmed freshwater fish indicating that majority of the bacterial isolates were intrinsically associated with the aquaculture system.

Antibiotic resistant genes (ARGs) in *E. coli* and *Aeromonas spp.*: The *ampC* gene was detected in all 8 phenotypically ampicillin-resistant *E. coli* isolates. However, out of eighteen β -lactam resistant isolates, five isolates harboured *bla*-TEM and only one isolate reported positive for *bla*CTX-M-gp1. None of the ciprofloxacin-resistant isolates harboured *qnrA* gene. Out of 4 tetracycline-resistant *Aeromonas spp.* isolates, three isolates harbored *tetL* and only one isolate reported positive for *tetE*.



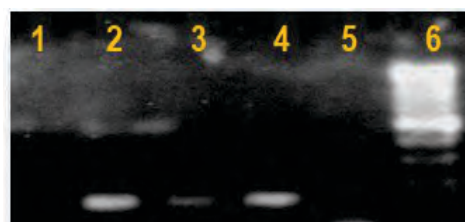
PCR amplification of *ampC* gene (634 bp) in *E. coli*; Lane L: 100 bp ladder; Lane 1: NC, lane 2-8: test isolates



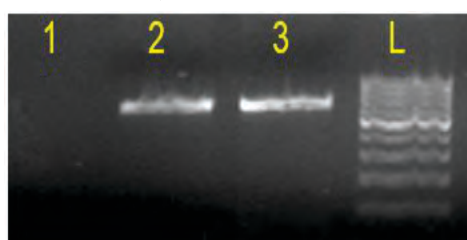
PCR amplification of *sull* gene (822 bp) in *Aeromonas spp.*; Lane L: 100 bp ladder; Lane 1: NC, lane 2-3: test isolates



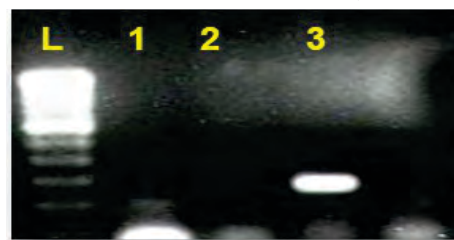
PCR amplification of *bla_{TEM}* gene (800bp) in *E. coli*; Lane L: 100 bp ladder; Lane 1: NC, lane 2-6: test isolates



PCR amplification of *tetL* gene (267bp) in *Aeromonas spp.*; Lane 1: NC, lane 2-5: test isolates; Lane L: 100 bp ladder;



PCR amplification of *bla_{CTX-M-gp1}* gene (688 bp) in *E. coli*; Lane L: 100 bp ladder; Lane 1: NC, lane 2-3: test isolates

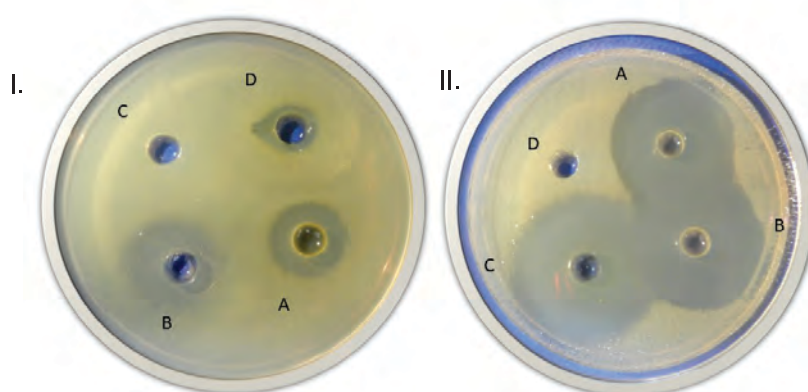


PCR amplification of *tetE* gene (278 bp) in *Aeromonas spp.*; Lane L: 100 bp ladder; Lane 1: NC, lane 2-3: test isolates

Antibiotic resistant genes (ARGs) in *E. coli* and *Aeromonas spp.*

ncidence of *Listeria spp.*, in fish and shellfish of retail markets: A total of 69 fish and shellfish samples namely catla, rohu, mrigal, grass carp, pangasius spp., pacu, shrimp and tilapia procured from four different retail markets of Visakhapatnam were investigated for the presence of *Listeria spp.*, following USDA method. A total of 54 suspected isolates were tested for umbrella motility and all the isolates showed negative for *Listeria spp.*

Antibacterial activity of plant oils on *E. coli* and *Aeromonas spp.*: The antibacterial activity of sixteen plant oils were tested and clove oil, cinnamon oil, thyme oil, tea tree oil showed maximum antibacterial activity against antimicrobial-resistant *E. coli*. Clove oil, peppermint oil, cinnamon oil, thyme oil, tea tree oil showed maximum antibacterial activity against antimicrobial-resistant *Aeromonas spp.*

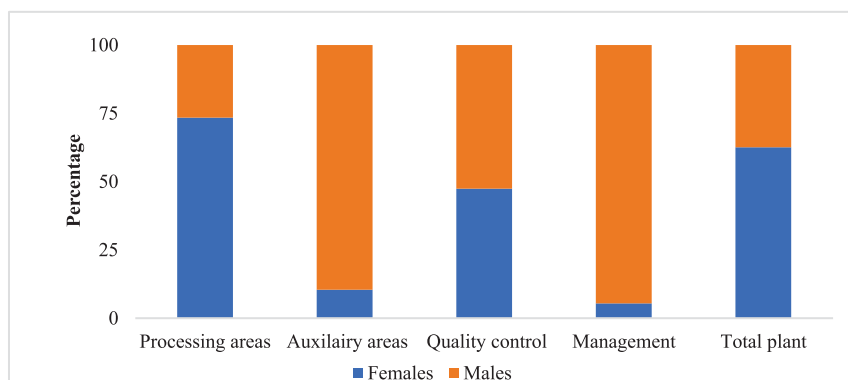


I.) Antibacterial activity of plant essential oils (Eos) against AMR *E. coli* spp.,
A. cinnamon oil, B. Tea tree oil, C. sterile water D: tetracycline (16µg/ml)

II.) Antibacterial activity of plant essential oils (Eos) against AMR *Aeromonas* spp.,
A. cinnamon oil, B. clove oil, C. tetracycline (16µg/ml) sterile water

|| The gender profile of personnel in shrimp processing units of Andhra Pradesh, India

A random survey of 20 shrimp processing units located in Andhra Pradesh, covering 10,051 personnel was undertaken to understand the gender profile within shrimp processing units. Females formed 63% of the total personnel in shrimp processing units. The proportion of females at the top managerial position i.e., CEO or MD, was only 6.5% and none of the plant managers were female.



Gender profile of personnel in shrimp processing units

Enzyme-assisted peeling of white leg shrimp (*Litopenaeus vannamei*, 80 counts): Shrimp (headless) were treated with proteolytic enzymes such as endo protease and exo protease to facilitate the shell loosening prior to peeling. Headless shrimp were treated with proteolytic along with enzyme combination, C: control without any enzyme treatment; T1: endo protease and exo protease (0.25% v/w, 1:1 ratio); T2: endo protease and exo protease (0.1% v/w, 1:1 ratio); T3: endo protease (0.25% v/w); T4: endo protease (0.1% v/w); T5: exo protease (0.25% v/w) and T6: exo protease (0.1% v/w). The proteolytic enzyme treatment effectively improved the peelability of the shrimp. The combination of endo protease and exo protease (at concentrations 0.25% and 0.1% v/w) treatment resulted in the best peeling of shrimp after 15 mins of enzyme maturation. The effect of enzymatic treatment on the extent of denaturation of protein during frozen storage was analyzed by its solubility in water or ionic

solutions. The SSN value of control and enzyme-treated samples decreased significantly after one month of frozen storage, while, values of water-soluble protein decreased. It was found that enzymatic maturation did not affect the spoilage indices like TVBN, TMA, PV and TBARS the shrimp as compared to the control. Though, endo and exo protease (0.25% and 0.1% v/w) treatment resulted in the best peeling of shrimp, the sensory evaluation indicated pigment loss and softness of meat during frozen storage.

3 Fishing technological interventions for sustainable marine ecosystem service along the east coast of India

Principal Investigator: Dr. R. Raghu Prakash

Life cycle assessment of fishing systems of Andhra Pradesh

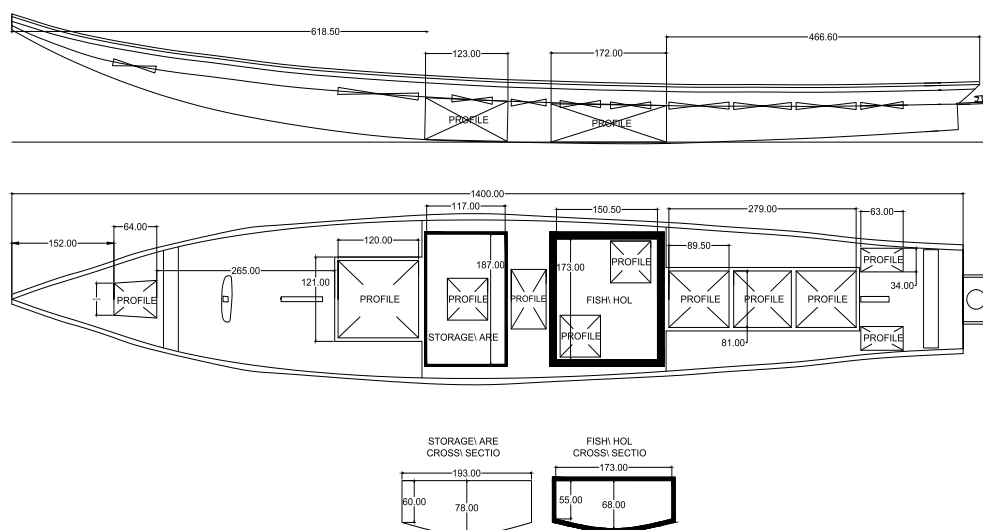
Life cycle assessment of fishing systems in Andhra Pradesh was conducted for trawlers, gill netters, and longliners. The total GWP of 15 m Trawler was 12638.35. The GWP of 15 m wooden trawler emitted 3.16 kg of CO₂ equ. to produce 1 kg of fish (Catch). Total GWP of 15m gillnetter was 10278.35. The total GWP of 15 m longliner was 10065.25. HDPE & nylon multi filament material contributed the maximum to all the environmental factors followed by lead.

Study on structural changes in craft and gears of Andhra Pradesh

The drastic change in changes in the structure of the fishing fleet in terms of size and installed engine horsepower among trawlers, long liners and gillnetters operating from Visakhapatnam Kakinada, Nizampatnam and Machalipatnam were documented. The shift from single mode of fishing to combination systems with minor design modifications like the installation of a gillnet winch and fish hold was observed.

Design development of a hauling winch and guide pulley mechanism

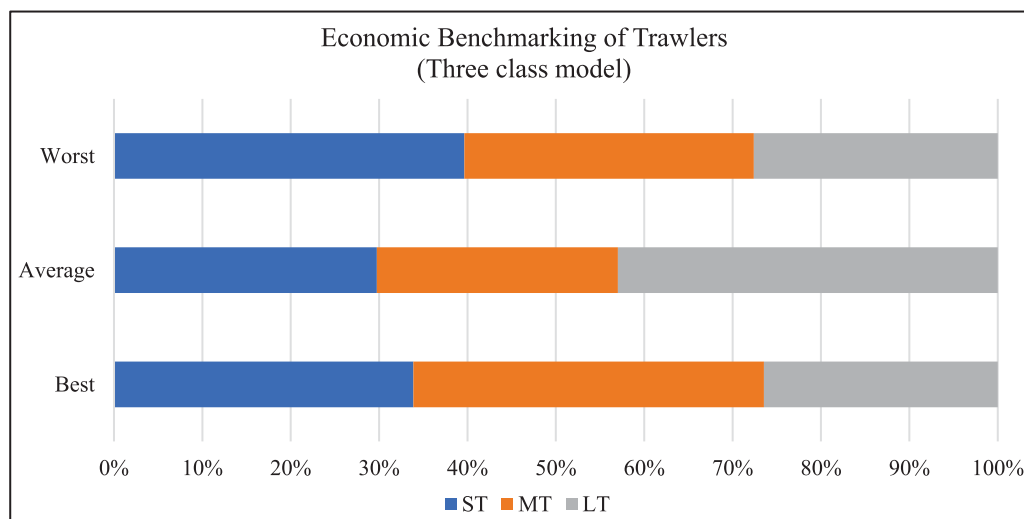
Design modifications for incorporation of a storage facility in form of insulated ice box of dimensions. Designed a hand-operated winch and guide pulley systems for motorized crafts involved in tuna long lining.



Design drawing of an onboard storage facility

Economic evaluation of fishing systems

The over-exploitation of both engine and fuel was observed among small trawlers. The medium trawlers utilized most of the inputs at most and reached the level of over exploitation.

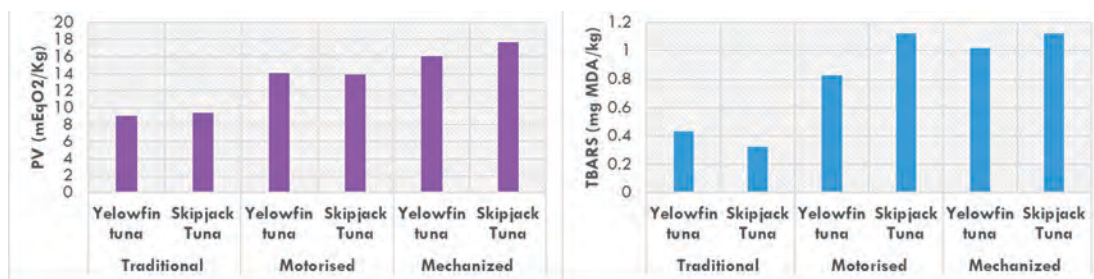


- ✦ The inputs highly exploited were craft (vessel size), gear (weight and mesh size), engine (HP) and fuel crew. Under the large trawlers category, the engine is the only input that is over-utilized
- ✦ The use of other inputs such as gear (weight and mesh size), fuel, and crew showed highly exploitative stage. This over-utilization of inputs resulted in fishing an expensive and uneconomical activity
- ✦ Among the operational costs of trawlers, fuel contributed the maximum (54%) followed by crew (23%)
- ✦ The optimum level of trawlers viz., technical optimum (TOL) and economic optimum (EOL) of the trawlers for the small, medium and large trawlers showed that medium trawlers gained comparatively high with 28% more revenue than the other two vessel categories
- ✦ Economic benchmarking of trawlers in Andhra Pradesh was calculated for the small, medium and large trawlers categories using the three class model (Best-Average-Worst classes)
- ✦ Among the trawlers studied around 41%, 48% and 32% of vessels in the small, medium and large trawlers were found best
- ✦ The economic benchmarking was derived for both numbers of vessels and various vessel categories

Quality evaluation of Tuna caught by different fishing methods

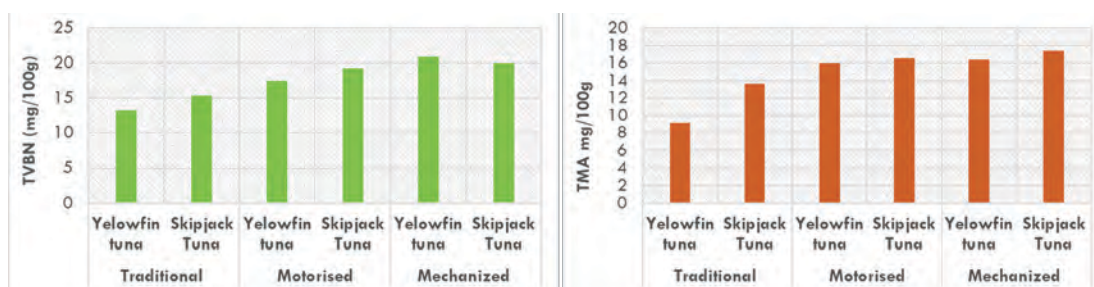
The biochemical quality and histamine formation in yellow fin tuna and skip jack tuna caught by different fishing methods including gill netting and hook and line by long lining and trolling methods operated by traditional as well as mechanized fishing crafts from Visakhapatnam and Pudimaddaka fishing village was analyzed.

The quality difference between yellow fin tuna and skipjack tuna caught by long lining was evaluated. Biochemical analysis such as lipid oxidation parameters – TBARS & PV and volatile amines - TVB-N & TMA of yellow fin tuna and skipjack tuna TVBN, TMA, PV and TBARS are in the ranged of 13.25-20.83 mg/100g, 9.1-17.41 mg/100g, 9.035-15.04m EqO₂/kg and 0.32-1.12 MAD/kg, respectively.



PV

TBARS



TVBN

TMA





Veraval Research Centre

Fertilized egg of Arid catfishes (*Arius dussumieri*)

|| Institute Projects

- ◆ Harvest and post-harvest interventions in marine resources available along Saurashtra coast
- ◆ Safety and quality aspects of fish and fishery products from the Gujarat coast

|| Most Significant Achievements

- ◆ LCMS/MS method developed and standardized for chloramphenicol estimation of in shrimp matrix
- ◆ The pre-treatment conditions for smoking Arid catfishes optimized
- ◆ Multidrug resistant *E.coli* with highest resistance to common antibiotics isolated from fish
- ◆ The extraction protocol for β -chitin from squid pen was optimized for developing a technology

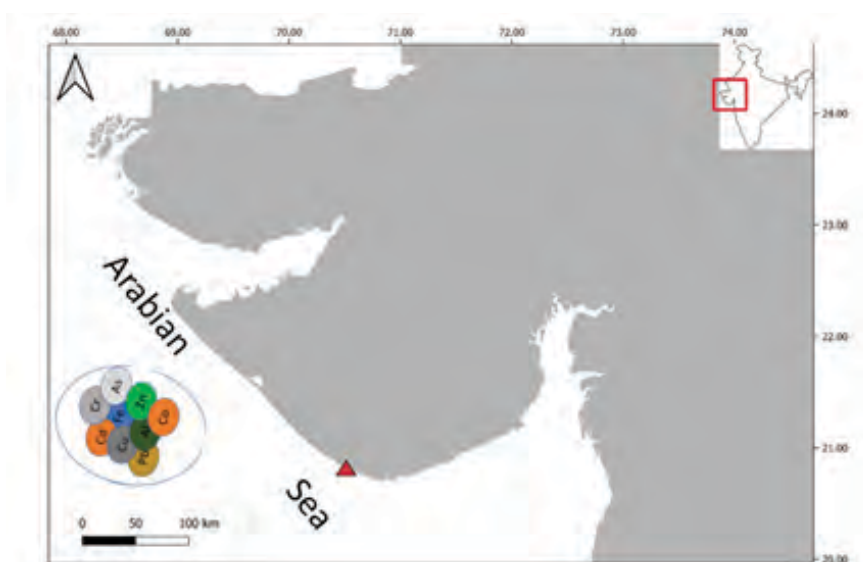
Chief Findings

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

Principal Investigator: Dr. Ashish Kumar Jha

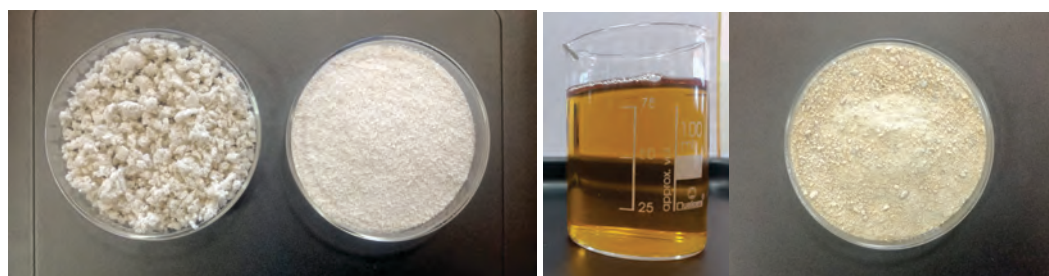
Hazard identification and health risk characterization

The trace elements in shark species were within the maximum permissible limit and a few instances value were exceeding the MPL might be due to the fact that the standards are given on wet-weight basis where as in the present study it is estimated on dry-weight basis and there is no potential risk of metals and trace minerals associated with consumption of the studied sharks from the region.



Characterization of seafood processing waste

Studied and characterized the seafood processing waste (Squid pen) and found that it's a good source of chitin-protein complex. The pen powder constitutes about 61.57 % protein and 28% chitin. Standardized method for extraction of β -chitin from squid pen collected from the seafood processing unit of Saurashtra coast.



Chitin & Chitosan

Caroteno protein & protein powder

Studies on the handline fishing system

Data has been collected from handline fishing from vessel Veraval harbour (16m L_{OA} ; 180 hp engine).

Catch and fuel use data have been collected from the month of September 2022 to February 2023.

Three grouper species viz. *Epinephelus diacanthus*, *E. areolatus* and *E. chlorostigma* formed the major catch.

The length-weight of the major fish caught from different hook sizes was measured for the length-weight analysis and selectivity study.



2 Safety and quality aspects of fish and fishery product from Gujarat coast

Principal Investigator: Dr. Ashish Kumar Jha

|| Isolation of Chloramphenicol

LCMS/MS method developed and standardized for chloramphenicol estimation of in shrimp matrix.

|| Virulence genes associated with *Salmonella* & *L. monocytogenes*

The prevalence of 12 virulence genes associated with *Salmonella* (n=94) isolated from seafood were studied and confirmed based on biochemical tests and the presence of *invA* gene. The study carried out for the detection of virulent genes namely *inlA*, *inlC*, *inlJ*, *PicA*, *PrfA*, *hlyA* and *iap*, in the isolates of *L. monocytogenes* and found all the genes are present in the 5 isolates of *L. monocytogenes* isolated from fish.

|| *E. coli* virulence genes in ice samples

About 6% of the ice samples analysed showed the presence of *E. coli* virulence genes such as *stx1*, *stx2*, *eaeA* and *hlyA*.

|| Multidrug resistance of *E. coli* isolates

E. coli isolates showed multidrug resistance (36%), highest resistance to ampicillin (58.44%) ciprofloxacin (55.19%), cefotaxime (46.75%) and tetracycline (40.25%).

|| Development of fortified ready-to-eat chikki

Protocol standardized for the formulation of ready-to-eat chikki fortified with collagen peptide (2%) and Vit B12(0.1 mg/100g). The product was nutritionally superior and organoleptically acceptable. The nutrient composition showed an average total protein of 15g/100g and energy of 537.52 Kcal/100g per serving of the product has been observed.

|| Effect of pre-treatments on the smoking quality of Ariid catfishes

Studied the effect of different pre-treatments on the smoking quality of Ariid catfishes (*Arius dussumieri*). Pre-treatment over-saturated brine for 4 hours followed by smoking at 70°C for 3 hours and drying at 50°C for 16 hours was found to be the optimum condition for smoking of Ariid catfishes. The smoke-dried product indicated high protein, lipid and mineral content.





Mumbai Research Centre

Blood clam (*Anadara granosa*)

||| Institute Projects

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

||| Most Significant Achievements

- ◆ Orange peel extract showed a marginal extension of shelf life in the case of Rainbow trout.
- ◆ Value addition of *Anadara granosa* (Blood clam) regionally termed as '*Khube*' was carried out and is ready for commercialisation

|| Chief Findings

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

Principal Investigator: Dr. Asha K. K.

|| Intervention in the harvest sector

Marine stretch (Mumbai, Thane, Palghar, and Raigad) and inland areas (three reservoirs in Thane, Raigad, Sholapur, and Ahmednagar) were selected for documenting the harvesting technologies along with problems that exist in respective ecosystems concerning fishing technologies.

PA monofilament gill nets and locally available bamboo traps were common in reservoirs and dolnets (42%), trawls (35%), seines (8%), and others including purse seines, gill nets in the marine catch in Mumbai, Thane, Palghar and Raigad districts of Maharashtra.

Plastic pollution from abandoned, lost, and discarded fishing gear was recorded as the biggest issue prevailing in the Mumbai region.

|| Utilization & effect of the plant-based extract on various farm-based fish/crustacean meat quality

Orange Peel Extract (OPE) was prepared and used for the study. A sufficient quantity of orange peel was collected from the juice center at Vashi and dried at 50°C. The peel was then collected and ground well into powder, which is used for the preparation of extract. Rainbow trout were collected, filleted and treated with different compounds viz., Orange peel extract, BHT and Control group. Treated fillets were stored under chilled and refrigerated conditions to study the shelf life. Proximate composition and other biochemical parameters were studied throughout the storage period. Various biochemical parameters were analysed during the storage period. It was observed an extension of two days for the treatment when compared with control under chilled storage and refrigerated condition.

|| Storage study of OPE & BHT treated coated Nobashi

Litopenaeus vannamei (Pacific white shrimp) was collected for the preparation of coated Nobashi to study its shelf life after treating it with various plant-based extracts under different storage conditions. The prepared Nobashi was treated with Orange Peel Extract (OPE) and BHT followed by battering and breading and finally stored under chilled conditions to study the storage parameters. It was observed that the treated sample has got a shelf life of 5 days under chilled storage conditions.

|| Recipe standardization of Khube Chutney powder

Anadara granosa (Blood clam) regionally termed as 'Khube' is a locally available clam species in the region of Vashi, Maharashtra. As a part of value addition in clam products, Khube Chutney powder was standardized by conducting sensory analysis. The clams were procured, cleaned, and boiled until its shell got opened. The meat was separated and dried in an electric dryer at 55°C. The dried clams were crushed and included as the main ingredient. Other ingredients such as bengal gram, black gram, coriander leaves, dry red chilly, curry leaves, coconut, tamarind, crushed clam and salt. As per the suggestion of sensory panelists necessary modifications were made and the recipe was standardized. As this clam species are well known for its high iron content, this product can be recommended for its nutritional benefits.

|| Preparation of Ready to Cook (RTC) clam product

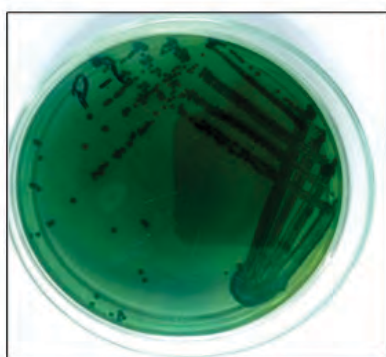
The blood clam was cleaned thoroughly and subjected to steaming. The meat was removed from the shell and subjected to various treatments for the preparation Ready to Cook products. Two popular marinated Recipes in Maharashtra, viz Kolhapuri Recipe and Malvani Recipe were standardized for the preparation of RTC clam meat. The whole batch was divided into three lots, control group (C), Kolhapuri (T1) and Malvani (T2). Initial proximate composition, and biochemical and microbiological quality analysis of the raw clam were carried. Once the samples were marinated the samples were drawn regularly the pH, drip loss, proximate, biochemical, texture, color and microbiological analysis. The samples were then packed and stored at 5°C to study the shelf life of RTC products on the 3rd day of storage, sufficient samples were drawn from the respective lots to study the quality changes on storage. Storage study was completed where in control group spoiled by the 15th day whereas the Kolhapuri masala group spoiled by the 16th day and the Malvani masala treated group spoiled by the 18th day of storage.

|| Microbiological quality assessment of online fish and fisheries products in Maharashtra

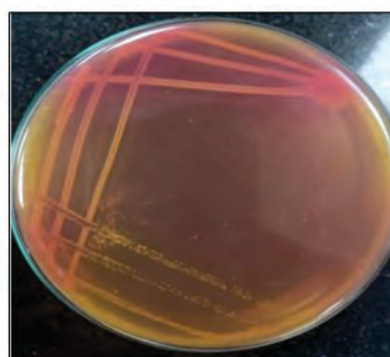
Analysis of Microbial quality of products purchased online from a few firms. There are some quality issues that need to be taken up with the parties for the benefit of consumers at large.

|| A study on labour migration in the seafood processing sector of Maharashtra

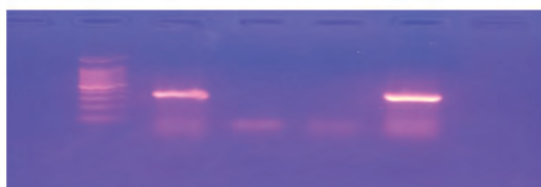
Baseline survey on labour migration in seafood processing industries of Maharashtra is in progress. For preliminary information, key informants (Quality Control In-charge) from 6 different units and it was found that categories and number of workers vary from unit to unit depending on the production capacity, approval of the unit, processing activities undertaken and product processed. General migration and employment pattern of the floor-level workforce from six seafood processing units have been recorded.



Green colony of *V. Parahaemolyticus*
on TCBS Agar plate



Yellow colony of *Staphylococcus aureus*
on MSA (Mannitol salt Plate)



368 bp (TOXR) gene





Externally Funded Research Projects

||| International Projects

- ◆ Establishing Value Chain for Coastal and Small Indigenous Freshwater Fish Species: Towards Nutritional Security for Rural Population
- ◆ DOSA - Diagnostics for One Health and User-Driven Solutions for AMR
- ◆ Does antimicrobial resistance (AMR) in livestock contribute to AMR in people in NE India? An interdisciplinary study investigating antibiotic use, drivers of AMR, and transmission dynamics
- ◆ Future Refrigeration India: INDEE+
- ◆ Food, gender, enterprise: Leveraging interdisciplinary for sustainable small-scale fisheries

III National Projects

- ◆ Agribusiness Incubation (ABI-NAIF)
- ◆ Global Warming Potential (GWP) of mechanized fishing methods of India and mitigation strategies: Analysis using Life Cycle Assessment (LCA)- Data Envelopment Analysis (DEA) approach
- ◆ Biomodulation of marine biopolymers for the preparation of biomaterials of healthcare importance
- ◆ All India Network Project on Fish Health
- ◆ Network project on Production systems, Agribusiness and Institutions
- ◆ Green clean and affordable energy for fishermen community: Development of a multipurpose solar thermal conversion system with gasifier/biomass heater backup
- ◆ Development of a foldable smart live fish transportation system for distant trade of table fish
- ◆ FSSAI-National Reference Laboratory
- ◆ NETSCoFAN-Food Testing Group
- ◆ Development of Portable Fish Freshness Assessment Sensor
- ◆ Design and development of hot air-assisted continuous infrared drying system for high-value fish and fishery products
- ◆ The pilot-scale implementation of Smart Packing Technology: Fish freshness indicator at field level to enhance domestic fish consumption
- ◆ The pilot-scale demonstration of seaweed-based feed production for fish and shrimp
- ◆ Replacement of Kerosene OBM with experimental inboard/Outboard diesel propulsion in small-scale fishing boats of Kerala
- ◆ Marine Fishery in Kerala- A study on evolution of policy, cost and earnings of fishing units and income of fisher households
- ◆ Marine Mammal Stock Assessments in India
- ◆ National Surveillance Programme for Aquatic Animal Diseases (NSPAAD)
- ◆ A detailed Foodomics study for food authentication and exploration of nutraceutical potential
- ◆ Deployment and maintenance of Wave Rider Buoy off Veraval and development of jellyfish and sardine advisories along the West coast
- ◆ Fine tuning of CIFT-TED for adoption in the trawl fisheries for the certification of marine shrimp harvested from India
- ◆ Developing of biorefinery workflow for high-value nutraceuticals from seaweed by Green Chemistry approach
- ◆ Matrix-specific phage formulations for the bio-control of enterotoxigenic Methicillin sensitive and resistant Staphylococcus aureus of safety concern
- ◆ Transforming Agri-food Systems in South Asia (TAFSSA)
- ◆ Improved coconut wood canoes for the small-scale fishing sector of the southeast coast of India
- ◆ Screening lytic phages from diverse marine and aquatic niche for controlling bacterial pathogens associated with aquaculture and post-harvest fish quality

Chief Findings

1 Establishing Value Chain for Coastal and Small Indigenous Freshwater Fish Species: Towards Nutritional Security for Rural Population

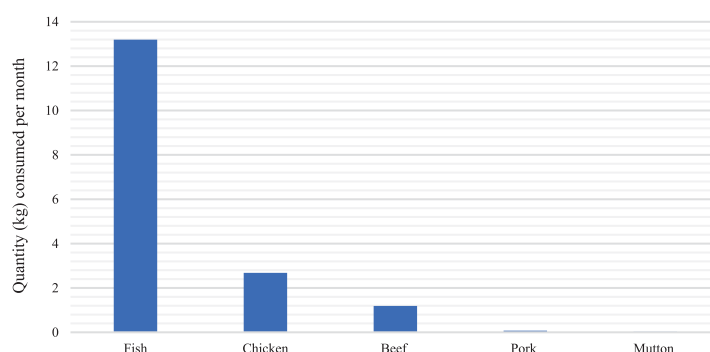
Principal Investigator: Dr. Suseela Mathew

Funding Agency: WorldFish

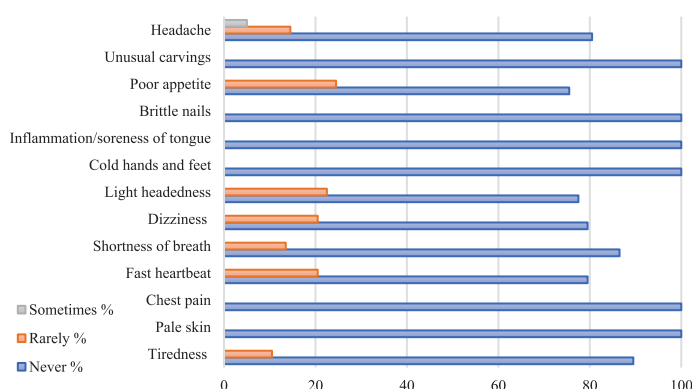
Total Budget: ₹110.00 lakhs

Development of fish-based foods in order to alleviate malnutrition in women and children

- ◆ Nutrient profiling and quality evaluation of fish-based products, developed under the project were completed
- ◆ The products increased growth rate in animal studies (Wistar albino rats) signifying the importance of the diet for healthy nutrition
- ◆ Studies on the fish consumption pattern in selected states of India viz Kerala, Karnataka, and Odisha indicated consumption of about 13 kg per month
- ◆ Intervention studies were conducted with the fish-based product-dry fish powder, in tribal districts of Odisha and Karnataka for a period of one month in Anganwaadis through entrepreneurs



Food Consumption Pattern in Malappuram





Product accessibility testing, ICAR-NRRI, Cuttack, Awareness talk on "Inclusion of fish in daily diet" by Dr. A.K. Mohanty, Preparation of Fish sausage at ICAR-CIFT

- ◆ Training-cum-Demonstration programme was conducted on the development of fish-based products at Cuttack, Odisha
- ◆ The consumption behaviour of the respondents revealed that the majority consumed fish once in two days and preferred their own liking while purchasing the fish. The dry fish consumption among the respondents indicated that more than one-third of the population is willing to include dry fish in their diet and consumed dry fish mostly 1-2 times a week. The respondents mostly preferred fish from the same region. The monthly consumption of fish and other meat was recorded and found that the respondents purchased the maximum quantity of fish followed by chicken
- ◆ Health profile of the respondents. The health profile of the respondents with reference to the iron deficiency study indicated that only a small proportion of the study population experienced tiredness, fast heartbeat, and shortness of breath

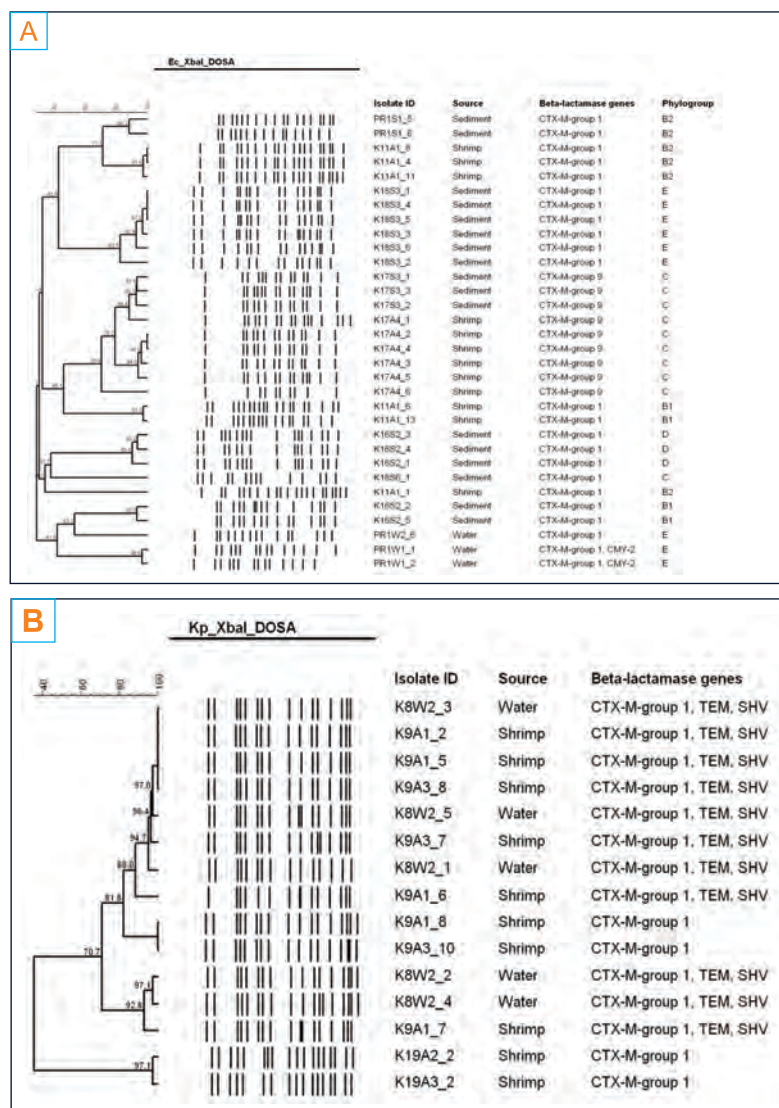
2 Diagnostics for One Health and user Driven Solutions for AMR (DOSA)

Principal Investigator: Dr. G.K. Sivaraman

Funding Agency: ESRC, UK & DBT

Total Budget: ₹98.34 lakhs

- ◆ Shrimp, water, and sediment samples from shrimp farms in Kerala culturing mainly *Litopenaeus vannamei* were screened in the study.
- ◆ The findings of our baseline assessment of AMR in the aquaculture farms revealed various genotypes of three major human pathogens namely, the extended-spectrum beta-lactamase (ESBL)-producing *Escherichia coli* & *Klebsiella pneumoniae*, and methicillin-resistant *staphylococci*.
- ◆ The predominant ESBL determinant among the isolates was blaCTX-M, with IncF and IncHI1 being the plasmid types carrying these genes. The isolates also harboured resistance genes such as tetA and tetB(tetracycline); sul1 and sul2 (trimethoprim-sulfamethoxazole); qnrB, qnrS, qepA, oqxB and aac(6')-Ib-cr (fluoroquinolones); and strA, strB, and aadA1 (aminoglycosides).
- ◆ Enterobacteriaceae AMR strains were screened for plasmid typing by PCR- based replicon typing (PBRT) and found a predominance of IncFIA & IncFIB plasmids in ESBL-producing *E.*



Dendrograms showing cluster analyses of XbaI-PFGE patterns of the (A) 32 ESBL-*E. coli* isolates and (B) ESBL-*K. pneumoniae* isolates recovered from shrimp aquaculture farms

coli and IncHI1 replicon type was in *K. pneumoniae* strains. This perhaps indicates the role of IncF plasmids in disseminating CTX-M-15 across different settings. IncHI1, the plasmid type found in the *K. pneumoniae* isolates, generally has a broad host range and has been reported in various environmental Gram-negative species.

- Concerning the *staphylococcal* isolates, multi-drug resistance was evident in the majority of isolates, with resistance observed mainly towards oxacillin, erythromycin, norfloxacin, and trimethoprim-sulfamethoxazole. Comprehensive genotyping of the methicillin-resistant *Staphylococcus aureus* (MRSA) isolates revealed a high prevalence of ST772-t345-SCCmec V, a community-associated epidemic clone. The isolates also carried many toxins (pvl, sea, seg, and sei) and biofilm-associated (ica, sdr, fib, fnbpA, clfB, and eno) genes. Whole-genome sequencing of a subset (n=12) of these isolates revealed a repertoire of resistance and virulence-associated loci, signifying a major environmental pool of these genes.

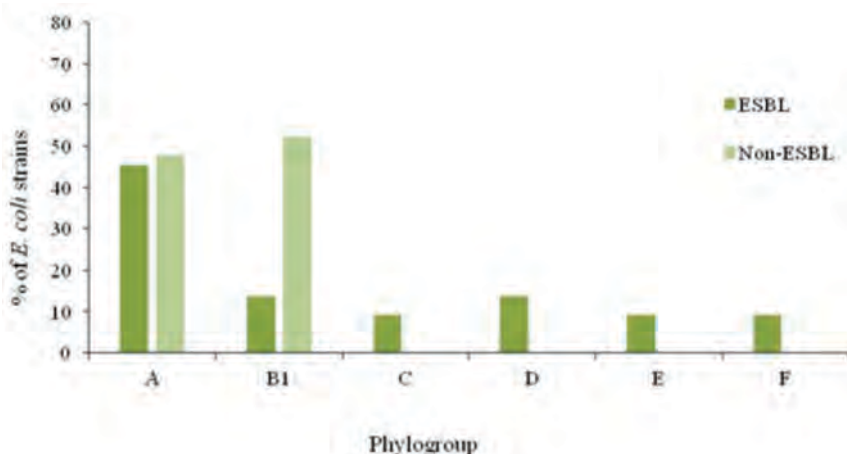
3 Does antimicrobial resistance (AMR) in livestock contribute to AMR in people in NE India? An interdisciplinary study investigating antibiotic use, drivers of AMR, and transmission dynamics

Principal Investigator: Dr. G. K. Sivaraman

Funding Agency: ESRC, UK & DBT

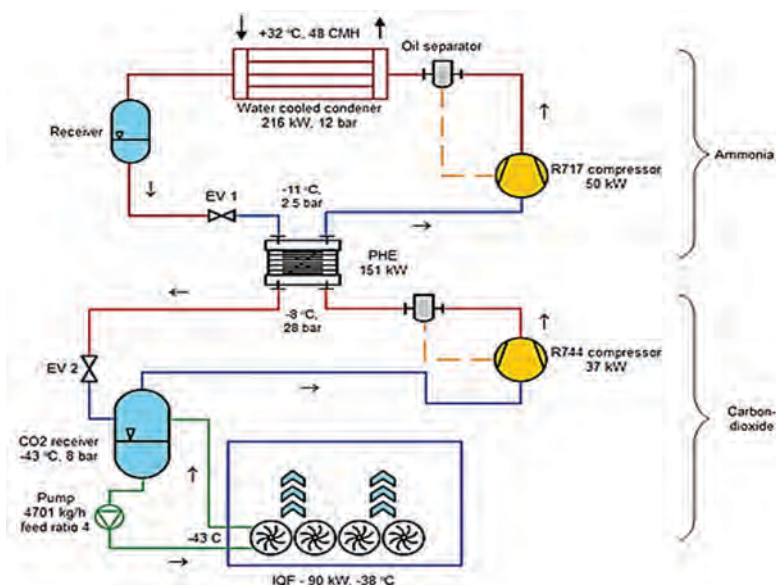
Total Budget: ₹74.30 lakhs

- ◆ The objectives of the current project were to conduct a systematic surveillance study to understand the prevalence of antimicrobial resistance (AMR) and to perform whole genome sequencing (WGS) of selected isolates belonging to both Gram-negative and Gram-positive bacteria.
- ◆ Identified unique MLST sequences of the 23 numbers of MRSA strains by pubmlst (public databases for molecular typing and microbial genome diversity) as ST 88 and is the first report from India from the retail fish market in Assam. The high prevalence of a single MLST clone, ST88, suggests that this lineage has a unique survival advantage in this fishery environment.



Phylogrouping of *E. coli* by Clermont's method

- ◆ Genomic characterization of *Klebsiella quasipneumoniae* sub sp. *simili pneumoniae* (India 238 strain) isolated from a retail market fish. The identity of the isolate was confirmed by whole-genome sequencing. Downstream analysis of the annotated genome acknowledged the presence of antimicrobial resistance genes (ARGs) such as CTXM-15 type, OKP-B-1, fosA5, and squab.
- ◆ Currently 140 complete-genome data sequences have been submitted to NCBI. 80 bacterial cultures resistant to clinically relevant antibiotics have been maintained at National Centre for Microbial Resource (NCMR), National Centre for Cell Science (NCCS), Pune.
- ◆ Dominance of *E. coli* over other Enterobacterales suggests the possibility of contamination from agricultural/industrial/urban wastewater. CTX-M-gp-1, with the CTX-M-15 variant, was the most widely circulating beta-lactamase gene detected. Other ESBL genes identified included blaTEM, blaSHV, and blaOXA-1-like. A few *E. coli* and *Klebsiella* sp. harboured plasmid-mediated AmpC beta-lactamase genes. The majority of the *E. coli* were assigned to low-virulence phylogroup B1 (40%, 33%) and A (30, 47%), while (8%, 14%) of them belonged to pathogenic phylogroup D. Concerning the plasmid types, IncFI was the most common in the isolates studied, with a countable representation of A/C, P, X, Y, and I1-Iy plasmid types.



The proposed schematic of the CO₂-NH₃ cascade refrigeration system

4 FRI-INDEE+ Indo-Norwegian project

Principal Investigator: Dr. George Ninan

Funding Agency: NTNU, Norway

Total Budget: ₹ 86.00 lakhs

Identification of demo site (seafood industry) for installation of cascade CO₂-NH₃ refrigeration system: Bell Foods Exim Private Limited is an ISO 2200-2005 Certified Company registered and incorporated in India as per the Companies Act 1956 with its head office and plant located at Thoppumpady, Ernakulam, Kerala, India. The Parent Company, M/s. Bell Foods, was founded in the year 1968, one of the first companies, set up in Cochin to process seafood for export to foreign countries. A 150-kW ammonia-CO₂ cascade refrigeration system operating at -42°C evaporating temperature for an IQF tunnel freezer will be installed in this seafood processing industry.

Stakeholder meeting: INDEE+ Norway Team Demo site visited the demo site for finalizing the technical requirements. Prof. Armin (NTNU) and Dr. Kristina (SINTEF O) visited Cochin on 13.12.2022 for the meeting. Initially, the personnel from the NTNU had interactive meetings with the end-user, Mr. Viju, of M/s Bellfoods, along with the vendors. The scientist and project staff of the FRI-INDEE+ project joined in the stakeholder meeting.



Meeting with the Bellfoods seafood industry owner Mr.Viju and vendors

- ◆ Educational training on the CO₂ transcritical unit at CIFT: CIFT Cochin received a condensing unit from NTNU-Norway for developing a training unit for the CO₂ refrigeration system. The CO₂ condenser unit received has a very simple configuration and is designed to operate under cold climatic conditions. The conventional CO₂ condensing unit will be modified to a transcritical CO₂ training unit.



5 Food, gender, enterprise: leveraging interdisciplinary for sustainable small-scale fisheries

Principal Investigator: Dr. Nikita Gopal

Funding Agency: Royal Academy of Engineering

Total Budget: ₹39.41 lakhs

- ◆ The project combines social science and engineering methodologies to encapsulate the challenges of biodiversity loss, declining catches and extreme climate events in small-scale fisheries of Kerala, India.
- ◆ The study location is Chellanam, a major small-scale fishing village of Kerala and the fishery is the ring seine fishery targeting sardines, mackerel, and anchovies. Mixed methodologies including personal interviews and group workshops using various participatory rural appraisal (PRA) tools have been used in the study targeting different age groups and gender.
- ◆ The study revealed that climate change and biodiversity loss are the major challenges in fishing. In addition, an increase in fuel prices, reduced fish prices and lack of other forms of support like subsidies and financial assistance are pushing out men from the fish harvesting sector. Traditional knowledge on when and where to fish is no longer adequate and species availability has undergone changes.
- ◆ Gender-based analysis revealed that a notable proportion of women were employed in the secondary sector of marine fisheries for both subsistence and additional income. Women contributed to small-scale and artisanal fisheries through post-harvesting activities such as fish drying, pre-processing (peeling), and marketing. Over time, there has been a gradual decline in women labour in the sector.
- ◆ The major factors that significantly contributed to the gradual decline of especially young women workforce in this sector were identified as the educational and economic progress of the fishing community, changes in the perspective of social status, lack of interest, lower wages, drudgery, lack of financial assistance and inadequate technical assistance. Marketing, health, lower access to landing centers, and climate-related changes were identified as factors.

National Projects

6 Agribusiness Incubation (ABI-NAIF)

Principal Investigator: Dr. George Ninan

Funding Agency: ICAR

Total Budget: ₹32.00 lakhs

Details given in page: 160-167

7 Global Warming Potential (GWP) of mechanized fishing methods of India and mitigation strategies: Analysis using Life Cycle Assessment (LCA)-Data Envelopment Analysis (DEA) approach

Principal Investigator: Dr. Leela Edwin

Funding Agency: National Innovations on Climate Resilient Agriculture (ICAR)

Total Budget: 147.20 lakhs

- ◆ Twenty longliner cum gillnetters (14-20m) from Tamil Nadu based at Thengapattanam fishing harbour and Cochin fisheries harbour of Kerala, ten purse seiners from Betul and Vasco of Goa (15-22m), and twelve trawlers from Veraval of Gujarat (14-18m) were selected for the study.
- ◆ Operational details were collected after each fishing trip from selected vessels operated from different locations for LCA and DEA analysis. Details of materials used for the construction of the fishing vessel including the hull, engine, propeller, shaft, sheathing material, and paint used were collected one time. Details of the engine and its horsepower, types, and size of fishing gear, details of fishing operations including the number of fishing days in a year, and the fuel used (diesel, petrol, kerosene, and lubrication oil) were collected.
- ◆ The LCA analysis of one energy-efficient fishing vessel designed by ICAR-CIFT and constructed under the Blue Revolution Scheme was conducted. The GWP of a commercial steel fishing vessel is 106790 kg Co₂ eq. while the GWP of the blue revolution scheme steel fishing vessel is 99434 kg Co₂ eq. The GWP analysis of the blue revolution scheme steel fishing vessel shows 6.8% less kg Co₂ eq. than commercial steel fishing vessels. The construction steel contributed the maximum to GWP compared to other inventories used in the construction process of these vessels.

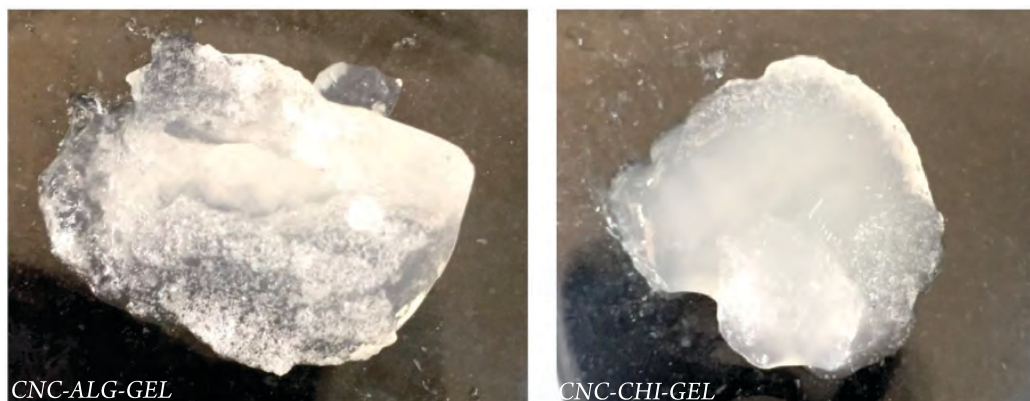


Distribution of FRP boats to Fishers



CIFT-FRP Pedal Fishing boat

- ◆ FRP boats for artisanal fishermen: Three Fiberglass reinforced plastic boats (FRP) were constructed and arrangements were made with the Paravur Scheduled Caste-Scheduled Tribe Service Cooperative Society for the distribution of the same to selected artisanal fishermen. One FRP pedal fishing boat was constructed and webbing materials were handed over to Peechi SC/ST Reservoir Fisheries Co-operative Society, Kerala for small-scale gillnetting in reservoirs. Distributed fishing nets to Peechi SC/ST Reservoir Fisheries Co-operative Society, Kerala for small-scale fisheries in reservoirs.
- ◆ The project was concluded and the final report submitted to the funding agency



Biomaterial-based hydrogels reinforced with cellulose nanocrystals

8 ICAR National Fellow Project - Biomodulation of marine biopolymers for the preparation of biomaterials of healthcare importance

Principal Investigator: Dr. R. Anandan

Funding Agency: ICAR

Total Budget: ₹57.00 lakh

- ◆ Development of biomaterial-based hydrogels reinforced with cellulose nanocrystals: The biopolymer-based hydrogels reinforced with CNC were synthesized and electrostatic chemical attractions, crosslinking of zinc ions, and inter-molecular interactions were involved between CNC and, alginate, chitosan, and gelatin used for the preparation of the hydrogels. The surface charge modification and the reinforcement of CNC enhanced the crystallinity and stability against degradation. Cytotoxicity studies in L929 cell lines confirmed its biocompatible nature for applications in tissue engineering, drug delivery and biomedical fields. Hydrogels reinforced with CNC enabled effective, cell adhesion, growth, and proliferation as evidenced.
- ◆ Bilayer Chitosan-Alginate-Poly Vinyl Alcohol scaffold with wound healing ability: Bilayer Chitosan-Alginate-Poly Vinyl Alcohol scaffold with was prepared and was found to be biocompatible and exhibited wound healing ability. A bilayer scaffold containing chitosan, Alginate, and Polyvinyl alcohol has been fabricated by freeze-drying method. The prepared scaffold was porous as confirmed by the surface images of the alginate-chitosan side of the bilayer scaffold by SEM. Enhanced mechanical properties were exhibited by the bilayer scaffold due to the presence of PVA.
- ◆ Preparation of rhamnolipid nanoparticles grafted chitosan and alginate: The protocols for the production of rhamnolipid nanoparticles grafted with chitosan and alginate were optimized. These nanoparticles are found to possess superior physicochemical, rheological, and biocompatibility properties, indicating suitability for functional food formulation in medical and nutraceutical fields.
- ◆ Preparation of Nano chitosan-based films incorporated with chlorhexidine: Characterization of the morphology and microstructures formation mechanisms have demonstrated that nano chitosan film reinforced with chlorhexidine possesses excellent physio-mechanical, thermal,

surface active and biological properties, which are essentially required for periodontal and wound healing applications. The biodegradable nature of chlorhexidine-grafted nano chitosan film warrants that it could be a potential alternative for commercially available non-degradable synthetic polymeric films in the biomedical sector. Biocompatibility investigations in male wistar rats have their non-toxic nature and tissue regeneration capability.



*Chlorhexidine grafted
Nanochitosan film*



*Biocompatibility investigations of
Chlorhexidine grafted Nanochitosan
film in male wistar rats*

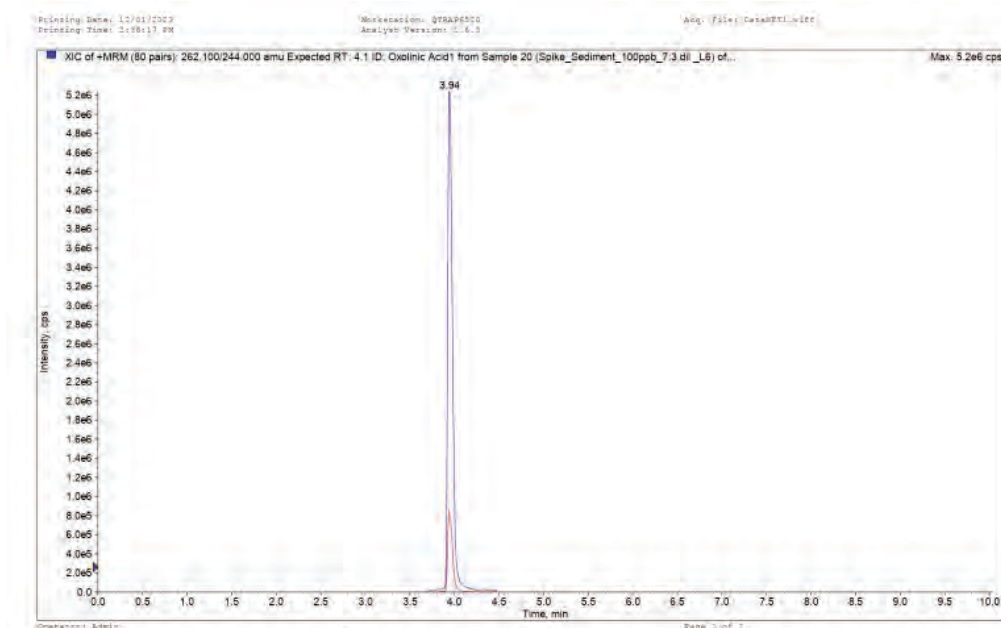
9 All India Network Project on Fish Health

Principal Investigator: Dr. Satyen Kumar Panda

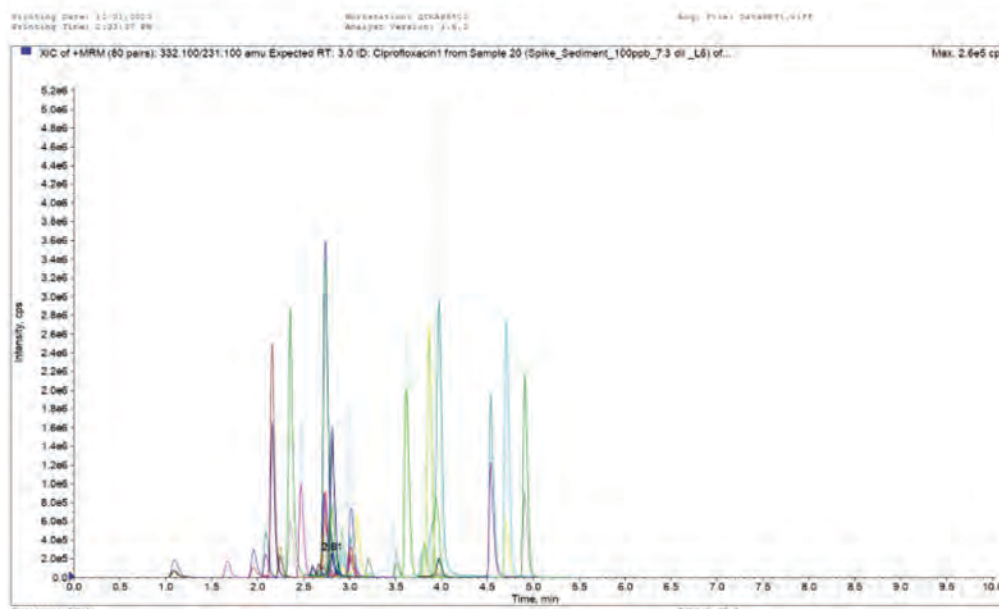
Funding Agency: ICAR

Total Budget: ₹85.50 lakhs

- ◆ Method validation for the estimation of Florfenicol, Florfenicol amine, Oxolinic acid, Enrofloxacin, and ciprofloxacin was carried out using LC/MS/MS.



*Linearity and individual chromatogram for one analyte Oxolinic acid from
the group of quinolones*



Extracted ion chromatogram (XIC) of multi-residue analysis of spiked antibiotics at 100 µg/kg concentration from sediment samples

- ◆ Method for antibiotic residues from sediment samples: A method was developed for the determination of antibiotic residues from sediment samples using Liquid Chromatography QTRAP Mass Spectrometry. The extraction and analytical method for the determination of 38 antibiotic residues from sediment samples using Liquid Chromatography QTRAP Mass Spectrometry was optimized. The antibiotic compounds include 14 Sulfonamides, 10 quinolones and fluoroquinolones, Albendazole, and its 3 metabolites, 4 tetracycline and its 3 epimers, and 3 beta-lactams.
- ◆ Withdrawal and pharmacokinetic analysis of florfenicol and its amine: Different antibiotic drug residues viz., florfenicol and its amine, Emamectin, Oxytetracycline Enrofloxacin (as the sum of enrofloxacin and ciprofloxacin), and Oxolinic acid in fish tissue, gill, bile, plasma, intestine, liver, and kidney portions were extracted and analyzed using 4000 QTRAP mass spectrometry. The LC-MS/MS analysis of different drug residues in spiked samples showed good linearity with an accuracy of 90- 110 % and a correlation coefficient (r) of 0.99. The experimental analysis focussed on withdrawal and pharmacokinetic analysis of florfenicol and its amine (FFC) in different species like *Pangasianodon hypophthalmus*, Rainbow trout, *Trachinotus blochii*, *Oreochromis niloticus*, etc. A total number of 1500 treated samples including internal organs were extracted and analyzed in the study. The samples were supplied by the different partnering institutes in the project.

10 Network project on a Production system, Agribusiness and Institutions

Principal Investigator: Dr. Suresh A.

Funding Agency: ICAR

Total Budget: ₹1.09 lakh

- ◆ The objective was to estimate the impact of important fisheries technologies in the realm of harvest and post-harvest of fisheries. A survey schedule was prepared to estimate the adoption of good drying practices in the case of fish drying and its economic impact. Using the survey schedule, primary data is being collected from 6 locations- Andhra Pradesh (Vizag), Gujarat (Veravel), Kerala (Cochin), Maharashtra (Mumbai), Puducherry and Tamil Nadu. The data are being collected for analysis.

11 Green, clean and affordable energy for fishermen Community: Development of a multipurpose solar thermal conversion system with gasifier/biomass heater backup

Principal Investigator: Dr. Murali S.

Funding Agency: DST, GoI

Total Budget: ₹24.71 lakhs

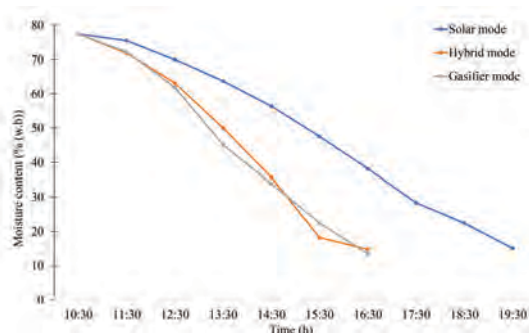
- Design and development of a multipurpose solar thermal conversion system with a gasifier heat backup: As per the design consideration, to dry 50 kg of shrimp, the amount of water to be removed was 35.3 kg; the heat energy requirement was 83661 kJ; the volumetric airflow rate was 598 m³/h; the mass flow rate of air was 718 kg/h; solar collector area required was 8 m² or 100 evacuated tubes with the solar manifold; electrical backup was 3.87 kW; biomass gasifier of 20 kg of coconut shell loading; insulated water storage tank capacity is 300 liters. The drying chamber dimensions were optimized as per the requirement.



Solar-gasifier hybrid dryer

III Performance evaluation of solar-gasifier hybrid dryer

Moisture content, drying rate, and drying efficiency: Shrimp from the initial moisture of 77.50% was lowered to the final moisture of 15.09 %, 13.46%, and 14.77% (w.b.) under the solar, gasifier, and hybrid mode, respectively. It was observed that the reduction in the moisture level of shrimp was much quicker for the first 3 h and then slowly diminished with time. The drying process took only 6 h to obtain the desired moisture level under gasifier and hybrid mode whereas it required 9 h for the solar mode of drying. The rate of moisture evaporation was significantly influenced by the time and moisture level of shrimp in all three modes of drying. The average drying rate of the solar, gasifier, and hybrid modes of drying was 0.33 g/g.dm, 0.46 g/g.dm, and 0.47 g/g.dm, respectively. The drying efficiencies obtained against time in all three modes of drying are presented in Figure. The peak drying efficiency of 24.74%, 42.22%, and 73.24% was obtained for solar mode, gasifier mode, and hybrid mode of shrimp drying at 13:00 h.



Moisture content against time plot for shrimp drying rate against time

III Quality analysis of the dried shrimp samples under each drying mode

Shrinkage percentage and Rehydration ratio: The percentage of shrinkage observed under the solar, gasifier, and hybrid mode were 19.95, 25.45, and 20.71 %, respectively. The reason for a lower percentage of shrinkage for the solar-dried sample was due to the slow removal of moisture during the drying process.



a) Raw shrimp, and dried under b) solar mode
c) gasifier mode d) hybrid mode

The rehydration ratio depends on the degree of cellular and structural disruption that happened in shrimp during drying. The average rehydration ratio observed for dried shrimps under the solar, gasifier, and hybrid mode were 2.52, 2.49, and 2.39 respectively. The rehydration ratio was better for the solar-dried samples due to the development of a porous structure with a prolonged drying period.

12 Development of a foldable smart live fish transportation system for distant trade of table fish

Principal Investigator: Dr. Parvathy U.

Funding Agency: Department of Science and Technology (DST)

Total Budget: ₹48.77 lakhs

III Developed a hypothermic anaesthetization system

For the conditioning of fish prior to live transport, a system was developed for the anaesthetization of aquatic animals in a controlled and uniform manner with effective cooling protocols.

III Designed and developed prototypes for live fish transportation

Prototypes were designed and developed for live transportation of fish in water as well as water less transportation of shellfish like shrimp and other crustaceans. Studies indicated promising results with better survival and upscaling possibilities.

III Developed two Axis Transportation Simulator

To simulate road transportation conditions, a two-axis transportation simulator was developed with definite rolling and pitching. This facilitates the imitation of transportation conditions on-road and could enable trials undertaken in laboratory conditions by replacing the actual road transportation trials.

||| Standardization of conditions for live fish transportation

For effective live transportation of fish and shellfish viz, GIFT tilapia and vannamei shrimp, the pre-transportation conditions like harvesting, holding, and loading protocols; transportation conditions viz., stocking density, water parameters, transit time and post-transportation procedures viz., acclimatization method and time for live transportation was standardized.



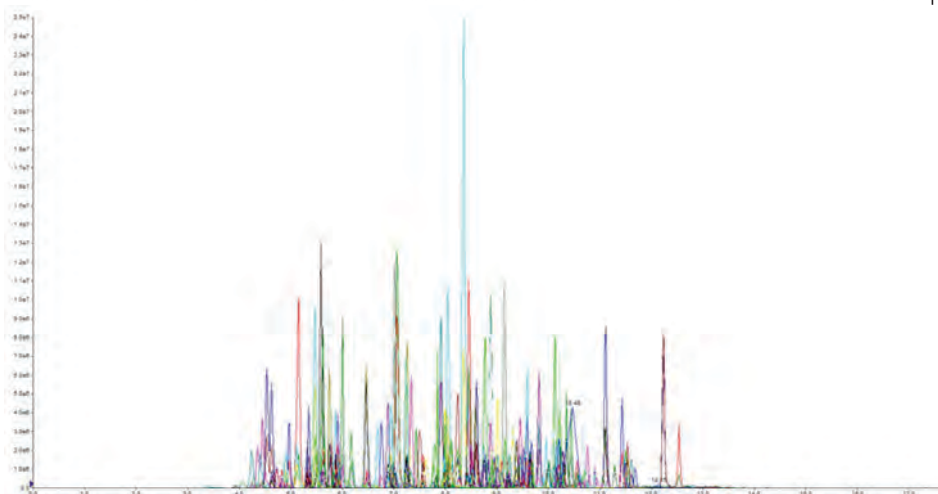
13 FSSAI-National Reference Laboratory

Principal Investigator: Dr. Satyen Kumar Panda

Funding Agency: FSSAI

Total Budget: ₹ 25.00 lakhs

- ◆ Multi-residue analysis of antibiotics in fish using Liquid Chromatography-Tandem Mass Spectrometry was carried out and analyzed 1600 samples from different categories
- ◆ Multi-residue analysis of FSSR-listed pesticides in fish and red meat using Liquid Chromatography-Tandem Mass Spectrometry and Gas Chromatography-Tandem Mass Spectrometry was carried out in multi-residue mega method for analysis of 354 chemical contaminants by GC-MS/MS and LC-MS/MS developed
- ◆ Natural Level of phosphorus in commercially important shrimp species and its compliance to Food Additive Regulation of FSSAI was carried out
- ◆ As per the request from FSSAI an analytical method was developed for FSSR-listed pesticides for meat products. An analytical method was developed for the GC amenable compounds in meat.
- ◆ Validation of a method for PAH: The AOAC method (AOAC 2014.08:2019) for the analysis of Polyaromatic Hydrocarbons (PAH) was validated for linearity, recovery, and repeatability. The recoveries were between 80-120% for all the target analytes. The regression coefficient of 0.99 was achieved for matrix-fortified standard-based calibration. The LOQ was 5ppb, at



Multiresidue analytical method for pesticides in meat

which all parameters of method validation were satisfied. The repeatability and reproducibility values of the analytes were less than 20% RSD. The method has been written as per FSSAI manual format and communicated with FSSAI for further review and inclusion in FSSAI Manual for Pesticide Residue.

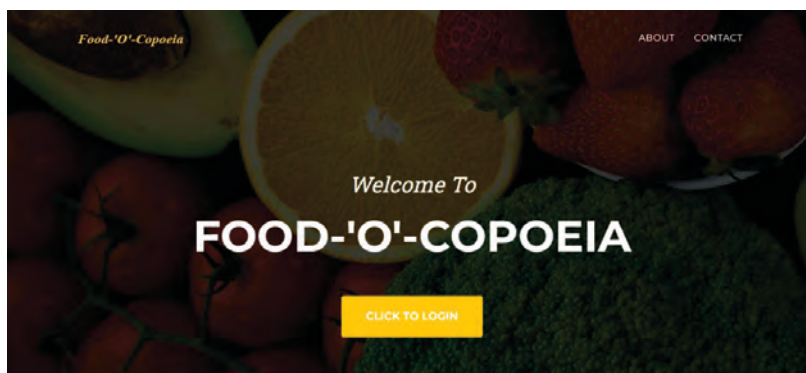
14 NETSCoFAN-Food Testing Group (FTG)

Principal Investigator: Dr. Satyen Kumar Panda

Funding Agency: FSSAI

Total Budget: ₹20.00 lakhs

- ◆ The food testing group of the Network for Scientific Co-operation for Food Safety and Applied Nutrition was involved in the development of an online portal for horizontal and vertical standards for fish and fishery products (Food-O-Coepia). The portal provides detailed information on standards pertaining to fish and fishery products.



Food-O-Coepia website home page

- ◆ A manual of analytical Methods for fish and fishery products was developed and submitted to FSSAI.
- ◆ ICP-MS method for the estimation of iodine in botanical supplements was developed.
- ◆ Authentication method using LC HR/MS for detection of adulterants in Tenospora botanical supplements in association with NRC grapes, Pune.
- ◆ NetSCoFAN has contributed to the development of policy development namely the Development of Manual Methods for Fish and Fish Products, Analysis of pesticide residue in foods, Development of Manual for analysis of antibiotic residues in foods, Heavy Metal content in fish and fish products for risk assessment by FSSAI and Codex, Guidance Note for Formalin in Fish and standard development for natural levels of formaldehyde in 156 species of finfish and shellfish species, General guidelines on sampling for Microbiological Analysis, Standard Specifications for setting up of a basic food testing laboratory and Ranking of states in terms of food safety index.
- ◆ The technologies developed with regulatory relevance include a NIR sensor-based platform for food authentication, Species authentication of shrimps, cephalopods, and the development of Fish freshness measurements using a portable miniaturized mass spectrometer.
- ◆ Further, the project also contributed to conducting survey/surveillance and contributed to the surveillance of antibiotic residues in aquaculture pond water, sediments, feeds, and cultured species in Freshwater and brackish water aquaculture farms of Andhra Pradesh and Kerala covered and detected the presence of banned veterinary drug residues in different samples.

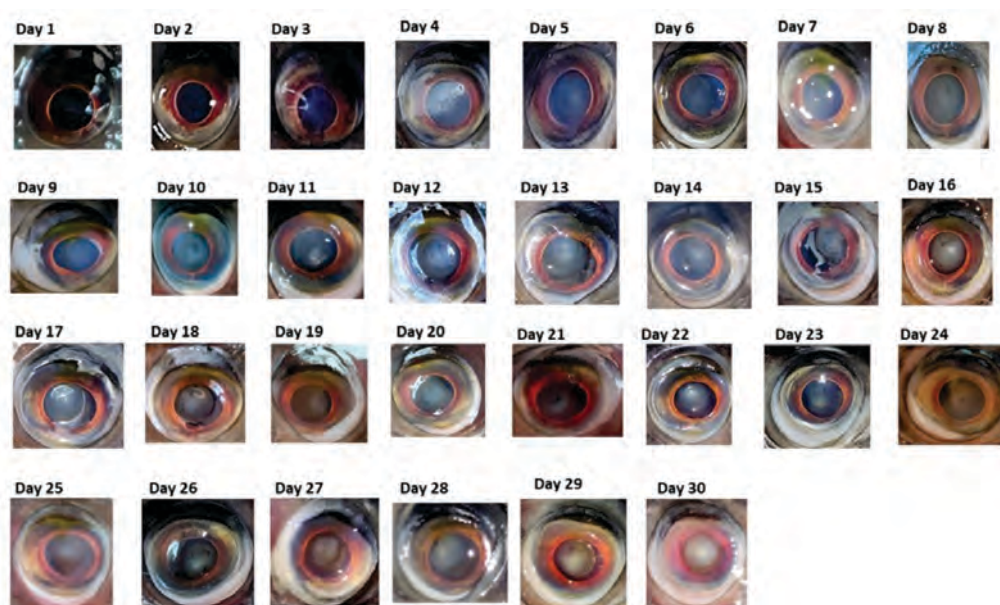
15 Development of portable fish freshness assessment sensor

Principal Investigator: Dr. George Ninan

Funding Agency: MoFPI, GoI

Total Budget: ₹26 lakhs

Fish and Image processing: Storage study for freshness evaluation has been carried out in two species, namely, Genetically Improved Farmed (GIF) Tilapia and Indian Mackerel. Images of the samples were acquired on each day during the storage study in order to record the progressive variations in the sample. The images are captured under three different conditions, namely, an open space, a closed room with a flashlight, and a shaded space. The focal distance between the camera and the fish was adjusted and the focal length was set according to the lighting conditions. A curated dataset formed from the collected images comprising around 30,000 images for GIF Tilapia and 10,000 images for Mackerel was then subjected to further image processing and analysis. Image segmentation, Training, optimization and regularisation of the RNN model were carried out.



Variations in the eye images of GIF Tilapia during storage study

16 Design and development of a hot air-assisted continuous infrared drying system for high-value fish and fishery products

Principal Investigator: Dr. Aniesrani Delfiya D. S.

Funding Agency: MoFPI, GoI

Total Budget: ₹27.02 lakhs

Designed and developed a commercial pilot scale model of a hot air-assisted continuous infrared drying system for high-value fishery products.

|| Drying of shrimp and anchovy in hot air-assisted continuous infrared dryer

The shrimp and anchovy were dried in a pilot scale hot air-assisted continuous infrared dryer under the IR intensity of $3,000 \text{ W/m}^2$, IR source to sample distance of 10cm, the drying temperature of 65°C , and air velocity of 1.5 m/s .

Drying and quality characteristics of shrimp and anchovy

Parameters	Shrimp	Anchovy
Drying time (h)	3	2.5
Final moisture content (%)	14.42	11.61
Specific energy consumption (kWh/kg of water evaporated)	3.36	3.08
Drying efficiency (%)	18.63	16.57
Total colour change (ΔE)	17.81	7.25
Shrinkage (%)	11.85	12.37
Rehydration ratio	2.42	2.38
Water activity	0.63	0.61



(a)



(b)

Shrimp (a) fresh (b) dried in pilot-scale hot air-assisted IR dryer



(a)



(b)

Anchovy (a) fresh (b) dried in pilot-scale hot air-assisted IR dryer

|| Economic analysis of shrimp dried under the pilot-scale dryer

Economic analysis was also carried out for the shrimp drying under the pilot-scale hot air-assisted continuous infrared dryer. The benefit-cost ratio was found to be 3.50 which indicates that the developed dryer is economically viable to prepare 20 kg of dried shrimp per day. Payback period of less than one year which indicates the cost-effectiveness of the dryer. A hot air-assisted continuous infrared radiation-based drying system was developed and the performance of the dryer was evaluated using shrimp and anchovy fish. Performance evaluation of the pilot scale model of a continuous hot air-assisted infrared dryer revealed that the drying time required is 3 and 2.5 h for shrimp and anchovy, respectively. The continuous hot air-assisted infrared dryer was found best for drying shrimp and anchovy with substantial energy savings, shorter drying time, and superior quality of the product compared to other commercially available convective dryers. This dryer can be used for the production of high-quality dried fish and fishery products with economic viability and it can be scaled up for commercial-scale continuous production.

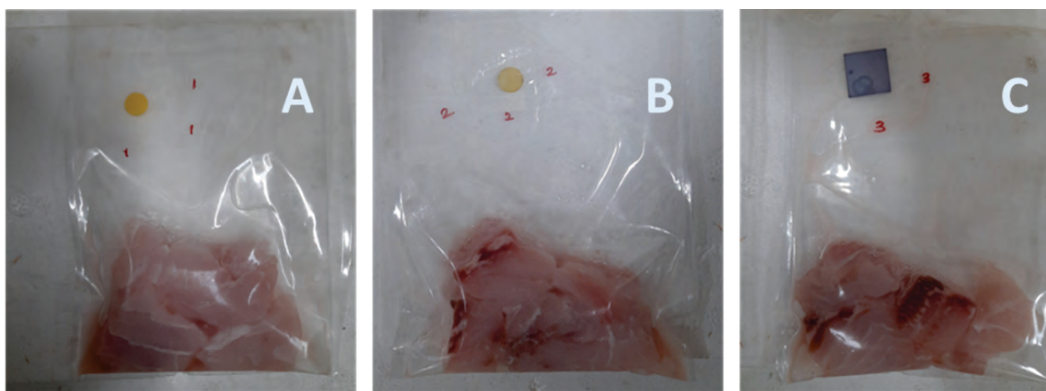
17 The pilot-scale implementation of “Smart Packing Technology: Fish freshness indicator” at field level to enhance domestic fish consumption

Principal Investigator: Dr. C. O. Mohan

Funding Agency: NFDB

Total Budget: ₹40.50 lakhs

As part of the smart packaging technology, a freshness indicator was developed for fish. The developed freshness indicators were evaluated for their ability to indicate colour change during storage periods. In this, seabass (*Lates calcarifer*) chunks were packed in polyester-polyethylene with 3 different indicator strips. The samples stored under chilled conditions were monitored for quality loss and the colour change in the indicator at regular intervals. The aerobic plate counts exceeded $7 \log \text{cfu g}^{-1}$ from its initial $4.01 \log \text{cfu g}^{-1}$ by the 12th day. Biochemical and sensory quality correlated with microbiological changes. Among the indicators tried, two indicators (A and C) gave colour change which correlated with the quality changes.



Seabass fish chunks with freshness indicators (A, B, C)

18 The pilot-scale demonstration of seaweed-based feed production for fish and shrimp

Principal Investigator: Dr. Ashish Kumar Jha

Funding Agency: NFDB

Total Budget: ₹36.00 lakh

Sargassum wightii and *Ulva sp.* of Phaeophyceae and Chlorophyceae respectively were collected from Adri Beach, Veraval. The proximate composition of the seaweeds was analyzed and made a feed by incorporating 5% *Sargassum wightii* on a dry weight basis. Another group of dried *Sargassum wightii* is kept for microbial fermentation which will be later used for feed preparation and the efficacy of the feed will be compared subsequently through animal trial, mainly on carp species.



Formulated Seaweed based aqua feed

19 Replacement of Kerosene OBM with experimental inboard/Outboard diesel propulsion in small-scale fishing boats of Kerala

Principal Investigator: Dr. M. V. Baiju

Funding Agency: Dept. of Fisheries, Kerala

Total Budget: ₹16.77 lakhs

The project aimed at resolving the issues regarding the OBM and kerosene which are affecting the small-scale fishers of Kerala. Since suitable marine diesel OBM engines are presently not available in the market, this experimental research was undertaken with the objective of making a survey and documentation on petrol+kerosene propulsion system, preparing a database on the new, used, and modified land/marine diesel engines ranging from 5 to 80 hp, identifying suitable craft using 9.9 hp, (25+9.9) hp and (25+40) hp OBM and designing of a propulsion system with above engines and optimization. The deliverable would help the industry to optimize the use of fuels and thereby minimize the carbon foot from the fisheries sector.

20 Marine Fishery in Kerala: A Study on Evolution of Policy, Cost, and Earnings of Fishing Units and Income of Fisher Households

Principal Investigator: Dr. Suresh A.

Funding Agency: State Planning Board, Kerala

Total Budget: ₹62.41 lakhs

Institutional analysis in fisheries governance through IAD Framework: Coastal fishing is subjected to continuous technological advancements, capital infusion, and consequent

improvement in fish catch. However, there are concerns about equity and resource sustainability. Various organizations representing different stakeholders have emerged in marine fisheries. The political state responds to these emerging situations by developing policies and guidelines. The evolution of fishery policy in Kerala is examined through institutional analysis and development framework.

Data collection from fishers on cost and earnings: Data on cost and earnings from fishing vessels from selected harbours in Kerala is being carried out by using a structured interview schedule. A total of 16 harbours/ landing centres were selected for this purpose.



With traditional fishermen at Neerkadavu landing centre in Kannur District

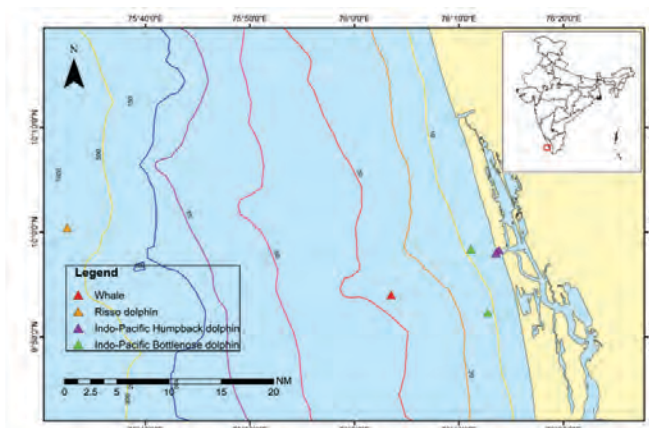
21 Marine mammal stock assessment in India

Principal Investigator: Dr. Leela Edwin

Funding Agency: Ministry of Fisheries, Animal Husbandry & Dairying, Govt. of India

Total Budget: 147.20 lakhs

Identification of marine mammals in the fishing ground using visual observation: Based on the onboard observations at the fishing grounds off Kochi, a total of 6 pods of marine mammals were sighted from 13 fishing cruises. The number of pods ranged from 2- 8. Altogether 16 individuals, representing 4 species were recorded. The species recorded are, *Tursiops aduncus* (Indo-Pacific bottlenose), *Sousa chinensis* (Indo-pacific humpback dolphin), *Grampus griseus* (Risso dolphin), and humpback whale.



Map showing the distribution of marine mammals in the fishing ground off Kochi



Arabian Sea Humpback whale breaching in the fishing ground off Kochi



A pair of Sousa chinensis sighted during socialisation

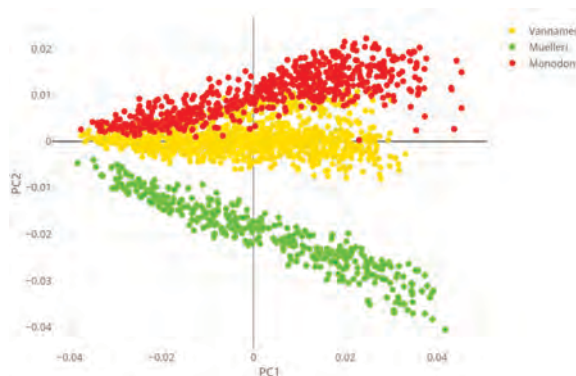
22 National Surveillance Programme for Aquatic Animal Diseases (NASPAAD)

Principal Investigator: Dr. Toms C. Joseph

Funding Agency: PMMSY, ICAR

Total Budget: ₹47.70 lakhs

The project is extended with the following objective namely, surveillance for OIE-listed pathogens in shrimp meant for export and domestic consumption, surveillance for OIE-listed pathogens in finfish meant for domestic consumption and export, and surveillance for OIE-listed pathogens in finfish / shrimp imported to India. Samples are being collected region-wise and commodity wise for evaluation.



p authentication using REIMS

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

Principal Investigator: Dr. Niladri S. Chatterjee

Funding Agency: ICAR - National Agricultural Science Fund (NASF)

Total Budget: ₹275.00 lakhs

Chemo-informatics models using Rapid Evaporative Ionisation Mass Spectrometry (REIMS) were developed for real-time authentication of shrimp species identity without any sample preparation requirement. Three commercially important shrimp species (as per FAO data) namely *Litopenaeus vannamei*, *Penaeus monodon*, and *Pleoticus muelleri* were considered for model development. The model could identify unknown test samples with 100% accuracy. Major phospholipid biomarkers were identified through MS/MS. Further chemo-informatics models were developed using portable NIR sensors for rapid and non-destructive species authentication of commercially important shrimps. An MOU has been signed with a start-up RAAV Techlab for collaborative data generation and commercialization.

24 Deployment and maintenance of Wave Rider Buoy off Veraval and development of Jellyfish and sardine advisories (INCOIS-SAR)

Principal Investigator: Dr. Madhu V. R./ Dr. Chinnadurai S.

Funding Agency: Indian National Centre for Ocean Information Services (INCOIS)

Total Budget: ₹74.00 lakhs

The project was operated with the objective to deploy and maintain WRB off-Veraval coast, to create a baseline on jellyfish diversity and distribution along the Gujarat coast, to study the spatiotemporal variation of the jellyfish, and to assess the impact of jellyfish on maritime activities.

Along the Kerala coast, a total of 407 sardine samples were collected and were found to have varying sizes. The total length ranged from 12 cm to 21 cm with an average weight of 48.3 grams. Among the samples, 60% were males, 11% were females, and 29% were sex-unknown samples. A jellyfish survey was carried out from the research vessel, Sagar Harita, and Jellyfish were encountered during southwest and winter monsoons (August to December). A total of 178 samples were collected and analysed from 13 various locations having depth range between 12 to 40 m. *Pelagiidae sp.* and *Cepheidae sp.* are commonly obtained species from shallow and deep water, respectively.



Sardine samples from the study area

On the Gujarat coast, an experimental onboard jellyfish survey was conducted along the Gulf of Kutch during the onset of the winter season. During the onboard survey, jellyfish aggregation was noticed in the Arambada and Positra regions of the Gulf of Kutch. The water sample for physio-chemical parameters and the jellyfish sample were collected for morphometric and molecular analysis. The species encountered during the surveys was *Catostylus perizi* (Ranson, 1945).



On-board experimental jellyfish survey (Gulf of Kutch)



Jellyfish and associated fauna

Other activities included the deployment of the wave rider buoy (WRB), an awareness campaign carried, and brochures were distributed among the coastal villagers for awareness creation. Two workshops were carried out at Chellanam fishing harbor and Cochin.



WRB Awareness programme held on 10.01.2023



Deployment of WRB off-Veraval

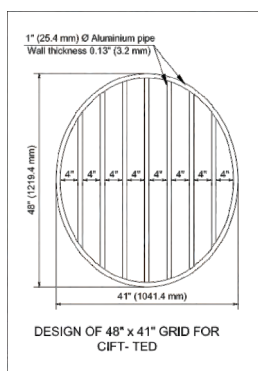
25 Fine tuning of CIFT-TED for adoption in the trawl fisheries for certification of marine shrimp harvested from India

Principal Investigator: Dr. M. P. Remesan

Funding Agency: Marine Products Export Development Authority (MPEDA)

Total Budget: ₹38.95 lakhs

The trials of newly fabricated fine-tuned CIFT-TED commenced onboard CIFT research vessel RV Matsyakumari II on 14th December 2022. The newly fabricated TED was attached to the shrimp trawl net with a square cod end mesh size of 25mm with a GoPro Hero 6 camera. The completed CIFT-TED was field tested onboard the CIFT research vessel Matsyakumari-II. GoPro Hero 6 camera was used for recording the underwater trials of CIFT-TED which was attached to the inside and top of the trawl belly. A total of 6 trials were conducted off Kochi at 30m depth with an average towing time of 45 minutes for each haul. CIFT-TED with cover codend was used during the trials to estimate the catch-loss. Preliminary trials revealed that there is no catch loss while dragging the net. However, 1-2% of fishes escape through the TED opening, when the net is being hauled at a very slow speed. Advanced version of GoPro cameras and underwater lights were already procured for further studies by fixing the cameras at the distal part of the TED.



Approved design of grid for CIFT-TED, Aluminium grid fabricated

A 15m shrimp trawl was fabricated for dive evaluation of CIFT-TED from smaller vessels at Poovar, where the underwater visibility was better. Steps were taken to hire smaller otter boards for an initial trial from MK-II, before the actual trial at Poovar. Arrangements are being made for hiring professional scuba divers for taking videos for underwater evaluation of CIFT-TED using imitation turtles.



Underwater view of flap sealing of CIFT-TED captured on GoPro camera

26 Developing a biorefinery workflow for high-value nutraceuticals from seaweed by green chemistry approach

Principal Investigator: Dr. Lekshmi R. G. Kumar

Funding Agency: DST-SERB

Total Budget: ₹39.66 lakhs

An ultrasonic-assisted extraction protocol was developed for obtaining seaweed antioxidants. For optimization of ultrasonic-assisted extraction, 13 different experiments were carried out by varying the sample-to-solvent ratio and time of the process. There was a significant difference in the yield and bioactivity of extracts with the increase in the sample-to-solvent ratio. A higher sample-to-solvent ratio resulted in an increased yield. A similar trend was observed for the bioactivity assays too.



Padina gymnospora



Phlorotannin rich extracts

The extraction of antioxidant-rich fractions from brown seaweed using the supercritical fluid extraction technique was optimized. The effect of 3 variables, viz, extraction pressure, time, and temperature on the yield, and antioxidant activities was assessed to optimize the best extraction conditions. Different extraction conditions were obtained by using response surface methodology by giving temperature, pressure, and time as input variables. The flow rate of carbon dioxide and the modifier (ethanol) was kept constant. The highest yield was obtained when a medium pressure condition was employed for a time period of 112 minutes.

The results of the study suggested that pressure had a positive implication by increasing the antioxidant fraction extraction from seaweeds as Ferric reducing power and total phenolic content of the extracts increased with the increase in pressure. When the effect of temperature was analyzed, it was found that an increase in temperature yielded seaweed extracts of the highest bioactivity. Overall, the results indicate that supercritical extraction is a promising alternative process for recovering compounds of high antioxidant activity from brown seaweeds.

A sustainable extraction technique was developed to extract phlorotannins from brown seaweed, a methodology has been devised for the extraction of alginate and cellulose from seaweed, and the biochemical profiling of fifteen brown seaweeds was completed in terms of nutrient and bioactivity for further work.

27 Matrix-specific phage formulations for the bio-control of Enterotoxigenic Methicillin sensitive and resistant *Staphylococcus aureus* of safety concern

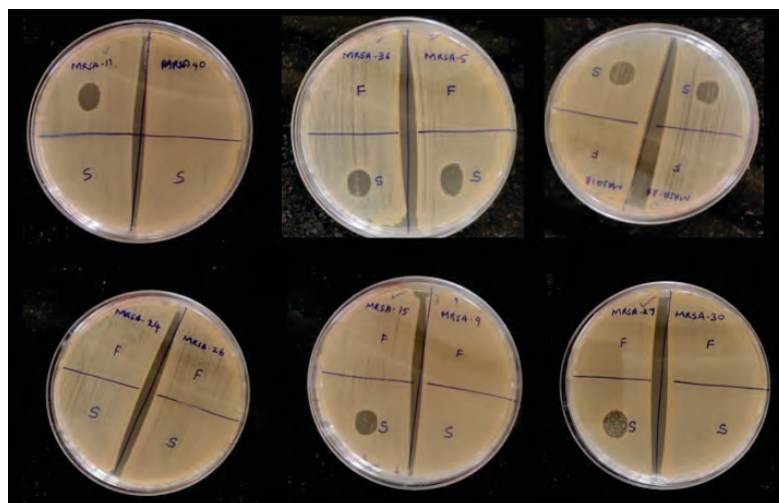
Principal Investigator: Dr. Murugadas V.

Funding Agency: Bhabha Atomic Research Centre (BARC)

Total Budget: ₹27.53 lakhs

|| Phages identified against repository of Methicillin resistant *Staphylococcus aureus* isolated from seafood

The project objective is to develop a specific phage formulation for the control of resistant organisms. The major work components include Isolation, clonal purification, and taxonomy of phages against Methicillin-sensitive *S. aureus* (MSSA) and Methicillin-resistant *S. aureus* (MRSA), and their selection for downstream applications, characterization of phages for host spectrum of activity, the multiplicity of infection, burst size, capsid genes diversity for selection of candidature phages, Genome sequencing, annotation of selected phages for in-



Spot represents the phages isolated against MRSA host

silico assessment of safety for formulated phage, assessment of the stability of phage formulation at varied conditions and development of stabilized phage formulation against MRSA and MSSA and assessing the efficacy and toxicity of the formulated stabilized phage cocktail against MSSA and MRSA in fishery products and laboratory animal model.

28 Transforming Agri-food Systems in South Asia (TAFSSA) funded by the One CGIAR of International Rice Research Institute (IRRI)

Principal Investigator: Dr. Suresh A.

Funding Agency: International Rice Research Institute (IRRI)

Total Budget: ₹8.86 lakhs

The objectives include developing a database on the spatial and temporal prices of selected fishes in the selected markets, the impacts of the communication on fish price formation, and its impact on fish purchase behaviour. During the period, carried out a preliminary analysis on fish prices in India vis-a-vis other non-vegetarian commodities.



The project team at CIFT, Cochin (From L to R). Dr. Prakashan C.V. (from IRRI, New Delhi office), Dr. A. Suresh (ICAR-CIFT), Dr. Ben Belton (IFPRI, Dhaka Office), Dr. Sudha Narayanan (IFPRI, New Delhi office) and Dr Sunny Jose (Council for Social Development, Hyderabad)

29 Improved coconut wood canoes for the small-scale fishing sector of the southeast coast of India

Principal Investigator: Dr. Leela Edwin

Funding Agency: Coconut Development Board (CDB)

Total Budget: 34.72 Lakhs

The project was successfully completed and the final report was submitted to Coconut Development Board, Kerala. The construction of a coconut wood canoe was completed and handed over to the South Asian Fisherman Fraternity (SAFF), Colachel, Tamil Nadu based on the suggestions from the beneficiaries.

A survey was conducted along the Tamil Nadu coast including Colachel, Inayam, Kadiyapattanam, and Thengapattanam of the Kanyakumari District for the identification of the project implementation site. Catamaran plays a major role in the fishing operations of the Kanyakumari District and also has a rich plantation of coconut. By considering the above facts and the proximity with the research institute for the practical implementation of the

Programme, the Colachel area of Kanyakumari district was selected. A stakeholder meeting was held at Kurumpanai village in Colachel, where 50 local fishermen attended. This is organized with the help of the South Asian Fishermen Fraternity (SAFF), a Fishermen Society, Colachel.

Inputs/suggestions regarding the type of canoe needed for use were obtained through discussion. A coconut wood canoe of dimensions 8m L_{OAR} , 1.1m breadth, and 0.7m depth with FRP sheathing was constructed and handed over to SAFF, Colachel, Tamil Nadu based on the suggestions from the beneficiaries.



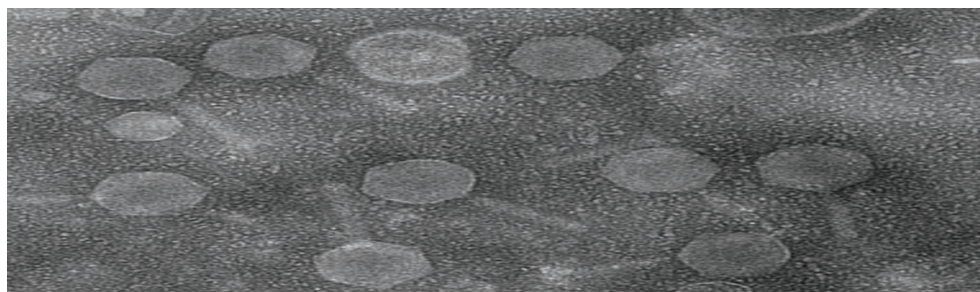
30 Screening lytic phages from diverse marine and aquatic niche for controlling bacterial pathogens associated with aquaculture and post-harvest fish quality

Principal Investigator: Dr. B. Madhusudana Rao

Funding Agency: DBT

Total Budget: ₹60.12 lakhs

The important achievements included the identification of Diverse infective and lytic machinery in genome analysis of tailed coliphages against broad-spectrum multidrug-resistant *Escherichia coli* and the demonstration of Vibriophage-LV6 antibacterial activity against six luminescent vibrio hosts.

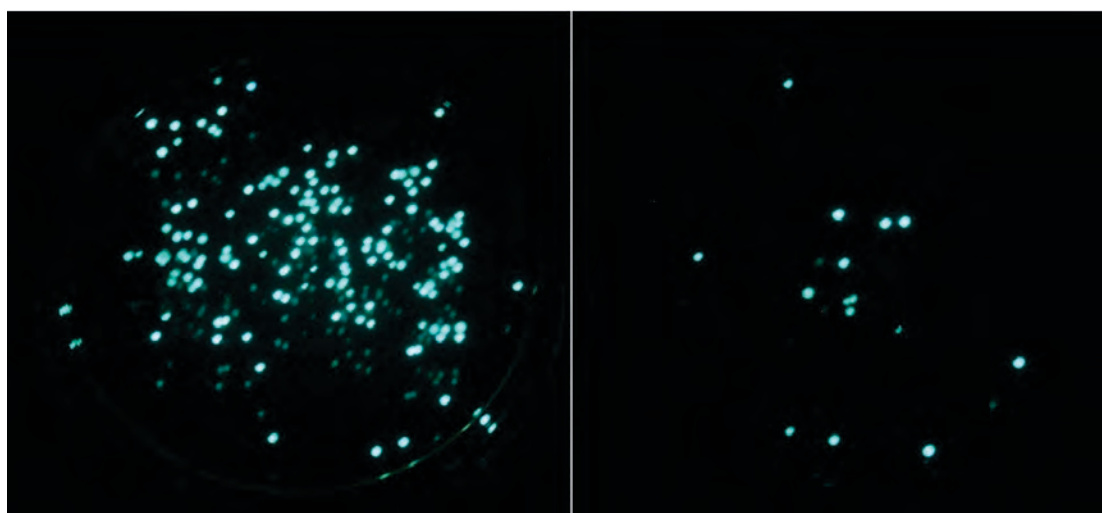


Coliphage genome comparison using Blast Ring Image Generator (BRIG) and transmission Electron Microscopy (TEM) analysis of Coliphages

Infective and lytic machinery identified in genome analysis of three-tailed coliphages: The genome sizes of coliphages ϕ EC-S-21, ϕ EC-S-24 and ϕ EC-. The genome size of the three coliphages ranged between 24 and 145 kb with Coding sequences (CDS) ranging between 30 and 251 amino acids. All three coliphages possessed diverse infective and lytic mechanisms, viz., lytic murein transglycosylase, peptidoglycan transglycosylase, n-acetylmuramoyl-l-alanine amidase, and putative lysozyme. The three coliphage genomes showed neither the presence of antibiotic resistance genes nor virulence genes, which makes them desirable candidates for use in phage therapy-based applications.

Transmission electron microscopy of coliphages with lytic activity against antimicrobial-resistant *E. coli*: TEM analyses of 10 coliphages indicated that 80% of coliphages exhibited Myoviridae features with long tails and icosahedral head while 20% displayed features of Podoviridae with short tails and icosahedral head.

Effectiveness of vibriophage- ϕ LV6 as antibacterial agent: Studies on the effect of vibriophage- ϕ LV6 on the growth of multiple luminescent vibrio hosts ($n=6$) at higher concentration (10^9 cfu/ml) at relatively lower (10^3 cfu/ml) concentrations of luminescent bacteria revealed a reduction in luminescent vibrio counts, reduction in sucrose non-fermenting vibrio counts and increased post-larvae survival in phage treated tanks compared to bacteria control tanks.



Bacteria spiked Tank

Phage treated Tank





COLLABORATION WITH OTHER INSTITUTES

International Institutes

- ◆ Borlaug Institute for South Asia (BISA), New Delhi
- ◆ CODEX Alimentarius Commission, Rome
- ◆ Food and Agriculture organization (FAO), Rome
- ◆ Green Climate Fund (GCF), South Korea
- ◆ Interdisciplinary Centre of Marine and Environmental Research (CIIMAR), University of Porto, Portugal
- ◆ International Rice Research Institute, Philippines
- ◆ 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
- ◆ Office International des Epizooties (OIE), France
- ◆ University of Arts London, UK
- ◆ University of Bradford, UK
- ◆ University of California, California
- ◆ University of Cambridge, UK
- ◆ University of Edinburgh, UK
- ◆ University of Liverpool, UK
- ◆ University of Southampton, UK
- ◆ WFC, Malaysia
- ◆ World organization for Animal Health, France
- ◆ World Wildlife Fund (WWF), India

National Institutes

- ◆ Assam University, Silchar, Assam
- ◆ BARC- Babha Atomic Research Centre, Mumbai
- ◆ 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), Kochi

- ◆ Cochin Shipyard Limited (CSL), Cochin
- ◆ CSIR- Indian Institute of Toxicological Research, Lucknow
- ◆ Department of Biotechnology, New Delhi
- ◆ Entrepreneurship Development Institute (EDII) of India, Ahmedabad
- ◆ Export Inspection Agency (EIA), Veraval and Porbandar
- ◆ Export Inspection Council (EIC), New Delhi
- ◆ Fishery Survey of India (FSI), Kochi
- ◆ Food Safety and Standards Authority of India (FSSAI), New Delhi
- ◆ Guwahati Medical College and Hospital, Guwahati
- ◆ ICAR-Central Institute of Temperate Horticulture, Lucknow
- ◆ ICAR-IVRI, Izatnagar, Uttar Pradesh
- ◆ ICAR-NDRI, Karnal, Haryana
- ◆ ICAR-NDRI, Karnal, Haryana
- ◆ ICAR-NIVEDI, Bengaluru
- ◆ ICAR-Research Complex for NEH, Umam
- ◆ ICAR Research Complex for NEH Region, Meghalaya
- ◆ ICAR-Central Institute of Fisheries Education (CIFE), Mumbai
- ◆ ICAR-Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar
- ◆ ICAR-Central Marine Fisheries Research Institute (CMFRI), Kochi
- ◆ ICAR-Central Marine Fisheries Research Institute (CMFRI), Veraval
- ◆ ICAR-Indian Agricultural Research Institute (IARI), Delhi
- ◆ ICAR-National Research Centre for Grapes, Pune, Maharashtra
- ◆ ICAR-National Rice Research Institute (NRRI,CRRI), 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 (IISc), Bangalore
- ◆ Indian Institute of Technology (IIT), Delhi
- ◆ Indian Institute of Technology (IIT), Hyderabad
- ◆ Indian Institute of Technology (IIT), Madras
- ◆ Indian Institute of Technology, Gandhinagar
- ◆ Indian National Center for Ocean Information Services (INCOIS), Hyderabad
- ◆ Krishi Vigyan Kendra (KVK), Lakshadweep (for Swachhta Action Plan)
- ◆ Krishi Vigyan Kendra, Kumarakom, Kerala



- ◆ Marine Products Export Development Authority (MPEDA), Kochi
- ◆ National Bank for Agriculture and Rural Development (NABARD), Mumbai
- ◆ National Fisheries Development Board (NFDB), 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 Center for Cell Science, Pune, Maharashtra
- ◆ Network for Fish Quality Management and Sustainable Fishing (NETFISH), MPEDA
- ◆ Petronet LNG, Kochi
- ◆ Raja Ramanna Center for Advanced Technologies, Indore, Madhya Pradesh
- ◆ Steel Authority of India Limited (SAIL), Maharashtra
- ◆ Silchar Medical College, Silchar, Assam
- ◆ Udyabhansinhji Regional Institute of Cooperative Management, Gandhinagar

III State Departments

- ◆ Agency for Development of Aquaculture Kerala (ADAK), Kerala
- ◆ Commissioner of Fisheries Office, State Fisheries Department, Taraporwala Aquarium, Charni Road, Mumbai, Maharashtra
- ◆ Department of Fisheries, Diu, Gujarat
- ◆ Department of Forestry, Tamil Nadu
- ◆ Dept of Fisheries of (i) Kerala (ii) Odisha (iii) Goa (iii) Andhra Pradesh
- ◆ District Youth Fishers Welfare Association, Visakhapatnam
- ◆ State Planning board, Thiruvananthapuram, Kerala
- ◆ 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
- ◆ Maharashtra State Rural Livelihood Mission (MSRLM), Maharashtra
- ◆ Perunthalaivar Kamaraj Krishi Vigyan Kendra (PKKV), Puducherry
- ◆ Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla, Kerala
- ◆ State Laboratory for Livestock, Marine and Agri Product (SLMAP), Ernakulam, Kerala
- ◆ Society for Assistance to Fisherwomen (SAF), Kerala
- ◆ State fisheries department, Gujarat and Uttarkhand

- ◆ State Fisheries Department, Himachal Pradesh
- ◆ State fisheries Department, Puducherry
- ◆ State Fisheries Department, Tamil Nadu
- ◆ State Institute of Fisheries Technology, Kakinada, Andhra Pradesh
- ◆ State Referral Institute for Water Quality (SRI), Nettoor, 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 (AAU), Jorhat, Assam
- ◆ Azim Premji University, Bangalore
- ◆ Birsa Agricultural University (BAU), Ranchi, Jharkhand
- ◆ Central Agricultural University (CAU), Imphal, Manipur
- ◆ Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh
- ◆ Christ College, Rajkot, Gujarat
- ◆ Cochin University of Science and Technology (CUSAT), Kochi, Kerala
- ◆ College of Fisheries Science, Veraval
- ◆ College of Fisheries, NAU, Navsar, Gujarat
- ◆ College of Fisheries, Ratnagiri, Maharashtra
- ◆ College of Veterinary and Animal Sciences, Thrissur, Kerala
- ◆ 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
- ◆ Guru Angad Dev Veterinary Animal Science University, Ludhiana, Punjab
- ◆ Gandhi Institute of Technology and Management (GITAM), Andhra Pradesh
- ◆ Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand
- ◆ Indira Gandhi Krishi Vishwavidyalaya (IGKV), Chhatisgarh
- ◆ Jawaharlal Nehru Krishi Vishwavidyalaya (JNKVV), Jabalpur, Madhya Pradesh
- ◆ Junagadh Agricultural University, Junagadh, Gujarat
- ◆ Kamadhenu University, Gandhi Nagar, Gujarat
- ◆ Karnataka Veterinary, Animal and Fisheries Sciences University (KVAFSU), Bidar, Karnataka
- ◆ Kendriya Vidyalaya, Mankhurd, Mumbai, Maharashtra



- ◆ Kendriya Vidyalaya, ONGC, Panvel, Navi Mumbai, Maharashtra
- ◆ Kerala Agricultural University, Mannuthy, Kerala
- ◆ 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 Jhunjunwala college of Arts, Science & Commerce, Vashi, Navi Mumbai, Maharashtra
- ◆ 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 Institute of Medical Sciences and Research Centre, Thiruvalla, Kerala
- ◆ Raja Ramanna Centre for Advanced Technology (RRCAT), Indore, Madhya Pradesh
- ◆ Sainath Hindi High school and Jr. College, Navi Mumbai, Maharashtra
- ◆ Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST), Jammu
- ◆ Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh
- ◆ SRM Institute of Science and Technology, Chennai, Tamil Nadu
- ◆ TNFU, Nagapattinam, Tamil Nadu
- ◆ University of Agricultural Sciences, Karnataka
- ◆ Veterinary College, Bengaluru, Karnataka
- ◆ Veterinary College, Hassan, Karnataka

||| Other Agencies

- ◆ Cheredev Macchimar Sevabhavi Santha, Ghansoli, Navi Mumbai, Maharashtra
- ◆ Coir Board, Kochi, Kerala
- ◆ Haritha Farmer's Club, Perumbalam, Alappuzha
- ◆ Indian Coast Guard, Veraval and Porbandar
- ◆ Koparkhairane Macchimar Sevabhavi Sanstha, Koparkhairane, Navi Mumbai, Maharashtra
- ◆ M/s. Anandi, NGO, Ahmedabad, Gujarat
- ◆ M/s. Sagar Manthan Machhimar Utthan Mandal, Veraval
- ◆ Mariaai Macchimar Co-operative Society, Vashi Gaon, Navi Mumbai, Maharashtra
- ◆ Marine National Park (MNP), Jamnagar, Gujarat
- ◆ National Cooperative Development Corporation (NCDC), Ahmedabad, Gujarat

- ◆ NIFTEM, Sonpat, Haryana
- ◆ NIFTEM, Tanjavur, Tamil Nadu
- ◆ RGCA, MPEDA, Mayiladurai, Tamil Nadu
- ◆ Snehakuja Trust, Kasargod, Kerala
- ◆ Wildlife Trust of India (WTI), Noida, Uttar Pradesh

||| Private Sector

- ◆ A. S. Food Products, Cochin
- ◆ Albys Agro Pvt Ltd., Kochi
- ◆ AlbysAgro Pvt. Ltd., Sanguem Industrial Estate Sanguem-Xelpem, Goa
- ◆ ALERT, Vijayawada, Andhra Pradesh
- ◆ All Kerala Trawl Fishermen Association, Kollam, Kerala
- ◆ Amalgam Foods Pvt. Ltd., Kochi
- ◆ Amar Aquatic Products, Gujarat
- ◆ Amar Polyfils Private Limited, Gujarat
- ◆ Ambuja Foundation, Kodinar
- ◆ Anand Traders, Ernakulam
- ◆ Athos Collagen, Mangrol, Gujarat
- ◆ Ave Health Care Private Limited, Thrissur
- ◆ AVT Naturals, Aluva, Kerala
- ◆ Baby Marine International, Ernakulam
- ◆ Boat owners association, Veraval
- ◆ Bodina Naturals Pvt. Ltd, Kochi, Kerala
- ◆ Capt Steel Eqpt. & Furniture, Ernakulam
- ◆ Chiranjeevi Processors, Tamil Nadu
- ◆ Cochin Food Tech Pvt. Ltd., Kochi, Kerala
- ◆ DeepMala Foods, Veraval, Gujarat
- ◆ Dellmarc, Thrissur, Kerala
- ◆ DRP Molecules Pvt. Ltd., Ernakulam, Kerala
- ◆ DuPont, Gurgaon, Haryana
- ◆ Envozyme Technologies Pvt. Ltd. Hyderabad, Telangana
- ◆ Fish Processing Establishments, Kerala
- ◆ Foo Foods India Private Limited, Calicut, Kerala
- ◆ Foundation for Environmental Research and Innovation (FERI-TRUST), Kannur, Kerala



- ◆ Garware Technical Fibres, Pune, Maharashtra
- ◆ Germkill India Labs LLP, Bangalore, Karnataka
- ◆ Germkill India Labs LLP, Cochin, Kerala
- ◆ Golden Catering Eqt., Visakhapatnam, Andhra Pradesh
- ◆ Grynd Fresh Pvt. Ltd., Kochi, Kerala
- ◆ Gujarat Forgings Pvt. Ltd., Rajkot, Gujarat
- ◆ Hindalco Industries Limited, Mumbai, Maharashtra
- ◆ ICICI Foundation, Ranchi, Jharkhand
- ◆ Ideal Trading Company, Kollam, Kerala
- ◆ Ishka Renewable Farms Pvt. Ltd., Padanthapuli, Tamil Nadu
- ◆ Izzie Food Industry, Ernakulam, Kerala
- ◆ Joecons Fisheries, Goa
- ◆ Kalasona Ingredients, Gujarat
- ◆ Katla Seafoods, Kaloar, Kerala
- ◆ Kavery Engineering, Alleppey, Kerala
- ◆ KEIND Marine Products LLP, Kochi, Kerala
- ◆ Kerala store, Bhopal, Madhya Pradesh
- ◆ Khumari Commune International Trust, Mumbai, Maharashtra
- ◆ Kings Infra Ventures Ltd., Thevara, Kerala
- ◆ Kirloskar Oil Engines Ltd., Rajkot, Gujarat
- ◆ KMR Venture, Malappuram, Kerala
- ◆ Kraftwork Solar, Ernakulam, Kerala
- ◆ Linga chemicals, Tamil Nadu
- ◆ Longshore Technologies LLP, Maharashtra
- ◆ Mag Feeds Pvt. Ltd., Thrissur, Kerala
- ◆ Master Traders, Thiruvananthapuram, Kerala
- ◆ Meck Pharmaceuticals & Chemicals Pvt. Ltd., Gujarat
- ◆ Meck Pharmaceuticals & Chemicals Pvt. Ltd., Ahmedabad, Gujarat
- ◆ Minicoy Island Novelty Mas Producers Society Ltd., Lakshadweep
- ◆ M S Swaminathan Research Foundation (MSSRF), Chennai, Tamil Nadu
- ◆ Navalt Solar & Electric Boats Private Limited, Kochi, Kerala
- ◆ Nishiindo foods Pvt. Ltd., Veraval, Gujarat
- ◆ Ocean Harbor Pvt. Ltd.
- ◆ One India Farms and Plantation, Kalamassery, Kerala

- ◆ Parayil Farms, Ernakulam, Kerala
- ◆ Phytozyme Biotechnology, Pollachi
- ◆ Premier Exports International, Alappuzha, Kerala
- ◆ Prime Harvest, Chellanam, Kerala
- ◆ Q Matrix Exim Pvt. Ltd., Andhra Pradesh
- ◆ Qualilife diagnostics, Mulund West, Mumbai, Maharashtra
- ◆ Quest Bio Organics, Kolkata
- ◆ RAAV Tech Labs Pvt. Ltd., New Delhi
- ◆ Real Exports, Veraval, Gujarat
- ◆ Sadhav Offshore Engineering Company, Mumbai, Maharashtra
- ◆ Sail Ganga EU Exports, Veraval, Gujarat
- ◆ Samudra Shipyard Pvt. Ltd., Aroor, Kerala
- ◆ Sardhara Engine Manufacturers, Rajkot, Gujarat
- ◆ Seafood Exporters Association of India (SEAI), Kochi, Kerala
- ◆ Seawing Crop Science LLP, Surat, Gujarat
- ◆ Sixth Taste Food products, Kochi, Kerala
- ◆ SMS Labs Services Private Limited, Chennai, Tamil Nadu
- ◆ Sri BioAesthetics Pt Ltd, Hyderabad, Telangana
- ◆ Srivatsav Enterprise, Visakhapatnam, Andhra Pradesh
- ◆ Suncrest Biopolymers, Andhra Pradesh
- ◆ Sunsharp Biotech Pvt. Ltd., Hyderabad, Telangana
- ◆ Team Sustain Limited, Cochin, Kerala
- ◆ Thanal Purusha Swayam Sahaya Sangham, Kannur, Kerala
- ◆ United Kireeti Marines, Andhra Pradesh
- ◆ Vanita Cold Storage, Veraval, Gujarat
- ◆ Zarin, Jammu & Kashmir
- ◆ Zeaquel Marine Exports Pvt. Ltd., Kozhikode, Kerala
- ◆ Zewa Ecosystems Pvt. Ltd., Thrissur, Kerala

||| Extension and Development Agencies

- ◆ Bay of Bengal Programme (BOBP), Tamil Nadu
- ◆ Kerala Water Authority, Thiruvananthapuram, Kerala
- ◆ National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana
- ◆ Panchayat office and SHG of Navagaon of Alibaugh, Raigad, Maharashtra



COMMERCIALIZATION OF TECHNOLOGIES

S No:	Technology	Date of Agreement signing	Name of the Client	Total Budget
1.	Dry fish, Fish pickle, Fish chutney powder	03.02.2022	Anand Traders Ernakulam	Rs.3,000/- +18% GST
2.	Solar Electric dryer (20 kg capacity) and dry fish processing	22.02.2022	A. S. Food Products Cochin	Rs.5,000/- +18% GST
3.	Chitin, chitosan, chitooligomers from shrimp shell waste using enzymatic process	25.02.2022	Longshore Technologies LLP Maharashtra	Rs.3,00,000/- +18% GST
4.	RTE Fish Canning unit	25.02.2022	Dept. of fisheries Himachal Pradesh	Rs.5,00,000/- +18% GST
5.	Retort based RTE Fish and Prawn curry (iguru and pulusu style)	03.03.2022	Q Matrix Exim Pvt. Ltd. Andhra Pradesh	Rs.75,000/- +18% GST
6.	Development of aquaculture products 1.Solid state fermentation of Bacillus with high spore count 2.Heterotrophic bacteria for nitrification & denitrification 3.Bacillus cultures inhibitory to vibrio sp. 4.Sulfide oxidizing heterotrophic bacteria	08.03.2022	Envozyme Technologies Pvt. Ltd. Hyderabad	Rs.5,00,000/- +18% GST
7.	Modified method of Chitin Production	Terms of Trade signed	Onshore Construction Company Pvt. Ltd., Mumbai	Rs.5,00,000/- +18% GST
8.	Processing, packaging transportation and marketing of rainbow trout	10.03.2022	Zarin, Jammu & Kashmir	Rs.10,000/- +18% GST

9.	V-form Double slotted otter board	29.04.2022	Mr. Prabhudas Bhensala Veraval	Rs.50,000/- +18% GST
10.	Collagen peptide from fish skin scale and bones.	04.05.2022	M/s Sunsharp Biotech Pvt. Ltd.,Hyderabad	Rs.2,00,000/- +18% GST
11.	Dry fish, fish pickle, fish chutney powder, instant dry fish masala	07.07.2022	KMR Venture Malappuram	Rs.20,000/- +18% GST
12.	Hygienic handling and packaging of fresh fish and processing of dry fish.	14.07.2022	Master Traders Trivandrum	Rs.5000/- +18% GST
13.	I. Retorted ready to fry Unnakkaya ii. Retorted Ready to eat sandwich spread with boneless chicken. iii. Retorted Ready to fry prawn's samosa. iv. Retorted ready to fry marinated fish. v. Retorted ready to eat pidium kozhiyum (steamed rice balls and chicken curry)	15.07.2022	Foo Foods India Private Limited, Calicut	Rs.50,000/- +18% GST
14.	Fish/shrimp feed and other products by utilizing fish processing discards	30.07.2022	M/s. Alert Andhra Pradesh	
15.	Dry fish processing	02.08.2022	Thanal Purusha Swayam Sahaya Sangham Kannur	Rs.3,500/- +18% GST
16.	I.Chitin from shrimp head waste using enzyme assisted protocol ii.Poultry/ aquafeed from shrimp head extract/ hydrolyzed extract iii.Foliar spray from shrimp head extract iv.Manure using shrimp shell extract	11.08.2022	Suncrest Biopolymers Andhra Pradesh	Rs.5,00,000/- +18% GST
17.	Frozen fish processing and its packaging techniques	17.08.2022	Zeaquel Marine Exports Pvt. Ltd., Kozhikode	Rs.30,000/- +18% GST



18.	Modified method of chitin production/ alternative chemicals for chitin production Ready to eat/serve fishery products in metal cans and retortable pouches	22.08.2022	Kings Infra Ventures Ltd., Thevara	Rs.10,00,000/- +18% GST
19.	Fish pickle, dry shrimp roast fish chutney powder	14.09.2022	Mr. Shuhail P.V.P., Kannur	Rs.20,000/- +18% GST
20.	High viscosity chitosan	15.09.2022	Kerala State Cooperative Federation for Fisheries Development (Matsyafed), Trivandrum	Rs.1,00,000/- +18% GST
21.	Shredder (Equipment)	28.10.2022	Minicoy Island Novelty Mas Producers Society Ltd. Lakshadweep	Under Swachhta Action Plan
22.	Value-added products from Murrel fish	06.12.2022	Shri. Joy Chirayath Chalakydy	Rs.30,000/- +18% GST



ISO/IEC 17025: 2017 ACCREDITATION

ICAR- CIFT laboratories are accredited to ISO/IEC 17025:2017 by NABL in the field of Chemical, Mechanical and Biological testing since the year 2005. Dr. A. A. Zynudheen, Principal Scientist and HOD-in-Charge, Quality Assurance and Management Division serves as the Quality Manager and Dr. Satyen Kumar Panda, Principal Scientist serves as the Technical Manager of NABL in the institute. NABL Cell with Smt. P.K. Shyma (ACTO, Engineering Division), Smt. N.C. Shyla (Technical Officer, AKMU), Shri. Rahul Ravindran (Technical Assistant, FP Division), Shri. G. Vinod (Sr. Technician, FP Division) and Shri. Ajith Chellappan (Sr. Technician, QAM Division) as members for the smooth functioning of the NABL activities in the institute.

CIFT laboratories are accredited by both National Accreditation Board for Testing and Calibration Laboratories (NABL) and Food Safety and Standards Authority of India (FSSAI) for the field of chemical and biological parameters for fish and fish products and residues in food products. Also accredited for chemical and biological parameters for water, marine and aquaculture products and mechanical parameters in paper, plastics and gear materials. The total recommended scope of accreditation for testing is 380 parameters, which includes testing of 309 Chemical parameters, 62 Biological parameters and 09 Mechanical parameters. The National Referral Laboratory facility in ICAR-CIFT, Kochi is also accredited as per ISO/IEC 17025: 2017. The Laboratories participated in 14 Proficiency Testing programs during 2022 of which 10 programmes were in chemical discipline and 4 programmes in biological disciplines. Inter Laboratory Comparison was also conducted for chemical, biological and mechanical parameters for paper & paper boards and plastic materials. The laboratory conducted internal audits at planned intervals to conform to the requirements of the management system and documents. Management Review Meeting was conducted as per schedule.

Onsite surveillance audit of scopes under integrated assessment done by NABL and FSSAI for chemical and biological parameters for fish and fish products during 18-19, March 2023 and Desktop surveillance report submitted for other scopes.

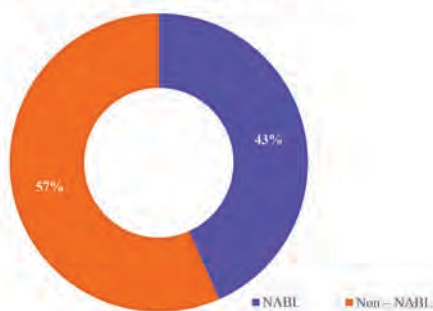
During the year 2022, a total of 429 samples including 186 NABL samples and 243 Non-NABL samples were analysed and total revenue of Rs. 54.75 lakhs was realised.

Certification under ISO 9001:2015 ACTIVITIES

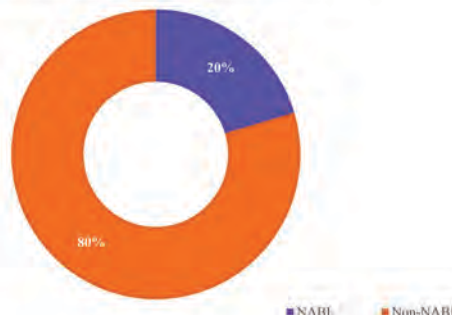
ICAR-CIFT is certified to ISO 9001:2015 in the field of Research and Development Services to promote Sustainable and Responsible Harvest and Post Harvest Technologies the Fisheries Sector, including Consulting, Training, Testing, Business Incubation and Transfer of Technologies since 2014. Dr. Nikita Gopal, Principal Scientist served as the Team Leader, ISO along with Dr. P. Muhamed Ashraf, Principal Scientist, Dr. C.O. Mohan, Senior Scientist, Dr. V. Murugadas, Senior Scientist, Dr. Aniesrani Delfiya. D.S. as the team members. Internal audits are regularly conducted by the ISO team for the smooth functioning of the ISO activities in the institute.

During the year 2022, the surveillance audit was duly completed and the institute was successfully recertified for ISO 9001:2015.

DETAILS OF SAMPLE RECEIVED (2021)



REVENUE GENERATED IN RUPEES (2021)





WORKSHOPS/SEMINARS/CONFERENCES

Sl. No.	Title of the programme	No. of participants	Venue, date and duration
1.	ICAR sponsored 10- day shortcourse on “Bycatch Reduction in Fisheries: Recent Advances”	24	17.01.2022 - 26.01.2022 Online mode
2.	B2B meet with solar dryer manufacturing firms and entrepreneurs	25	23.02.2022 ICAR-CIFT, Cochin
3.	Hindi workshop on 'Hindi language & literature’	22	25.03.2022 Online mode
4.	Kisan Bhagidari Prathamika Hamari: Webinar on “Nutritional Significance of Fish and its Fortification to Augment Human Health”	105	28.04.2022 Online mode
5.	Webinar on 'Role of Fisheries in Nutritional Security'	111	28.04.2022 Online mode
6.	National seminar on 'Safe Fish for Healthy Life' as part of world food safety day celebrations	162	07.06.2022 ICAR-CIFT Cochin
7.	National seminar on 'Safe Fish for Healthy Life' as part of world food safety day celebrations	110	08.06.2022 ICAR-CIFT Cochin
8.	Demonstration cum skill development programme on “Value Addition of Freshwater Fishers” for registered Fish Farmers of Matsya Bhavan Chalakudy	19	17.06.2022 ICAR-CIFT Cochin
9.	Training cum exposure program on “Post-harvest management and Value addition of Fish” for senior Officers under the World Bank funded APART Project implemented by the Department of Fisheries Govt of Assam	9	21.06.2022 - 25.06.2022 ICAR-CIFT Cochin
10.	Online training on “Quality Testing of Marine Fish based Food Products” for the entrepreneurs SHG members engaged in fish processing and preservation of marine fish products in A&N Islands	90	24.06.2022 Online mode
11.	Demonstration cum Skill development programme on “Fisheries based entrepreneurship” in collaboration with MSSRF, Chennai	30	28.06.2022 - 29.06.2022 ICAR-CIFT Cochin

12.	Hindi workshop on “Official language & modern technology”	18	30.06.2022 Online mode
13.	Hindi workshop on Noting & Drafting	18	05.07.2022 Online mode
14.	National seminar on Fish for health and prosperity	1000	16.07.2022
15.	Collaborative programme training cum demonstration on Post harvest	40	20.07.2022- 23.07.2022 KVK Thrissur
16.	Demonstration cum skill development programme on “Hygienic Seafood Handling and Value Addition” for SHG working under Alleppey Diocesan Charitable and Social Welfare society	15	29.07.2022- 30.07.2022 ICAR-CIFT, Cochin
17.	Webinar as part of National campaign on “Fish for health and prosperity”	50	02.08.2022 Online mode
18.	Webinar on “NUTRITIONAL SIGNIFICANCE OF SEAFOOD” as a part of 'Azadi Ka Amrut M and National Campaign on fish for health and prosperity'	500	05.08.2022 Online mode
19.	'Independence Day Fish Fair - Farmers Meet: Live Demonstration & Workshop on Value Added Products' under AKAM week for fishers/ fish farmers of nearby fishing villages in Navi Mumbai viz. Ghansoli, Diva, Vashi and Koparkhairane. During the programme, live demonstration on preparation of Value-added products from fish namely Fish cutlets and fish fingers were given.	31	06.08.2022 Ghansoli, Navi Mumbai
20.	Virtual Sensitization Workshop on Microbiological Examination of Seafood Pathogens based on ISO Methods under Transfer of Technology (ToT) activity of the center for Seafood Technologist.	74	22.08.2022 Online mode
21.	Training cum demonstration programme on “Pre-processing and hygienically drying of fish and shellfishes using ICAR-CIFT solar cum electric backup” and “Preparation of value added products from fish and fish waste under SCSP programme	20	22.08.2022 - 24.08.2022 KVK Puducherry
22.	Collaborative programme training cum demonstration on Post harvest fisheries	20	24.08.2022- 26.08.2022 KVK Thrissur



23.	Inplant training for 4th year BFSc students of college of Fisheries, Assam under student READY programme	21	24.08.2022-02.10.2022 ICAR-CIFT Cochin
24.	Training cum demonstration programme on "Pre-processing and hygienically drying of fish and shellfishes using ICAR-CIFT solar cum electric backup" and "Preparation of value added products from fish and fish waste under SCSP programme	20	25.08.2022 - 26.08.2022 KVK Tindivanam
25.	Webinar on Nutritional Management in Aquaculture: A Way to Prosperity	250	04.09.2022 Online mode
26.	Training cum demonstration programme on "Seafood value addition and waste management" under SCSP	20	22.09.2022 - 24.09.2022 ICAR-CIFT Cochin
27.	Hindi workshop on "Official language & its act"	16	05.10.2022 Online mode
28.	Training cum Demonstration programme on "Seafood Value addition and waste management" under SCSP	17	26.10.2022 - 28.10.2022 Govt. Fish Seed Hatchery, Peechi Thrissur
29.	Training cum Demonstration programme on "Hygienic handling and packaging of fish and waste management" under SCSP	93	26.10.2022 - 28.10.2022 ICAR-CIFT Cochin
30.	Organized an international seminar on "Interventions for control of AMR: Harnessing one health knowledge" as a Parallel Event in the 8th Global Conference on Gender in Aquaculture in association with SOFTI & Gender in Aquaculture & Fisheries Section of the Asian Fisheries Society	1000	21.11.2022 – 22.01.2022 IMA Hall, Cochin
31.	8 th Global Conference on "Gender in Aquaculture & Fisheries (GAF8)	35	21.11.2022 – 23.01.2022 SOFTI of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of Asian Fisheries Society (AFS)
32.	Programme on Handing over the Aluminium Canoe for Artisanal Fishing to Pazhassi Scheduled Tribe Reservoir Co-operative Society, Kannur under ICAR-CIFT Tribal Subplan (TSP)	50	12.12.2022 Samudra Shipyard, Aroor

33.	ICAR-CIFT Industry Interface Meeton 'VALUE FISH - VALUE WASTE Value addition and Zero waste management strategies for fishery resources of NEH region' (Under CIFT-NEH Component)	50	12.12.2022 ICAR Research Complex for NEHRegion Tripura Centre
34.	Demonstration of CO ₂ refrigeration in the identified seafood industry, a stakeholder meeting was held at on to sensitize the equipment vendor seafood industry owners and government officials.	50	12.12.2022 ICAR Research Complex for NEHRegion Tripura Centre
35.	National seminar "Towards Zero Waste in Fish utilization: Circular bioeconomy approaches for sustainable Management Waste 2 Wealth	80	26.10.2022 - 28.10.2022 ICAR-CIFT Cochin
36.	ICAR-CIFT Industry Interface Meet	85	14.12.2022 Hotel Regenta Central, Somnath
37.	Capacity Building Programme on "Value addition of fish and shell fish" under SCSP	20	19.12.2022 - 21.12.2022 ICAR-CIFT Cochin
38.	International Training programme on "Recent Technological Development in Fisheries: Pre and Post Harvest Operations"	10	ICAR-CIFT, Cochin





TRAININGS / AWARENESS PROGRAMMES

Sl. No.	Subject	No. of beneficiaries	Venue and date
1.	Capacity Building training programme to technical staff of Kerala Fisheries Department	26	18.01.2022 to 20.01.2022
2.	Training programme on Demonstration cum skill development programme on seafood value addition organized under Scheduled caste sub plan	25	18.01.2022 to 20.01.2022 Udayamperoor, Kochi
3.	Demonstration cum skill development programme on "Seafood Value Addition "organized by ICAR-CIFT, Kochi under Scheduled Caste Sub Plan (SCSP)	25	18.01.2022 to 20.01.2022 Udayamperoor, Kochi
4.	Demonstration cum skill development programme on "Seafood Value Addition " organized by ICAR-CIFT, Kochi under Scheduled Caste Sub Plan (SCSP)	20	26.01.2022 to 28.01.2022 KVK Kumarakom
5.	Demonstration cum skill development programme on "Seafood Value Addition " organized by ICAR-CIFT, Kochi under Scheduled Caste Sub Plan (SCSP)	4	09.02.2022 to 11.02.2022 Visakhapatnam Research Centre of ICAR-CIFT
6.	Pre-processing and drying of fish	20	22.02.2022 to 23.02.2022 ICAR-CIFT
7.	Pre-processing and drying of fish	20	22.02.2022 to 23.02.2022 ICAR-CIFT Cochin
8.	Training program on 'HACCP system for fish & shellfish processing industries'	74	28.02.2022 to 05.03.2022 Online mode
9.	Training programme under the project of "Collaborative technology Dissemination under SCSP for Improving Income and Employability in fisheries sector" Preparation of minced neat, battered and breaded fish products	30	15.03.2022 to 17.03.2022 Online mode
10.	Demonstration cum skill development programme on "Seafood Value Addition and Waste Utilization" under the centrally sponsored scheme SPMRM Govt of India, Department of Rural Development, UT of Lakshadweep by ICAR-CMFRI-KVK, Lakshadweep in collaboration with ICAR-CIFT	30	16.03.2022 to 18.03.2022 Amini Island of Lakshadweep
11.	Training program on "HACCP system for fish and shellfish processing industries"	81	28.03.2022 to 02.04.2022 ICAR-CIFT

12.	Training program on Bacteria of public health significance	22	30.03.2022 to 04.04.2022 ICAR-CIFT
13.	Ad-hoc training on 'Antimicrobial Resistance of Aeromonas spp. isolated from freshwater finfish farms: Studies on influence of temperature on resistance profile and antibacterial effect of plant oils'	1	18.04.2022 to 17.05.2022 Visakhapatnam Research Centre of ICAR-CIFT
14.	Ad-hoc training on 'Antimicrobial Resistance in Escherichia coli isolated from freshwater aquaculture farms: Resistance profiling, Antibiotic Resistant Gene prevalence and effect of plant oils'	1	18.04.2022 to 17.05.2022 Visakhapatnam Research Centre of ICAR-CIFT
15.	One day training on utilization of fish processing discards for the development of feed, silage foliar spray and manure	13	13.05.2022 ICAR-CIFT
16.	Training program on "HACCP concepts"	37	14.06.2022 to 18.06.2022 ICAR-CIFT
17.	Refrigerated mobile fish vending kiosk	12	16.06.2022
18.	One day training on utilization of fish processing discards for the development of feed, silage foliar spray and manure	12	17.06.2022 ICAR-CIFT
19.	Demonstration cum skill development programme on "Value Addition of Freshwater Fishers" for registered Fish Farmers of Matsya Bhavan Chalakudy	19	17.06.2022 ICAR-CIFT
20.	Training cum exposure program on "Post-harvest management and Value addition of Fish" for senior Officers under the World Bank funded APART Project implemented by the Department of Fisheries, Govt of Assam	9	21.06.2022 to 25.06.2022 ICAR-CIFT
21.	Demonstration cum skill development programme on "Fisheries based entrepreneurship" in collaboration with MSSRF, Chennai (Cochin Branch)	25	28.06.2022 to 29.06.2022 ICAR-CIFT
22.	Low-cost boat-building timbers and preservative technologies	35	06.07.2022 to 08.07.2022 Online mode
23.	"Pre-processing and Drying of fish"	19	13.07.2022 to 14.07.2022 ICAR – CIFT
24.	One day awareness program on "Advances in harvest practice for inland water bodies"	48	19.07.2022 Hirakud reservoir Sambalpur Odisha



25.	Collaborative training programme on "Entrepreneurship Development through Fish Processing" organized by Krishi Vigyan Kendra, Thrissur, funded by ICAR- Central Institute of Fisheries Technology under SCSP component programme	40	20.07.2022 to 23.07.2022 KVK, Kerala Agricultural University Thrissur.
26.	Awareness programme on Fish for health and prosperity Speakers - Dr. K.K. Asha, Principal Scientist and SIC (English), Dr. Abhay Kumar, Scientist (Hindi), Dr. Rehana Raj, Scientist (English), Smt. Sangeeta Gaikwad, CTO (English & Hindi)	850	25.07.2022 Sainath Hindi High school and Jr. college (science and commerce batch)
27.	Training program on Microbiological test methods for seafood as per ISO standards	7	25.07.2022 to 29.07.2022 ICAR-CIFT
28.	Awareness programme on Fish for health and prosperity; Speaker - Dr. Rehana Raj, Scientist (English)	1000	25.07.2022 to 29.07.2022 ICAR-CIFT
29.	National webinar on 'Fish for health and prosperity' on Fish for health and prosperity; Speaker - Dr. K.K. Asha, Principal Scientist and SIC (English)	100	27.07.2022 Online mode
30.	Awareness programme on fish for health and prosperity; Speaker -Dr. Rehana Raj, Scientist (English)	715	28.07.2022 Anjuman Islam's Abdul Azim Khatkhatay Secondary School, Vashi Navi Mumbai
31.	Engineering interventions in Post- harvest Fisheries sector (online training)	322	29.07.2022
32.	Awareness programmes on Fish for health and prosperity; Speakers - Dr. Abhay Kumar, Scientist (Hindi), Smt.Sangeeta Gaikwad, CTO (Marathi), Smt. Priyanka Nakhawa, STA (Marathi)	923	29.07.2022 to 04.08.2022 Navi Mumbai Municipal secondary school, Vashi Navi Mumbai
33.	Demonstration cum skill development programme on "Hygienic Seafood Handling and Value Addition" for SHG working under Alleppey Diocesan Charitable and Social Welfare society	15	29.07.2022 to 30.07.2022 ICAR-CIFT
34.	National webinar on 'Diseases in aquaculture and its mitigation measures' Speaker - Smt. Greeshma S.S., Scientist (Malayalam)	64	01.08.2022 Online mode

35.	Awareness programmes on Fish for health and prosperity Speakers - Smt. Sangeeta Gaikwad, CTO (Marathi), Smt. Priyanka Nakhawa, STA (Marathi)	600	01.08.2022 Cheredev Macchimar seva santha, Ghansoli Navi Mumbai
36.	Awareness programmes on Fish for health and prosperity; Speakers - Smt. Sangeeta Gaikwad, CTO (Marathi), Smt. Priyanka Nakhawa, STA (Marathi)	300	01.08.2022 Koparkhairane Macchimar seva bhavisansta, Koparkhairane, Navi Mumbai
37.	Sustainable Fishing Methods	60	01.08.2022 Govt. Fisheries Vocational Higher Secondary School, Arthunkal Alappuzha in connection with the Azadi ka Amrut Mahotsav celebration
38.	Awareness programmes on Fish for health and prosperity; Speaker - Dr. K.K. Asha, Principal Scientist and SIC (English)	1300	01.08.2022 Kendriya Vidyalaya, ONGC Panvel, Navi Mumbai
39.	Awareness programmes on Fish for health and prosperity; Speaker - Dr. K.K. Asha, Principal Scientist and SIC (English)	1260	01.08.2022 Kendriya Vidyalaya, Mankhurd Mumbai
40.	Awareness programme on Fish for health and prosperity; Speaker - Dr. Abhay Kumar, Scientist (Hindi)	200	01.08.2022 Sainath Hindi High school and Jr. college
41.	Awareness programmes by MRC of ICAR-CIFT (in collaboration with Mariaaimacchimarshahakarisantha Ltd. Vashi, Navi Mumbai) on Fish for health and prosperity; Speakers - Smt. Sangeeta Gaikwad, CTO (Marathi), Smt. Priyanka Nakhawa, STA (Marathi)	400	01.08.2022 MRC of ICAR-CIFT, Vashi
42.	Internship programme for B.Tech. students from KAU-KCAET, Tavanur	50	01-08.2022 to 06.08.2022 10.08.2022 to 20.08.2022 22.08.2022 to 27.08.2022 ICAR-CIFT, Cochin



43.	Awareness programmes on Fish for health and prosperity; Speakers - Smt. Sangeeta Gaikwad, CTO (Marathi), Smt. Priyanka Nakhawa, STA (Marathi)	200	02.08.2022 Diva village, Navi Mumbai
44.	Pre-processing and drying of fish	10	03.08.2022 to 04.08.2022 ICAR-CIFT, Cochin
45.	Boat building materials and navigational equipment in a fishing vessel	65	05.08.2022 Kerala University of Fisheries and Ocean Studies (KUFOS)
46.	Recent developments in fish harvesting technology in India	105	MES Asmabi college, Kodungaloor, Trissur, Kerala 07th August 2022.
47.	Entrepreneurship development and about onboard navigational equipments	85	08.08.2022 VHSC, Thevara
48.	Training cum demonstration programme on "Pre-processing and hygienically drying of fish and shellfishes using ICAR-CIFT solar cum electric backup" and "Preparation of value added products from fish and fish waste under SCSP programme	20	22.08.2022 to 24.08.2022 KVK Puducherry from
49.	Training cum demonstration programme on 'Hygienic handling and preparation of convenience fish & shrimp products' under MoA with M/S Rao Food & Groceries, East Godavari, Andhra Pradesh	2	23.08.2022 to 25.08.2022 Visakhapatnam Research Centre of ICAR-CIFT
50.	Collaborative training programme on "Entrepreneurship Development through Fish Processing" organized by Krishi Vigyan Kendra, Thrissur by ICAR- Central Institute of Fisheries Technology under SCSP component programme	20	24.08.2022 to 26.08.2022 KVK Thrissur and Employment Training Center, Mathilakam, Thrissur
51.	In-plant training programme for 4 th Year B.F.Sc students of College of Fisheries, Assam (Assam Agricultural University, Raha, Nagaon) under student READY Programme	21	24.08.2022 to 01.10.2022 ICAR-CIFT, Kochi

52	Training cum demonstration programme on "Pre-processing and hygienically drying of fish and shellfishes using ICAR-CIFT solar cum electric backup" and "Preparation of value added products from fish and fish waste under SCSP programme	20	25.08.2022 to 26.08.2022 KVK Tindivanam
53	e-ITEC Training Programme on "Quality and safety issues in fish and fishery products, organized by ICAR-CIFT	20	19.09.2022 to 01.10.2022 Online mode
54	Training cum demonstration programme on "Seafood value addition and waste management" under SCSP	20	22.09.2022 to 24.09.2022 ICAR-CIFT, Cochin
55	Training cum demonstration programme on "Fishery waste utilization" under SCSP	20	22.09.2022 to 24.09.2022 ICAR-CIFT, Cochin
56	Three days training on value addition and fish waste utilization under SC/ SP	25	22.09.2022 to 24.09.2022 ICAR-CIFT, Cochin
57	DST - SYST - MSTCS Project sponsored training programme on "Hygienic dry fish production technology"	20	28.09.2022 to 29.09.2022 ICAR-CIFT, Cochin
58	Training cum demonstration on 'Hygienic handling and preparation of convenience fish & shrimp products' under MOU with Shri Bokka Venkata Sunilraja, Dhaani's Square Apartments, Attapur, PNR Express Way, Hyderabad Telangana	2	28.09.2022 to 30.09.2022 Visakhapatnam Research Centre of ICAR-CIFT
59	Ad-hoc training on Microbiology to a post-graduate student of All India Institute of Hygiene and Public Health (AIHH & PH), Kolkata	1	10.10.2022 to 09.01.2023 Visakhapatnam Research Centre of ICAR-CIFT
60	Five days hands on training program on " Microbiological examination of seafood pathogens and good laboratory practices"	5	17.10.2022 to 21.10.2022 VKM Pvt. Ltd
61	Ad-hoc training on 'Biochemical Analysis' to post-graduate student of Andhra University, Visakhapatnam	1	17.10.2022 to 16.11.2022
62	Training cum Demonstration programme on "Seafood Value addition and waste management" under SCSP	20	26.10.2022 to 28.10.2022 Govt. fish seed hatchery, Peechi, Thrissur
63	Training cum Demonstration programme on "Hygienic handling and packaging of fish and waste management" under SCSP	20	26.10.2022 to 28.10.2022 ICAR-CIFT



64	Training cum Demonstration programme on "Seafood Value addition and waste management" under SCSP	17	26.10.2022 to 28.10.2022 ICAR-CIFT
65	Value addition and waste management training for fish farmers and entrepreneurs	17	26.10.2022 to 28.10.2022 Peechi Trichur
66	Hygienic handling of fish, packaging and waste management under SCSP	18	26.10.2022 to 28.10.2022
67	Advances in food process engineering and preservation for B.Tech students under SCSP	21	31.10.2022 to 04.11.2022 ICAR-CIFT, Cochin
68	Awareness campaigns in connection with the 'World Fisheries Day' with the theme "Sankalp se Siddhi" about the importance of hygiene in post-harvest seafood handling	25	17.11.2022 Vashi fish market Navi Mumbai
69	Awareness campaigns in connection with World Antibiotics Awareness Week (WAAW) with the theme "Preventing Resistance Together"	25	17.11.2022 Vashi fish market Navi Mumbai
70	Awareness campaigns in connection with the 'World Fisheries Day' with the theme "Sankalp se Siddhi".	120	18.11.2022 Mari AaiMachimar Co-operative Society, Vashi Gaon, Navi Mumbai
71	Awareness campaigns in connection with World Antibiotics Awareness Week (WAAW) with the theme "Preventing Resistance Together".	120	18.11.2022 Mari AaiMachimar Co-operative Society, Vashi Gaon, Navi Mumbai
72	Hygienic handling and drying of fish for farmers/entrepreneurs under the Scheduled caste sub-plan.	19	29.11.2022 to 01.12.2022 ICAR-CIFT, Cochin
73	Hygienic handling and drying of fish for farmers entrepreneurs under the Scheduled caste sub-plan	24	12.12.2022 to 14.12.2022 ICAR-CIFT, Cochin
74	Capacity Building Programme on "Value addition of fish and shell fish" under SCSP	20	19.12.2022 to 21.12.2022 ICAR-CIFT, Kochi

75	On the occasion of Kisan Diwas 'Fishers Meet & Awareness Programme' was organized with the theme 'Hygienic practices in Fish Handling & Cleaner Seas: Reducing Plastic Pollution'. Three lectures cum demonstrations were organized viz. 1.'Hygienic practices in fish handling' 2.'Plastic pollution from fishing gears' 3.'Preparation and importance of clam chutney powder'	65	23.12.2022 Ghansoli, Navi Mumbai
76	International Training programme on "Recent Technological Development in Fisheries: Pre and Post Harvest Operations"	10	ICAR-CIFT, Kochi
77	Capacity Building Programme on "Value addition of fish and shell fish" under SCSP	20	ICAR-CIFT, Kochi; 19-21st December 2022; 3 days
78	Online training on "Quality Testing of Marine Fish based Food Products" for the entrepreneurs SHG members engaged in fish processing and preservation of marine fish products in A&N Islands	90	Online, 1 day
79	International Training programme on "Recent Technological Development in Fisheries: Pre and Post Harvest Operations"	10	ICAR- CIFT, Cochin
80	Organized Hands on Training in "Modern Analytical Techniques in Nutritional Biochemistry (GC-FID-ECD HPLC-FLD-PDA, GC-MS, LC-MS, AAS, UV-Vis Spectrophotometer, and Electrophoresis)"	8	ICAR- CIFT, Cochin
81	Organized Hands on Training Programme conducted under WorldFish Project on "Analytical Techniques in Nutrient Profiling & Nutritional Labelling in Seafood"	10	ICAR- CIFT, Cochin
82	Organized Hands on Training in "Modern Analytical Techniques in Nutritional Biochemistry"	19	ICAR- CIFT, Cochin
83	SCSP training programme on "Utilization of Marine bioactive compounds - Research advances and Future Trends" from 05.12.2022 - 10.12.2022	18	ICAR- CIFT, Cochin
84	SCSP training programme on "Marine Bioprospecting: Extraction and Quantification Approaches" from 12.12.2022 -16.12.2022	5	ICAR- CIFT, Cochin
85	Awareness Programme on Inclusion of Fish in daily diet at Cuttack, Odisha	30	KVK, Cuttack
86	Training-cum-Demonstration programme on Nutritional development through fish and fish based products at Cuttack, Odisha	50	KVK, Cuttack



Training on "Microbial quality analysis of fish and fishery products" for the technologists of various fish processing establishments of Veraval during 03-08 January, 2022



Training on "Fish Handling and Value addition product Development" Under Scheduled Caste Sub-Plan (SCSP) to M/s Shree Bhimarao Matsya Udyog Seva Sahkari Mandali of Veraval, Gujarat during 04-09 July, 2022



Training on "Hygienic handling, Value addition and Packaging of Fish and Fishery products" under Scheduled Caste Sub-Plan (SCSP) to M/s Shree Jeevan Jyot Mahila Jagruti Mandal of Veraval, Gujarat 25-27 August, 2022.



In-plant training programme on "Fish processing and quality Assurance" to students of College of Fisheries Sciences & Research Centre, Etawah, U. P. during 30.09.2022-24.11.2022



Handing over the Trap to the stake holders



Demonstration cum training programme on "Aquafeed preparation" under SCSP to M/s Shree Bhimarao Matsya Udyog Seva Sahkari Mandali of Veraval, Gujarat on 15 December, 2022



Awareness programme on Ghost net retrieval jointly organized by ICAR-CIFT and Wildlife Trust of India on 23 December, 2022



National campaign on "Fish for Health and Prosperity" as part of Azadi Ka Amrit Mahotsav in schools from 30.07.2022-05.08.2022



DAPSC/SCSP/NEH PROGRAMMES

During the year 2022, ICAR-CIFT successfully conducted 114 trainings/capacity building programmes, 30 frontline demonstrations and 5 awareness camps/ workshops/exhibitions/exposure visits covering 21 states and 2 UTs of the country under the DAPSC/SCSP programmes. In addition, 33 other programmes including setting up of sale counters, provision of inputs such as dryers, nets, boats, pens, etc., setting up of dryers, mini fish processing units and custom hiring centres were also taken up during the period.



CIFT technologies including FRP canoes, fishing nets (microfilament, monofilament, gill net 32mm, 34 mm), solar tunnel dryer, solar dryer with electrical backup, fish smoking kiln, manual fish descaling machine, motorised fish descaling machine, refrigeration enabled fish vending kiosk, insulated fish storage boxes, mini fish processing units, fish based products (pickle, fingers, balls, cutlets) and dried fish were popularised among SC beneficiaries all over the country.



For conduct of DAPSC programmes and popularisation of CIFT technologies, ICAR-CIFT established linkages with 18 organisations including NETFISH; MPEDA; KAU, Thrissur; Dr. J. Jayalalithaa Fisheries University, Tamil Nadu; Assam Agriculture University, Jorhat; SKUAST, Jammu; SKUAST, Kashmir; OUAT, Bhubaneswar; ICAR-NRRI, Cuttack; ICAR- CIFA, Bhubaneswar; KVAFSU, Bidar, Karnataka; COF, Dholi, Bihar; College of Fisheries, Kamadhenu University, Gujarat; GADVASU, Punjab; BAU, Jharkhand; GBPUAT, Uttarakhand; COF, Veraval, Gujarat; PKKV, Puducherry and DOF, Tamil Nadu.



Details of DAPSC/SCSP Programmes conducted

Indicators	No. of Programmes	No. of Beneficiaries
Trainings / Capacity building	114	2925
Frontline demonstrations	30	1500
Awareness camps/ Workshops/ Exhibitions/ Exposure visits	5	10000
Others (Distribution of inputs such as nets boats, pens, etc.)	33	33

Overall, 12 CIFT technologies were selected for popularization through 114 capacity building programmes, 30 frontline demonstrations as well as awareness and input distribution programmes. The SCSP programmes of ICAR-CIFT were conceptualized and coordinated by Dr. A. K. Mohanty and Dr. A. Suresh as Nodal Officers and by Dr. Sajeer M. V. and Dr. Sajesh V. K. Co-Nodal Officers during 2022. The programmes could directly benefit nearly 14500 SC members all over the country.

Programmes under NEH component

ICAR-CIFT successfully conducted 27 training/capacity building programmes covering the North East states of Assam, Tripura, Mizoram, Meghalaya, Manipur and Arunachal Pradesh under its NEH component during the year 2022. Other programmes organized during the period were Stakeholders Interface, Establishment of mini fish processing unit, Distribution of technological inputs such as gear, publication of leaflets etc. CIFT harvest and post-harvest technologies including value addition, hygienic fish drying, smoking, pickle making, post-harvest management, solar tunnel dryer, fish smoking kiln technology, waste management methods etc. were popularised among the North eastern states. For the successful conduct of NEH programmes and popularisation of CIFT technologies, ICAR-CIFT established linkages with Central Agricultural University, Imphal, College of Fisheries, Lembucherra, ICAR Research Complex for NEH Region, Barapani, KVKs of NE region, ATARI Guwahati, ATARI Barapani and State Fisheries Departments.

Programmes/Activities	No. of Programmes	No. of Beneficiaries
Training Cum demonstration programme	27	582
Stakeholders Interface	1	50
Establishment of mini fish processing unit	3	30
Distribution of technological inputs	2	19
Publication	1	

The above NEH programmes were conceptualised and implemented by Dr. A. K. Mohanty, Coordinator, CIFT-NEH Component, Dr. Sajeew M. V., Nodal Officer, NEH programme, Dr. Sajesh V. K. and Dr. K. Rejula, Co-Nodal Officers with support of CIFT-NEH Programme Committee. The initiative taken in this regard by ICAR-CIFT could benefit around 700 stakeholders during the year 2022.



A view of various ICAR- CIFT NEH programmes

- ♦ Programme on Handing over the Aluminium Canoe for Artisanal Fishing to Pazhassi Scheduled Tribe Reservoir Co-operative Society, Kannur under ICAR-CIFT Tribal Subplan (TSP). on 12th December, 2022 at Samudra Shipyard, Aroor. Aluminium alloy for canoe construction has been initiated as it can be recycled, light in weight, having low corrosion rate and requires least maintenance. Designed and fabricated Aluminium Alloy canoe (Material Aluminium- Magnesium alloy 5083-Marine grade, L_{OA}- 4.5 m, Breadth 0.9 m and Depth 0.3 m) for artisanal fishing.
- ♦ Training cum Demonstration Programme on “Responsible Fishing in Reservoirs” under ICAR-CIFT SCSP sub plan 24 September 2022 at Pothundi Reservoir, Palakkad under Scheduled Caste Sub Plan (SCSP).
- ♦ Training Programme on “Net fabrication under Tribal Sub-Plan for fisher group from Pazhassi Reservoir, Kannur 17-19 October 2022 at ICAR-CIFT , Kochi.

Subject	No. of beneficiaries	Venue and date
Advanced microbiological and molecular techniques for improving the competence of students in Biological Sciences (under SCSP)	12	19.09.2022 to 24.09.2022 ICAR-CIFT, Cochin
ICAR sponsored skill development program for enhancing competence of students in Microbiology and Biotechnology (under TSP)	15	01.12.2022 to 07.12.2022 ICAR-CIFT, Cochin
ICAR sponsored skill development program for enhancing competence of students in Microbiology and Biotechnology (under SCSP)	17	12.12.2022 to 17.12.2022 ICAR-CIFT, Cochin

- ♦ The Biochemistry and Nutrition Division of ICAR-CIFT has conducted the SCSP training programme on “Utilization of Marine bioactive compounds - Research advances and Future Trends” from 05.12.2022 -10.12.2022. Fifteen participants from five different states of India were given training under the programme. There were 18 theory classes and 5 practical sessions carried out under this programme.
- ♦ The Biochemistry and Nutrition Division of ICAR-CIFT has conducted the SCSP training programme on “Marine Bioprospecting: Extraction and Quantification Approaches” from 12.12.2022 -16.12.2022. Nine participants from five different states of India were given training under the programme. There were 19 theory classes and 5 practical sessions carried out under this programme.



EXHIBITIONS ORGANISED

Sl. No.	Name of the Exhibitions	Organizers	Date (Duration)
1	Matsya Mela	Aquaculture Development Co-op Society (ADCOS), Payyannur, Kannur	13.01.2022 to 14.01.2022
2	At 'Science week festival' exhibition at Andhra University, Visakhapatnam	Andhra University	22.02.2022 to 28.02.2022
3	Kisan Mela at Samastipur, Bihar	Dr. Rajendra Prasad Agri. University	12.03.2022 to 14.03.2022
4	India Boat & Marine Show, Kochi	Cruze Expos, Kochi	25.03.2022 to 27.03.2022
5	12 th IFAF, Chennai	TNJFU	05.05.2022 to 07.05.2022
6	Vanitha Sammelan, Kochi	Cochin Shipyard	08.05.2022
7	2 nd Rural India Business Conclave	ICAR-CPCRI, Kasaragod	10.06.2022 to 13.06.2022
8	25 th national agriculture exhibition	Central Calcutta Science & Culture Organization for Youth	24.08.2022 to 27.08.2022
9	Mathrubhumi Agriculture Fest-2022, Palakkad	Mathrubhumi Printing & Publishing Ltd.	07.10.2022 to 11.10.2022
10	Krishi Darshan-2022, Thrissur	Kerala Agri. Dept	25.10.2022 to 29.10.2022
11	National Symposium on Fisheries & Aquaculture, Bhimtal	DCFR Bhimtal	18.11.2022 to 19.11.2022
12	Kerala Fish Fest-2022, Thiruvananthapuram	Govt. of Kerala	18.11.2022 to 21.11.2022



ICAR-CIFT Exhibition Hall at Andhra University



ICAR-CIFT stall in Exhibition,
Science festival, Kolkatta



Dr. U. Sreedhar, SIC delivering the key note
address in Conference on Fisheries and
Aquaculture organised by CII

Radio Talks

SI No.	Name	Topic	Broadcasted by	Date
1.	Dr. Remya S.	Value addition techniques for increasing fish consumption	All India Radio (AIR), Kochi	29.07.2022
2.	Dr. George Ninan	Incubation prospects in Fisheries Sector	AIR Kochi FM radio	02.08.2022
3.	Dr. Ashish Kumar Jha	Fish for Health and Prosperity	Radio talk 90.4 FM	01.08.2022
4.	Dr. Santhosh Alex	Plastic Pollution in AIR	Kochi FM	16.12.2022

REPLIES TO TECHNICAL QUERIES

Technical queries received from the various categories of clients such as fish processors, technologists, entrepreneurs, self-help groups, Government organizations and fisherfolk were attended to. The queries were related to the topics such as harvest and post-harvest technology of fish, participation in training programme and payment of fees, technical guidance, analytical testing services, assistance under technology transfer programme etc. Some of the items are given below:

- ♦ Technical comments provided by Dr. Sandhya K. M. to the request from Indian Fishnet Manufacturer Association (IFMA) regarding complete ban, use and import of Nylon-6 micro denier fishnet less than 210 Denier on 27th August 2022
- ♦ Query on fish hygiene, cutting, marketing, waste disposal matters and related training Fish/Prawn Pickle making
- ♦ The Visakhapatnam Research Centre received a total of 21 technical queries through email, telephone and walk-in, regarding chitin chitosan production, value added product preparation and drying techniques. Relevant information was provided by the concerned scientist working in that area.



- ◆ Smt. Greeshma S. S, Scientist visited aquaculture farms of Waredi village, Pen Taluk, Raigad district 24th May 2022 and technical advisories were delivered in regard with feed mill installation.
- ◆ Dr. Rehana Raj, Scientist delivered offline advisories on 'Fish value addition opportunities in farm reared species' on 28th June 2022 at MRC of ICAR CIFT (1 beneficiary)
- ◆ Smt. Greeshma S. S, Scientist delivered offline advisories on Seafood safety and quality on 8th July 2022 at Albys Agro Pvt. Ltd, Goa (7 beneficiaries)
- ◆ Smt. Greeshma S. S. Scientist delivered offline advisories on 'Women empowerment through seafood value addition' on 12th July 2022 at MRC of ICAR CIFT (1 beneficiary)
- ◆ Dr. Rehana Raj, Scientist delivered online advisories on 'Waste management in the Seafood sector in Maharashtra' on 12th July 2022 through email (1 beneficiary)
- ◆ Dr. Abhay Kumar, Scientist delivered offline advisories on Seafood Safety & Quality Problems to the technologists in Seafood Processing Industries from Maharashtra (Mumbai, Ratnagiri), Gujarat (Surat) (5+10+15= 30 nos.) during APE visit during 23rd June to 14th July 2022.
- ◆ Dr. K.K. Asha, Principal scientist & SIC and Smt. Greeshma S. S, Scientist delivered offline advisories on Best management practices in aquaculture on 18th July 2022 at MRC of ICAR CIFT (1 beneficiary)
- ◆ Dr. Rehana Raj, Scientist delivered online advisories on 'Fish Processing and Value addition in cultured fish species and opportunities in hands on training in these aspects' on 20th July 2022 over phone and email (1 beneficiary)
- ◆ Dr. Rehana Raj, Scientist delivered offline advisories on 'Fish Processing and Drying' on 25th August 2022 at MRC of ICAR-CIFT (Beneficiaries: 2 nos.)
- ◆ Dr. Abhay Kumar, Scientist delivered offline advisories on Seafood Safety & Quality Problems to the technologists in Seafood Processing Industries from Maharashtra (Mumbai), Gujarat (Navsari) during APE visit dated 27th July to 11th August 2022 (Beneficiaries: 5+10+10= 25 nos.)
- ◆ Dr. Rehana Raj, Scientist delivered offline advisories on 'Fish Farming and Value addition' on 18th August 2022 at MRC of ICAR-CIFT (Beneficiaries:2)
- ◆ Smt. Greeshma S. S, Scientist delivered offline advisories on Best management practices in aquaculture on 18th August 2022 at MRC of ICAR CIFT (Beneficiaries:2)
- ◆ Dr. Rehana Raj, Scientist delivered offline advisories on 'Fish Processing and Drying' on 22nd August 2022 at MRC of ICAR CIFT (Beneficiary:1)
- ◆ Smt. Greeshma S. S, Scientist delivered offline advisories on Nutritional profiling of seafood and advisories on CIFT technologies on 22nd August 2022 at MRC of ICAR CIFT (Beneficiary:1)
- ◆ Smt. Greeshma S. S, Scientist delivered online advisories on Seafood safety and quality on 22nd August 2022 at MRC of ICAR CIFT (Beneficiaries:17)
- ◆ Dr. Asha K K, Principal scientist & SIC delivered offline advisories on 'Good Laboratory Practices, Seafood Safety & Quality Problems' to the technologists during 4 APE visits in Fish Processing Industries in Mumbai on 29th August 2022, 7th September 2022, 21st September 2022 and 23rd September 2022. (Beneficiaries: 16 nos.)
- ◆ Shri Shravan Kumar, Scientist delivered offline advisory to the fishermen of Versova fishing village on 13th September 2022 to increase the catch efficiency in dol nets and set gill nets in shallow coastal waters in the western coastal stretch of Mumbai. (Beneficiaries: 13 nos.)
- ◆ Dr. Rehana Raj, Scientist delivered advisories over phone on 'Fish Processing and Drying' on 14th September 2022 at MRC of ICAR-CIFT (Beneficiary:1 no.)
- ◆ Dr. Abhay Kumar, Scientist Delivered offline advisories on Seafood Safety & Quality Problems to the technologists in Seafood Processing Industries from Ratnagiri, Maharashtra during APE visit dated 15th September 2022 (Beneficiaries: 10 nos.)
- ◆ Shri Shravan Kumar, Scientist actively work for the documentation and work of Rajbhasa Hindi
- ◆ Smt. Greeshma S. S., Scientist delivered offline advisories on 'Seafood Safety & Quality Problems' to the technologists during APE visit to Seasaga Enterprises Private Limited (App.No.278) on 13th October 2022 for Internal Alert at on account of Vibrio chlorae – Qatar (Beneficiaries: 5)

- ♦ Dr. Abhay Kumar, Scientist Delivered offline advisories on Seafood Safety & Quality Problems to the technologists in Seafood Processing Industries from Ratnagiri, Maharashtra during APE visit dated 15th September 2022 (Beneficiaries: 10 nos.)
- ♦ Shri Shravan Kumar, Scientist actively work for the documentation and work of Rajbhasa Hindi
- ♦ Smt. Greeshma S. S., Scientist delivered offline advisories on 'Seafood Safety & Quality Problems' to the technologists during APE visit to Seasaga Enterprises Private Limited (App.No.278) on 13th October 2022 for Internal Alert at on account of Vibrio chlorae – Qatar (Beneficiaries: 5)
- ♦ Smt. Greeshma S. S., Scientist delivered offline advisories on 'Microbiological examination of seafood pathogens and good laboratory practices' to the technologists in VKM Pvt Ltd, Taloja during training programme from 17th to 21st October 2022 (Beneficiaries: 5)
- ♦ Dr. Asha K K, Principal scientist & SIC delivered offline advisories on 'Good Laboratory Practices, Seafood Safety and Quality Problems' to the technologists during the APE visit to M/s. VKM Foods Private Limited on 1st November 2022. (Beneficiaries: 6)
- ♦ Dr. Asha K K, Principal scientist & SIC delivered offline advisories on 'Good Laboratory Practices, Seafood Safety and Quality Problems' to the technologists during APE visit to Sonia Marine Exports Pvt Ltd, on 15th November 2022. (Beneficiaries: 7)
- ♦ Dr. Asha K K, Principal scientist & SIC delivered offline advisories on 'Good Laboratory Practices, Seafood Safety and Quality Problems' to the technologists during the APE visit to Castlerock Fisheries Pvt Ltd, on 17th November 2022. (Beneficiaries: 6)
- ♦ Shri Abhay Kumar, Scientist Delivered offline advisories on Seafood Safety & Quality Problems to the technologists in Seafood Processing Industries from Maharashtra (Ratnagiri) during the APE visit dated 1st – 2nd November 2022. (Beneficiaries: 15)
- ♦ Dr. Rehana Raj, Scientist delivered offline advisories on Value added fishery products to the fisherwomen of Vashi Gaon, Navi Mumbai in connection with World Fisheries Day on 18th November 2022 (Beneficiary: 120)
- ♦ Dr. Rehana Raj, Scientist delivered offline advisories on the Importance of hygiene in post-harvest seafood handling to the fisherwomen of Vashi Gaon, Navi Mumbai in connection with World Antimicrobial resistance Awareness Week on 18th November 2022 (Beneficiary: 120)
- ♦ Smt. Greeshma S. S., Scientist delivered offline advisories on “Role of CIFT in catering the needs of fisheries sector” to the fisherwomen of Vashi Gaon in connection with World Fisheries Day on 18th November 2022 (Beneficiary: 120)
- ♦ Smt. Greeshma S. S., Scientist delivered offline advisories on “Prevent the emergence and spread of antibiotic resistance” to the fisherwomen of Vashi Gaon in connection with World Antimicrobial resistance Awareness Week on 18th November 2022 (Beneficiary: 120)
- ♦ Shri Shravan Kumar, Scientist delivered offline advisories on 'Conservation of fish and its sustainable fisheries and also the issue of microplastics and ghost fishing' to the fisherwomen in the awareness program organized on the occasion of World Fisheries Day in the collaboration of Mari Aai Machchimar Cooperative Society, Vashi, Navi Mumbai on 18th November 2022. (Beneficiary: 120)
- ♦ Dr. Abhay Kumar, Scientist delivered offline advisories on Seafood Safety & Quality Problems to the technologists in Seafood Processing Industries from Maharashtra (Gujarat) during APE visit on 22nd November 2022. (Beneficiaries: 7)





INVITED TALKS

||| Dr. George Ninan

- ♦ Transforming Aquaculture through Technological innovations – Fisheries Post-Harvest Sector, In Azadi Ka Amrut Mahotsav Webinar Series “Fostering Agri Start-up Ecosystem” organized by National Institute of Agriculture Extension Management on 01.03.2022
- ♦ Technological innovations in Post-Harvest Sector for Aquaculture, In National Webinar on “Diversification of aquaculture” by ICAR–Central Institute of Fisheries Technology on 01.03.2022
- ♦ Agri Business Incubators for Fishpreneurship in post-harvest sector, International e-Training on “Extension Management Strategies for Fishpreneurship” sponsored by AARDO on 09.05.2022
- ♦ Business opportunities in fish processing sector, In online seminar organized by District Industries Centre, Malappuram on 08.06.2022
- ♦ Micro Enterprises-opportunities in fisheries post-harvest sector , In training programme organised by Kerala Institute for Entrepreneurship Development on 20.6.2022
- ♦ Entrepreneurial opportunities in sea food processing and value addition, In Entrepreneurship Development Programme organised by TBI of NIT Calicut at kayamkulam on 24.06.2022
- ♦ Nurturing the fisheries start-ups through ABI: A framework approach, In 'New Start-up Opportunities in Fisheries' organised by ICAR –CIFT and sponsored by National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Ministry of Agriculture and Farmers' Welfare, Government of India on 14.07.2022
- ♦ Entrepreneurship development & opportunities in fisheries, In Fostering Entrepreneurship Development in the Livestock & Fisheries Sector” organized by NaaViC ABI Centre, ICAR –NIVEDI, Bengaluru on 25.08.2022
- ♦ Quality and safety issues in coated fish products: Industry Perspective, In ITEC training programme on Quality Assurance of Fish And Fishery Products organized by ICAR CIFT on 21.09.2022
- ♦ Entrepreneurship in harvest and post-harvest fisheries: Options and way forward, In SCSP training programme on advanced microbiological and molecular techniques organized by ICAR-CIFT on 23.09.2022
- ♦ Advancements and Applications" energy demands in fisheries post-harvesting in India, In SPARC online workshop on "CO₂ refrigeration systems: Fundamentals on 12.10.2022
- ♦ Entrepreneurship opportunities in value added fish products, National Seminar on recent advances in the postharvest technology of fish organized by the Neotia University, West Bengal

||| Dr. Leela Edwin

- ♦ National Science Day - 2022, Bhavans Vidya Mandir, Eroor on 28.02.2022
- ♦ Entrepreneurship development among scheduled tribe communities through harvest and post harvest management of fishes, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-K) Faculty of Fisheries from 02.03.2022 to 04.03.2022
- ♦ International Women's Day Celebrations, MPEDA on 08.03.2022
- ♦ Advances in harvest and post-harvest fisheries sectors in India:Initiatives of ICAR-CIFT, In Indian Fishereies Outlook 2022:Priming Indian Fisheries in Attaining Sustainable Development Goals, ICAR-CMFRI, Barrackpore, Kolkata, India on 23.03.2022
- ♦ Eco Friendly Fishing Techniques, In 12th IFAF, Chennai from 05.05.2022 to 07.05.2022

- ♦ Extension Management Strategies for Fishpreneurship, In International e-Training Technological advancements for boosting fishing sector of India, AARDO on 09.05.2022
- ♦ Responsible Fishing: Importance and Implementation Strategies, In 21 days national refresher course (NRC 2022) on fisheries, aquaculture and post-harvest technology on 10.05.2022
- ♦ ICT Application to enhance the profitability of fisheries based enterprises, In e-training program ICAR-CIFT & MANAGE, Hyderabad from 30.05.2022 to 03.06.2022
- ♦ Fisheries, aquaculture and post-harvest technology, In 21 Days National Refresher Course (NRC 2022) on 30.05.2022
- ♦ Utilisation of low value timbers for boat building, In Online Training Programme on Low-cost Boat Building Timbers and Preservative Technologies on 07.07.2022

||| Dr. A. K. Mohanty

- ♦ Promoting EDP in fisheries: Extension strategies & way forward, In 12th IFAF conference at ICAR-CIBA, Chennai on 10.05.2022
- ♦ Inclusive entrepreneurship along fish supply chain, In MANAGE sponsored Off-Campus online collaborative training programme "New Start-up opportunities in fisheries" on 12.07.2022
- ♦ Advanced extension techniques for translating research to development in fisheries, In International Training programme on "Recent Technological Developments in Fisheries: Pre and Post-Harvest Operations organised African Asian Rural Development Organisation (AARDO), New Delhi organised by ICAR-CIFT, Cochin from 12.12.2022 to 19.12.2022

||| Dr. M. P. Remesan

- ♦ Resource & Energy conservation measures in fishing gear, In 21 Days National Refresher Course (NRC 2022) "Fisheries, Aquaculture and Post-Harvest Technology on 17.05.2022
- ♦ Resource Conservation in Indian Fisheries: CIFT-TED Implementation", In the webinar held as part of Participatory Management for Sustainable Fisheries and Biodiversity Conservation, In Azadi ka Amrit Mahotsav National Campaign, ICAR-NBFGR, Lucknow on 04.08.2022
- ♦ Inland fishing and Advancements in trawling techniques, In Student READY programme for 4th year BFSc students of College of Fisheries, Assam Agricultural University, Raha, Assam at ICAR-CIFT from 01.09.2022 to 30.09.2022
- ♦ Swachh Sagar: CIFT's initiative, In National Campaign on Clean Coast- Safe Sea at ICAR-CIFT in association with 'Vigyan Prasar' on 12.09.2022
- ♦ Frontier areas of research in fishing technology, In SCSP training programme for improving the competence of SC students in biological sciences from 19.09.2022 to 24.09.2022

||| Dr. Nikita Gopal

- ♦ Promoting climate-Smart aquaculture systems, In IFAO & Worldfish on 27.01.2022
- ♦ Women and the changing tide, on Aquataalks, In the occasion of International Women's Day at Jaljeevika, Pune on 08.03.2022
- ♦ Climate Change, Coastal Ecosystems and Gender, In the occasion of International Women's Day at Swasthi Foundation, Thiruvananthapuram on 08.03.2022



- ♦ 'Why Gender Matters in Fisheries & Aquaculture, In 1st Indian Fisheries Outlook in the Session: Fisheries Extension, Governance & Policy organised by ICAR-CIFRI, Barrackpore, Professional Fisheries Graduates Forum, Mumbai and Society of Aquaculture Professionals, Chennai on 23.03.2022
- ♦ Women fish harvesters in India: Issues and Challenges, In National Workshop on: SSF Guidelines and Women in Fisheries, India organized by ICSF and FAO from 08.04.2022 to 10.04.2022
- ♦ Mainstreaming Gender in Aquaculture and Fisheries, In 12th IFAF conference at ICAR-CIBA, Chennai on 05.05.2022 to 07.05.2022
- ♦ Labour in fishing and fish processing: issues and challenges, In 12th IFAF conference at ICAR-CIBA, Chennai on 10.05.2022
- ♦ Why Gender Matters for Sustainable Fisheries and Aquaculture, In 4th World Small Scale Fisheries Congress from 10.05.2022 to 12.05.2022
- ♦ Towards a social economy of dried fish in South Asia, In 4th World Small Scale Fisheries Congress from 10.05.2022 to 12.05.2022
- ♦ Navigating weights and management in the dried fish value chain, In 4th World Small Scale Fisheries Congress from 10.05.2022 to 12.05.2022
- ♦ Tastes and smells of dried fish, In 4th World Small Scale Fisheries Congress from 10.05.2022 to 12.05.2022
- ♦ Practice & Ways to Strengthen Women's participation in Fisheries sector, In Dept. of Environment, Food and Rural Affairs (DERA), UK; World Bank and CII on 05.07.2022
- ♦ Community based enterprise development: An analysis of a successful case study, In MANAGE sponsored Off-Campus online collaborative training programme "New Start-up opportunities in fisheries" on 11.07.2022
- ♦ Conservation of Fisheries Biodiversity & Protective of Farmer's Rights, In ZTM-ABI Centre of ICAR-CIFT & KVK, ICAR-CMFRI on 25.07.2022
- ♦ Gender Inclusion Strategies for Fisheries & Aquaculture in India, In Ernst & Young (EY), for Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying
- ♦ Developing responsive and inclusive models for addressing gender inequalities in fisheries, In International Conference on Sustainable Development in Hill and Coastal Ecosystems, Role of gender and empowerment pathways for bringing gender equality at MSSRF, Chennai on 07.08.2022 to 09.08.2022
- ♦ Developing responsive and inclusive models for addressing gender inequalities in fisheries, In International Conference on Sustainable Development in Hill and Coastal Ecosystems, organised by MSSRF, Chennai on 09.08.2022
- ♦ Women In Small-Scale Fisheries: Proposals for A Better Future, 2022, In Fishing for Life 2022", South and South-East Asian Conference on Small Scale Fisheries and Aquaculture from 19.09.2022 to 20.09.2022
- ♦ Social Science in Fisheries Education in India, In ISAFE4, Asian Fisheries Society, Taiwan Branch and National Pingtung University of Science and Technology from 07.10.2022 to 08.10.2022
- ♦ Photo narrative on women in dried fish sector in Kerala, India, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2023 to 23.11.2022

- ♦ Decent work and thriving businesses for women working in fisheries: a cooperative action plan, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2023 to 23.11.2022
- ♦ Work related health issues among women workers in seafood processing units in central Kerala, India, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2023 to 23.11.2022
- ♦ Why are women labour moving away from the fisheries sector? A case study from a fishing village in kerala, india, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2023 to 23.11.2022
- ♦ Unpacking the gender perspectives of seaweed farmers: envisioning future pathways and call for action, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2023 to 23.11.2022
- ♦ Women Seaweed Growers Of India- Exploring The Intersection Of Farm And Household Dynamics At Play, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2023 to 23.11.2022
- ♦ Gender-based approaches in sustainable fisheries management, In International Training programme on "Recent Technological Developments in Fisheries: Pre and Post-Harvest Operations organised African Asian Rural Development Organisation (AARDO), New Delhi organised by ICAR-CIFT, Cochin from 12.12.2022 to 19.12.2022
- ♦ Work related health issues among women workers in seafood processing units in central Kerala, India, In Recent Technological Developments in Fisheries: Pre- and Post-Harvest OperationsDate

|| Dr. V. Geethalakshmi

- ♦ Assessment of post-harvest losses in the fish supply chain, In MANAGE Sponsored off-campus online collaborative training programme on 'Supply chain Management in Fisheries' organised at ICAR-CIFT, Cochin on 19.04.2022
- ♦ Management of culture-based fisheries in small reservoirs by population modelling – A case study, In 12th IFAF conference at ICAR-CIBA, Chennai from 05.05.2022 to 07.05.2022.
- ♦ Women's roles and challenges in diverse fisheries activities, In 12th IFAF conference at ICAR-CIBA, Chennai from 05.05.2022 to 07.05.2022
- ♦ Statistical techniques for successful management of fishprenureship, In 12th IFAF conference at ICAR-CIBA, Chennai from 05.05.2022 to 07.05.2022
- ♦ Supportive role of women in inland fish farming and technology Initiatives for doubling income, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8)organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2023 to 23.11.2022
- ♦ Data mining and computation software for improving fisheries research, In International Training programme on "Recent Technological Developments in Fisheries: Pre and Post-Harvest Operations organised African Asian Rural Development Organisation (AARDO), New Delhi organised by ICAR-CIFT, Cochin from 12.12.2022 to 19.12.2022



||| Dr. Ashaletha S.

- ♦ Women's role in fish supply chains, In MANAGE Sponsored off-campus online collaborative training programme on 'Supply chain Management in Fisheries' organised at ICAR-CIFT, Cochin on 21.04.2022
- ♦ Women initiated entrepreneurship in fisheries: An analytical perspective, In 12th IFAF conference at ICAR-CIBA, Chennai on 11.05.2022
- ♦ Women entrepreneurs in coastal villages: how vulnerable they are to disasters, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2023 to 23.11.2022
- ♦ Micro-enterprises in fisheries for livelihood security- Scope & Challenges, In International Training programme on "Recent Technological Developments in Fisheries: Pre and Post-Harvest Operations organised by African Asian Rural Development Organisation (AARDO), New Delhi organised by ICAR-CIFT, Cochin from 12.12.2022 to 19.12.2022

||| Dr. Toms C. Joseph

- ♦ Antimicrobial Resistance in Aquaculture: An issue of concern, In National Webinar on world microbiome day at School of Food Science and Technology, MG University, Kottayam on 27.06.2022
- ♦ AMR in fisheries and its mitigation measures, In Regional workshop on Technologies for sustainable and resilient fishery-based livelihoods in North East region at ICAR Research complex for NEH region, Barapani from 19.01.2023 to 20.01.2023
- ♦ The rising tide of antimicrobial resistance in aquaculture: can probiotic be the answer?, In International Seminar Interventions for Control of AMR: Harnessing One Health Knowledge Jointly organized by Gender in Aquaculture & Fisheries Section of the Asian Fisheries Society, ICAR-Central Institute of Fisheries Technology, Kochi and the Society of Fisheries Technologists (India) (SOFTI), Kochi at IMA Hall, Kaloor from 21.11.2022 to 22.11.2022

||| Dr. U. Sreedhar

- ♦ Climate Resilient practices in Fisheries, In Work shop on 'Climate Resilient practices and Value Chain in Small Scale Fishery' organised by Institute for Motivating Self-employment (IMSE) along with District Fishermen's Youth Welfare Association (DFYWA) on 12.07.2022
- ♦ About ICAR-CIFT and Avenues for youth in the field of Fisheries, In In 85th seminar on career guidance after 10+2' organized by Vizag Intellectuals and Professional Forum, Visakhapatnam on 24.07.2022
- ♦ Use of electronics and remote sensing in fisheries, In Special consumer outreach programme' organized by Telecom Regulatory Authority of India in association with department of fisheries, AP& ICAR-CIFT on 12.08.2022
- ♦ Recent Advances in Sustainable Fishing, In seminar RAAE-2022 organised by St. Ann's College for Women, Malkapuram, Visakhapatnam on 07.09.2022
- ♦ Innovation & Technology across the supply chain in fisheries, In Conference on Fisheries and Aquaculture with the theme "Showcasing Andhra Pradesh as a hub for Fisheries & Aquaculture Investment" jointly organised by CII Andhra Pradesh jointly with CII Food & Agriculture Center of Excellence (FACE) on 23.09.2022

||| Dr. B. Madhusudana Rao

- ♦ Emergence and dissemination of Antimicrobial Resistance (AMR) in Food Producing Animals: An overview of knowledge gaps and control strategies, In Utkarsha-National Livestock Conference, organized by the Indian Society of Animal Production and Management (ISAPM) and Sri Venkateswara Veterinary University (SVVU), Tirupati from 11.04.2022 to 13.04.2022
- ♦ Fish and Marine Products Processing for the Andhra Pradesh, In the 'Entrepreneurship Development Programme on Food Processing' organized by Federation of Andhra Pradesh Chambers of Commerce and Industry (FAPCCI), Vijayawada from 20.04.2022 to 21.04.2022
- ♦ Antimicrobial Resistance (AMR) and Antibiotic Residues in Food Producing Animals, In World Veterinary Day 2022 Celebrations organized by Animal Husbandry Department (Srikakulam District), Government of Andhra Pradesh on 30.04.2022
- ♦ Aquaculture practices to ensure safe seafood, In National campaign on Emerging Aquaculture Systems and Practices as part of Azadi ka Amrit Mahotsav organized by ICAR-Central Institute of Fisheries Technology (ICAR-CIFT) on 11.07.2022
- ♦ Pre-Harvest and Post-Harvest Practices in Aquaculture to meet the Food Safety Regulations, In Training Programme on 'Better Management Practices in Shrimp Farming. Avanti Aquaculture Skill Development Centre, Visakhapatnam on 11.07.2022
- ♦ Healthy food for boosting Immunity, In 85th seminar on career guidance after 10+2' organized by Vizag Intellectuals and Professional Forum, Visakhapatnam on 24.07.2022
- ♦ Food Safety Standards for Value Added Fish Products, In Training programme on 'Preparation of Fish and Prawn Value Added Products' organized by Fisheries Research Station, Undi, Andhra Pradesh on 12.08.2022
- ♦ Bacteriophages as natural antimicrobials, In the 'National Webinar on Antimicrobial Resistance (AMR), at ICAR-Central Institute of Freshwater Aquaculture (CIFA) as part of WAAW 2022 on 17.11.2022
- ♦ Application of advance tools in fisheries research (Biotechnology, Bioinformatics and Artificial Intelligence, In Fisheries and aquaculture for livelihood and National security" organized ICAR-Directorate of Coldwater fisheries research and Coldwater Fisheries Society of India, Bhimtal, Uttarakhand on 19.11.2022
- ♦ Phages for the control of Antimicrobial Resistance, In International Seminar on 'Interventions for control of AMR: Harnessing one Health Knowledge' a parallel event of the 8th Global Conference on Gender in Aquaculture & Fisheries (GAF8) jointly organized by SOFT(I), AFS and ICAR-CIFT on 21.11.2022
- ♦ Communicating Research findings to the Scientific Fraternity and General Public: An overview of the publication process, In SERB sponsored High End Workshop (Karyashala) entitled 'Ignition & infix of scientific temper in underprivileged areas: Reach to Unreach' organized by Government Degree College (Men) at Srikakulam on 23.12.2022

||| Dr. A. Suresh

- ♦ Economic Evaluation Tools for Biodiversity Management, In Thunchath Ezhuthachan Malayalam University on 15.03.2022
- ♦ Market imperfections in supply chain of fish: Need for reforms, In MANAGE Sponsored off-campus online collaborative training programme on 'Supply chain Management in Fisheries' organised at ICAR-CIFT, Cochin on 20.04.2022



- ♦ Fisheries And Sustainable Development Goals: The Case of India, In 12th IFAF conference at ICAR-CIBA, Chennai on 05.05.2022 to 07.05.2022
- ♦ Reforming supply chain of fish for economic efficiency: An overview, In 12th IFAF conference at ICAR-CIBA, Chennai on 11.05.2022
- ♦ Marketing ecosystem for entrepreneurial development in Fisheries, In MANAGE sponsored Off-Campus online collaborative training programme “New Start-up opportunities in fisheries” on 13.07.2022
- ♦ Production, Export and Competitiveness of Fish and Fishery products in India: An Analysis Across Technology and Policy, In 82nd Annual conference of ISAE, Session title: Innovation, Access to Technology and Competitiveness of markets organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2022 to 23.11.2022
- ♦ Gender impacts in fish vending in the context of changing Production and market relations: a case study in Kerala, In 8th Global Conference on “Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2022 to 23.11.2022
- ♦ Decentralized planning and agricultural development, In workshop to design a training module on Climate Smart Agriculture for elected representatives on 10.12.2022
- ♦ Global status and perspectives on value chain development in fisheries, In International Training programme on “Recent Technological Developments in Fisheries: Pre and Post-Harvest Operations organised African Asian Rural Development Organisation (AARDO), New Delhi organised by ICAR-CIFT, Cochin from 12.12.2022 to 19.12.2022

||| Dr. G. K. Sivaraman

- ♦ Application of Digital Intelligence in Aquaculture Health Management, In Online collaborative training programme on 'ICT applications to enhance profitability of Fisheries based enterprises' sponsored by National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Ministry of Agriculture and Farmers' Welfare, Government of India, organised by ICAR-CIFT, Cochin from 30.05.2022 to 03.06.2022
- ♦ Multi-drug resistant (MDR) bacteria pathogen in fisheries and its environment, In Indo-German Bilateral Workshop: “Agricultural Management Practice Effects on Soil- and Plant-associated bacterial communities and their resistome” – AMPESAP at Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Potsdam, Germany from 20.06.2022 to 22.06.2022
- ♦ Antimicrobial resistance in foodborne pathogens (Theory) & Determination of AMR in bacteria (Practical), In-plant training programme for 4th year BFSc students of College of Fisheries, Assam Agri. Unib, Raha, Nagaon under student READY Programme at ICAR- CIFT, Cochin from 24.08.2022 to 01.10.2022
- ♦ Antimicrobial resistance (AMR) in aquatic products, In International training programme on “Recent Technological Developments in Fisheries: Pre and Post-Harvest Operations organised by African Asian Rural Development Organisation (AARDO), New Delhi organised by ICAR-CIFT, Cochin from 12.12.2022 to 19.12.2022

||| Dr. Madhu V. R.

- ♦ Importance of fish behaviour for fishing gear design, In 21 Days National Refresher Course (NRC 2022)- "Fisheries, Aquaculture and Post-Harvest Technology on 17.05.2022
- ♦ Responsible Fishing with special reference to Turtle Excluder Devices, In One-day seminar organized by TNFAU on the occasion of Turtle Day on 23.05.2022
- ♦ Fishing as an occupation and associated livelihood projects, In Training programme on Fisheries and Aquaculture for the Grameen Bank Officers, Kerala University of fisheries and Ocean studies from 07.07.2022 to 08.07.2022
- ♦ Bycatch reduction devices: TED, Square mesh codend and pingers, In two days awareness cum training programme to all State Coordinators in MPEDA-NETFISH on 16.07.2022

||| Dr. Sajeew M. V.

- ♦ Studies on consumption patterns of fish, In MANAGE Sponsored off-campus online collaborative training programme on 'Supply chain Management in Fisheries' organised at ICAR-CIFT, Cochin on 21.04.2022
- ♦ Drivers and barriers in fish consumption: Consumer perspectives for entrepreneurship, In 12th IFAF conference at ICAR-CIBA, Chennai on 12.05.2022
- ♦ Women perceive benefits of fish consumption differently: empirical Evidence from Kerala, India, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2022 to 23.11.2022
- ♦ Participatory and Integrative Techniques for use with women farmers, In Collaborative Training Program No. 441 of MANAGE & ICAR CPCRI titled 'Gender Dimensions for knowledge integration and sustainable food systems through IFS' at ICAR CPCRI, RS, Kayamkulam on 05.01.2022

||| Dr. Pe. Jeyya Jeyanthi

- ♦ Supply chain performance measurement in fisheries, In MANAGE Sponsored off-campus online collaborative training programme on 'Supply chain Management in Fisheries' on 18.04.2022
- ♦ Cost reduction and pricing mechanism in the fish supply chain, In MANAGE Sponsored off-campus online collaborative training programme on 'Supply chain Management in Fisheries' organised at ICAR-CIFT, Cochin on 20.04.2022
- ♦ Performance appraisal and economic benchmarking of Trawlers operating in East Coast of India, In 12th IFAF conference at ICAR-CIBA, Chennai from 05.05.2022 to 07.05.2022
- ♦ Consumer behaviour studies for entrepreneurship development: An economic perspective, In 12th IFAF conference at ICAR-CIBA, Chennai on 12.05.2022
- ♦ Systematic approach to stakeholders' feasibility analysis for Entrepreneurship Development Process, In MANAGE sponsored Off-Campus online collaborative training programme "New Start-up opportunities in fisheries" on 11.07.2022
- ♦ Investment analysis for a viable business, In MANAGE sponsored Off-Campus online collaborative training programme "New Start-up opportunities in fisheries" on 13.07.2022
- ♦ Post-Harvest Losses in Fish: An Economic Approach, In College of Fisheries AAU, Rahathe, under READY programme from at ICAR-CIFT, Kochi on 24.08.2022 to 01.10.2022
- ♦ Womens' labour in fish vending in Kerala, India, In 8th Global Conference on "Gender in Aquaculture &



Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2022 to 23.11.2022

||| Dr. V. Chandrasekar

- ♦ Evaluation of Supply Chain Efficiency using Data Envelopment Analysis, In MANAGE Sponsored off-campus online collaborative training programme on 'Supply chain Management in Fisheries' organised at ICAR-CIFT, Cochin on 20.04.2022
- ♦ Evaluation of supply chain efficiency using Data Envelopment Analysis, In Supply chain management in fisheries Online collaborative training program with MANAGE, Hyderabad at ICAR-CIFT, Kochi on 24.04.2022
- ♦ Economic valuation of ecosystem services provided by black clam in the Vembanad estuarine system of Kerala", In 12th IFAF conference at ICAR-CIBA, Chennai from 05.05.2022 to 07.05.2022
- ♦ ICT applications for fishery entrepreneurship, Extension Management Techniques for Fishpreneurship" in collaboration with AARDO, New Delhi at ICAR-CIFT, Kochi from 09.05.2022 to 12.05.2022
- ♦ Information management in fishpreneurship using web-based tools, In MANAGE sponsored Off-Campus online collaborative training programme "New Start-up opportunities in fisheries" on 13.07.2022
- ♦ Mobile applications for sample testing and training facilities at ICAR-CIFT, In ICT applications to enhance the profitability of Fisheries based enterprises' in collaboration with MANAGE, Hyderabad at ICAR-CIFT, Kochi on 30.05.2022
- ♦ Modern management tools and approaches in the fisheries value chain, In Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach" jointly organized by TNFJU, Thoothukudi, college & MANAGE Hyderabad at ICAR-CIFT, Kochi from 28.09.2022 to 30.09.2022
- ♦ E-marketing for fish business, In Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach" jointly organised by TNFJU, Thoothukudi, college & MANAGE Hyderabad at ICAR-CIFT, Kochi from 28.09.2022 to 30.09.2022
- ♦ Skilling women in modern fish drying practices and impact on employment and income, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2022 to 23.11.2022

||| Dr. S. Visnuvinayagam

- ♦ Microbiological aspects of fish and fishery products, In AARDO sponsored international training programme at ICAR-CIFT from 24.08.2022 to 01.10.2022
- ♦ Alternative to antibiotics, In-plant training programme for the 4th year B.F.Sc. students of Fisheries, Assam Agricultural University, Raha, Nagaon under the student READY Programme at ICAR-CIFT from 24.08.2022 to 01.11.2022
- ♦ Relevance and appropriate detection techniques for pathogenic and indicator bacteria of aquatic importance, In Centre for Water Resources Development and Management (CWRDM), Kozhikode - 673 571, Kerala, India on 07.12.2022
- ♦ Microbiological aspects of fish and fishery products, In AARDO sponsored international training programme organised by EIS Division, ICAR-CIFT on 12.12.2022 to 19.12.2022
- ♦ Information management in fishpreneurship using web-based tools, In MANAGE sponsored Off-

Campus online collaborative training programme “New Start-up opportunities in fisheries” on 13.07.2022

- ♦ Mobile applications for sample testing and training facilities at ICAR-CIFT, In ICT applications to enhance the profitability of Fisheries based enterprises' in collaboration with MANAGE, Hyderabad at ICAR-CIFT, Kochi on 30.05.2022
- ♦ ICT interventions in fisheries value chain, In -plant training programme for 4th year B.F.Sc students of the at ICAR-CIFT, Kochi on 27.09. 2022
- ♦ Modern management tools and approaches in the fisheries value chain, In Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach” jointly organized by TNFJU, Thoothukudi, college & MANAGE Hyderabad at ICAR-CIFT, Kochi from 28.09.2022 to 30.09.2022
- ♦ E-marketing for fish business, In Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach” jointly organised by TNFJU, Thoothukudi, college & MANAGE Hyderabad at ICAR-CIFT, Kochi from 28.09.2022 to 30.09.2022
- ♦ Skilling women in modern fish drying practices and impact on employment and income, In 8th Global Conference on “Gender in Aquaculture & Fisheries (GAF8)organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2022 to 23.11.2022

||| Dr. Ashish Kumar Jha

- ♦ Development of Seaweed-based Products and Relevant Quality Issues, In Indian Technical Economic Cooperation (ITEC) programme on Recent Advances in Harvest and Post-Harvest Technologies in Fisheries organized by ICAR-CIFT on 21.09.2022
- ♦ Secondary fishery material generation in Saurashtra coast- A supply chain perspective, In National seminar on “Towards zero waste in fish utilization: circular bioeconomy approaches for sustainable management WASTE2WEALTH” conducted by ICAR-CIFT on 14.12.2022
- ♦ Bioaccumulation of hazardous metals and trace minerals in sharks: Evaluation of health risk to consumer, In International Conference on Responsible Aquaculture and Sustainable Fisheries Interact (RASHI) on 15.12.2022

||| Dr. Murugadas V.

- ♦ Seafood pathogen: detection, molecular fingerprinting and control; In Summer/Winter School (MOOC) on “Skill Development Program in Hygienic Handling and Seafood Valorization” for students and entrepreneurs at School of Industrial Fisheries, Cochin University of Science and Technology, Cochin on November 2022
- ♦ Surveillance for AMR in bacteria of aquatic bodies, In Training program on Emerging Waterborne Microbial Contaminants: Monitoring and Risk Reduction through Advanced Biotechnological at Centre for Water Resources Development and Management (CWRDM), Kozhikode on 06.12.2022

||| Dr. Viji P.

- ♦ Harvesting & post-harvest handling practices to meet quality regulations & Value addition of farmed fish & shell fish, In the training programme on 'Better management practices in Penaeus vannamei farming' organized by AVANTI Aquaculture Skill Development Centre at MLR, Andhra University on 21.07.2022
- ♦ Innovative technologies in Fish processing, In the webinar 'Role of MPEDA in development of Andhra Pradesh” organized by MPEDA on 21.07.2022



- ♦ Harvest and Post Harvest handling practices to meet quality regulations and value addition of fish, In the training programme on better management practices in Penaues vannamei farming, conducted by AU-Avanti ASDC, Visakhapatnam on 27.07.2022
- ♦ Harvest and Post Harvest handling practices for aquacultured shrimp, In training programme on better management practices in Penaues vannamei farming, conducted by AU-Avanti ASDC, Visakhapatnam on 10.08.2022
- ♦ Fish processing technologies and value addition, In training programme 'Capacity building of extension functionaries to meet emerging challenges in fisheries sector' conducted by Extension Education Institute, Hyderabad for the officers of Dept. of fisheries at SIFT, Kakinada on 11.10.2022
- ♦ Innovations & Technology across supply chain in Fisheries, In GCF-UNDP-MoEF& CC – GoAP Project workshop “Enhance Climate Resilience of India's Coastal Communities” organised by GCF-UNDP (India) at Vijayawada on 01.11.2022
- ♦ Surveillance for AMR in bacteria of aquatic bodies, In Training program on Emerging Waterborne Microbial Contaminants: Monitoring and Risk Reduction through Advanced Biotechnological at Centre for Water Resources Development and Management (CWRDM), Kozhikode on 06.12.2022

||| Dr. A. Jeyakumari

- ♦ Surimi and other mince-based fishery products, In On-line training for Master Trainers on Fish and Marine Products Processing organized by NIFTEM in collaboration with ICAR-CIFT on 06.01.2022
- ♦ Value added fishery products, In Training programme under the project “Collaborative Technology and Employability in Fisheries Sector in Odisha on 08.02.2022
- ♦ Value-added fishery products for senior officers under world bank funded, In Training – cum-exposure program on 'Post-harvest management and value addition of fish' for senior officers under the World Bank Funded APART project implemented by the Department of Fisheries, Govt. of Assam at ICAR-CIFT, Cochin, on 25.06.2022.
- ♦ Fish processing and value addition – Methods, Scope and Opportunities, In Value addition Training programme under SCSCP at Thrissur on 20.07.2022
- ♦ Seafood handling and curing techniques, In International training programme on “Recent technological development in fisheries: Pre and Post harvest operations, at ICAR-CIFT, Cochin on 14.12.2022

||| Dr. Prajith K. K.

- ♦ Marine mammal interactions in pelagic gears and its mitigation, In Training program on 'Bycatch Reduction in Fisheries: Recent Advances' organised by ICAR-Central Institute of Fisheries Technology, Kochi, ICAR-Centrallnstitute of Fisheries Technology, Kochi on 20.01.2022
- ♦ Pots and Traps for Energy Efficient and Responsible Fishing, In 21 Days National Refresher Course (NRC 2022) On “Fisheries, Aquaculture and Post-Harvest Technology” Organized by ICAR-Central Institute of Fisheries Technology, Kochi, Kerala, Faculty of Fisheries, Rangil, Ganderbal (SKUAST – Kashmir) & National Agriculture Development Cooperative Ltd. Baramulla, J & K
- ♦ Fish trap operation in reservoirs, In STC Training programme at ICAR-CIFT, Kochion 19.10.2022
- ♦ Inland fisheries – CIFTs Intervention, In International training programme on Recent technological developments in fisheries: Pre and post-harvest operations at ICAR-CIFT, Kochi from 12.12.2022 to 19.12.2022

||| Dr. Remya S.

- ♦ Non-Thermal Fish Processing Techniques, In 21 Days National Refresher Course (NRC 2022) on "Fisheries, Aquaculture and Post-Harvest Technology" jointly organized by ICAR-CIFT, Kochi, Kerala, Faculty of Fisheries, Rangil, Ganderbal (Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir) and National Agriculture Development Cooperative Ltd (NADCL) Baramulla on 21.05.2022
- ♦ Advanced Non-Thermal Fish Processing Techniques, In Training program on 'Promotion of technologies and & extension strategies for value addition and post-harvest technologies for the officers of fisheries sector' for the officers of Department of Fisheries, South Indian States and UTs conducted by Extension Education Institute (EEI), Hyderabad, on 09.06.2022
- ♦ Advanced packaging techniques for seafood products, In Training-cum-exposure programme on 'Post harvest management and value addition of fish' for senior officers under the World Bank Funded APART project implemented by the Department of Fisheries, Govt. of Assam at ICAR-CIFT, Kochi on 21.06.2022
- ♦ Packaging of stored fish, In Training Programme on "Refrigeration enabled fish vending kiosk" at ICAR-CIFT, Kochi on 22.06.2022
- ♦ Packaging and storage of dried fish, In Training programme on 'Pre-processing and drying of fish' conducted by engineering Division of ICAR-CIFT, Kochi at ICAR-CIFT, Kochi on 13.07.2022
- ♦ Non-Thermal Processing Technologies, In Training programme conducted by engineering Division of ICAR-CIFT, Kochi for the final year B.Tech (Agrl. Engg.) students of KAU-KCAET, Tavanur at ICAR-CIFT, Kochi on 05.08.2022
- ♦ Fish Processing, Packaging & Quality Control, In On-campus training programme organized by State Agricultural Management and Extension Training Institute (SAMETI), Trivandrum, Kerala for state government fisheries officers, at Trivandrum on 09.08.2022
- ♦ Non-Thermal Processing Technologies, In Training programme organized by engineering Division of ICAR-CIFT, Kochi for the final year B.Tech (Agrl. Engg.) students of KAU-KCAET, Tavanur at ICAR-CIFT, Kochi on 17.08.2022
- ♦ Non-Thermal Processing Technologies, In Training programme organized by engineering Division of ICAR-CIFT, Kochi for the final year B.Tech (Agrl. Engg.) students of KAU-KCAET, Tavanur at ICAR-CIFT, Kochi on 27.08.2022
- ♦ Non-thermal fish preservation techniques & techniques and Testing of packaging materials, In plant training programme for B.F.Sc students of College of Fisheries, Assam (Assam Agricultural University, Raha, Nagaon) under student READY Programme at ICAR-CIFT, Kochi on 27.08.2022
- ♦ Introduction to Packing and Packaging, In Training of Trainers (ToT) organized by Bharath Agro Processing and Marketing Co-operative Ltd., Ernakulam, at Kochi on 15.09.2022
- ♦ Quality issues in thermally processed fishery products, In ITEC training programme on "Quality assurance of fish and fishery products" organized by ICAR-CIFT, Kochi during 19th September to 1st October 2022 at ICAR-CIFT, Kochi on 24.09.2022
- ♦ Thermal and Non-thermal processing of fishes, In International training programme on 'Recent technological development in fisheries: pre and post-harvest operations' sponsored by AARDO, New Delhi at ICAR-CIFT, Kochi on 14.12.2022

||| Dr. Laly S. J.

- ♦ Seafood quality and chemical hazards in seafood, In National Webinar on 'Surviving the Pandemic through Aquaculture: The Kerala Experience' from 24.02.2022 to 25.02.2022



||| Dr. Jesmi Debbarma

- ◆ Edible food packaging film from seaweed, In Webinar on Transforming Waste into Wealth: Global Challenge, Local Solutions organized by CSIR-NIIST, Thiruvananthapuram on 19.01.2022
- ◆ Harvesting & Post Harvest Handling Practices of Shrimp to Meet Quality Regulations & Prevention of Usage of Banned Drugs, In the training programme on “Better management practices in *Penaeus vannamei* farming”, conducted by AU-Avanti ASDC, Visakhapatnam on 20.08.2022
- ◆ Seaweeds: Nutritional Values and Entrepreneurship opportunities, In Aquapreneurship Development for unemployed youth” organized by Late Shri Punaram Nishad College of Fisheries (DSVCKV), Kawardha (Chhattisgarh) in collaboration with MANAGE, Hyderabad on 07.09.2022
- ◆ Optimization of operational efficiency and cost in seafood industry, In webinar on seafood industry challenges 'How we conquer them' organized by Info infinite on 17.08.2022

||| Dr. Sajesh V. K.

- ◆ Supply chain management in fisheries: Implications for extension, In MANAGE Sponsored off-campus online collaborative training programme on 'Supply chain Management in Fisheries' organised at ICAR-CIFT, Cochin on 21.04.2022
- ◆ Fisherwomen in the Kerala state of India: an extension perspective, In 8th Global Conference on “Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal during 21.11.2022 to 23.11.2022

||| Dr. Manju Lekshmi N.

- ◆ Boat building materials and navigational equipment, In Azadi Ka Maholsav programme at Students of KUFOS on 05.08.2022
- ◆ Aquarium fabrication and its management, In Azadi Ka Maholsav programme at Students of VHSC, Thevara on 08.08.2022
- ◆ Issues pertaining to marine litter in the marine environment, In Pollution response seminar Conducted by the Indian Coast Guards on 10.08.2022 to 11.08.2022
- ◆ ICAR-CIFT research contributions in Marine litter, In National Task Force Workshop on Marine litter, IMO – GloLitter Project coordinated by FSI, Mumbai on 12.09.2022
- ◆ Environmental impacts of fishing, In Recent technological developments in fisheries: Pre and Post-harvest operations' sponsored by AARDO, New Delhi for foreign participants at ICAR-CIFT from 12.12.2022 to 19.12.2022

||| Dr. Parvathy U.

- ◆ Advanced fish processing technologies Speciality fish products, In Training of Master Trainers for Fish and Marine processing by NIFTEM, Thanjavur in collaboration with CIFT Cochin under Prime Minister Formalization of Micro Enterprise (PM-FME) scheme from 05.01.2022 to 10.01.2022
- ◆ Hygienic seafood handling, processing, packaging and value addition of fish and fishery products, In Demonstration cum skill development programme on “Seafood Value Addition and Waste Utilization” under the centrally sponsored scheme SPMRM, Govt of India, Department of Rural Development, UT of Lakshadweep by ICAR-CMFRI-KVK, Lakshadweep in collaboration with ICAR-CIFT at Amini Island of Lakshadweep from 16.03.2022 to 18.03.2022
- ◆ Fish Handling and Low Temperature Preservation, In 21 Days National Refresher Course (NRC 2022) on “Fisheries, Aquaculture and Post-Harvest Technology” by ICAR-Central Institute of Fisheries

- ◆ Technology, Kochi, and Faculty of Fisheries, Rangil, Ganderbal (Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir) and National Agriculture Development Cooperative Ltd. Baramulla from 10.05.2022 to 30.05.2022
- ◆ Opportunities for start-ups in value addition and fish processing, In Off-campus online collaborative Training Programme on 'New Startup Opportunities in Fisheries' sponsored by National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Ministry of Agriculture and Farmers' Welfare, Government of India on 11.07.2022 to 14.07.2022
- ◆ On-campus training programme organized by State Agricultural Management and Extension Training Institute (SAMETI), Trivandrum, Kerala for state government fisheries officers at Trivandrum on 09.08.2022
- ◆ Fish processing methods, Orientation training programme for entrepreneurs from Edappally block panchayath organized by Taluk Industries Office and Edappally block panchayath at Edappally Block Panchayath on 16.11.2022
- ◆ Value addition: Opportunities in fisheries sector of Tripura, In ICAR-CIFT-INDUSTRY interface on "VALUE FISH-VALUE WASTE: Seafood value addition and Zerowaste management strategies for NEH region" (Under CIFT-NEH Component) organized by ICAR-Central Institute of Fisheries Technology, Kochi and ICAR Research Complex for NEH Region, Tripura Centre at ICAR-RC for NEH, Tripura on 12.12.2022
- ◆ Issues pertaining to marine litter in the marine environment, In Pollution response seminar Conducted by the Indian Coast Guards on 10.08.2022 to 11.08.2022
- ◆ ICAR-CIFT research contributions in Marine litter, In National Task Force Workshop on Marine litter, IMO – GloLitter Project coordinated by FSI, Mumbai on 12.09.2022
- ◆ Environmental impacts of fishing, In Recent technological developments in fisheries: Pre and Post-harvest operations' sponsored by AARDO, New Delhi for foreign participants at ICAR-CIFT from 12.12.2022 to 19.12.2022

||| Dr. Anupama T. K.

- ◆ Microbial Toxins in Seafood, In National Refresher Course on Fisheries Aquaculture and Post-Harvest Technology organized by ICAR-CIFT, Kochi, Faculty of fisheries, Ganderbal (SKUAST-Kashmir) and National agriculture development cooperative Ltd. Baramulla, J&K on 11.05.2022

||| Dr. Sreejith S.

- ◆ Packaging materials used in seafood processing, In Training for Vocational Higher Secondary School students of GVHSS Kadamakudy, Ernakulam, on 07.01.2022

Safety and quality issues in smoked fishery products, In Indian Technical Economic Cooperation (ITEC) programme on Recent Advances in Harvest and Post-Harvest Technologies in Fisheries organized by ICAR-CIFT on 24.09.2022

||| Dr. Elavarasan K.

- ◆ Fish waste utilization, In SAMETI, Kerala Agriculture Department at Trivandrum on 10.08.2022

Protein and its derivatives from Fish waste, In 21 days National Refresher course on "Fisheries, Aquaculture and Post-Harvest Technology organised by ICAR-CIFT, SKUAST-Kashmir and NADCL, UT of J&K from 10.05.2022 to 30.05.2022



|| Dr. Rejula K.

- ◆ Prospective assessment of small-scale clam fishery: a case of Korapuzha river basin in Kerala, India, In 8th Global Conference on "Gender in Aquaculture & Fisheries (GAF8) organised by Society of Fisheries Technologists India (SOFTI) of ICAR-CIFT and Gender in Aquaculture Fisheries Section (GAFS) of the Asian Fisheries Society (AFS) at CAU Imphal from 21.11.2022 to 23.11.2022

|| Dr. Sarika K.

- ◆ Textural and functional modification of fish mince using High pressure processing, In International Workshop on "Emerging trends and new opportunities in High Pressure Processing" by Department of Agricultural engineering, KAU from 21.02.22 to 22.02.2022
- ◆ Non thermal preservation techniques, In Indian Technical Economic Cooperation (ITEC) programme on Recent Advances in Harvest and Post-Harvest Technologies in Fisheries organized by ICAR-CIFT on 22.09.2022
- ◆ HPP of fish and fish products, In High pressure processing of food products Organised by College of Food processing Technology and Bio-Energy, Anand Agricultural University, Anand on 06.10.2022
- ◆ Development and characterization of fish protein- seaweed biopolymer based edible film and its evaluation in food packaging, In International Conference on Responsible Aquaculture and Sustainable Fisheries Interact (RASHI) on 15.12.2022

|| Shri Paras Nath Jha

- ◆ Energy use and optimization in Indian fisheries, In 4th year. BFSc student of College of fisheries, Assam Agricultural University, Raha, Assam under student READY programme, ICAR-CIFT from 01.09.2022 to 30.09.2022
- ◆ Research activities of the Fishing Technology Division of ICAR-CIFT, In PG students of College of fisheries, Assam Agricultural University, Raha, ICAR-CIFT on 25.08.2022

|| Shri Sathish Kumar K.

- ◆ Curing, Drying and Smoking of fish, In National refresher course on "Fisheries, Aquaculture and Post-Harvest Technology organized by ICAR-CIFT, Cochin, SKUAST, Kashmir and NADCL, Baramulla on 10.05.2022 to 30.05.2022
- ◆ Smoked fishery products, In Post harvest management and value addition of fish organised by world bank funded APART project implemented by department of fisheries, Govt. of Assam from 21.06.2022 to 25.06.2022
- ◆ Packaging requirements of seafoods, In Hygienic seafood handling and value addition at ICAT-CIFT, Cochin from 29.07.2022 to 30.07.2022
- ◆ Packaging of fishery products, In training programme for the final year B.Tech (Agri. Engg) students of KAU-KCAET Tavanur at ICAR-CIFT on 01.08.2022 to 06.08.2022
- ◆ Packaging and storage of dried fish, In Pre-processing and drying of fish at ICAR-CIFT from 03.08.2022 to 04.08.2022
- ◆ "மீன்நுகர்வினைஊக்குவித்தல்: உத்திகளும், ICAR-CIFT - ஸ்பங்கும் (Fish Consumption: Promotional Strategies and Role of ICAR-CIFT)", In Azadi Ka Amrit Mahotsav at Madurai, TamilNadu on 06.08.2022
- ◆ Packaging of fishery products, In training programme for the final year B.Tech (Agri. Engg) students of KAU-KCAET Tavanur at ICAR-CIFT on 10.08.2022 to 19.08.2022
- ◆ Packaging of fishery products, In training programme for the final year B.Tech (Agri. Engg) students of KAU-KCAET Tavanur at ICAR-CIFT on 22.08.2022 to 29.08.2022

- ♦ Packaging techniques, Fisheries based Entrepreneurship organised by ICAR-CIFT, Cochin and ICICI Foundation from 23.08.2022 to 25.08.2022
- ♦ Preparation of smoked fish, In Seafood preparation by curing techniques at ICAR-CIFT, Cochin from 24.08.2022 to 1.10.2022

||| Dr. S. Murali

- ♦ Equipment and machinery for fish processing and value addition, In Virtual training program on "Profitable Farming through Mechanization" held from 07-11 February, 2022 organized by Extension Education Institute, Hyderabad on 10.02.2022
- ♦ Innovations in Fishery Engineering, In Virtual training program on "National Refresher Course (NRC 2022) on "Fisheries, Aquaculture and Post-Harvest Technology" held from 10th to 30th May 2022 organized by ICAR-Central Institute of Fisheries Technology, Kochi, Kerala Faculty of Fisheries, Rangil, Ganderbal (SKUAST – Kashmir) & National Agriculture Development Cooperative Ltd. Baramulla, J & K. on 24.05.2022
- ♦ Mobile alert system for dryer users, In Virtual Collaborative Training Programme of MANAGE, ICAR-CIFT, and TNJFU on "ICT applications to enhance the profitability of Fisheries based enterprises" on 02.06.2022
- ♦ Solar and wind energy applications in fisheries sector, In NFDB-sponsored training program on "Fisheries, and Aquaculture" organized by Kerala Institute for Entrepreneurship Development – KIED, Ernakulam, Kerala on 20.06.2022
- ♦ Solar dryer for hygienic preservation of fish, In Skill development training program on 'Fisheries based entrepreneurship' organized by ICAR-CIFT in collaboration with MSSRF, Chennai on 28.06.2022
- ♦ Engineering interventions in dry fish processing and fishpreneurship, In New Start-up Opportunities in Fisheries' sponsored by National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Ministry of Agriculture and Farmers' Welfare, Government of India from 11.07.2022 to 14.07.2022
- ♦ Fish Drying Technology –Solar Dryers, In MPEDA-NETFISH State Coordinators awareness cum training programme at MPEDA HQ, Panampilly Nagar, Cochin on 16.07.2022
- ♦ Engineering interventions in post-harvest fisheries sector, In 'Fish for health and prosperity' organized by ICAR-CIFT, Kochi as part of Azadi Ka Amrit Mahotsav celebrations on 29.07.2022
- ♦ Engineering interventions in post-harvest fisheries sector, In Students training for B.F.Sc. fisheries (Students ready program) organized by ICAR-CIFT, Kochi on 02.09.2022
- ♦ Fundamentals of heat and mass transfer and design of general purpose dryer, In Students training for B.F.Sc. fisheries (Students ready program) organized by ICAR-CIFT, Kochi on 13.09.2022
- ♦ Hybrid, solar and wind energy applications in fisheries and aquaculture sector, In EDP on Aquaculture and Fisheries for SC unemployed Youth, organized by KIED, Ernakulam on 20.10.2022
- ♦ Energy and water use optimization techniques for seafood processing industries", "Refrigerated mobile fish vending kiosk", "Image processing tool for fish quality and freshness evaluation", "Application of IoT in food drying process", In Training programme on "Advances in food process engineering and preservation" for B.Tech. students under SCSP programme on 31.10.2022 to 04.11.2022
- ♦ Innovations in fishery engineering, In International training programme on "Recent technological development in fisheries: Pre and postharvest operations" for International delegates sponsored by AARDO, New Delhi from 12.12.2022 to 19.12.2022



- ♦ Engineering Interventions in fisheries sector, In Training programme on "ICAR sponsored skill development training program for enhancing the competence in Microbiology and biotechnology under TSP" organized by MFB Division, ICAR-CIFT, Cochin-29 from 01.12.2022 to 07.12.2022
- ♦ Engineering Interventions in fisheries sector, In Training programme on "'Advanced Microbiological and Molecular Techniques for Improving the Competence of Students in Biological Sciences" organized by MFB Division, ICAR-CIFT, Cochin-29 from 12.12.2022 to 17.12.2022
- ♦ Engineering Interventions in post-harvest fisheries sector, In Training programme on "Utilization of Marine bioactive compounds - Research advances and Future Trend" organized by Biochemistry & Nutrition Division, ICAR CIFT, Cochin-29 from 12.12.2022 to 16.12.2022

||| Dr. Chinnadurai S.

- ♦ Trap operation: by-catch issues and mitigation measures, In By-catch Reduction in Fisheries: Recent Advances' by CIFT on 21.01.2022
- ♦ Role of ICAR-CIFT on development of Indian marine fisheries harvest sector, In Training for B. F. Sc students of Veraval fisheries college, Veraval on 29.01.2022

||| Shri Shravan Kumar

- ♦ Nektons and Benthos, In Lecture for the B.F.Sc students o the occasion of World fisheries day at Jayalalitha Fisheries University, Ponneri, Tamil Nadu on 21.11.2022

||| Dr. Ahamed Basha

- ♦ Role of microbes in water quality management in shrimp aquaculture ponds, In Hands on training on water & soil analysis and disease management in shrimp farming at Aquaculture Skill Development Centre (Avanti ASDC), Visakhapatnam Andhra Pradesh on 10.09.2022
- ♦ Antimicrobial resistance in Fisheries, In training programme 'Capacity building of extension functionaries to meet emerging challenges in fisheries sector' conducted by Extension Education Institute, Hyderabad for the officers of Dept. of fisheries at SIFT, Kakinada on 11.10.2022

||| Dr. Neethu K. C.

- ♦ Fundamentals of heat and mass transfer and mathematical modeling of drying operations" and "Design of general-purpose dryers, In Training programme on "Advances in food process engineering and preservation" for B.Tech. students under SCSP programme from 31.10.2022 to 04.11.2022
- ♦ Novel techniques of fish drying and preservation, In International training programme on "Recent technological development in fisheries: Pre and postharvest operations" for international delegates sponsored by AARDO, New Delhi from 12.12.2022 to 19.12.2022

||| Dr. Aniesrani Delfiya D. S.

- ♦ Advanced drying techniques: CIFT dryers, In Training cum exposure program on 'post-harvest management and value addition of fish' on 24.06.2022
- ♦ Hygienic handling, drying and packing of fish, In Demonstration cum skill development program on 'Fisheries based entrepreneurship' on 28.06.2022
- ♦ Advanced drying methods for fish and fishery products, In In-plant training program for the final year B.F.Sc. Students of Assam Agricultural University, Raha Nagaon under READY programme on 13.09.2022
- ♦ "Engineering properties of food materials" and "Advanced drying methods for fish and fishery products" in the training programme on "Advances in food process engineering and preservation", In

Training programme on "Advances in food process engineering and preservation" for B.Tech. students under SCSP programme on 31.10.2022

- ♦ Engineering Interventions in preservation of fish and fishery products, In Training programme on "Utilization of Marine bioactive compounds - Research advances and Future Trend" organized by Biochemistry & Nutrition Division, ICAR CIFT, Cochin-29 from 05.12.2022 to 10.12.2022
- ♦ Novel techniques of fish drying and preservation, In International training programme on "Recent technological development in fisheries: Pre and postharvest operations" for international delegates sponsored by AARDO, New Delhi from 12.12.2022 to 19.12.2022.

||| Smt. Alfiya P. V.

- ♦ Machinery and equipment involved in unit operation of fish and marine food processing, CIP, In Online training of Master Trainers on Fish & Marine processing under PM-FME organized by NIFTEM, Thanjavur and ICAR-CIFT, Cochin on 07.01.2022

||| Dr. Sreepriya Prakasan

- ♦ Business Opportunities through Fish Processing and Value addition, In Commerce, Taluk Industries Office, Kanayannur, Edappally Block Panchayat and Elamkunnappuzha Grama Panchayat, Vypin at Elamkunnappuzha Grama Panchayat, Vypin on 04.08.2022
- ♦ Fish processing and value added products, In Seminar on Entrepreneurship development organized by Directorate of Industries and Commerce and The District Industries Center, Kanayannur, Maradu at Maradu Priyadarshini Hall on 30.09.2022



HRD CELL

During the period under report, the Human Resource Development Cell (HRD Cell) of ICAR-CIFT met several times for deliberations and decision-making with regard to the training requirements of staff. Individual requests of staff members of all categories for their capacity building needs were processed for approvals. In addition, necessary approvals were obtained from the competent authority to enable staff that were specifically nominated by Secretary DARE and DG, ICAR and HRM Division of ICAR to undergo training. As recommended by HRD Cell, staff of CIFT (Total staff-214, Scientific-79, Technical-68, Administrative & Finance-67) participated in 36 training programmes during the year. The HRD Cell ensures that every employee records the training information in the ICAR-ERP system following completion of the training. Training needs assessment and Annual Training Plan (ATP) for Scientific, Technical, Administrative and Skilled Support Staff were made for the year 2022 and the ATP 2021-22 has been uploaded on the Institute website. Upon a request from the HRM Division of ICAR, category-wise and employee-wise skill deficient areas were furnished to the Council based on which the ATP 2020-22 was revised to include staff who hadn't undergone training during the past 7 years. Impact assessment of the trainings attended during the year 2019-20 was processed and furnished to the council.

Participation of staff in Training Programmes 2022

Scientific Staff

SI No.	Name(s) of Participant(s)	Training Attended	Organizer, Venue & Date
1.	Dr. Murali S.	Online training programme on "Laboratory Quality Management System and Internal Audit as per IS/ISO/IEC 17025:2017"	BIS 04.01.2021 to 07.01.2021
2.	Shri. Sathish Kumar K.	Online training programme on "Laboratory Quality Management System and Internal Audit as per IS/ISO/IEC 17025:2017"	BIS 04.01.2021 to 07.01.2021
3.	Dr. S. K. Panda	Proficiency testing provider (PTP) Assessor Training program	NABL, Chennai 21.02.2022 to 25.02.2022
4.	Dr. Jeyakumari A.	Hands-on training on "Chromatographic techniques for food quality analysis"	Department of Fish Quality Management Division, Fisheries college and Research Institute (FC&RI), Thoothukudi, Tamil Nadu 21.03.2022 to 26.03.2022
5.	Dr. Renuka V.	"Chromatographic techniques in seafood analysis"	Dept. of Fish Quality Management, FC&RI, Tamil Nadu Dr. J. Jayalalithaa Fisheries University (TNJFU) 21.03.2022 to 25.03.2022
6.	Dr. Madhusudana Rao B.	'Use of a validated protocol for estimation of Antimicrobial Usages (AMU) at farm level'	FAO India, in collaboration with ICAR-Directorate of Poultry Research (ICAR-DPR) and National Institute of Plant Health Management (NIPHM) from, 25.04.2022 to 26.04.2022

7.	Dr. Chandrasekar V.	Analytical Techniques for Impact Evaluation Methods	International Food Policy Research Institute (IFPRI), at Institute of Agricultural Sciences, Banaras Hindu University (BHU) 25.04.2022 to 30.04.2022
8.	Dr. Sullip Kumar Majhi	MDP on leadership development programme	ICAR-NAARM, Hyderabad 14.06.2022 to 25.06.2022
9.	Smt. Priya E. R.	Seafood HACCP Train-the-Trainer programme	US Food and Drug Administration and MPEDA 20.06.2022 to 23.06.2022 at MPEDA
10	Dr. Toms C. Joseph	Training Programme on “Managing Technology Value Chains for Directors & Division Heads” being	Administrative Staff College of India (ASCI), Hyderabad 25.07.2022 to 29.07.2022
11	Dr. Murugadas V.	(Online mode) a “Training workshop on Current Trends in Agricultural Bioinformatics”	SKILL-BIF, ICAR-NAARM, Hyderabad 14.12.2022 to 16.12.2022
12	Dr. Greeshma S. S.	ISO based microbiological testing for food borne pathogens”	ICAR-CIFT, Cochin

Technical Staff

SI No.	Name(s) of Participant(s)	Training Attended	Venue & Date
1	Shri. Rakesh M. Raghavan	Workshop on “Creative Writing”	Xavier Institute of Communications, Mumbai, March 2022
2	Smt. N. C. Shyla	Online training programme on “Introduction to Artificial Intelligence (AI-01) for Group A&B Officers”	Institute of Secretariat Training & Management (ISTM), New Delhi 06.06.2022 to 08.06.2022
3	Shri. Tulshiram A. Waghmare	Training on “Fish feed preparation & Fish Drying”	ICAR-CIFT, Head Quarter during 12.07.2022 to 15.07.2022
4	Smt. Anu Mary Jose	Online training programme on “Food Packaging & Safety Requirements”	Indian Institute of Packaging (IIP), Chennai, on 02.09.2022
5	Shri Suresh P.	Laboratory Animal Supervisors Training Course-2022	National Institute of Nutrition (ICMR) 10.10.2022 to 09.12.2022
6	Smt. Anu Mary Jose	Training programme on “Safety of food in plastic & metal packaging” (STC-10)	CFTRI, Mysore 28.11.2022 to 30.11.2022

Administrative Staff

SI No.	Name(s) of Participant(s)	Training Attended	Venue & Date
1.	Smt. Surya G.	Online Training Programme on “Pension & Retirement Benefits”	ICAR-NRRI, Cuttack 12.01.2022 to 14.01.2022
2.	Shri. Sabukuttan K. B.	Online Training Programme on “Pension & other Retirement Benefits”	ICAR-NRRI, Cuttack 12.01.2022 to 14.01.2022



3	Smt. Jyothilekshmi E.	Online Training Programme on "Pension & other Retirement Benefits"	ICAR-NRRI, Cuttack 12.01.2022 to 14.01.2022
4	Smt. Sobha K. S.	Online Training Programme on "Pension & other Retirement Benefits"	ICAR-NRRI, Cuttack 12.01.2022 to 14.01.2022
5	Smt. Sobha K. S.	Online Workshop on "MS-Office Suite-(MS-OS-07)"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 22.04.2022
6	Shri Rajeev P.	Online Workshop on "MS-Office Suite-(MS-OS-07)"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 22.04.2022
7	Smt. Akhila N. R.	Online training programme on "Pension & Retirement Benefits"	ICAR-NRRI, Cuttack 18.04.2022 to 20.04.2022
8	Shri Syam Prasad T. R.	Online training programme on "Pension & Retirement Benefits"	ICAR-NRRI, Cuttack 18.04.2022 to 20.04.2022
9	Shri Rizwan P.M.	Online Workshop on "Noting & Drafting"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 19.04.2022
10	Shri Subeesh S. S.	Online Workshop on "Noting & Drafting"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 19.04.2022
11	Ms. Archana N.	Online Workshop on "Noting & Drafting"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 19.04.2022
12	Shri Syam Prasad T. R.	Online Workshop on "Noting & Drafting"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 19.04.2022
13	Shri. P. N. Nikhil Das	Online Workshop on "Noting & Drafting"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 19.04.2022
14	Shri. Ajith K.S.	Online Workshop on "Noting & Drafting"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 19.04.2022
15	Shri. Thinakaran K.	Online Workshop on "Noting & Drafting"	Institute of Secretariat Training & Management (ISTM), New Delhi 18.04.2022 to 19.04.2022
16	Shri. Sabukuttan K. B.	Workshop on "Preparation of Roster" for Group 'A' and 'B' officers	Institute of Secretariat Training & Management (ISTM), New Delhi 04.05.2022 to 06.05.2022
17	Shri. Syam Prasad T. R.	Online training programme on "Public Procurement (Basic)"	Arun Jaitly National Institute of Financial Management, Faridabad 23.05.2022 to 28.05.2022
18	Smt. Akhila N. R.	Online training on 'National Pension Scheme (NPS)'	ICAR-NRRI, Cuttack 16.06.2022 to 18.06.2022
19	Shri. Syam Prasad T.R.	Online training on 'National Pension Scheme (NPS)'	ICAR-NRRI, Cuttack 16.06.2022 to 18.06.2022
20.	Smt. Renuka K.	Residential Training Programme on Public Procurement and Arbitration for Government Officers	Arun Jaitly National Institute of Financial Management (AJNIFM), Faridabad July-September 2022

ZONAL TECHNOLOGY MANAGEMENT & AGRIBUSINESS INCUBATION CENTRE

The Zonal Technology Management and Agribusiness Incubation (ZTM-ABI) Centre at ICAR-CIFT is a platform that facilitates the rapid commercialization of technologies and strengthens public-private partnerships by providing a networking and interaction framework between R&D organizations, businesses, and financial institutions. The Centre aims to promote innovation in goods, procedures, and business models to encourage the growth of competitive businesses in the fishing industry. The Centre offers proactive and value-added business services to registered incubatees through an entrepreneurial support system, including technology transfer, contract research, consultancy, contract services, office space, a licensed, cutting-edge pilot level production facility, on-site guidance, and specialized training for starting technology-based businesses. The Incubation Centre has multi-tenant infrastructure facilities that are well-suited for creating a corporate-level office for direct incubatees within the Institute's premises. The Centre's direct incubation services aim to provide support to clients during their infancy period.

The Centre regularly conducts Business Meets and industry-interface programmes to sensitize entrepreneurs, and viable business ideas are selected for incubation. Registered incubatees are permitted to meet with scientists and business associates as needed to optimize product formulation and identify suitable business strategies. The ZTM-ABI Centre at ICAR-CIFT is dedicated to fostering innovation and entrepreneurship in the fishing industry through a comprehensive range of business services and support.

III INCUBATEE REGISTRATION

In 2022, a total of 13 entrepreneurs registered for business incubation services at the ZTM-ABI Centre. The Centre caters to a diverse clientele ranging from young start-up firms in need of basic level technology support and training, to high-end business firms requiring R&D assistance for the development of diversified products. Here is a list of clients who registered for various technologies at the Centre during the year 2022.

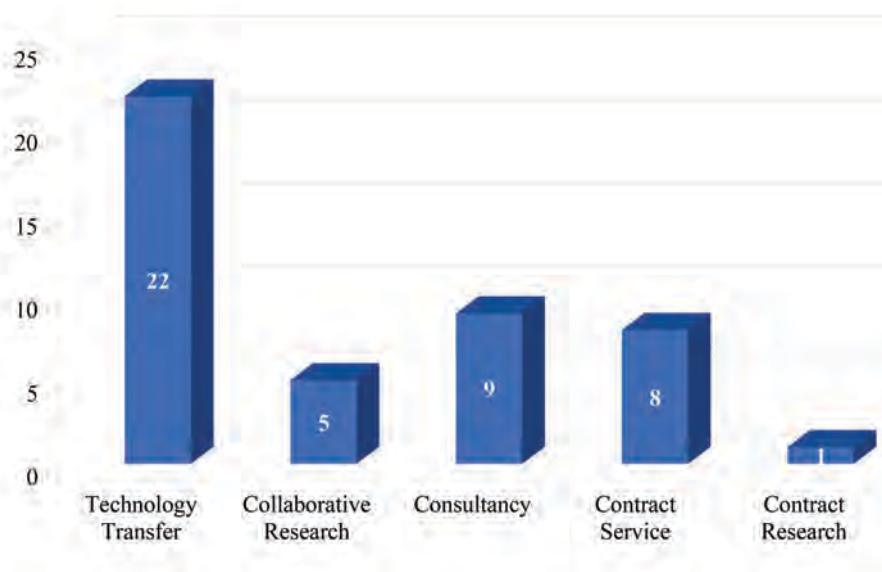
ZTM-ABI Centre

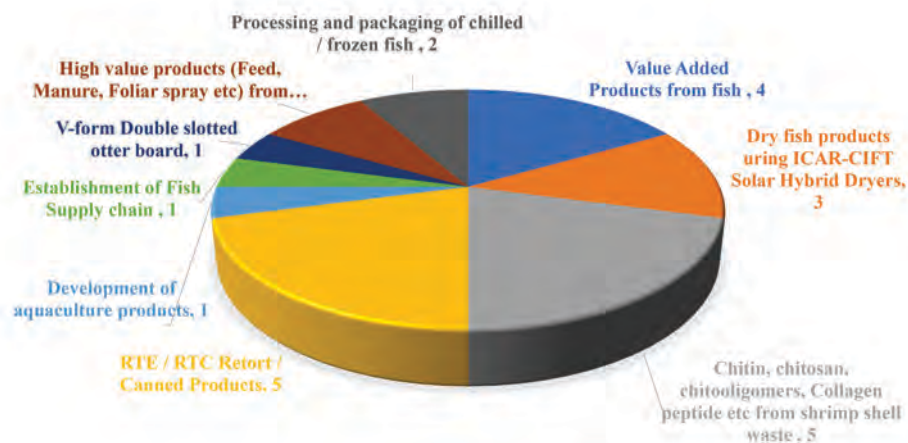
SI No.	Name of the Entrepreneur	Technology support
1	Zarin Gourmet Private Limited Mr. Syed Faaiz Qadri, Ms. Rifat Amin and Mr. Saurav P. Satish Jammu & Kashmir	Establishing all India supply chain for rainbow trout
2	A.S. Food Products, Ms. Anupama Alex, Kerala	Solar electric dryer and dry fish processing
3	PKM Fine Foods & Spices Pvt. Ltd, Mrs. Jainy M. Paul, Kerala	Ready to cook jackfruit in vacuum pack
4	Puakai Agriaqua, Mr. Donkina Santhosh, Andhra Pradesh	Seaweed by products
5	RaavTechlabs Pvt. Ltd., Mr. Rahul Kumar, New Delhi	Fish feed using insect protein. Organic fertilizers and waste management using insect farming.
6	Foo Foods India Private Limited Mr. Mohammed Fawaz T.C., Kerala	Retorted ready to fry Unnakkaya, Prawns samosa, Marinated fish Retorted ready to eat sandwich spread with boneless chicken, and 'Pidiyumkozhiyum' (steamed rice balls and chicken curry)

7.	Thanal Purusha Swayam Sahaya Sangham, Mr. Muhammed Rafeeq Kerala	Dried fish products
8.	Quest Bio Organics, Mr. Gangesh Kumar Varma, Kolkata	Growth enhancer as foliar spray
9.	Suncrest Biopolymers, Shri. N. Prasanth, Andhra Pradesh	i. Chitin from shrimp head waste using enzyme assisted protocol ii. Poultry/ aquafeed from shrimp head extract/ hydrolyzed extract iii. Foliar spray from shrimp head extract Manure using shrimp shell extract
10.	Zeaquel Marine Exports Pvt. Ltd., Mr. Niyas S.P., Kerala	Frozen fish processing and its packaging techniques
11.	Mr. Shuhail P.V.P., Kerala	Fish pickle, dry shrimp roast, fish chutney powder
12.	Sumesh T.R., Kerala	Dried fish products
13.	Zewa Ecosystems Pvt. Ltd.	Fish feed using insect protein. Organic fertilisers and waste management using insect farming.

III TECHNOLOGY TRANSFER AND PROFESSIONAL SERVICE FUNCTIONS

ICAR-CIFT has made significant strides in developing various technologies in diverse areas such as energy-efficient fishing vessels, gear designs, processing/preservation techniques, smart packaging techniques, value-added products/by-products, cost-effective food processing machineries, and health care/aquaceutical products, among others. The following chart enumerates the technology commercialization projects and professional service functions (Consultancy, Collaborative Research, Contract Research (Sponsored / Grant-in-Aid) and Contract Service) undertaken by ZTM-ABI Centre in the year 2022.

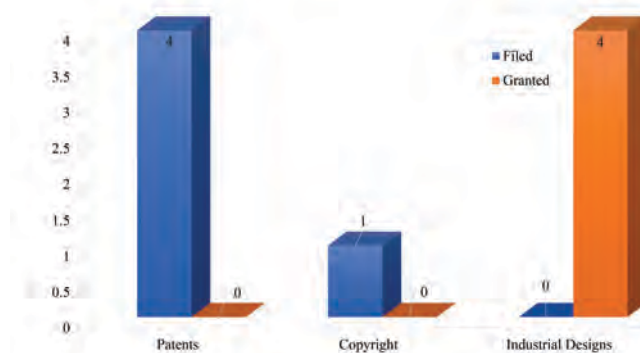




Category of technology transfer agreements signed in various disciplines

INTELLECTUAL PROPERTY RIGHTS

Intellectual Property Rights plays a critical role in safeguarding the research output of institutes, promoting innovation, and creating a more vibrant and sustainable research ecosystem. The ZTM-ABI Centre has facilitated the filing of 4 patents, 1 copyright and 4 industrial designs for ICAR-CIFT.



PARTICIPATION IN KISAN SAMMAN SAMMELAN 2022

Five clients who had graduated from the ZTM-ABI Centre of ICAR-CIFT, Kochi attended the Agri-Startup Conclave organised as part the Kisan Samman Sammelan 2022, and they got an opportunity to showcase their products, network with stakeholders, market their innovations and seek funding from investors. The program was inaugurated by Prime Minister, Shri. Narendra Modi on October 17 at Pusa in New Delhi. Bodina Naturals (P) Ltd started by Mr. Bobby Kizhakkethara, Zaara Biotech (P) Ltd started by Mr. Najeef Bin Haneef, Foo Foods India (P) Ltd started by Mr. Mohammed Fawas, Zarin Gourmet (P) Ltd started by 3 student entrepreneurs, Saurav, Rifat and Faaiz, and Zcorp Organic (P) Ltd started by Mr. Sundar Raj were the five shortlisted start-ups. ZTM-ABI Centre, CIFT organised a virtual meeting as part of the Sammelan, which was attended by 310 participants. The day which was called to be a 'historical day for farmer's welfare', witnessed the attendance of more than 13,500 farmers and 1500 Agri Startups from across the country, and virtual attendance of over one crore farmers from various ICAR institutions. The Sammelan was also attended by researchers, policy makers and other stakeholders.



*Program organised by ZTM-ABI Centre at CIFT, Kochi
in connection with the Kisan Samman Sammelan*



*ICAR-CIFT Incubatees at Pradhan Mantri Kisan
Samman Nidhi 2022, New Delhi*

RECOGNITION TO ZTM-ABI INCUBATES

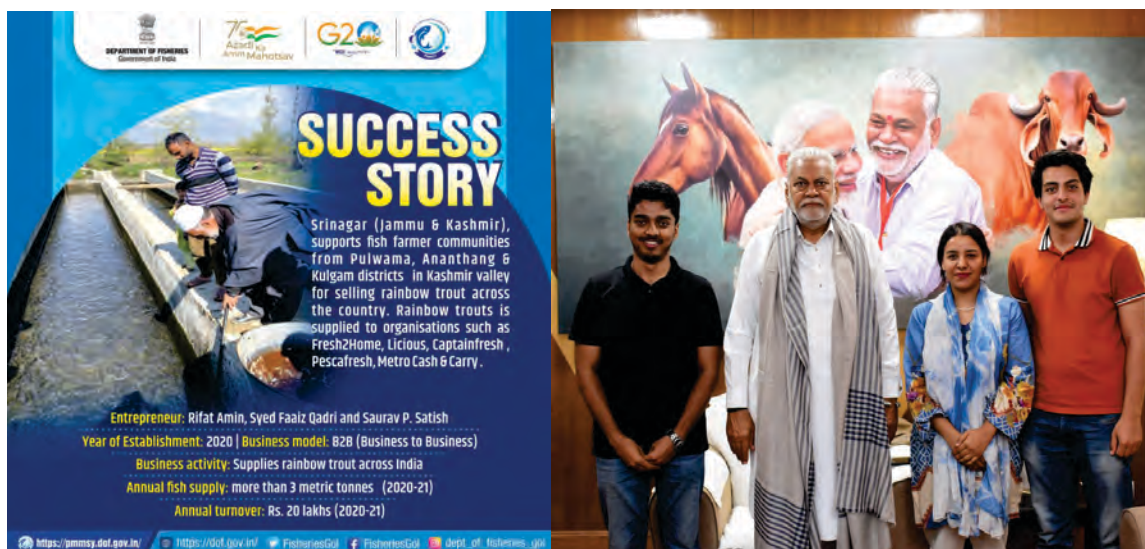
Long Shore Technologies LLP

ICAR-CIFT has transferred the technology for processing of shrimp waste into protein, chitin and chitosan to Mr. Amey Naik, incubate of ZTM-ABI Centre. The technology for integrating the processes to obtain multiple products like protein, protein hydrolysates, chitin, chitosan and carotenoproteins along with recycling possibilities of water was demonstrated. This initiative of Long Shore Technologies LLP and their work on utilization of shrimp by products for the production of valuable products was greatly appreciated by Shri Parshottam Rupala, Honourable Union Cabinet Minister for Fisheries, Animal Husbandry and Dairying, Government of India. Mr. Amey was selected as Sujana Champion for the Biotechnology Sector by i-Hub, Govt. of Gujarat.



||| Zarin Gourmet Private Limited

ICAR-CIFT incubate, Zarin Gourmet Pvt. Ltd. has successfully established a pan India level supply chain for Rainbow Trout Fish. With the training and technical / business guidance from the Institute they have developed a B2B Model and are now associated with leading seafood business entities like Fresh2Home, Licious, Captainfresh, Pescafresh, Metro Cash & Carry & Nandu's, Spar Hyper Market, Star Bazaar and many other Super/Hyper Markets in Metropolitan Cities. This business model established by 3 students of Naropa Fellowship (Ladakh), Mr. Syed Faaiz Qadri, Ms. Rifat Amin and Mr. Saurav P Satish, is also focused on supporting farmer communities across Kashmir Valley in selling the produce (Rainbow Trout Fish) across the country. The success story of Zarin Gourmet Pvt. Ltd. has gained nationwide recognition and was featured as a successful start-up venture by Ministry of Fisheries - Govt. of India. The business model was specially appreciated by Shri. Parshottam Rupala, Honourable Union Cabinet Minister for Fisheries, Animal Husbandry and Dairying, Government of India during the Kisan Samman Sammelan 2022.



|| Launch of e-trading platform for digital transformation of fisheries supply chain by Resinnov Blue project of FERI Trust

The project was launched with the aim of modernisation of the conventional supply chain with digital technologies through exploration of new market avenues. Online Auction platform shall be the alternative to the physical auctions at landing centres, wholesale trade centers or farms. Fish farmers, fishermen, boat owners, auctioneers, wholesalers and retailers can be the stakeholders of the online auction platform. This is the first national instance of introducing Online Auction in the Indian fisheries sector. Total four types of auctions are integrated in the platform. Incremental, Reserved and Automatic mode of auctions are made available for the sellers, whereas Reverse Auction feature is provided exclusively for the buyers to get competitive bids from multiple sellers for bulk orders. Auction duration could be set to several minutes, hours or days. The digital transformation initiative for fisheries supply chain envisage to solve the low catch price concerns for the fishermen communities, as well as focus to develop demand cluster through network of digital retailers for effective market linkages and quality assurances.



As part of digital transformation of national fisheries supply chain, ZTM-ABI incubates Dr. Rojith Girindran and Dr. Rakesh V. B., founders of FERI Trust developed two e-commerce and e-auction platforms through their Resinnov Blue Project. The platforms were officially inaugurated by Dr. Leela Edwin, Director, ICAR-CIFT on 22nd September 2022.

|| ICAR-CIFT Clients featured in 100 Super Success Stories by NFDB

Success stories of ICAR-CIFT incubates were published in the 100 Super Success Stories from Indian Fisheries published by National Fisheries Development Board (NFDB), Hyderabad





Webinar on Conservation of Fish Biodiversity & Protection of Farmers' Rights

As part of the Azadi ka Amrit Mahotsav program, the Zonal Technology Management & Agribusiness Incubation (ZTM-ABI) Centre, ICAR-CIFT has organised a Webinar on Conservation of Fish Biodiversity & Protection of Farmers' Rights in association with KVK, CMFRI on 25th July 2022. Dr. B. Meenakumari, Former Chairperson, National Biodiversity Board & also Former DDG (Fisheries), ICAR; and Dr. P.E. Rajasekharan, Principal Scientist, Indian Institute of Horticultural Research were the invited speakers. A total of 260 participants, including farmers, scientists and students, attended the program. This programme was organized in connection with the National Campaign on Fish for Health and Prosperity, initiated by the Fisheries Science Division of ICAR.



Entrepreneurship Skill Training Programme

Skill Training Programme on fish based value-added products was organized for a group of beneficiaries selected by the Kerala Institute for Entrepreneurship Development (KIED), Ernakulam on 26th October, 2022



III Manufacture and supply of ICAR-CIFT designed machineries to Clients through empanelled agencies

The Centre has facilitated the manufacture and supply of 18 ICAR-CIFT dryers, 6 refrigerated vending kiosks and 13 descaling machines through the empanelled agencies to various clients.

Sno.	Details of client	No: of Units / Capacity
SOLAR HYBRID DRYER		
1	A.S. Food Products, Kochi, Kerala	Solar Electrical Hybrid Dryer (20 kg capacity) – 1 unit
2	MS Swaminathan Research Foundation, Chennai	Solar Electrical Hybrid Dryer (20 kg capacity) – 11 unit
3	Eagle Dry Fish Unit	Solar Electrical Hybrid Dryer (20 kg capacity) – 1 unit
4	Principal Investigator, College of Fisheries Jammu & Kashmir	Solar Electrical Hybrid Dryer (40 kg capacity) – 1 unit
5	Jeevani SVEP MECTeam, Alappuzha, Kerala	Solar Electrical Hybrid Dryer (20 kg capacity) – 1 unit
6	Mr. Vinu Babu, Kollam, Kerala	Solar Electrical Hybrid Dryer (20 kg capacity) – 1 unit
7	Mr. Asokan, Kuzhuppilly	Solar Electrical Hybrid Dryer (20 kg capacity) – 1 unit
8	Mr. L.X. Varghese, Mundamveli, Kochi	Solar Electrical Hybrid Dryer (20 kg capacity) – 1 unit
REFRIGERATED MOBILE FISH VENDING KIOSK		
1	Fisherwomen Activity Groups in Kerala, through CSR Initiative of Cochin Shipyard Ltd.	6 units
2	KMR Venture, Punnathala, Malappuram	1 unit
HAND-OPERATED FISH DESCALING MACHINE		
1	Fisherwomen Activity Groups in Kerala, through CSR Initiative of Cochin Shipyard Ltd.	6 units
2	G.B. Pant University of Agriculture and Technology, Uttarakhand	5 units
3	Mr. L.X. Varghese, Mundamveli, Kochi	1 unit
4	Kayalmadathil Foods	1 unit

AWARDS AND RECOGNITIONS

III Academic Excellence



Mr. Chinnadurai S., Scientist, Veraval Research Center of ICAR-CIFT awarded Ph.D for the Thesis "Studies on Development of Optimum Depuration Protocols for Commercially Important Edible Bivalves of India" from the Department of Biosciences, Mangalore University, Mangalore, under the guidance of Dr. K. Sunilkumar Mohamed, Former Principal Scientist and Head, ICAR-CMFRI

Mr. Aneesh P. A., Senior Technical Assistant, Quality Assurance and Management Division, ICAR-CIFT, Kochi was awarded Ph.D. for the Thesis "Optimization of supercritical fluid extraction, characterization and assessment of bioactivities of astaxanthin oil from processing discards of Ridgeback shrimp (*Solenocerachoprai Nataraj*, 1945)" from the Cochin University of Science and Technology (CUSAT), Kochi, under the guidance of Dr. Suseela Mathew, Principal Scientist, ICAR-CIFT, Cochin.



III Best Indian Fisheries Scientist Award



Dr. Tejpal C. S., Scientist, Biochemistry & Nutrition Division received Dr. M. S. Swaminathan- Best Indian Fisheries Scientist award for the year -2018 from the Professional Fisheries Graduate Forum, India.



Dr. Sandhya K. M., Senior Scientist received Best Fisheries Scientist Award during the 6th International Conference on "Current issues in Agricultural, Biological, Applied Sciences for Sustainable Development (CIABASSD-2022)" organized by Kalimpong Science Centre, West Bengal; ICAR- National Agricultural Higher Education Project (NAHEP)-IG & Agro-Environmental Development Society (AEDS), UP from 11-13th June 2022.

III PhD. Thesis Award

- ◆ **Dr. Parvathy U.**, Senior Scientist received the Best PhD thesis Award in Fish Processing for the study, '*Optimization of process parameters for enzymatic hydrolysis of tuna red meat protein with emphasis on specific applications*' under the guideship of Dr. George Ninan (Guide), Director, ICAR-CIFT, Cochin and Dr. A. A. Zynudheen (Co-Guide), Principal Scientist and HOD (i/c), Quality Assurance and Management Division, ICAR-CIFT in the "International Conference on Advances in Agricultural, Veterinary and Allied Sciences for Improving Livelihood and Environmental Security' organized jointly by ICAR-IGFRI, Regional Research Station, Srinagar, ICAR-NAHEP, Birsa Agricultural University, Ranchi and NADCL, J&K from 28-30th September 2022.

- ♦ **Dr. Laly S. J.**, Senior Scientist received the Padma Shri Dr. V. G. Jhingran award for the 'Best PhD thesis 2021' for the thesis, '*Screening and Characterisation of Allergens in Selected Seafoods*' under the guideship of Dr. T. V. Sankar, Principal Scientist, ICAR-CIFT. The award was presented during the international conference on "Responsible Aquaculture and Sustainable Fisheries Interact (RASHI)" during 13-16 December 2022, jointly organized by the College of Fisheries, CAU (Imphal), Tripura in collaboration with the College of Fisheries Lembucherra Alumni Association (COFLAA), and North East Society for Fisheries and Aquaculture (NESFA), India at its campus at Lembucherra, Tripura.



- ♦ **Dr. Parvathy U.**, Senior Scientist received the Padma Shri Dr. V. G. Jhingran award for the 'Best PhD thesis 2019' for the study, '*Optimization of process parameters for enzymatic hydrolysis of tuna red meat protein with emphasis on specific applications*' under the guideship of Dr. George Ninan (Guide), Director, ICAR-CIFT, Cochin and Dr. A. A. Zynudheen (Co-Guide), Principal Scientist and HOD (i/c), Quality Assurance and Management Division, ICAR-CIFT. The award was presented during the international conference on "Responsible Aquaculture and Sustainable fisheries Interact (RASHI)" during 13-16 December 2022, jointly organized by the College of Fisheries, CAU (Imphal), Tripura in collaboration with the College of Fisheries Lembucherra Alumni Association (COFLAA), and North East Society for Fisheries and Aquaculture (NESFA), India at its campus at Lembucherra, Tripura.



- ♦ **Dr. Lekshmi R. G. Kumar**, Scientist received the Padma Shri Dr. V. G. Jhingran award for the 'Best PhD thesis 2020' for the study, '*Designing squalene loaded biopolymer microparticles with emphasis on stability, bioavailability and applicability as a functional food ingredient*' under the guideship of Dr. Suseela Mathew, Principal Scientist, Biochemistry and Nutrition Division, ICAR-CIFT. The award was presented during the international conference on "Responsible Aquaculture and Sustainable Fisheries Interact (RASHI)" during 13-16 December 2022, jointly organized by the College of Fisheries, CAU (Imphal), Tripura in collaboration with the College of Fisheries Lembucherra Alumni Association (COFLAA), and North East Society for Fisheries and Aquaculture (NESFA), India at its campus at Lembucherra, Tripura.



Young Scientist Award

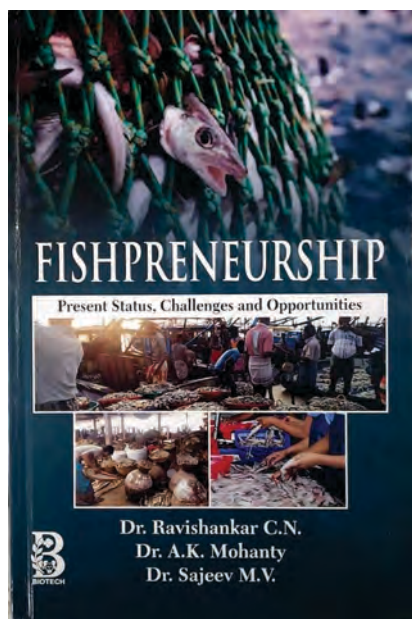
- ♦ **Dr. Anupama T. K.** received Young Scientist Award during three days International Conference on "Advances in Agricultural, Veterinary and Allied Sciences for Improving Livelihood and Environmental Security (AAVASILES-2022)" jointly organized by ICAR-IGFRI, Regional Research Station, Srinagar, ICAR-NAHEP, Birsa Agricultural University, Ranchi, and NADCL Baramulla, UT of J & K, during 28-30th September, 2022
- ♦ **Dr. Sarika K.**, Scientist received Young Scientist Award: 2022 on the Occasion of Fisheries and Life Science Awards ceremony by the Society of Fisheries and Life Sciences on 31.07.2022
- ♦ **Dr. K. Ahamed Basha**, Scientist selected as Young Scientist in Fisheries Technology from Society for Advancement in Agricultural Technology and Development, Uttarakhand-263642
- ♦ **Dr. K. Ahamed Basha**, Scientist is selected as Young Scientist in Fisheries and Life Science Awards: 2022 advertised by the Society of Fisheries and Life Sciences, College of Fisheries, Mangaluru, Karnataka, India

Best Paper Award

- ♦ **Dr. A. Suresh**, Principal Scientist received Dr. N. A. Majumdar Prize Award for the best paper for the manuscript titled "Production, Export and Competitiveness of Fish and Fishery Products in India: An Analysis Across Technology and Policy Phases" authored by A. Suresh, V. Geethalekshmi, V.R. Renjini and Neethu Mol Jacob, under the Subject III, "Innovations, Access to Technology and Competitiveness of Markets" at the 82nd Annual Conference held under the auspices of Central Agricultural University, Imphal during November 10-12th, 2022.
- ♦ **Dr. C. S. Tejpal**, Scientist received SOFTI Best Paper Award-2021 for the manuscript entitled "Thiamine and Pyridoxine loaded Vanillic Acid Grafted Chitosan: A Functional Food Ingredient to mitigate swimming induced Oxidative Stress in Animal Model" authored by C. S. Tejpal, K. Elavarasan, R. G. K. Lekshmi, N. S. Chatterjee1, K. Anuj, K. K. Anas, H. M. Devi, E. Sanal, R. Anandan and S. Mathew during Annual General Meeting of the Society, conducted at ICAR-Central Institute of Fisheries Technology, Cochin on 24th August 2022.

- ♦ **Dr. Laly S. J.**, Senior Scientist received the SOFTI Best Paper Award-2020 for the research article entitled "Fluoride Removal from Water using Chitosan Coated Activated Carbon and Cuttle Bone Ash in Combination with Alumina" authored by S. J. Laly, E. R. Priya and A. A. Zynudheen which appeared in Vol. 57 No.3 of "Fishery Technology", has been selected for the Best Paper Award for the year 2020.
- ♦ **Dr. A. Jeyakumari**, Senior Scientist received the best paper award for the research article entitled 'Effect of drying methods on physicochemical and functional properties of Chitosan, by Jeyakumari A., Aleena Aslam., Elavarasan K. 2022. In the National Conference on Advancement of Science and Technology for Environment, Society and People (NCATESP-2022)
- ♦ **Dr. Elavarasan K.**, Scientist received the best paper award for the research paper entitled "Production and characterization of medium viscosity chitosan from Industrial chitin" in the International Conference on "Fish for Security and economical sustainability" 12th Indian Fisheries and Aquaculture Forum organized by TNJFU from 5th to 7th May at Chennai.
- ♦ **Shri Kusunur Ahamed Basha**, Scientist awarded as a best paper award for the paper abstract titled as "Effect of plant-derived essential oils on antimicrobial-resistant Escherichia coli and Aeromonas spp." by In the international seminar on "Interventions for the control of AMR: Harnessing one health knowledge" a parallel event of GAF8 jointly organized by SOFT(I), GAF and ICAR-CIFT during 21-22nd Nov 2022 at Kochi, Kerala.

|| Best Book Award



'Best Agricultural Extension Book Award'- Second Prize for the book: FISHPRENEURSHIP: Present Status, Challenges and Opportunities by Ravishankar, C.N., A.K. Mohanty, Sajeev, M.V. (eds.) (2021). Biotech Books, New Delhi, pp: 342. The award was presented by National Institute of Agricultural Extension Management (MANAGE) for the Best Book in Agricultural Extension for the year 2021.

|| Best Presentation Award

- ♦ **Dr. Sandhya K. M.**, Senior Scientist received the Best paper presentation award (2nd Prize) for the paper presented on "Assessment of evidence of fishing gear losses from selected areas of Indian Waters" during the International Conference on Advancement of Science and Technology for Environment, Society and People (ICATESP-2022) (Online) organized by Society for Technology, Environment, Science & People, Kozhikode, Kerala during 28-29 January 2022
- ♦ **Dr. Sandhya K.M.** Senior Scientist received Best paper presentation award (2nd Prize) for the paper presented on 'Ghost fishing by lost set gillnets: A simulation study from Indian waters' in 6th International Conference on Current Issues in Agricultural, Biological, Applied Sciences for Sustainable Development (CIABASSD-2022)" organized by Kalimpong Science centre, West Bengal; ICAR-National Agricultural Higher Education Project (NAHEP)-IG & Agro-Environmental Development Society (AEDS), UP from 11-13th June 2022

- ♦ **Dr. Visnuvinayagam S.**, Senior Scientist received Best paper presentation award for the paper entitled 'Enhancement of chitosan's antibacterial activity by addition of copper oxide nanoparticle' by Visnuvinayagam S, Murugadas V, Sivaraman G.K, Teena G, Anandan R, Pavan Kumar D, Toms C. Joseph, in the International conference: GAF8 - The 8th Global Conference on Gender in Aquaculture & Fisheries, Shaping the Future: Gender Justice for Sustainable Aquaculture and Fisheries, Parallel Event 1: Interventions for Control of AMR: Harnessing One Health Knowledge, organized by ICAR-Central Institute of Fisheries Technology (ICAR-CIFT), Society of Fisheries Technologists (India) (SOFTI), Gender in Aquaculture & Fisheries Section of the Asian Fisheries Society, during 21-22nd November, 2023 at IMA Hall, Cochin-29.
- ♦ **Dr. Prajith K. K.**, Senior Scientist received the best oral presentation award for the work "Floating cages as FADs: A novel concept to double the income of artisanal fisherfolk" by Prajith K. K., Riswana Barith, Sandhya K. M., Remesan M. P, and B. Manoj Kumar during the international seminar on artisanal fisheries: Regional and global significance, a parallel event of GAF8 jointly organized by SOFT(I), GAF and ICAR-CIFT during 21-22nd November 2022 at Kochi, Kerala.
- ♦ **Dr. Parvathy U.** received the best oral presentation award for the paper entitled "Bioactive and storage properties of astaxanthin-cow milk encapsulates" by Parvathy U., Binsi P.K. and Arya Raguvaram in the 1st Indian Fisheries Outlook 2022 on "Priming Indian Fisheries in Attaining Sustainable Development Goals" under the Theme: "Fisheries post-harvest technology and value addition" held from 22-24th March 2022 at ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal.
- ♦ **Dr. Parvathy U.** received the best third oral presentation award for the paper entitled "Characterization of Cuttle fish ink and its application studies in fish mince model" by Parvathy U., Aiswarya Mohan and Binsi P. K., for presentation (online) in the "International Conference on Advances in Agricultural, Veterinary and Allied Sciences for Improving Livelihood and Environmental Security' organized jointly by ICAR-IGFRI, Regional Research Station, Srinagar, ICAR-NAHEP, Birsa Agricultural University, Ranchi and NADCL, J&K from 28-30th September, 2022.

|| Best Poster Award

Best Poster Award for the poster entitled 'Incidence of ESBL-producing Enterobacteriaceae and methicillin-resistant staphylococci in shrimp aquaculture settings of Kerala', by Vineeth Rajan, Ardhra Vijayan, Gopalan Krishnan Sivaraman, Ravikrishnan Elangovan, Alison Prendiville and Till T Bachmann In: International seminar: Interventions for the control of AMR; harnessing one health knowledge' a parallel event of the 8th global conference on Gender in Aquaculture and Fisheries (GAF8), jointly organized by ICAR- Central Institute Fisheries Technology, SOFTI, and Gender in Aquaculture and Fisheries section of the Asian Fisheries Society (AFS) during 21-22nd November 2023 at IMA Hall, Cochin-29.

Best Poster award for the poster entitled "Vibriophage- ϕ LV6: a Siphoviridae phage for the control of luminescent Vibrios in Penaeus vannamei shrimp hatcheries" by Manikantha Benala, Murugadas Vaiypauri, Visnuvinayagam Sivam, Karthika Raveendran and Madhusudana Rao Badireddy, at the international seminar on "Interventions for control of AMR: Harnessing one health knowledge", a parallel event of the 8th Global Conference on Gender in Aquaculture & Fisheries (GAF8) jointly organized by SOFT(I), GAF and ICAR-CIFT during 21-22nd Nov, 2022 at Kochi.

Best Poster award for the poster entitled "Augmenting Livelihood and Knowledge of Aborigines and Immigrants of Andaman and Nicobar Islands through Value Addition in Fisheries by Dr. Sreepriya Prakasan at GAF8 jointly organized by SOFT(I), GAF and ICAR-CIFT during 21-22nd Nov, 2022 at Kochi.

Best Poster award for the poster entitled "Development of protein powder and noodles from Squilla- a viable opportunity for the utilization of an untapped fishery resource" by Viji P., Jesmi Debbarma, Madhusudana Rao, B. and George Ninan in the theme 'Aquatic Food processing, product development, value addition and packaging' in 12th Indian Fisheries and Aquaculture Forum conducted at Chennai during 5-7th May 2022.

|| Registration of Design

Certificate of registration of design has been received with design no. 341136-001 dated 20.03.2021 in class 15-05 in respect of "Hot Air Assisted Continuous Infrared Dryer"

|| Award for Execution of Excellent Hindi Work 2021-2022

Visakhapatnam Research Centre of ICAR-CIFT has received third prize for Execution of Excellent Hindi Work for the year 2021 to 2022 under Small Central Offices category by the Town Official Language Implementation Committee (TOLIC), Visakhapatnam.

Visakhapatnam Research Centre of ICAR-CIFT won third prize in a quiz competition conducted on the occasion of Hindi Pakhwada (हिंदीपखवाड़ा) celebration by FSI on 28.10.2022.



PME CELL

The Priority setting, Monitoring and Evaluation (PME) Cell of ICAR-CIFT functioned during the year 2022, 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 2022 and those completed by March 2022 were evaluated and graded. RPPI, RPPII and RPPIII of 29 ongoing Institute projects and 11 concluded projects were processed.

There were 29 Institute Projects & 26 Externally Funded Projects in operation in the institute during the period under report

|| Externally funded projects

A total of 33 proposals for external funding were routed through the Cell after ascertaining that they fall under the mandate and priority research areas of the Institute.

|| 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 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 meeting was convened during 05-07th April 2022 to review the progress achieved in the ongoing research projects of the Institute during 2021-22 and to discuss the research project proposals for the year 2022-23. The Institute Research Project Document for the year 2021-22 was compiled and brought out for discussion at the meeting. The House discussed in detail the 18 ongoing research projects, 11 completed projects and 11 new projects.

|| **Verification of CAS Reports of Scientists:** The PME Cell verified and scrutinized Career Advance Scheme Reports submitted by 37 institute 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. During the year virtual mode of participation was promoted in such events.

|| **Publication of the Scientific Papers and maintenance of database:** Facilitated processing and approval for about 250 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/ Minister 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.



AKMU

Agricultural Knowledge Management Unit (AKMU) caters to meet the ICT needs of the institute by providing and maintaining the Internet, Email, Video Conferencing and other computer related facilities. AKMU provides internet connectivity to nearly 350 systems through LAN and wifi connectivity to nearly 300 users. ICAR-CIFT is presently connected with a 1000 Mbps lease line under National Knowledge Network (NKN) provided by Govt. of India and 20 Mbps ILL from BSNL to provide all the ICT services around the clock for the employees of the Institute. Local Area Networking (LAN) was managed by AKMU.

|| Management of ICAR-CIFT Website (<https://cift.res.in/>)

- ◆ It highlights overall research activities and achievements of the institute and acts as an interface between institute and end users.
- ◆ The information on training programmes, recruitments of temporary staff, tender notices and other circulars of the institute are periodically uploaded in the Institute Website to the transparency of the working condition.
- ◆ This unit is manager online meetings in different platforms like google meet, webex and zoom.
- ◆ AKMU manages institute's official social media accounts like facebook, twitter and whatsapp for disseminating the institute's technologies and activities to the public.
- ◆ These facilities are being used for monitoring and evaluating research programmes in the Research Centers of the institute and also other organizations.
- ◆ The contents of the Institute Website are periodically updated.

|| Support to Stakeholders

- ◆ AKMU also gives real time reply to queries received from farmers, students, entrepreneurs, researchers and others in the agricultural and allied sectors to e-Krishi Manch, a public interface platform developed by ICAR for stakeholders.
- ◆ AKMU also provides input to KM Portal developed by ICAR by updating details of the institute higher authorities contact information, sophisticated analytical instrumentation facility and financial transaction details of the institute.

|| Institute Activities

- ◆ AKMU assisted in successfully implementing ICAR MIS & FMS and e-office in the institute by providing technical and training support. AEBAS system for attendance of staff is also maintained by AKMU. Verifying and certifying quality of information technology equipment purchased was managed by this unit.
- ◆ AKMU provides K7 Enterprise Security through the server for protecting from malware threats and other external sources of threats, thus improving the ICT efficiency. It also acts as a gateway to protect from intrusion attacks to prevent the leakage of confidential data by adding 250 clients to the system.

O L SECTION

Hindi Week Celebrations 2022

The Valedictory function of the Hindi Week Celebrations 2022 was conducted on 30.9.2022 at ICAR-CIFT. Shri P.Vijayakumar, Deputy Director (Retired), Regional Implementation Office, Cochin was the Chief Guest for the occasion. Dr. Leela Edwin, Director, Acting, presided over the function. Shri Mahesh Kubdikar, Chief Administrative Officer welcomed the gathering. Shri P. Vijayakumar praised the effort of CIFT in implementing Official Language and the read out the main points pertaining to the Annual Programme issued by the Department of Official Language Dr. Leela Edwin, Director, Acting, expressed her happiness with the work done by the Official Language Section of CIFT. She congratulated the Official Language Section and the Staff members in successfully completing the Parliamentary Committee Inspection and also urged the staff to use more Hindi in their day-to-day work. Dr P. Shankar, ACTO read out the message from Director General, ICAR. The Chief Guest Shri P.Vijayakumar released the Training Manual of the Institute. Dr Leela Edwin, Director, Acting distributed the Certificate to Shri Subhesh S.S. as a part of encouragement for doing work in Hindi.



The Chief Guest Shri P.Vijayakumar speaking on the Occasion

Hindi Workshop on Technical Terminology

Dr Santhosh Alex, ACTO conducted an Official Language Workshop on Technical Terminology for the Technical Officer/ Staff of ICAR-CIFT on 16.12.2022. The participants were appraised of Technical Terminology Commission and its Glossary. Various Technical terms pertaining to the work done by the employees were also taught during the workshop which will be helpful in writing their work dairies in Bilingual.

Parliamentary Committee Inspection

The Second Sub Committee of Committee of Parliament on Official Language inspected ICAR-CIFT. The inspection was held at Taj Kovalam on 27.9.2022. Dr. Leela Edwin, Director, Acting, Dr. Nikita Gopal, Principal Scientist, Shri Paras Nath Jha, Scientist, Dr. Santhosh Alex, ACTO, Dr. P. Shankar, ACTO, Shri P.P. Anil Kumar, FAO and Shri R.N. Subramaniam, AO, took part in the inspection.



Inspection by the Second Subcommittee of Parliament on Official Language

|| Faculty support in other organizations

Dr Santhosh Alex, Asst Chief Technical Officer, ICAR-CIFT was the resource person for the Hindi workshop conducted on 1.12.2022 for the Officers of the Directorate of Light houses and Lightships, Cochin. Dr. Santhosh Alex, delivered a lecture on the topic "Rajbhasha, *dasha va Disha aur Karvanyayan.*"



Dr. Santhosh Alex, delivering the lecture



LIBRARY

The Library is committed to serving the information needs of the scientific community of the Institute. Apart from strengthening collection, the library focuses on the implementation of the latest information services for the benefit of users.

Library Collection

The total number of books in the collection has gone up to 012909 volumes this year. Online databases viz., ASFA (Aquatic Science and Fisheries Abstracts, Indian Standards and patent database 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 users to search the library collection.

Mobile/ Web App

MyLOFT mobile/web app has been subscribed to facilitate remote access to the library subscribed premium e-resources.

CeRA (Consortium of e-Resources on Agriculture)

More than 2000 online journals are available through CeRA (Consortium of e-Resources on Agriculture). Library has supplied copies of 26 articles under DDR (Document Delivery Request) facility of CeRA (Consortium of e-Resources on Aquaculture) to the member libraries.

Institutional Membership

CIFT library is a member of IAMSILIC (The International Association of Aquatic and Marine Science Libraries and Information Centers) and is part of the Interlibrary 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 from September 2016 onwards

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.

Plagiarism Checking

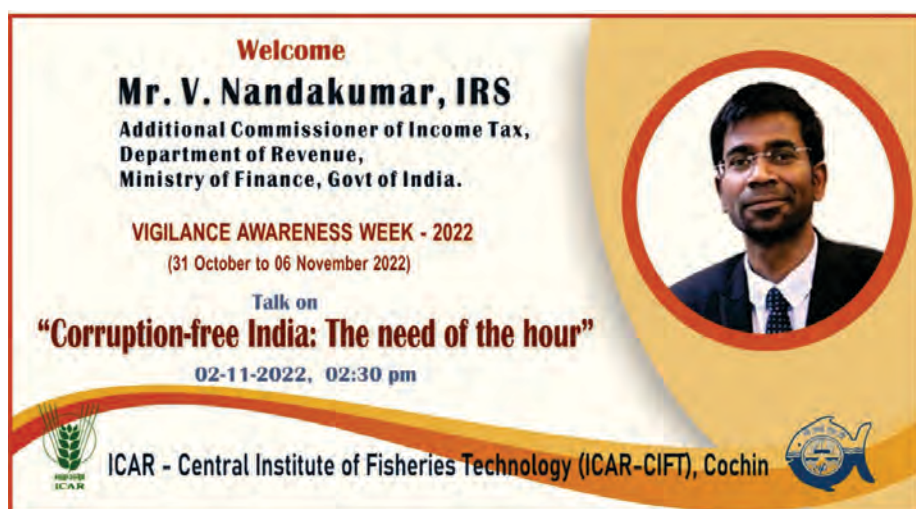
The library offers plagiarism-checking services using software to its members. During this period, checked text similarity in 442 research articles and score reports have been generated, indicating similarity in percentage.



EVENTS AND CELEBRATIONS

|| Vigilance Awareness Week 2022

As part of the annual Vigilance Awareness Week observance, ICAR CIFT, Cochin arranged a quiz program on 1st November 2022. Eight teams representing various sections of the institute participated in the competition. Furthermore, a painting competition was held at Annai Saradha Devi Government High School, Vadhanur, Puducherry on November 7, 2022, centered around the theme of "Corruption-free India." The competition featured three categories based on grade levels, and a total of 50 students took part. Winners in each category (1st, 2nd, and 3rd place) received prizes. Additionally, an invited talk by Mr. V. Nandakumar IRS, Additional Commissioner of Income Tax, was organized on November 2, 2020. The online lecture, titled "Corruption-free India: The need of the hour," was conducted via the Zoom platform from 2:30 PM to 3:30 PM.



|| ICAR-CIFT organized Fit India Freedom run 3.0 campaign

ICAR-CIFT, Cochin followed the Ministry of Youth Affairs and Sports' guidelines and observed the Fit India Freedom Run 3.0 campaign. A 'Unity Run' took place for the staff members of ICAR-CIFT, Cochin at the Cochin Port Trust walkway premises on October 27, 2022. With the active participation of 60 staff, covering a distance of 5 kilometers, the event was inaugurated by Dr. Leela Edwin, Acting Director of ICAR-CIFT, Cochin. Dr. Pe. Jeyya Jeyanthi, Senior Scientist and Nodal officer of the Fit for Freedom Run 3.0 Campaign, coordinated the event.





ICAR-CIFT, Kochi National Campaign on Clean Coast- Safe Sea

ICAR-Central Institute of Fisheries Technology (ICAR-CIFT), Kochi organised a National Campaign Programme on **Swachh Sagar Surakshit Sagar** (Clean Coast- Safe Sea) on 12th September, 2022 at Kochi in collaboration with the Ministry of Earth Sciences, Government of India. The programme was chaired by Dr. Leela Edwin, Director (Acting), ICAR-CIFT in the presence of Dr. Sandeep Barua, Scientist F and Dr. B. K. Tyagi, Consultant, Vigyan Prasara, Department of Science and Technology, GOI, New Delhi.





International Day of Yoga Celebrations at ICAR-CIFT

On June 21, 2022, International Day of Yoga was celebrated at ICAR CIFT headquarters and its three research centers. Dr. Leela Edwin, Acting Director of ICAR-CIFT, presided over the function, highlighting the significance of yoga for physical and mental well-being. Dr. Radhika A F, Consultant at Amrita Institute of Medical Sciences, delivered a talk on "Yoga for Humanity" as the Chief Guest. The practical session featured Common Yoga Protocol by AYUSH, including asanas and pranayama techniques, and recognized two outstanding performers. Prizes were also distributed to winners of various competitions.



Mr. Deepak B., a certified Yoga instructor, served as the chief guest and resource person at Visakha patnam Research Centre. Dr. U. Sreedhar, Scientist-in-Charge, and Dr. B. Madhusudhana Rao from ICAR-CIFT emphasized the importance of Yoga and its health benefits. The teaching session began with prayer and concluded with a meditation session, covering essential asanas for everyday well-being.

Smt. Deepa Singhal, Yoga Guru from Yoga Vidya Niketan, Vashi, graced the Mumbai Research Centre of ICAR-CIFT as the chief guest. Dr. Abhay Kumar, Scientist-in-Charge, extended a warm welcome to the attendees.



Dr. Ashish Kumar Jha, Senior Scientist & Scientist In-Charge, welcomed and provided an overview of the program at Veraval Research Centre. Shri. Abhay Thakar, Yoga instructor from Sanskrit University, Veraval, conducted the yoga session and discussed its everyday life benefits.

ICAR-CIFT Celebrates 65th Foundation Day with fervor

ICAR-Central Institute of Fisheries Technology (CIFT), Cochin, was filled with fervor as it celebrated its 65th Foundation Day. The esteemed presence of Dr. P Pravin, Asst. Director General (Marine Fisheries) ICAR, New Delhi, as the Chief Guest, alongside luminaries such as Dr. K. Gopakumar, former DDG (Fisheries), and former Directors Dr. T. K. Srinivasa Gopal and former Director in-charge Dr. M K Mukundan spoke on the occasion.



ICAR South zone sports 2022

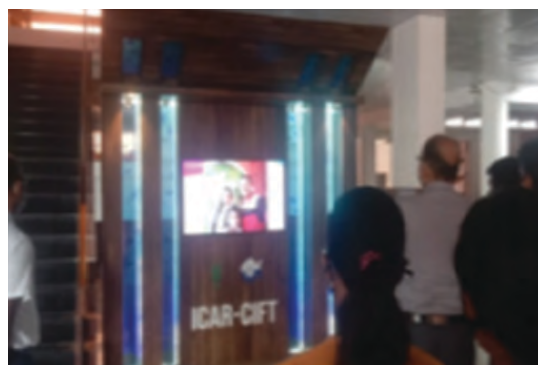
ICAR-CIFT participated in ICAR Inter-Institutional Sports Tournament organised by ICAR-NAARM, Hyderabad at RSC ground, Secunderabad during 20-25 November, 2023. ICAR-CIFT won in Carroms (Winner), Football (runner-up), 4 x 100 meters relay for women (Silver). Shri Rajasaravanan received the Carroms championship in men category. Dr. Pe. Jeyya Jeyanthi won first in long jump and third in 200metres. Shri. Aneesh won third in High jump during the tournament.



ICAR-CIFT contingents during ICAR south zone sports meet at Secunderabad (20-25 November 2023)

ICAR-CIFT observes National Girl Child Day - 2022

ICAR-CIFT, Cochin observed the **National Girl Child Day-2022** by organizing the event 'Selfie with daughters' on 24 January, 2022. The staff from both headquarters and centres actively participated and the photos of the staff members with their daughter/s were displayed in the lobby of the ICAR-CIFT, Cochin towards signifying the National Girl Child Day. The event was co-ordinated by Dr. Pe. Jeyya Jeyanthi, Senior Scientist, ICAR-CIFT, Cochin.



Womens Day Celebration at ICAR-CIFT

At ICAR-CIFT Kochi, Women's Day was celebrated on 8th March, 2022 to commemorate the unparalleled contributions of women in every sphere of life like arts, culture, medicine, army, education and agriculture, etc with enthusiasm, honoring the achievements and contributions of women



ICAR-CIFT Celebrating 76th Independence Day of India

On the significant day of India's 76th Independence Day in 2022. Dr. Leela Edwin, the esteemed Director of the institute, proudly hoisted the flag both the institute and the Residential complex in Thevara. In the research centres, respective scientist in-charges hoisted the national flag.



Onam Festival Celebration

During the grand celebration of the Onam festival at ICAR-CIFT Kochi, the staff actively participated in a series of traditional sports events that added an element of excitement and friendly competition, which brought the staff together in a spirit of fun and camaraderie. These events not only bring their young age memories but also promoted team building and a healthy work-life balance among the staff members



|| World Food Safety Day

ICAR-Central Institute of Fisheries Technology, Cochin hosted a National Seminar on '**Safe fish for healthy life**' to commemorate World Food Safety Day. The event aimed to raise awareness about food quality and safety concerns and mobilize efforts to prevent and manage foodborne risks. Dr. K Riji John, Hon'ble Vice-Chancellor of Kerala University of Fisheries and Ocean Studies, emphasized the importance of safe fish and commended ICAR-CIFT's initiatives in quality testing. A Food Safety Quiz competition was also conducted to promote awareness among college students.



|| Republic day celebration at ICAR-CIFT

On the 26th of January, 2022, ICAR-CIFT Kochi celebrated the 73rd Republic Day. With a strong sense of patriotism and dedication, scientists, technical, administrative staff, senior research fellows, young professionals, and supporting staff assembled in front of the Administrative building. The Director, Dr. Leela Edwin, commenced the celebration by unfurling the National Flag.



INSTITUTE JOINT STAFF COUNCIL (IJSC)

ICAR-CIFT crossed its 112th meeting this year and it is a milestone in the history of ICAR, that an institute is conducting systematically 4 meetings in a year and crossed 110 meetings.

During the year 2022 four IJSC meetings were conducted (109-112)

IJSC members visited Visakhapatnam Research Council of CIFT to collect first-hand information from Centre.

Secretary Staff side Shri Nobi P.S. attended the 40th meeting of Central Joint Staff Council meeting held on 18.06.2022 at NASC, ICAR, New Delhi in the capacity of FAC member.



Shri Nobi P. S. IJSC Secretary (Staff side) attending 40th Central Joint Staff Council meeting at NASC, ICAR, New Delhi

Shri Nobi P.S. attended 93rd AGM of ICAR held at NASC ICAR, New Delhi, in the capacity of FAC member of CJSC

IJSC members committed vital roles in various management committees of the institute, viz: compassionate appointment, quarters allotment, recreation club, departmental canteen, standing sports committee, staff welfare fund, award utilisation, etc:



RECREATION CLUB

ICAR-CIFT Recreation Club plays a pivotal role in bringing together all the CIFT staff of the institute in a common platform and maintains a cordial relationship among them. This will act as a binding force in the staff milieu in particular and among various sections in general. The club in fact, conducts different social and cultural programmes in the institute to facilitate a stress-free working environment among the staff.

The following are the programmes the club has conducted to meet its social obligations under the new executive committee.

- ♦ The Club celebrated New Year 2022 in CIFT by greeting and welcoming the staff offering a piece of cake on 01st of January 2022 in the front lobby of this institute. As an icing on the cake, a sweet box was donated to Sneha Bhavan, Palluruthy as a New Year Gift to the inmates.



- ♦ The Club has facilitated the setting up of information kiosks of the State Bank of India for displaying financial and loan facilities available with the Bank to the staff members of this Institute.



- ♦ The formal Onam Celebration *Aarppo Erroo* 2022 was held on the 30th of August, 2022 in the presence of Chief guest Major Ravi, Cine Artist cum Director at A. N. Bose Auditorium. *Pookkalam* competitions, *Onasadya* sponsored by Canteen Committee, prize distributions of various competitions and cultural programme were the main attractions of the day.



- ♦ Award distribution for academic excellence to the Wards of staff for the year 2020-21 and 21-22 was held on the occasion of Onam celebration. From this year (2022) onwards, a new ever-rolling trophy was introduced for the overall champion of Onam competitions. This trophy was sponsored by the Fish Processing Division in fond memory of late Dr. K. Ashok Kumar, The Former Head, Fish Processing Division.



- ♦ The General Body meeting of the Recreation Meeting held in the Conference hall on 20th December, 2022.
- ♦ As a routine programme executive members of the club as a team go to the club members on the respective birthdays and greet them with birthday gifts, which were purchased by the club exclusively for this purpose.



REPRESENTATION IN COMMITTEES

|| Dr. George Ninan

As Expert member

- ♦ Appraisal Committee Meeting on 02.02.22 to review the proposals for establishing Common Incubation Centres under PMFME scheme, MoFPI
- ♦ Fifteenth Appraisal Committee Meeting for Setting up of Common Incubation Centre under PMFME Scheme on 02.09.2022.
- ♦ Fourteenth Appraisal Committee Meeting for Setting up of Common Incubation Center under PMFME Scheme on 04.08.2022.

As Subject Expert

- ♦ TIUSMP scheme of MPEDA on 13.07.2022

As Panellist

- ♦ Plenary session on Technology initiatives in improving the post- harvest, domestic & export consumption of fish in the First conference on FISHTECH organized by FICCI on 15.07.2022

As Co-coordinator

- ♦ Workshop on Conservation of Fisheries Biodiversity & Protection of Farmers' Rights organized by ZTMC –ABI Unit of ICAR CIF T and Krishi Vigyan Kendra, CMFRI on 25.07.2022.

|| Dr. Leela Edwin

Advisory committee/Passing board

- ♦ Passing board committee of MFScstudents at KUFOS

External expert

- ♦ External examiner for BFSc and MFSc/MSc KUFOS
- ♦ MFSc/MSc Comprehensive viva for the students at KUFOS

|| Dr. Zynudheen A. A.

As Member

- ♦ Assessment Panel of Experts, Export Inspection Council
- ♦ Kerala State Committee for Fish quality assurance and management
- ♦ Technical Working Group, Ministry of Fisheries, Government of India

|| Dr. R. Anandan

As Member secretary

- ♦ CPCSEA approved institutional animal ethics committee, ICAR-CIFT, Cochin

As Member

- ♦ CAS Assessment for Scientist , ICAR-CMFRI, Cochin
- ♦ Assessment promotion of Scientists, IIMR, Hyderabad
- ♦ Institutional Animal Ethics Committee

As Lab Assessor

- ♦ NABL



|| Dr. Bindu J.

As Member Secretary

- ◆ Institute Research Committee

As Member

- ◆ Committee for Formulating a road map for Mussel farming in Kasargod District under One District One product program under Government of Kerala

|| Dr. Toms C. Joseph

As Chairman

- ◆ IBSC, ICAR-CIFT, Cochin

As Member

- ◆ Board of Studies of Faculty of Veterinary & Animal Sciences, Kerala Veterinary and Animal Sciences University.
- ◆ Institutional Bio-safety committee (IBSC) of Cochin University of Science and Technology

As a Faculty Board of studies

- ◆ Faculty of Ocean Science and Technology and Faculty of Fisheries Management

As Co-ordinator

- ◆ International Conference on Interventions for Control of AMR: Harnessing One Health Knowledge, Organized by ICAR-CIFT and along with SOFTI & Gender in Aquaculture & Fisheries Section of the Asian Fisheries Society (GAFS of the AFS)

|| Dr. R. Raghu Prakash

As Member

- ◆ Board of studies meeting of Dept of Zoology, Andhra University on 17.08.2022

|| Dr. U. Sreedhar

As Chairman

- ◆ Second Research Advisory Committee (RAC) meeting of CMLRE at CMLRE, Kochi on 12.10.2022

As External expert

- ◆ Meeting for Screening and Assessment of applications for the posts of 'Controller of Examinations and Technical Officers on Deputation' for Andhra Pradesh Fisheries University on 23 August 2022.

As External examiner

- ◆ Selection Committee for the interview of one Field Assistant at VRC of CMFRI, Visakhapatnam on 08.09.2022

As Member

- ◆ First meeting of Research Advisory Committee (RAC) for the 15th Financial Commission programs of CMLRE on 07.02.2022 in virtual mode
- ◆ Online interview conducted for the post of Agromet-Observer, Krishi Vigyan Kendra; DAMU project, Rastakuntubai, Parvathipuram Manyam District on 19.07.2022
- ◆ Selection committee for the interview of young professionals-II conducted by ICAR-CMFRI Visakhapatnam 29.07.2022
- ◆ Selection Committee meeting for recruitment of Project Scientist - II (Post Code: 06 & 09); Project Scientist – I (Post code 13 & 15) for eleven posts on contractual employment at INCOIS, Hyderabad on 31.10.22 & 01.11.22.

|| Dr. Femeena Hassan

As Chairman

- ◆ Committee for considering the promotion of Technical staff of ICAR-IISR, Kozhikode, Kerala

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council

|| Dr. A. Suresh

As Member

- ◆ Member of Governing Council and Member of Senate of Kerala University of Fisheries and Ocean Studies, Pananagad, Ernakulam.
- ◆ Standing Committee of Governing Council of KUFOS on Planning, Development and Research
- ◆ Sub-committee of GC of KUFOS to revise the statute of KUFOS in accordance with the Amended Act
- ◆ Member of committee to evaluate shelf of Projects on agriculture, animal husbandry, fisheries and dairy development for State Resource Group for Decentralisation, Government of Kerala.
- ◆ Subject Expert of the Selection Committee to evaluate the Shri J.V.H. Dixitulu Award 2022, instituted by The Asian Fisheries Science Indian Branch along with the Marine Biological Association of India (MBAI - based in Central Marine Fisheries Research institute, Kochi), The Association of Aquaculturists (based in Central Institute of Freshwater Aquaculture, Bhubaneswar) and the Inland Fisheries Society of India (IFSI – based in Central Inland Fisheries Research Institute, Barrackpore)
- ◆ Expert sub-group on “Social Security for Fish Workers: An Assessment and Suggestions for Reform” of the Working Group, “Inland and Marine Fisheries Sector” of Kerala State Planning Board, as part of formulation of 14th Five Year Plan.
- ◆ Drafting committee for preparing the report of the Expert sub-group on “Social Security for Fish Workers: An Assessment and Suggestions for Reform” of the Working Group, “Inland and Marine Fisheries Sector” of Kerala State Planning Board, as part of formulation of 14th Five Year Plan.
- ◆ Expert Sub-Group on “A plan to expand and modernize supply chain in in Agriculture”, of the Working Group, “Agriculture and cooperation sector” of Kerala State Planning Board, as part of formulation of 14th Five Year Plan.
- ◆ Drafting committee for preparing the report of the Expert Sub-Group on “A plan to expand and modernize supply chain in in Agriculture” of the Working Group “Agriculture and cooperation sector” of Kerala State Planning Board, as part of formulation of 14th Five Year Plan.
- ◆ Chairman/ member of committees to select SRF and Young Professionals in ICAR-CIFT
- ◆ Enquiry committee for verifying complaints regarding violations of KUFOS statutes, acts and UGC regulations, constituted by Vice Chancellor, KUFOS.
- ◆ Executive Committee of Indian Society of Agricultural Economics, Mumbai.
- ◆ Executive Committee of Agricultural Economics Research Association (India), New Delhi.
- ◆ Editorial Board of the Journal “Fishery Technology” by Society of Fisheries Technologists (India)



|| Dr. Asha K. K.

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council

As Resource Person

- ◆ For MFSc. ICAR-CIFE Mumbai for Discipline Diagnostic Biochemistry- Lecture on Lipid carriers and disorders on 3rd September 2022

|| Dr. B. Madhusudana Rao

As Subject expert

- ◆ Selection committee constituted for the recruitment of Junior Research Fellow in the DST-SERB-SRG project entitled "Metagenome mining of marine macroalgal epiphytic microbiome for novel drug targets" at GITAM (Deemed to be University), Visakhapatnam on 18.01.2022
- ◆ Interview panel for the recruitment of Junior Research Fellow in the SERB-Startup research grant project in GITAM School of Science GITAM (deemed to be University) Visakhapatnam on 20.07.2022

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council
- ◆ Selection committee for the Career Advancement Scheme of in-service teachers of Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh in the disciplines of Veterinary Microbiology (VMC) and Veterinary Public Health and Epidemiology (VPHE) conducted by Sri Venkateswara Veterinary University, Tirupati, on 21.04.2022
- ◆ Selection committee for SMS (Horticulture), Farm Manager and Programme Asst (Computer Science) for BCT-KVK, Haripuram, Visakhapatnam on 01.07.2022
- ◆ Selection committee for SMS (Agrometeorology) and Agromet Observer under DAMU project, Amdalavalasa, Srikakulam on 19.07.2022
- ◆ 8th Academic Council meeting of Dr. V. S. Krishna Government Degree College, Visakhapatnam On 28.10.2022

|| Dr. G. K. Sivaraman

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council

As Research Supervisor

- ◆ Standing Committee of the Syndicate on Academic Matters, Cochin Univ. Of Sci & Tech (CUSAT), Cochin, Kerala
- ◆ ICAR- CIFE, Mumbai
- ◆ Veterinary College, KVASU, Bengaluru.

As Nodal officer

- ◆ As IBSC, DBT Nominee
- ◆ Thrissur Veterinary College, Mannuthy
- ◆ ICAR- CMFRI, Kochi

|| Dr. Satyen Kumar Panda

As Member Secretary

- ◆ FSSAI Working Group on Development of Standards for Fermented Fishery Products

As Convener

- ◆ FAD 15/ Panel 1: To review and revise IS 5404: 1984 'Methods for drawing and handling of food samples for microbiological analysis
- ◆ FAD 15/ Panel 3: Review of Indian Standards related to Microbiological Media Ingredients

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council
- ◆ FSSAI Scientific Panel on Fish and Fisheries Products
- ◆ Method Review Group, FSSAI
- ◆ RAFT Committee, FSSAI on approval of rapid food testing kits
- ◆ Fish, Fisheries and Aquaculture Sectional Committee, FAD 12, Bureau of Indian Standards
- ◆ Food Hygiene, Safety Management and other systems sectional committee, FAD 15, Bureau of Indian Standards
- ◆ Technical Working Group, Ministry of Fisheries, Government of India
- ◆ FSSAI Technical Evaluation Committee for setting up of Microbiology Laboratory under Central Sector Scheme
- ◆ ISO SC9 WG30 for mass spectrometry based method development for Staphylococcal enterotoxin.
- ◆ ISO SC9 WG-3 for Validation of Bacterial Toxin Methods
- ◆ FAD 27 & FAD 28 of Bureau of Indian Standards

|| Dr. Murali S.

As Expert member

- ◆ MPEDA final joint inspection of industry final application under TIUSMP scheme on 25.03.2022

|| Dr. Ashish Kumar Jha

As Chairman

- ◆ Town Official Language Implementation committee, Veraval

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council
- ◆ Physical Verification Committee of MPEDA
- ◆ Board of Studies for Fisheries Science Faculty at Kamdhenu University

As External examiner

- ◆ Thesis evaluation for College of Fisheries, Kamdhenu University



|| Dr. Murugadas V.

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council
- ◆ Standards for Shaphari Certification of hatcheriesMPEDA, Kochi

|| Dr. S. Visnuvinayagam

As Member

- ◆ Assessment Panel of Experts

As Judge

- ◆ Regional-level Children's Science Congress competition for KVK

|| Dr. A. Jeyakumari

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council

|| Dr. Viji P.

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council
- ◆ Selection committee for the post of Cook (hostel) in CIFNET, Visakhapatnam Unit on 28.09.2022

|| Dr. Sandhya K. M.

As Member

- ◆ TXD18:Textile Materials for Marine/Fishing Purposes Sectional Committee of Bureau of Indian Standards
- ◆ Matsyafed, Kochi for the establishment of newly proposed yarn twisting unit at Paravoor, Alappuzha

Advisory committee/ Passing board

- ◆ Passing board committee of MFSc students at KUFOS

External expert

- ◆ External examiner for BFSc and MFSC/MSc KUFOS
- ◆ MFSc/MSc Comprehensive viva for the students at KUFOS

|| Dr. Prajith K. K.

Advisory committee/Passing board

- ◆ Passing board committee of MFSc students at KUFOS

External expert

- ◆ The selection committee for the recruitment of project personnel at Fishery Survey of India for the PMSSY-funded project on "Marine mammal stock assessment in India" on 10th and 11th October 2022.
- ◆ External examiner for BFSc and MFSC/MSc KUFOS
- ◆ MFSc/MSc Comprehensive viva for the students at KUFOS

|| Dr. Laly S. J.

As Jury member

- ♦ 30th KVS (Regional) National Children Science Congress 22-23

As Member

- ♦ Assessment Panel of Experts, Export Inspection Council

|| Dr. Jesmi Debbarma

As Member

- ♦ Assessment Panel of Experts, Export Inspection Council

|| Dr. Parvathy U.

As Member

- ♦ PhD Research committee of KUFOS and CUSAT
- ♦ GAF Core Committee
- ♦ Assessment Panel of Experts, Export Inspection Council

|| Dr. Manju Lekshmi N.

As Member

- ♦ FAO-IMO-Norway Glolitter partnership project

Advisory committee/ Passing board

- ♦ Passing board committee of MFScstudents at KUFOS

External expert

- ♦ External examiner for BFSc and MFSc/MSc KUFOS
- ♦ MFSc/MSc Comprehensive viva for the students at KUFOS

|| Dr. Anupama T. K.

As Member

- ♦ Assessment Panel of Experts, Export Inspection Council
- ♦ Physical Verification Committee of MPEDA
- ♦ National Campaign in Fish Health management in aquaculture

|| Dr. Pankaj Kishore

As Member

- ♦ Assessment Panel of Experts, Export Inspection Council

|| Mr. Sreejith S.

As Member

- ♦ Assessment Panel of Experts, Export Inspection Council
- ♦ Physical Verification Committee of MPEDA

**As External examiner**

- ♦ For Thesis Viva voce examination of MFSc students of College of Fisheries Science, Kamadhenu University

|| Dr. Ahamed Basha**As Member**

- ♦ Assessment Panel of Experts, Export Inspection Council

|| Dr. Priya E. R.**As Member**

- ♦ Assessment Panel of Experts, Export Inspection Council

As Jury member

- ♦ 30th KVS (Regional) National Children Science Congress 22-23

|| Dr. Ranjit Kumar Nadella**As Member**

- ♦ Assessment Panel of Experts, Export Inspection Council

|| Dr. Ezhil Nilavan**As Member**

- ♦ Assessment Panel of Experts, Export Inspection Council

|| Dr. Minimol V. A.**As Member**

- ♦ Assessment Panel of Experts, Export Inspection Council

|| Dr. Muthulakshmi T.**As Member**

- ♦ Assessment Panel of Experts, Export Inspection Council

|| Smt. Alfiya P. V.**As Member**

- ♦ Meeting board of Studies, Food Technology, Calicut University on 22-03-2022.

|| Dr. Tejpal C. S.**As Member**

- ♦ Passing Board Member of academic programmes of KUFOS.
- ♦ BIS FAD 12/Panel II meeting on Fish Feed Standards on 13th June, 2022 on virtual mode

|| Dr. Abhay Kumar

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council
- ◆ Inspection the seafood processing establishment of M/s.Aqua Foods Exim, Plot No. B4, additional Lote MIDC, Asgani Village, Taluka-Khed, Ratnagiri-415708 in connection with Technology Development for specific Value Added Products (TDSVAP) Financial Assistance on 18th November 2022

|| Smt. Greeshma S. S.

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council
- ◆ Selection committee

|| Dr. Sarika K.

As Member

- ◆ Assessment Panel of Experts, Export Inspection Council

As External examiner

- ◆ For Thesis Viva voce examination of MFSc students of College of Fisheries Science, Kamadhenu University

|| Dr. S. Chinnadurai

As External examiner

- ◆ For MFSc Thesis evaluation of College of Fisheries Mangaluru, Karnataka veterinary, Animal and Fisheries Sciences University

As Technical Expert

- ◆ Dolphin Census-2022 in association with Marine National Park, Jamnagar

As Resource person for Fishing Gear Technology

- ◆ BFSc students, College of Fisheries Sciences, Kamadhenu University

|| Dr. Rehana Raj

As Evaluator

- ◆ 12th IFAF at Chennai Organised by TNJFU & AFSIB, Indian Branch during 5-7th May 2022

|| Dr. Aniesrani Delfiya D. S.

As Member

- ◆ ISO: 9000:2015 surveillance audit of ICAR-CIFT, Cochin r on 11.10.2022.



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, Dept. of Fish Processing Technology, KBAFS, Kolkatha (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. S. D. Tripathi, Former Director, ICAR-CIFE, Mumbai

Members:

1. Dr. A. K. Upadhyay, Prof. & HOD, Department of Fish Harvest and Processing Technology, College of Fisheries, Pantnagar
2. Dr. K. Rathnakumar, Dean, College of Fisheries Engineering, TNJFU, Nagapattinam
3. Dr. K. N. Gurudutt, Former Head, CFTRI, Mysore
4. Dr. M. N. Venugopal, Former Prof., College of Fisheries, Mangalore
5. Prof. Biswanth Sadangi, Former Head, ICAR-CIWA & Emeritus Scientist, ICAR-NRRI
6. Asst. Director General(M.Fy), ICAR, New Delhi
7. Director, ICAR-CIFT, Kochi

Member Secretary: Dr. V. R. Madhu, Principal Scientist, ICAR-CIFT, Kochi

Institute Management Committee (IMC)

Chairman: Director, ICAR-CIFT

Members:

1. Shri P. I. Sheik Pareeth, MD, Kerala State Coastal Area Development Corporation Ltd.
2. Dr. Shamila Monteiro, 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. Shanmuganadam, Rajesh Nagar, 158 Mettupatti P.O., Madurai-625 502.
6. Dr. Rani Palaniswami, Officer-in-charge, Research Centre of CIFRI, Kochi
7. Dr. Alavandi S. V., HOD, ICAR-CIBA, Chennai
8. Dr. S. Kalavathi, Principal Scientist, ICAR-CPCRI, Kayamkulam
9. Dr. K. V. Rajendran, HOD, ICAR-CIFE, Mumbai
10. Assistant Director General (M. Fy.), ICAR, New Delhi - 12
11. Senior Finance and Administrative Officer, ICAR-CMFRI, Cochin

Member Secretary: Senior Administrative Officer, ICAR-CIFT, Kochi

|| Grievance Cell

Chairman: Director, ICAR-CIFT

Members:

1. Dr. George Ninan, Principal Scientist & HOD(i/c), Engg. Dvn., ICAR-CIFT
2. Shri Mahesh B. Khubdikar, Chief Admn. Officer, ICAR-CIFT
3. Shri Prashant Kumar, Chief Fin. & Accts. Officer, ICAR-CIFT
4. Dr. Ranjith Kumar Nadella, Scientist, ICAR-CIFT
5. Shri Babu K.S, Tech. Officer., ICAR-CIFT
6. Smt. Sobha K S, UDC, ICAR-CIFT
7. Smt. Mary Vineetha P.T, SSS, ICAR-CIFT

Member Secretary: Shri R.N. Subramanian, Admn. Officer, ICAR-CIFT, Cochin

|| Institute Joint Staff Council (IJSC)

Chairman: Dr. George Ninan, Director, ICAR-CIFT

Members (Official Side):

1. Dr. Leela Edwin, PS & HOD, FT. Div., ICAR-CIFT
2. Dr. Zynudheen A A, PS & HOD (i/c), QAM Div., ICAR-CIFT
3. Dr. Toms C. Joseph, PS & HOD (i/c), MFB Div., ICAR-CIFT
4. Dr. Amulya Kumar Mohanty, PS & HOD EIS Dvn., ICAR-CIFT
5. Shri Anil Kumar.P.P, Sr. Fin. & Accounts Officer

Secretary (Official Side): Shri Mahesh B. Khubdikar, Chief. Admn. Officer, ICAR-CIFT

Members (Staff Side):

1. Shri K. Das., Assistant, ICAR-CIFT
2. Shri P. Mani, Assistant
3. Shri. Vipin Kumar V., Sr. Tech. Assistant, ICAR-CIFT
4. Shri. P. Raghavan, SSS, ICAR-CIFT
5. Shri. A. Vinod, SSS, ICAR-CIFT

Secretary (Staff Side): Shri P. S. Nobi, Tech. Officer, ICAR-CIFT

|| Project Monitoring and 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. In-Charge Engineering, ICAR-CIFT
7. Extension, Information & Statistics, ICAR-CIFT

Member Secretary: Dr. T. V. Sankar, Officer In-Charge, PME cell, ICAR-CIFT



LIST OF ON-GOING RESEARCH PROJECTS

Institute Projects

S No:	Name of Project	Principal Investigator	Location of Project	Co-Investigators/ Project Associates
1	Studies on Resource and Energy Conservation in Trawl Systems	Dr. M. P. Remesan	Cochin Visakhapatnam	Dr. Madhu V. R. Dr. M. V. Baiju Dr. Raghu Prakash Dr. K. K. Prajith Dr. Chinnadurai S. Dr. Renjith R. K. Shri Paras Nath Jha Shri Shravan Sharma
2	Technological interventions for improvement of the fishing system in selected inland water bodies of India	Dr. Sandhya K. M.	Cochin Veraval Visakhapatnam	Dr. M. P. Remesan Dr. M. V. Baiju Dr. Sreedhar U. Dr. Sullip Kumar Majhi Dr. Prajith K. K. Dr. Renjith R. K. Shri Shravan Kumar Sharma Shri Kamei G.
3	Improved technologies for protection of materials in marine environment.	Dr. P. Muhamed Ashraf	Cochin	Dr. Leela Edwin Dr. Saly N. Thomas Dr. Chinnadurai S. Dr. Manju Lekshmi N. Dr. Sandhya K. M. Dr. Murugadas
4	Studies on fish behaviour as an input for developing responsible fishing systems	Dr. Madhu V. R.	Cochin Veraval	Dr. Renjith R. K. Shri Paras Nath Jha Dr. Chinnadurai S. Dr. Tejpal C. S. Dr. Prajith K. K.
5	Development of nanosensors for precision aquaculture and technologies to protect fishing materials	Dr. P. Muhamed Ashraf	Cochin Visakhapatnam	Dr. Leela Edwin Dr. Sullip Kumar Majhi Dr. Sandhya K. M. Dr. Manju Lekshmi N. Dr. Chinnadurai S.
6	Investigation on environmental burdens associated with selected small-scale fishing systems, value-added fishery product/ aquaculture system of India using LCA approach	Shri Paras Nath Jha	Cochin Mumbai	Dr. Leela Edwin Dr. M. V. Baiju Dr. Sandhya K. M. Dr. Manju Lekshmi N. Dr. Renjith R. K. Shri Satish Kumar K. Shri Shravan Kumar Sharma

7	Studies on fishing operations and energy use for formulation of guidelines for selected small-scale marine fisheries of India	Dr. Leela Edwin	Cochin	Dr. M. V. Baiju Dr. Manju Lekshmi N. Dr. R. K. Renjith Dr. K. K. Prajith Dr. Sandhya K. M. Shri Paras Nath Jha
8	Valorisation of marine and agro waste for development of green packaging materials	Dr. Bindu J.	Cochin Veraval Mumbai Visakhapatnam	Dr. Remya S. Shri Satish Kumar Smt. Sreelakshmi K. R. Dr. Toms C. Joseph Dr. Renuka V. Dr. Priya E. R. Dr. Sarika K. Shri Sreejith S. Dr. Jesmi Debbarma
9	SMART PACK: Development and characterization of smart packaging films for enhancing quality and shelf life of fishery products	Dr. C. O. Mohan	Cochin	Dr. Satyen Kumar Panda Dr. Joshy C. G. Dr. Visnuvinayagam S. Dr. Elavarasan K. Dr. S. Remya Smt. Sreelekshmi K. R. Dr. Pankaj Kishore Dr. Anuj Kumar Dr. Ranjit Kumar Nadella
10	Development and validation of biomedical and cosmetic products from secondary fishery raw materials	Dr. Binsi P. K.	Cochin Veraval Mumbai Visakhapatnam	Dr. Zynudheen A. A. Dr. Muhammed Ashraf P. Dr. Anandan R. Dr. Femeena Hassan Dr. Viji P. Dr. Renuka K. Dr. Jeyakumari A. Dr. Parvathy U. Dr. Anupama T. K. Shri Ezhil Nilavan Dr. Sarika K. Dr. Rehana Raj Dr. Laly S. J.
11	Development of Soft Computing Systems in Fisheries Technology for Technology Dissemination and Policy Formulation.	Dr. Joshy C. G.	Cochin	Dr. George Ninan Dr. Zynudheen A. A. Dr. Satyen Kumar Panda Dr. Elavarasan K. Dr. Suresh A. Mr. Premdev
12	Process development and scaling up of production of different	Dr. Elavarasan K.	Cochin Mumbai	Dr. J. Bindu Dr. C. O. Mohan Dr. C. G. Joshy



	molecular weight chitosan with different degree of de-acetylation and evaluation of their applications			Dr. Jeyakumari A. Dr. V. Renuka Dr. Tejpal C. S.
13	Technological interventions in value addition and advanced processing techniques for fish and shell fish	Dr. Remya S.	Cochin Veraval Mumbai Visakhapatnam	Dr. T. V. Sankar Dr. George Ninan Dr. Toms C. Joseph Dr. Bindu J. Dr. Satyen Kumar Panda Dr. C. O. Mohan Dr. C. G. Joshy Dr. Viji P. Dr. Jesmi Debbarma Dr. Parvathy U. Dr. Pankaj Kishore Shri Sreejith S. Shri K. Sathish Kumar Mrs. Sreelakshmi K. R. Dr. Sarika K. Dr. Neethu K. C. Dr. Rehana Raj Shri Ezhil Nilavan S. Smt. Sreepriya Prakashan
14	Interventions in processing and preservation of commercial and unconventional fishery resources	Dr. George Ninan	Cochin Veraval Mumbai Visakhapatnam	Dr. Zynudheen A. A. Dr. Bindu J. Dr. Mohan C. O. Dr. Joshy C. G. Dr. Binsi P. K. Smt. Sreelakshmi K. R. Smt. K. Sarika Dr. Parvathy U. Dr. Rehana Raj Dr. Laly S. J. Smt. Greeshma S. S. Dr. Jeyakumari A. Dr. Abhay Kumar Dr. Viji P. Dr. Toms C. Joseph
15	Enhancing Utilization of rest raw materials of aquatic origin for feed, Agricultural and Industrial product development	Dr. Zynudheen A. A.	Cochin Veraval Mumbai Visakhapatnam	Dr. Femeena Hassan Dr. Binsi P. K. Dr. Jeyakumari A. Dr. Parvathy U. Dr. Renuka V. Dr. Devananda Uchoi Dr. Joshy C. G. Dr. K. Sathish Kumar

				Dr. Visnu Vinayagam Dr. Pankaj Kishore Dr. Madhu V. R. Dr. Sangeetha (<i>Assistant Professor, KVK Kottayam</i>) Dr. Sekhar M. (<i>Scientist, CMFRI, Vizag Centre</i>) Dr. V. Sreenivasan (<i>IISR, Calicut</i>) Dr. T. V. Sankar
16	Ensuring safety of fish and fishery products: Framework for validating regulatory specifications	Dr. Satyen Kumar Panda	Cochin Veraval Mumbai	Dr. Zynudheen A. A. Dr. Femeena Hassan Dr. Laly S. J. Dr. C. O. Mohan Dr. Pankaj Kishore Dr. Devananda Uchoi Dr. Ranjit Kumar Nadella Smt. Priya E. R. Dr. Niladri Sekhar Chatterjee Dr. Bindu J. Dr. Remya S. Dr. Suresh A. Dr. Joshy C. G. Dr. Suresh A. Dr. V. Murugadas Dr. Tejpal C. S.
17	Development of rapid testing platforms for quality assessment of seafood	Dr. Laly S. J.	Cochin	Dr. S. K. Panda Dr. Femeena Hassan Smt. Priya E. R.
18	Biotechnological approaches for utilization of aquatic microbial resources and their products	Dr. Toms C. Joseph	Cochin Mumbai Visakhapatnam	Dr. B. Madhusudana Rao Dr G. K. Sivaraman Dr. Murugadas V. Dr. Visnuvinayagam S. Shri. Radhakrishnan Nair V. Shri. Ezhil Nilavan S. Smt. Greeshma S. S. Smt. T. Muthulakshmi Dr. Minimol V. A. Dr. K. Ahamed Basha Dr. Remya S. Dr. Elavarasan K. Dr. Divu D. Dr. Suresh Kumar Mojjada Dr. Anupama T. K.
19	Virulence and antibiotic resistance	Dr. S. Visnuvinayagam	Cochin	Dr. Toms C. Joseph Dr. G. K. Sivaraman



	profiling of seafood-borne pathogens and development of control measures			Shri Radhakrishnan Nair V. Dr. Murugadas V. Dr. Kusunur A. Basha Dr. Greesma. S. S. Smt. T. Muthulakshmi Shri Ezhil Nilavan S. Dr. Abhay Kumar Dr. Minimol V. A. Dr. Anupama T. K.
20	A Green Technology Approach on Isolation, Purification and Product Development from marine biomolecules	Dr. R. Anandan	Cochin	Dr. Suseela Mathew Dr. Asha K. K. Dr. Renuka V. Dr. Niladri Sekhar Chatterjee Dr. Tejpal C. S.
21	Evaluation of anti- nutritional factors (ANFs)/ secondary metabolites in fish feed and feed ingredients	Dr. Tejpal C. S.	Cochin	Dr. Lekshmi R. G. Kumar Dr. Sanal Ebnezer Dr. Anas K.K.
22	Valorization of seaweed resources for functional food, nutraceutical, cosmeceutical, biomedical, and bioremediation applications	Dr. Niladri Sekhar Chatterjee	Cochin	Dr. Suseela Mathew Dr. Asha K. K. Dr. R. Anandan
23	Novel Bio-Molecules for Food and Nutraceutical Applications from Marine Resources	Dr. Asha K. K.	Cochin	Dr. Suseela Mathew Dr. R. Anandan Dr. Tejpal C. S. Dr. Lekshmi R. G. Kumar Shri Anas K. K. Dr. Renuka V.
24	Engineering interventions in post-harvest sector	Dr. George Ninan	Cochin	Dr. Murali S. Dr. Neethu K. C. Dr. Aniesrani Delfiya D. S. Dr. Lekshmi R. G. Kumar
25	A study on the entrepreneurship ecosystem in fisheries and the cybernetics of Women Initiated Enterprises in Fisheries (WIEF) in selected coastal states of India	Dr. Ashaletha S.	Cochin Veraval Mumbai Visakhapatnam	Dr. A. K. Mohanty Dr. Suresh A. Dr. Sajesh V. K. Dr. Rejula K. Dr. Viji P. Dr. Anupama T. K. Smt. Greeshma

26	An Assessment of Extension System in Marine Fisheries Sector of Kerala	Dr. Sajesh V. K.	Cochin	Dr. Amulya Kumar Mohanty Dr. Ashaletha S. Dr. A. Suresh Dr. Pe. Jeyya Jeyanthi Dr. Rejula K. Dr. Renjith R. K. Smt. Sreelakshmi K. R.
27	Impact assessment of ICAR-CIFT Technologies	Dr. V. Chandrasekar	Cochin	Dr. Nikita Gopal Dr. A. Suresh Dr. V. Geethalakshmi Dr. Pe. Jeyya Jeyanthi Dr. Rejula K. Dr. A. K. Mohanty
28	Assessment of post-harvest losses in the fish value chain	Dr. Pe. Jeyya Jeyanthi	Cochin Visakhapatnam	Dr. A. K. Mohanty Dr. Nikita Gopal Dr. V. Geethalakshmi Dr. Ashaletha S. Dr. Viji P. Dr. V. Chandrasekar Dr. Sajesh V. Dr. Rejula K.
29	A study of digital fish marketing ecosystem in India	Dr. Sajeev M. V.	Cochin Visakhapatnam	Dr. A. K. Mohanty Dr. C. G. Joshy Dr. Abhay Kumar Dr. Jesmi Debbarma
30	Assessing input and service delivery system for marine fisheries in Kerala	Dr. A. Suresh	All India	Dr. A. K. Mohanty Dr. Nikita Gopal Dr. V. Geethalakshmi Dr. S. Ashaletha Dr. Sajeev M. V. Dr. V. Chandrasekar Dr. Sajesh V. K. Dr. Rejula K.
31	Evolving SMART EDP Module for livelihood security of small-scale fisher folk through fish-preneurship	Dr. A. K. Mohanty	Cochin	Dr. Ashaletha S. Dr. Sajeev M. V. Dr. Pe. Jeyya Jeyanthi Dr. Sajesh V. K. Dr. Rejula K.
32	Occupational structure, labour productivity and labour migration in the fisheries sector	Dr. Nikita Gopal	Cochin	Dr. V. Geethalakshmi Dr. A. Suresh Dr. Sajeev M. V. Dr. Pe. Jeyya Jeyanthi Dr. V. Chandrasekar



33	Development of Smart Trawls Systems for the North East maritime states of India.	Dr. U. Sreedhar	Visakhapatnam	Dr. R. Raghu Prakash Shri G. Kamei Dr. Sulip Kumar Mahji
34	Augmenting value and safety of wild and farmed fish of the East Coast through technological approaches	Dr. B. Madhusudana Rao	Visakhapatnam	Dr. P. Viji Dr. Jesmi Debbarma Dr. K. Ahamed Basha Dr. U. Parvathy
35	Fishing technological interventions for sustainable marine ecosystem service along the east coast of India	Dr. R. Raghu Prakash	Cochin Visakhapatnam	Dr. U. Sreedhar Dr. Jesmi Debbarma Dr. M. V. Baiju Shri G. Kamei Dr. Jeyanthi P. Dr. Rajendra Nayak Dr. Madhu V. R.
36	Safety and quality aspects of fish and fishery product from Gujarat coast	Dr. Ashish Kumar Jha	Veraval	Dr. Anupama T. K. Shri Sreejith S. Dr. Sarika K.
37	Harvest and post-harvest interventions in marine resources available along Saurashtra coast	Dr. Ashish Kumar Jha	Veraval	Shri Sreejith S. Dr. Sarika K. Dr. Chinnadurai S. Dr. Anupama T. K.
38	Assessment of fish harvest and post-harvest technological aspects and mitigation measures for problems with special reference to Maharashtra	Dr. Asha K. K.	Mumbai Cochin	Dr. Abhay Kumar Smt. Greeshma S. S. Dr. Rehana Raj Shri Shravan Kumar Sharma Dr. Nikita Gopal
39	Biotechnological approaches for utilization of aquatic microbial resources and their products	Dr. Toms C. Joseph	Mumbai	Dr. Abhay Kumar Smt. Greeshma S. S.

EXTERNALLY FUNDED PROJECTS

International Projects

Sl. No	Name of Project	Principal Investigator	Location of Project	Co-Investigators/ Project Associates
1	Establishing Value Chain for Coastal and Small Indigenous Freshwater Fish Species: Towards Nutritional Security for Rural Population	Dr. Suseela Mathew	Cochin	Dr. A. K. Mohanty Dr. R. Anandan Dr. George Ninan Dr. Murali S. Dr. S. K. Panda Dr. K. K. Asha Dr. M. V. Sajeev Dr. C. O. Mohan Dr. V. Murugadas Dr. C. G. Joshy Dr. N. S. Chatterjee Dr. K. Elavarasan Dr. Tejpal C. S. Mr. Akshay P.* Mrs. Gopika R.*
2	DOSA - Diagnostics for One Health and User-Driven Solutions for AMR	Dr. G. K. Sivaraman	Cochin	Dr. Vineeth Rajan* Ms. Ardhra Vijayan*
3	Does antimicrobial resistance (AMR) in livestock contribute to AMR in people in NE India? An interdisciplinary study investigating antibiotic use, drivers of AMR, and transmission dynamics	Dr. G. K. Sivaraman	Cochin	Dr. Sudha S.* Mr. Muneeb Hamza *
4	Future Refrigeration India: INDEE+	Dr. George Ninan	Cochin	Dr. Manoj P. Samuel Dr. Murali S. Dr. Baiju M. V. Dr. Jeyakumari A. Dr. Arun B. S.*
5	Food, gender, enterprise: Leveraging interdisciplinary for sustainable small-scale fisheries.	Dr. Nikita Gopal		Dr. Madhu V. R. Dr. Sandhya K. M. Dr. Rejula K. Dr. Bethan O'Leary, (University of Exter, UK) Dr. Deepayan Bhowmik, (Newcastle University, UK) Mr. Richard James (MacCowan, Biomimicry Innovation Lab)



National Projects

Indian Council of Agricultural Research				
6	Agribusiness Incubation (ABI-NAIF)	Dr. George Ninan		
7	Global Warming Potential (GWP) of mechanized fishing methods of India and mitigation strategies: Analysis using Life Cycle Assessment (LCA)- Data Envelopment Analysis (DEA) approach	Dr. Leela Edwin	All India	Dr. Raghu Prakash Dr. Madhu V. R. Dr. M. V. Baiju Mr. V. Chandrasekar Mr. Paras Nath Jha Smt. Yasmi V. S.* Shri Sreejith S.* Shri Rithin Joseph*
8	Biomodulation of marine biopolymers for the preparation of biomaterials of healthcare importance	Dr. R. Anandan	Cochin	Dr. Pavan Kumar Dara* Smt. Rosemol Jacob M.*
9	All India Network Project on Fish Health	Dr. Satyen Kumar Panda	Cochin	Dr. Niladri Sekhar Chatterjee Dr. Ranjit Koumar Nadella Dr. Rajisha R.* Mrs. Nanitha Krishna E. K.*
10	Network project on Production system, Agribusiness and Institutions	Dr. Suresh A.	Andhra Pradesh Gujarat Kerala Maharashtra Tamil Nadu	Dr. V. Geethalekshmi Dr. S. Ashaletha Dr. V. Chandrasekar Dr. Elavarasan K. Dr. Sreepriya Prakasan Dr. S. Murali Shri S. Sreejith Dr. Viji P. Dr. Rehana Raj
Department of Science and Technology (DST)				
11	Green clean and affordable energy for fishermen community: Development of a multipurpose solar thermal conversion system with gasifier/ biomass heater back up	Dr. Murali S.	Cochin	Dr. Manoj P. Samuel Dr. Aniesrani Delfiya D. S. Smt. Alfiya P. V. Dr. Sajesh V. K. Mr. Amal P. A.*

12	Development of a foldable smart live fish transportation system for distant trade of table fish	Dr. Parvathy U.	Cochin	Dr. Binsi P. K. Shri Sathish Kumar K. Dr. Murali S. Shri Vishnu R. Nair* Shri Jithin T. J.*
Food Safety and Standards Authority of India (FSSAI)				
13	FSSAI-National Reference Laboratory	Dr. Satyen Kumar Panda	Cochin	Dr. Pankaj Kishore Dr. Devananda Uchoi Dr. V. Murugadas Dr. C. O. Mohan Ms. Priya E. R. Dr. Ranjit Kumar Nadella Ms. Pranamya C. Haridas* Ms. Megha Sivadas*
14	NETSCoFAN-Food Testing Group (FTG)	Dr. Satyen Kumar Panda	Cochin	Dr. Niladri Sekhar Chatterjee Dr. Pankaj Kishore Dr. Devananda Uchoi Dr. V. Murugadas Dr. C. O. Mohan Smt. Priya E. R. Dr. Ranjit Kumar Nadella Ms. Asha Mary Joseph* Shri Shamil Rafeeq*
Ministry of Food Processing (MoFPI)				
15	Development of Portable Fish Freshness Assessment Sensor	Dr. George Ninan	ICAR-CIFT, Cochin	Dr. Murali S. Dr. Anierani Delfiya D. S. Smt. Alfiya P. V. Dr. Murugadas V. Dr. Binsi P. K. Dr. Manoj P. Samuel Ms. Reshma Ramadas*
16	Design and development of hot air-assisted continuous infrared drying system for high-value fish and fishery products	Dr. Aniesrani Delfiya D. S.	Cochin	Dr. Manoj P. Samuel Dr. Murali S. Smt. Alfiya P. V. Mr. Prashob K.*
Ministry of Food Processing (MoFPI)				
17	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. Dr. Pankaj Kishore Dr. Bindu J.



18	The pilot scale demonstration of seaweed-based feed production for fish and shrimp.	Dr. Ashish Kumar Jha	Veraval	Shri Sreejith S.
Govt. of Kerala				
19	Replacement of Kerosene OBM with experimental inboard/ Outboard diesel propulsion in small-scale fishing boats of Kerala"	Dr. M.V. Baiju	Cochin	Mr. Paras Nath Jha
20	Marine Fishery in Kerala- A study on evolution of policy, cost and earnings of fishing units and income of fisher households	Dr. Suresh A.	Cochin	Dr. Leela Edwin Dr. Nikita Gopal Dr. Madhu V. R. Dr. Sajeew M. V. Dr. Sajesh V. K.
Pradhan Mantri Matsya Sampada Yojana (PMMSY)				
21	Marine Mammal Stock Assessments in India	Dr. Leela Edwin	All India	Dr. Prajith K. K. Mr. Paras Nath Jha Shri Rithin Joseph* Shri Hrishikesh P.* Shri Zainul Abid P. M.*
22	National Surveillance Programme for Aquatic Animal Diseases (NASPAAD)	Dr. Toms C. Joseph	Cochin	Dr. V. Murugadas Mr. S. Ezhil Nilavan Ms. Athira P. S.* Ms. Athira A. S.*
National Agricultural Science Fund (NASF)				
23	A detailed Foodomics study for food authentication and exploration of nutraceutical potential"	Dr. Niladri S. Chatterjee	Cochin	Dr. Pankaj Kishore
Indian National Centre for Ocean Information Services (INCOIS)				
24	Deployment and maintenance of Wave Rider Buoy off Veraval and development of jellyfish and sardine advisories along the west coast	Dr. Madhu V. R./ Dr. Chinnadurai S.	Veraval	

Marine Products Export Development Authority (MPEDA)				
25	Fine tuning of CIFT-TED for adoption in the trawl fisheries for the certification of marine shrimp harvested from India	Dr. M. P. Remesan	Cochin Vishakhapatnam	Dr. Madhu V. R. Mr. Paras Nath Jha Shri Subinlal A. V.*
Science and Engineering Research Board (SERB)				
26	Developing of biorefinery work flow for high value nutraceuticals from seaweed by Green Chemistry approach	Dr. Lekshmi R. G. Kumar	Cochin	Dr. Suseela Mathew Dr. Chatterjee N. S. Ms. Vidya Mohanan* Ms. Abhirami N.*
Board of Research in Nuclear Sciences (BRNS)				
27	Matrix specific phage formulations for the bio-control of enterotoxigenic Methicillin sensitive and resistant Staphylococcus aureus of safety concern	Dr. Murugadas V.	Cochin	Dr. B. Madhusudana Rao Dr. S. Visnuvinayagam Dr. Karthika R.*
International Rice Research Institute (IRRI)				
28	Transforming Agri-food Systems in South Asia (TAFSSA)"	Dr. Suresh A.	Kerala	Dr. A. K. Mohanty Dr. Pe Jeyya Jeyanthi Dr. Rejula. K.
Coconut Development Board (CDB)				
29	Improved coconut wood canoes for the small-scale fishing sector of the southeast coast of India	Dr. Leela Edwin	South-East coast	Dr. P. Muhamed Ashraf Dr. M. V. Baiju Dr. Manju Lekshmi N. Smt. Leonna A. M.* Kum. Jesna S.* Smt. Neeraj Kumar*
Department of Biotechnology (DBT)				
30	Screening lytic phages from diverse marine and aquatic niche for controlling bacterial pathogens associated with aquaculture and post-harvest fish quality	Dr. B. Madhusudana Rao	Visakhapatnam	Dr. M. M. Prasad Dr. V. Murugadas Dr. G. K. Sivaraman Dr. S. Vishnuvinayagam Smt. R. Karthika* Smt. B. Manikantha*



LIST OF PERSONNEL IN ICAR-CIFT

Managerial Personnel

Director: **Dr. George Ninan**

HEADS OF DIVISION

Fishing Technology Division (I/c)	: Dr. Leela Edwin , Principal Scientist
Extension Information & Statistics Division (I/c)	: Dr. A. K. Mohanty , Principal Scientist
Biochemistry and Nutrition Division (I/c)	: Dr. Suseela Mathew , Principal Scientist
Quality Assurance and Management (I/c)	: Dr. A. A. Zynudheen , Principal Scientist
Fish Processing Division (I/c)	: Dr. J. Bindu , Principal Scientist
Microbiology, Fermentation & Biotechnology (I/c)	: Dr. Toms C. Joseph , Principal Scientist
Engineering Division (I/c)	: Dr. George Ninan , Principal Scientist
Officer In-charge, PME Cell	: Dr. T. V. Sankar , 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 Officer	: Shri P. P. Anilkumar

HEADQUARTERS, COCHIN SCIENTIFIC PERSONNEL

Principal Scientist

1. Dr. M. P. Remesan
2. Dr. Nikita Gopal
3. Dr. V. Geethalakshmi
4. Dr. A. A. Zynudheen
5. Dr. Manoj P. Samuel (*Deputation*)
6. Dr. R. Anandan
7. Dr. J. Bindu
8. Dr. P. Muhamed Ashraf
9. Dr. Ashaletha S.
10. Dr. Femeena Hassan
11. Dr. Toms C. Joseph
12. Dr. Suresh A.
13. Dr. G. K. Sivaraman
14. Dr. V. R. Madhu
15. Dr. Satyen Kumar Panda (*Deputation*)

Senior Scientist

1. Dr. M. V. Baiju
2. Dr. Sajeev M. V.
3. Dr. C. O. Mohan
4. Dr. Pe. Jeyya Jeyanthi
5. Dr. Binsi P. K.
6. Dr. V. Chandrasekhar
7. Dr. C. G. Joshy
8. Dr. V. Murugadas
9. Dr. Visnuvinayagam S.
10. Dr. Sajesh V. K.
11. Dr. A. Jeyakumari
12. Dr. Prajith K. K.
13. Dr. Niladri Sekhar Chatterjee
14. Dr. Sandhya K. M.
15. Dr. Remya S.
16. Dr. Laly S. J.
17. Dr. V. Renuka

Scientist

1. Shri V. Radhakrishnan Nair
2. Dr. N. Rajendra Naik (*Deputation*)
3. Dr. Manju Lekshmi N.
4. Dr. Parvathy U
5. Dr. Pankaj Kishore
6. Dr. Anupama T. K.
7. Dr. Ranjith Kumar Nadella
8. Dr. Tejpal C. S.
9. Dr. Elavarasan Krishnamoorthy
10. Dr. Rejula T.
11. Shri Paras Nath Jha
12. Smt. Muthulakshmi T.

13. Dr. Renjith R. K.
14. Smt. Sreelakshmi K. R.
15. Smt. Priya E. R.
16. Dr. Lekshmi R. G. Kumar
17. Dr. Devananda Uchoi
18. Shri Sathish Kumar K.
19. Dr. Minimol V. A.
20. Shri Anas K. K.
21. Shri Ezhil Nilavan S.
22. Dr. Murali S.
23. Dr. Aniesrani Delfiya D. S.
24. Dr. Neethu K. C.
25. Smt. Sreepriya Prakash

TECHNICAL PERSONNEL

Chief Technical Officer

1. Dr. B. Ganesan
2. Smt. P. K. Shyma
3. Dr. M. Baiju

Assistant Chief Technical Officer

1. Smt. T. Silaja
2. Dr. T. V. Bhaskaran
3. Smt M. Rekha
4. Dr. Santhosh Alex
5. Smt. K. K. Kala
6. Shri Sibasis Guha
7. Shri P. S. Babu
8. Dr. P. Shankar
9. Dr. Ancy Sebastian

Technical Officer

1. Shri V. N. Dileepkumar
2. Shri C. Subash Chandran Nair
3. Shri P. S. Nobi
4. Smt. P. K. Geetha
5. Shri Sajith K. Jose
6. Shri P. V. Sajeevan
7. Smt. P. A. Jaya
8. Shri V. K. Siddique
9. Shri G. Gopakumar
10. Smt. N. Lekha

11. Shri K. S. Babu
12. Smt. Bindu Joseph
13. Shri T. P. Saju
14. Smt. N. C. Shyla
15. Shri P. D. Padmaraj
16. Shri P. S. Sunil Kumar
17. Shri N. Sunil

Senior Technical Assistant

1. Shri C. K. Suresh
2. Shri Aneesh P. A.
3. Shri Noby Varghese K. A.
4. Shri Vipin Kumar V
5. Smt. Vineetha Das
6. Shri T. Jijoy
7. Smt. Susmitha V.
8. Smt. Sruthi P.
9. Shri Rahul Ravindran
10. Smt. Prinetha U. P.
11. Shri Rakesh M. Raghavan
12. Dr. Dhiju Das P. H.

Technical Assistant

1. Shri K. C. Anish Kumar
2. Shri Vinod G.
3. Shri Ajith V. Chellappan
4. Smt. Anu Mary Jose



5. Smt. Archana G.
6. Smt. P. J. Mary
7. Shri P. Suresh
8. Smt Reshmi K.

9. Shri Sreejith V. N.

Senior Technician

1. Shri Ajeesh K.
2. Shri M. T. Udayakumar

ADMINISTRATIVE PERSONNEL

Administrative Officer

1. Shri R. N. Subramanian
2. Smt. Ponnamma Radhakrishnan

Assistant Administrative Officer

1. Shri M. N. Vinodh Kumar
2. Smt. V. K. Raji
3. Smt. K. Renuka
4. Smt. Surya G.

Finance and Accounts Officer

1. Smt. Sreedevi M. R.

Private secretary

1. Shri R. D. Goswami
2. Smt. Anitha K. John

Assistant

1. Smt. Akhila N. R.
2. Smt. A. R. Raji
3. Shri P. Mani
4. Smt. Jaya Das
5. Smt E. Jyothilekshmy
6. Smt. P. R. Mini
7. Shri Santhosh Mohan

8. Smt. Shiji John

9. Shri Syam Prasad T. R.

10. Shri P. G. David

Upper Division Clerk

1. Smt. K. V. Suseela
2. Shri T. D. Bijoy
3. Smt. Sobha K. S.
4. Smt. Subin George
5. Smt. Suni Surendran
6. Shri Deu Umesh Aroskar
7. Shri Rajeev P.
8. Shri Gouri Sankar Sahoo

Lower Division Clerk

1. Shri Rizwan P. M.
2. Miss. Archana N.
3. Shri Subeesh S. S.
4. Shri K. S. Ajith
5. Shri K. Thinakaran
6. Shri P. N. Nikhil Das

SUPPORTING PERSONNEL

1. Shri K. K. Karthikeyan
2. Smt. P. T. Mary Vinitha
3. Shri O. P. Radhakrishnan
4. Shri Sachida Nanda Dash
5. Shri P. Raghavan

6. Shri T. M. Balan
7. Shri V. Deepak Vin
8. Shri K. R. Rajasaravanan
9. Shri A. Vinod
10. Smt. M. G. Soudamini

VISAKHAPATNAM RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

1. Dr. R. Raghu Prakash
2. Dr. B. Madhusudana Rao
3. Dr. Sullip Kumar Majhi

Senior Scientist

1. Dr. P. Viji
2. Dr. Jesmi Debbarma

Scientist

1. Shri Gaihiangnam Kamei
2. Shri Kusunur Ahamed Basha

TECHNICAL PERSONNEL

Senior Technical Officer

1. Shri Bhuneshwar

Technical Officer

1. Shri Himansu Sekhar Bag
2. Smt. Tessa Francis

Senior Technical Assistant

1. Shri Medidi Prasanna Kumar

Senior Technical

1. Shri G. Bhushanam

ADMINISTRATIVE PERSONNEL

Assistant Administrative Officer

1. Shri Das K.

Upper Division Clerk

1. Shri Amit Vengraj(*Deputation*)
2. Shri Ramesh Mirdha

Lower Division Clerk

1. Shri M. Sreevishnu Prabhakara Rao
2. Smt. Nalla Naveena

SUPPORTING PERSONNEL

Assistant Administrative Officer

1. Shri Triloknath Banchor
2. Shri Sanyasi Ganik
3. Smt. Gyananetri Nag

4. Shri Sushil Kumar Mehar
5. Shri Kedar Meher
6. Shri Lalit Oram

VERAVAL RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Scientist

1. Shri Sreejith S.
2. Dr. Sarika K.
3. Dr. Chinnadurai S.



TECHNICAL PERSONNEL

Technical Officer

1. Shri Sida Hanif Ummer Bhai

Senior Technical Officer

1. Shri G. Kingsley
2. Smt. Nimmy S. Kumar

Senior Technician

1. Shri Jitendra Bachubhai Malamadi

Technical Assistant

1. Shri Yogesh D. Kriplani

ADMINISTRATIVE PERSONNEL

Assistant Administrative Officer

1. Shri Avinash N. Agawane

Assistant

1. Shri M. Arockya Shaji

Lower Division Clerk

1. Smt. Joshna S.
2. Shri Anish T. V.

SUPPORTING PERSONNEL

1. Shri Ashwinkumar Mohanlal Vala
2. Shri Makwana Krasan Kana
3. Shri Narsinh K. Masani
4. Shri P.Ramakrishna
5. Shri Rohtash

Auxiliary Staff

1. Smt. Veena Shreedhar Narkar

MUMBAI RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

1. Dr. L Narasimhamurthy (*Deputation*)

Scientist

1. Smt. Greeshma S. S.

2. Dr. Abhay Kumar

3. Dr. Rehana Raj

4. Shri Shravan Kumar Sharma

TECHNICAL PERSONNEL

Chief Technical Officer

1. Smt Sangeetha D Gaikwad
2. Smt Thriveni Gopal Adiga

Senior Technical Assistant

1. Smt. Priyanka Ajay Nakhawa

Technical Assistant

1. Shri Thulsiram A. Waghmare
2. Miss Megha G.

ADMINISTRATIVE PERSONNEL

Lower Division Clerk

1. Smt. Bhavyamol C. G.

SUPPORTING PERSONNEL

1. Smt. Priyanka P. Bait



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