



भारत अनुप
ICAR

C I F T

Newsletter



From the Director's Desk

As we look back, the last quarter of the year 2014 (October-December) seems to be a fruitful one as far as ICAR-CIFT family is concerned.

We could make noteworthy contributions on research front as well as in technology dissemination sector. Our young scientists proved their talent by bagging Dr. K. Ravindran Endowment Award, Young Marine Biologist Award, AFSIB Young Scientist Award and two best poster awards during the period. Another matter of delight is that from ICAR-CIFT, a large team actively took part in the 10th Indian Fisheries and Aquaculture Forum held at Lucknow and made more than 20 paper presentations on different research topics. Furthermore, it was decided that ICAR-CIFT would be holding the prestigious event of 11th Indian Fisheries and Aquaculture Forum. Likewise, ICAR-CIFT could make its proud presence in the International symposium on Marine ecosystems-Challenges and opportunities (MECOS II) held in Cochin by way of more than 10 research paper presentations and could put ICAR-CIFT's innovative technologies on show.

The Institute could chip in in the India's biggest ever cleanliness drive, Swachh Bharat Mission, the national level campaign initiated by the Government of India, in a great way. All the staff members in Head Quarters, Regional Centres as well as in Residential Complex at Cochin actively participated in cleaning campus and office premises to make this highly appreciable initiative a successful one.

Towards the capacity building role, the Institute could productively conduct six training programmes, a SAARC sponsored International Training Course and an ICAR sponsored Winter School during this quarter, besides 11 out-station training programmes and nine exhibitions. For benefiting the stakeholders in a wider span, technology transfer programmes were organized in North-Eastern states of Assam and Arunachal Pradesh and among the tribal communities of Andhra Pradesh and West Bengal. Under Technology Transfer efforts of the Institute, consultancy agreements were signed with four different firms. The Tropical Cyclone - Hudhud, which devastated India's south-eastern coast, has caused big loss to the fishers of Andhra Pradesh coast. Our team from Visakhapatnam Centre of ICAR-CIFT has visited the affected areas and ICAR-CIFT has decided to initiate mitigation measures and actions for improving the adaptability of fishing communities to face any future natural calamities in fishing villages.

(Ravishankar, C.N.)
Director



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Winter School at ICAR-CIFT, Cochin

The ICAR sponsored Winter School on "Recent advances in the development of nutraceuticals, health foods and fish feed from fish and shellfish processing discards" was conducted at ICAR-CIFT, Cochin from 10 November to 1 December, 2014. Dr. A.A. Zynudheen, Senior Scientist was the Course Director. The Winter School was officially inaugurated by Prof. (Dr.) Mohan Joseph Modayil, Former Chairman, ASRB and Former Director, CMFRI, Cochin on 10 November, 2014. Dr. T.V. Sankar, Head, QAM Division welcomed the gathering while Dr. George Ninan, Senior Scientist and Course Coordinator gave a brief description about the programme and its importance. Dr. K.V. Lalitha, HOD, MFB and Director-in-Charge, ICAR-CIFT presided over the meeting. Dr. C.O. Mohan, Scientist and Coordinator of the Winter School proposed the vote of thanks. On the occasion, Course Manual and brochures were also distributed to the participants.



Dr. K. Gopakumar, former DDG (Fy.), ICAR, New Delhi conducting classes



Practical session in progress



Dr. Mohan Joseph Modayil inaugurating the Winter School

The 32 participants of the Winter School were from Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Jharkhand, Jammu & Kashmir, etc. Most of the participants were from the disciplines of fish processing technology and food and nutrition. The course duration was 21 days and the course content was covered in 36 lectures and 12 practical sessions.

The major topics were on fish processing, fishery waste management and quality control aspects. A session on the significance of trawl bycatch was also held. Detailed sessions on Bioactive compounds, Emerging technologies in fish processing, Fishery waste management - Problems and Prospects, etc. were also handled by the retired Scientists of the Institute. Theory classes were also held on HACCP concepts, Nutritional significance, Enzymes of commercial applications and Byproducts from crustacean processing waste. During the first week of the programme the major practical sessions were on Handling and processing of fish and shellfishes and providing opportunities to understand the different sophisticated analytical instruments like HPLC, LCMS-MS etc. Fish oil extraction and quality evaluation, preparation of chitin and chitosan from shrimp shell waste, etc. were also demonstrated to the participants. Lectures were also conducted on Medical applications of chitosan, Preparation of glucosamine hydrochloride and Production and significance of fish meal, by experts from outside the Institute. Other important sessions focusing on Collagen-chitosan membrane for biomedical applications, Byproducts from shark, Biotechnological approaches for recovering biomolecules from fish processing waste, Emerging pathogens and quality issues in fishery byproducts, Nutritional and biomedical significance of marine macromolecules in human health care, Health and functional foods from fish, Commercial production of squalene, Drugs from the sea etc. were also conducted. Sessions on Statistical methods for process optimization, Silage and its applications, Export potential of fishery byproducts, Novel techniques in packaging of fishery byproducts, Protein and



Participants and faculty of the Winter School

carotenoid pigments from prawn shell, Chemical hazards in seafoods, Fermented and smoked fish products and Commercially important seaweeds of Indian coast were also covered during the Winter School.

Practical sessions under laboratory conditions and in pilot scale levels were conducted on Preparation of fish protein hydrolysate, Extraction of gelatin, Preparation of fish silage, fish meal, squalene and its quality evaluation, Fatty acid profiling of fish oil, Utilization of frame meat from fish processing, Preparation of feed and Quality evaluation of chitosan and glucosamine hydrochloride. The out-station

visit including industrial visits to pre-processing plant, chitosan plant, fish meal and oil plant helped the participants to know the recent trends in the utilization of fish and fishery wastes.

The valedictory function was held on 1st December and Dr. T.K. Srinivasa Gopal, Former Director, ICAR-CIFT was the Chief Guest. Certificates were distributed on the occasion by the Chief Guest. Programme evaluation and feedback from participants were collected for getting an opinion about the Winter School training and from the feedback it is concluded that the Winter School was a grand success.

International Training at ICAR-CIFT, Cochin

ICAR-CIFT, Cochin has conducted an International training course on "Fish Processing, Quality Control and HACCP" during 20-26 October, 2014. The training course was sponsored by SAARC Agriculture Centre (SAC), Dhaka, Bangladesh and 12 participants from different SAARC countries viz. Bangladesh, Bhutan, Sri Lanka, Maldives and India had attended the training.

Ms. Leena Nair, IAS, Chairman, MPEDA, Cochin formally inaugurated the training course on 20 October and Dr. C.N. Ravishankar, Director, ICAR-CIFT presided over the function. Dr. Md. Nure Alam Siddiky, Senior Programme Officer (Livestock), SAC, Dhaka, Bangladesh addressed the audience as the Chief Guest.

The training programme covered important and

emerging technologies in fisheries and issues of post harvest fisheries management. The course included different aspects of post harvest technologies such as advances in post harvest technology of fish and shellfish, pilot scale production of coated fishery products and chilled fish products, testing of packaging materials, pilot scale production of canned products, fish packaging technologies, hands-on training sessions on emerging technologies like High Pressure Processing and Pulse Light preservation. A visit to the pilot scale facilities for fish processing and value addition was also arranged. The participants were also trained on the preparation of silage and silage-based feed formulations.



Ms. Leena Nair, IAS inaugurating the programme



Practicals in progress



Participants and faculty of the programme

Under the quality control aspect, the training covered detailed sessions on Fish quality assurance, chemical, physical and biological hazards and panel discussions, Standard sanitary operation procedures (SSOP), HACCP, Hazard analysis and HACCP Plan form. A faculty from industry Shri Satyan, Manager, Mangala Seafoods, Aroor, also took classes during the industrial visit. The candidates

were appraised about the requirements for marine products exporting units.

The valedictory session of the training was conducted in advance on 25 October and certificates were distributed to the participants by Dr. C.N. Ravishankar, Director, ICAR-CIFT.

Training Programme on Responsible Fishing

Pulicat lake is the second largest brackish water lake in India located in the border of Andhra Pradesh and Tamil Nadu states on the Coromandal Coast of South India. About 12,370 fishermen depend on fishery of the lake. In Kolathimedu village, situated in the southern part of the lake, 166 fishermen belonging to Iruler caste (ST) are enrolled under 12 SHGs. Most of the tribal fishermen in this village use wooden catamarans to operate castnets and small meshed gillnets in the lake. Fisherwomen are also involved in hand picking of fish and crab fattening to supplement their income.

After conducting preliminary assessment, ICAR-CIFT conducted a two-day training programme on "Responsible Fishing Techniques" for the tribal fisherfolk in Pulicat lake on 8th and 9th October, 2014. Dr. S. Balasubramaniam, HOD, EIS Division presided over the inaugural function held on 8 October, 2014, in which Dr. Premanjali Rao, Director (Finance

& Administration), CReNIEO, Shri Sebastian, PTA President, National Matriculation School, Pulicat and Shri S. Meerasa, Project Coordinator, CReNIEO were present. About 50 trainees participated in the programme.

Dr. M.P. Remesan, Principal Scientist, ICAR-CIFT, Cochin made a presentation on the methods of Responsible fishing. Fabrication of castnet from readymade netting was demonstrated to the participants by Shri P.N. Sudhakaran, Technical Officer, ICAR-CIFT. Dr. S. Balasubramaniam, HOD, EIS Division, in his presentation in the local language dealt with the topics such as avoidance of over-fishing, environmental pollution of the lake, catching of juveniles and non-target species, sustainable fisheries and extension methodologies to be followed for wide scale adoption of improved practices. As a follow up it is proposed to distribute 300 kg of netting materials among the tribal fisherfolk in Pulicat.



Assessment of training requirement at Kolathimedu village



Fabrication of castnet in progress



Hudhud

A tropical cyclone of Bay of Bengal and its impact on fisheries sector

The Bay of Bengal is a zone fertile for the formation of intense storms. The "westward wind flow direction" in areas north of a cyclone in the Bay contributes to storm surges, an abrupt rise in the sea level, imitating conditions of a mini Tsunami and major water movements towards land. While the incidence of cyclones is the highest on the Odisha coast, it is Andhra Pradesh that has borne the brunt of tropical cyclones. As a matter of fact 26 out of 36 most fierce cyclones that harmed planet earth taking the death toll to a total of more than 2,684,483 lives are believed to be Bay of Bengal storms.

Hudhud and its impact

Tropical cyclone Hudhud, which slammed into India's south-eastern coast as a Category 4 storm on 12th October 2014, fits the trend. Bringing maximum sustained wind speeds of 217 Km (135 miles) per hour, the storm caused at least 50 deaths, forced hundreds of thousands of people to evacuate, and left a broad swath of destruction. Preliminary estimates suggest that the storm caused more than \$ 2 billion of property damage, which would make Hudhud the second most expensive tropical cyclone in India's history. In Visakhapatnam alone, the storm uprooted tens of thousands of electric poles, causing widespread blackouts. By 14 October, 2014, the storm had weakened to a low-pressure system, according to the India Meteorological Department. Heavy rainfall and wind warnings remained in effect for Bihar, West Bengal, Sikkim and Uttar Pradesh.

In Visakhapatnam and in adjoining areas, nearly 29,000 fisher families are living whose source of income is from marine sources. Harvested fish are sold by women fishers, youth and other family members. In the aftermath of Hudhud (as on 25.10.2014) the scenario is completely changed and situation bleak from Payakaraopeta (South side of Visakhapatnam) to Bheemunipatnam (North of Visakhapatnam) were a total of 64 fishing villages are located and impact of tropical cyclone is extremely dreadful.

The estimated loss is nearly ₹ 19.66 crores and 391 craft and gear are completely damaged whereas 190 were



Hudhud image at 10.40 am on 12th October 2014. Source: [http://geoimages.gsfc.nasa.gov/images/image_records/84000/84547\(hudhud_tmo_2014285\)](http://geoimages.gsfc.nasa.gov/images/image_records/84000/84547(hudhud_tmo_2014285)). Courtesy NASA

partially damaged. This kind of severe tropical cyclone was not seen for the last 100 years. The condition of fishers living in hamlets, within city limits of Visakhapatnam viz., Peddajalaripeta, Jalari Yendada, Vasavanipalem, Jabbar veedhi and Thota veedhi is abominable, in view of the damage to craft and gear that needs immediate repair, without which venturing into sea for catching fish is not possible.

Fishing harbor

The fishing harbor of Visakhapatnam is severely damaged due to the cyclone. The fishing harbor used to provide employment opportunity to thousands of peoples directly or indirectly. Every day nearly 650 mechanized and traditional crafts operate for catching fish from the sea. Due to severe winds of more than 200 km speed nearly 90% of boats were damaged. Actual value of damages to fisheries, both marine and inland sectors due to Hudhud tropical cyclone is provided in the Table. Data was obtained from Department of Fisheries, Government of Andhra Pradesh.

Damage to Hatcheries

The infrastructure damage to the 14 hatcheries located in Visakhapatnam District is ₹ 41.5 million. Though only eight hatcheries contained stock, the loss amounted to 114 million (stock) with a financial loss of ₹ 50 million. The total damage incurred by all the 14 hatcheries located in Visakhapatnam District is ₹ 91.5 million.

Visakhapatnam being highly vulnerable and prone to climate change-related natural disasters like tropical

Damages to the fisheries sector due to Hudhud tropical cyclone

Name of the village	No. of units damaged	Total damage ₹ lakhs
Marine sector		
Bheemili	320	
Visakhapatnam	1130	
Atchuthapuram	677	
Nakkapalli	80	
Total	2207	1878.92
Inland Sector		
Madugula	131	
Atchuthapuram	145	
Total	276	12.08
Hatcheries	14	915.00



cyclones and Tsunamis and flash floods, the fisherfolk, who are socially and economically weak segment of the society are the most vulnerable to such disasters and calamities. Most natural disasters cannot be prevented, but their impact could be minimised by taking up proper adaptive and mitigation strategies in risk-prone areas. In this context, public sector organisations like ICAR-CIFT, especially through their social scientists, can do a major role in building public-private partnerships to create adaptability in coastal communities. They can also play a major role to conduct short-term training programmes for the public, NGOs and volunteer organisations regarding the handling of emergency situations. Special awareness campaigns through electronic and print media and conducting participatory workshops would be useful to equip people to be prepared and avoid disasters due to becoming panic. An effective information system should be established for dissemination of warnings and directive messages for disaster risk reduction.

Remedial measures to overcome the Hudhud damage and to brace future exigencies due to natural calamities

The remedial measures suggested includes:

1. More intense storms are predicted in future in Bay of Bengal owing to an increase in sea surface temperature. Mitigation measures in this respect through fisheries management included implementation of fuel efficiency norms for fishing vessels to decrease CO₂ emission. It is well demonstrated that through technological improvement, gear modifications and behavioral change, the fishing sector can substantially decrease the damage to aquatic ecosystems, reduce GHG emission and lower operational costs for fuel without excessive negative impacts.
2. Awareness creation and capacity building is very essential among the most vulnerable section, the fisherfolk and it can be done in a public-private partnership mode. Special awareness programmes through electronic and print media would be useful to equip people to be prepared.
3. Planting of casuarina tree all over east coast within a width of 400-500 meters from shore area. The long term benefit is that the impact of storm surge will be lessened if not stopped completely. This will help reduce the damage.
4. Changes in infrastructure design namely semi circular and semi global structures with gaps for gale passage to sustain permanent damage.
5. Better weather forecasting systems with enhanced accuracy.

(Inputs by Dr. M.M. Prasad, Dr. G. Rajeswari, Dr. R. Raghu Prakash, Dr. U. Sridhar, Dr. B. Madhusudana Rao, Smt. Arathy Ashok, Smt. P. Viji and Kum. Jesmi Debbarma, Visakhapatnam Research Centre of ICAR-CIFT).

SATCORE Inter Comparison Exercise

ICAR-CIFT, Cochin and INCOIS, Hyderabad jointly organized the SATCORE Inter Comparison Exercise (SICOME 2014) at the Fishing Technology Division of ICAR-CIFT during 28 September to 2 October, 2014.

Training Programmes

During the quarter the following in-house training programmes were conducted at ICAR-CIFT, Cochin:

1. Fish processing, quality control and HACCP (20-26 October)
2. Molecular characterization of pathogens isolated from seafood (21 October - 4 November)
3. Fishing craft designing (10-15 November)
4. Value addition of freshwater fishes (15-20 December)
5. Production of chitin and chitosan (16-17 December)
6. HACCP concepts (22-27 December)

Outreach Programmes

During the quarter the following outreach programmes were conducted by the Institute:

1. Awareness programme on 'Sanitation and hygiene' for fish vendors at fish market, Aroor, Alappuzha district on 14 October, 2014.
2. Awareness campaign on 'Seafood processing and food-borne illness', in connection with Global Hand Washing Day at Moothakunnam, Ernakulam district on 15 October, 2014.
3. Interaction programme for small groups of fishermen in Kollam, Azheekal and Kayangulam on Correct practices of surface preparation and painting of steel vessels during 11-13 November, 2014.
4. Training cum demonstration programme on 'Fish/prawn value addition' at Vizianagaram on 21 November, 2014.
5. Training programme on 'Post harvest handling of fish' for fisher women collectives organized under Action Aid Programme by European Commission at Pudimadaka, Visakhapatnam on 4 December, 2014. More than 150 fisher women beneficiaries have attended the programme.
6. Training cum demonstration programme on 'Post harvest handling and value addition of fish' to the fisher women collectives from Mangamaripeta under the Action Aid Programme by European Commission on 5 December, 2014 at the Visakhapatnam Research Centre. Thirty six women beneficiaries have attended



- the training programme.
7. Training programme on 'Responsible fishing, hygienic fish handling and fish processing techniques' at North Lakhimpur, Assam during 20-22 December, 2014. Eighty fisherfolk attended the programme.
 8. Training cum demonstration programme on 'Use of eco friendly FRP coracles and preparation of value added fish products' at Rampachodavaram, East Godavari during 22-24 December 2014. More than 60 beneficiaries have attended the programme.
 9. Training programme on 'Responsible fishing, hygienic fish handling and fish processing techniques' at KVK,

Jairampur, Changlang, Arunachal Pradesh during 27-28 December, 2014. About 40 fisherfolk attended the programme.

10. Training cum demonstration programme on 'Hygienic preparation of salt cured fish and value added fish products' at Ganga Sagar, Sagar Islands, 24 Parganas, West Bengal during 28-30 December 2014. Forty beneficiaries have attended the programme.
11. Training programme on 'Responsible fishing, hygienic fish handling and fish processing techniques' at Namsai, Arunachal Pradesh during 30-31 December, 2014. About 40 fisherfolk attended the programme.

Participation in Exhibitions

During the quarter the Institute participated in the following exhibitions:

1. Exhibition held in connection with the National conference on 'Sustainability of natural resources and environment with emphasis on aquatic ecosystem for livelihood security' held at G.B. Pant University of Agricultural Sciences and Technology, Pant Nagar during 10-12 October, 2014.



Shri P. Karunakaran, M.P., Kasaragod visiting ICAR-CIFT stall in Swasraya Bharat

2. 'Swasraya Bharat-2014' held at Regional Agricultural Research Station, Kerala Agricultural University, Padannakkad, Kasaragod during 14-19 October, 2014.
3. Exhibition held in connection with India-International Food and Agri-Aqua Expo 2014 at KUFOS, Cochin during 30 October to 3 November, 2014.
4. Exhibition held in connection with 10th Indian Fisheries



Smt. Ansajitha Rassal, President, Thiruvananthapuram District Panchayath visiting ICAR-CIFT stall at PIB Campaign



Dignitaries visiting ICAR-CIFT Stall in 10th IFAF





MECOS-2 at Cochin



PLACROSYM at Calicut



Indian Biodiversity Expo at Chennai



Karshika Mela at Thodupuzha

and Aquaculture Forum at NBFGR, Lucknow during 12-15 November, 2014.

5. Exhibition held in connection with the Public Information Campaign by Press Information Bureau, Thiruvananthapuram during 26-28 November, 2014.
6. Exhibition held in connection with the International Symposium on Marine ecosystems: Challenges and opportunities (MECOS-2) at Cochin during 2-5 December, 2014.

7. Exhibition held in connection with 21st Plantation Crops Symposium (PLACROSYM) at IISR, Calicut during 10-12 December, 2014.
8. Exhibition held in connection with Indian Biodiversity Expo at SRM University, Kattankulathur, Chennai during 17-20 December, 2014.
9. Karshika Mela exhibition at Thodupuzha during 26 December, 2014 to 4 January, 2015.

World Fisheries Day Celebrated

The ICAR-CIFT Visakhapatnam Research Centre celebrated World Fisheries Day on 21 November, 2014 in collaboration with MPEDA, NETFISH and ACTION AID NGO. More than 300 women fishers participated in the programme.

A formal meeting was conducted which was presided over by Dr. M.M. Prasad, Principal Scientist and Scientist Incharge, ICAR-CIFT Visakhapatnam Research Centre. The Scientists from the Centre participated in the celebrations. In the presidential address Dr. Prasad talked about the importance of World Fisheries Day, touching important

aspects namely recent severe tropical cyclone Hudhud and its impact on fishers living in coastal areas of Visakhapatnam, hazards associated with fishing in inclement weather conditions, post harvest handling of fish and hygienic handling and value added fish product development for sustainable development of fisheries. Dr. G. Rajeswari, Principal Scientist talked on employing proper gear while harvesting fish, conservation of fish resources for the continuous development of fisheries and role of women in fisheries development. Dr. U. Sreedhar, Senior Scientist focussed in conserving the aquatic resources to



World Fisheries Day celebrations

the next generation and role of advanced technologies in harvesting fish from marine waters. Dr. B. Madhusudana Rao, Senior Scientist discussed on hygienic handling of fish and how fish tend to spoil in the absence of proper hygiene and human health hazards associated with pathogenic bacteria harboured by the contaminated fish and its ingestion. Smt. Arathy Ashok, Scientist interacted with women fishers. Dr. Ali from MPEDA emphasized the role of his organization in development of fisheries in the region. Shri Hanumantha Rao, State Coordinator of NETFISH talked on development of fisheries in Visakhapatnam and adjoining areas. The meeting came to an end with vote of



A view of the participants

thanks from Shri Arjuli Das from the NGO.

The main session was followed by interactive session in which women fisher representatives from different fishing hamlets expressed their needs and aspirations. Two important aspects that garnered attention were role of fish as food in development and growth of children and also need for quality and quantity of ice catering the needs of fishers especially during the glut catches.

At the end of the meeting all the participants including resource persons from host institutes and other governmental agencies participated in "Swachh Bharat Mission" and cleaned up Mangamaripeta Beach.

Training Programmes and Distribution of Input Materials at NEH States

North Lakhimpur, Assam

A training on 'Responsible fishing, hygienic fish handling and fish processing techniques' was conducted by ICAR-CIFT, Cochin at North Lakhimpur, Assam during 20-22 December, 2014. Eighty fisherfolk attended the training which was conducted in collaboration with District Rural Development Agency (DRDA). Shri D.J. Hazarika, Project Director, DRDA, North Lakhimpur presided over the inaugural function. Dr. S. Balasubramaniam, HOD, EIS, ICAR-CIFT was the Chief Guest. Shri P.K. Hazarika, Nodal Officer, Upper Assam Region, DRDA, North Lakhimpur and BTC, Kokrajhar wel-

comed the participants.

Training sessions on 'Responsible fishing' by Shri G. Kamei, Scientist, 'Hygienic fish handling and production of value added products' by Shri B.K. Panda, Senior Technical Officer and 'Extension interventions on responsible fishing and hygienic fish handling' by Dr. S. Balasubramaniam were held. Demonstrations were conducted on the preparation of fish pickles, fish balls, fish cutlets and dried fish products. Arrangements were also made for the distribution of ten FRP canoes (6 m length) and five FRP coracles which were procured earlier under the NEH component.



Inauguration of the training



Demonstration on value added products



Changlang, Arunachal Pradesh

Another training programme on 'Responsible fishing, hygienic fish handling and fish processing techniques' was conducted at Krishi Vigyan Kendra, Jairampur, Changlang during 27-28 December, 2014. There were training sessions on 'Responsible fishing', 'Hygienic fish handling and production of dried fish products' and 'Extension interventions on responsible fishing and hygienic fish handling'. Demonstrations were conducted on the fabrication of cast-nets by Shri H.V. Pungera, Technical Officer and about 2 to 3 kgs of net materials and sinkers were distributed to the participants after the training. About 40 participants attended the programme.



Distribution of net materials

Namsai, Arunachal Pradesh

Another training programme on 'Responsible fishing, hygienic fish handling and fish processing techniques' was conducted at Namsai, Arunachal Pradesh during 30-31 December, 2014. Shri R.K. Sharma, Deputy Commissioner, Namsai was the Chief Guest of the inaugural programme. There were training sessions on 'Responsible fishing', 'Hygienic fish handling and production of dried fish products' and 'Extension interventions on responsible fishing and hygienic fish handling'. Demonstrations were conducted on the fabrication of castnets. After the demonstration, net materials were distributed to three SH groups of fisherfolk. About 40 participants attended the programme.



Training session in progress



Participants and faculty at Changlang



Participants and faculty at Namsai

Sensitization Programme on Insulated Fish Bags

Visakha Freshwater Fish Sellers and Farmers Association runs a wholesale fish market at Rampuram, Pedagadi village, on the outskirts of Visakhapatnam city. The fish retailers carry the purchased fish in crates, insulated fish boxes and in bags stitched from plastic gunny bags. Fisherwomen who sell fish in the Visakhapatnam urban area were found transporting the fish in the bags with ice to the markets in auto rickshaws. Carrying the fish in this manner exposes the fish to dust and flies and the ice melts at faster rate. Hence, a sensitization programme on insulated fish bags was conducted by the Visakhapatnam Research Centre of ICAR-CIFT. The insulated fish bag was demonstrated to few fish retailers in the whole sale fish market on 16 November, 2014. The bags were found helpful to keep fish in chilled condition and free from dust and flies.



Demonstration of insulated fish bags



Tribal Sub Plan Programme at Ramapachodavaram



Dr. M.M. Prasad explaining the importance of foldable fish traps



Shri Gandham Chandrudu, IAS distributing fish traps



Participants with resource persons

Under the Tribal Sub Plan, a training cum demonstration programme on "Use of eco-friendly FRP coracles and Preparation of value added fish products" was organized at PMRC (Project Monitoring Resource Centre) of ITDA (Integrated Tribal Development Authority) at Ramapachodavaram, East Godavari District, Andhra Pradesh during 22-24 December, 2014. The programme for the benefit of 61 participants was inaugurated by Shri Gandham Chandrudu, IAS, Project Officer, ITDA. The inaugural meeting was presided over by Dr. M.M. Prasad, Principal Scientist and Scientist Incharge of ICAR-CIFT Visakhapatnam Research Centre. Dr. M.S. Kumar, CTO, Visakhapatnam Research Centre of ICAR-CIFT offered felicitations. Dr. Rammohana Rao, ADF (In Charge, Rajahmundry) proposed vote of thanks. An exhibition of technologies developed by ICAR-CIFT was also arranged. The value added products and the technologies developed at ICAR-CIFT on waste utilization drew maximum attention by the Chief Guest. Later the Chief Guest distributed inputs like foldable fish traps, gillnets and insulated fish bags based on the technologies developed by ICAR-CIFT. Ice boxes and electrical heat sealers were also given to the tribal fishers of Surampalem and Bhoopathipalem Reservoirs.

The FRP coracle was launched and demonstrated in Bhoopathipalem Reservoir. Instructions were given on the operation and precautions to be taken during the operation of FRP coracles. At the end of the programme, a feedback session was held.

TSP Programme at Gangasagar

The Visakhapatnam Research Centre of ICAR-CIFT conducted a training cum demonstration under Tribal Sub Plan in Gangasagar of Sagar Islands, West Bengal in collaboration with Vivekananda Institute of Biotechnology (VIB) of Shri Ramakrishna Ashram (Under the Core Support Programme of DST, Govt. of India) during 28-30 December, 2014. Sagar Island constitutes of 44 villages and nine Gram Panchayats with a total population of 267,000 out of which 5387 are fisher families spread across all the villages. Among the villages, Gangasagar has the highest density of fisher population and majority of them are economically backward. Hence Gangasagar was chosen to conduct the TSP.

The inaugural session of the programme was presided over by Dr. M.M. Prasad, Principal Scientist and SIC of ICAR-CIFT Visakhapatnam Research Centre. Shri Sanjoy Halder of VIB welcomed the gathering. In the inaugural address Dr. Prasad spoke on the role of ICAR in catering to the food and nutritional security needs of population. He also told that ICAR-CIFT gives equal emphasis in developing technologies that suits rural conditions namely foldable fish traps for harvesting fish, fabrication of fishing gears that are eco-friendly in nature and use of insulated fish bags for fish transportation from landing centres and during sale while ensuring quality for better price realization. Shri Tapan Roy



Demonstration of value added fish products



Quality assessment of cured fish

Chowdhary, Advisor to the VIB and the young Saint of the Ashram, Basudev Swamy Maharaj also spoke on the occasion.

During the three day programme, lectures were given on importance of fish as food, hygienic handling of fish at different stages right from harvest to post harvest, product development, storage till it reaches the consumer/plate, reasons for spoilage of fish and the measures to control the same, preparation of different value added fish products and advantages of improved eco friendly gears with less drudgery. The value added fish products namely fish pickles, cutlets and pakoda were demonstrated. Salt curing of fish in hygienic and scientific way were also demonstrated.

The inputs such as foldable fish traps, gillnets, insulated fish bags, heat sealers and ice boxes were given 'gratis' to the participants. Posters showing the importance of consuming fish for nutritional needs and also for increasing awareness among the tribal fishers were also distributed. A field visit was undertaken to the dry fish curing yards of Begumkhali village of Gangasagar Gram Panchayat, Sagar Block of 24 Paraganas District, West Bengal to assess the quality of cured fish. It is observed that the cured fish had considerable amount of extraneous material. This was mainly due to improper handling and absence of sorting before drying.

ICAR-CIFT, Cochin Observes 'Swachh Bharat Abhiyan'

As a part of 'Swachh Bharat Mission' a massive cleaning programme was carried out from 27 September, 2014 onwards. During the drive all the laboratories and office rooms of the Institute were cleaned by the staff members. Banners of 'Swachh Bharat' were displayed in the Office and Residential Complex. Cleaning drive in the ICAR-CIFT Residential Complex was carried out on 28th September, 2014 by the inmates of the Complex. On 2nd October the Director, and staff of the Institute assembled in the corridor and took 'Swachh Bharat Pledge'. All employees of the Institute including Director attended the cleaning campaign.



Director administering the Swachh Bharat Pledge



Swachh Bharat Mission in ICAR-CIFT, Cochin



Cleaning the premises



Cleaning the residential campus

Awareness programme on 'Sanitation and hygiene for fish vendors'

As part of Swachh Bharat Mission, the Quality Assurance and Management Division of ICAR-CIFT conducted a one-day awareness programme on 'Sanitation and hygiene for fish vendors' at Aroor fish market in association with Matsyafed, Govt. of Kerala on 14 October, 2014. Around 80 members from the fishermen community representing the two Fishermen Development Co-operative Societies of Aroor Panchayat participated in the programme. Shri C.K. Pushpan, Aroor Panchayath President inaugurated the programme. Dr. C.N. Ravishankar, Director, ICAR-CIFT while addressing the gathering stressed on the importance of sanitation and hygiene in maintaining the quality of fish and assured all scientific guidance from ICAR-CIFT to transform Aroor fish market as a modern hygienic fish market in Kerala. Dr. T.V. Sankar, Head, QAM in his address solicited everybody's total involvement in making the market a hygienic one and awareness campaigns and classes on sanitation and hygiene would upgrade their knowledge towards that.



Dr. C.N. Ravishankar addressing the participants



A section of the participants

Dr. K. Ashok Kumar, Principal Scientist delivered a talk on the need for personal and environmental hygiene and sanitation in the markets for better realization of money. Dr. Femeena Hassan, Senior Scientist offered a class on hygienic practices to be followed in handling of fish, sanitation and personal hygiene of the fish vendors. Shri Thankappan, President, Aroor Ezhupunna Fishermen Development Co-operative Society and Shri Manoharan, President, Aroor Inland Fishermen Development Co-operative Society also spoke on the occasion. Shri K.C. Shivanand, District Manager, Matsyafed emphasized that sanitation practices in Kerala is affecting the seafood quality. Smt. K.K. Rema, Programme Coordinator, Matsyafed proposed vote of thanks. The awareness programme imparted a good knowledge on the practice of hygiene and sanitation in fish markets to produce safe food.

Swachh Bharat Mission at Mumbai RC of ICAR-CIFT

Swachh Bharat Mission started successfully in Mumbai Research Centre of ICAR-CIFT from 25 September, 2014 with a special programme on 2 October, 2014 in which a pledge was taken in the office building by the staff and the Scientist Incharge of the Centre. Dr. L.N. Murthy, SIC explained the importance of the cleanliness drive in Swachh Bharat Mission. During the drive the laboratories and office rooms of the Centre were cleaned by the staff members.

Consultancy Agreements Signed

During the period under report ICAR-CIFT, Cochin signed the following consultancy agreements:

1. With **M/s. Kerala Livestock Development Board Ltd., Thiruvananthapuram** for 'renewal of HACCP certification' for three sperm stations functioning at Mattupatti, Kulathupuzha and Dhoni under the Board. The total consultancy charges are ₹ 1,80,000/- (+ Service Tax).
2. With **M/s. Shandong Heavy Industry India Pvt. Ltd., Hinjewadi, Pune** for providing validation and certification of two diesel engine models (WP6C Model and WD10C Model) manufactured/marketed by the party for fishing vessel applications for a consultancy fee of ₹ 4,50,000/- (+ Service Tax).
3. With **Department of Fisheries, Andaman and Nicobar Administration, Port Blair** for implementation of the scheme, 'Introduction of intermediary mechanized fishing craft' in A&N Islands under the Rashtriya Krishi Vikas Yojana.
4. With **M/s Herald Marine Products Pvt. Ltd., Govindapuram, Palakkad** for providing 'technical guidance for the production and quality assessment of fish meal and oil'. The total consultancy charges are ₹ 20,000/- (+ Service Tax).



Awards and Recognitions

AFSIB Young Scientist Award to Smt. S. Remya

Smt. S. Remya, Scientist, Veraval Research Centre of ICAR-CIFT has bagged AFSIB Young Scientist Award instituted by the Asian Fisheries Society, Indian Branch (AFSIB) for scientists below the age of 35, working in the field of fisheries, aquaculture and related disciplines. The award was presented during the valedictory function of 10th Indian Fisheries and Aquaculture Forum held at NBFGR, Lucknow during 12-15 November, 2014.



Smt. Remya receiving the award from Dr. B. Meenakumari, DDG (Fy.), ICAR, New Delhi

Dr. K. Ravindran Endowment Award to Smt. S. Remya

Smt. S. Remya, Scientist, Veraval Research Centre of ICAR-CIFT bagged Dr. K. Ravindran Endowment Award for the best paper presentation in the National seminar, '24th



Smt. Remya receiving the award from Dr. K. Muralidharan, President, Swadeshi Science Movement

Swadeshi Science Congress', organized by Swadeshi Science Movement - Kerala and Thunchath Ezhuthachan Malayalam University, during 6-8 November, 2014, at Tirur, Kerala. The award winning paper was on 'Development of a novel biodegradable and antimicrobial packaging system for extending the shelf life of fish' by S. Remya, C.O. Mohan, G.K. Sivaraman, C.N. Ravishankar and T.K. Srinivasa Gopal.

Young Marine Biologist Award to Dr. K.K. Prajith

Dr. K.K. Prajith, Scientist, Veraval Research Centre of ICAR-CIFT bagged Young Marine Biologist Award for his paper entitled "Square Mesh Window Bycatch Reduction Devise (SMW-BRD) for stationary bagnets of Hooghly riverine system" authored by K.K. Prajith, V.R. Madhu, M.P. Remesan and P. Pravin presented during International symposium on 'Marine ecosystems - Challenges and opportunities' (MECOS-2) held at Cochin during 2-5 December, 2014.



Dr. Prajith receiving the award from Prof. (Dr.) Rashid Sumalia, Director, Fisheries Economics, University of British Columbia, Canada

Best Poster Awards to ICAR-CIFT Teams

Dr. S.K. Panda, Senior Scientist received the Best Poster Award for the poster titled, "Nutritional evaluation of processing discards from Tiger Tooth Croaker (*Otolithes ruber*)" by V. Renuka, A.A. Zynudheen, S.K. Panda, S. Remya, G.K. Sivaraman and C.N. Ravishankar presented at 10th Indian Fisheries and Aquaculture Forum at NBFGR, Lucknow during 12-15 November, 2014.

The posters entitled, 'Gender roles in fisheries along the Vembanad estuarine system', by P. Sruthi, Liya Jayalal and Nikita Gopal and 'Workspaces of women in the ornamental fish value chain in Kerala', Liya Jayalal, P. Sruthi and Nikita Gopal bagged the best poster awards during the 5th Global Symposium on 'Gender in Aquaculture and Fisheries' held at NBFGR, Lucknow during 13-15 November, 2014 as a parallel event during the 10th Indian Fisheries and Aquaculture Forum.



Publications

Research Papers

1. Bindu, J., Mallick, A.K., Ravishankar, C.N. and Srinivasa Gopal, T.K. (2014) – Suitability of polymer-based retortable pouches for packaging of fish products, In: *Polymers for Packaging Applications* (Eds. Sajid Alavi et al.), P 83-96, Apple Academy Press, CRC, Canada.
2. Minu, P., Shaju, S.S., Muhamed Ashraf, P. and Meenakumari, B. (2014) – Phytoplankton community characteristics in the coastal waters of the south-eastern Arabian sea, *Acta Oceanol. Sin.*, **33(12)**: 170-179.
3. Muhamed Ashraf, P., Lalitha, K.V. and Leela Edwin (2014) – Synthesis of poly aniline hybrid composite – A new and efficient sensor for the detection of total volatile base nitrogen molecules, *Sensors and Actuators* **208**: 369-378.
4. Laly, S.J., Ashok Kumar, K. and Sankar, T.V. (2014) – Chemical contaminants and water quality in shrimp farms of Edavanakkadu area, Cochin, India, *Fish. Technol.*, **51(4)**: 234-241.
5. Prajith, K.K., Dhiju Das, P.H. and Leela Edwin (2014) – Dolphin Wall Net (DWN) – An innovative management measure devised by ring seine fishermen of Kerala, India to reduce/or eliminate marine mammal-fishery interactions, *Ocean & Coastal Management*, **102**: 1-6.
6. Shabir A. Dar, Saly N. Thomas, Chakraborty, S.K. and Jaiswal, A.K. (2014) – Length-weight relationships for five species of Clupeidae caught from Mumbai coast, India, *Fish. Technol.*, **51(4)**: 291-294.

Visitors at Visakhapatnam RC of ICAR-CIFT

Dr. Krishna Mohan, Director of Fisheries, Odisha visited Visakhapatnam Research Centre of ICAR-CIFT and had a discussion on "Transfer of technologies, identification of locations, technological needs related to harvest and post harvest sector and Tribal Sub Plan Programmes" on 8 October, 2014.

Dr. V. Ramakantha, IFS, Director, IWST, Bangalore visited different laboratories of the Centre and interacted with the scientists in the meeting for possible collaborative research in biochemical aspects of wood preservation which is essential for construction of conventional fishing craft.

Six delegates from Marine Resources Development Department, Ministry of Marine Resources, Eritrea visited the Centre on 11 November 2014. Research activities of the Centre has been explained to the delegates and showcased the products developed at the Centre related to fish harvest



Ms Liya and Ms Sruthi receiving the award from Dr. B. Meenakumari, DDG (Fy.), ICAR, New Delhi

Celebrations

Vigilance Awareness Week

The Institute celebrated Vigilance Awareness Week during 27 October to 1 November, 2014. On 27 October, the Director and staff of the Institute together took 'Vigilance Awareness Pledge'.

Rashtriya Ekta Diwas

The Institute celebrated Rashtriya Ekta Diwas on 31 October, 2014. On the occasion, the Director and staff of the Institute assembled together and took 'Rashtriya Ekta Pledge' followed by collective singing of National Anthem.

Quami Ekta Week

The Institute celebrated Quami Ekta Week during 19-25 November, 2014. On 25 November, the Director and staff of the Institute assembled together and took 'National Integration Pledge'.

Official Trainer Certificate Received

Dr. K. Ashok Kumar, Principal Scientist and Dr. S.K. Panda, Senior Scientist, Quality Assurance and Management Division, ICAR-CIFT, Cochin received the official trainer certificate from Association of Food and Drug Officials (AFDO), USFDA for conducting training on Hazard Analysis and Critical Control Point (HACCP) and Sanitation Control Procedures (SCP).



Participants of the HACCP and SCP training



and post harvest technologies.



Dr. B. Madhusudana Rao, Senior Scientist explaining about ICAR-CIFT technologies to the delegates from Eritrea

Invited Talks

Dr. A. Vasantha Shenoy, Joint Secretary (PR), SORT, Cochin delivered an invited talk on "Organ donation" on 26 November, 2014 at ICAR-CIFT, Cochin.

Radio Talk

Dr. M.M. Prasad, Principal Scientist & SIC, Visakhapatnam RC of ICAR-CIFT delivered a radio talk on "Tropical cyclones like Hudhud in Bay of Bengal and climatic factors impacting fishers" through All India Radio, Visakhapatnam on 18 December, 2014.

Post Graduate Studies

Shri P.H. Dhiju Das and Smt. G.S. Hema under the guidance of Dr. Leela Edwin and Dr. Suseela Mathew, respectively presented pre-synopsis presentation on the Ph.D. research topics "Investigation in the structural changes, operation and

energy use of ring seine fishing systems of Kerala" and "Isolation, characterization and bioevaluation of collagen and collagen peptides from fish skin" on 18 December 2014 at ICAR-CIFT, Cochin.

Personnel News

Participation in Seminars/Symposia/Workshops etc.

- **Dr. C.N. Ravishankar**, Director – AGRIP 2014 and ZTMC Annual Meeting, IIHR, Bangalore (9-10 October)
- **Dr. C.N. Ravishankar**, Director – Meeting on Vision 2050, ICAR, New Delhi (9 December)
- **Dr. C.N. Ravishankar**, Director, **Dr. Suseela Mathew**, HOD, B&N, **Dr. Femeena Hassan**, **Dr. S. Ashaletha**, Senior Scientists, **Dr. C.O. Mohan**, **Smt. P. Jeyanthi**, **Shri V. Chandrasekar**, **Dr. K.K. Prajith**, **Smt. S.J. Laly**, **Smt. U. Parvathy**, **Shri G. Kamei**, Scientists and **Kum. K.L. Chithrakala**, Research Fellow – International symposium on Marine ecosystems – Challenges and opportunities (MECOS 2), Cochin (2-5 December). Dr. Ravishankar delivered an invited talk on "Challenges and opportunities in harvest and post harvest of fish" in the Symposium. The following research papers were also presented in the Symposium:
 1. Gender integrated value chain analysis of a women enterprise on fresh fish processing by S. Ashaletha, M. Nasser, K.V. Lalitha and V. Geethalakshmi
 2. Bacterial progression in *Lethrinus lentjan* (Lacepede, 1802) from different tactical locations by Femeena Hassan, Tressa Gracious, V. Geethalakshmi and S. Sanjeev
 3. Technical efficiency of small scale fishing units in Kerala by P. Jeyanthi, Nikita Gopal, V. Chandrasekar

and S. Balasubramaniam

4. Quality characteristics and food safety hazards associated with stripped catfish *Pangasius hypothalmus* marketed in Kerala by S.J. Laly, S.K. Panda, S. Sanjeev and T.V. Sankar
5. An economical analysis of dry fish export units in Gujarat by V. Chandrasekar, P. Jeyanthi and Nikita Gopal
6. Compliance of marine fishing regulations act (MFRA) in the maritime states of India by G. Kamei and Leela Edwin
7. Effect of Potassium sorbate and vacuum packaging on the shelf life extension of monosex tilapia during ice storage by U. Parvathy, S. Mohamed Raushan, George Ninan, A.A. Zynudheen and C.N. Ravishankar
8. Wooden canoe-based small scale fishery: A socio-economic profile of fishermen in south west coast of India and Lakshadweep by K.L. Chithrakala, K.A. Roshan, James J. Pulikottil, Nikita Gopal and Leela Edwin
9. Square mesh window bycatch reduction device (SMW-BRD) for stationary bagnets of Hooghly riverine system by K.K. Prajith, V.R. Madhu, M.P. Remesan and P. Pravin
10. Quality of Longtail tuna (*Thunnus tonggol*) chunks packed under reduced oxygen atmosphere in chilled storage conditions by C.O. Mohan, C.N.



Ravishankar and T.K. Srinivasa Gopal

11. Combined effect of O₂ scavenger and essential oil on the quality of packaged fish by S. Remya, C.O. Mohan, J. Bindu, G.K. Sivaraman and C.N. Ravishankar

- **Dr. C.N. Ravishankar**, Director and **Dr. V.R. Madhu**, Senior Scientist – NAAS Silver Jubilee Workshop on 25 years of Indian fisheries and aquaculture: The way forward, CIFE, Mumbai (21-22 October)
- **Dr. Leela Edwin**, HOD, FT – Seminar on Indigenous technical knowledge and its application in traditional fisheries, held in connection with World Fisheries Day celebrations, KUFOS, Cochin (21 November)
- **Dr. Leela Edwin**, HOD, FT – Meeting held in connection with the use of ring seines off the coast of Thiruvananthapuram, Govt. of Kerala, Thiruvananthapuram (22 November)
- **Dr. Leela Edwin**, HOD, FT, **Dr. K.V. Lalitha**, HOD, MFB, **Dr. P. Pravin**, **Dr. Nikita Gopal**, Principal Scientists, **Dr. Femeena Hassan**, **Dr. J. Bindu**, **Dr. S.K. Panda**, **Dr. Toms C. Joseph**, Senior Scientists, **Shri V. Radhakrishnan Nair**, **Dr. V. Murugadas**, **Shri V. Chandrasekar**, **Dr. K.K. Prajith**, **Dr. A. Jeyakumari**, **Kum. Jesmi Debbarma**, **Smt. P. Viji**, **Smt. S. Remya**, Scientists, **Smt. P.K. Shyma**, Asst. Chief Tech. Officer, **Kum. Liya Jayalal**, **Kum. P. Sruthi**, **Shri K.V. Vishnu**, **Shri K.K. Ajeeshkumar**, Research Fellows - 10th Indian Fisheries and Aquaculture Forum on Towards responsible aquaculture and sustainable fisheries, NBFGR, Lucknow (12-15 November). Dr. Leela Edwin presented a Lead Talk on “Development perspectives in fish harvest and post harvest technologies” in the Session on “Harvest and post harvest in India”. The Scientists also presented the following research papers in the Forum:

1. *Edwardsiella tarda* infection in *Pangasius hypophthalmus* from aquaculture farm in Kerala, India by Toms C. Joseph, D. Reghunathan, V. Murugadas and K.V. Lalitha
2. Study on the susceptibility of Asian Tiger Shrimp (*Penaeus monodon*) post larvae to three *Vibrio* species by Toms C. Joseph, D. Reghunathan, S. Muhamed, P.G. Akhlnath, V. Murugadas and K.V. Lalitha
3. Effect of spices on quality of vacuum packed *Pangasianodon hypophthalmus* steaks during iced storage by Jesmi Debbarma, B.M. Rao, L.N. Murthy, J. Bindu and M.M. Prasad
4. Microbial quality of seafood samples from fish processing plants in Gujarat by G.K. Sivaraman, A.K. Jha, S. Remya, V. Renuka, K.V. Lalitha and C.N. Ravishankar
5. Isolation and characterization of Methicillin-

resistant coagulase positive Staphylococci from seafood in Gujarat by G.K. Sivaraman, A.K. Jha, Toms C. Joseph, K.V. Lalitha, S. Remya, V. Renuka and C.N. Ravishankar

6. Nutrient profiling and evaluation of quality characteristics of monosex tilapia during ice storage by U. Parvathy, George Ninan, A. Jeyakumari and A.A. Zynudheen
7. A new generation active packaging system with antimicrobial film and CO₂ scavenger for fish preservation by S. Remya, C.O. Mohan, J. Bindu, G.K. Sivaraman and C.N. Ravishankar
8. Evaluation of baseline cleanliness of food contact surfaces using ATP-Bioluminescence and conventional microbiological methods in selected fishery-based microenterprise units by Femeena Hassan, K.V. Nija and T.V. Sankar
9. Development of tuna sausage employing high pressure treatment and shelf life evaluation during storage by J. Bindu, C.K. Kamalakanth, V.S. Nimisha and S.K. Panda
10. Square Mesh Window Bycatch Reduction Device (SMW-BRD), an innovative design for traditional hilsa bagnet for reducing juvenile bycatch in Narmada estuary by K.K. Prajith, M.P. Remesan, V.R. Madhu and P. Pravin
11. Effect of addition of two major carps in various percentages to the biofloc technology (BFT) applied culture system of Giant Freshwater Prawn, *Macrobrachium rosenbergii* by K.K. Prajith and B. Madhusudana Kurup
12. Shelf life extension of Indian mackerel using modified icing system with mint (*Mentha arvensis*) and citrus (*Citrus aurantium*) extracts by P. Viji, P.K. Binsi, S. Visnuvinayagam, C.N. Ravishankar and T.K.S. Gopal
13. A comparative study on the addition of shrimp powder and hydrolysate on physico-chemical properties of an extruded snack by A. Jeyakumari, M.S. Rahul Das, C.G. Joshy and J. Bindu
14. A study on ice utilization pattern by Kerala fisheries sector by V. Radhakrishnan Nair, V. Geethalakshmi and Nikita Gopal
15. Workspaces of women in the ornamental fish value chain in Kerala by Liya Jayalal, P. Sruthi and Nikita Gopal
16. Gender roles in fisheries along the Vembanadu estuarine system by P. Sruthi, Liya Jayalal and Nikita Gopal
17. Status of migrant workers in the seafood processing units of Alappuzha, Kerala by Chacko



Babu, Liya Jayalal, P. Sruthi, P. Jeyanthi and Nikita Gopal

18. Functional oil from deep sea shark (*Echinorhinus brucus*): Its fatty acid profile, anti-inflammatory and anti-ulcer activities by K.V. Vishnu, K.K. Ajeeshkumar, Suseela Mathew, R. Anandan, K.K. Asha, Niladri Sekhar Chatterjee and B. Ganesan
19. Squid protein hydrolysate from Indian squid (*Loligo duvacei*) obtained by enzyme digestion and their bioactivities by K.R. Remyakumari, K.K. Ajeeshkumar, R. Navaneethan, K.K. Asha, Niladri Sekhar Chatterjee, R. Anandan, B. Ganesan and Suseela Mathew
20. Comparison of antioxidant potential of fish protein hydrolysate prepared from rohu (*Labeo rohita*) processing waste by enzymatic digestion with and without inclusion of fish entrails by Md. Aklakur, K.K. Asha, Niladri Sekhar Chatterjee, R. Anandan and Suseela Mathew
21. Comparative study on traditional and modernized fish meal units in Veraval, Gujarat – An economic analysis by V. Chandrasekar, P. Jeyanthi and Nikita Gopal
22. Indigenous knowledge on use of coconut spadix as a fish aggregating devise for squid jigging in south east coast of India by K.K. Prajith, F. Daniel Raj, T. Jose Fernandez and Leela Edwin
23. Nutritional evaluation of processing discards from Tiger Tooth Croaker (*Otolithes ruber*) by V. Renuka, A.A. Zynudheen, S.K. Panda, S. Remya, G.K. Sivaraman and C.N. Ravishankar

- **Dr. Leela Edwin**, HOD, FT, **Dr. T.V. Sankar**, HOD, QAM, **Dr. Suseela Mathew**, HOD, B&N, **Dr. A.A. Zynudheen**, HOD I/c, FP, **Dr. Saly N. Thomas**, **Dr. Nikita Gopal**, Principal Scientists and **Dr. A.R.S. Menon**, Chief Tech. Officer – 4th Meeting of World Ocean Science Congress Organizing Committee, CIFT, Cochin (25 November)



WOSC meeting in progress (On the Dias L to R: Dr. T.V. Sankar, Shri A. Jayakumar, Secretary General, Vigyan Bharati, New Delhi, Prof. B. Madhusudana Kurup, VC, KUFOS, Cochin, Dr. Leela Edwin and Dr. V.N. Sanjeevan, former Director, CMLRE, Cochin)

- **Dr. Leela Edwin**, HOD, FT and **Dr. Nikita Gopal**, Principal Scientist – 5th Global Symposium on Gender in Aquaculture and Fisheries, NBFGR, Lucknow (13-15 November). Dr. Leela Edwin Chaired the Session on Gender in sustainable fisheries and aquaculture management. The Special Workshop on the USAID-NACA Project was Co-chaired by Dr. Nikita Gopal.



Sessions in progress

- **Dr. K.V. Lalitha**, HOD, MFB, **Dr. Toms C. Joseph**, Senior Scientist and **Dr. V. Murugadas**, Scientist - International Workshop on Aquatic animal disease surveillance, NBFGR, Lucknow (4-15 November)
- **Dr. T.V. Sankar**, HOD, QAM – Board of Studies meeting in Biotechnology, CUSAT, Cochin (26 November)
- **Dr. T.V. Sankar**, HOD, QAM and **Dr. K. Ashok Kumar**, Principal Scientist – ISO special meeting on ratification of comments of ISO, Cochin (4 October)
- **Dr. T.V. Sankar**, HOD, QAM and **Dr. K. Ashok Kumar**, Principal Scientist – UGC sponsored lecture series, MES College, Ponnani (22 November). Dr. Sankar delivered as talk on “Seafood safety” while Dr. Ashok Kumar delivered a talk on “Standard sanitary operating procedure for seafood industry”.
- **Dr. T.V. Sankar**, HOD, QAM, **Dr. K. Ashok Kumar**, Principal Scientist and **Dr. S.K. Panda**, Senior Scientist – Meeting for finalizing the comments for the requirements of the forthcoming ISO T234 meeting at Iceland, NIPHAT, Cochin (24 November)
- **Dr. T.V. Sankar**, HOD, QAM and **Dr. S.K. Panda**, Senior Scientist – Meeting of FAD 12 Fish and Fishery Products, BIS, New Delhi (7 November)



- **Dr. Suseela Mathew**, HOD, B&N - Meeting for recognizing ICAR-CIFT, Cochin as a research centre in harvest and post harvest technology of fish and other marine organisms, KUFOS, Cochin (22 December)
- **Dr. M.M. Prasad**, SIC, Visakhapatnam – Training programme on Post harvest handling of fish for fisher women collectives, Visakhapatnam (4 December) (As resource person)
- **Dr. M.M. Prasad**, SIC, Visakhapatnam – Seminar, Dr. V.S. Krishna Govt. College, Visakhapatnam (10 December). Dr. Prasad delivered an invited talk on 'Need for quality assurance in seafood' in the Seminar.
- **Dr. M.M. Prasad**, SIC, Visakhapatnam and **Dr. G Rajeswari**, Principal Scientist – Capacity building programme on 'UN-HE for SHE Feminist Campaign', Visakhapatnam (10 December)
- **Dr. M.M. Prasad**, SIC, Visakhapatnam, **Dr. R. Raghu Prakash**, Principal Scientist and **Dr. U. Sreedhar**, Senior Scientist – Meeting on Origin, prognosis and effect of Hudhud cyclone, CSBB, Andhra University, Visakhapatnam (28 October). Dr. Prasad also presented a report on the 'Impact of Hudhud on fisheries and the remedial measures' in the Meeting.
- **Dr. G.K. Sivaraman**, SIC, Veraval - Conference on Sustainable Seafood 2014 GKAFCC, Veraval (19 December). Dr. Sivaraman also presented a paper on "Perspective on fisheries technology, innovations and way forward" by G.K. Sivaraman and S. Remya in the Conference.
- **Dr. L.N. Murthy**, SIC, Mumbai – ICAR Regional Committee Meeting, Raipur (17-18 October)
- **Dr. L.N. Murthy**, SIC, Mumbai – Indo-Norwegian Cooperation joint workshop on Aquaculture, Mumbai (30 October)
- **Dr. Saly N. Thomas**, Principal Scientist – Institute Management Committee Meeting of CMFRI, Cochin (21 October)
- **Dr. Saly N. Thomas**, Principal Scientist – Expert committee meeting for the implementation of new fish net factory at Thiruvananthapuram, Cochin (12 December)
- **Dr. P. Pravin**, Principal Scientist – National workshop on Promotion of self-employment in Punjab, MGSIPA, Chandigarh (25 November). Dr. Pravin also delivered an invited talk on "Employment opportunities in fisheries sector" in the Workshop.
- **Dr. P. Pravin**, Principal Scientist – Inauguration of 'Sea club' by NETFISH/MPEDA, St. Albert's College, Cochin (27 November). Dr. Pravin also delivered an invited talk on "Bycatch reduction for the responsible fishing in trawl fishery".



Dr. P. Pravin with Sardar Parkash Singh Badal, Honourable Chief Minister of Punjab

- **Dr. P. Pravin**, Principal Scientist – MDP on Leadership management, NAARM, Hyderabad (1-12 December)
- **Dr. P. Pravin**, Principal Scientist – Seminar on Indigenous traditional knowledge, FIRMA, Cochin (27 December). Dr. Pravin delivered an invited talk on "Indigenous traditional knowledge" in the Seminar.
- **Dr. K. Ashok Kumar**, Principal Scientist – National seminar held in connection with World Food Day Celebrations, Thiruvananthapuram (16 October). Dr. Ashok Kumar delivered an invited lecture on "Delivering healthy living through safe food from farm to fork" in the Seminar.
- **Dr. K. Ashok Kumar**, Principal Scientist – Seminar on Food safety and quality assurance, SAMETI, Thiruvananthapuram (13 November). Dr. Ashok Kumar delivered an invited lecture on "Food safety" in the Seminar.
- **Dr. M.P. Remesan**, Principal Scientist – Workshop for Liaison Officers for SC/ST/OBC's, ISTM, New Delhi (20-21 October)
- **Dr. M.P. Remesan**, Principal Scientist, **Dr. K.K. Prajith**, **Smt. S. Remya**, Scientists and **Dr. A.R.S. Menon**, Chief Tech. Officer – 24th Swadeshi Science Congress with focal theme on Learning and dissemination of science and technology through Malayalam, Malayalam University, Tirur (6-8 November). Dr. Remesan took part in the panel discussion on fisheries held in connection with the Congress and delivered an invited talk on "Advances in fish harvesting technologies and responsibilities of fishermen". The following papers were also presented by the Scientists in the Congress:
 1. Efficacy of biofloc technology (BFT) in the hatchery, nursery and grow out of giant freshwater prawn, *Macrobrachium rosenbergii* by K.K. Prajith, Saritha Thomas and B. Madhusudana Kurup.
 2. Development of a novel biodegradable and anti-microbial packaging system for extending the shelf life of fish by S. Remya, C.O. Mohan, G.K. Sivaraman, C.N. Ravishankar and T.K. Srinivasa Gopal
- **Dr. Nikita Gopal**, Principal Scientist – Synthesis



workshop for the Thematic studies on 'Gender in aquaculture in Cambodia, Lao PDR, Thailand and Vietnam', Bangkok, Thailand (29 September – 1 October)



Dr. Nikita Gopal with other participants of the workshop

- **Dr. Nikita Gopal**, Principal Scientist – Vision 2050 meeting, New Delhi (19 November)
- **Dr. Nikita Gopal**, Principal Scientist – RFD Mid term review meeting, New Delhi (20 November)
- **Dr. Femeena Hassan, Dr. S.K. Panda**, Senior Scientists and **Dr. Pankaj Kishore**, Scientist – European Union-CITD training programme on 'Food safety and SPS, technical regulations, standardization and support to Post Clearance Audit (PCA) in customs, Cochin (10-13 December)



Dr. Femeena Hassan, Dr. Pankaj Kishore and Dr. S.K. Panda along with Ms Else-Marie Andersen, Senior Fishery Legislation Specialist, Denmark

- **Dr. P. Muhamed Ashraf**, Senior Scientist – National Fluorescence and Raman Workshop, IISER, Pune (15-19 December)
- **Dr. George Ninan**, Senior Scientist – Workshop on Dissemination of technologies by central research agencies, Thiruvananthapuram (9 December)
- **Shri M.V. Baiju**, Senior Scientist – Seminar, CIFNET, Cochin (9 October). Shri Baiju delivered a talk on "Recent advancements in fishing vessel engineering" in the Seminar.
- **Dr. S.K. Panda**, Senior Scientist – Meeting of the FSSAI Scientific Panel on Food additives, flavourings,

processing aids and materials in contact with food, New Delhi (15-17 October). Dr. Panda presented the requirements of additive in different categories of fish and fishery products in the Meeting.

- **Shri V. Radhakrishnan Nair**, Scientist – Training programme on Advances in omics data analysis: Learning by example, IASRI, New Delhi (3-23 December)
- **Smt. S.J. Laly and Smt. U. Parvathy**, Scientists – International SAARC training programme on Fish processing, quality control and HACCP, ICAR-CIFT, Cochin (20-26 October)
- **Smt. U. Parvathy**, Scientist – Meeting of the Chief Executives of Research Institutes, Govt. Secretariat, Thiruvananthapuram (15 November)
- **Dr. Niladri Sekhar Chatterjee**, Scientist – Advanced training in Mass Spectrometric techniques, NRC Grapes, Pune (1-10 December)
- **Dr. A. Jeyakumari and Shri S. Sreejith**, Scientists - Winter school on Recent advances in the development of nutraceuticals, health foods and fish feed from fish and shellfish processing discards, ICAR-CIFT, Cochin (10 November – 1 December)
- **Shri S. Sreejith**, Scientist – Technology clinic for entrepreneurs, DIC, Thrissur (3 December). Shri Sreejith delivered an invited talk on "Value addition in fisheries sector" in the Clinic.
- **Shri Ranjith Kumar Nadella**, Scientist – International conference on Challenges and opportunities in animal health at the face of globalization and climate change, DUVASU, Mathura (30 October – 1 November). Shri Nadella also presented a paper entitled, "Use of organic acids as antibacterial agents in milkfish (*Chanos chanos*) larval rearing systems to control Vibriosis" by N. Ranjith Kumar, Prasanna Kumar Patil, M. Kailasam, M. Natarajan and K.V. Lalitha.
- **Shri Ahamed Basha**, Scientist – Workshop on Interfacing innovation and IPR for licensing and commercialization of technology in the changing global scenario with special reference to genetic resources, NBAIM, Kusmaur (18-20 December).
- **Smt. T. Silaja**, Sr. Tech. Officer – National seminar on Managing innovation in new generation libraries, Rajagiri College of Social Sciences, Cochin (16-17 December). Smt. Silaja also presented a paper entitled, "New generation library services – Experience and challenges" by T. Silaja and Suseela Mathew in the Seminar.
- **Dr. Santhosh Alex**, Sr. Tech. Officer – Hindi Workshop (MPEDA, Cochin - 25 November and 20 December, FSI, Cochin – 15 December, NPOL, Cochin – 17 December, CMFRI, Cochin – 18 December, AG's Office, Cochin – 19 December) (As resource person).



- **Dr. Santhosh Alex**, Sr. Tech. Officer and **Dr. P. Shankar**, Tech. Officer – National seminar in Hindi, NPOL, Cochin (21 November). They also presented the following papers in the Seminar:
 1. Role of Hindi in Science and Technology by Santhosh Alex
 2. Importance of Hindi journals and programmes in Science and Technology by P. Shankar
- **Shri P.J. Davis**, SAO – Regional workshop on RTI – Improving transparency and accountability in government, Cochin (19 December)
- **Shri K. B. Sabukuttan**, AAO – Orientation training programme on Record management, National Archives of India, Puducherry (26-28 November)
- **Shri T. Viswanathan**, AAO and **Smt. Suni Surendran**, LDC – Workshop on Service tax, KSPC, Cochin (26 November)
- **Smt. K. Renuka**, Asst. – Special training programme on Recruitment rules, ISTM, New Delhi (10-21 November)
- **Smt. Shiji John**, UDC – Special training programme on Noting and drafting, establishment rules etc., ISTM, New Delhi (24 November – 5 December)
- **Shri M. Kiran Das**, RA – Global Agro-Meet & Biofach India - International conference and exposition on Value added processing, Cochin (6-8 November)
- **Kum. K.L. Chithrakala**, SRF – Indo-EU Workshop on Coastal zone management and impact on society, Alappuzha (6-9 October)
- **Shri K. Rushinadha Rao**, SRF – Training programme on Geospatial technologies: Wetland ecosystem, Andhra University, Visakhapatnam (1-21 December)

Personalia

Appointments

1. Shri Anuj Kumar, Scientist, Food Technology, ICAR-CIFT, Cochin

Promotions

1. Smt. P.K. Shyma, Sr. Tech. Officer, ICAR-CIFT, Cochin as Asst. Chief Tech. Officer
2. Shri B.K. Panda, Sr. Tech. Officer, ICAR-CIFT, Cochin as Asst. Chief Tech. Officer
3. Shri K.V.S.S.K. Harnath, Sr. Tech. Officer, ICAR-CIFT RC, Visakhapatnam as Asst. Chief Tech. Officer

Transfers

1. Shri K.S. Sreekumaran, AF&ACO, ICAR-CIFT, Cochin to ICAR-CMFRI, Cochin

Retirements

1. Dr. S. Sanjeev, Principal Scientist, ICAR-CIFT, Cochin
2. Shri Tomy Rebellow, Tech. Officer, ICAR-CIFT, Cochin
3. Dr. C. Jessy Joseph, DD(OL), ICAR-CIFT, Cochin
4. Smt. P.K. Thankamma, Asst., ICAR-CIFT, Cochin
5. Smt. V.P. Vijayakumari, Private Secretary, ICAR-CIFT, Cochin

Initiatives for Business Incubation in Fisheries at ICAR-CIFT

The concept of business incubation is gaining momentum all over the world as a successful business model, particularly in developing countries like India. In this era of globalization, where scientific knowledge and research findings have proved to be the key elements of economic development of a country, the role of Business Incubators assumes an important position in the new business paradigm. The Business Incubators acts as catalysts for economic growth by combining the features of technology commercialization, entrepreneurship and business facilitation.

Business incubators can make use of the increasing demand of high level of entrepreneurship development and integrate its activities into the fabric of the community for achieving economic development. The heart of a true business incubation programme is the ongoing, personalized, and comprehensive services that are provided to its clients. By following best practices, an incubator can merge inno-

vation and entrepreneurship, support and guide entrepreneurs to market their business concepts, work effectively to reduce the failures and attain ability of free standing in the global market.

From the experience gained from the interaction with budding entrepreneurs, three primary reasons have been identified, which creates difficulty to the small and medium start-up businesses to remain competent. They are lack of access to capital, lack of managerial skills, and the lack of knowledge about how to estimate their markets, gauge growth and potential business basics. Incubators are proved tools that can specifically address these three issues. High risk start-ups are instrumental in creating jobs, and business incubators play a role in making and leveraging the investments these entrepreneurs make.

Fisheries sector with its important role played in the socio-economic development of the country has become a powerful income and employment generator, and stimulates



the growth of a number of subsidiary small, medium and large scale industries. In order to translate the research results arising from the field of fisheries and other agricultural sectors, ICAR have set up an innovation based Business Incubation Centre (BIC) at the ICAR-Central Institute of Fisheries Technology (ICAR-CIFT), Cochin. BIC is managed by Zonal Technology Management-Business Planning and Development (ZTM-BPD) Unit and aims at establishment of food business enterprises through IPR enabled ICAR technologies.

BIC supports operations on business projects as a measure of enhancing the foundation for new technology based industries and establishing a knowledge-based economy. It focuses on finding new ways of doing business in fisheries and allied agricultural fields by finding doors to unexplored markets. The Centre helps the prospective entrepreneurs, by providing pro-active and value-added business support in terms of technical consultancy, infrastructure facility, experts' guidance and training to develop technology based business ideas and establish sustainable enterprises. It acts as a platform for the speedy commercialization of the ICAR technologies, through an interfacing and networking mechanism between research institutions, industries and financial institutions. The Incubator at ICAR-CIFT differs from traditional Business Incubators as it is tailored specifically for technology based industries and is operational at an area with a high concentration of fish production. This industry-specific incubator also allows new firms to tap into local knowledge and business networks that are already in place. BIC offers their services to industries not only in Cochin, but also all over India through virtual incubation. Beyond promoting business growth, the Centre is also trying to bring its benefits to all the fishing communities in India.

This unique Business Incubator is now known as a "One Stop Shop", where entrepreneurs can receive pro-active, value-added support in terms of technical consultancy, and access to critical tools such as entrepreneur-ready technologies, vast infrastructure and other resources that may otherwise be unaffordable, inaccessible or unknown. With the aim of transforming the incubator into a symbol of entrepreneurship and innovation, the ZTM-BPD Unit has created an environment for accessing timely scientific and technical assistance and support required for establishment of technology based business ventures. The activities of the ZTM-BPD Unit focuses on finding creative and innovative ways for linking public sector resources and private sector initiatives within and across regional and national boundaries for promoting economic growth. The Centre uses the right expertise in relevant fields to identify and analyze the constraints and barriers hindering the growth of a business, and devise appropriate strategies. It explores the various structures and strategies to help small enterprises to grow and ensure a promising future in the

global market. It fosters corporate and community collaborative efforts, while nurturing positive government-research-business relationships.

Process of Incubation

The Business Incubation Centre targets entrepreneurs, from fledgling start-ups in need of basic small scale processing capacity to sophisticated businesses in need of R&D back up, office infrastructure and pilot / test market processing facility for the development of new products. It possesses good infrastructure facilities suitable for providing direct incubation of nine entrepreneurs in a corporate environment within the premises of ICAR-CIFT, at a time. The purpose of direct incubation is to support emerging companies through their infancy. BIC apart from being a multi-tenant facility with on-site management that delivers an array of entrepreneurial services to clients operating with the facility, it also serves clients that are not located in the facility through virtual incubation or incubation without walls.

The Centre regularly conducts industry interface and technology promotional programmes for sensitization of entrepreneurs and to identify interested potential candidates for physical and virtual incubation. The clients at BIC gets the privilege of meeting Scientists, Business Manager and Business Associates directly, to discuss and finalise the strategies to be adopted to take the business forward. It is also the peer-to-peer relationships that develop within the incubator, that ensures the delivery of basic services such as how to actually incorporate a business; what are the legal issues; how to take intellectual property protection; how to do basic accounting and cash flow; how to do business presentations etc. Those kinds of skills are transmitted as part of the incubation process.

The residency period for direct incubatees is normally for two years, extendable by another year in special cases, depending on the progress of incubation. As the business venture becomes mature enough, the concessions and the facilities provided to the incubatee companies will be gradually withdrawn. Each incubatee of the Unit will have to pay to the Institute a charge for utilization of space, at a rate concessional to the benchmark rate which is the prevailing market rent realizable. Incubatee mentoring will continue in virtual mode after graduation, on need basis.

Services and facilities offered by ICAR-CIFT Business Incubator

The Centre through its business support services provides links to supporting industries; upgrade technical / managerial skills; provide scientific / technical know-how; assist in market analysis, brand creation and initial test marketing; protect IP assets; and find potential investors and strategic partners.

Incubation facilities under one roof are:

- Furnished office suites within the premises of ICAR-CIFT,



Pilot Plant at ICAR-CIFT for Business Incubation

with shared facilities like secretarial assistance, computing, copying, conferencing, video conferencing, broadband internet and communication services

- Pilot level production lines
- Culinary facility
- Access to modern laboratory facilities for product testing and quality control
- Access to well-equipped physical and digital libraries

Pilot Level Production Lines

A state-of-the-art generic semi-commercial production facility is made available to incubating entrepreneurs for developing value added products from fish. BIC provides access to these facilities along with support of manpower, and assists the entrepreneurs in production and testing of new product formulations. For the tenants, the pilot plant is an ideal testing arena to determine the commercial viability of new products. The plant also serves as a process lab, a place to see how processing equipment impacts food products under varying conditions. There are production

lines for pre-processing, cooking, retort pouch processing, canning, sausage production, extruded products, chitin and chitosan, smoking, curing and drying, breaching and battering and product packaging. By providing access to these resources, the Centre greatly reduces one of the major barriers to the commercialization of institute technologies by smaller firms - the high capital cost of intermediate or large scale process equipment.

Business Services

The business oriented services offered by BIC include assistance in complying with business regulations and licensing procedures, financing, information services, marketing, and tailor-made services designed for the various tenant enterprises. Incubator clients can also gain special advantage in terms of tax savings through special regulations for Business Incubators. BIC also offers a wide variety of services, with the help of strong associations throughout the Business Incubation Network.

(Inputs by Dr. George Ninan and Dr. C.N. Ravishankar)

List of priced publications available from ICAR-CIFT, Cochin

1. Improved trawls developed at CIFT (₹ 50/-)
2. Microbiological and molecular methods of detection of *Listeria monocytogenes* in seafood (₹ 60/-)
3. Bounties of the sea (Hindi) (₹ 75/-)
4. Enzyme linked immuno sorbant (ELISA) for Chloramphenicol residue in shrimp (₹ 50/-)
5. PCR technique for detection of white spot syndrome virus (₹ 50/-)
6. Synthetic fish netting yarns (₹ 25/-)
7. TED for turtle-safe trawl fisheries (₹ 30/-)
8. TED for turtle-safe trawl fisheries (Tamil) (₹ 50/-)
9. TED for turtle-safe trawl fisheries (Telugu) (₹ 50/-)
10. Fish canning - Principles and practices (₹ 125/-)
11. Laboratory techniques for microbiological examination of seafood (₹ 90/-)
12. Rubber wood for marine applications (₹ 40/-)
13. Value added products from low priced fish (Malayalam) (₹ 50/-)
14. The seafood canning industry in India (₹ 35/-)
15. Gillnets in marine fisheries of India (₹ 100/-)
16. Biochemical methods for determining stress and disease status in Crustaceans (₹ 90/-)
17. Electronic instrumentation technology developed by CIFT (₹ 60/-)



18. Immunological and metabolic alterations during infection and stress in Crustacea (₹ 60/-)
19. Responsible fishing contribution of CIFT (₹ 70/-)
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26. Community fish smoking kilns (₹ 40/-)
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28. Food safety guidelines for common food (₹ 50/-)
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30. Handbook of fishing technology (₹ 500/-)
31. Handbook of fishing technology (Hindi) (₹ 500/-)
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58. Important fishery resources of Madhya Pradesh (₹ 8/-)

For copies write to: The Director, ICAR-Central Institute of Fisheries Technology, CIFT Junction, Matsyapuri P.O., Cochin - 682 029

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Swachh Bharat Mission

"Sanitation is better than Independence"

- Mahatma Gandhi

