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News from the Research Front

Customised Nutritional-mix from Collagen Peptide

Fish scale and bone contain protein, mainly in the form of collagen and minerals like calcium (Ca), phosphorus (P) and magnesium (Mg) along with traces of sodium (Na) and sulphur (S). Collagen contains relatively high amounts of amino acids such as glycine, proline and hydroxyproline. Hydrolysis of collagen molecules yields peptides with bioactive, functional and sensory properties that are better than those of native proteins from which they are obtained. Bioactive collagen peptides have great potential in pharmaceutical, nutraceutical and food processing industries. Now a days, collagen peptide is being incorporated in to a wide array of products, including protein bars, cereal bars, protein drinks, smoothies etc. Apart from their nutritional benefits, collagen peptides exhibit a wide range of physiological functions including antihypertensive, antioxidative, opioid agonistic, anticancer immunomodulatory, antimicrobial, prebiotic, mineral binding, antithrombotic and hypocholesterolemic effects. Collagen peptide as a food supplement may improve low bone density in people under malnutrition and those suffering from degenerative joint diseases.

The waste generated from fish processing is around 50% of the starting material by weight, and is more costly to dispose. On an average, 30% of fish processing waste accounts for the protein collagen, which is mainly seen associated with scales, bone, skin, and connective tissue of the animals. It has been observed that collagen peptide from fish processing discards can be absorbed to blood stream much better than those



Nutritional mix prepared with collagen peptide from fish scales

केन्द्रीय मत्स्यकी प्रौद्योगिकी संस्थान

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Proximate composition of nutritional mix prepared from fish scales

Parameters	Mean value (g/100 powder)
Moisture	04.33
Fat	03.83
Protein	78.92
Total Carbohydrate	11.25
Ash	01.13

derived from other animal sources such as bovine. Mumbai Research Centre of CIFT together with Fish Processing Division of CIFT, Cochin has formulated a nutritional mix containing 78% protein based on collagen peptide derived from fish scales. The product can be consumed along with milk as a health drink, can be a component of chappathi, or can be sprinkled over salads. The health-mix also contains natural mango pulp and oat fibres as the major ingredients, which effectively masks the bitterness of collagen peptide as well as modify the viscosity of the product (in drink). The product is mainly intended for middle aged and old people, ladies and sportspersons who need regular supply of collagen for healthy joints and bones. It may also be

beneficial for patients suffering from osteoporosis and long-term- nursing home residents where there is a possibility of development of pressure ulcers. The nutritional mix contains the essential dietary nutrients such as amino acids, vitamin C, carotenoids, polyphenolic flavanoids and minerals such as calcium, phosphorous, potassium, magnesium, zinc, iron and selenium. Polyphenolic compounds help the human body protect itself from oxidant stress, diseases, and cancers, and fight against these ailments by boosting the body's immunity level. Collagen from fish scales has found application in reconstruction of corneal stroma, as the structure of collagen fibrils in fish scales is very similar to that of human corneal stroma.

Collagen products have been designated as 'Generally Recognized As Safe (GRAS)' food products or food additives by the Food and Drug Administration (FDA). It does not react with drugs or other food or food ingredients as it is a natural product. Being a high quality protein, collagen peptide is ideal for the elderly and sports nutrition. There is an increasing interest in the production of fish collagen and peptides from non-bovine sources due to social and safety issues. Therefore, fish processing waste can be considered as an abundant and cheaper raw material for the commercial production of this new era health supplement.

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Mumbai Research Centre of CIFT*

Characterization of Aquatic Bacteria with Hydrocarbon Degradation Potential

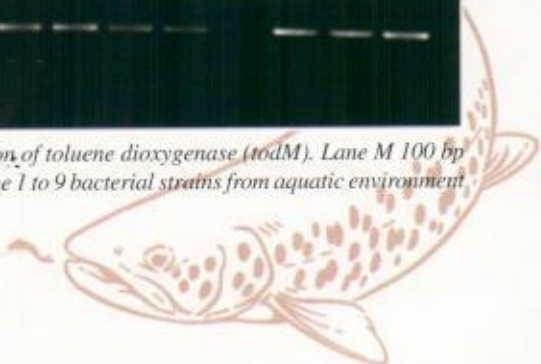
Increasing human needs towards petrochemical products has resulted in significant contamination of a number of marine and terrestrial sites with petroleum or petroleum by-products. Petroleum is a complex mixture of hydrocarbons and other organic compounds, grouped into four major classes: saturates (including long chain n-alkanes), aromatics (polycyclic aromatic hydrocarbons), asphaltenes, and resins. Petrochemical products are known to possess toxic, mutagenic and carcinogenic properties. Hydrocarbon-degrading microorganisms are ubiquitous in the aquatic environment, and biodegradation was shown to be successful in naturally remediating oil contamination associated with several oil spills.

Microorganisms biodegrade hydrocarbons, including aliphatics such as n-alkanes, monoaromatics such as toluene, and polynuclear aromatic hydrocarbons (PAHs) such as

pyrene. The ability of these microorganisms to mineralize alkanes and aromatic hydrocarbons can be examined by monitoring the presence of the *alkB* gene that codes for the alkane hydroxylase responsible for the hydroxylation of C6-



PCR for detection of toluene dioxygenase (*todM*). Lane M 100 bp DNA ladder. Lane 1 to 9 bacterial strains from aquatic environment.





C12 alkanes within the pathway for alkane metabolism and the *xylE* gene that encodes for catechol 2, 3-dioxygenase which catalyzes the cleavage of catechols. The *ndoB* gene encodes for naphthalene dioxygenase, the first enzyme in the naphthalene degradation pathway and *todM* encodes for the large subunit of terminal dioxygenase, one of the three components of toluene dioxygenase, the first enzyme in the toluene degradation pathway. These catabolic genes can be used in systematic studies to evaluate the

biodegradation potential of isolates from a defined hydrocarbon-contaminated site.

Fifty strains of bacteria isolated from aquatic environment were screened for the presence of *alkB*, *xylE*, *ndoB*, *cat* and *todM* genes. Nine bacterial strains had *alkB* gene while eleven had *todM* gene. None of the bacterial strains had *xylE*, *ndoB* and *cat* gene. The hydrocarbon degrading bacteria identified in the study belonged to genera *Pseudomonas* sp., *Bacillus* sp., and *Enterobacter* sp.

Dr. Toms C. Joseph and Dr. K.V. Lalitha

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Assessment of Baseline Cleanliness of Food Contact Surfaces Using ATP-bioluminescence and Traditional Microbiological Method

Food quality and safety are the major concerns faced by the food industries today. Food - borne disease constitutes a major health problem in the present scenario. The increasing incidence of food-borne diseases emphasizes the importance of improving and maintaining a high standard of food safety in food service establishments. The incidence of disease transmitted by seafoods are usually less reported. But a study by Huss, 1995 says that there are substantial evidences to show that fish and fish products are high on the list of food products that causes food-borne diseases. Small and medium sized food businesses like microenterprise units have been slow to adopt these food safety management systems (FSMSs). Poorer hygiene in small microenterprises is influenced by deficient education, financial constraints and lack of awareness in food safety (Violaris *et al.*, 2008). Hygiene monitoring of food contact surfaces is a useful tool for the detection of risks associated with the production, manufacture and consumption of seafood.

To understand the hygienic conditions in fishery based microenterprise unit, a pre-processing unit run by women from Cochin was selected. The baseline cleanliness of the selected food contact surfaces namely Floor, Working table, Worker's hand, Utensils and Machinery of the fishery based microenterprise was analyzed using traditional microbiological swab analysis method and ATP-bioluminescence method. ATP-bioluminescence was measured luminometrically with Hygiena SystemSURE plus.

The ATP-bioluminescence is based on adenosine triphosphate (ATP) found in all living organisms, as an excellent marker for viability and cellular contamination. These

systems deliver a rapid, direct, objective measurement of cleaning efficiency, hygienic status and risk, primarily by the measurement of ATP.

The study also envisaged to determine the efficiency of sanitizers namely sodium hypochlorite and stabilized hydrogen peroxide. The oldest

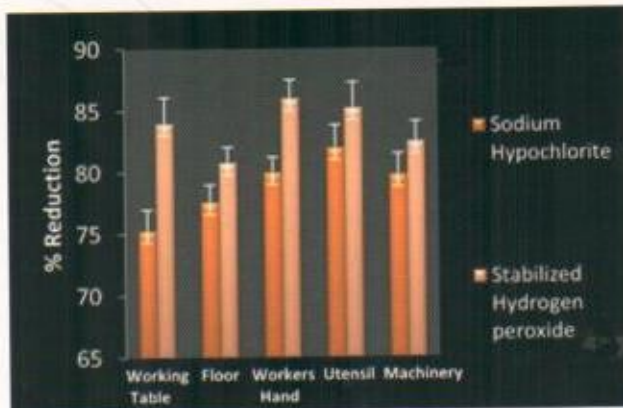
and most widely used method for monitoring hygiene is swabbing either with sterile swabs or sponges, rinsing, and cultivating the collected bacteria (Miettinen *et al.*, 2001). For the routine determination of total viable counts, also referred to as aerobic plate count, ISO: 4833:2003 and tests based on this standard remain the most common approach used routinely by laboratories (Baylis, 2003). Detection of ATP through ATP-bioluminescence technology is a method of choice to replace traditional method and significantly shorten the time to detect without losing reliability. It is an excellent and sensitive biomarker of contamination.

The total plate count values obtained by traditional microbiological swabbing and the relative light unit values clearly indicated the reduction of bacterial load from initial values after the application of sanitizers. The initial load was found to be higher. It is evident from the study that reduction of pathogens was higher in the area where

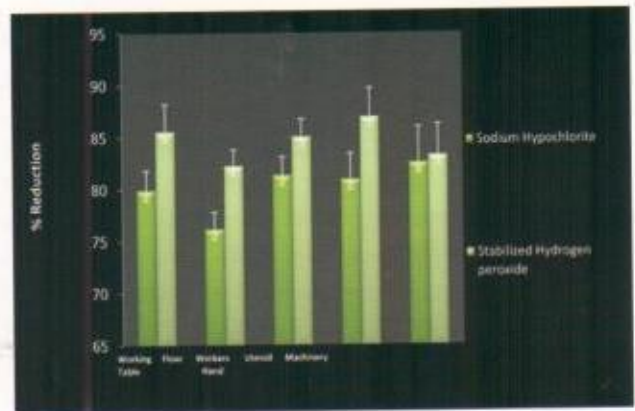


Hygiena System SURE plus





Percentage reduction in Total Plate Count per cm² from different surfaces after application of sanitizers



Percentage reduction in Relative Light Unit (RLU) from different surfaces after the application of sanitizers

stabilized hydrogen peroxide was used as disinfectant. Bacterial load was found to be significantly ($p < 0.05$) reduced from the initial values when both sanitizers were used. It is also clear that floor contains higher bacterial load (floor > workers hand > working table > machinery > utensils) and least bacterial load was found in utensils.

The improvement of the microenterprise unit's hygiene was clearly identifiable after treatment with the sanitizers. The result showed that there is a considerable difference after the treatment with both the disinfectants. The effectiveness of two treatments in reducing bacterial

load was confirmed by comparing the data on bacterial load (Traditional Microbiological Swab Analysis) and cleanliness (ATP-bioluminescence) before and after treatment from five food contact surfaces in the microenterprise unit ($P < 0.01$).

For improving food safety and public health, the hygienic status of the microenterprise units should be improved and food handlers should be trained well on sanitation. A cleaning schedule have to be properly followed which can ensure the quality and safety of the product.

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Fish Calcium Capsules as Dietary Supplement

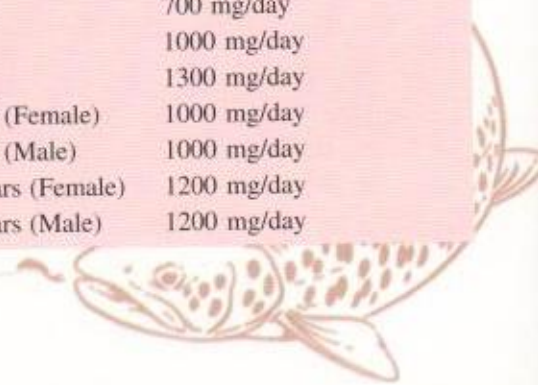
Industrial processing of fish and shellfish results in the accumulation of skin, scales, viscera, bone and bone frames (in case of surimi production). The fish processing by-products and waste are found to be rich in proteins, lipids, chitin, collagen, minerals, and vitamins. Fish waste is a potential raw material for high-value products having industrial and pharmaceutical applications.

Calcium, the most abundant mineral in the human body, has several important functions. More than 99% of total body calcium is stored in the bones and teeth where it functions to support their structure. The remaining 1% is found throughout the body in blood, muscle, and the fluid between cells. Calcium is directly involved in the development and maintenance of the skeletal system and participates in several physiological processes. In addition to its structural functions, calcium plays an important role in muscle contraction, blood clot formation, nerve impulse transmission, the maintenance of cell integrity and acid-

base equilibrium, and activation of several important enzymes. Although most people are aware that calcium is an important element as a dietary component, it is severely deficient in most diets. When calcium intake is low or calcium is poorly absorbed, bone breakdown occurs because the body must use the calcium stored in bones to maintain normal biological functions such as nerve and

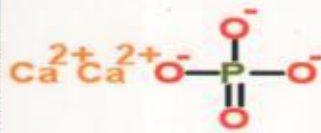
Recommended calcium intake for different age groups

Age group	Recommended intake
0-6 months	200 mg/day
7-12 months	260 mg/day
1-3 years	700 mg/day
4-8 years	1000 mg/day
9-18 years	1300 mg/day
19-50 years (Female)	1000 mg/day
19-70 years (Male)	1000 mg/day
Over 50 years (Female)	1200 mg/day
Over 70 years (Male)	1200 mg/day





Fish bone



Calcium capsules

muscle function. In general, the basic source of calcium is the diet.

Calcium levels are tightly controlled by a complex interaction of hormones and vitamins. Dietary requirements vary throughout the life of humans and are greatest during periods of growth and pregnancy. Generally, calcium is obtained from the diet and it is severely deficient in most of regular diets. Therefore, to improve calcium intake, several calcium-fortified products are in the market and demand for these products is growing continuously. The major source of calcium is the diet, and the most common and trusted source of calcium is milk or other dairy products. Wheat and maize are very poor sources of calcium. Most of the calcium provided by cereal foods comes from the calcium containing ingredients that are added to bread and biscuits as functional ingredients, such as calcium propionate and calcium phosphates.

It is well documented that consumption of small fish is nutritionally beneficial in providing a rich source of

calcium. Calcium in fish could be absorbed to the body as tested *in vivo*. Fish bone, which was separated after removal of muscle from the frame, is a valuable source of calcium as "Dicalcium phosphate," which has the ideal calcium phosphorus ratio of 2:1. The organic component of fish bone, which accounts for 30% of the material, is mainly collagen.

CIFT, Cochin has optimized the process to extract calcium from fish bones which is mainly treated as processing discard during filleting operation of large fishes *viz.*, tuna, carps etc. Before packing the material was powdered and supplemented with vitamin D for enhancing the absorption and bioavailability. *In vivo* studies conducted at CIFT in albino rats have shown that fish calcium powder supplemented with vitamin D has improved the absorption and bioavailability. Since calcium supplementation in diet is having high significance especially for women and aged, this product from fish bone is a viable and affordable option for dietary calcium supplementation.

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Multifunctional Hydroxyapatite Crystals from Fish Processing Discards

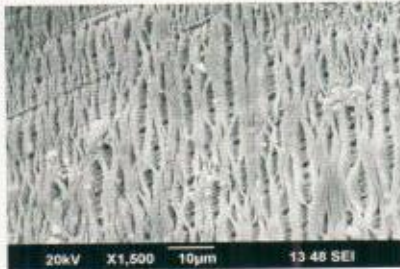
Hydroxyapatite (HAP) is seen embedded in the organic matrix of collagen, normally associated with the natural materials such as bone and fish scales. These mineral crystals are responsible for the bone hardness, strength and rigidity, and collagen fibres provide flexibility. It is one of the few materials, classified as a bioactive natural material that supports bone in growth and osseointegration; hence, popularly known as the 'second generation calcium supplement'. Hydroxyapatite and

calcium phosphate based biomaterials have attracted considerable interest in the field of tissue engineering. Among the main areas of application of HAP, the most promising ones are orthopaedics and orthodontics, where bone tissue has to be replaced, partially or totally. The studies indicate that the total global biomaterials market is expected to be worth US\$ 58.1 billion by 2014, growing at a Compound Annual Growth Rate (CAGR) of 15% from 2009 to 2014. Interestingly, Asian market size is estimated





Raw scales from Rohu fish (*Labeo rohita*)



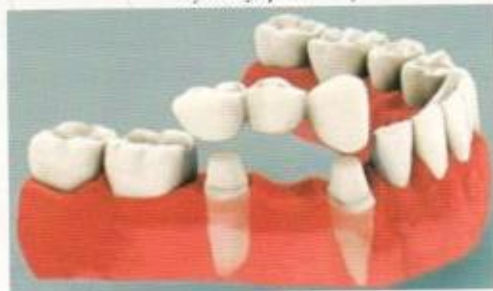
Scanning electron micrograph of hydroxyapatite crystals



Crystalline structure of hydroxyapatite



Artificial bone



Dental capping



Hydroxyapatite

to increase at the highest CAGR of 18.2% in the same period. The manufacture of biomaterials and devices depends on both cost-effective production technology and the availability of cheaper raw materials. Fish processing waste offers a rich source of this highly valuable mineral composite. The content of hydroxyapatite in fish scales and bones ranges from 40 to 45% (w/w). Hydroxyapatite from such natural sources is biologically safe and economical as it is prepared from cheaper raw materials. Worldwide, fish industry waste is considered as an important pollutant having serious impact on the environment. The Fish Processing Division of CIFT, Cochin has developed and standardized a novel low cost method for preparing hydroxyapatite crystals from fish processing waste which otherwise causes serious environmental problems.

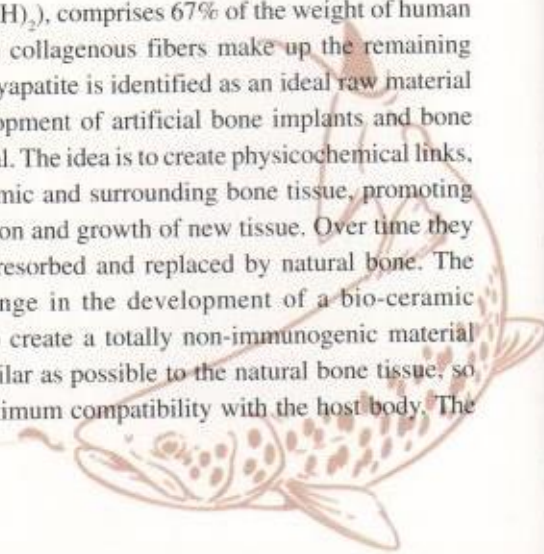
Hydroxyapatite as natural mineral supplement

Human body need a balance of calcium and phosphorus. The Recommended Daily Intake (RDI) for calcium and phosphorous for an adult is 1000 mg each (FDA). Research has indicated that 85% of women over the age of 20 and at least 50% of men from age 35 consume less calcium than this RDI value. The major role of calcium in the body is building healthy bones and teeth. The lack of calcium quite often leads to osteoporosis, which is the main cause of bone fractures in adults. Women are at much higher risk for osteoporosis, especially after menopause. Calcium is also critical for many other biological functions, including muscle contraction, blood clotting and neural

transmission. Almost 99% of the total calcium taken by the body is being stored in the bones, the remaining 1% circulates in the body as serum component. If the body does not get enough calcium through food to keep the right amount circulating in the blood, the body will strip calcium from the bones where it is stored, causing the bones to get weaker. Although many foods supply various calcium and phosphate salts, human and animal hard tissues are the only natural source of calcium hydroxyapatite which is much easier for the body to absorb. There is increasing evidences to suggest that hydroxyapatite is more effective than calcium supplements in maintaining the bone mass.

Hydroxyapatite as bio-ceramic material

Bone is comprised of three basic building blocks - collagen fibrils, mineral plates, and a matrix of unmineralized, non-fibrillar organic material, mostly made of proteoglycans and glycoproteins. Hydroxyapatite ($\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$), comprises 67% of the weight of human bone, and the collagenous fibers make up the remaining 33%. Hydroxyapatite is identified as an ideal raw material for the development of artificial bone implants and bone filling material. The idea is to create physicochemical links, between ceramic and surrounding bone tissue, promoting their integration and growth of new tissue. Over time they are partially resorbed and replaced by natural bone. The major challenge in the development of a bio-ceramic material is to create a totally non-immunogenic material that is as similar as possible to the natural bone tissue, so as to get maximum compatibility with the host body. The





ideal bio-ceramic material could be easily fabricated and preserved and should be biocompatible and biodegradable. Since, hydroxyapatite is the basic bone mineral, it is totally biocompatible and nontoxic and becomes an integral part of the living bone tissue. However, the synthetic form of hydroxyapatite has been shown to be chemically and crystallographically similar, but not identical, to naturally occurring HAP. These materials should have high porosity (the order of hundreds of microns) to allow the development of bone within and across them. The multifunctional hydroxyapatite prepared by CIFT is multiporous and have high degree of interconnectivity. The high porosity of HAP permits the bone tissue grow into the pores of the implant once inserted.

Artificial tooth enamel

Dental caries represents the most prevalent chronic disease in both children and adults. Roughly 97% of tooth enamel and 70% of dentin comprises of hydroxyapatite. At the initial stage of dental caries, bacteria cause the damage of enamel which is scarcely being self-repaired by living organisms. Therefore, the remineralization of enamel minerals by using synthetic apatite is always suggested in dental research. The native structure of enamel is too complex to be remodeled. The synthesized apatite crystallites often have different dimensions, morphologies, and orientations from the natural ones, which result in poor adhesion and mechanical strength during the restoration. Additionally it has been documented to possess antibacterial potentials and hence is a potential candidate for pulp capping and cavity lining.

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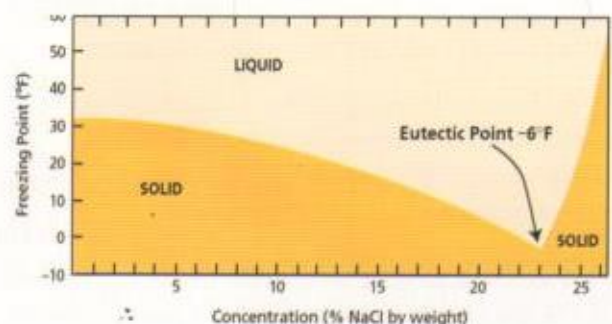
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Brine Freezing Improves the Quality of Tiger shrimp (*Peneaus monodon*)

Shrimps are most sought after seafood products due to its their unique taste and culinary properties. They decompose quickly due to various factors like enzymatic and microbiological activities. The highest shrimp quality can be obtained in the shrimp preserved immediately after harvesting. Freezing is one of the best methods to retain sensory and nutritional quality of the food. In the processing plants, it is frozen either in block by glazing with water and freezing in an air-blast freezer, plate freezer or individually frozen (IQF). Although freezing is an effective method of preserving foods for longer duration, some deterioration in quality occurs during storage. The extent of quality loss depends on many factors, including the rate of freezing and thawing, storage temperature, temperature fluctuations, freeze-thaw abuse during storage, transportation, retail display and consumption. For any food, rapid freezing is recommended to prevent the formation of large ice crystals that can damage cells which degrade the quality by allowing loss of moisture during the frozen storage and upon thawing. Cryogenic freezing method like brine freezing will be useful in reducing the freezing time and maintaining better quality of fishery

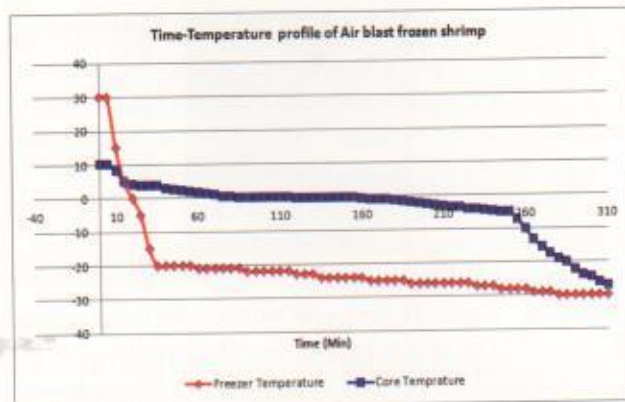
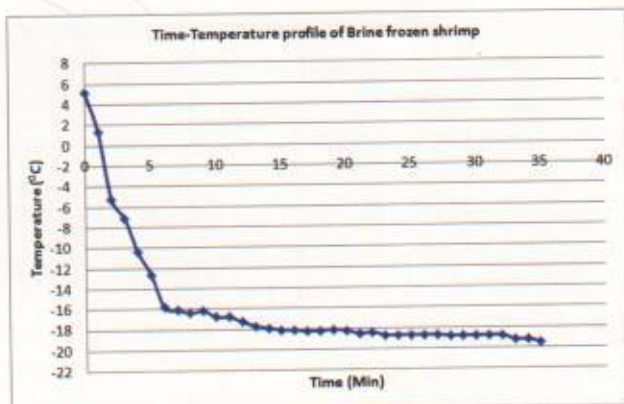
products compared to conventional air blast freezing.

Use of salt brine for preserving fishery products are known from centuries. However, the use of salt brine for refrigerant has not been widely adopted. It promises a bright future as this can be used to freeze fishery products rapidly maintaining its texture and sensory quality. The freezing point of water can be lowered predictably with given salt concentration. An optimum temperature of -21°C can be reached with brine solution at 23.3% (w/v) of salt concentration, which is known as eutectic point. Any concentration above or below will result in higher



Freezing point of salt brine solution





Time-Temperature profile of brine and air blast frozen Tiger shrimp



Fresh and brine frozen Tiger shrimp

temperatures. A comparative study was conducted at CIFT to investigate the effect of air blast freezing and brine freezing methods on the quality changes of Tiger shrimp (*Peneaus monodon*).

Freshly harvested Tiger shrimps (L = 16 ± 2cm, w= 50 ± 3g each) were frozen by blast freezing (2 kg each) at -30 °C. For brine freezing, shrimps were passed over the conveyor belt for brine solution treatment prepared by mixing food grade sodium chloride (21%), sugar (5.3%) and water (73.7%) in the brine mixing tank. Upon freezing, the shrimps were frozen stored maintaining a temperature of -18 °C. Freezing time was significantly less for brine frozen shrimps (35 min.) compared to air blast frozen shrimps (5 h). Freezing loss and thawing loss was higher for air blast frozen shrimp (2.24 and 0.86% respectively) compared to brine frozen samples (1.84 and 0.38% respectively). Total mesophilic and total psychrotrophic

counts of brine frozen shrimps were lower than air blast frozen shrimps. Brine freezing also lowered total enterobacteriaceae counts. Salt content (NaCl) of brine frozen shrimp was higher (1.62%) compared to air blast frozen sample (0.38%). Peroxide value was observed higher for brine frozen samples whereas free fatty acids and TBA value was higher for blast frozen prawn. The results indicated that brine freezing reduces the freezing time considerably and improves the microbial quality of shrimp whereas salt content and lipid oxidation was more compared to air blast frozen samples. Sensorily, samples frozen using brine was rated better. The brine freezing treatment has led to an increase in NaCl content in the white muscle. This increased salt content could be responsible for the higher lipid oxidation and the lower lipid hydrolysis development. NaCl has been reported to act as pro-oxidant by enhancement of the pro-oxidant effect of chelatable iron ions widely present in fish muscle. Since long shelf-life time is highly essential for commercializing brine freezing method for fishery products, the employment of other protective treatments such as glazing, vacuum packaging, modified atmosphere packaging and natural antioxidant application can be used as hurdle to prevent or to inhibit lipid oxidation and to retain sensory and nutritional properties.

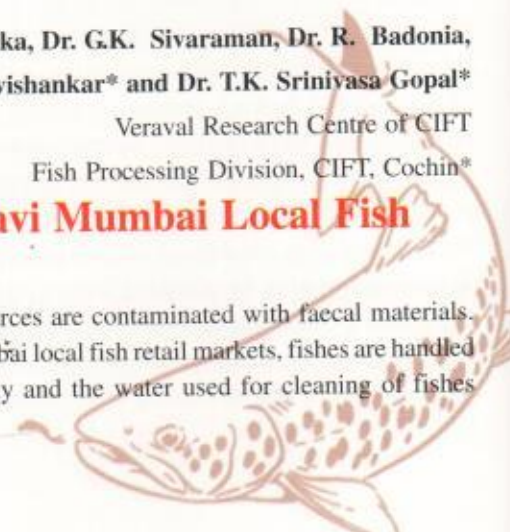
Dr. C.O. Mohan, S. Remya, V. Renuka, Dr. G.K. Sivaraman, Dr. R. Badonia, Dr. C.N. Ravishankar* and Dr. T.K. Srinivasa Gopal*

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Faecal Indicators in Water Samples of Navi Mumbai Local Fish Markets

Faecal indicators are the microorganisms that normally exist in the intestine of warm blooded animals and the presence of these microorganisms in water indicates that

the water sources are contaminated with faecal materials. In Navi Mumbai local fish retail markets, fishes are handled unhygienically and the water used for cleaning of fishes





are not of potable quality. Moreover, the retail fish markets in Navi Mumbai is an unorganized sector, which usually find a market place with poultry, vegetables and other food commodities together. Most of the retail markets are not having a raised platform for keeping the fish and the sheds are not properly covered. The floor is quite often occupied by stray dogs particularly during the night hours. Hence, there is a high possibility of faecal contamination in these unhygienic markets. In this context, a study was conducted to determine the faecal indicator level of the water from the Navi Mumbai local fish markets.

A total of 28 water samples from the local fish market, Vashi, Navi Mumbai was analyzed for Aerobic Plate Count (APC) and faecal indicators such as *E. coli*, faecal Streptococci (FS) and Sulphite reducing Clostridia (SRC) as per standard protocol and results were analyzed based on Pearson Correlation Coefficients.

Microbiological levels of all 28 samples were more than the recommended limits. The average values of APC, *E. coli*, FS and SRC were 483.89, 53.21, 49.36/ml and 13.96/100ml respectively. The result indicates the poor hygienic condition of the local fish markets. The correlation coefficient of the faecal indicators were analyzed based on the Pearson Correlation Coefficients, and very high correlation was found between *E. coli* and faecal

Streptococci (FS) i.e., 0.77. Next higher level of correlation was found between APC and *E. coli* i.e., 0.47.

Correlation between the faecal indicators present in water samples

Faecal indicators	Correlation Coefficient
TPC and <i>E. coli</i>	0.47
TPC and faecal Streptococci	0.34
TPC and Sulphite reducing Clostridia	0.36
<i>E. coli</i> and faecal Streptococci	0.77
<i>E. coli</i> and Sulphite reducing Clostridia	0.22
Faecal Streptococci and Sulphite reducing Clostridia	0.05

The higher level of faecal indicators in the water samples of the local fish markets is a sign of very poor hygienic condition which symbolize threats to human health. The correlation between *E. coli* and faecal Streptococci was very high, suggesting that FS may be a suitable alternative for *E. coli* in water sample analysis. SRC shows least correlation when compared with other indicators since this bacteria indicates the remote contamination, not a recent contamination.

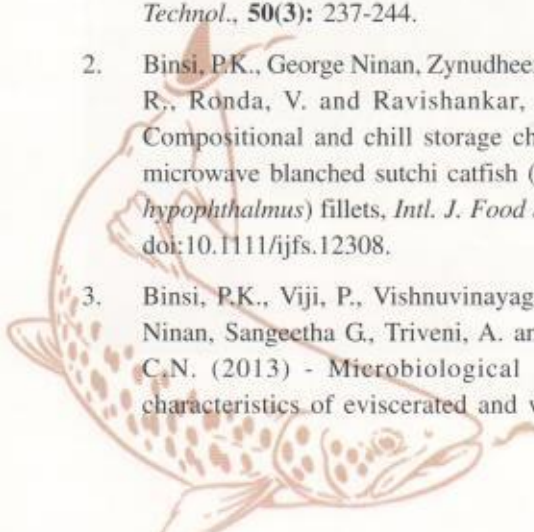
Dr. S. Vishnuvinayagam, Dr. P.K. Binsi and P. Viji

Mumbai Research Centre of CIFT

Publications

Research Papers

- Biji, K.R., Saumya Teresa Chacko, Yathavamoorthi, Y., Ravishankar, C.N., Bindu, J. and Suseela Mathew (2013) - Optimization of process parameters for ready-to-serve bread spread from Blue swimmer crab *Portunus pelagicus* in tin-free steel cans, *Fish. Technol.*, **50(3)**: 237-244.
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Training Programmes

Cochin

1. Isolation, characterization and bioactivity of glycosaminoglycans from cuttlefish (*Sepia pharaonics*) (30 May - 6 July)
2. Advanced analytical techniques in biochemistry (22-26 July)
3. Survey of traditional fishing methods and documentary practices (2 August)
4. HACCP concepts (12-17 August & 19-23 August)
5. Laboratory analysis in microbial examination of foods (19-23 August)
6. Isolation and identification of bacteria of public health significance in food (19-23 August)
7. Seafood quality assurance (26 August - 5 September)
8. Production of value added products from Masmin and packaging of finished products (6-7 September)
9. Energy management and conservation study for fish preservation by application of conventional and non-conventional energy sources (18-26 September)

10. Chemical and microbiological evaluation of water (18-28 September)
11. Water analysis (23-27 September)
12. Laboratory techniques in molecular biology (23-28 September)
13. Technical guidance for setting up of laboratory (23-28 September)

Veraval

1. Microbiological quality of seafood (2-7 September)

Mumbai

1. Microbiological quality control for seafood (29 July - 3 August)



Analytical techniques in biochemistry - Participants and Faculty



Hands-on training at Mumbai





Participation in Exhibitions

During the quarter the Institute participated in the following exhibitions:

1. Exhibition held in connection with International conference on Tropical roots and tubers for sustainable livelihood under changing agro-climate, CTCRI, Thiruvananthapuram during 9-12 July, 2013.



Exhibition at NBFGR, Lucknow

2. Exhibition held in connection with Expert consultation on Fish genomics research in India: a way forward, NBFGR, Lucknow on 2 August, 2013.
3. 17th National exhibition on the theme 'India advancing towards a world power', Santiniketan, West Bengal during 21-25 September, 2013.



Shri A.K. Panigrahi, Sr. Tech. Officer receiving memento at the exhibition at Santiniketan

Outreach Programmes

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

1. Programme on Hygienic handling of dry fish and preparation of value added products in collaboration with Agricultural Technology Management Agency (ATMA) at Visakhapatnam fishing harbor on 3 July, 2013 for the benefit of 25 fisherwomen.
2. Outreach programme on 'Essentiality of baseline cleanliness for a fishery microenterprise unit' at Alappuzha on 15 July, 2013.
3. Training on 'Hygienic fish drying to improve livelihood of coastal fisherwomen' at MS Swaminathan Research Foundation, Poompuhar, Nagapattinam during 16-19 July, 2013.
4. Skill upgradation training on 'Hygienic handling and preparation of value added products' at Mangamaripeta fishing village on 18 July, 2013 for the benefit of 27 fisherwomen. The programme was organized by District Fishermen Youth Welfare Association, Visakhapatnam
5. A one-day training programme on 'Introduction of food safety and hygiene' for the benefit of women micro enterprise at Moothakunnam, Ernakulam district on 22 July, 2013.
6. Training programme on 'Preparation of value added fish products' at Kuzhippilly village, Ernakulam during 24-25 July, 2013.

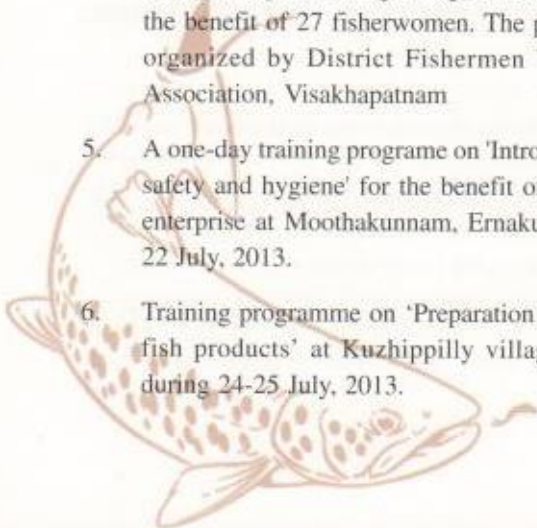
7. Mass training programme organized by the Kerala State Coastal Area Development Corporation (KSCADC) in association with NAIP-RHSSP project of CIFT, Cochin at Nalapakam, Kollam during 3-5 August, 2013.
8. Skill upgradation training on 'Preparation of value added fish products' for 30 women fishers from Bheemli, Chinna Mangamaripeta, Pedda Mangamaripeta and Kothur fishing villages of



Inauguration of training at Kuzhippilly



Skill upgradation training at Visakhapatnam





Visakhapatnam district during 19-21 August, 2013. The programme was organized by District Fishermen Youth Welfare Association, Visakhapatnam.

9. Training on 'Fabrication of improved fishing nets and responsible fishing' and 'Preparation of value added fish products' at Bodoland Territorial Council, Kokrajhar, Assam during 26-29 August, 2013.
10. Skill upgradation programme on 'Value added fish products' for 32 women fishers from Pudimadaka fishing village during 12-13 September, 2013. The

programme was organized by District Fishermen Youth Welfare Association, Visakhapatnam.



Participants and resource persons of Skill upgradation training at Visakhapatnam

Two New Products of CIFT, Cochin Released

Hydroxyapatite from Fish Scales

CIFT has developed and standardized a novel method for preparing hydroxyapatite (HAP) crystals from fresh water fish scales. Hydroxyapatite and calcium phosphate based biomaterials have attracted considerable interest in the field of tissue engineering. Among the main areas of application of HAP, the most promising areas are orthopedics and orthodontics, where bone tissue has to be replaced, partially or totally. HAP is identified as an ideal raw material for the development of artificial bone implants and bone filling material. Being a high value pharma product extraction of hydroxyapatite from fish scales offer exciting scope for the utilization of fish waste.

Fish Calcium Capsules

Fish discards like bones and scales are important source of calcium which has several important functions in human body. The Fish Processing Division of CIFT, Cochin has developed and standardized a low cost method for the extraction of calcium from fish bones. Calcium is extracted from rohu bones by removing protein and fat and encapsulated with supplemented vitamin D. *In vivo* studies

conducted at CIFT in albino rats have shown that fish calcium powder supplemented with vitamin D has improved the absorption and bioavailability. This product from fish bones is a viable and affordable option for dietary calcium supplementation, particularly for the women and aged.

The products were released by Shri Sharad Pawar, Hon. Union Minister of Agriculture and Food Processing on 16 July, 2013 during the ICAR Foundation Day Celebrations at New Delhi.



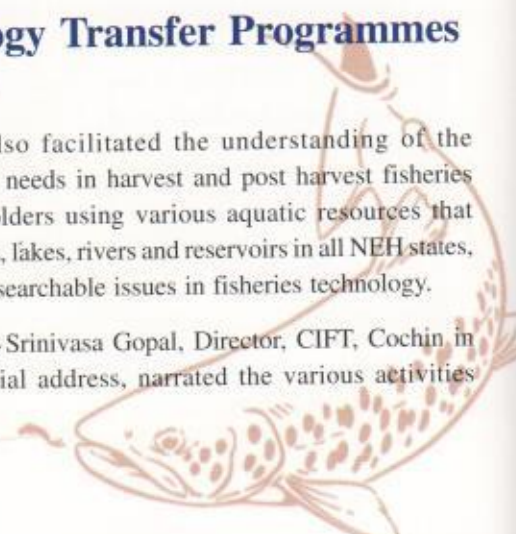
Releasing of the products by Shri Sharad Pawar. Also seen are Dr. T.K. Srinivasa Gopal, Director, CIFT and Dr. S. Ayyappan, DG, ICAR

North-East Regional Workshop on Technology Transfer Programmes in NEH States

A Regional Workshop on 'Technology Transfer Programmes in NEH States' was organized by CIFT, Cochin at National Research Centre on PIG (NRCPI), Rani, Guwahati on 10 July, 2013. The Workshop was organized to facilitate face-to-face interaction between researchers, policy makers, Fisheries Department Officials and stakeholders in fisheries so as to plan technology transfer programmes for the year 2012-14 in NEH states. The

Workshop also facilitated the understanding of the technological needs in harvest and post harvest fisheries from stakeholders using various aquatic resources that includes beels, lakes, rivers and reservoirs in all NEH states, and on the researchable issues in fisheries technology.

Dr. T.K. Srinivasa Gopal, Director, CIFT, Cochin in his presidential address, narrated the various activities





Address by Shri M.S. Sahoo, IAS



Inaugural session in progress

carried out by CIFT in NEH region for the past one decade, and highlighted the scope for the future works in the 12th Plan Period. Dr. S.V. Ngachan, Director, ICAR Research Complex for NEH Region, Umiam, Meghalaya inaugurated the Workshop. In his inaugural address, he congratulated CIFT for its ventures in NEH states, and advised the participants and the representatives from State Departments of Fisheries to utilize the technological programmes offered, and to reap the maximum benefits from CIFT's ToT interventions. Dr. Dilip Kumar Sarma, Director, NRCP, Guwahati and Shri Mukesh Sandesh Sahoo, IAS, Principal Secretary, Bodoland Territorial Council offered felicitations on the occasion. In the technical session, HODs from CIFT viz., Dr. Leela Edwin, Dr. T.V. Sankar, Dr. S. Balasubramaniam, Dr. C.N. Ravishankar and Dr. M.M. Prasad, SIC, Visakhapatnam Research Centre of CIFT made presentations and answered the technical queries of the stakeholders.

About 80 officials and stakeholders representing State Departments of Fisheries, KVKs, NGOs, Bodoland Territorial Council, and fishermen/fisherwomen associations from Assam, Manipur, Arunachal Pradesh, Tripura and Nagaland participated in the programme with very good interaction and feedback in technical sessions.

During the interaction with the participants, the following technological needs/interventions were noted:

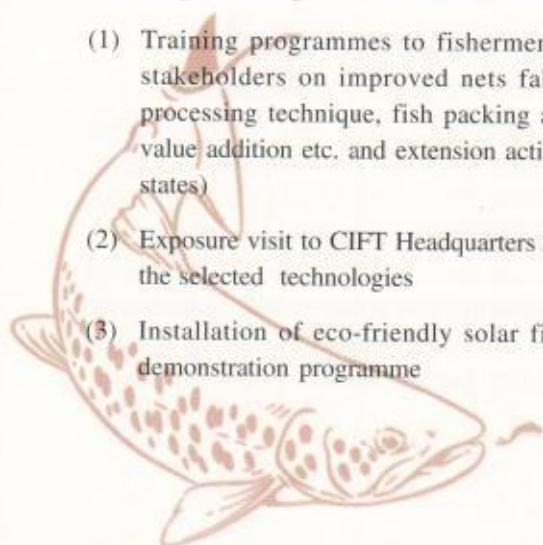
- (1) Training programmes to fishermen/fish farmers/stakeholders on improved nets fabrication, fish processing technique, fish packing and marketing, value addition etc. and extension activities (all NEH states)
- (2) Exposure visit to CIFT Headquarters and training on the selected technologies
- (3) Installation of eco-friendly solar fish dryers and demonstration programme



Interactive session in progress

- (4) Installation and demonstration of fish smoking kilns
- (5) Introduction of improved fishing crafts such as FRP canoes/coracles
- (6) Infrastructure and instruments for preparation of value added fish products
- (7) Establishment of mini fish processing facilities in the Centres such as ICAR Complex for NEH Region, Umiam, Meghalaya, Directorate of Fisheries/ICAR Complex, Imphal, Manipur and KVK, Roing, Arunachal Pradesh
- (8) Capacity building programmes for stakeholders on income generation avenues for employment generation
- (9) FRP boats for operation in aquaculture ponds
- (10) Maintenance of hygiene and sanitation in community production units and food safety standards for fishery products/local recipes
- (11) Use of degradable materials in hatcheries (Assam) due to the problems in the disposal of FRP waste materials
- (12) Training in stake nets operation in Manipur state

Dr. S. Balasubramaniam, Head and Dr. J. Charles Jeeva, Senior Scientist, Extension, Information and Statistics Division, CIFT, Cochin coordinated the Workshop.





Distribution of Improved Gillnets

Under the National Agricultural Innovation Project-RHSSP sub project, a programme on distribution of improved gill nets suitable for reservoir fisheries in seven dams of Palakkad district was organized by CIFT, Cochin in association with the Kerala Fisheries Department, Malampuzha, Palakkad, at Kollengode Block Panchayat Hall, on 22 July, 2013. The function was presided over by the President of Kollengode Block Panchayat, Shri K. Vasudevan. The inauguration was carried out by Shri K. Babu, Honourable Minister of Fisheries and Excise, Govt. of Kerala by lighting the traditional lamp and distributing the gillnets to the fishermen of Meenkara and Chulliyar dams. Shri K. Babu appreciated the efforts of Scientists of CIFT, Cochin in providing technical inputs to the fisheries sector for the overall improvement in the livelihood and income of the fishermen. Dr. K.V. Lalitha, Consortium Principal Investigator welcomed the gathering and Shri M. Nasser, Co-PI of Project gave a detailed report on the project interventions carried out for reservoir fisheries in Palakkad. Smt. T. Pradeepa, President, Kollengode Gram Panchayat,

Smt. Mallika Swaminathan, Smt. Anu Ramesh and Smt. K.C. Vijayakumari, Members, Kollengode Gram Panchayat offered felicitations. Shri Y. Sayed Muhammed, Fisheries Deputy Director, Malampuzha proposed vote of thanks. The programme was co-ordinated by Dr. S. Ashaletha and Dr. V. Geethalakshmi. A total of 132 fishermen belonging to various dams in Palakkad, namely Valayar, Mangalam, Pothundi, Kanjirapuzha, Meenkara and Chulliyar were benefited from the programme. After the inaugural function there was a discussion with the Project team chaired by the Minister. Officials of Department of Fisheries and Block Panchayat President also participated in the meeting and discussed about the future action plans for developing reservoir fisheries in Kerala. Scope for technological interventions like introduction of customized boat designs suiting different climatic conditions of various reservoirs of Kerala and improvised FRP coracles were presented by Shri M. Nasser which was well received by the Minister. Also, the possibility of value added fish products in the reservoir fisheries sector was suggested to be explored.



Shri K. Babu, Hon'ble Minister inaugurating the programme



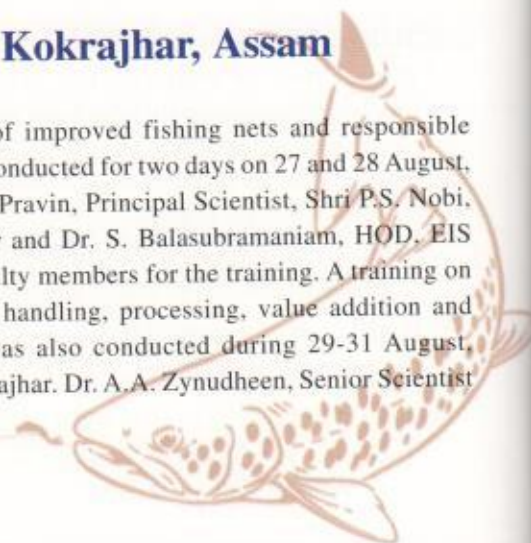
Hon'ble Minister distributing gillnets to the fishermen

Technology Transfer Programmes at Kokrajhar, Assam

CIFT, Cochin organized two training programmes on 'Fabrication of improved fishing nets and responsible fishing', and 'Preparation of value added fish products' at Bodoland Territorial Council, Kokrajhar, Assam during 26-28 August, 2013.

On 26 August, 2013, the training was inaugurated by Hon'ble Chief Sjt. Hagrama Mohilary which was attended by 150 fish farmers/fishermen. A training on

Fabrication of improved fishing nets and responsible fishing was conducted for two days on 27 and 28 August, 2013. Dr. P. Pravin, Principal Scientist, Shri P.S. Nobi, Tech. Officer and Dr. S. Balasubramaniam, HOD, EIS were the faculty members for the training. A training on Post harvest handling, processing, value addition and packaging was also conducted during 29-31 August, 2013 at Kokrajhar. Dr. A.A. Zynudheen, Senior Scientist





and two technical staff from Fish Processing Division conducted the training. About 140 trainees attended both

training programmes. Dr. S. Balasubramaniam coordinated the training programmes.



Inauguration of the training



Participants with faculty

Training Programme on Essentiality of Baseline Cleanliness

One day training programme on "Essentiality of baseline cleanliness for a fishery microenterprise unit" was conducted for women microenterprise units viz., Grihajyothi, Pavithram and Snehadeepam, at Chandiroor, Alappuzha on 15 July, 2013. The programme was organized as part of the DST project entitled "Food safety interventions for women in fish based microenterprises in coastal Kerala". Dr. Femeena Hassan, Senior Scientist and Principal Investigator of the Project took a class on "Essentiality of baseline cleanliness for a fishery microenterprise unit". The class dealt with the problems associated with inadequate sanitation, the importance of sanitation in destroying vegetative cells of microorganisms of public health significance, and in reducing numbers of other undesirable microorganisms, but without adversely affecting the food or its safety for the consumer.

The Research Fellows of the Project gave a demonstration on how to clean food contact surfaces where the main works are carried out. The participants were informed about a cleaning schedule, water and

chlorine treatment and about the use of detergents, how the cleanliness of floor and food contact surfaces can be maintained and the necessity of doing the exercises. Further, a hygiene monitoring survey was also conducted to understand the prevailing status. Swab was collected from five different surfaces of the unit which included the working table, worker's hand, utensils, floor and equipment before and after treatment with disinfectant. The analysis revealed that current cleaning schedule in the unit is inadequate.

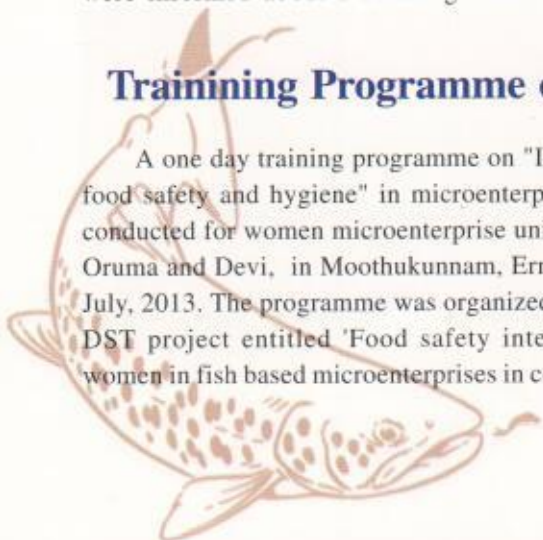


Project staff interacting with stakeholders

Training Programme on Introduction to Food Safety and Hygiene

A one day training programme on "Introduction of food safety and hygiene" in microenterprise units was conducted for women microenterprise units viz., Sneha, Oruma and Devi, in Moothukunnam, Ernakulam on 20 July, 2013. The programme was organized as part of the DST project entitled 'Food safety interventions for women in fish based microenterprises in coastal Kerala'.

Dr. Femeena Hassan, Senior Scientist and Principal Investigator of the Project took a class on "Introduction to food safety and hygiene". She highlighted the essentiality of maintaining hygiene for the production of safe food. The main aim of the class was to create awareness on how to implement food safety systems to ensure that food is safe to consume in a bid to halt the



increasing incidence of food poisoning.

Prior to the programme, a hygiene monitoring survey was also conducted. On that day swab samples were collected from microbial challenged areas of microenterprise unit and analyzed for microbial load.



Hygiene check of a worker's hand

The results were discussed during the programme. The feedback from the trainees reveals that before training they were less aware of food safety and hygiene practices and the training imparted a good knowledge on food safety and they assured that they will practice what has been taught so as to produce safe food.



Project staff interacting with stakeholders

Agri-Tech Investors Meet 2013

The 'Agri-Tech Investors Meet 2013' was organized by the National Agricultural Innovation Project (NAIP) and Indian Council of Agricultural Research (ICAR) during 18-19 July, 2013 at A.P. Shinde Symposium Hall, NASC Complex, New Delhi. The two-day Meet showcased commercializable NAIP technologies from different sectors of agriculture and their business potentials. The participants got an opportunity to interact with NAIP agri-business incubators for their support on agri-ventures.

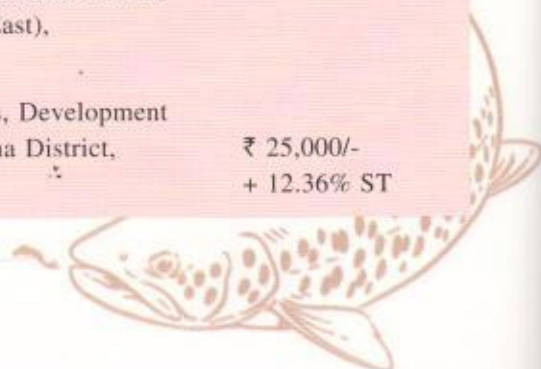
In the sector-wise presentation session, a presentation on 'Value added fish products' developed under NAIP RHSSP project was made by Dr. K.V.

Lalitha, CPI of the Project in the Marine products session chaired by Dr. B. Meenakumari, DDG (Fy.), ICAR.

The event featured B2B meetings for technology commercialization and partnership engagement, two-day agri-exhibition featuring more than 80 ready-to-commercialize agri-technologies from crops, horticulture, food processing, animal husbandry, fibres, agri-engineering, industrial processing and fisheries sector and Agribusiness incubators and their services.

CIFT, Cochin has signed and handed over two Memorandum of Agreements through ZTM-BPDU, South Zone, during the programme. The details are as follows:

No.	Name of the Technology	Name of the client	Consultancy fee
1	Fish curry in retortable pouches	M/s. Monsoon Bounty Foods Manufacturing Pvt. Ltd., No.W115SB Complex, Mezzanine Floor, 3 rd Avenue, Anna Nagar (East), Chennai - 600 040	₹ 1,50,000/- + 12.36% ST
2	Fish Kure - Extruded snack food from fish	M/s. Charis Food Products, Development Area, Aroor P.O, Alappuzha District, Kerala	₹ 25,000/- + 12.36% ST





Handing over MoU to M/s Monsoon Bounty Foods Manufacturing Pvt. Ltd.



Handing over MoU to M/s Charis Food Products

Workshop cum Training on Survey of Traditional Fishing Methods and Documenting Practices

A Workshop cum training on "Survey of traditional fishing methods and documenting practices" was organized under the National Innovation Foundation funded project "Village knowledge register of Thoothoor fishing community and Establishing knowledge based enterprises by pooling best innovative and traditional knowledge practices" on 8 August, 2013 at CIFT, Cochin. The CIFT and Innovation India, a non-profit organization are partnering institutions with National Innovation Foundation in which this project is carried out with the help of Association of Deep Sea Going Artisanal Fishermen (ADSGAF). The project is being carried out with the aim of scientifically documenting the indigenous knowledge and traditional practices of the world renowned sea faring community of Thoothoor. The programme began with a welcome speech of Dr. Leela Edwin, Head, Fishing Technology Division and Principal Investigator of the project. A brief introduction about the project and workshop cum training was given by the PI. The PI also thanked Bay of Bengal Programme

for offering support for drawing different designs of hook and line used by Thoothoor fishermen. Shri J. Vincent Jain, Chief Executive Officer, ADSGAF, Thoothoor, Partner of the project gave remarks and assumed that through this project Thoothoor fishermen will get a national recognition. The formal vote of thanks was proposed by Dr. P. Pravin, Co-PI of the Project.

The Workshop was conducted to the seven trainees for getting first hand information on the documentation procedure for a better output while compiling data and to ensure the local representation of the technologies. The Workshop was aimed to enable the creation of a village knowledge register of fishing community of Thoothoor village by documenting and developing database/register of outstanding traditional knowledge and innovations of fishermen in long lining.

The session started with a training class on 'Community resource analysis through PRA' by Shri Allwin Thomas, Community Development Supervisor,



Shri J. Vincent Jain, CEO giving remarks. On the dais are Dr. Leela Edwin and Dr. P. Pravin



Shri Allwin Thomas imparting training on the topic 'Community resource analysis through PRA'





Jalanidhi, Govt. of Kerala. Dr. J. Charles Jeeva, Senior Scientist, CIFT, Cochin delivered a lecture on the topic 'Tools and techniques for social survey and documentation'. A practical session for data collection was also organized during the training.

Dr. P. Pravin explained the questionnaire and cleared the doubts of trainees in the interactive session. After the session, a field visit to Thoppumpady harbour and Fort Cochin was also arranged.

Training Programme Under TSP Held at Fraserganj, West Bengal

CIFT, Cochin organized a one day training programme on "Responsible fishing" for the benefit of the members of Fraserganj Tribal Fishermen Cooperative Society, West Bengal on 19 September, 2013 under the Tribal Sub Plan (TSP) programme. Smt. Samuli Das, Fraserganj Panchayat Pradhan inaugurated the programme which was presided over by Shri Sabapathi Sahadev Mondal, President, Fraserganj Tribal Fishermen Cooperative Society. Dr. M.P. Remesan, Principal Scientist, CIFT, Cochin gave the Key Note address. Felicitation were offered by Shri L.Z. Padani, Member, Fraserganj Panchayat, Shri Vidut Giri and Shri Arunab Mitra, Technical Officers, CIFRI, Kolkata. Shri Debashish Das, Technical Officer, CIFRI, proposed vote of thanks. About 60 men and women participated in the programme.

The importance of selective fishing gears like gill net and fabrication and rigging of simple gill net with recommended mesh size for Hilsa and other fishes in the region was presented by Dr. V.R. Madhu, Senior Scientist, CIFT, Cochin. Fabrication and rigging of selective surface drift gill net (Chandi jaal) with large mesh for Hilsa was demonstrated to the fishermen during the practical session. Shri H.V. Pungera, Tech. Officer, Veraval RC of CIFT conducted the practical session.

CIFT has already initiated steps for procuring about 1000 kg gill nets with mesh size ranging from 100 mm to 280 mm and other accessories for distribution among the tribal fishermen at Fraserganj and Bali island.

The concept and need for responsible fishing in the light of Code of Conduct on Responsible Fishing (CCRF) was discussed with particular reference to Hilsa fishing and related issues. The existing non-selective fishing gears and indiscriminate fishing methods prevalent in the traditional Hilsa fishing grounds in India and the nature of fish landings, quantity of discards and the consequences on the fishery resources were highlighted in the presentations made by Dr. M.P. Remesan. The second lecture was completely on the ongoing CIFT-CIFRI collaborative project on Hilsa conservation and the interventions planned to reduce the landings of Hilsa juveniles in the bag nets.



Practical session in progress



Participants and resource persons of the training programme





MoES-NOAA Training Workshop

Under the Ministry of Earth Sciences (MoES) - National Oceanic and Atmospheric Administration (NOAA), USA collaboration on research and development, a training workshop on "Algal blooms and fishery prediction system" was organized at the Quality Assurance and Management laboratories of CIFT, Cochin in association with CMLRE and NOAA, during 23-27 September, 2013. The programme was organized under the research project on HAB toxins titled "Characterization of harmful algal blooms along the Indian Coast". Dr. K. Ashok Kumar, Principal Scientist is the Principal Investigator and the project is under implementation during the XII plan period. CIFT being a leading agency under the National HAB programme of MoES, actively cooperated with CMLRE in conducting the Workshop. NOAA - NMFS, INCOIS, CMFRI, and NIO are the other associated partners of the National HAB and Fishery Predictions Project.

Dr. Vera L. Trainer, Programme Manager, Harmful Algal Blooms Programme at the Northwest Fisheries Science Centre, Dr. T.V. Sankar, Head, QAM Division and Dr. K. Ashok Kumar were the Faculty of the Workshop. Two research fellows Kum. R. Rajisha and Kum. Rose Mary Mathew from QAM Division participated in the Workshop. They also participated in the one-day FORV Sagar Sampada cruise field trip on

24 September, 2013 organized for understanding the sampling protocols and data/sample analysis including practical sessions on data analysis.

A hands-on training on toxin detection was conducted on 24 September, 2013. Dr. Vera L. Trainer (NOAA), Dr. Bill Peterson (NOAA), Dr. T.V. Sankar and Dr. K. Ashok Kumar headed the training session. Dr. Vera L. Trainer demonstrated the Jellet Rapid Tests for PSP, ASP and DSP, lateral flow tests to detect Marine Biotoxins in shellfish and phytoplankton. The JRT PSP test is a simple, qualitative (yes/no)-lateral flow test that indicates the presence or absence of PSP in a sample below the regulatory limit. JRTs have given consistent results with the mouse bioassay using thousands of shellfish samples tested worldwide. Therefore, the JRT Test can be an useful screening method for PSP, ASP and DSP toxins. Dr. Vera L. Trainer also demonstrated the PSP Toxins Saxitoxin (STX) analysis by ELISA (ABRAXIS ELISA and PP2A Kits for NSP, ASP, DSP and PSP). The test is a direct competitive ELISA based on the recognition of Saxitoxin by specific antibodies. She also demonstrated the operational procedure of Miniphotomer Model 6+, a user friendly ELISA reader. Dr. T.V. Sankar discussed the lipid profile analysis of zooplanktons for elaborating the transfer of lipid from such organisms to higher aquatic lives.



Algal bloom sampling using Bongo net, Onboard FORV Sagar Sampada



Faculties and participants of the Workshop, Onboard FORV Sagar Sampada



Participants of the HAB Group with Dr. Vera L. Trainer

Business Meet of "Fish Maid Entrepreneurs"

The Kerala State Coastal Area Development Corporation (KSCADC) organized a Business Meet of "Fish Maid Entrepreneurs" in collaboration with NAIP sub project, "Responsible harvesting and utilization of selected small pelagics and freshwater fishes (RHSSP)" on 3 September, 2013 at Thiruvananthapuram. Dr. K. Ampady, IIS, Managing Director, KSCADC formally inaugurated

the Business Meet. During the inaugural speech he briefed the business plan and the marketing concept for imminent 'Fish Maid' outlets throughout the state. Project Co-PI Dr. S. Ashaletha, Senior Scientist, CIFT, Cochin made an introductory speech about 'Fish Maid' products and its health benefits compared to other snack foods for the entrepreneurs. Project Co-PI and Principal Scientist Shri





M. Nasser made a presentation on 'Fish Maid' business model. During the presentation he explained the vast scope and present scenario of Quick Service Restaurants in Indian food sector and the significance of Fish Maid products in this purview. Afterwards, there was a detailed discussion with delegates, during which they raised many doubts regarding mode of operation, technical as well as marketing supports from KSCADC and NAIP-RHSSP. A total of 42 entrepreneurs from different regions of Kerala attended the



Dr. K. Ampady explaining the business plan

Business Meet.

The procedure went on till evening and afterwards, the scrutiny of the entrepreneurs' profile was initiated based on the documents provided by them. The officials from KSCADC and CIFT jointly did the session on the next day. The programme concluded in the evening of 4 September, 2013, after finalizing the future steps to be undertaken for implementing the business model.



The entrepreneurs in the Business Meet

Karnataka Government to Propagate FRP Coracles for Inland Fishermen

The Honourable Chief Minister of Karnataka, Shri Siddaramaiah has declared in his 2013-14 Budget Speech that 2000 FRP coracles will be distributed to inland fishermen (Budget Speech Article No. 115). This declaration is in continuation of CIFT's distribution of 20 FRP coracles and gill nets under the Tribal Sub Plan to the tribal fishermen of Kabini Reservoir. This was for the first time that FRP coracles were introduced in the state. These coracles were distributed to the members of the Girijanara Meenugarara Sahakara Sangha, Kabini Colony, Kabini,

Mysore District through the Karnataka State Co-operative Fisheries Federation, Mysore in March 2013. FRP coracles of 2.2m diameter suitable for gillnet fishing in the reservoirs of



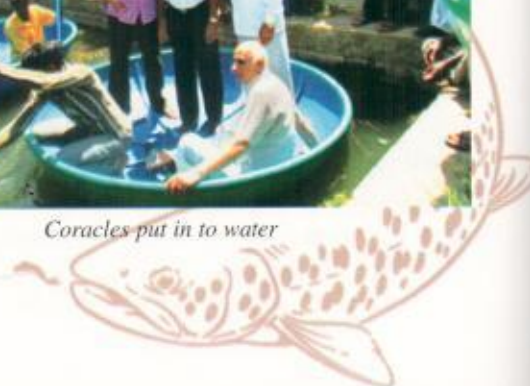
FRP coracles ready for distribution



Distribution of gillnets



Coracles put in to water





Karnataka was designed by CIFT and fabricated with reinforcement of FRP itself.

Generally coracles used by the tribals were made of natural fibrous materials covered with plastic sheet and reinforced using bamboo rods which are not sufficiently strong and durable. These coracles had a maximum life of one year only. FRP coracles are strong, durable and do not

require maintenance. Since it is lighter it can be carried to different locations by the migratory fishermen who are engaged in coracle fishing in the reservoirs.

Considering the success of this venture and order to propagate this new technology, coracles were fabricated and transported to the NEH region for gillnet operation in beels, reservoirs etc.

'Fish Maid' in the Track of Commercialization

Under the ongoing consultancy programme of NAIP value chain sub-project RHSSP (Responsible harvesting of selected small pelagics and freshwater fishes) with collaboration of Kerala State Coastal Area Development Corporation (KSCADC) the commercialization of value added fish products, mass production and marketing of 'Fish Maid' is initiated at 'Nalapakam' Fish Processing Facility, Fisheries Department, Kollam. After selection of suitable women stakeholders through various screening procedures, pilot level mass production trials were held in different steps including theory and

practical sessions during 12 August to 5 September, 2013. The venture will create an additional employment generation for 250 fisherwomen in the nearby coastal villages through which the consumers will be introduced to innovative trendy fishery products. Also, fisherwomen skills will be gainfully engaged directly in fish processing and marketing. Intensive product making training will be done for ten weeks. The overall programme was monitored by Shri M. Nasser, Dr. S. Ashaletha, Co-PIs of the project and Shri Jalajakumar, DGM, KSCADC.



Dr. K. Ampady, Managing Director, KSCADC inaugurating the training programme



Demonstration of product making

Impact Assessment of NAIP-RHSSP Project

As a part of impact assessment of NAIP projects, NAIP-RHSSP Project's first level of impact assessment study was done by Dr. T.K. Katiha, Principal Scientist (M&E), NAIP, ICAR on 27 September, 2013. After the initial discussion with Project Leader Dr. K.V. Lalitha, HOD, MFB and PI of the Project Dr. Katiha had a detailed interactive meeting with Project Investigators Shri M. Nasser, Dr. S. Sanjeev, Dr. V. Geethalakshmi, Dr. S. Ashaletha and Dr. R. Anandan. Dr. Katiha explained about the impact assessment procedure. Accordingly present status of each successful technology developed under the project was described. The progress achieved against the project objective formulated under production, processing and marketing strategies was also discussed. Later, he visited the display of the products, 'Fish Maid' (Ready to

Eat products), 'Fertifish' (organic manure developed under the project), Omega-3 based products, 'Drish' (hygienically processed and packed dry fish), Fuel Efficient Propellers, On-board fuel monitoring system etc. Afterwards, based on the information gathered from the field as well as the project staff, Dr. Katiha selected four technologies from among the major successful ones for secondary assessment. The detailed assessment of the selected technologies will be done in due course by the impact assessment team of the World Bank. During the discussion Dr. Katiha stressed the importance of popularizing the omega-3 enriched chicken egg and meat developed from sardine based omega-3 fatty acids considering its advantages compared to the omega-3 egg of plant origin.





CIFT, Cochin Conducts RAC Meeting

The Research Advisory Committee of CIFT, Cochin met on 22 August, 2013. The following were present in the meeting: Padmashree Dr. V. Prakash, FRSC, Distinguished Scientist of CSIR, Ex. Director, CIFTRI, Hon. Director of Research, Innovation and Development, JSS, Technical Institution Campus, Mysore, Dr. (Mrs.) Rintu Banerjee, Professor, Dept. of Agriculture & Food Engineering, Indian Institute of Technology, Kharagpur, Dr. D.S. Shesappa, Former Dean, College of Fisheries, Mangalore, Dr. K.C. Dora, Dean, College of Fisheries, West Bengal University of Animal & Fisheries Science, Chakagaria, Kolkata, Dr. S. Jeevan, Chief Executive Officer, Samudra Shipyards (P.) Ltd., Aroor, Dr. Madan Mohan, Asst. Director General, ICAR, New Delhi, Dr. T. K. Srinivasa Gopal, Director, CIFT and Dr. Leela Edwin, HOD, FT and Member Secretary, RAC.

Prior to the meeting, the RAC Chairman and members visited the laboratories of the Institute to acquaint themselves with the research work being carried out in the different Divisions.

Dr. T.K. Srinivasa Gopal, Director, CIFT welcomed the Chairman and Members of the newly constituted RAC.

In his welcome address he outlined the major activities of the Institute and requested the Chairman and Members of RAC to critically examine the research activities of the Institute and suggested to give their valuable comments on them.

After presentation of the highlights of the work of the Institute by the Director, the Heads of Divisions of the Institute made brief presentations highlighting the major achievements of the Divisions.

The Chair appreciated the excellent work and the good presentations made by the Heads of Divisions. Suggestions were given on fine tuning of project programmes and protecting the Intellectual Property generated from the project. He emphasized the need to orient the research to benefit the industry and other stake holders. The other RAC members gave valuable inputs in all projects especially those operating in their fields of specializations.

A meeting was also held on 23 August, 2013 with all Research Fellows of the Institute. The Committee has given valuable guidance to the SRFs for their future research work.



RAC Meeting in progress



RAC members visiting FP Division



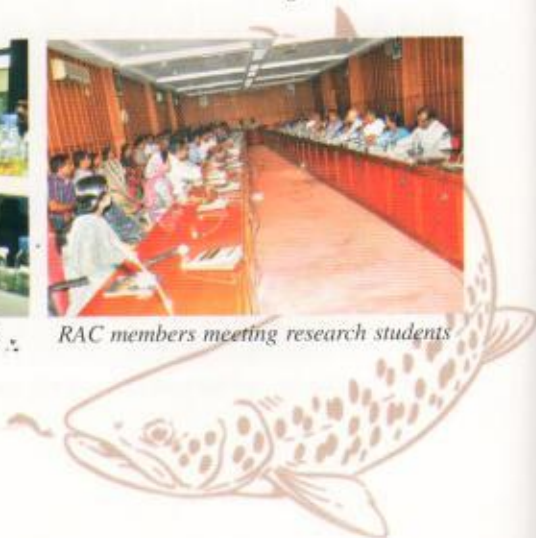
RAC members visiting FT Division



RAC members visiting MFB Division



RAC members meeting research students





Training on Administrative Rules and Regulations

A training programme on Administrative rules and regulations was organized at CIFT, Cochin during 22 July to 3 August, 2013 for the benefit of administrative staff of the Institute.

Radio Talks

The following Radio Talks were delivered by the scientists and technical officers during the quarter:

1. Dr. M.M. Prasad, SIC, Visakhapatnam - "Wealth from waste - Fishing industry: A case scenario", (In Telugu), AIR, Visakhapatnam (7 July, 2013)
2. Dr. M.M. Prasad, SIC, Visakhapatnam - "Conservation of endangered marine turtles", (In Telugu), AIR, Visakhapatnam (15 September, 2013)
3. Dr. G. Rajeswari, Principal Scientist - "Modern methods in trawling", (In Telugu), AIR, Visakhapatnam (14 July, 2013)
4. Dr. K.K. Asha, Scientist - "Fish spoilage - causes, indices and prevention", (In Malayalam), AIR, Kochi (15 July, 2013).
5. Dr. M.S. Kumar, Asst. Chief Tech. Officer - "Conservation of endangered marine turtle's", (In Telugu), AIR, Visakhapatnam (15 September, 2013)



Shi N. Viswambharan, former AO, CIFT taking classes

Invited Talk

Mr. Robert Gibson, Senior Operations Manager, Food and Bioprocessing Division, Agri-value Processing Incubator, Alberta Agriculture and Rural Development, Canada gave a talk on Innovations and commercialization of agri-value processing incubator at Leduc, Alberta, Canada at CIFT, Cochin on 30 September, 2013.



Mr. Robert Gibson delivering the talk

Hindi Workshop for Administrative Staff

A one day Hindi Workshop was conducted on 22 August, 2013 for the Administrative staff of the Visakhapatnam Research Centre of CIFT. The Workshop began with Dr. Santosh Alex, Sr. Tech. Officer, welcoming the participants. Dr. M.M. Prasad, SIC spoke on the occasion. Smt. A. Aruna, Hindi Pradhyapak, Hindi Teaching Scheme, Visakhapatnam was the resource person for the Workshop. She conducted classes on noting and drafting. She also spoke on the importance of Official Language policy of the Department of Official Language. The doubts of the participants were also cleared during the Workshop.



Hindi workshop in progress

Celebrations

National Sadbhavana Diwas

The Institute celebrated National 'Sadbhavana Diwas' on 20 August, 2013 in connection with the observance of Communal Harmony Fortnight. On the day, the staff of

the Institute assembled together and took Sadbhavana Day Pledge.

Hindi Chethana Mas

Cochin: Chethana Mas 2013 was celebrated at CIFT,



Cochin during 26 August to 27 September, 2013. During the Chethana Mas various competitions in Hindi were conducted for the staff members of the Institute, such as Technical Quiz, Administrative Quiz, Cross Word, Matsya Lok, Street Play, ICAR Song, Administrative Terminology and Scientific Terminology. Concluding function of Chethana Mas was conducted on 27 September, 2013. Chief Guest of the function was Dr. A. Gopalakrishnan, Director, CMFRI, Cochin. The function was presided over by Dr. P.T. Lakshmanan, Director I/c, CIFT, Cochin. Welcome address was delivered by Shri P.J. Davis, Senior Administrative Officer, CIFT. Felicitations were offered by Shri Vijayakumar, Officer Incharge, Southern Regional Hindi Implementation Centre, and Shri K.K. Ramachandran, Secretary, Kochi TOLIC. Vote of thanks was proposed by Dr. C. Jessy Joseph, Deputy Director (OL), CIFT. Chief Guest distributed the prizes to the winners of the competitions. The Rajbhasha Pratibha



Dr. P.T. Lakshmanan delivering the Presidential Address



Chief Guest Dr. A. Gopalakrishnan giving away the Rajbhasha Pratibha Puraskaram to Kum. T. Deepa



Artists from Noopur Academy presenting Kathak dance

Puraskar 2013 was awarded to Kum. T. Deepa who scored the maximum points, and Best Division prize was given to Administration Division.

A very colourful cultural programme was presented during the function. Shri Rakesh Kamath an invited artist presented 'Sopana Sangeetham'. The administrative staff of the Institute presented a "Street Play" and Dr. K.K. Prajith, Scientist presented 'Ardhanareeswara' Dance. A group of artists from Noopur Arts Academy, Bangaluru presented a Kathak Dance (Lucknowi style) performance which was sponsored by the ICCR, Thiruvananthapuram.

Mumbai: Hindi week was celebrated during 24-28 September, 2013 at the Centre and competitions on various themes were conducted. Prize distribution for the winners was carried out on 30 September, 2013.

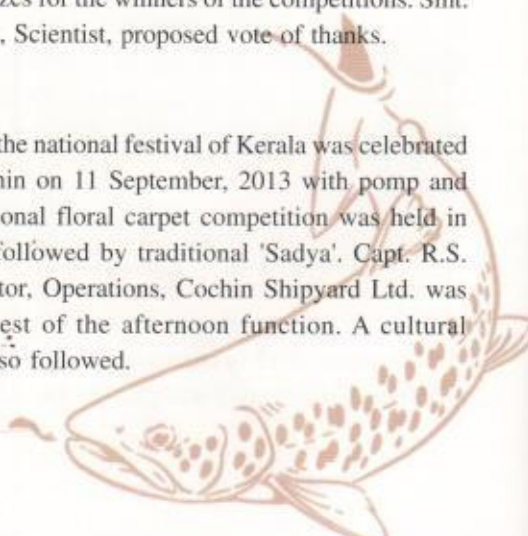


Letter writing competition in progress

Visakhapatnam: Hindi Week Celebrations were conducted at the Centre during 17-24 September, 2013. During the week, various competitions were held for the staff members of the Centre. The valedictory function was held on 25. September, 2013. The programme began with the welcome speech by Dr. Santosh Alex, Sr. Tech. Officer. The meeting was presided by Dr. M.M. Prasad, SIC & PS. Shri M.R. Ghoke, Pay & Accounts Officer, Customs and Central Excise Department, Visakhapatnam was the Chief Guest for the occasion. He urged the staff members to use simple Hindi in the day to day correspondence. Later he distributed prizes for the winners of the competitions. Smt. Arathy Ashok, Scientist, proposed vote of thanks.

'Onam'

'Onam' - the national festival of Kerala was celebrated at CIFT, Cochin on 11 September, 2013 with pomp and gaiety. Traditional floral carpet competition was held in the morning followed by traditional 'Sadya'. Capt. R.S. Sunder, Director, Operations, Cochin Shipyard Ltd. was the Chief Guest of the afternoon function. A cultural programme also followed.





Capt. R.S. Sunder inaugurating the Onam celebrations



Cultural programme in progress

Independence Day

The Institute celebrated 63rd Independence Day of the nation by hosting the national flag at its premises. Dr. T.K. Srinivasa Gopal, Director hosted the Tricolour.

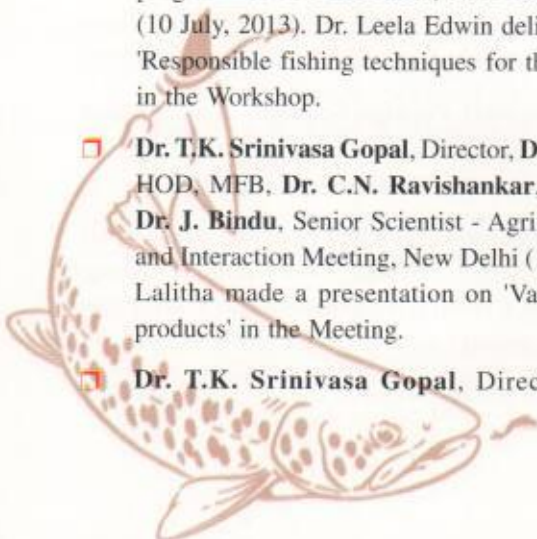


Dr. T.K. Srinivasa Gopal hosting the Tricolour

Personnel News

Participation in Seminars/Symposia/Workshops etc.

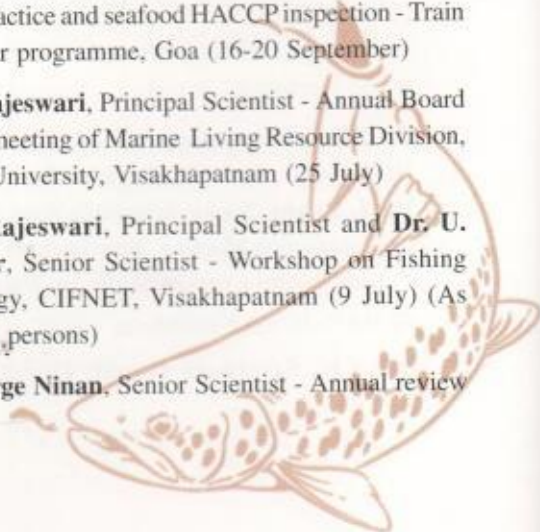
- ❑ **Dr. T.K. Srinivasa Gopal**, Director - Director's conference and ICAR Foundation Day Celebrations, ICAR, New Delhi (16 July)
- ❑ **Dr. T.K. Srinivasa Gopal**, Director, **Dr. Leela Edwin**, HOD, FT, **Dr. S. Balasubramaniam**, HOD, EIS, **Dr. C.N. Ravishankar**, HOD, FP, **Dr. M.M. Prasad**, SIC, Visakhapatnam and **Dr. J. Charles Jeeva**, Senior Scientist - Workshop on technology transfer programmes in NEH states, NRC on Pig, Guwahati (10 July, 2013). Dr. Leela Edwin delivered a talk on 'Responsible fishing techniques for the NEH region' in the Workshop.
- ❑ **Dr. T.K. Srinivasa Gopal**, Director, **Dr. K.V. Lalitha**, HOD, MFB, **Dr. C.N. Ravishankar**, HOD, FP and **Dr. J. Bindu**, Senior Scientist - Agri Tech Investors and Interaction Meeting, New Delhi (17-18 July). Dr. Lalitha made a presentation on 'Value added fish products' in the Meeting.
- ❑ **Dr. T.K. Srinivasa Gopal**, Director, **Dr. C.N. Ravishankar**, HOD, FP and **Dr. P. Pravin**, Principal Scientist - National workshop on Repeat study on assessment of post harvest losses of major horticultural crops, animal and fishery products of India, ICAR, New Delhi (29 August)
- ❑ **Dr. T.K. Srinivasa Gopal**, Director and **Shri C.G. Joshy**, Scientist - Performance indicator meeting of KVK's, institutes and Deemed Universities, NCAP, New Delhi (17 July)
- ❑ **Dr. Leela Edwin**, HOD, FT - First meeting of the Technical Committee constituted by the Ministry of Agriculture for assessing the impact of fishing ban and to review its duration, CMFRI, Cochin (12 July)
- ❑ **Dr. Leela Edwin**, HOD, FT - National strategic consultation and conference on Green technology for carbon free fishing, Nagercoil (13 July). Dr. Leela Edwin presented a paper on 'Energy reduction in fishing' in the Conference.
- ❑ **Dr. Leela Edwin**, HOD, FT - Meeting of Vigilance Study Circle, Kerala Chapter, SBT,





Thiruvananthapuram (7 August)

- ❑ **Dr. Leela Edwin**, HOD, FT - First meeting of Expert committee for Comprehensive review of deep sea fishing and policy guidelines, New Delhi (26 September)
- ❑ **Dr. Leela Edwin**, HOD, FT and **Dr. Saly N. Thomas**, Principal Scientist - Review of Indian oil sardine fishery improvement project organized by WWF-India and Marine Stewardship Council, Cochin (24 September)
- ❑ **Dr. Leela Edwin**, HOD, FT and **Dr. P. Pravin**, Principal Scientist - Trainers training programme on Moving towards sustainability, FSI, Cochin (6-8 August) (As resource persons). Dr. Leela Edwin delivered a talk on 'Energy efficiency in fishing' while Dr. Pravin delivered a talk on 'Basics of seamanship and navigation for fishermen' in the programme.
- ❑ **Dr. Leela Edwin**, HOD, FT, **Dr. Saly N. Thomas**, Principal Scientist, **Dr. J. Bindu**, **Dr. P. Muhamed Ashraf**, Senior Scientists and **Shri G. Omanakuttan Nair**, Sr. Tech. Officer - National seminar on Biopolymers and green composites - Emerging science and technology, KSPC, Cochin (27 September)
- ❑ **Dr. Leela Edwin**, HOD, FT and **Shri M.V. Baiju**, Senior Scientist - Third annual review meeting workshop of the NFBSEAR, New Delhi (22-23 July)
- ❑ **Dr. K.V. Lalitha**, HOD, MFB and **Dr. Toms C. Joseph**, Senior Scientist - Orientation training programme of the project on 'National surveillance programme for aquatic animal diseases', NBFGR, Lucknow (17-20 September)
- ❑ **Dr. T.V. Sankar**, HOD, QAM - National symposium on Prospects and advances in biotechnology and bioprocess engineering, Sri Budha College of Engineering, Pattor (1 August). Dr. Sankar delivered an invited talk on 'Applications of biotechnology and bioprocess engineering in food quality control' in the Symposium.
- ❑ **Dr. T.V. Sankar**, HOD, QAM - 8th meeting of Scientific panel for Biological hazards, FDA, New Delhi (30 August)
- ❑ **Dr. T.V. Sankar**, HOD, QAM and **Dr. K. Ashok Kumar**, Principal Scientist - FAD-12 meeting of BIS, NIPHATT, Cochin (24 September)
- ❑ **Dr. C.N. Ravishankar**, HOD, FP - FSSAI meeting on fish and fishery products, New Delhi (2 July)
- ❑ **Dr. M.M. Prasad**, SIC, Visakhapatnam and **Dr. R. Raghu Prakash**, Senior Scientist - Workshop on Fish conservation methods, Visakhapatnam (27 September) (As resource persons). Dr. Prasad delivered a talk on "Carbon footprints, climate change and their impact on fisheries: Mitigation efforts" in the Workshop.
- ❑ **Dr. M.M. Prasad**, SIC, Visakhapatnam, **Dr. U. Sreedhar**, Senior Scientist and **Smt. Arathy Ashok**, Scientist - State level workshop on Towards sustainable fishing, CIFNET, Visakhapatnam (20 August) (As resource persons)
- ❑ **Dr. S. Vishnuvinayagam**, SIC, Mumbai and **Dr. P.K. Binsi**, Scientist - Seventh edition of 'Food World India' - The global convention for food business and industry, FICCI, Mumbai (23-24 September)
- ❑ **Shri M. Nasser**, Principal Scientist and **Dr. S. Ashaletha**, Senior Scientist - Business meet of FISHMAID entrepreneurs, Thiruvananthapuram (3 September)
- ❑ **Dr. Saly N. Thomas**, Principal Scientist - Meeting before the officials of State Fisheries Department of Maharashtra, Mumbai (22 July). Dr. Saly presented the draft report on 'Craft and gear of Maharashtra'.
- ❑ **Dr. P. Pravin**, Principal Scientist - Meeting on issues related to security/fisheries, Bangalore (1-3 July)
- ❑ **Dr. P. Pravin**, Principal Scientist - Teachers training programme on Moving towards sustainability, FSI, Mangalore (3-5 September) (As resource person). Dr. Pravin delivered a talk on 'Business of seamanship and navigation' in the programme.
- ❑ **Dr. K. Ashok Kumar**, Principal Scientist and **Dr. S.K. Panda**, Senior Scientist - Workshop on Good wild caught practice and seafood HACCP inspection - Train the trainer programme, Goa (16-20 September)
- ❑ **Dr. G. Rajeswari**, Principal Scientist - Annual Board of study meeting of Marine Living Resource Division, Andhra University, Visakhapatnam (25 July)
- ❑ **Dr. G. Rajeswari**, Principal Scientist and **Dr. U. Sreedhar**, Senior Scientist - Workshop on Fishing technology, CIFNET, Visakhapatnam (9 July) (As resource persons)
- ❑ **Dr. George Ninan**, Senior Scientist - Annual review

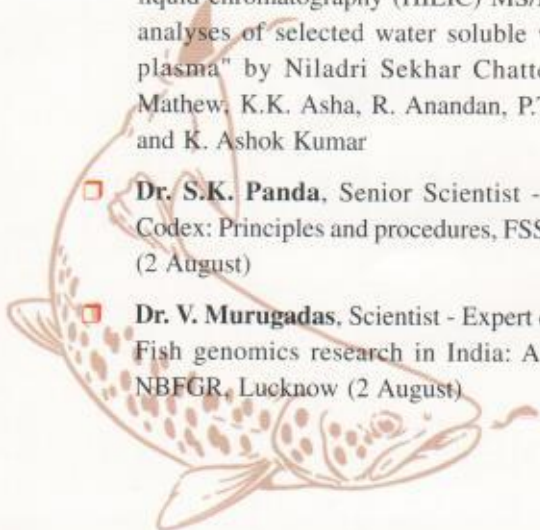




meeting of KVKs of Zone III, KVK, Pathanamthitta (9 July) (As resource person). Dr. George Ninan also took a class on 'Harvest and post harvest technologies developed by CIFT'.

- ❑ **Dr. A.A. Zynudheen**, Senior Scientist - International conference on Tropical roots and tubers for sustainable livelihood under changing agro climate, CTCRI, Thiruvananthapuram (9-13 July)
- ❑ **Dr. R. Raghu Prakash**, Senior Scientist - 4th Training programme of Fishery Survey of India, Goa (24-26 September) (As resource person). Dr. Raghu Prakash delivered a lecture on 'CCRF towards sustainable fisheries' in the programme.
- ❑ **Dr. S. Ashaletha**, Senior Scientist - Sustainable agri-village programme, Palluruthy, Cochin (12 July)
- ❑ **Dr. S. Ashaletha**, Senior Scientist - Extension Meet, College of Agriculture, Vellayani, Thiruvananthapuram (10 September)
- ❑ **Dr. S. Anandan**, Senior Scientist - National conference on Current approaches and challenges in nanomaterials and nanomedicine, Rajah Serofji Government College, Thanjavur (29-30 August). Dr. Anandan delivered an invited lecture on "Biochemical and nutraceutical applications of marine nanobiopolymers" in the Conference
- ❑ **Dr. V.R. Madhu**, Senior Scientist - Meeting on Purchase and implementation of Marine Ambulance Service for the coastal waters of Kerala, Thiruvananthapuram (8 July)
- ❑ **Dr. K.K. Asha**, Senior Scientist and **Dr. Niladri Sekhar Chatterjee**, Scientist - Workshop on Mass spectrometry and International conference on Frontiers of mass spectrometry, MG University, Kottayam (6-9 September). Dr. Niladri also presented a research paper entitled, "Hydrophilic interaction liquid chromatography (HILIC) MS/MS method for analyses of selected water soluble vitamins in rat plasma" by Niladri Sekhar Chatterjee, Suseela Mathew, K.K. Asha, R. Anandan, P.T. Lakshmanan and K. Ashok Kumar
- ❑ **Dr. S.K. Panda**, Senior Scientist - Workshop on Codex: Principles and procedures, FSSAI, New Delhi (2 August)
- ❑ **Dr. V. Murugadas**, Scientist - Expert consultation on Fish genomics research in India: A way forward, NBFGR, Lucknow (2 August)

- ❑ **Dr. A. Jeyakumari**, Scientist - Short course on Thermal processing of ready to eat (RTE) meat products, NRC on Meat, Hyderabad (9-18 July)
- ❑ **Smt. P. Viji**, Scientist - National conference on Bulk packaging of hazardous goods for exports and the importance of UN certificate, Mumbai (30 August)
- ❑ **Dr. P.K. Binsi**, Scientist - Expert committee meeting to present the research proposal entitled, "Use of natural resins and gums for preservation and value addition of fishery products", IIT, Delhi (30 August)
- ❑ **Dr. P.K. Binsi and Smt. P. Viji**, Scientists - Workshop on Towards sustainable fishing, Navi Mumbai (31 July). Dr. Binsi acted as a member in the panel discussion.
- ❑ **Dr. P.K. Binsi and Smt. P. Viji**, Scientists - International symposium on Ready to eat foods: Innovations in ready-to-eat products: Drivers, trends and emerging technologies, Mumbai (25-26 September)
- ❑ **Dr. K.K. Prajith**, Scientist - Short course on taxonomy and identification of commercially important crustaceans of India, CMFRI, Cochin (20-24 August)
- ❑ **Smt. T. Silaja**, Sr. Tech. Officer - Workshop on Information literacy in the digital Era, IISR, Kozhikode (12 August)
- ❑ **Shri P. Bhaskaran**, Sr. Tech. Asst. and **Shri Shaiph Mustafa**, SRF - Workshop on KOHA integrated library systems, CPCRI, Kasaragod (29-30 August)
- ❑ **Smt. A. Razia Mohamed and Smt. K.A. Anju**, Research Associates - Conference and exposition on Building and managing an IP ecosystem for business excellence, Hyderabad (26-27 July)
- ❑ **Kum. Nimisha V. Satheesh**, SRF - National symposium on 'Foodxplore '13 - Process, preserve and prosper', TNAU, Coimbatore (20-21 September). Kum. Nimisha also presented a poster entitled, "Effect of high pressure treatment on the physico-chemical and microbiological changes in mango (*Mangifera indica* L.) cv. Prior pulp during chill storage" by Nimisha V. Satheesh, C.K. Kamalakanth, J. Bindu, Sanjoy Das and T.K. Srinivasa Gopal in the Symposium.



Personalia

Promotions

1. Dr. V.R. Madhu, Scientist, Cochin as Senior Scientist
2. Dr. K.K. Asha, Scientist, Cochin as Senior Scientist
3. Dr. S.K. Panda, Scientist, Cochin as Senior Scientist
4. Dr. L.N. Murthy, Scientist, Visakhapatnam as Senior Scientist
5. Shri G. Omanakuttan Nair, Tech. Officer, Cochin as Sr. Tech. Officer
6. Smt. K.S. Mythri, Jr. Lab. Asst. (T4), Cochin as Tech. Officer
7. Shri P. Rdhakrishna, Jr. Lab. Asst. (T4), Visakhapatnam as Tech. Officer
8. Shri G. Gopakumar, Carpenter (T-II-3), Cochin as Sr. Tech. Asst.
9. Shri Himansu Sekhar Bag, Driver (T-II-3), Visakhapatnam as Sr. Tech. Asst.
10. Shri P.D. Padmaraj, Jr. Lab. Asst. (T3), Cochin as Sr. Tech. Asst.
11. Shri Rabinarayan Sahoo (Late), Launch Driver (T3), Cochin as Sr. Tech. Asst.
12. Shri H.V. Pungera, Jr. Lab. Asst. (T3), Veraval as Sr. Tech. Asst.
13. Shri P. Mani, UDC, Cochin as Asst.
14. Shri D.P. Parmar, UDC, Visakhapatnam as Asst.

Transfers

1. Dr. J. Charles Jeeva, Senior Scientist, CIFT, Cochin to Directorate of Research on Women in Agriculture, Bhubaneswar

Retirements

1. Shri P.K. Vijayan, Principal Scientist, Cochin

Priced publications available from CIFT

1. Improved trawls developed at CIFT (₹ 50/-)
2. Biochemical composition of Indian food fishes (₹100/-)
4. Laboratory Manual – Enzyme linked immuno sorbent (ELISA) for chloramphenicol residue in shrimp (₹ 50/-)
5. Manual – PCR technique for detection of white spot syndrome virus (₹ 50/-)
6. Spl. Bulletin – 11 Synthetic fish netting yarns (₹ 25/-)
7. Spl. Bulletin – 12 CIFT – TED for turtle-safe trawl fisheries (₹ 30/-)
10. Fish canning – Principles and practices (₹ 125/-)
11. Laboratory Manual on Microbiological examination of seafood (₹ 90/-)
12. Spl. Bulletin – 13 – Rubber wood for marine applications (₹ 40/-)
13. Value added products from low priced fish (Malayalam) (₹ 50/-)
14. The seafood canning industry in India (Monograph) (₹ 35/-)
15. Gillnets in marine fisheries of India (Monograph) (₹ 100/-)
16. Manual of biochemical methods for determining stress and disease status in crustaceans (₹ 90/-)
16. Electronic Instrumentation Technology developed by CIFT (₹ 60/-)
17. Immunological and metabolic Alterations during Infection and Stress in Crustacea (₹ 60/-)
18. Responsible Fishing Contribution of CIFT (₹ 70/-)
19. Fish Dishes for Healthy living (₹ 75/-)
20. Seafood Packaging (₹ 65/-)
21. Sensors and Measurement Systems for Environmental, Marine, Fisheries and Agricultural Applications (₹ 180/-)
22. Stake nets of Kerala (₹ 40/-)
23. Fishtoons (Hindi) (₹ 80/-)
24. Seafood Quality Assurance (₹ 120/-)
25. Community fish smoking kilns (₹ 40/-)
26. HACCP concepts in seafood industry (₹ 100/-)
27. Food safety guidelines for common food items (₹ 50/-)
28. Fishing Traps of Assam (₹ 300/-)
29. Handbook of Fishing Technology (₹ 500/-)
30. Inland Fisheries Gears and Methods of Northern Kerala (₹ 150/-)
31. Modern Analytical Techniques (₹ 100/-)
32. Semi pelagic trawl system – An eco-friendly alternative to bottom trawling for small scale mechanized sector (₹ 50/-)
42. Processing Bombay Duck (₹ 25/-)
43. Trawling methods and designs of Saurashtra coast (₹ 20/-)
44. Long Lines for sharks (₹ 25/-)
46. Processing and Utilization of *Acetes indicus* (Jawla prawn) (₹ 30/-)
47. Mussel meat products (₹ 25/-)
48. Whale shark (*Rhyncodon typus*) (₹ 40/-)