ISSN 0971-0167

मत्स्य प्रौद्योगिकी समाचार
Fish Technology Newsletter

Vol. XXIV / No. 4, October - December 2013

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News from the Research Front

First All India Technical Survey on Fishing Craft and Gear

The first all India baseline survey of marine mechanized fishing craft and gear and use of energy in the fishing sector of the country was successfully completed, for the creation of a database on fishing craft of India. A technical report was submitted by FAO experts to the Govt. of India in 1950's. The lack of a technical compilation of fishing craft and gear at the national level and a comprehensive database in this area has been a lacuna for many years which deterred policy makers and administrators from reaching conclusions for decision making. Marine fisheries have gone through significant changes since the 1950's and there has been enormous changes in type of fishing operations, number, capacities, catch and adoption of advanced technologies. Scientists, Research Scholars and Technical Officers from Fishing Technology Division of CIFT carried out this survey from 1st October 2012 to 30th September 2013. This was done as part of the project 'Green Fishing Systems for Tropical Seas' funded by National Fund for Basic, Strategic and Frontier Application Research in Agriculture (NFBSFARA).

The study covered the main fishing harbours and important landing centres all along the Indian coast including Lakshadweep and Andaman & Nicobar Islands. Twenty two maritime districts from the west coast and 15 maritime districts from the east coast and one typical centre each from the island territories were identified as survey locations based on the maximum number of fishing units operated as per CMFRI Marine Fisheries Census 2010, India (Fig. 1). Three to five fishing villages were covered under each

Field level benchmark survey conducted along the Indian coast

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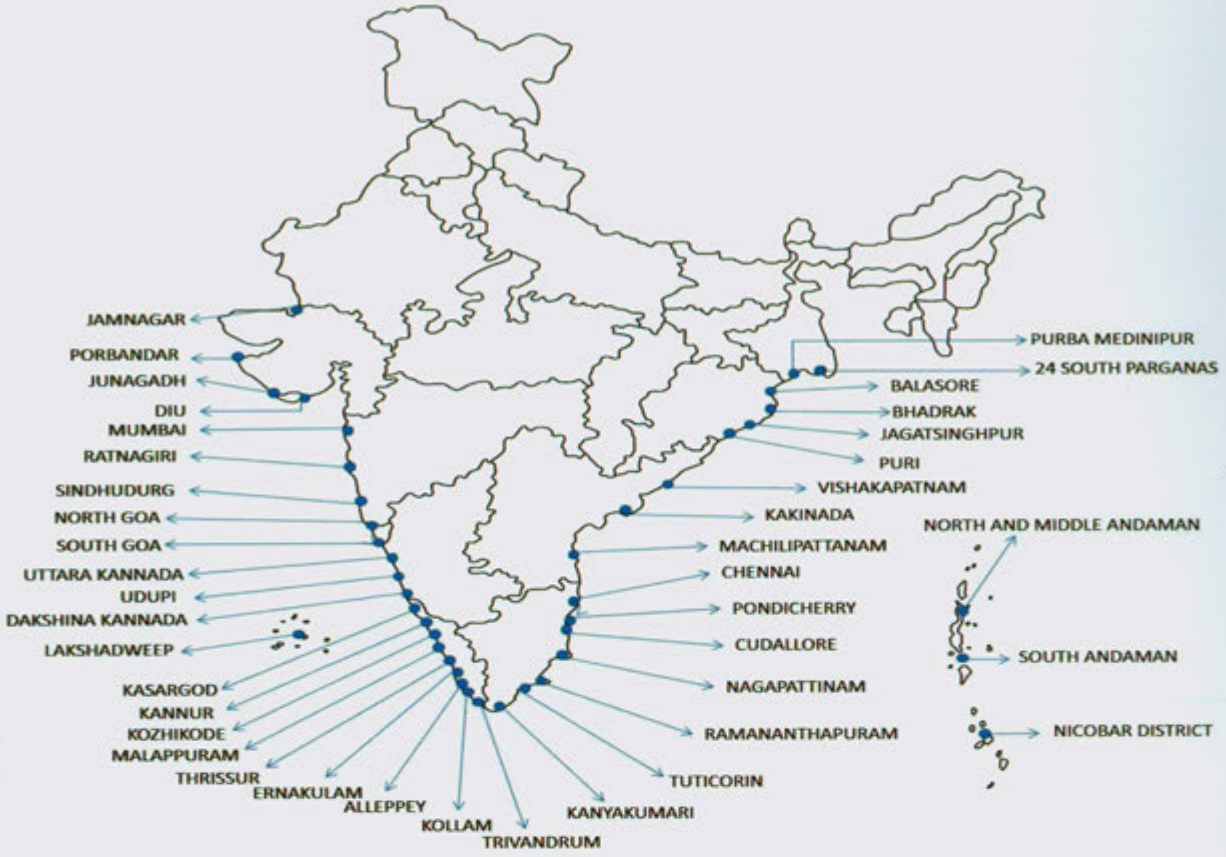
Coastal Districts Surveyed



All India craft and gear survey locations

identified location. Secondary data were collected from state departments, fishermen cooperative societies and log books maintained onboard fishing vessels.

The most popular fishing vessels were identified based on the type of fishing, number of units operating and region of operation and detailed lines plan and structural drawings of 35 selected designs of fishing vessels were documented. The details of the engine power, fish hold capacity, number of crew onboard, type of fishing done from the boat, average fuel consumed during the trip etc. were also collected. The classes of vessels are: trawler, trawler-cum-long liner, purse seiner, gillnetter, gillnetter-cum-long liner, ring seiner and long liner.

As fuel is a major contributor to the operational expenses, the data on engine power, type of engine and approximate fuel consumption for different classes and sizes of vessels were also collected. It was observed that the engine powering was not commensurate to the size of the fishing vessels.

The structural, operational and design differences in the common fishing gear systems of different coastal states *viz*. details regarding the dimensions, materials, accessories like floats, sinkers; operational parameters and specific details of the gears were also studied. The different type of gears operated from mechanized/motorized craft were trawl nets (pelagic and demersal), gillnets (drift gill nets, set gill nets, trammel nets and surrounding gill nets), surrounding nets (purse-seines and ring seines) and hooks and lines (hand lines, long lines and troll lines).

The outcome of the project is expected to benefit the fishing industry in particular and will also benefit researchers and policy makers in general; by quantifying and evaluating the characteristic parameters and operational efficiency of the existing fishing craft and gear designs. These survey results offer strong evidence for the need for effective management measures to be implemented for bringing about brighter future for Indian fisheries.

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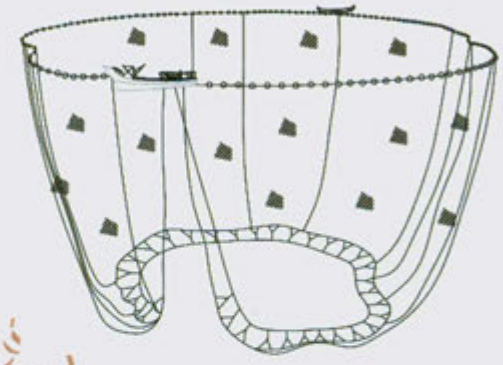
A modified method for calculation of sinking speed of ring seine

Ring seine and its operation

Ring seine is one of the most aggressive, effective and advanced fishing methods practised along the west and east coasts of India. The ring seine or the mini purse seine gear was first designed and introduced by the Central Institute of Fisheries Technology, Cochin as a new gear for the traditional craft. This gear has become very popular among fishermen along the entire coast of India with various modifications of the fishing gears and methods. This gear contributes to a major share of the total marine production of Kerala state with 51.6% of the total landings.

The ring seine differs from purse seine in the mode of operation. The peculiarity of ring seines, which are mostly operated in depths of 20-40m, is that the bottom of the gear touches the sea bed, unlike oceanic purse seine operations. Therefore the depth of the gear (which is mostly 80-100m) is more than twice the depth of operation.

Ring seine in operation



Diagrammatic view of ring seine operation

Sinking speed and catch efficiency

Studies on the underwater behaviour and sinking speed of the fishing nets are being carried out all over the world. The catch efficiency of ring seine depends on its length, depth, sinking speed, net type, hanging ratio, and the skill in operation among which, the sinking speed is one of the most important factors. Webbing weight, mesh size, mesh geometry, material used, twine size, and the hanging coefficients are the principal factors that influence the sinking speed. Effective encircling of a fish shoal with ring seine will take 8 to 12 minutes. Faster sinking speed prevent the escape of fish shoal which moves in the direction opposite to the gear and escape through the open end and bottom portion of the gear. With the help of theoretical sinking speed studies, it is possible to calculate the time required for the gear to touch the bottom of the sea bed and the parameters influencing the sinking. Knowledge of sinking speed coupled with gear related parameters will help in adjusting the operational parameters, thus increasing the efficiency of operation and reducing the production cost of ring seines.

Fishermen are also aware about the importance of sinking speed in ring seine fishing and they tend to increase the weight of the sinker line for faster sinking of the net. The addition of excess sinkers may tear the webbing when operation is carried out in muddy waters. The excess lead weight also increases the total weight and cost of the gear and makes handling/operation more cumbersome.

Although sinking speed has been worked out for purse seines that do not touch the sea bottom, it is for the first time that a method was derived for calculation of sinking speed of a seine that layers towards the bottom portion. In the case of purse seines operated in deeper waters, as described by Misund *et al.* (1992) the net during sinking has a snake part at the top, a twisted part and a straight part at bottom, whereas in the case of ring seine which is operated in shallow waters, the net sinks straight, due to excess weight of webbing, until the sinker line touches the bottom.

This method for theoretical calculation of sinking speed was based on the methods of Dickson (1980); FAO (1990) and Misund (1992) to suit the method of operation followed by ring seines used in shallow waters. The following parameters were taken for calculation of sinking speed: Specific weight of seawater (ρ), Acceleration of gravity (g), Twine drag coefficient (C_d), Skin friction drag (C_f), Hanging Coefficent Floatline (u_1), Hanging Coefficent Vertical direction (u_2), Knot dia.(d_k), Normal area of twine per unit length of headline (A_{ci}), Twine dia.(d), Bar length (a), Drag coefficent of sphere (C_k), Shadow drag coefficent (C_s), Area of webbing (A_s), Lead line sinking speed at depth z (v_z) and Lead line sinking speed at depth i (v_i). For the analysis an assumption was made that the ring seine when sinking

makes a straight path and at all depths the ring seine sinks at a constant speed.

$$\text{Sinking Speed (m/min}^{-1}\text{) (Z)} = \sqrt{\frac{G \; X \; 2g}{\rho \; X \; C_{d0} \; X \; S}}$$

G = Weight of ring seine material in water (webbing + accessories)

g = Acceleration due to gravity (m/s^2)

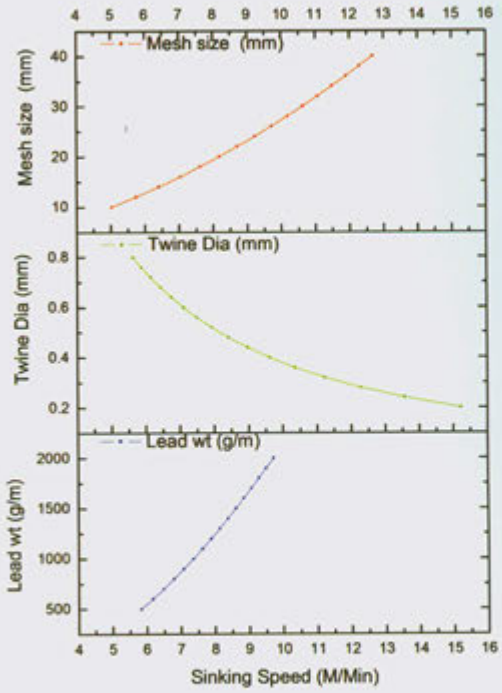
ρ = Density (g/cc) of sea water

C_{d0} = Drag coefficient of knotted meshes

S = Webbing surface area

The formula was applied for varying twine diameter, mesh size and lead weight as shown in the picture:

This method shows that mesh size, twine size, density of webbing material in water and sinker weight are the main factors influencing the sinking speed of ring seines commonly operated along the Kerala coast. Field trials with prototype designs are required for substantiating the theoretical findings.



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Quality evaluation of monosex tilapia during ice storage

Tilapia species is currently one of the most popular cultivated freshwater fish in the world, to such an extent that they have been called the fish of the future. The most important producers of tilapia today are China, Egypt, Indonesia and Philippines. The advantages of tilapia are its rapid growth, resistance to various diseases and stress, tolerance to changing environmental conditions, and willingness to spawn in captivity. Very few studies have been conducted on the quality and shelf life of freshwater fish during ice storage conditions in contrast to the information available for marine species.

The common tilapia is normally highly prolific. As a result, space and food become limited resources leading to a reduced growth rate or even stunting. Batches of young monosex tilapia can be obtained from tilapia breeders by utilizing techniques such as hybridization and hormones. When certain species or strains of tilapia breed with each other, the resulting batch of hybrids consist of a very low number of females or no females at all. Breeding of female *Oreochromis nilotica* (Nile tilapia) or *Oreochromis mossambicus* (Mozambique tilapia) with male *Oreochromis aurea* (Blue tilapia) or *Oreochromis hornorum* (Zanzibar tilapia) will result in all male tilapia offsprings. Such monosex tilapia will have comparatively better growth than common tilapia.

Whole cleaned tilapia

Gutted and cleaned tilapia

Tilapia Steaks

The purpose of this study was to evaluate the quality and shelf life of monosex tilapia during ice storage. Monosex tilapia having an average length and weight of about 22 cm and 266 g respectively was procured from a local culture pond. The sample was further made into three lots *viz*., whole cleaned (Sample A), gutted and cleaned (Sample B) and steaks (Sample C). All the samples were packed in polythene bags and kept in insulated boxes in iced condition. Ice was changed periodically throughout the sampling period and sampling was done at two days interval.

The proximate composition of tilapia was analyzed (Table 1). The fatty acid composition study indicated that oleic acid (33.28%) and palmitic acid (24.70%) were found in higher levels whereas caprylic acid (0.028%) was the most limiting one. The major class fatty acids in tilapia were the mono-unsaturated fatty acids (42.36%), which is mostly on account of the high content of oleic acid. It was also found that omega-3 fatty acid present in the sample was 7.15%. The amino acid analysis indicated higher levels of aspartic acid (16.15%), glutamic acid (22.52%), lysine (15.64%) and alanine (15.74%), whereas tryptophan (0.03%) was the most limiting amino acid. Proline (1.05%), tyrosine (1.69%) and methionine (1.86%) were also found in low levels.

Table 1. Proximate composition of monosex tilapia

Parameter	Composition (%)
Moisture	73.44 ± 0.24
Protein	17.11 ± 0.16
Fat	6.75 ± 0.04
Ash	1.18 ± 0.01

Quality parameters *viz*., pH, TBA, PV, FFA, TMA and TVBN as well as colour and texture were analyzed during the storage period. The moisture content of all the samples remained steady throughout the storage period whereas in all the samples there was a slight increase in pH values which may be on account of the bacterial action on fish during ice storage.

The TBA values showed an increasing trend during the storage. TBA increase was less in Sample A compared to Sample B and C. PV and FFA also showed increasing trend for all the samples indicating that oxidation of fish lipids is taking place during the storage.

Sensory evaluation was conducted based on the quality attributes like appearance, flavour, odour, texture and over all acceptability. The present study showed that whole cleaned samples (Sample A) had a higher shelf life of 27 day and Sample C had a marked off-taste towards the 19th day whereas Sample B was rejected on the 23rd day under iced conditions. The results indicated a gradual reduction in the quality during ice storage.

Monosex tilapia is getting popular and has high potential in the future market. Hence more studies need to be conducted on the quality and processing aspects of the species.

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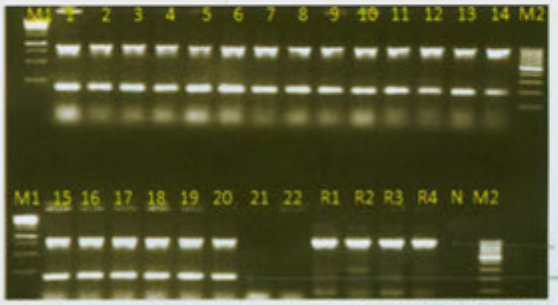
Predominance of Enterotoxigenic *Eschericia coli* in seafood and aquatic environments of Kerala

Escherichia coli can cause wide variety of diseases in human beings including in infants of even after few days of birth. It is having great potential to colonize and reside in the intestinal tract of almost all the warm blooded animals including human beings. *E. coli* is transmitted mostly through contaminated water and food materials which is popularly called as feco-oral route of transmission. Contamination is mainly because of the anthropogenic activity near the water reservoirs such as rivers, lakes, drinking water sources etc. *E. coli* is used as an indicator organism for sewage contamination in water. So, its presence in the food reflects the poor sanitary hygiene and sewage water contamination.



M1-1kb marker, 1-22 *E.coli* isolates,R1- strain 11113, R2- strain12568 R3- strain vt3, R4- strain O42, M2-100bp

Multiplex PCR for detection of enterotoxigenic E. coli targeting pho A (903bp), Lt1 (275bp) Lt2 (720bp), St1 (175bp) genes

Currently, over thousands of serotypes are identified and predominant serogroups are non-pathogenic which resides in the intestinal tract and only few groups are pathogenic. Previously serogrouping was the test method used to categorize *E. coli*. *E. coli* are categorized into major six pathotypes based on presence of virulence determinants. They are: 1. Enterotoxigenic *E. coli* (ETEC), 2. Enteropathogenic *E. coli* (EPEC), 3. Enteroinvasive *E. coli* (EIEC), 4. Enteroaggregative *E. coli* (EAggEC), 5. Enterohemorrhagic *E. coli* (EHEC) or Shiga-toxin-producing *E. coli* (STEC), also called verocyto toxin-producing (VTEC) and 6. Diffusively aggregated *E. coli* (DAEC). Among these, EPEC, ETEC, EHEC and EIEC are commonly associated with food. ETEC produce secretory toxins (enterotoxins); EPEC adhere intimately to epithelial cells and induce host cell trans-membrane signaling; EIEC invade eukaryotic cells and STEC produce Shiga toxins.

Detection of these pathogens by conventional methods are not only expensive but also laborious, requires special expertise and various detection assays such as cell culture, cytotoxicity assays etc. Polymerase chain reaction (PCR) assay can be effectively used for confirmation of toxigenic potential and identification of pathotypes of *E. coli*. A study was conducted to screen fish, shellfish and water samples from landing centers and retail markets located at Alapuzha, Kottayam and Ernakulam districts of Kerala, India for pathogenic *E. coli* targeting genes for virulent characters by PCR. Typical *E. coli* colonies obtained from Levine-EMB agar were confirmed by biochemical tests and pathotyped by two single gene specific PCR assay (one targeted against *bfpA* gene specific for EPEC, one targeted against *rfbeO157* specific for *E. coli* O157:H7) and two multiplex PCR (one targeted against *phoA*, *Lt1*, *Lt2*, *St1* genes specific for ETEC and another targeted against *Stx1*, *Stx2*, *eaeA* genes specific for EHEC). None of the samples harbored *E. coli* O157:H7. Enterotoxigenic *E. coli* was more predominant in the samples than the EPEC and EHEC. The presence of diarrheagenic *E. coli* in the food samples indicates the unhygienic handling practices or the contaminated water used in handling of the fish in retail markets. Hence, it is important to identify the control points along the food production chain to minimize or avoid contamination of fish by these pathotypes and to ensure seafood safety.

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Jawala shrimp and tilapia: Potential candidates for seafood analogues

Jawala shrimp (*Acetes* sp.) is one of the major non-penaeid species harvested in huge quantities along Maharashtra coast. The utilization or processing of this species is a major concern as it is very small in size and is very difficult to peel. Hence, majority of the catch is either discarded or sundried in a traditional way. As the shrimp is having the texture and flavour of that from the penaied groups such as *Peneaeus* or *Metapenaeus* spp., there is a scope for utilization of this species for the development of value added products. Similarly, tilapia is a widely cultured freshwater fish species in India. The meat of tilapia is boneless and white in colour and hence, it is suitable for developing mince based products.

Presently, several value added seafood products are being developed to meet the demand of working population all over the world. Surimi-based analogues or surimi

Jawala shrimp

Cooked shrimp analogue before battering and breading

Battered and breaded shrimp analogue

seafood is considered as a low cost alternative to shrimp/ lobster and has great prospects for earning foreign exchange. Seafood analogue is one such product prepared out of surimi. Analogues are also called imitation products as it imitates the colour, flavour and appearance of the authentic products. An imitation product with a very specific texture is generated by the gelling of proteins and the gelatinization of starch.

Table 1. Sensory score for the boiled and coated shrimp analogue

Attribute	Average Score*	
	Without coating	Coated
Colour	8.2	8.55
Appearance	7.95	8.50
Odour	8.25	8.45
Texture	7.85	8.65
Flavour	7.85	8.55
Over all acceptability	8.05	8.54

*based on 9 point hedonic scale

Mumbai Research Centre of CIFT has standardized a method to develop an analogue product based on tilapia surimi and Jawala extract. Jawala extract was prepared from Jawala shrimp using a suitable buffer. The whole Jawala shrimp is homogenized and extracted with the buffer at room temperature. The extract showed good sensory properties in terms of odour and taste of that of shrimp. For the preparation of analogue product, surimi was prepared from tilapia mince using two washing steps in chilled water. The mince was manually pressed by using a muslin cloth and was ground with sucrose, salt, corn starch, Jawala extract and oil in a grinder. The total grinding time given was 15 minutes. Temperature of the mixture was maintained at 4 °C during grinding. The finely ground paste was made into a layer of 1 cm thickness and was cooked at 90 °C for 30 min. in a water bath.

Addition of Jawala extract imparted a light pink colour to the product. The cooked product was cut into the shape of fingers and then battered, breaded and fried. Both the boiled and coated product imitated the flavour of shrimp. The texture of the product was assessed by folding test and graded as 'A'. The coated fingers showed satisfactory sensory acceptability by the sensory panel. The overall sensory acceptability of the product is given in Table 1. The boiled product can also be used as a base material for seafood salads. The analogue product can be stored in chilled or frozen condition.

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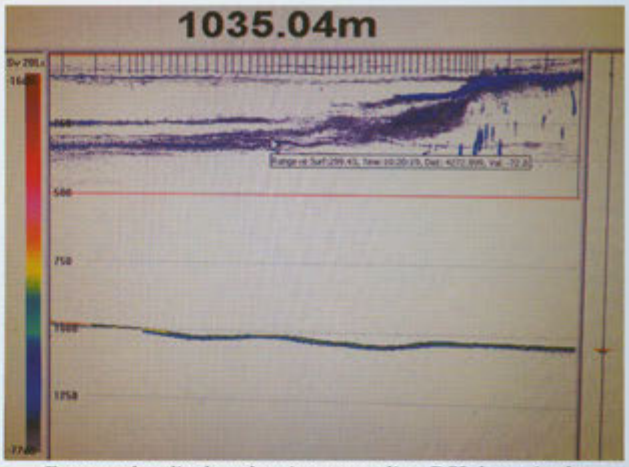
Aimed trawling for myctophids in the Arabian Sea

Harvesting of under-utilized fish resources are among the possible solutions to sustain capture fish production and also to facilitate the recovery of over-exploited conventional fish resources. Under-exploited resources such as mesopelagic fishes, mostly constituted by myctophids, squids and krill, are the most promising potential resources in this respect (FAO, 2001). Vipin *et al.* (2012) reported 137 myctophid species from Indian Ocean. Various reports stated that these fishes are a potential resource for production of commercial fishery products such as fish meal, fish oil, fish silage and surimi and some other products like lubricating oil, cosmetics and wax (Nair *et al.*, 1983; Noguchi, 2004; Olsen *et al.*, 2010).

To develop the technologies for commercial exploitation and utilization of myctophids, CIFT has taken a MoES/CMLRE funded project titled, "Myctophid resource assessment in the Arabian sea and development of harvest and post harvest technologies for their utilization". Under the project CIFT has fabricated a 45 m four equal panel myctophid trawl taking into consideration

45 m myctophid trawl under tow

Shooting of 49.5m Cosmos krill trawl

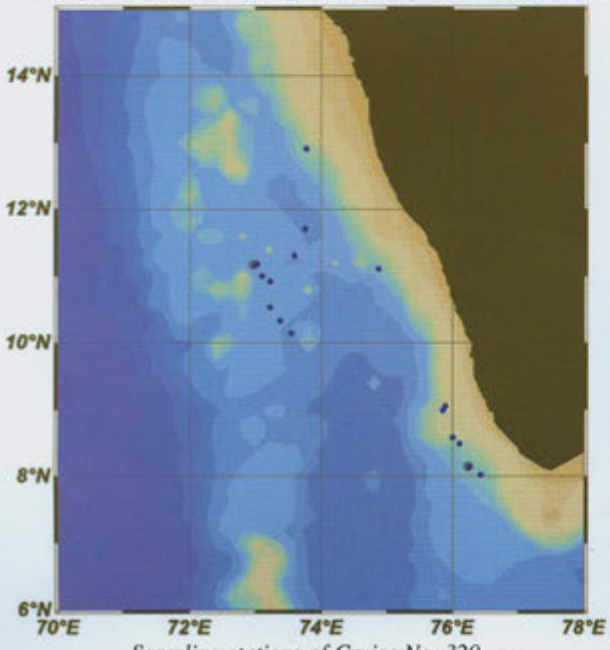


Ecosounder display showing ascending DSL layer in the evening

of biological and behavioural characteristics of the myctophid species and fishing conditions, and characteristics of the vessel. Performance evaluation of net was carried out in comparison with Cosmos krill mid water trawl of Danish origin, from FORV Sagar Sampada.

The FORV Sagar Sampada Cruise No. 320 started on 4th October 2013 from Cochin and ended on 16th October, 2013. 45 m myctophid trawl and 49.5 m Cosmos trawl was operated at 18 stations in combination with Thyboron trawl door (Type-7) each weighing 700 kg and depressor weighing 150 kg at a depth range of 120-2230 m. SIMRAD EK60 and EA60 eco sounders at 38 KHz and 120 KHz were used to detect the DSL.

Experimental trawling was carried out off Kollam, Thiruvananthapuram, Beypore, Lakshadweep Sea and Mangalore. The catch comprised of fin fishes, cephalopods and crustaceans. Total catch of mesopelagic fishes ranged from 3 kg to 67.8 kg/haul of which myctophids catch constitutes 0.9 kg to 40.68 kg. Eleven species of myctophids and 30 other species were identified onboard using standard keys. Major species are *Benthosema pterotum*, *B. fibulatum*, *Myctophum spinosum* and *Diaphus watsei*. Out of 18 stations surveyed, major quantity of myctophids was recorded at Station 7 and 10 in the Lakshadweep sea.



Sampling stations of Cruise No. 320

In general, catch of mesopelagics was less probably due to the less towing speed realized against the required speed of 2.5k to 3k. Further when the DSL was within 100m depth during night and is relatively easy to capture, fishing operations could not be carried out due to safety issues. Catch was less in 45 myctophid trawl, compared to Cosmos trawl as the codend mesh size is 25 mm in the former and 10 mm for the later. An inner lining with PA knotless netting having 10-15 mm mesh size can be

Catch of myctophids off Lakshwadeep

Catch dominated by Chauliodus sloani and Oplophorus typus

provided for the codend of 45 m trawl, like the Cosmos trawl, to retain all myctophids.

Declining catches from the intensively fished shelf waters have made the myctophids, a potential resource for exploitation. Further trials planned in the projects from research vessels of CMLRE and CIFT and onboard commercial deep sea shrimp trawlers in Kollam will reveal the extent of resource availability and also to optimize harvesting technologies.

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Isolation and characterization of thermophilic *Campylobacter* spp. from seafood

Thermophilic *Campylobacter* infection is one of the very important emerging food-borne diseases of human beings. In United States of America (USA) among all food-borne bacterial diseases, the incidence of *Campylobacter* spp. is highest followed by *Salmonella*. In a calendar year *Campylobacter* spp. was responsible for 43,696 laboratory confirmed cases of food-borne diseases in USA with around 17.1% hospitalization rate (Scallan *et al*., 2011). In India due to lack of sufficient surveillance measures and proper sampling of food stuffs for thermophilic *Campylobacter* spp., it is very difficult to ascertain the actual occurrence rate of this group of pathogen in different food items. Moreover, the difficulty in isolation procedures very often under-estimates the occurrence rate of this organism. In India, there are reports of isolation of thermophilic *Campylobacter* from chicken and vegetables and very often *Campylobacter* spp. has been isolated from stool samples from the patients suffering from diarrhoea in different parts of the country including Kerala (Indira Devi *et al*., 1989; Kumar *et al*., 2001; Rizal *et al*., 2010). Among different species of thermophilic *Campylobacter; C. jejuni, C. coli* and *C. lari* are the most important. They cause mild to severe form of diarrhoea and are very often associated with bloody diarrhoea. In addition to these, *C. jejuni* was also found to cause Guillain-Barre syndrome, an autoimmune disorder affecting peripheral nervous system causing ascending paralysis. *Campylobacter* lari has also been reported to cause prosthetic joint infection, pleurisy, urinary tract infection and bacterimia. Thermophilic *Campylobacter* is mostly transmitted to human beings through consumption of contaminated chicken, pork and beef. Seafood is not generally considered as a potential source of *Campylobacter* infection in human beings. But there are reports of isolation of *Campylobacter* spp. from seafood (Wilson and Moore, 1996). In India, there is no reported work on study of prevalence of thermophilic *Campylobacter* in seafood. Keeping this in view, the present study was undertaken with the objectives of studying the occurrence of thermophilic *Campylobacter* in fishes sold in Cochin and surrounding area and also to standardize a PCR for identification of *Campylobacter jejuni* in seafood.

A total of 99 samples of fish and fishery environment including ice and sea water from different markets and fish farms of Ernakulam and Thrissur districts were screened for the presence of thermophilic *Campylobacter* during the period August, 2011 to October, 2013. Ten 1g of sample was blended in 90 mL of Bolton broth with 7% laked horse blood and was incubated at 37 °C for 4 h and then incubated at 42 °C in an anaerobic jar with *Campylobacter* gas generating kit (Difco). Then 10 µl of the culture from this enrichment was streaked onto *Campylobacter* selective agar plates (Skirrow and Blaser-Wang). The plates were incubated at 42 °C for 48 h under *Campylobacter* gas generation kit (Difco). Suspected *Campylobacter* colonies (slightly translucent pink convex shiny colonies with regular edges) were picked up, purified on respective agar

Fig. 1: Compylobacter jejuni specific PCR at different annealing temperatures using DNA of C. jejuni white shrimp isolate as template: Lane M: 100 bp DNA ladder (Fermentas), Lane 1: 58 °C, Lane 2: 60 °C, Lane 3: 62 °C, Lane 4: 64 °C, Lane 5: 66 °C, Lane 6: 68 °C

Fig. 2: Compylobacter jejuni specific PCR at 62 °C annealing temperature: Lane M: 100 bp DNA ladder (Fermentas), Lane 1: Edwardsiella tarda, Lane 2: Staphylococcus aureus, Lane 3: Listeria monocytogenes ATCC 19115, Lane 4: Lactobacillus plantarum, Lane 5: Vibrio parahaemolyticus, Lane 6: C. jejuni (White shrimp isolate) and Lane 7: C. jejuni (Acetes isolate)

and inoculated into Bolton broth and was incubated at 42 °C under 10% CO_2 concentration. All the suspected isolates were checked for aerobic growth at 42 °C. Suspected isolates, which didn't grow aerobically, were selected for further confirmation. The cultures were further characterized by biochemical tests as mentioned in Bacteriological Analytical Manual, USFDA. The *C. jejuni* isolates were further confirmed by *C. jejuni* specific PCR using primers HIP400F (5`-GAAGAGGGTTTGGG TGGTG-3`) and HIP1134R (5`-AGCTAGCTTCGC ATAATAACTTG-3`) targeting *hipO* gene of *C. jejuni* (Linton *et al.*, 1997). This PCR assay was performed at different annealing temperatures *viz.* 58, 60, 62, 64, 66 and 68 °C. The specificity of the PCR assay was checked with different bacterial species including *Edwardsiella tarda, Escherichia coli, Staphylococcus aureus, Listeria monocytogenes, Bacillus cereus, Lactobacillus plantarum, Salmonella* Welterverden, *Aeromonas hydrophila,* and *Vibrio parahaemolyticus*.

Out of 99 samples analyzed for thermophilic *Campylobacter*, two samples were found to harbour *Campylobacter jejuni*. A total seven isolates were recovered from those positive samples. Interestingly, both the positive samples were shellfish i.e. Indian white shrimp (*Fenneropenaeus indicus*) and Jawala paste shrimp (*Acetes indicus*). In addition to this, one sample was found to harbour *C. upsaliensis*, which is apparently non-pathogenic. Both the positive samples were procured from such a fish market, where chicken and fish are being sold in close vicinity. In *C. jejuni* specific PCR assay, all the isolates yielded 735 bp PCR products from all the seven isolates. This particular PCR was carried out at different annealing temperatures and it was found that 62 °C was the most suitable annealing temperature. The amplification was observed up to 66 °C while, no amplification was observed when the PCR was carried out at 68 °C. In case of 64 and 66 °C annealing temperatures, non-specific amplification was also observed (Fig. 1).

As far as the specificity of the PCR is concerned, no cross amplification was found with any of the other bacteria *viz. Edwardsiella tarda, Escherichia coli, Staphylococcus aureus, Listeria monocytogenes* ATCC 19115, *Bacillus cereus, Lactobacillus plantarum, Salmonella* Welterverden, *Aeromonas hydrophila* and *Vibrio parahaemolyticus* (Fig. 2).

In many places of India including Kerala, chicken and fishes are being sold from the same market. So, there is every possibility of transmission of *Campylobacter* spp. from chicken to fishes. In the present study, two shrimp samples were found positive to thermophilic *Campylobacter* species and both the samples were procured from the same fish market, where fish and chicken are being sold in the close vicinity. PCR targeting *hipO* gene is a very reliable method for identification of *C. jejuni* as this gene is very unique in this pathogen. Here all the isolates were confirmed by *hipO* gene specific PCR. This indicates that the existence of *C. jejuni* in fish market although the rate of occurrence is very less. Hence, it is also required to periodically screen the seafood samples for thermophilic *Campylobacter* species.

References

Indira Devi, K., Rajamma, L. and Sukumaran, M. (1989) - *Campylobacter* diarrhoea in children in Trivandrum. *Indian J. Paediatrics*, **56:** 657-660.

Kumar, A., Agarwal, R.K., Bhilegaonkar, K.N., Shome, B.R. and Bachhil, V.N. (2001) - Occurrence of *Campylobacter jejuni* in vegetables. *Intl. J. Food Safety*, **67:** 153-155.

Linton, D., Lawson, A.J., Owen, R.J. and Stanley, J. (1997) - PCR detection, identification to species level, and fingerprinting of *Campylobacter jejuni* and *Campylobacter coli* direct from diarrheic samples. *J. Clinical Microbiol.*, **35:** 2568-2572.

Rizal, A., Kumar, A. and Vidyarthi, A.S. (2010) - Prevalence of pathogenic genes in *Campylobacter jejuni* isolated from poultry and human. Intl. *J. Food Safety*, **12:** 29-34.

Scallan E., Hoekstra, R.M, Angulo, F.J., Tauxe, R.V., Widdowso, M.A., Roy, S.L., Jones, J.L. and Griffin, P.M. (2011) - Food-borne illnesses acquired in the United States - Major pathogens. *Emerging Infectious Diseases*, **17:** 7-15.

Wilson, I.G. and Moore, J.E. (1996) - Presence of *Salmonella* spp. and *Campylobacter* spp. in shellfish. *Epidemiology & Infection*, **116:** 147-153.

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Microbiology, Fermentation and Biotechnology Division, CIFT, Cochin

Publications

Research Papers

1. Bindu, J., Kamalakanth, C.K., Ravishankar, C.N. and Srinivasa Gopal, T.K. (2013) - Development of ready to serve rice and sardine curry in high impact polypropylene containers, *Fish. Technol.*, **50(4):** 307-312.
2. Boopendranath, M.R. and Shahul Hameed, M. (2013) - Energy analysis of mini-trawl operations, off Cochin, Kerala, India, *Fish. Technol.*, **50(4):** 289-293.
3. Leela Edwin, Saly N. Thomas, P. Pravin, Remesan, M.P. and Boopendranath, M.R. (2013) - Trawl codend selectivity of torpedo scad, *Megalapsis cordyla* (Linnaeus, 1758), *Fish. Technol.*, **50(4):** 351-353.
4. Madhusudana Rao, B., Floyd L. Inman III and Len Holmes (2013) - Bioluminescence and chitinase production during chitin fermentation by *Vibrio harveyi*, *J. Life Sciences, USA*, **7(5):** 97-104.
5. Madhusudana Rao, B., Murthy, L.N. and Prasad, M.M. (20123) - Shelf life of chill stored pangasius (*Pangasianodon hypophthalmus*) fish fillets: Effect of vacuum and polyphosphate, *Indian J. Fish.*, **60(4):** 93-98.
6. Muhamed Ashraf, P. and Saly N. Thomas (2013) - Electrochemical characteristics of micro and nano metre sized mixtures of cerium oxide incorporated aluminum, *Indian J. Chemical Technol.*, **11:** 400-405.
7. Nikita Gopal and Leela Edwin (2013) - Technology evaluation model for rural innovations - Case study of rubber wood fishing craft for the small-scale fisheries sector, *Fish. Technol.*, **50(4):** 331-336.
8. Raghu Prakash, R., Rajeswari, G., Sreedhar, U. and Swamy Kumar, M. (2013) - Size selectivity of square mesh codends for *Saurida tumbil* (Bloch 1795) and *Nibea maculata* (Bloch & Schneider, 1801) in Bay of Bengal, *Fish. Technol.*, **50(4):** 285-288.
9. Sanjoy Das, Lalitha, K.V. and Nirmala Thampuran (2013) - Isolation and molecular characterization of atypical entertoxigenic *Bacillus cereus* with negative Voges-Proskauer reaction from Indian white shrimp *Fenneropenaeus indicus* (H. Milne Edwards, 1837), *Indian J. Fish.*, **60(4):** 113-117.
10. Sreekanth, G.B., Chakraborty, S.K., Jaiswar, A.K., Renjith, R.K., Pazhayamadom, D.G., Kamei, G., Visakh, G. and Ali, S.S. (2013) - Analysis of merisic characters of the Japanese threadfin bream, *Nemipterus japonicas* (Bloch, 1791) along Indian coast, *Indian J. Fish.*, **60(4):** 119-121.
11. Viji, P., Binsi, P.K. and Visnuvinayagam, S. (2013) - Extrusion technology in developing ready to eat fish based snacks. *Beverages & Food World* **40(11):**
12. Visnuvinayagam, S., Binsi, P.K. and Viji, P. (2013) - An insight to sulphite-reducing *Clostridia*. *Beverages & Food World*. **40(12):** 31.

Training Programmes

Cochin

1. Value added fishery products (5 August - 4 November & 26-30 November)
2. Proximate analysis of fish (30 September - 5 October & 31 October - 7 November)
3. Modern analytical techniques in biochemistry (30 September - 10 October)

4. HACCP concepts (21-24 October)
5. Value addition and secondary agriculture with special reference to fish and fishery products (21-24 October)
6. ISO 22000 and HACCP for seafood industry (4-18 November)
7. Laboratory techniques in microbiological examination of seafoods (19 November - 2 December)
8. Fisheries by-products, prawn shell powder, chitin, chitosan and glucosamine hydrochloride (2-28 December)

Visakhapatnam

1. Laboratory techniques for microbiological examination of seafoods (2-12 December)

Mumbai

1. Value addition and fishery waste management (20-22 November)
2. Preparation of value added fishery products (11-13 December)

Value addition and secondary agriculture with special reference to fish and fishery products at Cochin

Participants and faculty of training programme at Visakhapatnam

Value addition and fishery waste management at Mumbai: Participants and faculty

Preparation of value added fishery products at Mumbai

Participation in Exhibitions

During the quarter the Institute participated in the following exhibitions:

1. Exhibition held in connection with the 8th National conference of Krishi Vigyan Kendras, UAS, Bangalore during 23-25 October, 2013.
2. Exhibition held in connection with the National seminar on Taxonomy for managing biodiversity: Present scenario and future challenges, Dr. V.S. Krishna Govt. College, Visakhapatnam during 25-26 October, 2013.
3. 11th Rural Technology Mela held at Rural Technology Park, NIRD, Hyderabad during 8-13 November, 2013.
4. India International Trade Fare, Pragathi Maidan, New Delhi during 14-27 November, 2013.
5. Exhibition held in connection with 'Arunachal Meen Mahotsav - 2013' at Itanagar, Arunachal Pradesh during 21-22 November, 2013.
6. Exhibition held in connection with the National seminar SYMSAC-II at HSR Research Centre, Madikeri, Karnataka during 27-29 November, 2013.

7. 'Global Konkan Festival' at Navi Mumbai during 14-17 December, 2013
8. Exhibition held in connection with 7th International Food Convention at CFTRI, Mysore during 18-21 December, 2013.
9. 'Karshika Mela - 2014', Thodupuzha during 26 December 2013 to 4 January, 2014.
10. Exhibition organized by Department of Fisheries at Gondia, Maharashtra on 27 December, 2013.

Exhibition at Bangalore

Dr. U. Sreedhar, Senior Scientis, CIFT explaining at IITF

Dr. D. Rameshwar Singh, Project Director, DKMA, ICAR and Dr. S.D. Singh, ADG (I. Fy.), ICAR visiting CIFT stall in IITF

Rural Technology Mela at Hyderabad

Visit of Arunachal Chief Minister Shri Nabam Tuki at CIFT stall at Itanagar

Global Konkan Festival at Navi Mumbai

Exhibition at Gondia

Outreach Programmes

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

1. Workshop cum training programme on 'Advances in long lining' for the fishermen engaged in long lining operations at Vizhinjam on 1 October, 2013.
2. Awareness programme on 'Contaminants in seafood' at Moothakunnam, Ernakulam district on 11 October, 2013.
3. Training on 'Value added products' at Kottapalem and Lankevanidibba at Repalle, Guntur district during 5-6 November, 2013.
4. Training-cum-demonstration programme on 'Harvest and post harvest technology' under Tribal Sub Plan Programme at Vengalaraya Sagar, Vizianagaram district during 21-23 November, 2013.
5. Training-cum-demonstration programme on 'Harvest and post harvest technology' at Ranchi, Jharkhand during 15-18 December, 2013.
6. Training cum demonstration programme on 'Improved fishing nets and responsible fishing techniques' at Frasergunj, West Bengal on 18 December, 2013.
7. Training-cum-net distribution programme on 'Improved fishing nets and responsible fishing techniques' at Ramakrishna Ashram KVK, Nimpith, West Bengal on 19 December, 2013.

Short Course on Marketing Research for Value Chain in Fisheries

A 10 day ICAR Short Course on "Marketing Research for Value Chain in Fisheries", was organized by CIFT, Cochin during 1-10 October, 2013. Dr. Nikita Gopal, Senior Scientist, EIS Division was the Course Director and Dr. S. Balasubramaniam, Head, EIS Division was the Co-Director.

Marketing is the process of communicating the value of a product or service to customers, for the purpose of selling the product or service. It is a critical business function for attracting customers. Creating value is inherent in marketing, and this can be understood from the fact that, the concept of value chain is gaining importance both academically as well as in practical applications in the food industry. The addition of value at each level of the marketing chain is what is envisaged in this approach. This is market linked, and researching the market is, thus an essential component. The course was intended to give the participants an exposure to the tools of marketing research which can be used within a value chain framework. Twenty seven participants from the states of UP, Bihar, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh and Kerala participated in the Short Course. The participants were from diverse backgrounds including research and academics, Central and State Government Departments, private retail sector, NGOs, and students.

The Course had both theory and hands on sessions. Lectures covered the basic concepts of marketing research and value chain. The course gave an exposure to export and domestic marketing scenario and research in the area, introduced the concept of supply chain management, had theoretical and practical statistical applications relevant to marketing research and presented business models in fisheries. Faculty were drawn from CIFT, CMFRI, MPEDA, and the private sector. Field visits to fisheries

Inauguration of the Short Course by Shri N. Ramesh, ITS, Director (Marketing), MPEDA, Cochin

SAS software hands on session in progress

related Institutes in Cochin like MPEDA, NIFPHATT and CMFRI and seafood factory and fish landing centres were organized. Participants were exposed to quantitative tools using SPSS and SAS software. On the last day, participants made brief presentations on topics of their interest related to marketing research.

The course was inaugurated by Shri N. Ramesh, ITS, Director (Marketing), Marine Products Export Development Authority, Cochin on 1st October, 2013 and the Guest of Honour was Dr. R. Narayanakumar, Head, Socio-Economic Evaluation and Technology Transfer Division, CMFRI, Cochin.

Dr. T.K. Srinivasa Gopal, Director, CIFT presided over the valedictory function and handed over the certificates to the participants.

National Training on Non-thermal and Non Chemical Processing Technology

The CIFT, Cochin conducted a National Training on "Non-thermal and Non Chemical Processing Technologies: Application of High Pressure and Pulsed Light Technology for Food Processing" during 18-31 October, 2013. On 18 October the programme was inaugurated by Dr. S. Girija, Director, NIFPHATT, Cochin. The function was presided over by Dr. T.K. Srinivasa Gopal, Director, CIFT and Dr. Mukund V. Karwe, Professor and Chair, Rutgers University, USA was the Guest of Honour. Dr. Karwe released the training manual. Dr. J. Bindu, Senior Scientist was the Course Director.

Alternative or novel food processing technologies are being explored and implemented to provide safe, fresher-tasting, nutritive foods without the use of heat or chemical preservatives. The development of emerging and non-thermal technologies in food processing addresses specific consumer needs toward safe, healthy, and minimally processed foods. These innovative non-thermal processes also lead to environmental friendly and sustainable food manufacturing techniques with low energy requirements and reduced water use that overcome some limitations associated with the current food processing practices. The two main non-thermal processing technologies looked into was High Pressure Processing (HPP) and Pulsed Light Technology (PLT).

HPP holds the potential for preserving foods by combining elevated pressures (up to 900MPa or approximately 9000 atmospheres) and moderate temperatures (up to 120 °C) over a short period. Other advantages of the technology include uniform pressure application, minimal heat damage to food and potential for altering functional properties of foods. The possibility of extending shelf-life without heating the food for prolonged periods greatly helps to satisfy consumer demand for fresher and higher quality heat-sensitive foods.

Pulsed light (PL) is an emerging non-thermal technology consisting of short time high-peak pulses of broad spectrum white light of wavelength 200-1100 nm. Pulsed light treatment is a quick and relatively inexpensive method for reducing the microbial load on a range of different surfaces in food processing environments. Effective PL treatments for the inactivation of bacteria from foods, food packaging, food equipment and utensils, will result in safer and more shelf stable foods, to the benefit of consumers and food industry.

Dr. S. Girija, Director, NIFPHAAT, Cochin inaugurating the training programme

Lecture in progress

Sixteen participants from ICAR Institutes/State Agricultural Universities/Central Agricultural Universities working in a position not below the rank of Scientist/ Assistant Professor/Lecturer attended the training. They represented nine states of the country.

The list of external faculty included Dr. Mukund V. Karwe, Professor and Chair, Rutgers University, USA, Dr. P.S. Rao, Associate Professor, IIT Kharagpur, Dr. Ashish Kumar Singh, Senior Scientist, NDRI, Karnal, Dr. K.P. Sudheer, Associate Professor, KCAET, Tavanur and Dr. Navin Rastogii, Principal Scientist, CFTRI, Mysore.

The following were the topics dealt with in the training: Introduction to food processing, Overview of food engineering and food engineering properties, Introduction to high pressure processing, General overview of high pressure in food applications of HPP for fish products, Rheology, texture, and sensory aspects of foods, Inactivation of pathogenic microorganisms by non-thermal methods, Effect of HPP on bioactive compounds, Pulsed light applications in food, High pressure processing of vegetables, Microbial aspects of high pressure processing, Effect of high pressure on nutritional quality, Design of experiments and analysis of data using statistical methods, Safety standards and certification for sea foods, Economics of HPP and pulsed light technology.

In the hands on training, microbial inactivation kinetics and practical demonstration of high pressure processing of fish, yogurt, fruits etc. and pulsed light was undertaken. Apart from this, field visits to fish processing plants and landing centres were also organized. On completion of the classes CIFT laboratories were visited by the trainees. The programme concluded on the 31st October, 2013 with a formal valedictory function in which evaluation and feedback from participants were sought followed by distribution of certificates to trainees.

Participants and faculty of the training programme

AgrInnovate India Ltd., ICAR First Foundation Day Celebrations

AgrInnovate India Ltd. (AgIn), a "For profit" Company owned by Department of Agricultural Research & Education (DARE), Ministry of Agriculture, Government of India celebrated its First Foundation Day at NASC Complex, New Delhi on 19th October, 2013. The event was organized as a conglomerate on "Innovative Partnerships", in association with National Agricultural Innovation Project (NAIP). Dr. Abhijit Sen, Member, Planning Commission was the Chief Guest of the occasion. The event witnessed inaugural meeting, technical sessions on Building innovative partnerships and Commercialization of NAIP technologies, Launch of website for AgrInnovate India Ltd., Panel Discussions and Technology Exhibition.

Dr. C.N. Ravishankar, Principal Investigator, ZTM-BPD Unit, CIFT, Cochin gave a presentation on the 'Role played by the ZTM-BPD Units in catalyzing agri-business growth'. His presentation covered the activities of all the five ZTM-BPD Units *viz*. CIFT, Cochin, IARI, New Delhi, IVRI, Izzatnagar, CIRCOT, Mumbai and NIRJAFT, Kolkatta, as well as 12 new BPD Units.

As part of the event, the Council honoured entrepreneurs who have successfully adopted ICAR

technologies and established agribusiness ventures. The aim was to recognize and award exceptional entrepreneurial leaders who have demonstrated business excellence, innovation and profitability in association with ICAR Institutes. Two entrepreneurs, Shri K.R. Reddy, Founder Chairman & Managing Director, Sri Biotech Laboratories India Limited, Hyderabad and Shri N. Karthikumar, KRL Foods, Namakkal, Tamil Nadu were selected from the ICAR member institutes of South Zone. Dr. Abhijit Sen gave away the awards and honoured the entrepreneurs.

During the Technology Showcase-cum-Exhibition session, Dr. C.N. Ravishankar presented the technologies under the theme Poultry breeds/Fish strains and Fishery gadgets. This included selected technologies from CIBA, Chennai, CIFA, Bhubaneshwar, CMFRI, Cochin and PDP, Hyderabad.

Dr. Abhijit Sen, Member, Planning Commission visiting the Exhibition Pavilion

'Innovation 4 Industry' Meet in Fisheries

A Business Meet titled 'Innovation 4 Industry for Fisheries' was organized at Vashi, by the Zonal Technology Management - Business Planning and Development (ZTM-BPD) Unit, operational at CIFT, Cochin, Mumbai Research Centre of CIFT along with Sea Food Exporters Association, Maharashtra Chapter on 23 November 2013. The objective of the workshop was to popularize the path breaking technologies developed by CIFT, as well as to scientifically and commercially address the issues faced by the sea food industry in Maharashtra.

Dr. T.K. Srinivasa Gopal, Director, CIFT during his presidential address indicated that the Fisheries Research Institutes under ICAR has got a good number of entrepreneur ready technologies ranging from culture, capture to value addition of fish, which has the potential to attract the fishery industry in India to utilize and exploit the immense investment opportunities available in this sector. He also emphasized on the ZTM-BPD initiative at CIFT in bringing together the scientific community and industry representatives in a single platform. He urged the participants to adopt new and innovative production technologies in fisheries and to bring out profitable business ventures. He also delivered a lead talk on the emerging technologies in fish processing and preservation.

The Chief Guest of the function Shri Rustom Irani, President, Seafood Exporters Association, Maharashtra Chapter in his inaugural speech emphasized the necessity of building public private partnership for the upliftment of the fisheries industry. He insisted all the industrialists and other delegates to utilize the opportunities for diversifying the sector by adopting the innovative technologies developed by CIFT. The workshop consisted of an exclusive technical conference that featured technical presentations and panel sessions for providing a topical arena for the industry professionals to enhance their technical knowledge, share ideas with scientific community and implement new business ideas. The scientists of CIFT, Dr. C.N Ravishankar, Dr. T.V. Sankar, Dr. George Ninan, Dr. A.A. Zynudheen, Dr. C.O. Mohan, Dr. P.K. Binsi, Shri P. Anil Kumar, Deputy Director, MPEDA, Mumbai and Shri Nitin Singh, Business Manager, Business Incubation Centre, CIFT gave presentations during the technical session. The session was followed by the panel discussion on the issues and problems faced by the sea food industry in Maharashtra. The industry meet witnessed participation from 35 seafood entrepreneurs from Maharashtra, officials from Marine Products Export Development Authority (MPEDA), officials from Export Inspection Agency (EIA) and officials from College of Fisheries, Ratnagiri.

Shri Rustom Irani delivering the inaugural speech

Workshop on Koha Open Source Software

'Strengthening of Digital Library and Information Management under NARS (e-GRANTH)' is a subproject under Component-1 of National Agricultural Innovation Project (NAIP), Indian Council of Agricultural Research (ICAR). The prime objective of the project is to provide greater accessibility and visibility to scientific and scholarly literature on agriculture through building collaborative model at local, national and international level for the libraries under NARS.

Union Catalogue and Digital Libraries are the new initiatives of a modern library which have a lot of implications worldwide. e-GRANTH project envisages to make the library resources of partner institutions publically available on the internet. CIFT, Cochin is a part of the implementation of the project and 39 libraries in ICAR system are linked together so that information available in these libraries can be accessed by all by sitting in one library. For this a common open software named Koha has to be implemented in all these libraries.

CIFT, Cochin conducted a two day Workshop on 'Implementation of automated library management system using Koha Open Source Software' during 12-13 December, 2013. The Workshop was intented to develop the capacity of library and information professionals in using the Koha software.

The inaugural session was presided over by Dr. T.K. Srinivasa Gopal, Director, CIFT, Cochin. Dr. A.K. Jain, Principal Scientist, Agriculture Physics Division, IARI, New Delhi, who is the CPI of the Project inaugurated the Workshop. Dr. Suseela Mathew, Principal Scientist and CCPI of the project welcomed the gathering while Smt. T. Silaja, Sr. Tech. Officer and Co-CCPI proposed the vote of thanks

Dr. A.K. Jain inaugurating the Workshop

Shri A.J. Thomson, Librarian. St. Joseph's College, Devagiri, Kozhikode who is associated with Koha open source software since its inception in 2000 was the resource person of the Workshop. The participants were from different libraries all over the country.

Capacity Building Programme for ATMA Women Farmers

A one day capacity building programme on "Entrepreneurship development based on fish value addition" was conducted on 21 November, 2013 by NAIP value chain sub project on "Responsible harvesting and utilization of selected small pelagics and freshwater fishes" in association with Krishi Bhavan, Department of Agriculture, Govt. of Kerala at CIFT, Cochin for a group of women farmers of ATMA from

Participants and faculty

Practical session in progress

Thrikkakkara Grama Panchayath. The main objective of the training was to open the entrepreneurial opportunities for women farmers through the production and marketing of fish based value added products from small pelagics and freshwater fishes. Twenty one women farmers attended the training programme.

During the inaugural function, Smt. R. Sheela, Agriculture Officer, Department of Agriculture explained the significance of the training programme for women farmers. Dr. S. Ashaletha, Senior Scientist & Co-ordinator of the programme gave a lecture on entrepreneurship opportunities in fish based value addition, omega -3 enriched poultry products and the importance of entrepreneurship in the production and marketing of fish based value added products.

The theory session was followed by a practical session. Product demonstration and training was imparted by Senior Research Fellows of the Project. The participants were trained on production of certain selected fish based value added products and an introduction to business planning in this sector was also given.

Training on Culture, Processing and Value Added Products of Trout

A farmers training on "Culture, processing and value added products of trout" was jointly organized by the Directorate of Coldwater Fisheries Research, Bhimtal, Central Institute of Fisheries Technology, Cochin and Krishi Vigyan Kendra, Bajoura, Kullu, at the KVK, Kullu during 11-13 December, 2013. Dr. A. Barat, Director, DCFR inaugurated the programme. Dr. C.N. Ravishankar, Head, Fish Processing Division and Dr. Chandrakantha, KVK in Charge offered felicitations. Dr. J. Bindu, Senior Scientist, Dr. C.O. Mohan. Scientist, Shri V.T. Sadanandan and Shri N. Sunil, Tech. Assts. demonstrated the various processing activities. Forty trout farmers of Himachal Pradesh participated in the training.

Training was mainly imparted on practical aspects which included hygienic handling of trout, filleting (double skin and skinless), preparation of steaks and different types of cuts. Value added products demonstrated included battered and breaded products like balls, fingers and cutlets using mince of trout, condiment-incorporated steaks and trout pickle. The use of pouches and thermoformed trays for packaging different value added fish products and trout pickle were taught to the trainees. Also demonstrated method of preparation of trout silage and feed using trout silage. Procedure for smoked trout in oil in TFS cans was explained in detail since the participants highly appreciated the smoked trout products.

Inauguration of the training programme

Training in progress

Faculty of DCFR, CIFT and KVK

Tribal Sub Plan Programmes at Ranchi, Jharkhand

A Training-cum-Demonstration Programme for the benefit of Scheduled Tribe Fisher Folk for three days under Tribal Sub Plan programme was conducted by Visakhapatnam Research Centre of CIFT at Ranchi, Jharkhand during 16-18 December, 2013. One hundred and thirty tribal fishers associated with different Cooperative Societies have participated and were benefited by the programme. Training was organized at the Director of Fisheries Office, Ranchi and demonstrations on fishing gears were conducted at Hatia Reservoir, Ranchi and Chandil Reservoir, Saraikela District. Chandil Reservoir is the biggest reservoir in Jharkhand with a catchment area of 18900 hectares. Cage culture of fast growing fish like *Pangasius suchi* is being actively followed in the reservoir with the help of State Fisheries Department.

One day prior to the commencement of training programme, the team of experts from Visakhapatnam Research Centre of CIFT visited the local whole sale fish market to assess the marketing conditions. The whole sale fish markets starts at 5.00 AM and will wound up at 6.30 AM. One of the major observations made in the market is aquaculturists selling the produce *sans* middleman. This paves way to profit of the primary producer i.e., aquaculturists.

Survey in progress

View of cage culture in Chandil Reservoir, Saraikela, Jharkhand

The team also visited the Chandil Reservoir which is 80 Km from Ranchi. The progress being made with utilization of aquatic resources for cage culture employing Pangasius could be an eye opener to the rest of country. The team also briefed the electronic media on the importance of TSP and CIFT contribution therein.

On 16 December, 2013 the training programme was inaugurated by Shri Rajiv Kumar, Director of Fisheries, Ranchi. Dr. M.M. Prasad, Principal Scientist and SIC of the Centre explained about the purpose of the training programme in his presidential address. After the inaugural session Dr. Prasad explained to the trainees regarding the importance of fish in nutritional security followed by the technical sessions on 'The latest trends in harvest technologies for inland waters' by Dr. U. Sreedhar, Senior Scientist and 'Utilization of inland fishery resources for value addition' by Dr. L.N. Murthy, Senior Scientist. In the afternoon session, practical demonstrations were held on use of foldable fish traps, employment of eco-friendly fishing gears *viz*., BRDs, TEDs etc. by Dr. Sreedhar. Various technologies developed by CIFT were also showcased in the programme. Foldable fish traps and other inputs were handed over to fishers on gratis. Interactive sessions were held simultaneously while TCDs was in progress. Shri Aditya Swaroop, IAS, Principal Secretary Animal Husbandry & Fisheries, Government of Jharkhand visited the training centre and appreciated the efforts made by CIFT in TSP front. He also emphasized to make maximum use of the technologies developed at CIFT for the development of fisheries in Jharkhand and visited the stall in which technologies developed at CIFT were exhibited.

Shri Mannan Mallick, Hon'ble Minister of Animal Husbandry and Fishery, Govt. of Jharkhand visited the venue and he urged the youth to engage in fishing activities

Shri Aditya Swaroop, IAS, Principal Secretary, AH &F, Govt., of Jharkhand addressing trainees

Shri Mannan Mallick, Hon'ble Minister of Animal Husbandry and Fishery, Jharkhand visiting the venue

Training on Value added fish products

to earn livelihood. Technical demonstrations on hygienic handling of fish and preparation of value added fish products were conducted by Dr. Murthy with the assistance of Shri M. Prasanna Kumar, Tech. Asst., CIFT. Value added products preparation included fish pickle, minced meat preparation using meat mincers, fish pakoda, fish cutlet, fish fingers and fish wafers.

Field demonstrations on different harvest technologies were conducted in Hatia Reservoir, Ranchi. In the afternoon beneficiary feedback was collected and they expressed that training gave them an opportunity to learn many new things related to fisheries. Visit was also made to Chandil Reservoir in order to explore the potential for fisheries harvest and post harvest interventions in future.

Tribal Sub Plan Programme at Vengalaraya Sagar, Andhra Pradesh

Training-cum-Demonstration Programme for the benefit of Scheduled Tribe Fisher Folk for three days under Tribal Sub Plan programme was conducted by CIFT, Cochin at Vengalaraya Sagar, Salur Mandal, Vizianagaram Dist., Andhra Pradesh during 21-23 November, 2013. The tribal fishers affiliated to the Girijana Swadeshi Matsya Parisramika Cooperative Society, China Cheepuravalasa, Salur, Vizianagaram, Andhra Pradesh participated in the programme. Girijana Swadeshi Matsya Parisramika Cooperative Society has 270 tribal fishers as members from 13 villages namely Pandiri Mamidi valasa, Kudhada valasa, Royyavani valasa, Pedda Cheepuri valasa, Chinna Borrapanuku valasa, Lakshmipuram, Jilledu valasa, Annamraju valasa, Paalika valasa and Pasupuvanipalem. These tribal fishers fish in the Vengalaraya Sagar reservoir. The Vengalaraya Sagar has a catchment area of 360.05 Km^2 and the reservoir area is 1903 acres (770Ha).

The programme included Demonstration of fishing gear and traps, Demonstration of coracles in the Vengalaraya Sagar reservoir, Training on value added products preparation *viz*., fish pickle, fish pakoda, fish cutlet, fish fingers, fish wafers minced meat preparation using meat mincers and training on Hygienic handling of

Resource persons from CIFT with officials of the Department of Fisheries

Inauguration of the programme

fish for the benefit of 145 tribal fishers.

Demonstration of use of coracle

Training on Value added fish products

Tribal Sub Plan Programmes at Frasergunj, West Bengal

CIFT, Cochin has organized a training cum demonstration programme on "Improved fishing nets and responsible fishing techniques" at Frasergunj, West Bengal for the benefit of the members of Frasergunj Tribal Fishermen Cooperative Society on 18 December, 2013. The inaugural function was presided over by Shri Sahadeb Mondal, President, Frasergunj Tribal Fishermen Association. Dr. S. Balasubramaniam, HOD, EIS, CIFT welcomed the participants and explained about the tribal plan programmes for the benefit of fisherfolk organized by CIFT under the TSP. The Frasergunj Panchayat Pradhan Smt. Samuli Das inaugurated the programme and the Officer-in-charge, Coastal Police, Frasergunj delivered the Key Note address. Dr. V.R. Madhu, Senior Scientist, Fishing Technology Division, CIFT and Shri H.V. Pungera, Technical Officer, Veraval Research Centre of CIFT conducted the demonstration on 'Improved fishing nets fabrication and rigging'. The code of conduct on responsible fishing has been narrated with particular reference to hilsa fishing. The importance of selective fishing gears like gill net and fabrication and rigging of simple gill nets were explained. About 55 participants (men and women) participated in the programme.

The second training-cum-net distribution programme was conducted at Ramkrishna Ashram Krishi Vigyan Kendra (RAKVK), Nimpith, South 24 Parganas Dist., West Bengal on 19 December, 2013. A total of 50 participants attended the training on "Improved fishing nets and responsible fishing techniques" . Dr. Nilenderjyoti Maitra, Programme Coordinator, RAKVK, Nimpith presided over the inaugural function and Shri P. Chatterjee, SMS (Fishery), KVK welcomed the participants. Dr. S. Balasubramaniam, HOD, EIS, CIFT delivered the Key Note address, and explained about the extension methodologies used for promoting technology adoption and about the tribal plan programmes for the benefit of fisherfolk organized by CIFT under the TSP. Dr. V.R. Madhu, Senior Scientist, Fishing Technology Division, CIFT presented a power point presentation on 'Improved fishing nets and responsible fishing techniques'. Shri H.V. Pungera, Technical Officer, Veraval Research Centre of CIFT conducted the demonstration on 'Improved fishing nets' fabrication and rigging.

During both the programmes, fishing net materials such as nylon monofilament nets (110 mm, 120 mm, 150

Participants and faculty of the programme at Frasergunj

Participants and faculty of the programme at Nimpith

mm mesh sizes) and nylon monofilament nets (180 mm and 200 mm) and PP ropes of 8 mm and 10 mm were distributed among the participants. Each fishermen received materials of about 4 kg nets and 2 kg ropes during the programme. Further, data on the socio-economic conditions of tribal fisherfolk were also collected from the participants.

Distribution of fishing gear

Meeting on Livelihood of Tribal Fishermen

A meeting was held in the Mumbai Research Centre of CIFT on 6 October, 2013 for the betterment of the Tribal fisherman livelihood utilizing TSP funds. The meeting was attended by members of four fisherman societies in Thane District of Maharashtra. The meeting was presided by Dr. T.K. Srinivasa Gopal, Director, CIFT. Dr. Leela Edwin, Head, Fishing Technology Diision, CIFT gave a presentation on the various technology options in fish harvesting. Dr. P.K. Binsi, Scientist of MRC delivered a talk on 'Value addition in fish processing'.

Meeting in progress

Workshop on Valuation and Pricing of Agricultural Technologies

A Workshop on 'Valuation and Pricing of Agricultural Technologies' was organized by AgrInnovate India, ICAR on 26th December, 2013 at NASC, New Delhi. The Workshop was aimed at taking stock of guidelines and methodologies being followed in ICAR and other departments, and also to identify parameters and criteria for development of guidelines and methodology for valuation and pricing of agricultural technologies. ICAR has identified six task groups for development of guidelines in the following areas; Seed and planting material, Plant protection methods and bio-formulations, Food processing and post-harvest management, Animal diagnostics and vaccines, Farm machinery and equipment, and Poultry breeds, fish strains and fish gadgets.

The ZTM-BPD Unit, CIFT led the group 'Poultry Breeds, Fish Strains and Fish Gadgets', to develop guidelines and methodologies for valuation and pricing of all kinds of technologies and material of IP value in this sector. Dr. C.N. Ravishankar, HOD, Fish Processing and PI, ZTM-BPDU attended the Workshop and gave a lead talk on 'Tools and techniques for valuation and pricing of technologies'. He was also the Rapporteaur for the session 'Aspects and parameters to be considered for valuation and pricing, market research and foresight for agricultural technologies'.

Dr. Ravishankar making the presentation

ISO meeting on Fisheries and Aquaculture

The 7th plenary meeting of International Organization for Standardization for ISO/TC 234 'Fisheries and Aquaculture Technical Committee', associated Working Group and Advisory Group meetings were held at Cochin during 28-29 October, 2013. Delegations from Thailand, Iceland, France, Norway, India and other countries participated. The Indian delegation was led by Dr. B. Meenakumari, Deputy Director General (Fisheries), ICAR, New Delhi.

India being the leader of the working group, four set of traceability standards, earlier circulated as committee draft were presented. In this meeting all the

inputs received from various participating nations were deliberated upon and consensus was arrived. The following draft standards on traceability were discussed in detail and recommended for notification as final draft international standard (FDIS):

- ISO/CD 16741: Traceability of Crustacean products - Specifications on the information to be recorded in farmed Crustacean distribution chains
- ISO/CD 18537: Traceability of Crustacean products - Specifications on the information to be recorded in captured Crustacean distribution chains
- ISO/CD 18538: Traceability of Molluscan products - Specifications on the information to be recorded in farmed Molluscan distribution chains
- ISO/CD 18539: Traceability of Molluscan products - Specifications on the information to be recorded in captured Molluscan distribution chains

Mr. Svein Ludvigsen, Chairman of ISOTC-234 addressing international delegates

Dr. K. Ashok Kumar, Principal Scientist and Dr. Satyen Kumar Panda, Senior Scientist, CIFT being members of the drafting committee participated in all the deliberations and replied to queries raised by country delegates. Being a member of Sectional Committee (FAD 12), Dr. T.V. Sankar, Head, QAM Division, CIFT also participated in the country delegation and provided valuable suggestions for traceability standards and attended the advisory group meetings.

The possibility of twinning arrangement with Norway (the present ISO/TC 234 Secretariat) was discussed. Indian delegation agreed in principle to the proposal as it would allow greater involvement of India in governance and technical work development of International Standards under ISO/TC 234. Committee Draft ISO/CD 16488 'Marine finfish farms - Requirement for infrastructure, dimensioning, design, installation, operation and management of open net cage systems' was discussed and country representatives opined for economic up-scaling and regionalization of the cage designs. France presented a new work item proposal (NWIP) on "Minimum requirements for certification of products from sustainable marine fishery" during the meeting.

World Fisheries Day Observations

CIFT Visakhapatnam Research Centre observed World Fisheries Day with the theme "Safety of Fishers" on 21 November, 2013 at Vizianagaram. The programme was organized in collaboration with Department of Fisheries, Government of Andhra Pradesh with extremely good response from fishers of different hamlets, Self Help Groups of Vizianagaram and adjoining areas. In the morning session host of dignitaries from Vizianagarm District delivered talks on various initiatives undertaken for the development of fisheries by different governmental agencies. Dr. S. Balasubrmaniam, Principal Scientist & HOD, EIS, CIFT, Cochin delivered Key Note Address and explained the activities of CIFT. Dr. M.M. Prasad, Principal Scientist & SIC, CIFT Visakhapatnam RC delivered a talk on Development of fisheries in Andhra Pradesh and role of CIFT in the same specially harvest and post harvest aspect of fisheries in Andhra Pradesh. Dr. G. Rajeswari, Principal Scientist delivered a talk on Conservation of the fisheries resources for sustainable development and Dr. L.N. Murthy, Senior Scientist supervised demonstration of different technologies developed at CIFT such as value added fish products. Dr. M.S. Kumar, CTO and Shri P. Radha Krishna, Tech. Officer explained to fishers and other visitors about the technologies and products developed at CIFT through Exhibition. From Department of Fisheries, Govt. of Andhra Pradesh Dr.

Release of souvenir

Phani Prakash, Asst. Director, Fisheries and his team actively participated and organized the programme smoothly and successfully. A souvenir was released on the occasion.

Training cum demonstrations were held in use of foldable fish traps, employment of eco-friendly fishing gears *viz.*, BRDs, TEDs, development of value added fish products etc. An exhibition was also held on various technologies developed at CIFT. FRP coracles, fish traps and other inputs were handed over to fishers on gratis. Interactive sessions were held simultaneously while TCDs were in progress. The programme was widely covered by both print and electronic media.

Dr. L.N. Murthy demonstrating fish wafer preparation

Handing over of CIFT technology coracle to tribal fishermen

International Training Conducted

An international training was organized under TCS Colombo Plan on 'ISO 22000 and HACCP for seafood industry' during 4-18 November, 2013 for Ms Samila Sulani Abeysinghe, Development Officer, Department of Fisheries and Aquatic Resources, Colombo, Sri Lanka.

Another international training programme on 'Fisheries by products, prawn shell powder, chitin, chitosan and glucosamine hydrocloride' under TCS Colombo Plan was conducted during 2-28 December, 2013. Ms Mar Lar Soe, Assistant Fishery Officer and Ms Nwe Ni Aung, Deputy Assistant Fishery Officer, Yangon, Republic of Myanmar were the beneficiaries

Ms Samila with the faculty of the training

Ms Mar Lar Soe and Ms Nwe Ni Aung with the faculty of the training

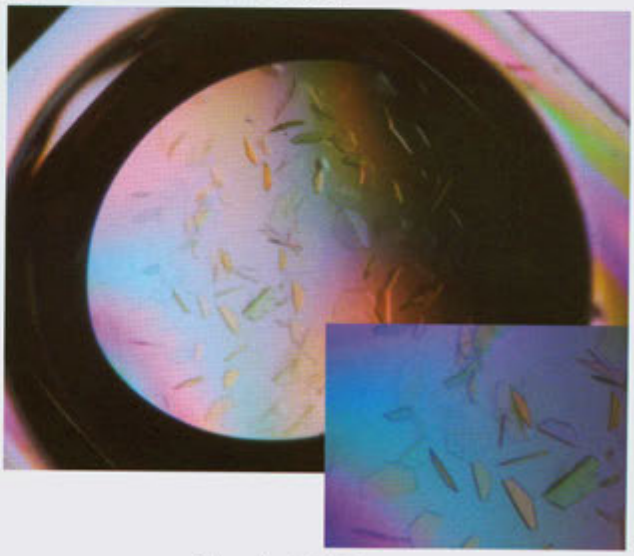
Deputation Abroad

Dr. K.K. Asha, Senior Scientist, CIFT, Cochin was deputed by ICAR, New Delhi for undergoing a three month short term project under the aegis of World Bank-funded National Agricultural Innovative Project (NAIP) at the Biosciences Department of Brookhaven National Laboratory, Department of Energy, Upton, USA. Dr. Asha carried out the work under the mentorship of Dr. Eswarmoorthy Subramaniam during the period 19th September to 17th December, 2013.

Dr. Asha worked on a chromate reductase ChrR, a

Dr. Asha at the Brookhaven National Laboratory

dimeric protein enzyme from *E. coli* that has a very promising role in the field of bioremediation as it is understood to act on the pollutant hexavalent Chromium (Cr VI) and reduce it to the much harmless trivalent Chromium (Cr III) form. She learned cloning techniques, protein expression and purification. She carried out experiments that led her to form a new mutant of the gene, ChrR by introducing a point mutation. Subsequently she used techniques to clone the mutated gene, express the protein in bacterial cells and purify the same. She was able to crystallize a mutant protein by using drop vapor diffusion method and audited the data collecting process in the National Synchrotron Light Source (NSLS). Mutations introduced into strategic positions of the enzyme are expected to enhance its activity many-fold and thus have great relevance for bioremediation. ChrR Y128N is a protein where the amino acid tyrosine (Y) is substituted by aspargine (N) at the 128 position and studies carried out at BNL have shown that this particular mutation has caused an enhancement of the chromate reductase activity of *E. coli* by about 1500 times. Further studies have to be carried out to analyze the catalytic efficiency of the double mutant that was made and expressed during the training. Polyacrylamide gel electrophoresis of the mutant protein (PAGE) was carried out using the samples collected at various stages of purification for determining the purity and efficiency of the protein purification. The final eluted fraction gave only one protein band indicating good purification. The purified protein was used to crystallize under specific conditions. Large and clear crystals of ChrR mutant formed.



Crystals of ChrR mutant

Hindi Workshop Conducted

A Hindi Workshop was conducted for the benefit of Scientists and Technical Officers of the Visakhapatnam Research Centre on 12 December, 2013. Dr. Veerotama Patar, Asst. Director, Hindi Teaching Scheme, Visakhapatnam was the Resource Person for the workshop. She conducted classes on Official Language Policy and Sentence Construction. The staff members took part with great interest and their queries were answered.

Vigilance Awareness Week Observance at CIFT, Cochin

Vigilance Awareness Week was observed at CIFT, Cochin during 28 October to 2 November, 2013. The celebrations started on the morning of 28th October with the Director and Staff of the Institute assembling together and taking the Vigilance Awareness Pledge.

In the meeting held in the afternoon, Shri P.C. Cyriac, IAS (Retd.) and Former Chief Secretary, Govt. of Tamil Nadu delivered a talk on "Promoting good governance: Positive contribution of vigilance". The meeting was presided over by Dr. T.K. Srinivasa Gopal, Director, CIFT. In the talk Shri Cyriac opined that deterrent punishment should be given to people who are caught in corruption. He also suggested that every government office should be directed to issue acknowledgement receipts for complaints by the public. The due date for the grievance redressel should also be intimated. This will lead to good governance. Dr. Leela Edwin, Head, Fishing Technology and Vigilance Officer introduced the Guest and welcomed the gathering. Shri R. Anil Kumar, Senior Administrative Officer Incharge proposed the vote of thanks.

Shri P.C. Cyriac delivering the talk. On the dias are Shri R. Anil Kumar, Dr. T.K. Srinivasa Gopal and Dr. Leela Edwin

Release of Technical Brochures

Mumbai Research Centre of CIFT has released nine technical brochures on the occasion of 'Innovations 4 Industry meet in fisheries' held on 23 November, 2013 at Royal Orchid Hotel, Vashi, Navi Mumbai. The brochures detailing the technical features of some of the technologies developed by CIFT including chitosan and its derivatives, collagen peptide, chitosan sponge, seafood analogues, fish silage, fish oil for food fortification, instant fish gravy mix, fish sausage and fish de-scaling machine were released by the Chief Guest of the function Shri Rustom Irani, President, Seafood Exporters Association, Maharashtra Chapter in the presence of Director, CIFT. The function was witnessed by 35 entrepreneurs from seafood Industry.

Release of the brochures (L to R: Dr. T.V. Sankar, HOD, QAM, CIFT, Shri Rustom Irani, President, Seafood Exporters Association, Maharashtra Chapter, Dr. T.K. Srinivasa Gopal, Director, CIFT, Dr. C.N. Ravishankar, HOD, FP, CIFT and Dr. S. Vishnuvinayagam, SIC, Mumbai Research Centre of CIFT

UHMWPE Rope as a Substitute for Steel Wire Rope in Fishing Vessels

Warps are well lubricated steel wire ropes of identical length with marking at intervals, fully wound on the winch drums when not in use. Wire of 9-16mm diameter is common, depending on the size of the trawler and net. They are used for lowering the trawl net to required depth and after towing for 1-4 h hauling the net onboard. As it is made of steel, it is prone to corrosion. Weight is more and splicing is difficult. Backlash caused by broken steel ropes is dangerous. Steel wire rope with grease onboard fishing vessels is a long pending issue as it is listed as contaminant by the countries importing fish.

To address the above issues, for the first time CIFT in collaboration with Garware Wall Ropes Ltd. Pune, has initiated scientific trials with Plateena (ultra high molecular weight polyethylene, UHMWPE) rope, substituting steel wire ropes, onboard Matsyakumari-II. 1000m of 12 mm dia. steel wire rope weigh about 500kg where as 1000 m of 12 mm dia. Plateena rope weigh only 120 kg. Shrimp trawls and fish trawls were operated with the new rope. Shooting, hauling, spread of the otterboards and opening of the trawl were normal. Further trials in the deeper waters with trawl telemetry sensors is being taken up during the upcoming long trips of the vessel to get exact vertical opening of the net and spread of the otter boards.

Plateena rope as warps onboard MFV Matsyakumari-II

FRP boats and Coracles for NEH Region

Twenty numbers of FRP boats of L_{OA} 6.0 m, breadth 0.85 m and depth 0.35 m were constructed at CIFT, Cochin. Five numbers of FRP coracles having diameter of 2.15 m were also constructed. The fishing crafts were transported to Guwahati for distribution in NEH states. These light weight boats and coracles can be used in reservoirs and lakes mainly for gill net fishing.

FRP boats and coracles ready for transportation

Institute Management Committee Meeting

The Institute Management Committee met on 22 November, 2013. Dr. T.K. Srinivasa Gopal, Director, CIFT chaired the meeting. The other members who attended the meeting were: Dr. C. Mohanakumaran Nair, Pro VC, KUFOS, Cochin, Shri K.G. Prakasan, Jt. Director (Central Zone), Department of Fisheries, Govt. of Kerala, Dr. V. Kripa, HOD, FEMD, CMFRI, Cochin, Dr. T.V. Sankar, HOD, QAM, CIFT, Cochin, Shri A.V. Joseph, Chief F&AO, CMFRI, Cochin, Smt. Chhaya D. Jadhav, At. Post Lanja, Maharashtra, Shri P. Gopinath, Thrissur and Shri P.J. Davis, SAO, CIFT, Cochin as the Member Secretary.

Management Committee Meeting in progress

Secretary to the Govt. of India Visits CIFT, Cochin

Shri Anup Kumar Thakur, Secretary to the Govt. of India, Ministry of Agriculture, Department of Animal Husbandary, Dairying and Fisheries, New Delhi visited CIFT, Cochin on 7 November, 2013 as part of his official tour to Cochin during 5-7 November, 2013. The Secretary was welcomed by Dr. T.K. Srinivasa Gopal, Director, CIFT and there was an interaction meeting with the various HODs on the activities and achievements of the Institute. The Secretary visited the various laboratories, BPD unit, Pilot plant and ATIC of the Institute and had interactions with the scientists.

Shri Anup Kumar Thakur having discussions with the Director and HOD's

Visiting the BPD Unit

Foreign Delegation Visits CIFT, Cochin

India and the U.S.A. have announced a new agriculture partnership to address global food security, during the visit of US President Obama to India during November, 2010. As a part of this initiative, to address the food security challenges in Africa, MANAGE (Ministry of Agriculture, GOI), Hyderabad has been assigned with the responsibility of organizing the U.S.-India-Africa Triangular International training programme on "New Dimensions in Agricultural Extension Management for Extension Functionaries" from Liberia, Kenya and Malawi. As part of the above programme, 30 international delegates from Liberia,

Kenya and Malawi have visited CIFT, Cochin on 13 November, 2013 along with Dr. S. Sentil Vinayagam, Director (AE), MANAGE.

Dr. P.T. Lakshmanan, Head, Biochemistry & Nutrition Division and Director-in-charge, CIFT presided over the meeting. Dr. S. Balasubramaniam, Head, Extension, Information and Statistics Division in his welcome address explained about the technology transfer activities carried out at the Institute. Dr. S. Sentil Vinayagam narrated about the whole training programme in agriculture and allied sectors conducted at MANAGE, Hyderabad and has told that out of 90 extension officials to be trained under the programme, two batches of 60 officials have completed with the current batch. The trainees had interactions with the Head of Divisions who had attended the meeting and answered the queries raised by the trainees. They were also taken around the Pilot Plant Complex by Dr. C.N. Ravisankhar, Head, Fish Processing Division and the team left the Institute by the afternoon.

Training was imparted to another batch od 15 International trainees from Maldives as a part of their training at CMFRI, Cochin on 27 November, 2013.

Dr. S. Sentil Vinayagam, Director (AE), MANAGE speaking on the occasion

Visit to the Pilot Plant Complex

Interaction with international delegates

Invited Talk

During the quarter Dr. Jagdeep Saxena, DKMA, ICAR, New Delhi gave an invited talk on Writing for the media (In Hindi) at the Head Quarters on 7 October, 2013.

Dr. Jagdeep Saxena delivering the talk

CIFT Participates in ICAR Sports Meet

The Foot Ball Team of CIFT who were the Winners of South Zone in the ICAR Zonal Sports Meet participated in the ICAR Inter Zonal Sports Meet held at Secunderabad during 17-20 December, 2013.

Quami Ekta Week Celebrations

The Institute celebrated Quami Ekta Week during 19-25 November, 2013. On 25 November the Director and Staff of the Institute assembled together and took Quami Ekta Pledge.

Awards and Recognitions

Dr. A.R.S. Menon receives the Indira Gandhi Sadbhavana Award

Dr. A.R.S. Menon, Chief Technical Officer, CIFT, Cochin received the Indira Gandhi Sadbhavana Award instituted by National Integration and Economic Council, New Delhi. The award is given for the category 'Science Popularization'. The award was presented to Dr. Menon during the National Symposium on 'Life and works of Late Smt. Indira Gandhi' held at Teen Murthi Bhavan, New Delhi to mark the 96th Birth Anniversary of Late Smt. Indira Gandhi on 21 November, 2013. His Excellency Dr. S.C. Jamir, Hon'ble Governor of Odisha gave away the award. His Excellency Shri Virendra Kataria, Lt. Governor of Puducherry, Hon'ble Dr. Bhisma Narain Singh, Former Governor of Tamil Nadu and Assam, Hon'ble Ch. Randhir Singh, Former Governor of Sikkim and Shri G.V.J. Krishnamurthy, Former Chief Election Commissioner of India were the other dignitaries present on the occasion.

Dr. S.C. Jamir presenting the award to Dr. Menon. Also seen is Ch. Randhir Singh

Dr. Santosh Alex Felicitated

Dr. Santosh Alex, Sr. Tech. Officer, Visakhapatnam Research Centre of CIFT who has been chosen to be featured in the seventh Edition of 'Asian Admirable Achievers' an International Publication that features 500 achievers from different fields across Asia every year, for his contributions to Indian literature for his translation works in five languages, was felicitated in the Town Official Language Implementation Committee Meeting by Shri Anil Kumar, DRM and Chairman, TOLIC, on 30 October, 2013.

Dr. Santhosh Alex after the felicitations

Personnel News

Participation in Seminars/Symposia/Workshops etc.

- **Dr. T.K. Srinivasa Gopal,** Director - Meeting to discuss about the development action plan for livelihood options, Bali Islands, Sundarbans (1 October)
- **Dr. T.K. Srinivasa Gopal,** Director - Review meeting of NFBSFARA funded project on Stock characterization, captive breeding seed production and culture of Hilsa, Godhakali (2 October)
- **Dr. T.K. Srinivasa Gopal,** Director - Interactive workshop on Administrative and financial matters for the ICAR Institutes located in southern region, NAARM, Hyderabad (9-10 December)
- **Dr. T.K. Srinivasa Gopal,** Director - Sectional Committee meeting of FADC-BIS, New Delhi (23 December)
- **Dr. T.K. Srinivasa Gopal,** Director - Shadow CODEX Committee meeting, FDA, New Delhi (24 December)
- **Dr. T.K. Srinivasa Gopal,** Director and **Dr. Leela Edwin,** HOD, FT - ICAR-GWRL interface meeting, Wai, Maharashtra (6 October)
- **Dr. T.K. Srinivasa Gopal,** Director, **Dr. T.V. Sankar,** HOD, QAM, **Dr. C.N. Ravishankar,** HOD, FP, **Dr. S. Vishnuvinayagam,** SIC, Mumbai, **Dr. George Ninan, Dr. A.A. Zynudheen,** Senior Scientists, **Dr. C.O. Mohan, Dr. P.K. Binsi,** Scientists and **Shri Nitin Singh,** Business Manager - Innovations for Industry Meet, Mumbai (23 November)

- **Dr. T. K. Srinivasa Gopal,** Director, **Dr. C.N. Ravishankar,** HOD, FP, **Smt. S. Remya,** Scientist, **Shri Vineeth Kumar, Smt. K.B. Biji, Smt. K.A. Anju,** Research Associates, **Shri C.K. Kamalakanth, Shri T.R. Ananthanarayanan, Shri C.T. Nithin** and **Kum. Nimisha V. Satheesh,** Research Fellows - 7th International Food Convention, CFTRI, Mysore (18-21 December). Dr. Ravishankar delivered an invited lecture on "Role and impact of the business incubator in promoting entrepreneurship and business innovation in fisheries sector" in the Convention. The following research papers were also presented by the team in the Convention:

  i. Combined effect of ginger essential oil and *sous vide* processing on the quality of Indian mackerel steak under refrigerated storage by S. Remya, C.O. Mohan, J. Bindu, C.N. Ravishankar, R. Badonia and T.K. Srinivasa Gopal

  ii. Effect of high pressure on shucking of green mussel (*Perna viridis*) meat and its quality evaluation during chill storage by J. Bindu, J. Ginson, C.K. Kamalakanth, S. Das and T.K. Srinivasa Gopal

  iii. Quality changes in high pressure treated marinated yellow fin tuna (*Thunnus albacares*) steaks during chill storage by C.K. Kamalakanth, V.S. Nimisha, J. Bindu, S. Das and T.K. Srinivasa Gopal

  iv. Inactivation of *Escherichia coli* 0157 in yellow fin tuna (*Thunnus albacres*) using pulsed light technology by T.R. Ananthanarayanan, S.K. Panda, C.T. Nithin, J. Bindu and T.K. Srinivasa Gopal

  v. Influence of smoke source characteristics on the composition of indigenous liquid smoke and comparison of polycyclic aromatic hydrocarbons (PAH) in traditional masmin and liquid smoked masmin by C.T. Nithin, Niladri S. Chatterjee, Suseela Mathew, J. Bindu, T.R. Ananthanarayanan and T.K. Srinivasa Gopal

- **Dr. Leela Edwin,** HOD, FT - Second meeting of the Expert committee for comprehensive review of deep sea fishing policy guidelines, CIBA, Chennai (31 October)

- **Dr. Leela Edwin,** HOD, FT - Third meeting for Comprehensive review of deep sea fishing policy and guidelines, ICAR, New Delhi (21 November)

- **Dr. Leela Edwin,** HOD, FT - Regional workshop on Fisheries management for member countries of Indian Ocean Rim Association for Regional Co-operation (IORARC), Cochin (18 December). Dr. Leela Edwin also delivered a lecture on "FAO Code of Conduct on Responsible Fishing" at the Workshop.

- **Dr. Leela Edwin,** HOD, FT - Workshop on Draft science and technology policy, 2013, Govt. of Kerala, Cochin (19 December)

- **Dr. Leela Edwin,** HOD, FT and **Dr. M.M. Prasad,** SIC, Visakhapatnam - Consultative meeting of fisheries development in West Bengal: Research, extension and developmental support by the ICAR fisheries institutes, CIFE RC, Kolkatta (22 November)

- **Dr. Leela Edwin,** HOD, FT, **Dr. T.V. Sankar,** HOD, QAM and **Dr. C.N. Ravishankar,** HOD, FP - Management development programme on Leadership management, NAARM, Hyderabad (25 November - 7 December)

- **Dr. Leela Edwin,** HOD, FT and **Dr. M.P. Remesan,** Principal Scientist - Winter School on ICT-oriented strategic extension for responsible fishing management, CMFRI, Cochin (18 November) (As resource persons). Dr. Leela Edwin delivered a lecture on 'Responsible use of energy in fishing' while Dr. Remesan delivered a lecture on 'Advances in harvest strategies experience of CIFT in responsible fisheries'.

- **Dr. T.V. Sankar,** HOD, QAM - Workshop on Codex Alimentarius Commission: Principles and procedures, Cochin (2 October)

- **Dr. T.V. Sankar,** HOD, QAM, **Dr. K. Ashok Kumar,** Principal Scientist and **Dr. S.K. Panda,** Senior Scientist - 7th Meeting of ISO/TC 234 and associated Working group and Advisory group meetings, Cochin (28-29 October)

- **Dr. C.N. Ravishankar,** HOD, FP - Workshop on Technology valuation and pricing, ICAR, New Delhi (25-26 December). Dr. Ravishankar made an invited talk on "Tools and techniques for valuation and pricing of technologies" in the Workshop.

- **Dr. C.N. Ravishankar,** HOD, FP and **Shri Nitin Singh,** Business Manager - First Foundation Day Celebrations of AgrInnovate India Ltd., ICAR, New Delhi (19 October). Dr. Ravishankar gave a

presentation on the 'Role played by the ZTM-BPD Units in catalyzing agri-business growth' in the Meeting

- **Dr. Suseela Mathew,** HOD I/c, B&N - Final report presentation meeting of the project, 'Isolation and characterization of collagen and gelatin from aquatic sources and conversion of them into pharmaceutical and food grade products', DBT, New Delhi (13 November)
- **Dr. Suseela Mathew,** HOD I/c, B&N - State level seminar and workshop on Biological techniques, M.A. College, Kothamangalam (27 November). Dr. Suseela Mathew gave an invited talk on "Principles of LCMSMS and GCMSMS" in the Workshop.
- **Dr. M.M. Prasad,** SIC, Visakhapatnam - Interactive session with aqua culturists of Andhra Pradesh, CIFE RC, Kakinada (16 November)
- **Dr. M.M. Prasad,** SIC, Visakhapatnam - ICAR Interface meeting of line departments in agriculture, allied sectors, universities and ICAR institutes in Andhra Pradesh, Bapatla (17 November)
- **Dr. M.M. Prasad,** SIC, Visakhapatnam and **Dr. Santhosh Alex**, Sr. Tech. Officer - Half yearly meeting of Town Official Language Implementation Committee (TOLIC), Visakhapatnam (30 October)
- **Dr. Saly N. Thomas,** Principal Scientist - 2nd State wide Guidance Council meeting of the Matsya Samrudhy programme of Kerala State Fisheries Department, Thiruvananthapuram (8 October)
- **Dr. Saly N. Thomas,** Principal Scientist - Strategic workshop on Communication needs of marine fishermen, Chennai (9-10 November)
- **Dr. P. Pravin** and **Dr. K. Ashok Kumar,** Principal Scientists - Workshop on Enhancing research collaborations through National Knowledge Network (NKN), Bangalore (17-19 October)
- **Dr. P. Pravin,** Principal Scientist and **Dr. V.R. Madhu,** Senior Scientist - 2nd Symposium on Ecosystem approaches to the management and conservation of fisheries and biodiversity in the Asian region, Cochin (27-30 October). Dr. Pravin presented an invited paper on 'Bycatch Reduction Devices' in the Symposium.
- **Dr. K. Ashok Kumar,** Principal Scientist and **Dr. S.K. Panda,** Senior Scientist - Meeting of the National committee on Sanitary import permit for fish and fishery products, NIFPHATT, Cochin (17 October)
- **Dr. G. Rajeswari,** Principal Scientist - National seminar on Recent trends in aquaculture for sustainable environment, St. Theresa's College, Eluru (22-23 November). Dr. Rajeswari delivered a lecture on "Recent trends in fisheries technology development in Andhra Pradesh of India" in the Seminar.
- **Dr. G. Rajeswari,** Principal Scientist and **Dr. B. Madhusudana Rao,** Senior Scientist - Workshop on Biological sciences 'Bio-Essence', Visakha Govt. Degree College for Women, Visakhapatnam (19 December) (As resource persons). They also delivered the following talks:
  i. Recent trends in fishing technology - Dr. G. Rajeswari
  ii. Microbes in post harvest fisheries - Dr. B. Madhusudana Rao
- **Dr. S. Ashaletha,** Senior Scientist - Workshop on Healthy women, healthy society, Vypeen, Ernakulam (4 October). Dr. Ashaletha delivered a lecture on "The role of fish in healthy society" in the Workshop.

Dr. Ashaletha delivering the lecture

- **Dr. S. Ashaletha,** Senior Scientist - National conference on Krish Vigyan Kendras, UAS, Bangalore (23-25 October)
- **Dr. R. Raghu Prakash,** Senior Scientist - 3rd International fisheries symposium on Shaping fisheries and aquaculture today for a healthier tomorrow, Jomtien, Thailand (28-30 November). Dr. Raghu Prakash also presented a paper entitled, "Fishing technology interventions to minimize ecological impacts of fishing operations using gear selectivity and bycatch reduction devices for sustainable fisheries development and conservation of aquatic resources by R. Raghu Prakash, G.

Rajeswari and U. Sreedhar in the Symposium.

- **Dr. R. Raghu Prakash,** Senior Scientist - International conference on Small scale fisheries governance development for well being and sustainability, CESS, Hyderabad (10-13 December). Dr. Raghu Prakash also presented a poster entitled, "Fishing technology interventions to improve sustainability and viability of small scale fisheries with special reference to Lakshadweep long lining model" by R. Raghu Prakash, P. Parvain, M.V. Baiju, M. Baiju, S.K. Paresh and K.V. Aneesh Kumar in the Conference.
- **Dr. U. Sreedhar,** Senior Scientist - Training programme for creating awareness on generation of satellite tuna advisories, INCOIS, Hyderabad (7-10 October)
- **Dr. U. Sreedhar,** Senior Scientist - National seminar on Taxonomy for managing biodiversity: Present scenario and future challenges, Dr. V.S. Krishna Govt. College, Visakhapatnam (25-26 October). Dr. Sreedhar also delivered a lecture on "Responsible harvesting of deep sea resources in Indian EEZ" in the Seminar.
- **Dr. Femeena Hassan,** Senior Scientist - Group monitoring workshop, DST, Jaipur (12 November)
- **Dr. P. Muhamed Ashraf,** Senior Scientist - National workshop on Characterization of advanced materials, Mar Evanios College, Thiruvananthapuram (6-8 November). Dr. Ashraf delivered an invited talk on "Electrochemical impedance spectroscopy and its application" in the Workshop.
- **Dr. P. Muhamed Ashraf,** Senior Scientist - 6th India Nano International conference, Bangalore (4-6 December)
- **Dr. S.K. Panda,** Senior Scientist - 2nd Scientific panel meeting of Fish and fishery products of FSSAI, New Delhi (15 October)
- **Dr. S.K. Panda,** Senior Scientist, **Shri Rahul Ravindran** and **Shri M.M. Lijin Nambiar,** JRFs - National workshop on Seafood safety and trade, CUSAT, Cochin (17-19 December). Dr. Panda also delivered an invited lecture on 'Harmonization of food safety standards in seafood trade' in the Seminar.
- **Dr. V.R. Madhu,** Senior Scientist - Project proposal meeting of Chief Conservator of Forests, Mumbai (6 November)
- **Shri V. Radhakrishnan Nair,** Scientist - 14th ESRI India Users Conference 2013 on 'GIS - Transforming our world', New Delhi (11-12 December). Shri Radhakrishnan Nair presented a paper on 'Reservoir modeling using geo-spatial technology for fisheries management' by V. Radhakrishnan Nair, P. Pravin, Nikita Gopal, K.V. Kumar and N.H. Rao in the Conference.

Shri Radhakrishnan Nair making his presentation

- **Shri V. Radhakrishnan Nair, Shri V. Chandrasekar** and **Smt. P. Jeyanthi,** Scientists - ICAR Short course on Marketing research for value chain in fisheries, CIFT, Cochin (1-10 October)
- **Shri V. Chandrasekar,** Scientist - Winter school on ICT-oriented strategic extension for responsible fisheries management, CMFRI, Cochin (5-25 November)
- **Dr. V. Muragadas,** Scientist - Short course on Metagenomics - Role of next generation sequencing and bioinformatics, AAU, Anand (15-24 October)
- **Smt. P. Jeyanthi,** Scientist - Training programme on Data analysis using SAS, IISS, Bhopal (9-14 December)
- **Dr. Venkiteswarlu Ronda,** Scientist and **Smt. P.K. Shyma,** Sr. Tech. Officer - Training programme on Laboratory quality management system and internal audit, BIS, Chennai (18-21 November)
- **Dr. K.K. Prajith** and **Smt. S.J. Laly,** Scientists - Workshop on Scientific paper writing, Cochin (14-17 October)
- **Dr. K.K. Prajith** and **Smt. S.J. Laly,** Scientists - Workshop on Scientific presentations, Cochin (18-21 November)
- **Dr. K.K. Prajith,** Scientist - Refresher course, University of Calicut (26 November) (As resource

person). Dr. Prajith delivered a talk on 'Sustainable fisheries and aquaculture' in the programme.

- **Shri Ankur Nagori, Dr. A. Jeyakumari, Smt. S. Remya, Kum. Jesmi Debbarma** and **Smt. U. Parvathy,** Scientists - National training course on Application of high pressure and pulsed light technology for food processing, CIFT, Cochin (18-31 October)
- **Dr. A. Jeyakumari,** Scientist and **Shri Jomey George,** SRF - National seminar on Therapeutics of marine bioactive compounds, Gandhigram Rural Institute, Gandhigram (9-10 December). They also presented the following research papers in the Seminar:
  i. Effect of chitosan on the quality of restructured products from *Pangasius hypophthalmus* fish mice during chilled storage by A. Jeyakumari, George Ninan, A.A. Zynudheen, K.V. Lalitha and C.N. Ravishankar
  ii. Antimicrobial and antioxidant extract from *Halymenia floresia* - an edible red algae from Gulf of Mannar by Jomey George, K.R. Remyakumari, N.S. Chatterjee, S.K. Panda, Suseela Mathew, R. Anandan, K.K. Asha and P.T. Lakshmanan
- **Dr. A.R.S. Menon,** Chief Tech. Officer - Inter Media Publicity Coordination Committee Meeting, AIR, Thiruvananthapuram (4 October)
- **Dr. A.R.S. Menon,** Chief Tech. Officer - Inter Media Publicity Coordination Committee Meeting, AIR, Thiruvananthapuram (1 November)
- **Dr. Santhosh Alex,** Sr. Tech. Officer - Hindi workshop, HPCL, Visakhaptanam (11 November)
- **Dr. Santhosh Alex,** Sr. Tech. Officer - Hindi workshop, MPEDA, Visakhaptanam (11-12 November)
- **Dr. Santhosh Alex,** Sr. Tech. Officer - Hindi workshop, CIFNET, Visakhaptanam (19-20 December)
- **Shri C. Subhash Chandran Nair,** Sr. Tech. Asst. - Workshop on HD Video, Cochin (19 November)
- **Shri P.J. Davis,** SAO - Training course on Knowledge management, ISTM, New Delhi (7-9 October)
- **Shri P.J. Davis,** SAO - Orientation course on Record management, National Archives of India, Puducherry (2-6 December)
- **Shri P. Krishnakumar,** AAO - Workshop on Income Tax (WiTax), ISTM, New Delhi (25-26 November)
- **Shri T. Viswanathan,** AAO - Workshop on Noting and drafting, ISTM, New Delhi (21-22 November)
- **Shri Eldo George,** SRF - National workshop on Koha Library Management Software, ANGRAU, Hyderabad (25-26 October)
- **Shri K.K. Ajeesh Kumar,** SRF - National seminar on New frontiers in molecular biology, MA College, Kothamangalam (12-13 December). Shri Ajeesh Kumar also presented a research paper entitled, "Biochemical and nutritional profiling of selected marine fishes from Gulf of Mannar" by K.K. Ajeesh Kumar, K.V. Vishnu, Niladri S. Chatterjee, Suseela Mathew and P.T. Lakshmanan in the Seminar
- **Kum. V.P. Souda,** JRF - Winter school on Climate change and variability, marine ecosystems and coastal zone management, Cochin (2-7 November)

Personalia

Promotions

1. Dr. M.S. Kumar, Asst. Chief Tech. Officer, Visakhapatnam as Chief Tech. Officer
2. Smt. Jaya Das, UDC, Cochin as Asst.
3. Smt. E. Jyothilekshmi, UDC, Cochin as Asst.

Transfers

1. Dr. Sanjoy Das, Senior Scientist, CIFT, Cochin to Kakdweep Research Centre of CIBA, Chennai
2. Dr. C.O. Mohan, Scientist, Veraval to Cochin
3. Dr. K.K. Prajith, Scientist, Cochin to Veraval
4. Shri Deu Umesh Aroskar, LDC, Cochin to Mumbai

Retirements

1. Dr. P.T. Lakshmanan, Principal Scientist & HOD, B&N Division, Cochin
2. Shri G. Chinna Rao, Astt., Visakhapatnam
3. Shri C.B. Kolvalkar, SSS, Mumbai

Priced publications available from CIFT

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2.	Microbiological and molecular methods of detection of *Listeria monocytogenes* in seafood	₹ 60.00
3.	Kadalekum Kanivukal (Bounties of the sea) (In Hindi)	₹ 75.00
4.	Laboratory Manual - Enzyme linked immuno sorbant (ELISA) for chloramphenicol residue in shrimp	₹ 50.00
5.	PCR technique for detection of white spot syndrome virus	₹ 50.00
6.	Synthetic fish netting yarns	₹ 25.00
7.	CIFT - TED for turtle-safe trawl fisheries	₹ 30.00
8.	CIFT - TED for turtle-safe trawl fisheries (In Tamil)	₹ 50.00
9.	CIFT - TED for turtle-safe trawl fisheries (In Telugu)	₹ 50.00
10.	Fish canning - Principles and practices	₹ 125.00
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12.	Rubber wood for marine applications	₹ 40.00
13.	The seafood canning industry in India	₹ 35.00
14.	Gillnets in marine fisheries of India	₹ 100.00
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24.	Seafood quality assurance	₹ 120.00
25.	Community fish smoking kilns	₹ 40.00
26.	HACCP concepts in seafood industry	₹ 100.00
27.	Food safety guidelines for common food items	₹ 50.00
28.	Fishing traps of Assam	₹ 300.00
29.	Handbook of Fishing Technology	₹ 500.00
30.	Handbook of Fishing Technology (In Hindi)	₹ 500.00
31.	Inland fishing gears and methods of Northern Kerala	₹150.00
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34.	CIFT- Semi pelagic trawl system - An eco-friendly alternative to bottom trawling for small scale mechanized sector (In Hindi)	₹ 50.00
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Publications by CIFT Staff available from outside

1. Fish packaging technology (edited by Dr. K. Gopakumar)	₹ 270.00	Concept Publishing Co., A 15-16, commercial Block, Mohan garden, N Delhi - 110 059
2. Tropical fishery Products - Dr. K. Gopakumar	₹ 70.00	Science Publishers Inc. P.O. Box - 699, Enfield, NH 03748, USA
3. Post harvest technology of fish and fishery products - Shri K.K. Balachandran	₹ 895.00	1. Education book suppliers, Convent Rd., Ernakulam 2. Prabhu's Book House, Cochin 3. Daya Publishing House, 1123/74, Devaram Park, Trinagar, N Delhi - 110 035.

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