

Annual Report 2005-06



Central Institute of Fisheries Technology
(Indian Council of Agricultural Research)
Matsyapuri P.O., Cochin - 682 029



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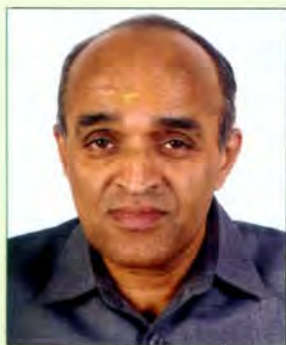
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Preface



In spite of the dwindling manpower, CIFT managed to keep the tempo of research work during the current year also. This has, no doubt, put all staff, (Scientific, Technical, Administrative and Supporting) under tremendous work pressure. But I am happy, they could take the challenge with determination and dedication, for which I want to compliment all my colleagues.

Landings from the marine capture sector is plateauing, but the number of fishing boats operating in the productive coastal and near shore waters is increasing, especially after the post-Tsunami relief operations. Wood being the main construction material for fishing boats, this is leading to a depletion of our shrinking forests. It increases the cost of construction of boats and reduces the earning per boat, making fishing an unviable occupation. Under these circumstances, alternate materials for construction of less expensive, maintenance free boats particularly for the traditional fishermen in the marine sector and the fishermen in the riverine and reservoir sectors, has become a necessity. Accordingly, during the current year, alternate materials for boat construction was a major thrust area of research for CIFT. Fibreglass, under-used wood like rubber wood (after chemical preservative treatment) and rubber wood sheathed with FRP were tried. Coconut wood is also under trial as a material for boat construction. For the inland sector, Aluminium as a boat construction material was tried for the first time. Details of these studies are presented in the main text of this report. These innovations were popularized in the North Eastern region also.

On the harvest side, eco-friendly trawls such as CIFT semi-pelagic trawl system (CIFT-SPTS-1) and conservation technologies such as square mesh windows and codends were popularised. Extensive field testing of the award winning Juvenile Fish Excluder cum Shrimp Sorting Device (JFESSD) was also undertaken. Collapsible fish traps made of nylon webbing of 60 mm mesh-size mounted on steel frames were accepted well by fishermen. These stackable traps solved problems of transportation and ensured profitable operation of multiple traps. Use of large mesh in purse seines tried by fishermen under CIFT's guidance proved successful in harvesting large sized high value fishes such as carangids, pomfrets, horse mackerel and mackerel making small-scale mechanized purse seining economically more viable. Purse seines are now gradually getting a revival because of this development. Lakshadweep fishermen have found high sea gillnets made of High Density Polyethylene (HDPE) and Polyamide (PA), introduced by CIFT in their waters, a new and welcome change giving very good catches of hitherto unexploited high value fish species other than tuna. In the riverine and reservoir sectors also, the Aluminium boat and new gears advocated by CIFT are getting good acceptance. CIFT has introduced active fishing technique of trawling (for the first time) in fast flowing rivers like Brahmaputra using OBM powered FRP boats of CIFT design. Studies on the quality of indigenously manufactured hooks for use in long lining gave very useful information. Extensive training programmes conducted for the benefit of all seven states of the North East, in fishing and traditional fish processing are bringing about a positive change in the fisheries scenario in that area.

Diversification, value addition, utilization of low value fishes and better products for the untapped domestic market were the thrust areas in the post harvest sector. Convenience foods like ready to eat products, coated products, sauces, different types of extruded products etc. and improved materials and methods for packaging of fishery products received due attention. Vacuum packaging and modified atmosphere packaging were also studied as possible methods of improving shelf life of fresh fish and processed fishery products. Hygiene for the fish and fishery products meant for the domestic market was another key area which was given importance. Fisheries Departments of various states like Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Uttaranchal, Uttar Pradesh, besides the seven NEH states were all given necessary technical help through training programmes conducted in those states. Assistance was given to the authorities of Tamil Nadu, Andhra Pradesh, Andaman & Nicobar Islands and Kerala in their Tsunami Relief Programmes also.

In view of the increasing demand for hygienically dried and attractively packed dry fish, research on different types of dryers using solar energy with electrical/LPG back up were designed and prototypes



fabricated. These eco-friendly and energy efficient dryers have generated a lot of interest among entrepreneurs who find it useful for vegetable and fruit drying also. Other processing machineries like meat bone separator were also developed and prototypes fabricated.

Fishery wastes have always been an environmental problem causing foul smell and proliferation of pathogenic bacteria. Simple technology developed for the conversion of these objectionable wastes into high quality poultry/animal feed is changing this scenario fast.

Basic studies on the Biochemistry and Microbiology of captured and cultured inland and marine fishes of commercial importance have also yielded valuable information. Marine bio-prospecting was another area where attention was focused. Promising bioactive compounds isolated from aquatic sources are currently being subjected to more detailed studies for their nutraceutical and therapeutic properties. New biotechnological methods for identifying pathogenic bacteria have also been developed.

Valuable data on the economics of production and marketing (internal as well as export) of processed fishery products and the economic implications of the changing global scenario were collected and studied. Extensive training and awareness programmes on hygienic fish handling and product development were conducted in different parts of the country. Impact of spiraling fuel costs and subsidies given by different state governments to mechanized fishing boats was also studied in detail. Action research on community based coastal zone management with emphasis on women's problems was another area where a good amount of work was done. In the Tsunami affected areas, awareness programmes on the desirability of growing mangroves to prevent sea erosion, could produce discernible positive response. Research Centers of the Institute at Veraval, Visakhapatnam, Mumbai and Burla took up location specific problems of the respective region and conducted extensive awareness programmes in nearby states also. Local industry was given necessary technical help by these Centers.

The scientists of the Institute continued to function as members of the Inter Departmental Panel (IDP) and the Statutory Audit Team (SAT – since stopped) for clearing processing units for export to EU countries. Factory technologists were given detailed training in scientific fish processing and extensive analytical assistance were extended to them for improving the quality of products. Consultancies, analytical assistance and other services earned more than One crore rupees for the Institute during the year, which is a record. The Agricultural Technology Information Centre (ATIC) set up under the NATP also did commendable work in transfer of information and technology.

Distinguished visitors (listed elsewhere) and invited specialists who gave scientific talks on relevant frontier technologies expressed appreciation of the work done at the Institute. A total of 22 applications submitted for patents are in various stages of processing and are expected to be cleared shortly.

The academic programmes of the Institute leading to M. F. Sc. and Ph. D. degrees in fish processing technology were continued during the year also. Several educational video films were made and shown to target groups. The media, both print and visual, gave good support to the activities and helped in effective dissemination of knowledge.

The Institute continued to get laurels for the outstanding work done in official language implementation. The first ever Ganesh Shankar Vidyarthi Award, the new award instituted by the ICAR for the best Hindi scientific house journal brought out, was bagged by CIFT's "Jaladhi".

In other extra-curricular activities like ICAR sports also CIFT could make a mark at the national level.

The year that went by, was thus a year of notable achievements for CIFT. We welcome helpful suggestions for further improving the activities so that we can serve the nation better.

(Dr. K. Devadasan)
Director



Executive Summary

- ❖ An Aluminium alloy fishing craft of 5.2 m LOA, 1.10 m breadth and 0.55 m depth for the rivirine and reservoir fishermen and the traditional coastal marine fisheries sector was constructed and launched
- ❖ Performance of preservative treated rubber wood canoe and FRP sheathed canoe were found good even after 38 months and 28 months of operation, respectively
- ❖ Two layers of FRP sheathing was found optimum for rubber wood for constructing fishing canoes, based on strength property evaluation
- ❖ The major causative organism damaging wood samples exposed to Cochin harbour waters is found to be the borer, *Sphaeroma terebrans*
- ❖ The rate of leaching of Copper Chrome Arsenate was not directly proportional to the retention of the preservative in the wood while method of treatment and extent of fixation were found to be important in reducing leaching
- ❖ The new Aluminium composite showed increased corrosion resistance and brightness over pure Aluminium
- ❖ Indian hooks were found to be as good as imported ones in corrosion resistance
- ❖ Quality evaluation of different brands of polyamide monofilament yarns available in the field showed that only 12% of the total brands satisfied BIS specifications
- ❖ Field trials of International Smart Gear Award winning design of Juvenile Fish Excluder cum Shrimp Sorting Device showed pronounced sorting effect, with over 95% of the shrimps preferentially retained in the lower segment of the codend
- ❖ Collapsible fish trap was well accepted by fishermen in the inland sector of north Kerala
- ❖ Optimization studies on the codend mesh sizes for commercially important fin fish for adult retention and juvenile escapement revealed that a good percentage of catch (72%) was retained by the 30 mm square mesh codend
- ❖ Trials with 18 m semi-pelagic trawl fitted with semi-pelagic trawl net is a highly efficient, low drag trawl system in comparison to the destructive bottom trawling
- ❖ Studies conducted at different landing centers of Saurashtra showed that HDPE is gradually replacing the PA gill nets along the entire stretch of Saurashtra
- ❖ Preliminary estimations revealed that the quantum of bycatch generated by trawlers operating along the Saurashtra coast is in the range of 500-750kg. for multi-day fishing and 100-150kg. for single day fishing
- ❖ A process for the production of fish sauce from anchovy by salt fermentation was developed and the storage characteristics of the product at ambient temperature were studied for one year
- ❖ Iced storage characteristics and shelf life of *Pangasius sutchi* and *Cyprinus idella* were worked out and the effect of iced storage on the quality characteristics and yield of fillets and mince were evaluated
- ❖ Ready to serve squid masala in retortable pouches had a shelf life of 12 months at ambient temperature
- ❖ Process parameters for preparing ready to serve fish products from Mahaseer (*Tor khudre*) and smoked tuna were standardized
- ❖ Vacuum packaging and packing under Carbon dioxide enhanced the keeping quality of dried shark
- ❖ Shrink wrapping was found to increase the shelf life of frozen pomfret and pearl spot during frozen storage
- ❖ Packaging materials for condiment incorporated ready to fry and ready to eat fish products were





standardized and it was found that Polyester Low Density Polyethelene (PEST/LDPE) laminated pouches were ideal materials

- ❖ Active packaging studies indicated that both Oxygen scavengers and Carbon dioxide emitters were effective in enhancing the shelf life of dry fish and chilled fish, respectively
- ❖ Some of the new innovations in value added products are:
 - Edible fish powder from tuna red meat waste and small sized fresh water major carps
 - Fish powder incorporated cookies
 - Processed carragenan from cultured seaweed, *Kappaphycus alvarizi*
 - Fish calcium from sardine and rohu scales
 - Masmin flakes from red and white meat of skipjack tuna
 - Dried fillets from rohu
 - Ready to eat maricream from cuttlefish
- ❖ Methods for the preparation of the Chitosan derivatives such as Chitosan with low viscosity, Carboxymethyl Chitosan and Chitosan sulphate were developed
- ❖ Processing and quality parameters of some innovative by-products prepared from gills, bones, vertebral column, skin and intestinal parts of big size fishies like Ghol, Koth, Sail fish etc. were standardized
- ❖ Frozen storage shelf life studies of *Octopus cyaneus* processed and stored at -18°C were carried out. Organoleptic, chemical and bacteriological indices of the product were found to be good even after six months
- ❖ Good quality fish wafers were prepared from 'Karali' (*Chirocentrus dorab*) using corn flour and sago powder
- ❖ Good quality marinades were prepared with blanching in a medium of salt using fishes like tuna, mackerel and shark
- ❖ Heavy metal levels in farmed fish and prawns were found to be far below the hazard limits
- ❖ A new method for the detection of biogenic amines by derivatisation and use of evaporative light scattering detector is being standardized
- ❖ A herbal technique for prevention of blackening of shrimps during iced storage was developed
- ❖ Antibiotic residues were not detected in any of the 348 samples of farmed shrimp and 14 shrimp feeds tested
- ❖ PCR method for identification of pathogenic strains of *E. coli* was developed
- ❖ Non-proteolytic *Clostridium botulinum* types B and E were detected in fish. A 445 bp DNA fragment specific for *C. botulinum* type E was detected in toxigenic isolates from fish
- ❖ Incidence of Salmonella was 27% in 117 seafood samples tested
- ❖ A molecular diagnostic method for differentiating typical and atypical Salmonella isolates from seafood was worked out
- ❖ PCR based method proved to be the most sensitive for Salmonella detection than Seafood Rapid Test and ELISA method
- ❖ Multiplex PCR based method was developed and standardized for easy differentiation of *Listeria monocytogenes* from *L. innocua* in seafoods
- ❖ For rapid detection of enterotoxigenic *Bacillus cereus*, virulent gene specific PCR was developed





- ❖ No co-relationship was found between hemolysin production and enterotoxin production in case of *B. cereus* isolates
- ❖ The results of the study on the quality of post-Tsunami seafood off the coast of Visakhapatnam, suggest that there was no major deviation in the seafood quality during the post-Tsunami period
- ❖ *Listeria monocytogenes*, a potential human pathogen was found to be absent in all the 300 samples of different fish and fishery products analyzed from Saurashtra region
- ❖ Variation in occurrence of faecal Coliforms and faecal Streptococci near and offshore waters of Hirakud reservoir was noted
- ❖ Analysis of 31 samples of fresh fish from Vashi (Mumbai) retail markets indicated that overall quality of fresh fish is good except for the presence of faecal indicator organism *E. coli* in 12 samples
- ❖ Pharmacologically active extracts from sea weeds like *Vallisnaria spiralis*, *Euchemia cottoni* and *Eichornia crassipes* were tested in experimental animals and it was observed that compounds with analgesic, antipyretic, hypoglycemic and wound healing properties are present in these species
- ❖ Toxicity studies using PAH in fish revealed that the antioxidant system was affected adversely due to the toxic stress
- ❖ Organochlorine pesticide content of fish samples from Kerala coast was well below the toxic limits
- ❖ Monitoring of heavy metals in fish, shellfish etc. has shown that even though metals like Cadmium, Copper, Zinc, Manganese and Nickel are present in most samples, the concentrations were within permitted levels
- ❖ Functional properties of fish proteins varied with the habitat of the fish
- ❖ The various equipments/instruments designed and developed includes Eco-friendly tunnel fish dryer with solar collector and drying chamber, Forced circulation dryer with P.V. Cells, PVC tent dryer, Hygienic fish cutting table, Quantum radiometer, LCB detector for metal cans, Digital moisture indicator for dry fishery products and 750L and 100L PUF insulated FRP ice boxes
- ❖ A modified navigational light control system and two channel and five channel electronic thermometers were developed
- ❖ Fishing vessel for mechanized fishing in fast flowing rivers and FRP fishing vessel for reservoir fishing were designed, fabricated and popularized
- ❖ Fish meat-bone separator was designed and a prototype fabricated
- ❖ A study on the hygienic fish handling practices to be used in the prawn peeling units revealed that the constraints in adoption of hygienic practices among the small scale units were non-availability of skilled workers, increased electricity charges, seasonal nature of the activity, more investment and less profit
- ❖ On an average, each peeling unit had employed seven male workers and about 54 female workers. The mean investment in a small peeling unit was Rs.1.45 lakhs.
- ❖ Increased cost of culture, risk due to mortality, water pollution and non-availability of quality seeds were reported as major constraints for aquafarming
- ❖ The fuel utilized by the mechanized fishing industry in Andhra Pradesh in 2004 was estimated at 53052 KL at 70% fishing capacity utilization. The total cost of fuel worked out to be Rs.144.25 crores out of the total operational cost of Rs.188 crores
- ❖ Time series analysis of prices of squid and cuttle fish exported from India to EU was carried out and the seasonal variation has been found to be significant with demand being high during festival seasons, especially during December-January





Introduction

The **Central Institute of Fisheries Technology** (named at the time of inception as Central Fisheries Technological Research Station) was set up following the recommendations of a high power committee constituted by the Ministry of Food and Agriculture, Government of India. It started functioning at Cochin in 1957 under the Department of Agriculture of the then Ministry of Food and Agriculture with a small nucleus of staff for research work in fishing craft and gear. Other Divisions soon followed. The administrative control of the Institute was brought under the Indian Council of Agricultural Research from 1 October, 1967.

The Institute is the only national center in the country where research in all disciplines relating to fishing and fish processing is undertaken. Research Centres at present function at Veraval (Gujarat), Visakhapatnam (Andhra Pradesh), Burla (Orissa) and Mumbai (Maharashtra). The Hoshangabad (Madhya Pradesh) and Calicut (Kerala) Centres were closed down in June 2004 and March 2006 having completed the work assigned to the Centres.

Mandate

- ❖ To evolve innovative and cost-effective technologies for fish harvest
- ❖ To develop and standardize various aspects of post-harvest technologies
- ❖ To develop technologies for extraction of biomedical, pharmaceutical and industrial products from aquatic organisms
- ❖ To act as a repository of information on harvest and post-harvest technologies with a systematic data base
- ❖ To conduct transfer of technology through training, education and extension education programmes
- ❖ To provide consultancy services and to popularize the innovations for overall development of the fishery industry





Organizational set-up

The Institute is headed by the Director with whom all administrative and financial powers are vested. He is assisted by a Senior Administrative Officer, Administrative Officer and Assistant Administrative Officers for dealing with matters relating to general administration and Assistant Finance and Accounts Officer for looking after the financial and accounting aspects as also internal audit of the Institute. The Technical Section is headed by a Technical Officer who attends to the technical matters including those connected with research projects handled by the Institute and implementation of Right to Information Act-2005. Official Language Implementation Section is headed by the Assistant Director (Official Language).

The research work is carried out by the following Research Divisions:

1. Fishing Technology Division
2. Fish Processing Division
3. Quality Assurance and Management Division
4. Microbiology, Fermentation and Biotechnology Division
5. Biochemistry and Nutrition Division
6. Engineering Division
7. Extension, Information and Statistics Division

The Institute is housed in its own building in Willingdon Island, Cochin, and in all Research Centres, except Burla, where it functions in a building owned by the State Government. It has residential quarters for the staff at Cochin and Visakhapatnam. It has very good library and I.T. facilities. A well equipped workshop, an animal house, model fish processing halls, pilot plant facilities and a good fleet of vehicles are also available. An Agricultural Technology Information Centre (ATIC) functions in its own building within the main campus.

Statement showing budget allocation and actual expenditure for the year 2005-2006

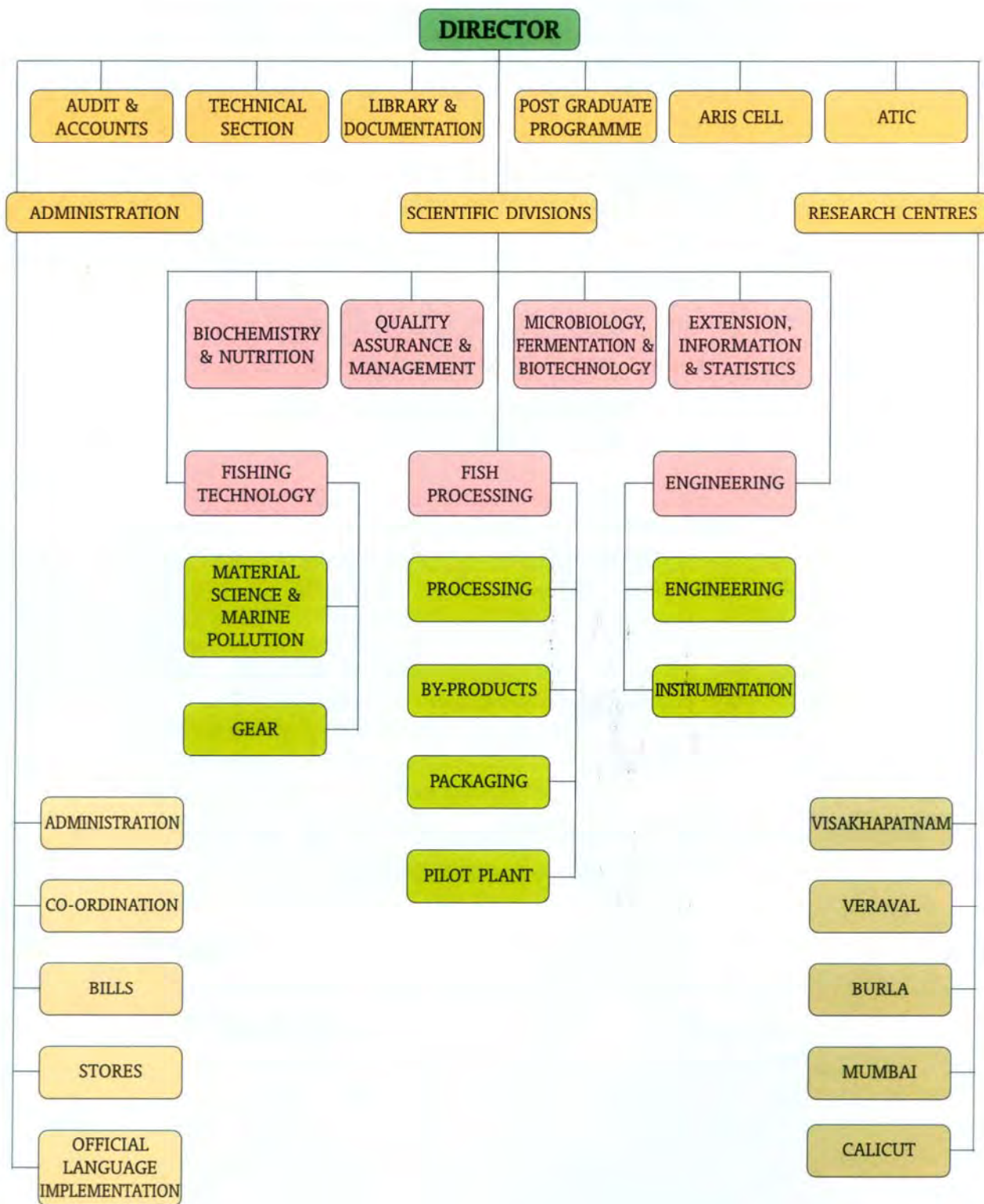
(Rs. in Lakhs)

Particulars	Non-Plan			Plan		
	Budget Estimate	Revised Estimate	Expenditure	Budget Estimate	Revised Estimate	Expenditure
Establishment charges	665.00	785.00	782.22	8.00	-	-
Overtime allowances	0.40	0.40	0.40	-	-	-
Travelling allowances	6.00	13.40	13.40	13.26	20.00	19.98
Other charges	75.00	72.00	71.97	519.74	484.00	484.08
Works	18.60	45.20	45.17	55.00	55.00	55.00
NEH	-	-	-	15.00	10.00	10.00
Other items	3.00	-	-	-	4.00	3.61
TOTAL	768.00	916.00	913.16	611.00	573.00	572.67





Organogram





Addresses of Headquarters and Research Centres



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A quick glance at salient research achievements

- ❖ CIFT has developed and introduced 12 standard designs of mechanized wooden fishing boats in the size range of 7.67 to 15.2 m LOA for coastal and intermediate range. It is estimated that over 80% of the nearly 54,000 mechanized wooden fishing crafts in the Indian fishing fleet confirm to the popular CIFT designs or its later adaptations.
- ❖ Hull maintenance of the fishing vessels is important for increasing its service life. CIFT has developed a package of technologies for protection against bio-deterioration, fouling and corrosion for increasing the life span, substantially reducing maintenance cost of fishing vessels.
- ❖ Aluminium-Magnesium alloy sheathing with cathodic protection and prescribed coating system was developed as a cost-effective substitute for Copper sheathing for wooden hulls as protection against marine borers. This technology is widely used in the small-scale mechanized vessels.
- ❖ Epoxy resin based coating developed has improved the life span of cast iron propellers, making it a cost-effective substitute for bronze propellers in fishing boats.
- ❖ Spheroidal graphite cast iron with Nickel (21-24%) was recommended as substitute for conventional Manganese-Bronze for propellers of fishing boats, resulting in cost savings of 25-30%.
- ❖ Superior cost-effective antifouling paint formulations incorporating Cuprous oxide and modified indigenous resins were developed for protection against fouling in fishing boats.





- ❖ CIFT has developed technologies for the chemical preservation and upgradation of low cost timbers to make them more durable. These have extended the service life of fishing crafts and contributed towards the efforts against deforestation.
- ❖ Technology was evolved for upgradation of cheaper secondary species of wood as substitutes for boat scantling, by impregnation with styrene-polyester monomers, fortification with Creosote/Tributyl tin oxide and polymerization with gamma irradiation.
- ❖ CIFT has made immense contribution towards the standardization of the netting, netting yarn and netting twine used for fishery purposes. These developments have led to an increase in the productivity of the fishing gear and increase in net profits due to low maintenance and long service life of the nets.
- ❖ CIFT has made significant contributions in the development of fishing gear and methods for the traditional sector, traditional motorized sector, small-scale mechanized sector and large-scale industrial sector in Indian fisheries, which is reflected in the increase in fish production.
- ❖ Improvements were made in the design and durability of lobster traps as substitute for traditional traps of short life span and low efficiency, for harvesting of spiny lobster.
- ❖ A mini-trawl for operation from traditional crafts powered by outboard motors of 8-15 hp, for shallow water shrimp trawling was introduced.
- ❖ The purse seine was introduced and popularized for operation from traditional plank built canoes (*Thangu vallom*) powered by outboard motors, for efficient harvesting of pelagic shoaling fishes. Since its introduction, the mini-purse seine has become very popular among the fishermen of motorized sector along the coast line of Kerala, significantly contributing to the landings of pelagic resources such as sardines, mackerel and anchovies.
- ❖ Specially designed trawl for shrimp trawling with vertical opening and extra long wings on either side was found effective for sweeping of wider horizontal area along the sea bed resulting in increased shrimp catch.
- ❖ Bulged belly trawl with relatively high opening was designed to improve the catch of finfishes without compromising on shrimp catch.
- ❖ In high opening trawls, vertical opening of the trawl is increased by innovative design improvements, facilitating capture of demersal as well as off-bottom resources.
- ❖ Large mesh trawl with relatively large meshes in the front portion resulted in significant reduction in trawl resistance, making use of the herding effect of large meshes on fin fishes. These designs have been well accepted by the trawler fishermen of Gujarat, Karnataka and Kerala.
- ❖ Otter boards are sheer devices used in trawls for keeping the trawl mouth horizontally open. Different sizes of flat rectangular boards and vertically cambered otter boards have been introduced by CIFT for the benefit of small-scale mechanized fleet, during the course of its development. V-form otter boards with high stability, better hydrodynamic efficiency, low maintenance cost and longer service life is now replacing the flat rectangular boards in the small-scale mechanized sector. Overall savings by adoption of V-form





otter boards in place of flat rectangular boards is about 15%.

- ❖ Purse seines for catching pelagic fishes such as sardine and mackerel, from small mechanized vessel has been developed.
- ❖ Long lines for sharks using indigenous hooks has been developed as a low energy resource-specific alternative to energy intensive less selective fishing methods such as trawling.
- ❖ Troll lines for predatory fishes such as Spanish mackerel and barracuda using buffalo horn, stainless steel spoon and fish head jigs were developed.
- ❖ Marine gill net optimized for catching sardine, mackerel, Spanish mackerel, pomfret and hilsa, in terms of material and mesh size were introduced for the benefit of non-motorized and mechanized segments of the industry.
- ❖ Gear systems have improved the capture fishery production from the inland open water resources significantly over the years. Trammel nets and monolines were also introduced in reservoir systems.
- ❖ Technology for the extraction of Chitin from shrimp shell and conversion to Chitosan has successfully addressed a very serious environmental threat due to the careless disposal of the waste. Eight parties have already taken this technology and started production and marketing. Nearly 20% of the available shell waste is being used by these industries for conversion to Chitin and Chitosan. In addition to creating employment, this has become a highly remunerative industry.
- ❖ Ready-to-serve fish curry products in retortable pouches can be stored at ambient temperature. This revolutionary technology has already been given to more than a dozen parties who have already started production and marketing. This technology has long term impact in terms of value addition.
- ❖ Isinglass is a product that has got application as a clarifying agent in breweries, mainly in the beer industry. The technology was transferred to an industry for commercialization. This has resulted in the production of a value added product which has got demand in domestic and foreign market.
- ❖ The technology for extraction of Poly Unsaturated Fatty Acids (PUFA) from fish oil is as a very important contribution towards nutritional security by providing a vital nutritional component. Many multinational companies are importing PUFA-enriched products and this technology will lead to import substitution. This value-added product will help in increasing the income of the fishermen.
- ❖ Collagen-Chitosan film has wide applications as a wound dressing and in dental surgery. It replaces the imported Teflon membrane used in dental surgery and the cost will be only a small fraction of that of the imported material. The raw material is fish air bladder, which does not find any use now. This technology can utilize the industrial waste and thus can enhance the income of the fishermen.
- ❖ Database on biochemical composition of fish serves as the major source of data for product formulation and nutrition labeling.
- ❖ A single step microbiological assay was perfected for detecting residues of eight antibiotics in seafood, viz. Chloramphenicol, Oxolinic acid, Tetracycline, Oxytetracycline, Furazolidine, Nalidixic acid, Neomycin and Trimethoprim which are commonly found used in aquaculture farms in





India. The method can detect antibiotic residues to a level of 0.1 ppm. About 65 seafood factories in Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Maharashtra and Gujarat exporting seafood to EU and US are direct beneficiaries of this technology.

- ❖ A two step nested PCR method for the detection of White Spot Syndrome Virus in shrimps was developed, standardized, assessed and introduced for commercial use. This method will detect the presence of as small as 10 virions per host larvae. The technology is being used for regular testing of post larvae before introduction to the farms.
- ❖ A RT-PCR method to test the presence of the devastating Yellow Head Virus in shrimp farms was developed, assessed and commercialized. This is the only test method for YHV now available in India. The method is being currently used for screening frozen shrimp for YHV, being exported to the US, to meet the phytosanitary regulation of the WTO.
- ❖ An improved ELISA method for detection of residues of Chloramphenicol, a 'zero tolerant' antibiotic, in processed seafood for export to EU, US and Japan was evolved. This improved method was assessed and commercialized in 2003. It is now regularly used to monitor Chloramphenicol level in farmed and processed shrimps. Hundreds of shrimp farmers and seafood exporters have gained by the technology.
- ❖ The 'Chloritest paper' developed for detection of ppm levels of Chlorine in process water, an essential requirement to implement sanitation and hygiene practice in food processing industry, was transferred to M/S Glaxo Laboratories. This has resulted in the rejection of seafood/food items on the basis of contamination with pathogens significantly, resulting in substantial savings of foreign exchange to the country.
- ❖ Suitable programmes were organized for implementation of HACCP in the seafood industry. A software and multimedia CD was also developed for HACCP.
- ❖ Throughout India the effluent treatment system attached to seafood processing units is a neglected area resulting in serious environmental problems. To alleviate this problem of pollution by the seafood industry, an efficient effluent treatment plant was designed to treat the effluents conforming to the Pollution Control Board standards.
- ❖ The following engineering equipment have been developed by CIFT for use in fishing and fish processing:
 - * SS Tilting Kettle
 - * Oil fryer for battered and breaded products
 - * Tunnel Dryer
 - * 15.5 m fuel efficient steel fishing vessel
 - * Fibreglass canoes
 - * Environmental data acquisition system
 - * Temperature-Salinity meter
 - * Ship borne data acquisition system
 - * Speed and distance log
 - * Trawl depth meter





- ❖ The following aspects having management and policy level implications in fisheries have been studied by the Institute:
 - * Idle capacity in fish processing plants in India
 - * Price analysis of Indian seafood in the export market
 - * Economics of artisanal fisheries
 - * Economics of operation of fishing vessels on both West and East coast of India
 - * Price spread in domestic fish markets of Kerala and Gujarat
 - * Fuel utilization pattern by the fishing industry in India
 - * Assessment of harvest and post harvest losses in fisheries
 - * Estimation of inland fish landings in reservoirs
- ❖ The Institute also undertakes research studies which provide feedback to technology development and transfer. The following are some of the works undertaken:
 - * Socio-economic profile of fisherfolk in different parts of the country and development of socio-economic status scale
 - * The areas and extent of participation of women in fisheries related activities
 - * The types and activities of Co-operatives and other organizations in fisheries and the role played by them in small scale fisheries
 - * Adoption behaviour including extent of adoption, communication, decision making, response to technological gaps of fishermen in traditional, mechanized and motorized sectors and fish curers in relation to technology transfer by the Institute
 - * Evaluation of the training and extension programmes taken up the Institute in terms of gain in knowledge, awareness, practices and constraints
 - * Studies on ban on monsoon trawling, coastal zone management and socio-legal issues



Research Achievements



HEADQUARTERS, COCHIN

Fishing Technology Division





Research projects handled

- ❖ Studies on biodeterioration and material upgradation for marine applications
- ❖ Optimization and upgradation of traditional fishing systems for inland and marine sector
- ❖ Development studies on responsible trawl systems
- ❖ Bycatch reduction devices for selective shrimp trawling
- ❖ Impact of Copper Chrome Arsenic (CCA) wood preservative on the aquatic environment
- ❖ Standardisation of fishing gear materials and fishing accessories
- ❖ Improved fishing craft and gear for NEH region
- ❖ Application of remote sensing and GIS for marine fishery resource management
- ❖ Investigations on the effect of bottom trawling on the benthic fauna of Saurashtra coast, Gujarat

Chief findings

- * An Aluminium alloy fishing craft for traditional fisheries sector was constructed and launched. The craft christened 'Kayal' is of 5.2 m LOA, 1.10 m breadth and 0.55 m depth.
- * Performance of preservative treated rubber wood canoe (LOA 6.4 m, breadth 0.83 m and depth 0.42 m) after 38 months of operation was found good. After 28 months operation, the FRP sheathed canoe (LOA 6.05 m, breadth 0.77 m and depth 0.39 m) also showed sound condition. Both the canoes were free from bio-deterioration or any physical damage.
- * Rubber wood FRP sandwich composite panels exhibited proportional increase in modulus of rupture to increase in number of layers while in the case of maximum compressive stress, increasing the number of layers did not bring out increase in strength. Based on strength property evaluation, two layers of FRP sheathing was found optimum for rubber wood for constructing fishing canoes.
- * Preservative treated coconut wood panels of less than 20 years showed softening of tissues and borer attack after four months exposure to sea water.
- * The borer, *Sphaeroma terebrans* was found to be the major causative organism damaging the wood samples exposed to Cochin harbour waters. Due to its attack 46% of the volume of chini wood (*Tetrameles nudiflora*) was lost within nine months of exposure.
- * The leaching of chemical contaminants, Cu and Cr from Copper Chrome Arsenate (CCA) treated rubber wood was high during the initial period of exposure to sea water, but decreased after 24 h. The rate of leaching of Cr was more than As and Cu.
- * The rate of leaching of CCA constituents was not directly proportional to the retention of the preservative in the wood while method of treatment and extent of fixation were found to be important in reducing leaching.
- * Acute toxicity study of CCA constituents, Copper, Chromium and Arsenic on *Villorita cyprinoides* showed that Copper has the highest bio-





concentration potential compared to Chromium and Arsenic.

- * Concentration of Cu, Cd, Pb and Zn was found highest during the month of February in the Cochin harbour waters.
- * Significantly high levels of Zn and Ni concentration were detected in bio-film settled on Aluminium panels (AA 1100) exposed in the Cochin harbour waters.
- * The optimum concentration of Titanium oxide and Cerium oxide required for reinforcement of pure Aluminium was found to be 0.2 and 0.1% respectively. The new Aluminium composite showed increased corrosion resistance and brightness over pure Aluminium.
- * Indian and imported fishing hooks did not show substantial difference in terms of physical and mechanical properties. Positive correlation in the case of diameter and weight with respect to deformation load equal to bite length was observed.
- * Experiments on the comparison of the sinking force of non-lead sinkers used in fishing gears with lead sinkers of same weight showed that the sinking force of iron sinkers was 3.83% less than that of lead sinkers. Sinkers made of cement and clay showed considerable lowering in the sinking force for the same mass of material (36.07%) as that of Lead (40.02%).
- * Quality evaluation of different brands of polyamide monofilament yarns available in the field showed that only 12% of the total brands satisfied BIS specifications.
- * Selectivity experiments conducted off Cochin using 150 mm mesh codend showed retention of large size groups of *Pampus argenteus*, *Portunus sanguinolentus* and *Sphyrna zygaena* and about 91% escapement of small sized species and juveniles such as *Rastrelliger kanagurta*, *Sardinella* spp., *Megalaspis cordyla*, *P. sanguinolentus* and *Polynemus tetradactylum*.
- * Field trials of International Smart Gear Award winning design of Juvenile Fish Excluder cum Shrimp Sorting Device (JFE-SSD) showed pronounced sorting effect, with over 95% of the shrimps preferentially retained in the lower segment of the codend.
- * Collapsible fish traps with 11.5 x 0.75 x 0.65 m frame covered with black nylon webbing of 60 mm mesh size was well accepted by fishermen in the inland sector of north Kerala.
- * The gill net fishing operation in Lakshadweep was very successful. The HDPE and PA high sea gill nets had good catches and more landings of tunas were observed in PA nets of 120 mm mesh size.
- * Trawling operation in Brahmaputra river using mini trawl net and CIFT designed FRP boat fitted with 9.6 hp OBM was introduced.
- * Introduction of large mesh ring seines was facilitated in the motorized traditional sector, off Cochin.





Report of work done

Aluminium craft for traditional fishing sector

An Aluminium alloy fishing craft was designed and fabricated to use in the inland and marine sector to make use of the light weight, dent resistance, high corrosion resistance, high ratio of strength to weight, toughness and elasticity of the material. The efforts resulted in the outcome of alternate materials to wood for fishing craft construction.

The hull design was developed at CIFT. The shape is that of a catamaran or twin hull. This is an open boat without deck. The forward is made with a watertight enclosure giving buoyancy. In the aft also two watertight chambers are made. The aft is constructed to hold an Out Board Motor (OBM). A detachable type awning is provided which is also made in Aluminium. Rings are fitted in the aft for pulling the boat. Marine grade alloy sheets which contain 4.7 percent Magnesium were used for the construction.

The main dimensions of the craft are LOA 5.20 m, breadth 1.10 m and depth 0.55 m. The hull is welded using TIG method. Dye penetration test was carried out to check the hull welding and the welding quality was found good. Two seats are provided in the craft. A 1.9 hp OBM is sufficient for this craft. The construction was carried out by M/s Parur Metal Industries, Parur under the supervision of CIFT. Aluminium being a highly corrosion resistant material, coating is not given to the hull. However a Zinc anode is fitted to the under water hull to protect the boat from galvanic action which may be generated from the alloy material used for the manufacture of propeller. The cost of the craft excluding engine is Rs. 1,20,000/-.



Aluminium craft designed by CIFT

Performance monitoring of rubber wood canoes

All the five rubber wood canoes, viz. three with preservative treated rubber wood and two with FRP sheathing, were continued to put into service trials. Monitoring of the performance of the canoes was carried out regularly and defects, if any, in terms of physical damage and biological attack was recorded. After 38 months of service, the treated rubber wood canoes were found to be sound in condition with no signs of physical damage or bio-degradation. The two FRP sheathed canoes also showed very good performance after 16 – 26 months of service. Canoes are found to be free from bio-deterioration or any physical damage. Fishermen using the canoes are regularly putting them into service and are satisfied with the performance.

Sheathing materials for rubber wood

Suitability of using relatively inexpensive rubber wood after sheathing with FRP was investigated. Rubber wood panels were sheathed with one layer, two layer and three layers of FRP and the principal mechanical strength properties of the composite panels were compared with the properties of





unsheathed rubber wood panels. It was found that modulus of rupture increased proportionally with increase in the number of layers of sheathing. No significant difference in maximum compressive stress of composite panels was found when compared to unsheathed control. Based on the strength properties, two layers of sheathing was found optimum for rubber wood for fishing canoe construction.

Utilization of coconut wood for marine purposes

Experiments were continued on durability of natural and preservative treated coconut wood. Coconut wood panels of size 50 x 50 x 200 mm, cut from a tree of less than 20 years of age, treated with Copper Chrome Arsenic (CCA), Creosote and a combination of CCA and Creosote were exposed to field tests along with untreated control panels. Observations are taken every month as per ASTM D 2481-81. The untreated panels and the treated panels, viz., Creosote treated, CCA treated and dual treated panels have started showing signs of borer attack and softening within six months of exposure.

Another set of panels cut from the wood of above 75 year old tree, were treated with, (1) neem oil, (ii) CCA, (iii) Creosote, and (iv) dual treatment (CCA and Creosote) and are being air dried for exposure to marine, soil and atmospheric conditions.

Quantification of marine woodborer damage



Borer attack within nine months

The studies on quantification of borer damage of wood by exposing samples of chini wood (*Tetrameles nudiflora*) of size 26 x 11 x 2 cm to Cochin harbour waters for marine wood borer attack and assessing the damage were continued. Volume of wood lost due to the attack was calculated based on the volume of burrow.

The light borer attack observed on the samples in the initial four months increased to medium attack in the 5th month and to heavy attack in the 7th month of exposure. The borer attack was very heavy and the volume of wood lost at the end of 9th month was 46% of the initial volume of wood. *Sphaeroma terebrans* was the main

organism causing the damage.

Impact of CCA wood preservative on the aquatic environment

Rubber wood panels were treated with CCA at three different retentions of 16 kg/m³, 29 kg/m³ and 42 kg/m³ and were allowed to leach in deionised water. The rate of leaching was found to be not directly proportional to the retention of the preservative in the wood. The studies on the biodiversity of fouling organisms and marine wood boring organisms on these treated panels were initiated. The preliminary results show that the abundance of barnacles is significantly less on CCA treated panels. The experiment to find out whether the presence of CCA accelerates corrosion of nails (copper, iron, painted iron and galvanized iron) was continued in the laboratory in the salt spray chamber.





Nails embedded in wood treated to 42 kg/m³ of CCA, showed higher corrosion rate whereas the corrosion rate was similar for wood treated to 16 and 29 kg/m³ and untreated wood.

Acute toxicity study of Copper, Chromium, Arsenic and CCA on *Villorita cyprinoides* showed that among CCA constituents, Copper has the highest bio-concentration potential when compared to Chromium and Arsenic.

Monitoring of pollution in the estuarine environments of Cochin

The quality parameters of Cochin harbour water were monitored during different seasons. Water samples collected from the three stations of Cochin estuary viz., Mattancherry wharf, Ernakulam wharf and north oil tanker berth were analysed for Cadmium, Zinc, Copper and Lead using anode stripping voltammetry with hanging mercury drop electrode. Zinc, Cadmium, Lead and Copper concentration varied between 0 to 78.06, 0 to 3.21, 0 to 7.79 and 5.00 to 21.75 ppb respectively. Copper and Zinc concentrations were significantly higher. Copper was detected throughout the year. Lead and Copper was maximum during the summer months viz., March – May. An increased concentration of Zinc was detected during monsoon months whereas higher Cadmium was detected during post monsoon. Among the stations, higher levels of Zinc, Cadmium, Copper and Lead were recorded in Mattancherry wharf area.

Heavy metal accumulation in bio-films on Aluminium and steel surfaces

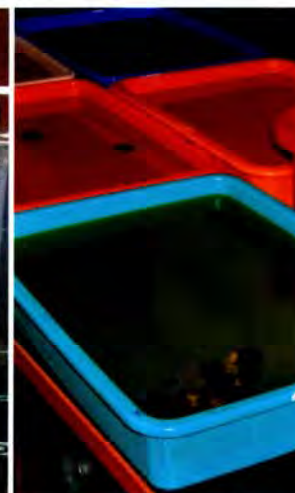
Stainless steel (304 grade) and Aluminium (AA1100) panels were exposed in the Cochin estuary for three days every month during the year and were analysed for heavy metals in the bio-film samples formed. The samples were analysed using ICP AES. Significantly higher levels of accumulation of metals were detected in bio-film samples. One-day-old bio-film recorded maximum concentration of metals than three-day-old samples. Cd, Cr, Co, Ni and V were not detected in the bio-films formed on Aluminium. Similar trend was observed in the case of SS304 except the presence of Chromium and Nickel, which might have been accumulated due to corrosion of steel, which is having Nickel and Chromium. Zinc accumulation in bio-film is comparatively higher in both Aluminium and steel panels. In general, results revealed that increased levels of Chromium were detected during pre-monsoon season in all the coupons. High concentration of Mn and Zn was recorded during monsoon. Increased levels of Lead were detected in post-monsoon. There is significant variation between seasons, nature of sample and elements.

Development of Cerium oxide and Titanium oxide reinforced Aluminium for marine applications

Pure Aluminium was reinforced with Cerium oxide (CeO₂) and Titanium oxide (TiO₂) in different concentrations and its electrochemical characteristics were studied for its use in marine conditions. Cerium oxide reinforcement in Titanium



Panels in salt spray chamber



Toxicity study on *Villorita cyprinoides*





oxide Aluminium matrix had enhanced the corrosion resistance in 3.5% NaCl even though there was a slight reduction in hardness due to the reinforcement. These results were further confirmed by linear sweep voltammetry, electrochemical impedance and open circuit potential stability. The optimum concentration for better performance under marine condition was recorded in pure Aluminium reinforced with 0.2% CeO₂ and 0.1% TiO₂.

Evaluation of properties of fishing hooks

Collection of samples of fishing hooks of different brands and sizes of Indian and foreign make were continued. Testing of physical and mechanical strength properties of the collected hooks was carried out. Mustad-Key and Mustad-

Crown (Norway), VMC (France), Youvella (South Korea), EW (Eagle wave Hooks, Japan) and 3 Yacht (South Korea) were the popular imported brands while Fish (India), Addya (India), Trishul-Viaadi (India) and Star (India) were the branded Indian hooks in use. It was observed that non-branded, locally made hooks made in places like Elatur and Beypore, both in Kerala and Manvalakurichi in Tamil Nadu were also being used for fishing. The physical dimensions and the load to deformation upto bite length for hook No. 7, 10, 12, 13, 14, 15, 16, 17 and 18 (Straight, Round bent with flat eye) of different brands were tested. The results did

not show much difference between the imported and Indian brands in hook No. 15 while in hook No. 7 diameter and deformation load of VMC brand was comparatively less than other brands. Analysis of the hook wire diameter, weight of hook and deformation load equal to bite length for hook No. 7 of five brands (three imported and two Indian brands) indicated positive correlation in the case of diameter and weight with respect to deformation load.

Evaluation of corrosion resistance of Indian and imported fishing hooks

Testing of corrosion resistance of fishing hooks as per ASTM B -117 using salt spray chamber was carried out. Hook No. 7 of five types (three imported and two Indian brands) were subjected to corrosion resistance test for 100 hours. The initial results of the analysis indicated that Indian brands are comparable to their foreign/imported counterparts. VMC brand from France showed good resistance to corrosion. Corrosion rate in Indian brands ranged from 20.649–38.106 mpy while that of imported brands was between 15.147 and 53.181 mpy.

Standardization of fishing gear materials and fishing accessories

During the period under report, samples of different manufacturers and of different specifications of polyamide (PA) monofilament yarns, fishing hooks, floats and sinkers were collected from important fishing centres of Kerala, Tamil Nadu, Andhra Pradesh, West Bengal, Karnataka, Maharashtra and Gujarat. A total of 210 samples of PA monofilament yarn were collected in sizes ranging from 0.08 to 3.0 mm diameter. A total of 276 types of hooks of different brand, size/number and material, 120 types of float samples and 32 types of sinkers of varying size, shape and material were collected. Out of the total 210 samples

Load Required for Deformation Equal to Bite Length





of PA monofilament yarn collected, 173 were tested for breaking load and elongation. Quality evaluation of different brands of PA monofilament yarns showed that only 12% of the total brands available satisfied BIS specifications (IS 7533:2003).

Testing of knot break load showed that 10 to 30% reduction in strength occurred due to knotting. Outdoor weathering studies on PA monofilament yarns were completed. Samples retrieved every 30 days from February 2005 were tested for breaking load and elongation. The break load of the samples exposed to outdoor weather showed a substantial decrease in strength. The collected floats were subjected to physical measurements, weight, buoyancy measurements, bursting strength tests etc. Analysis showed that PVC floats have higher buoyancy per unit weight than HDPE floats. A new equipment, viz., High pressure autoclave has been installed to test the bursting strength of fishing floats and preliminary tests were conducted. It was found that the bursting strength of HDPE spherical floats of 6" diameter ranged from 30-42 kg/cm² implying that these can be safely operated up to a depth of 420 meters. Of the total 32 types of sinkers collected, the physical dimensions of 11 sinkers were recorded and their respective sinking forces were calculated. When the sinking force of non-lead sinkers used in fishing gears were compared with lead sinkers of same weight, it was found that in the case of iron sinkers, the sinking force was 3.83% less than that of lead sinkers. Whereas, sinkers made of cement and clay showed considerably low sinking force for the same mass of material and it was found to be 36.07% and 40.02% of lead respectively. The make, cost, source and gear in which these items were used were also recorded.

Whole trawl selectivity studies

Whole trawl selectivity experiments were conducted during April-June 2005, onboard MFV Sagar Shakthi using a 33 m fish trawl rigged with V-form otter boards. *Stolephorus waitei*, *Uroteuthis (Photololigo) duvauceli*, *Sardinella longiceps*, *Secutor insidiator*, *Megalaspis cordyla*, *Lactarius lactarius*, *Lepturacanthus savala*, *Pampus argenteus*, *Metapenaeus dobsonii*, *Leiognathus equulus*, *Rastrelliger kanagurta*, *Siganus canaliculatus* and *Thryssa mystax* were observed to be escaping through front trawl sections. *U. duvauceli* and *S. longiceps* constituted more than 70% of the fishes escaped through front trawl sections.

Large mesh purse seines

When the purse seine fishery of Kerala was facing hard times and the number of vessels was reduced to 17 from 100, CIFT came up with suggestions for changes in the mesh size. The purse seine nets and ring seines of Kerala are criticized for its very small size (10-18 mm) destroying the fish wealth, as very small fishes and juveniles cannot escape the net. The newly introduced purse seine net has 45 mm mesh, which has improved the catches. With increased mesh size, the target species were large size mackerels, skipjack tunas, pomfrets, carangid species etc. This net has found wide acceptance among fishermen, as the catches are of good marketable size. The programme was taken up with the 'Manassery Matsya Thozilali Vikasana Kshema Sahakarana Sangham' at Manassery, Cochin.





Trawl codend selectivity studies

Selectivity experiments were conducted off Cochin using 18 m semi-pelagic trawl system having 65 mm and 150 mm diamond mesh codends using cover codends. In the 65 mm diamond mesh codend and 15 mm mesh codend cover,



Sardine juveniles escaped

(23 hauls; 7.8 kg.h⁻¹) the major species retained in the codend were *Pampus argenteus* (69.43%), *Megalaspis cordyla* (9.37%), *Rastrelliger kanagurta* (4.14%), *Sphyrna zygaena* (2.91 %), *Thryssa mystax* (1.25%), *Sardinella longiceps* (0.69%) and *Johnius borneensis* (0.67%). Major species escaped were juveniles of commercial species and small-sized species of fishes such as *S. longiceps* (45.86%), *Ambassis ambassis* (9.79%), *M. cordyla* (9.34%), *Alepes klenii* (7.10%), *Leiognathus splendens* (5.89%), *R. kanagurta* (2.66%), *J. borneensis* (2.66%), *Lactarius lactarius* (1.47%), *Secutor insidiator* (1.40%), *Sardinella fimbriata* (1.14%), *T. mystax* (0.93%), *Polynemus tetradactylum* (0.77%), *Sardinella albella*

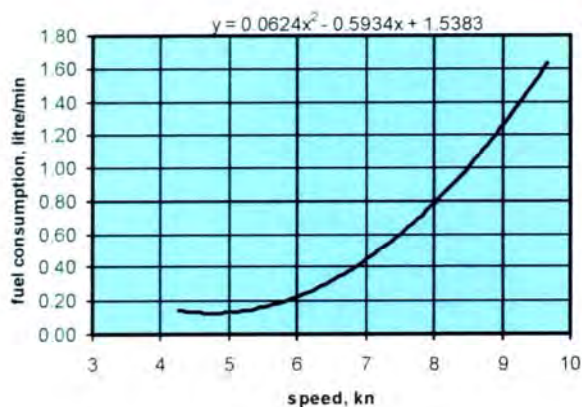
(0.73%) and *Alepes djedaba* (0.51%).

150 mm mesh codend showed retention of large size groups of *P. argenteus*, *Portunus sanguinolentus* and *S. zygaena* and about 91% escapement of small sized species and juveniles such as *R. kanagurta*, *Sardinella* spp., *M. cordyla*, *P. sanguinolentus*, *P. tetradactylum*, *T. mystax*, *A. ambassis*, *Charybdis feriatus*, *Pellona ditchella*, *J. borneensis*, *L. splendens*, *S. fimbriata*, *S. insidiator*, *Chirocentrus dorab*, *A. klenii*, *L. lactarius*, *Scylla serrata* and *Oratosquilla neap*.

Fuel consumption profile of steel trawler

Studies on economic vessel speed and economic engine RPM was conducted using Fuel flow measurement system installed onboard MFB Matsyakumari. A reduction of 1 km in cruising speed from 9.5 to 8.5 km was found to give a fuel savings of about 30% in a 17.5 m 277 hp@ 1000 rpm steel trawler.

Bycatch Reduction Devices for selective shrimp trawling



Fuel consumption profile of 17.5 m steel trawler

Fabrication of the prototypes of hard and soft BRDs was completed. Hard BRDs included Rectangular SS grid (1000 x 800 mm), Oval SS grid (1000 x 800 mm), Rectangular SS grid with bottom slot (1000 x 800 mm) and three different designs of fisheye BRDs (200 x 300 mm). Soft BRDs included three designs of Radial Escapement Devices (150 mm, 100 mm and 80 mm mesh sizes), two designs of sieve nets (60 mm and 80 mm), two designs of Big eye BRDs (300 x 150 mm) and three designs of separator panel BRDs (50 mm, 60 mm and 80 mm).





Field trials of International Smart Gear Award winning design, Juvenile Fish Excluder cum Shrimp Sorting Device (JFE-SSD) were conducted using 27.7 m shrimp trawl rigged with V-type otter board from MFB Matsyakumari. Among the total catch of 58.2% in the lower codend, 17.5% of the catch constituted of high value fin fishes retained in the upper codend and 58.2% constituted by shrimps, squilla and small-sized fin fishes in the lower codend. About 24% of the catch constituted by juveniles was observed to have escaped. There was pronounced sorting effect, with over 95% of the shrimp preferentially retained in the lower segment of the codend.

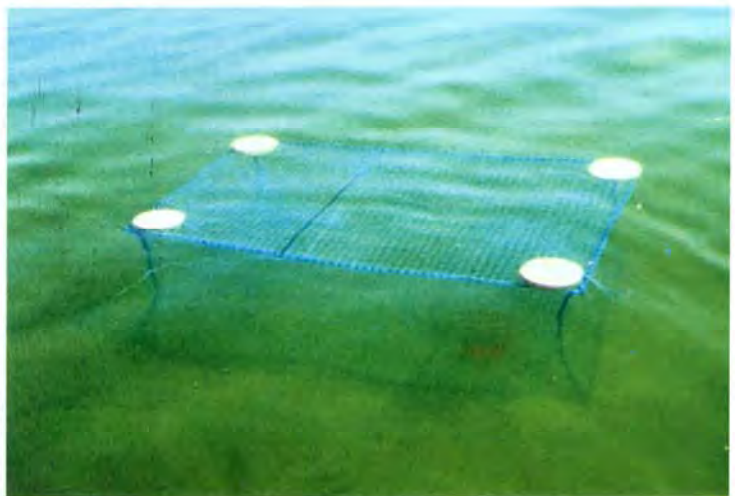


JFE-SSD operation

Improvement in fish traps

Collapsible fish traps (1.1 x 0.75 x 0.6 m) were designed and fabricated and field trials were carried out at Valapatnam and Kuppam rivers, Kannur. Eight PVC floats (150 mm x 20 mm), two each at four corners and four cement sinkers were used to keep the trap in proper shape under water. Catch was comparable to the traditional fishing traps.

Another set of collapsible fish traps were also designed and fabricated with the dimensions: 1.5 m x 0.75 x 0.75 m using 10 mm and 6 mm SS rods for operation in the marine waters. PE netting of 1.5 mm dia. twine with 30 mm mesh size was used to cover the frames. Field trials for rocky fishes were carried out at Vizhinjam in collaboration with Vizhinjam Research Centre of CMFRI. The operations were not successful due to heavy currents and waves. Collapsible traps are found not suitable for operation in such sea conditions.



Collapsible fish trap operation

Collapsible crab traps (size: 0.9 x 0.4 x 0.4 m) made of PE webbing (80 mm mesh size and 2 mm twine size) were designed and fabricated. Eight PVC floats (150 mm x 20 mm), two each at four corners and four cement sinkers were used to keep the trap in proper shape under water. The catch was not encouraging.

Improved lobster traps

A total of 80 number of lobster traps were distributed to fishermen at fishing villages of Enayam and Kadiapatnam. All the traps at Kadiapatnam were lost in the Tsunami which hit the village in December 2004, causing intensive destruction to craft and gear. A preliminary assessment of destruction of traps was made. Another set of modified lobster traps were made with powder coating to make a comparative study with traps with plastic





coating. Two traps were given to a fisherman at Inayam fishing village for field trials.

Popularization of pelagic gill nets

Experimental fishing operations with gill nets for large pelagics in Lakshadweep waters were completed with encouraging results. The catch comprised of Yellow fin tunas, Big eye tunas, Skipjack, Sail fish, Seer fish, Sharks and Carangids. The fishing nets were given to local fishermen through the Department of Fisheries, Lakshadweep Administration for commercial operation.

Field trials with PA and PE gill nets of 100 mm and 120 mm were carried out through small scale fishermen at Managalore. The nets were found successful for catching Seer and Tuna. Catch of Seer was more in PA gill nets. There were operational difficulties of PE gill nets during strong current due to the floating nature of the material.

Fishing experiments in Hirakud reservoir

Fishing experiments were carried out in Hirakud reservoir using trammel nets, simple gill nets and drop lines. The catch in trammel nets of inner mesh sizes of 50, 55, 60, 65, 70, 75 and 80 mm bar comprised mainly *Eutropichthyes vacha* (26%), *Notopterus chitala* (23%) and *Labeo rohita* (10%). The other species caught were *L. fimbriatus*, *L. calbasu*, *Silonia silondia* and *Catla catla*. Drop line experimental fishing using 21 units having hook size 18 and 19 was conducted and the catch consisted mainly of *M. gulio*, *R. chrysea*, *M. armatuo*, *Anguilla bengalensis* and *Ompok bimaculatus*. Nylon monofilament simple gill nets with mesh size 60, 70, 80, 90, 100, 110, and 120 mm caught mainly *E. vacha*, *N. notopterus*, *L. fimbriatus*, *L. calbasu*, *S. silondia*, *Rita chrusea*, *Pangasius pangasius*, *Mystus senghala* and *M. àor*. The total catch was 24017 kg and it was maximum in 60 mm gill net.

Documentation of inland fishing methods

A survey on different fishing gears and methods used in the rivers and reservoirs of Kerala was carried out. Gill nets of nylon monofilament of varying mesh sizes are the most commonly used gear in reservoirs. FRP coracle of 19 m diameter and FRP canoes of 3.7 – 3.8 m LOA are used for operation. Gill nets, drag nets, lift nets, traps, hook and line, 'Koruvala' etc. are used in the river systems. Details of craft and gear used in Hiran reservoir, Gujarat, and Hoogly river in West Bengal were also collected. Scale drawings of the different fishing gears are being made using computer software and a report is being compiled.

Improved fishing craft and gear for NEH region

Survey work on the different fishing craft and gears were continued in Assam and Arunachal Pradesh. During the period under report, the following places were surveyed in Assam: Nagaon, Jorhat, North Lakhimpur, Dhemaji, Sonitpur, Darrang, Cachar, Hailakandi, Karimganj, Dibrugarh and Tinsukia. In Arunachal Pradesh, Itanagar and Namsai (Lohit district) were covered for the survey on fishing craft and gears. Scale drawings of the different fishing gears used in Assam were made using computer software and a preliminary report was prepared.

Fishing experiments were carried out with mini trawl net using CIFT designed FRP boat with a 9.6 hp OBM at Brahmaputra river in Chandrapur and





Palasbari areas during the month of October. Due to uneven fishing grounds and clay bottom, the fishing operations were discontinued. Fishermen were contacted for trial operations and selectivity studies in gill nets were also initiated. The EY 60 portable Echosounder was operated from canoes to know the depth in different regions of the Brahmaputra river (Chaygaon, Palasbari, Sualkuchi, Amingaon, Uzanbazaar and Chandrapur) for carrying out fishing operations. Similarly, the Current meter was used to know the rate of flow of water during December 2005.



Trawling operation in Brahmaputra river

Two traditional fishing canoes of 8.24 m and 9 m LOA were given FRP sheathing at Majgaon (North Guwahati) fishing village during December 2005. The boats are being operated for fishing and the same is being monitored. Samples of different boat building timbers (Sal, Urium, Azar and Poma) collected from different places in Assam were tested for their mechanical strength properties.

Impact of bottom trawling on the benthic fauna

Pilot studies were undertaken along the different depths zones ranging from 10 to 50 m off Veraval to find the most suitable areas for the experiments. Based on the pilot study, five zones (areas) were selected for sampling. Experimental trawling operations were conducted in the depth zone 15 to 45 m off Veraval during the month of September 2005. A total of 20 experiments were conducted in the experimental zone. Biological and physico-chemical data was collected from these sites before and after trawling to quantify the changes due to bottom trawling operations. The samples are under analysis for variations of sediment texture, sediment organic matter, macrobenthos and meiobenthos.

Polychaetes belonging to the families Ampharetidae, Spionidae, Hesionidae, Oweniidae and Scalibregmatidae were identified both before and after the experimental trawling operations in pilot sampling. Total numerical density of macrobenthos was found to be increased after trawling in all the stations in pilot sampling.

Data on the bycatch landed by the trawlers (single and multi-day fishing) operating along the Gujarat coast was collected and the preliminary observations show an average bycatch landings of 500-750 kg/trip for the multi-day fishing trawlers and 100-150 kg/trip for the single day operational trawlers. Juveniles of commercially important species like *Trichiurus lepturus* and *Otolithes cuvieri* formed the majority in bycatch landed during the beginning of the fishing season, whereas *Grammoplites suppositus* and crabs (*Maturta* sp.) formed the major bycatch towards the end of the fishing season.



Fish Processing Division





Research projects handled

- ❖ Processing and product development from bycatch and deep sea fishes
- ❖ Handling, processing and preservation of freshwater fish with special emphasis on transportation and improvement in traditional preservation techniques
- ❖ Modern technologies for packaging of fish and fishery products
- ❖ Development of high value products from fish and fish processing waste
- ❖ Improvement and value addition of traditional fish products
- ❖ Development of eco-friendly technologies for the production of water soluble derivatives of chitin and biodegradable membranes from chitosan
- ❖ Suitability of polymer coated tin free steel cans for canning fish and fish products
- ❖ Development of extruded products utilizing low value fishes

Chief findings

- * The process for the production of coated edible oyster was standardized and its frozen storage characteristics were studied during storage at -20°C.
- * A process for the production of fish sauce from anchovy by salt fermentation was developed and its storage characteristics were studied at ambient temperature for one year.
- * Chemical characteristics of the freshwater fishes *Pangasius sutchi* (freshwater cat fish), *Cyprinus idella* (grass carp) and *Tor khudree* (Mahaseer) were studied.
- * Iced storage characteristics and shelf life of *P. sutchi* and *C. idella* were worked out and the effect of iced storage on the quality characteristics and yield of fillets and mince were evaluated.
- * A method to utilize the filleting waste was developed.
- * Procedures for production of smoked products from *T. khudree* and *C. carpio* were standardized.
- * Ready to serve Squid masala in retortable pouches had a shelf life of 12 months at ambient storage.
- * Standardized process parameters for preparing ready to serve fish products from *T. khudree* and smoked tuna.
- * Vacuum packaging and packing under Carbon dioxide enhanced the keeping quality of dried shark.
- * Shrink wrapping was found to increase the shelf life of frozen pomfret and pearl spot during frozen storage.
- * Indigenous thermoformed trays made of Polypropylene were found to be suitable for packing chilled, frozen and heat processed fish products.
- * PEST/LDPE laminate and metallised polyester/LDPE laminated pouches were found suitable for packing ready to eat fried extruded fish products.
- * Packaging materials for condiment incorporated ready to fry and ready to eat fish products like prawn chutney, fried prawns and fried anchovies were





standardized and it was found that PEST/LDPE laminated pouches were ideal materials.

- * See-through retortable pouches made of polyester, nylon, cast PP coated with Aluminium oxide was found to be suitable for processing smoked tuna.
- * Active packaging studies indicated that both Oxygen scavengers and Carbon dioxide emitters were effective in enhancing the shelf life of dry fish and chilled fish, respectively.
- * Edible fish powder was prepared from red meat of tuna.
- * Fish powder incorporated cookies was prepared.
- * Prawn flavour was prepared from prawn shell waste and incorporated into curry preparation.
- * Fatty acid composition of tuna eye balls were determined.
- * Processed carrageenan was prepared from cultured sea weed *Kappaphycus alvarizi*.
- * Fish Calcium was prepared from sardine and rohu scales.
- * Chitosan with low viscosity was prepared.
- * Carboxymethyl Chitosan was prepared and its properties were studied.
- * Food grade gelatin was prepared from skin waste of fresh water fish.
- * Hydrolysate from fish was used for the preparation of ready to drink product.
- * Chitosan sulphate and chloride were prepared.
- * The quality of dry fish sold in local markets were evaluated.
- * Masmin in flakes was prepared from red and white meat of skipjack tuna.
- * Quality dried fillets were prepared from fresh water fish rohu.
- * Production parameters of extruded products of low value fishes were standardized.

Report of work done

Storage studies and evaluation of biochemical and organoleptic characteristics of fish sauce



Fish sauce from anchovies

Storage studies of the three samples of fish sauce prepared from anchovy (*Stolepherous* spp.) was carried out for one year. The colour comparator readings indicated that there was not much variation in the colour of the fish sauce samples. The characteristic taste and flavour of the sauce remained unchanged. The TVN values after 12 months of storage were 98.7, 184, 166.6 mg/100 ml. Peroxide content was below the detectable limit and the Histamine content was negligible, being 2.88, 2.68 and 3.27 mg/100 ml respectively. The Nitrogen content appeared to be stabilized at 14.00 g/l in all the samples. No fungal growth or





other signs of spoilage was observed. It shows that the fish sauce can be kept well for more than 12 months storage and it may be attributed to the high content of salt (28%).

Coated fish products

The preparation of frozen coated edible oyster was standardized and its frozen storage characteristics were studied for more than one year. The product showed good organoleptic characteristics initially but indicated rancid flavour and spoiled taste after 12 months storage at -20°C . During the storage period the moisture content decreased from 53.79 to 48.16%, peroxide value increased from nil to 43.24 and total plate count decreased from $5.04 \times 10^4/\text{g}$ to $2.36 \times 10^3/\text{g}$.

Chemical characteristics of freshwater fishes

The freshwater fishes vary in their chemical characteristics. *Pangasius sutchi* has a moisture content of 82.9% while *Cyprinus idella* has a moisture content 75.24% and *Tor khudree* has a moisture content 79.33%. Water soluble Nitrogen content was higher in *P. sutchi*, while in the other two cases it was between 25 and 30%. The non protein Nitrogen content of *P. sutchi* was 21.96% of total Nitrogen, whereas it was 11.9% for *C. idella* and 8.83% for *T. khudree*. The peroxide value, free fatty acid and thiobarbitoric acid values were very low in all the three fishes.

Iced storage studies

The iced storage characteristics and shelf lives of *P. sutchi* and *C. idella* were studied. Both *P. sutchi* and *C. idella* showed drastic increase in moisture content. In *P. sutchi* the moisture content increased from 82.9 to 88.08% by six days and in *C. idella* it increased from 75.24% to 82.69% by nine days. The values of salt soluble Nitrogen, water soluble Nitrogen and non protein Nitrogen showed a decrease in the case of *P. sutchi* while these values did not show significant change in the case of *C. idella* upto nine days.

Fillets

Fillets were prepared from *P. sutchi* and *C. idella*. The yield of skinless fillets was 26.8% from *P. sutchi* and 40.28% from *C. idella*. A progressive decrease in the yield of fillet was noticed during iced storage. The low yield was mainly due to breakage of fillets and gaping. The fillet quality was also significantly reduced beyond three days iced storage.

Mince

Good quality mince was obtained up to two days in ice and beyond three days the quality of the mince was reduced drastically. Since the water content of the meat was increasing on storage of fish in ice, the chemical and sensory characteristics were affected significantly. The texture showed a rapid decrease in quality on iced storage.

Utilization of filleting waste

The frame obtained as filleting waste was cooked and the meat in the frame was recovered. The yield of the cooked meat from the frame of *T. khudree* was 37%. The cooked meat was converted into cutlet. The cutlet has a moisture content of 63.9%, protein 12% and fat 6.8%. The product had very good organoleptic properties. The bones after removing the meat on cooking were





Edible fish powder from *T. khudree*

cleaned and sterilized in an autoclave at 121°C for 10 minutes. It was then dried and powdered. The powder had smooth finger feeling and could be incorporated in curry products for fortification of Calcium.

Smoked products

The sensory characteristics of products prepared using saw dust from different sources for generating smoke was studied and it was found that the smoke generated from the saw dust from teak wood gave the best product in appearance, texture and flavour.

The method of preparation of smoked fillets from *T. khudree* was standardized.

The best product is obtained by dipping the fillets in 5% salt solution, surface drying for one hour at 40°C and smoking at 70°C for half an hour. In the case of *C. carpio* the surface drying was carried out at 50°C for one hour. The other parameters remained same. Vacuum packaging of the product and storing at 3°C give a shelf life of more than four months for both the products.

Process parameters for ready to serve fish products in retortable pouches

Squid masala was prepared after blanching squid tubes with 2% salt solution. The product was very well accepted after processing. Hence, a fresh batch of squid masala was prepared for storage studies in retortable pouches. The product after processing to Fo 7.5 was commercially sterile and even after storage for 12 months at ambient storage showed very good acceptability.

Standardization of process parameters for preparing ready to serve fish products from fresh water Mahaseer (*T. khudree*) was undertaken. Fresh fish were collected from upper banks of Chalakudi river and were brought to the laboratory in iced condition. Two types of fish preparations were prepared (Mughlai and Punjabi style). Steaks were packed in pouches along with curry and were sealed and processed in retort to Fo of 8. The product after processing was acceptable with regard to all sensory attributes. The product was acceptable even after a storage period of four months.

Vacuum packaging of dried fishes

Studies on effect of vacuum and Carbon dioxide packing on the quality of dried shark were continued. Commercial dried samples of shark from the market were further dried and packed in PEST/LDPE pouches in air, under vacuum and in Carbon dioxide. After storage for seven months, it was observed that vacuum packed and Carbon dioxide packed samples were superior to air packed samples. The control samples developed ammoniacal odour.

Shrink and cling film packaging for chilled and frozen fish products

Studies on shrink packing of white pomfret in four different forms was undertaken. Sample I was control fish air packed without shrink film (LDPE), Sample II was shrink packed whole, Sample III was control ordinary air packed after gutting and Sample IV was dressed fish shrink packed using LDPE shrink





film at 150°C. All the samples were quick frozen at -40°C for about four hours and kept in frozen storage at -20°C. Storage studies of this batch indicate that the products are good in all aspects even after a period of six months. Studies on frozen storage of shrink-wrapped pearl spot were conducted. Whole pearl spot and gutted pearl spot were shrink-wrapped with 100 gauge LDPE and were packed under air. All four samples were frozen and stored at -20°C and regularly assessed for changes in quality parameters. After nine months, it was observed that all samples were in acceptable condition. Shrink packed samples were superior to air packed samples with respect to sensory attributes.

Suitability of locally available packaging material for indigenous thermoform containers for thermal processing

As an alternative to imported thermoformed trays, suitability of indigenous polypropylene trays was studied. PP trays sealed with multilayer top film were found to withstand thermal processing. Initial trials showed that these trays can be used for processing prawn and fish biriyani. Biryani could be stored only for two months in PP trays due to high gas transmission rate. In Aluminium foil lined trays, the products had a shelf life of five and half months. Indigenous PP trays were found suitable for chilled fish products stored at -20°C.

Presently trays for packing value added fish products are imported and are expensive. The locally available trays made of PVC, Polystyrene etc. are not suitable as they cannot be heat sealed on top with any films. So, trials were undertaken to study the suitability of indigenously developed impact polypropylene thermoformed trays for packing frozen fish products. The impact PP trays were stored at -20°C to study their suitability for frozen storage. The trays remained in good condition even after 10 months.

Testing of different properties of locally available opaque and see through retort pouches

Indigenous opaque retortable pouches were collected from six different manufacturers and were tested for various physical and chemical properties. Pouches from all the sources were found to be suitable for food contact application and physical properties like tensile strength, heat seal strength, bond strength etc. were found to be optimum. The overall migration residue was well within the prescribed limits. It was observed that flex cracks developed after thermal processing in case of one supply.

Suitable packaging material for extruded products

Ready to fry fish products were extruded using a single screw extruder. These products were packed in polyester/LDPE pouches as well as PP trays. Changes in various quality parameters are being monitored during storage at ambient temperature.

The storage stability of ready to eat, fried, extruded fish products packed in low density polyethylene, plain polyester polyethylene laminate and metallised polyester polyethylene laminate were studied. The product had a shelf life of 30 days in LDPE pouches, 45 days in PEST/LDPE laminate and 60 days in metallised polyester/LDPE laminate. Under ambient conditions and relative humidity of 94%, the product had a tendency to absorb moisture. Water activity of the fried product was 0.25.

Ready to fry extruded prawn wafers in tube form was developed using





single screw extruder. The prawn meat was mixed with rice flour at different proportions and extruded. The product with 10% prawn was found to be ideal with good puffing characteristics. The final product did not give any prawn flavour even at 30% level. Hence trials were undertaken to mix the prawn powder to the extruded starch product after frying. It was observed that the flavour was better and experiments will be continued to standardize the product and packaging materials.

Ready to eat products from fish and shellfish

Packaging materials for condiment incorporated ready to fry and ready to eat anchovy were standardized. Fresh anchovies were procured from the harbour and after cleaning, were mixed with masala paste. They were then dried under the sun to a moisture level of 15%. The dried anchovies were divided into two lots. One batch was packed in ordinary 200 gauge polypropylene pouches and laminated PEST/LDPE pouches. Other batch of dried anchovies were fried in vegetable oil and packed similarly. Both samples remained in good condition even after two months of storage.

Condiment incorporated ready to eat fried prawns was prepared with commercially dried prawns. Dried prawns were cleaned and the head and tail portion removed. Prawns were then roasted in a pan, mixed with chilly powder, turmeric powder, salt and curry leaves. The prawns were then fried in oil and packed in polypropylene and laminated pouches for storage studies.

Standardization of packaging materials for chutney powder from dried prawns was done. Two types of traditional chutney powders were prepared. One by using ingredients like Bengal gram, black gram, tamarind, coriander, coconut, curry leaves, red chilly etc. and the other by using grated coconut, red chilly, curry leaves, tamarind and salt along with dried prawns. The chutney powder was packed in ordinary PP film pouches and also in laminated pouches under air and vacuum. The product is stored at ambient temperature for storage studies.

Ready to eat dried and fried prawn with spices packed in laminated pouches in air and vacuum were acceptable for 11 months. Samples packed in air in PP pouches were discarded due to rancidity after eight months of storage. Similarly dried prawn chutney was also acceptable for 11 months of storage in laminated pouches. Pronounced rancidity was observed in samples packed in ordinary PP pouches due to high permeability of the film compared to laminated film pouches.

Smoked and thermal processed tuna and other fish products in opaque and see through pouches

Studies on standardization of smoking parameters for tuna was undertaken. Fresh tuna procured from the harbour was cut into steaks, brined and smoked in the kiln at 75°C for 30, 60 and 90 minutes using coconut husk. The smoked tuna steaks were thermal processed in oil, brine and as natural pack to F_0 of 10. Samples were kept for storage studies at ambient and accelerated temperatures. After 11 months of storage all the samples remained in good condition. However samples stored at ambient temperature were superior to samples stored at 37°C and no rancidity was observed in both samples.

Suitability of imported see through retortable pouches for processing smoked tuna was undertaken. Pouches made of three layer laminates consisting of





polyester, nylon, cast PP coated with Aluminium oxide were used for the study. Tuna steaks were smoked using coconut wood at 70°C. The smoked tuna steaks were thermal processed in see through pouches in oil, brine and as natural pack to Fo of 10. The samples were stored at ambient and accelerated conditions and even after seven months, samples remained in good condition.

Active food packaging

Preliminary work on active food packaging was initiated. Oxygen absorbers were procured from M/s. Sealed Air India Pvt. Ltd., Bangalore. Trials with dry fish (*Pangasius sutchi*) have been initiated. The O₂ scavengers were placed in the EVOH pouch along with dry fish and storage studies were conducted. Changes in the gas composition inside the pouch were monitored. It was observed that the Oxygen absorber could absorb almost 99% of Oxygen inside the pouch within a day. The fish quality was monitored by analyzing TBA, PV, TVBN, TMA and colour. The samples kept with Oxygen absorbers showed minimal chemical changes compared to control without Oxygen absorbers.

Trials were undertaken to standardize Carbon dioxide emitters also using different chemicals. Four different combinations of chemicals as Carbon dioxide emitters were tried. Studies were conducted with these emitters to enhance the shelf life of sardine in chilled condition. Samples stored in air pack were compared with samples stored under Carbon dioxide emitters. Initial trials indicated that Carbon dioxide emitters enhanced shelf life of sardine compared to air packs. Shelf life enhancement was better in the combination of Sodium bicarbonate + Citric acid, followed by Citric acid + Sodium bicarbonate + Iron powder; Citric acid + Sodium bicarbonate + Ferrous carbonate; and Sodium bicarbonate + Sodium dihydrogen phosphate.

High value products from fish and fish processing waste

Tuna red meat, which is discarded as a processing waste was used for the preparation of edible fish powder. The dried powder had a chocolate brown colour and had a protein content of 86.15%. It can be stored at ambient temperature for a month without any change of quality. Cookies were prepared using standard recipes by incorporating edible fish powder at different levels. Edible fish powder prepared from *Nemipterus* (whole fish) was compared with red meat of tuna. Cookies prepared using tuna powder was rated to be good at 5% level.

Flavour prepared from prawn and crab meat were incorporated in vegetable curry.



Smoked tuna in see through pouches



Fish powder incorporated cookies

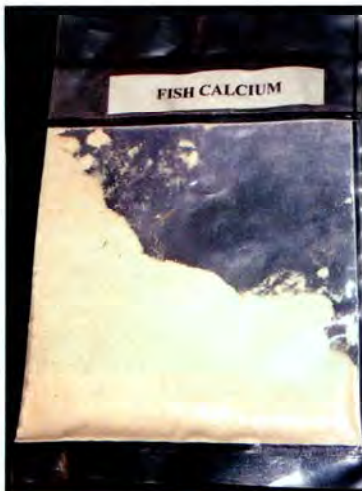




It was stored at -30°C . The product was found to be good after storage for one month. Flavour prepared from prawn was superior to that of crab with regard to organoleptic qualities.



Carrageenan from sea weeds



Fish Calcium from sardine and rohu scales

Fatty acid composition of tuna eye balls were determined using gas chromatograph. It contains 4% DHA and 2.5% EPA.

Purified Carrageenan was prepared from cultured sea weeds *Kappaphycus alvarizi*. Yield was about 33%. Gel strength, sulphate content and clarity were determined.

Fish Calcium was prepared and purified from sardine and rohu scales after removing protein. The yield of Calcium was about 9.5%.

Chitosan with low viscosity was prepared by treatment with dilute HCl followed by deacetylation at low temperature. Nitrogen content of 6.37% and a number of amino group of 0.805

equivalent/100 g was noticed. The sample when dissolved was crystal clear and almost colourless.

Chitosan sulphate and Chitosan chloride were prepared using Sulphuric acid and Hydrochloric acid. Properties of these products were studied.

Extraction of food grade gelatin from skin of fresh water fish was carried out. Optimum conditions were standardized. Yield was in the range of 5-12%. The gelatin samples were white and crystalline in appearance.

Fish hydrolysate was prepared using enzyme bromelain. Hydrolysate prepared was tried in different concentrations for the preparation of ready to drink beverages.

Evaluation of quality of dry fish marketed in local markets

Dried shrimp, calcium fish (Nandan), silver belly, anchovy, sole, shark and *Lactarius* collected from Ernakulam and Kozhikode markets were tested for various parameters. Most of the fishes were bought from Mangalore, Porbandur and Visakhapatnam. The fish sample collected from Kozhikode were found to contain *Aspergillus niger*, *Penicillium* spp. *Polypaecellium* spp. and *Rhizopus/Mucor*. The prawns and calcium fish collected from Ernakulam market were good in appearance and the peroxide value and Histamine content were within the acceptable limit. Salt content of prawn and calcium fish was nearly 1.0% whereas, it was 21.04% in silver belly and 6.78% in anchovy.

Fish sold through super markets in Kozhikode were found to be of only medium quality with a sensory score 3 to 6 in the scale 1-10. Moisture content varied from 21-52%, salt 4 to 2%, protein 23-34% and fat 0.2 to 8.8%.

Production of masmin

Masmin in flakes was prepared under hygienic conditions from red and white meat separately from skipjack tuna. These products showed slight difference in proximate composition, the product from red meat had higher





protein and fat content than that from white meat. When stored in LDP bags at ambient temperature, the characteristics were retained even after four months.

Production of dry fillets from rohu

Fillets were made from fresh rohu and dried after the following treatments:

1. 10% brine + Potassium sorbate
2. 10% brine + Potassium sorbate + Chitosan
3. 10% brine + Chitosan

Storage of these products in PP laminates at ambient temperature showed good shelf life. There was no fungal growth, foul smell or rancid odour. Organoleptic evaluation of the product in fried form as well as curry indicated good taste and acceptance.

Effect of ginger and turmeric extract on the storage of salted dried sardine

Salted sardine along with extracts of ginger and turmeric and in combination with Ascorbic acid stored in wooden barrels with facility for draining the self brine resulted in self dried salted sardine with acceptable characteristics.

Dry fish procured from market were washed and treated with brine and 1% Acetic acid, 1% Chitosan and 1% Acetic acid and sun dried. It was found that Chitosan with Acetic acid and Acetic acid alone improved sensory characteristics and storage life of the fish, while the product was better with Chitosan in Acetic acid than Acetic acid alone.

Production of water soluble derivatives of Chitin

Alkali Chitin, Carboxymethyl Chitin and water soluble derivatives of Chitin were prepared and purified in different experimental conditions. Yield was recorded. Properties like molecular weight, moisture, viscosity, degree of acetylation etc. were determined. The production of Carboxymethyl Chitin was standardized. Chitosan membranes were prepared with different additives like glycerol, Carrageenan and Alginic acid. Its quality parameters like thickness, tensile strength, Oxygen transmission rate, water vapour transmission rate etc. were analysed for different films. Quality of films were found to be good.

Polymer coated tin free cans for canning

Studies on suitability of indigenously manufactured polymer coated tin free steel cans were carried out. The cans were found to withstand thermal processing conditions and suitable to process different varieties of fish and fish products.

Extruded products of low value fishes

Process parameters for different products like Sardine in brine, Sardine in oil, Mackerel in brine, Mughalai U.P. curry, Malabar sardine curry, Mackerel curry, Shrimp biriyani, Squid masala, Shrimp



Squid masala





curry, Mackerel in oil, Tuna in brine, Tuna in oil, Fried mussel, Smoked mussel, Cooked mussel in oil, Fried mussel in brine, Traditional mussel curry, Crab curry, Crab paste in tin free steel cans etc. were standardized. Storage studies of these products at ambient storage are also under progress. Standardization of products using a single screw extruder with various combinations of cereal types of flours with fish is being undertaken.



Quality Assurance and Management Division





Research projects handled

- ❖ Studies on the level of sanitation and hygiene in fishing boats, fish landing centers, transport and domestic markets for hazard control
- ❖ Chemical residue management in farmed and wild fish and shellfish of India

Chief findings

- * About 39.4% samples consisting mainly IQF prawns meant for export were found positive for bacterial inhibitor test. However none of the samples were positive for Chloramphenicol and Nitrofurantoin.
- * Good quality Marinades were prepared using low cost fishes like tuna, mackerel and shark, with blanching in a medium of salt.
- * High quality ready to eat Maricream was prepared from cuttle fish.
- * Heavy metal levels in farmed fish and prawns were found to be far below the permitted limits. Cadmium could not be detected in any of the samples of prawns analyzed.
- * Cooking did not remove completely many metallic contaminants from fish/shellfish.
- * A new method for the detection of biogenic amines using evaporative light scattering detector with derivitisation is being standardized.
- * A herbal technique for prevention of blackening of shrimps during iced storage was developed.
- * Extensive surveys on domestic fish markets and landing centres were undertaken to ascertain the problems existing in operation.

Report of work done

Bacteriological analysis of fish and fishery products

Ninety nine samples consisting of raw frozen and cooked frozen (IQF) fish and fishery products, milk and milk products, food additives etc. meant for export and local consumption were tested for the presence of bacterial inhibitors. Four ATCC bacterial cultures viz. *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis* and *Micrococcus luteus* and EU Four Plate Test were used for the detection of bacterial inhibitory substances. About 39.4% samples consisting of mainly IQF prawns meant for export were found positive in bacterial inhibitor tests. Subsequent investigations with Charm II System and LCMS-MS revealed that none of these samples are positive for Chloramphenicol and Nitrofurantoin.

Studies were conducted to improve the sensitivity of bacterial inhibitor tests by using sensitive bacterial cultures and different media.

Enterotoxigenicity of few *S. aureus* isolates obtained from fish were tested by RPLA technique. 40% of the isolates were found to be enterotoxigenic and they produced mainly enterotoxins A and D.





Over 150 samples of frozen fish and fishery products meant for export were tested for the presence of bacterial pathogens viz. *V. cholerae* 01, *Shigella*, *V. parahaemolyticus*, *V. vulnificus*, *S. aureus* etc. All samples were found free from *V. cholerae* 01, *Salmonella*, *Shigella* etc. Incidence of other pathogens like *V. parahaemolyticus* varied from 10 to 16%.

Preparation of Marinade

Studies were undertaken to prepare safe and quality improved Marinades from fishes like Tuna, Mackerel and Shark. The marinading liquor was made by mixing preservatives like Acetic acid, Sodium metabisulphite and Sodium chloride. The sliced fish meat was blanched at 80°C for 90 seconds. Spices like cardamom, clove, cinnamon, pepper and green chillies were added for enhancement of flavour and taste of blanched meat. At ambient condition of 28 to 30°C, the storage life was 12 weeks. Whereas at 10°C, the storage life was 18 weeks. After this period, the product was found unsuitable due to turbidity of the liquor, colour change of meat and very soft texture and flavour changes. Biochemical, bacteriological and sensory evaluation were conducted at intervals and the sample remained acceptable for 12 weeks to 18 weeks at 10°C.

Benzopyrene in smoked products

Survey on the occurrence of Benzopyrene in Masmin - a traditional product of Lakshadweep was continued. The traditional Masmin contained 8-15 ppb Benzopyrene whereas the lab products contained only 0-1 ppb which was below permissible limit (2 ppb). Lowering of Benzopyrene in the product was attained by increasing velocity of air in the smoke chamber, wetting of saw dust and lowering of smoking temperature.

Maricream from cuttlefish

A high quality ready to eat product-Maricream which is a sweet product and relished like ice cream, was prepared from cuttlefish. Further studies on this product such as shelf life, nutritional aspects etc. is under way.

Chemical hazards in fish and fishery products

Heavy metals like Hg, Cd, Pb etc. were monitored in finfish and shellfish products. In *Penaeus indicus* and *P. monodon* Cd and Ni were absent. The levels of other heavy metals in fish samples were found to be in the range, Hg -0.12 to 2.07 ppm and As -1.76 to 3.97 ppm.

A test strip for estimating sulphite level in prawn muscle was perfected. The test strip was further improved by modifying the environment of preparation and the paper was found to be stable for more than six months.

Malachite green test has been standardized using fresh prawn muscle and by spiking with standard Meta bisulphite solution of varying level of SO₂. SO₂ level 0.01 ppm showed positive reaction with malachite green.

Impact of good aquaculture practices on the level of chemical residues in fish and shellfish

The levels of toxic metals like Hg, Pb, As, Cd and Zn were monitored in fish/prawn samples from two major aquaculture farms in Trichur and Ernakulam. Water quality characteristics like pH, Total Suspended Solids (TSS), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), salinity, nutrients and toxic heavy metals were monitored in the water collected from the farms. The results





indicated that both farms are good with respect to water quality characteristics. The levels of heavy metals were either nil or found only in traces. However, As and Hg were found in low levels (Hg-0.12 to 0.207 ppm, As-1.76 to 3.97ppm). In the freshwater prawn, Cd was found in the range of 0.188 to 1.10 ppm and Pb was found to be >0.7 ppm. Both these concentrations are above the recently revised tolerance limits of 0.5 ppm.

Heavy metal level in marine samples

The survey on occurrence of heavy metal residues in marine landings were continued. Several finfish samples and prawn samples from Cochin fisheries harbour were monitored for heavy metals. The results indicated that some of the metals were at significant levels (Pb - 4.6 to 21.94 ppm, As - 9.65 to 47.35 ppm, Cr - 9.58 to 40.4 and Zn - 93.4 to 221.4 ppm).

The level of Lead is alarming and needs continued monitoring.

Survey of fish markets for hazard control

Extensive survey on various domestic fish markets of Ernakulam, Kottayam, Malappuram and Trichur districts were under taken. Survey included collection of fish/shellfish samples kept for selling, water and ice samples used in markets and swabs from fishers, stalls, tables, transport vehicles etc. Discussions with individual traders and Traders' Associations were also conducted to ascertain the problems existing in operation.

It is understood that these markets host a range of conditions that may cause problems such as:

- Insufficient space for sale, leading to produce being sold in the open unsanitary surface and in unhygienic conditions with consequent spoilage and contamination.
- Non availability of good quality water and ice.
- The poorly designed and constructed sheds, making the marketing process inefficient and inhibiting customer flow.
- A general lack of building maintenance, hygiene and sanitation.
- Insufficient circulation space and traffic management measures, leading to vehicular and pedestrian congestion.
- Lack of parking provision and areas for unloading.



A dry fish stall at Alleppey being surveyed

- Poor condition of roads and pavings.
- Inadequate drainage and severe flooding problems, leading to produce losses and potential health problems.
- Inadequate waste handling facilities including treating of effluents.
- Inadequate site security and overnight storage facilities.
- Inadequate hygienic provision for fish handling, including a lack of refrigerated/insulated storage facilities.

All these happens in spite of availability of appropriate local technologies.





The fish collected from these markets exhibited good acceptance. The TMA and TVBN values were near the border-line. The biogenic amine levels in the samples were: Putrescine 0.02 - 0.08 mg/Kg, Cadeverine 0.152-0.236 mg/Kg, Spermidine 1.78 - 2.0 mg/Kg, Spermine 1.9 - 2.02 mg/kg, Tyramine 0.252 - 0.569 mg/kg, Agmatine 0.788 - 0.865 mg/kg, Histamine 0.885 - 3.65 mg/kg., all well below the tolerance limits.

The water and ice samples collected showed higher TSS and BOD values indicating higher organic content. The microbial quality of fish, ice and water were quite unsatisfactory pointing to the low quality of water used.

A survey on fish landing centers of Karaikkal, Poompuhar, Arcottuthurai and Nagapattinam in Tamil Nadu was undertaken and a package of practice for handling and transportation of fish to reduce fish quality losses is being prepared. A new design of fish auction hall and vending tables are also under preparation.



A fish landing centre at Nagapattinam bustling with activities

Studies on Paralytic Shellfish Poison (PSP) and Diarrhetic Shellfish Poison (DSP) of shellfish

Fifty two samples of Green mussels, clams and oysters, collected from Calicut (Puthiyappa), Ponnani, Quilon, Cochin and Vizhinjam were tested for PSP and DSP using standard procedures. All the samples were found to be free from PSP and DSP.

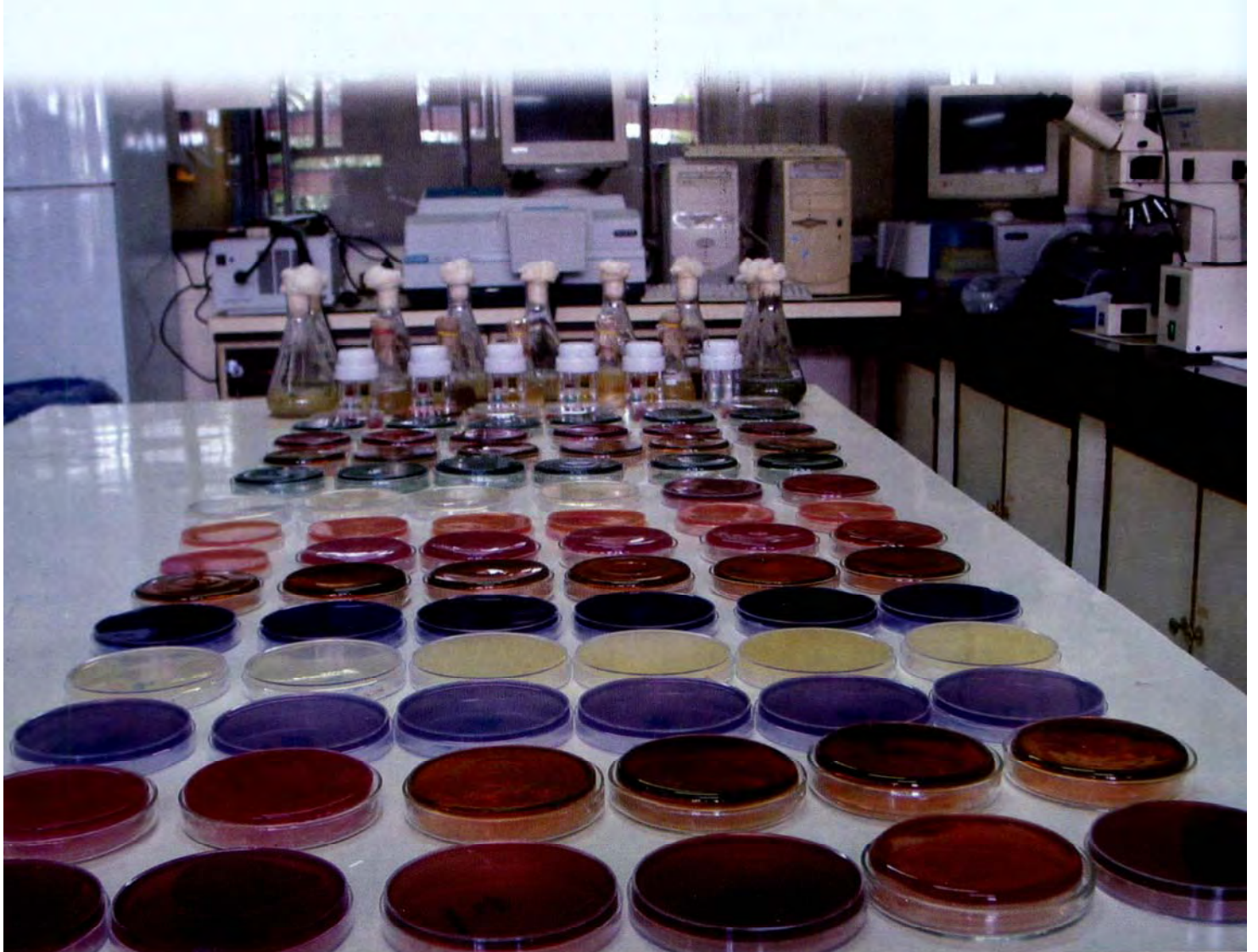
A new method for the detection of biogenic amines using evaporative light scattering detector with derivitisation is also under investigation.

Studies on organic preservatives

In view of the increasing demand for organic products, an attempt was made to develop herbal agents for prevention of melanosis in chilled prawn. A herbal method was perfected to prevent melanosis in prawn for ten days in chilled condition. The treatment was seen superior to the Sulphur dioxide treatment widely used in industry. A patent application was also filed for the technology.



Microbiology, Fermentation and Biotechnology Division





Research projects handled

- ❖ Microbial ecology, seafood safety and molecular methods for detection of pathogens and toxins
- ❖ Genomic investigations on aquatic and fish microorganisms and development of molecular diagnostic methods for pathogens
- ❖ Isolation and characterization of obligate halophiles from marine ecosystem and salt pans: Identification of genes regulating halophilicity
- ❖ In-service training programme in Molecular Biology for fisheries scientists
- ❖ National risk assessment programme for fish and fish products for domestic and international markets
- ❖ Identification and characterization of bacterial genes imparting osmo-tolerance and their validation in plants
- ❖ Development of gene constructs for producing WSSV resistant Penaeid shrimp and its validation in shrimp cell culture system

Chief findings

- * Antibiotic residues were not detected in any of the 348 samples of farmed shrimp and 14 shrimp feeds tested.
- * *E. coli* 0157 : H7 could not be detected in freshwater and brackish water aquaculture systems when tested by PCR and cultural method with Latex agglutination test.
- * PCR method for identification of pathogenic strains of *E. coli* was developed.
- * Out of 198 *E. coli* isolates from farmed fish, shrimp and environs, monitored for toxigenic potential, seven isolates were found to possess genes encoding for labile toxin (LT) and ST.
- * A study on the growth rate and enzyme potential of 34 strains of *Aeromonas* species, viz. *Aeromonas hydrophila*, *A. sobriae*, *A. veronii* and *A. caviae* at ambient and refrigerated and frozen storage indicated that these species are spoilers at ambient storage and delayed spoiler at refrigerated conditions.
- * Non-proteolytic *C. botulinum* types B and E were detected in fish.
- * A 445 bp DNA fragment specific for *Clostridium botulinum* type E was detected in toxigenic isolates from fish.
- * The level of *Clostridium perfringens* in mud and *Macrobrachium rosenbergii* from a freshwater farm was in the range of 0-0.4 MPN/g.
- * *Pseudomonas* and *Brochothrix thermosphacta* counts on aquacultured *Macrobrachium rosenbergii* were initially low, but their numbers increased during iced storage.
- * Incidence of Salmonella was 27% in 117 seafood samples tested.
- * A molecular diagnostic method for differentiating typical and atypical Salmonella isolates from seafood was worked out.
- * Salmonella isolates showed 90-95% similarities in the Carbon and amino





acid utilization pattern and 95% of the isolates were resistant against Erythromycin, 35% resistant against Sulphamethizol, 34% resistant against Carbenicillin and only 10% of the isolates were resistant against Oxytetracycline.

- * All strains identified as *Salmonella* were serotyped in the laboratory, based on *Salmonella* specific antisera. A total of 13 different serotypes were identified namely, *Salmonella* Brancaster, *S. Ohio*, *S. Typhimurium*, *S. Newport*, *S. Mbandaka*, *S. Weltreveden*, *S. Oslo*, *S. Braenderup*, *S. Derby*, *S. Lindenburg*, *S. Bareilly*, *S. Nchanga*, and *S. Emek*.
- * Serovars were also confirmed by molecular typing based on *invA*, ST11 and ST15, and *stn* gene, the *Salmonella* specific genes.
- * Three small plasmids of sizes 1kb, 2kb and 6kb were isolated from *Salmonella* Braenderup while, *S. Ohio* harboured four plasmids of sizes 1.5kb, 2.5kb, 4kb and 7kb.
- * Detection limit of *Salmonella* in seafood samples by PCR was $<5 \text{ CFU.ml}^{-1}$.
- * PCR based method proved to be the most sensitive for *Salmonella* detection in seafood compared to culture method, *Salmonella* Rapid Test (SRT) and ELISA method.
- * Incidence of *Listeria* in seafood samples was 29.4%, but *Listeria monocytogenes* was not detected in any of the fish sample tested.
- * Multiplex PCR based method was developed and standardized for easy differentiation of *Listeria monocytogenes* from *L. innocua* in seafoods.
- * Method for species level identification of *Listeria* by species specific PCR was standardized and *L. monocytogenes*, *L. innocua* and *L. ivanovii* could be easily distinguished.
- * Growth kinetics of *L. monocytogenes* showed that it can grow in up to 10% salt concentration but can survive up to 13% salt concentration in BHI broth.
- * Diarrheic enterotoxin production was found in 71.4% of the *Bacillus cereus* isolates from seafoods.
- * For rapid detection of enterotoxigenic *Bacillus cereus*, *hbla* virulent gene specific PCR was developed.
- * No co-relationship was found between hemolysin production and enterotoxin production in case of *B. cereus* isolates.
- * The *Staphylococcus aureus* Type A, B & C were detected in dried fish. However, these samples were free from the enterotoxin.

Report of work done

Antibiotic resistance of enteropathogenic *E. coli* in fish

Studies were conducted on antibiotic sensitivity of *Escherichia coli* strains from farm and environmental sources such as farmed shrimp, farm water, bottom mud, feeder canal water and organic manure. Studies were carried out against 12 antibiotics reported to be used in aquaculture and results were compared with clinical isolates of *E. coli* of animal and human origin obtained





from hospitals and veterinary sources. Majority of the isolates showed antibiotic sensitivity to one antibiotic only and a small percentage to four antibiotics. *E. coli* isolates of human and veterinary origin showed multiple antibiotic resistance to six to eleven of the antibiotics tested.

Antibiotic residues in farmed shrimp and processed fishery products

A total of 348 samples of farmed shrimp and 14 samples of shrimp feed were tested for antibiotics by ELISA method. No antibiotic was detected in any of the shrimp and feed samples. But inhibitory compound was detected in some samples.

Enteropathogenic *E. coli* in fish farms and farm environments

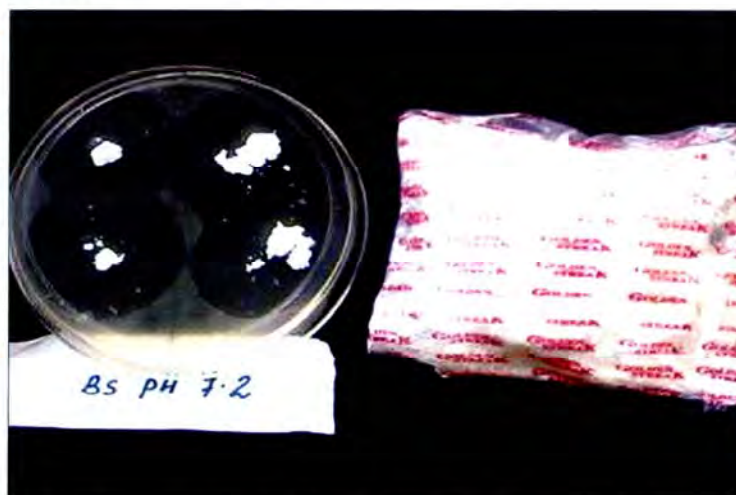
Out of 168 strains of *E. coli*, seven strains were found to possess genes encoding for labile toxin - LT (2 Nos.), stable toxin - ST (1 No.) and shiga toxin - Stx (1No.) and four number haemolysin hly. These strains were recovered from shrimp (LT, hly), source water (LT, hly), diseased cows (ST, stx and hly). Rapid identification of *E. coli* 0157: H7 has been developed by using Chrome agar (TM) 0157.

Toxicogenic potential of environmental *E. coli* isolates from farm and detection of their virulence associated genes

PCR method was standardized for detection of six groups of enteropathogenic *E. coli* namely EPEC, ETEC, EIEC, EAEC, EHEC and STEC by amplifying genes encoding for virulence markers *eae*, *lt*, *st*, *ipah*, *pCVD*, *stx* *hly* and *phoA*. For this purpose, different combinations of running conditions were tried and optimized. Effort is also under way to develop a multiplex PCR which can detect all the six groups of pathogenic *E. coli* by seven virulence markers.

Spoilage potential of *Aeromonas* species from fish/shellfish and environments

In vitro studies on the spoilage potential of *Aeromonas* species *A. hydrophila*, *A. veronii*, *A. sobriai* and *A. caviae* in sterile fish muscle immediately after death was carried out at ambient (30±1°C), refrigeration (5-8°C) and freezing (-20°C) temperatures by growth kinetics and their enzyme potential showed that all the strains produced protease and lipase at ambient temperature. But delayed proteolysis and lipolysis were observed at low temperature storage, parallel with growth rate, indicating that these species are spoilers at ambient storage and delayed spoiler at refrigerated conditions.



Antibiotic residues in farmed shrimp and processed fishery products



Mauve color colony, characteristic of *E. coli* 0157: H7, produced only by CFSMEI 1006 isolate from diarrhea affected calf in Chrome agar

Rapid identification of *E. coli* 0157 : H7

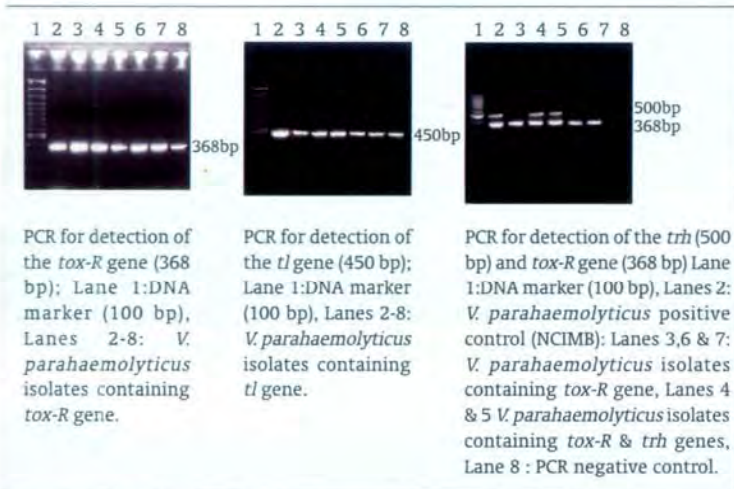




At -20°C, there was no enzyme activity and no spoilage though viable cells of *A. veronii*, *A. sobriai* and *A. caviae* could be detected. Microbiological analysis were supported by chemical indices such as TMA and TVN.

Molecular characterization of *Vibrio* spp. isolated from aquatic environments

A PCR method was standardized for detecting the virulence factors of *Vibrio parahaemolyticus* and *tdh*, *trh*, *tlh* and *tox-R* genes were monitored in the environmental isolates of *V. parahaemolyticus* from shrimp, post larvae and fish. The isolates carried *trh*, *tlh* and *tox-R* genes but *tdh* was not detected in any of the isolates.



Virulence of environmental *V. parahaemolyticus*

Distribution of *Clostridium botulinum* in aquatic environments

Fish and shellfish samples (16 Nos.) when screened for non-proteolytic *C. botulinum* by mouse bio-assay showed that two out of 16 samples (13%) were positive for *C. botulinum*. Seven out of 25 isolates (28%) were positive for toxigenicity. *C. botulinum* type B toxin was detected in two samples and type E in one sample. Trypsinised samples were more toxic than untreated samples.

PCR method for detection of toxigenic *Clostridium botulinum*

A method was standardized for detection of toxigenic *Clostridium botulinum*. DNA from the toxigenic *C. botulinum* isolates were extracted by heating at 99°C for 10 min. to break up the cells and release the bacterial DNA. A 445 bp DNA fragment specific for type E was amplified.

Occurrence of *Clostridium perfringens* in culture farms

Samples of water, mud and farmed *Macrobrachium rosenbergii* collected from a farm located at Harippad, Alleppy district of Kerala were examined for *Clostridium perfringens* by Most Probable Number method. *C. perfringens* was not detected in water. MPN count of *C. perfringens* from mud and whole and headless prawn samples were in the range of 0-0.4MPN/g.

Detection of *Salmonella* in fish and fishery environments

Salmonella was detected in 27 out of 117 seafood samples. Thirty two isolates were fully characterized biochemically and their antibiotic resistance pattern was studied. *Salmonella* specific PCR based technique was developed for rapid identification. A molecular diagnostic method for differentiating typical and atypical *Salmonella* isolates from seafood was worked out. Using *Salmonella* specific primer *ST 11* and *ST 15*, amplified product of size 429 bp was detected only for typical and ATCC *Salmonella* culture. For *Salmonella* specific *invA* gene primers, 284 bp product was observed only for typical *Salmonella* and ATCC cultures and there was no product for atypical *Salmonella* isolates.

Sensitivity of PCR was <5 cfu.ml⁻¹ when pure culture of *Salmonella* was tested. When seafood samples were artificially contaminated with *Salmonella*





of known dilutions, dilution having cell count $<5 \text{ cfu.ml}^{-1}$ gave positive result indicating that there was no inhibition in PCR from food particles and detection limit was also same as with pure culture.

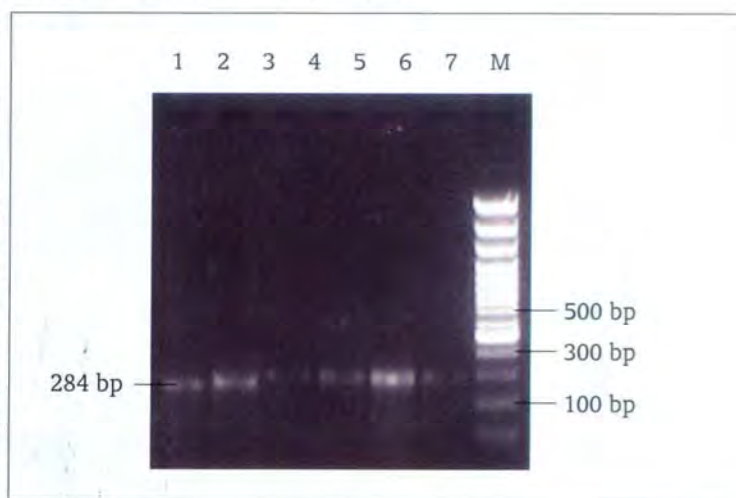
Microbiology of handling and processing of farmed shrimp

Microbiological changes in ice stored whole and deheaded prawn after treatment with approved preservatives, sorbate and citric acid were evaluated for 16 days based on counts of total aerobic bacteria, *Pseudomonas*, faecal Streptococci, faecal Coliforms and *E. coli*. In treated whole prawn, the counts except faecal Streptococci, were significantly reduced immediately after treatment and continued till storage for five days in ice. Faecal Streptococci were high in untreated whole and headless prawn and significant reduction was noticed after treatment in headless prawn only.

Serotyping of Salmonella isolates based on Salmonella specific antisera

Thirty two Salmonella isolates were characterized by serological method based on different somatic and flagellar antigens. A total of 13 different serotypes namely, S. Brancaster, S. Ohio, S. Typhimurium, S. Newport, S. Mbandaka, S. Weltveden, S. Oslo, S. Braenderup, S. Derby, S. Lindenburg, S. Bareilly, S. Nchanga, and S. Emek were identified.

Fourty six Salmonella serovars were also molecular typed based on Salmonella specific genes *invA*, ST11 and ST15, and *stn* gene. PCR products of 284 bp, 429 bp and 260 bp, respectively for *invA*, ST11, ST15, and *stn* gene were detected. All three primers were equally sensitive and gave same results and no product was observed for atypical Salmonella. An eight hour PCR has been developed for rapid identification of Salmonella from seafood.



Detection of Salmonella by 8 h PCR in fish, shrimp, clam, mussel, oyster and crab samples

Comparison of different methods of rapid detection of Salmonella from fish and fishery environments

Detection of Salmonella from seafood by conventional culture method was compared with rapid methods available in the markets such as Polymerase Chain Reaction (PCR) method, Salmonella rapid test (Oxoid) and ELISA method (Salmonella-Tek). Results showed that PCR method was most sensitive and rapid (45% positives) followed by ELISA (24%). Detection rate with culture method was 20% and Oxoid Salmonella rapid test (18%).

Molecular characterization of Salmonella using plasmid profiling, RAPD, ribotyping etc.

A modified plasmid isolation method has been standardized for characterization of Salmonella plasmids. Two large Megadalton plasmids were isolated from Salmonella Typhimurium. Three small plasmids of sizes 1kb, 2kb and 6kb were isolated from S. Braenderup and S. Ohio harboured 1.5kb, 2.5kb, 4kb, and 7kb plasmids. Plasmids were not isolated from S. Newport and S. Virchow.





Listeria spp. in fish in retail domestic trade

A total of 34 samples including 29 fresh and five frozen samples were tested for the presence of *Listeria* spp. *L. monocytogenes* was not detected in any of the fish sample tested. *Listeria* spp. was detected in 29% samples.

Standardization of genus and species specific PCR for Listeria

A multiplex PCR has been standardized for differentiation of *L. monocytogenes* from its non-pathogenic member i.e. *L. innocua* using three sets of primers i.e. *L. monocytogenes* specific primers LL5/LL6, *L. innocua* specific primers lin0464F/lin0464R and *Listeria* genus specific primers UI/LII. Two amplified products of 938 bp and 267 bp were obtained in the case of *L. monocytogenes*, two amplicons of 938 bp and 749 bp for *L. innocua*, but only one band i.e. *Listeria* genus specific band of 938 bp size for *L. ivanovii* and *L. grayi*. No amplified product was obtained for *Staphylococcus aureus* and *Bacillus cereus* included as negative controls. This Multiplex PCR can be used for rapid detection of *L. monocytogenes* from seafoods.

Salt tolerance, haemolysin production and antibiotic sensitivity of Listeria isolates

Listeria monocytogenes NCTC 11994 and *L. innocua* ATCC 33090 were found to grow well up to 10% salt concentration when inoculated into BHI broth containing NaCl (concentration 1-14%). Growth of *L. monocytogenes* and *L. innocua* was observed up to 10%. At salt concentration above 12%, only survival was noticed. β -hemolysin production was noticed in majority of the *Listeria* isolates. No correlation has been found between production of enterotoxin and production of β -hemolysin. Strains which are non-enterotoxigenic, have also been shown to produce hemolysin.

Listeria isolates and type strains of *L. monocytogenes*, *L. innocua*, *L. grayi* and *L. ivanovii* were tested for antibiotic susceptibility. Most of them were found to be sensitive to Neomycin, Penicillin G, Erythromycin, Vancomycin, Ciprofloxacin, Trimethoprim, Ampicillin, Gentamicin, Kanamycin, Chlortetracycline and Rifamycin but resistant to Sulphamethoxazole.

Enterotoxigenic Bacillus cereus in fish from retail trade

Out of total 22 samples (18 fresh and four frozen) tested, incidence of *B. cereus* was 50%. Enterotoxigenic *B. cereus* was detected in nine samples (seven fresh and two frozen). Diarrheic enterotoxin production was detected in 71% of the isolates.

Rapid detection of Bacillus cereus by molecular method

Bacillus cereus group specific PCR has been standardized using primers Bal F1 and Bal R1. All the *B. cereus* isolates yielded 533 bp amplified product without any cross-amplification with other *Bacillus* species tested.

Detection of Bacillus cereus virulence genes

All enterotoxigenic isolates were tested for the presence of three *Bacillus cereus* virulent genes i.e. *hbla*, *bceT* and *entFM* by PCR using specific primer pairs. The *hbla* gene was detected only in enterotoxigenic isolates. A correlation has been found between presence of *hbla* gene and enterotoxin production. While majority of the enterotoxigenic isolates were found to possess *entFM* gene, *bceT* gene was not detected in any of the isolates.





Enterotoxin production by *Staphylococcus aureus* under saline conditions

The effect of Sodium chloride on growth and enterotoxin production by *Staphylococcus aureus* showed that the limiting salt concentration for *S. aureus* enterotoxin A in BHI broth was 18%, though growth was noticed at 20% salt. Up to a salt concentration of 10% NaCl, toxin was produced within 24 hours. Production of SEB and SEC was noticed upto 15% salt concentration. *Staphylococcus* enterotoxins were found to be stable at high salt levels. Though *Staphylococcus aureus* was capable of toxin production in salted fish, none of the dry fish samples analyzed, showed the presence of the enterotoxins.

Distribution of Enterococci in aquatic systems

In marine, brackish water and freshwater finfish/shellfish samples (12 Nos.) from retail outlets in and around Cochin, Enterococcus counts ranged from 10^2 to 10^5 cfu/g. In most of the fish and shellfish samples, Enterococci constituted <1% of the total aerobic bacterial population and the dominant species identified were *Enterococcus faecalis* and *E. faecium*. In addition, *E. dispar* and *E. hiesae* were isolated to a lesser extent.

Screening of post larvae of shrimps for presence of WSSV

Thirty samples of *P. monodon* post larvae were screened for the presence of WSSV by nested PCR. Fifteen samples were positive by nested PCR in the second step. None of the samples were positive by the first step.

Real-time PCR (QPCR) method for the detection of White Spot Syndrome Virus (WSSV)

The detection limit of WSSV was determined using 0.1ng to 0.1pg of DNA by SYBR Green PCR. The thermal profile of the SYBR Green PCR was standardized. A linear relationship was observed between the copy number of virus template and C_T values for all the four primer pairs. A dissociation curve with a single peak was obtained for all the primer pairs. R^2 value for the primers ranged from 0.9730 to 0.9914. The molecular weight of the amplification product was confirmed using 2.5% agarose gel. Out of the four primers (W 4, W 5, W 6, W 7) tested, W 7 gave the lowest C_T value.

Screening of post larvae of shrimps for the presence of Monodon baculo virus

Samples of *P. monodon* post larvae were tested for MBV by impression smear technique and MBV was not detected in 12 samples. Occlusion bodies ranging from 5-30% were detected in the positive samples.

Isolation of halophilic bacteria and characterization of genes encoding osmo-tolerance in bacteria and yeast

Studies were initiated for the isolation of halophilic bacteria from crude salt samples, salted fish and marine fresh fish. The microflora was dominated by *Bacillus* species. Other isolates were identified as genera *Arthrobacter*, *Pseudomonas* and *Micrococcus*. The antiporter genes encoding osmo-tolerance in yeasts, the HAL1 gene from *Schizosaccharomyces cerevisiae* and SPAC1 gene from *S. pombe* were PCR amplified using cDNA prepared from cells in the log





phase of growth. The size of HAL1 and SPAC1 genes were 885 bp and 2280 bp respectively.

The osmolyte encoding genes in bacteria *E. coli* from marine environment, the betA and betB genes encoding for Betaine Aldehyde dehydrogenase and Choline dehydrogenase respectively with sizes 1671 bp and 1473 bp respectively were PCR amplified. Similarly, Glycosyl glycerol-major compatible solute, accumulated by fresh water cyanobacteria *Synechocystis* is formed by Glycosyl glycerol phosphate synthase (GGPS) and Glycosyl glycerol phosphate phosphatase (GGPP). The GGPS and GGPP genes from *Synechocystis* were PCR amplified. The sizes of GGPP and GGPS genes were 1269 bp and 1700 bp respectively.

In-service training in Molecular Biology for fishery scientists

One training programme of six months duration was conducted during the period under report. A total of four selected candidates attended the training course. Through theory and practical classes, as per DBT approved syllabus, the students have been given strong foundation in Molecular Biology. Thrust areas in Biotechnology like isolation of genomic and plasmid DNA, agarose and SDS-PAGE electrophoresis for separation of DNA, RNA and proteins, use of restriction enzymes, transformation of competent *E. coli* gene expression, PCR and Reverse Transcriptase PCR etc. were covered in the practical. They were assigned a short research project of about three months duration and they have successfully completed the course.

National risk assessment programme for fish and fish products for domestic and international markets

Total microbial quality of 66 samples collected from retail cold storages, retail markets and processing plants located in Kerala was evaluated. Fresh, frozen and dried fish and battered and breaded fishery products were examined. Fish (Oil sardine, Mackerel, Seerfish, Tuna, Tilapia, Reef cod, Pomfret, Rohu, Pearl spot), Crustaceans (Tiger shrimp, White shrimp, Scampi), Seacrab and mollusc (Clams, Mussels, Oysters, Squid) were analysed. Total plate count, counts of Coliform, *E. coli*, faecal Streptococci, coagulase positive *Staphylococcus aureus* and pathogens *Salmonella*, *Vibrio cholerae* and *V. parahaemolyticus* were monitored. Frozen shrimp samples were also examined for the presence of bacterial inhibitors and residues of eight antibiotics. *Salmonella*, *Vibrio cholerae* and *V. parahaemolyticus* could not be detected in any of the frozen shrimp, dry fish and value added products. Incidence of *Salmonella* was 6% in fresh fish and *V. cholerae* non-O1 was detected in 16% of the samples.

Identification and characterization of bacterial genes imparting osmo-tolerance

Na^+/H^+ antiporters, responsible for the maintenance and regulation of intracellular Na^+ and H^+ homeostasis and providing salt tolerance to organisms were identified in *Schizosaccharomyces cerevisiae* and *S. pombe*. The osmolyte encoding genes responsible for synthesizing Choline dehydrogenase and Betaine aldehyde dehydrogenase from choline and imparting osmo-tolerance were identified in *E. coli* isolated from marine environment. From freshwater





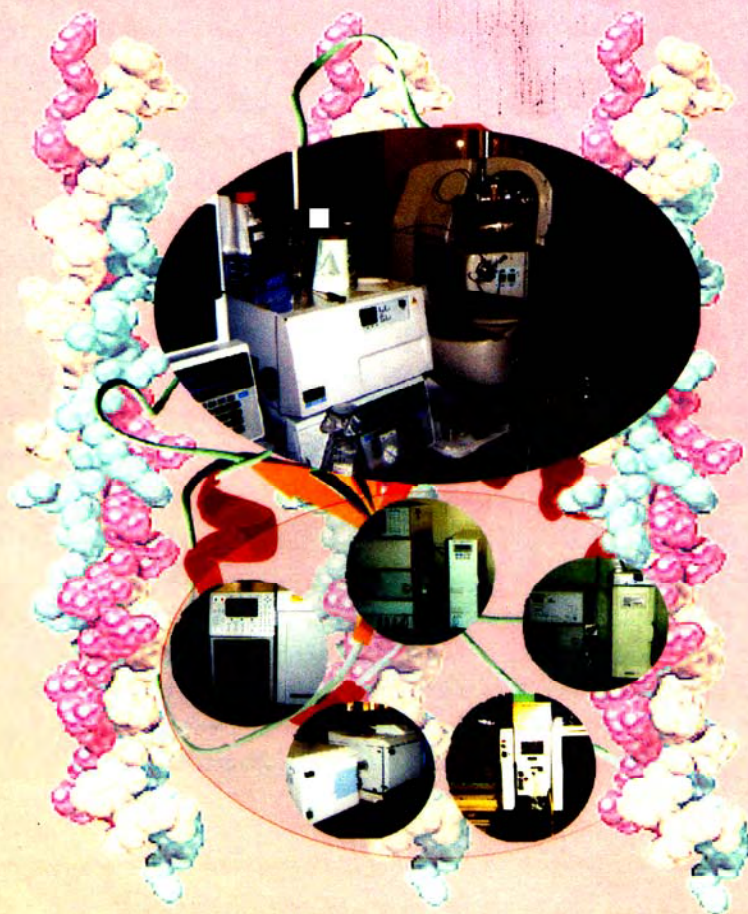
cyanobacteria *Synechocystis*, genes synthesizing Glycosyl glycerol phosphate synthase and Glycosyl glycerol phosphate phosphates which are responsible for accumulation of Glycosyl glycerol and imparting osmo-tolerance were identified.

Development of gene constructs for producing WSSV resistant Penaeid shrimp

The work on development of gene constructs for producing WSSV resistant Penaeid shrimp was initiated in November 2005. The genes encoding for envelope proteins VP28, VP281 VP68, VP466 and one nucleocapsid protein (VP26) of WSSV were PCR amplified. The confirmation of these genes by sequencing and their expression in prokaryotic system are underway.



Biochemistry and Nutrition Division





Research projects handled

- ❖ Isolation, identification and characterization of natural bioactive substances of therapeutical importance from Indian waters
- ❖ Toxicity induced stress on the metabolism of fish and distribution of toxic contaminants in fish and shellfish
- ❖ Isolation and characterization of fish lipases for commercial applications
- ❖ National risk assessment programme for fish and fish products for domestic and international markets
- ❖ Functional properties of protein from marine, brackish water, fresh water and deep-sea fishes of India
- ❖ Resource assessment of deep-sea fishes along the continental slope of Indian EEZ

Chief findings

- * Pharmacologically active extracts prepared from seaweeds like *Vallisneria spiralis*, *Euchemia cottoni* and *Eichornia crassipes* were tested in experimental animals and it was observed that compounds with analgesic, antipyretic, hypoglycemic and wound healing properties are present in these species.
- * A number of bioactive peptides in the molecular weight range of 800 to 1900 dalton are present in the haemolymph of shrimp, *Penaeus monodon*.
- * A number of biochemical parameters like albumin:globulin ratio, protein content and antioxidant status of the haemolymph were adversely affected in WSSV-infected *Penaeus monodon*. Treatment with thulsi improved the conditions and the effect was comparable to that of β -glucan, a known immunostimulant.
- * Toxicity studies using PAH in fish revealed that the antioxidant system was affected adversely due to the toxic stress.
- * Organochlorine pesticide content of fish samples from Kerala coast was well below the toxic limits. BHC and Heptachlor epoxide were the most common pesticides. DDT and its metabolites were present in a significant proportion of the samples.
- * Monitoring of heavy metals in fish, shellfish etc. has shown that eventhough metals like Cadmium, Copper, Zinc, Manganese and Nickel are present in most samples, the concentrations were within permitted levels. Lead was not detected in any of the samples analysed.
- * Fish and prawn samples from culture farms were found to be free from residues of antibiotics like Chloramphenicol and Tetracyclines.
- * Functional properties of fish proteins varied with habitat of the fish and it was found that pH also affect the functional properties significantly.
- * Lipids from deep sea fish had high proportion of non-saponifiable matter.





Report of work done

Bioactive substances from aquatic sources

Two species of octopus (*Octopus vulgaris* and *O. variabilis*) and three species of sea weeds (*Vallisnaria spiralis*, *Euchemia cottoni* and *Eichornia crassipes*) were screened for presence of bioactive substances. Extracts were prepared using water and methanol and tested for analgesic, antipyretic, anti-inflammatory, antiulcer, wound healing and hypoglycemic effects in male albino mice and rats.

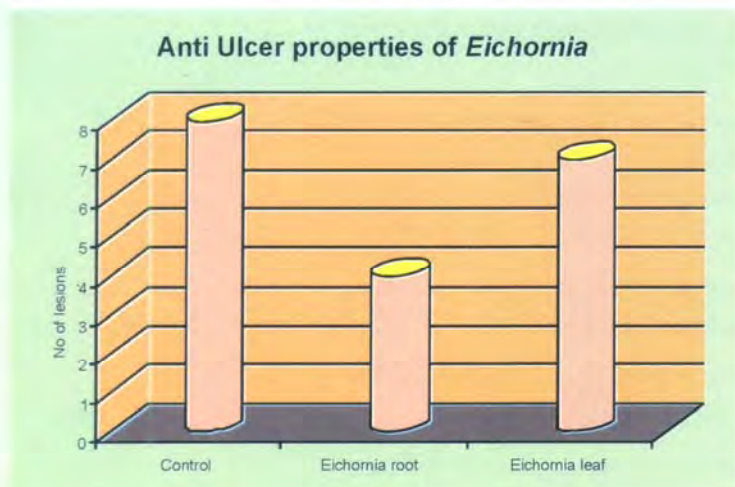
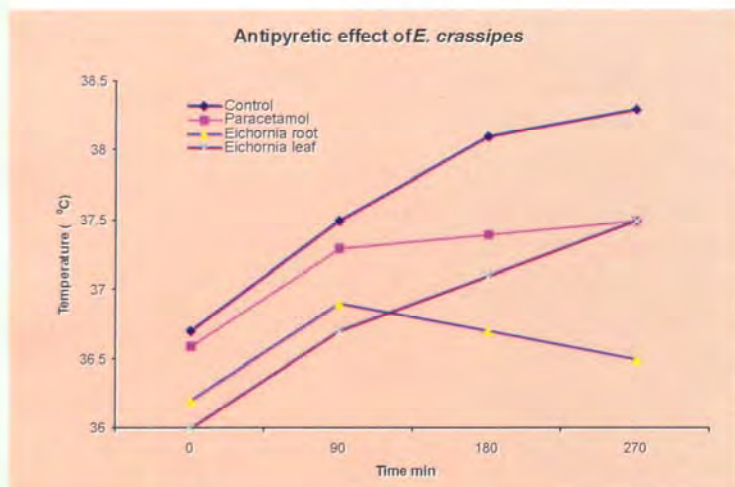
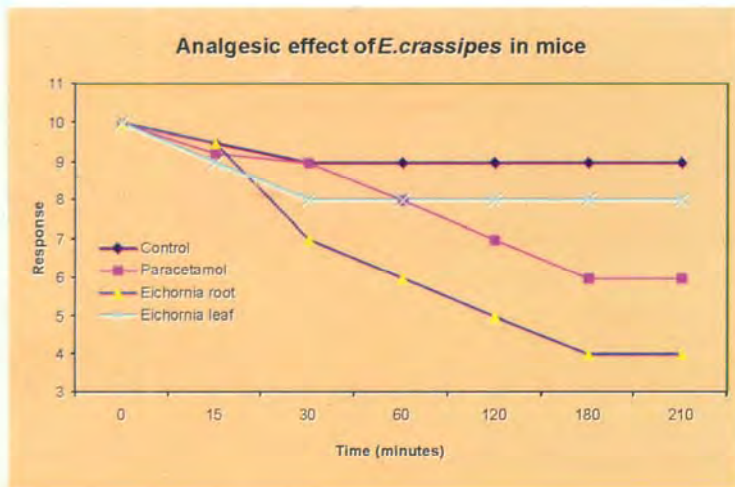
Preliminary results indicated that among the species tested, extracts from *E. crassipes* was the most promising source for substances with the above mentioned properties and hence further detailed investigations were made with extracts from different parts of *E. crassipes*. Roots and leaves were separated and extracted with methanol. After removal of methanol, the residue was reconstituted in water and tested for the presence of various chemical constituents and biological activities.

The extracts were tested for the presence of carbohydrates, proteins, amino acids, triterpenoids, alkaloids, flavanoids and saponins. It was found that triterpenoids, saponins and flavanoids were present in these extracts.

The analgesic effect of the extract was compared with Paracetamol. Results showed that analgesic activity of the extract from root was higher than that of Paracetamol. Extract from leaves did not show any significant analgesic activity.

During the studies on antipyretic effects, it was found that extract from the roots of *E. crassipes* was very effective in controlling the temperature in induced fever in albino rats. Its efficiency was more than that of Paracetamol. Extract from leaves was comparable to Paracetamol in its antipyretic effects.

To study the antiulcer properties, ulcer was induced in experimental animals (albino rats) by feeding ethanolic HCl and curative effect of the extracts were tested. Extracts from roots of *E. crassipes* reduced the number of lesions to about 50% than in control animals. Extracts from leaves was not as effective as that from the roots.





Another important observation was that the extracts from roots, when applied to wounds, helped in much faster healing when compared with controls (no treatment). In this case also the root extract was more effective than leaf extract.

The extract from *Euchemia cottoni* was very effective in reducing glucose levels in experimental animals. The level of serum glucose was reduced by about 35% in two hours, compared to control animals (without any treatment).

Isolation of bioactive peptides from shrimp

Standardization of procedure for extraction and purification of bioactive peptides from shrimp was initiated. After an initial purification, the fractions were screened for peptides using LC MS-MS. It was found that the haemolymphs contained a large number of peptides in the molecular weight range of 800 to 1900 daltons. Further work on characterization and purification is in progress.

Pesticide residues in fish

Fish and shellfish samples collected from Kerala coast were analysed for Organo Chlorine Pesticides (OCP). BHC was the most common OCP and it was present in about 80% samples. Heptachlor and Heptachlor epoxide were present in about 70% of the samples and the DDT group (DDT and its metabolites) in about 50% of the samples. The important observation was that in spite of the wide distribution, the concentration of these organochlorine pesticides in the tissues of the species studied was within limits allowed.

Heavy metals in fish and shellfish

Monitoring for the presence of heavy metals (Cadmium, Cobalt, Copper, Lead, Manganese, Nickel and Zinc) has shown that these metals, excluding Lead, were present in varying amounts, but below toxic levels in the samples analyzed. Lead was not detected in any of the samples.

Antibiotic residues

Prawn and fish samples from different areas were analyzed to determine the levels of antibiotic residues. A total of 48 samples were analyzed and residues of Chloramphenicol and Nitrofurans were not detected in any of these samples.

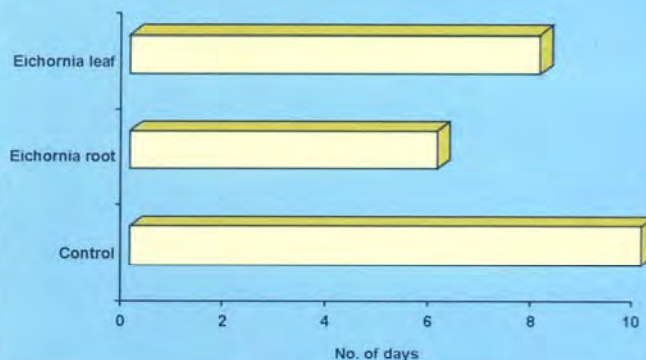
Functional properties of proteins

Studies on functional properties like solubility, water holding capacity, emulsion forming, viscosity and gelation of proteins have shown that there are significant variations, depending on the habitat of the fish.

Lipids from deep sea fish

Twenty three samples of deep sea fish collected during the course of FORV Sagar Sampada were analyzed for proximate composition and lipid profile. Preliminary data showed that there was no significant deviations in the proximate composition, except that lipid content of three species were high (17-26%). It was also observed that liver oils of three species had high unsaponifiable matter.

Wound Healing properties of *Eichornia*



Engineering Division





Research projects handled

- ❖ Design and development of eco-friendly fish dryers and indigenous electronic instruments for the Indian fisheries
- ❖ Development of add-on protruding bows for small fishing vessels to reduce fuel consumption

Chief findings

- * The following equipment/instruments were designed and developed:
 - Eco-friendly Tunnel Fish Dryer with solar collector and drying chamber.
 - Forced Circulation Dryer with P.V. Cells
 - PVC Tent Dryer
 - Quantum Radiometer
 - LCB detector for metal cans
 - Digital moisture indicator for dry fishery products.
 - PUF insulated FRP ice boxes (750 L and 100 L) for NEH region.
 - Modified Navigational Light Control System
 - Two channel and Five channel electronic thermometers.
 - Two fishing vessel designs in FRP for the traditional and unique lift-net operation in Lok-tak area of Manipur, and fabricated 20 boats of each design.
 - Mechanised FRP fishing vessels for fishing in fast flowing rivers.
 - FRP fishing vessel for reservoir fishing.
 - Hygienic fish cutting table and vending system
 - Hygienic fish sorting table
- * In order to develop protruding bows for reducing fuel consumption characteristics of existing fishing fleet of the country, hull shapes and operational parameters of five vessels from the west coast was collected and analysed. Models of the 15 m and 18 m vessels were prepared for model studies.
- * Fish meat-bone separator was designed and a prototype was fabricated.

Report of work done

Design and development of eco-friendly fish dryers

Eco-friendly tunnel fish dryer: A Solar Tunnel Dryer having an efficient heat absorbing and utilization system was designed and developed. Special quality toughened glasses are used in the system to enhance the absorptivity





Shri Mohankumar, IAS, Chairman, MPEDA, Cochin inspecting the eco-friendly tunnel fish dryer



Forced circulation dryer under demonstration at Midnapur

and PVC netting. Several trials were carried out for hygienic drying of fish and good results were obtained. The dryer was taken for demonstration at Midnapur and Junput (West Bengal) and had evinced lot of interest among fisheries officials

of solar radiation and to reduce the emissivity. The solar heating system is well insulated to prevent loss of thermal energy. Continuous flow of hot air is maintained by a forced circulation system with the help of photo voltaic cells to enable faster drying rate. Perforated plastic trays are introduced in the drying tunnel to get uniform drying. Training programmes were conducted among fisherwomen, through Corporation of Cochin to popularise the use of the dryer. Demonstration of the dryer was also carried out at Dimapur, Nagaland during the Agri-Expo 2006 in the presence of Union Ministers, State Ministers of North-East region, fisheries officials, ICAR dignitaries and several other visitors. All appreciated the performance of the Solar Tunnel Dryer.

Forced circulation dryer: Designed and developed a forced circulation fish dryer with U.V. resistant plastic covering. This fish dryer is made of special quality plywood, which can withstand adverse climatic conditions. Provision has been given to heat the air in a heat collector and the hot air is passed through a chamber with a forced air circulation system. A P.V. panel is provided in the system so as to regulate the flow of air in accordance with the intensity of solar radiation obtained during the drying process. Fish can be kept for drying in trays made of wooden frames

PVC tent dryer: A PVC tent dryer consisting of U.V. resistant, transparent plastic sheet covered on a triangular frame was designed and developed. The dryer is simple in construction and can be constructed using M.S. rectangular tubes. Airflow due to natural convection is from bottom to the top and escapes through vent pipes. Bottom of the tunnel dryer is provided with specially designed coal tar tanks so as to absorb more solar radiation and to retain and dissipate heat after sunshine hours. The dryer was tested for field level experiments by drying fish. The



Fish drying in PVC tent dryer





performance of the dryer was compared with sun drying. The dryer was evaluated for finding the performance in actual loaded conditions with fish hanging in stainless steel rods. Several drying trials were conducted satisfactorily.

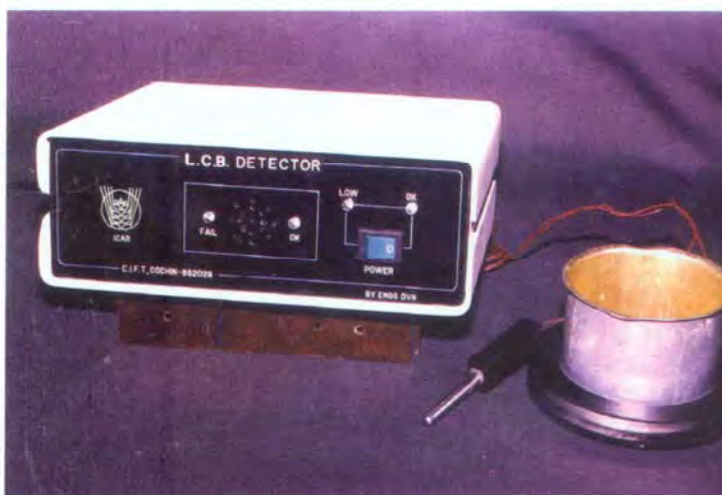
Development of indigenous electronic instruments

Quantum Radiometer: A Quantum Radiometer for measuring the total radiation in the solar spectrum was designed and developed. The instrument was tested, calibrated and its performance evaluated in the field condition in comparison with the Li-Cor imported meter.



Quantum Radiometer

LCB detector for metal cans: A sensor and electronic circuitry for finding the breaks in the lacquer coating in metal cans was designed and developed. The instrument makes an alarm and also shows an indication if the metal can is defective. Performance evaluation of the instrument was made with different types of metal cans. It is found that about 50% of the Aluminium cans having single side coating are defective whereas about 90% of TFS can with double side coating are found perfect.



LCB detector for metal cans

Modified engineering version of Navigation light control system with alarm facility for small fishing vessels: The instrument will display the status of the exterior lights on an interior mimic panel and sound alarm when there is any fault in the circuit and when the exterior lamp is faulty. Modifications were made in the electronic part of the instrument such as power regulator circuits, alarm circuits and display boards.

Digital moisture indicator: A digital moisture indicator for finding the moisture level of dry fish/food products was designed and developed. Sensor and electronics were tested and calibrated and the performance of the instrument with different dry fish/food products was studied.



Moisture meter

Five channel electronic thermometers: Two numbers of five channel electronic thermometer with Pt-100 sensors were developed. The instrument was calibrated in the range 0 to 100°C and was





developed for studying the temperature distribution pattern inside solar dryers developed in the Division. One unit was installed in the new generation eco-friendly fish dryer and the other unit in the solar fish dryer with LPG back up.

Two channel electronic thermometers: Two numbers of two channel electronic thermometer with Pt-100 sensors were developed for studying the temperature distribution pattern inside solar dryers developed in the Division. The instrument was calibrated in the range 0 to 100°C.

Development of add-on protruding bows for small fishing vessels

In order to develop protruding bows for reducing fuel consumption characteristics of existing fishing fleet of the country, a research study was initiated to establish the resistance profile of the fleet. Under the programme, hull shapes and operational parameters of five vessels from the west coast was collected and analysed. Models of the 15 m and 18 m vessels were prepared for model studies.



Fishing vessel for fast flowing rivers

Mechanized fishing vessel for fast flowing rivers

A fishing vessel was specially designed for mechanized fishing in fast flowing rivers. The size of the vessel is 8.35 m and fitted with 10 hp outboard motor. Three vessels of this design were fabricated in FRP for operation in the Assam stretch of Brahmaputra. Two of these vessels were handed over to Fishermen Co-operatives at Chandrapur and Palasbari in Assam for fishing operation and the third vessel is handed over to the Dept. of Fisheries, Assam for brooder collection. The FRP mould developed and fabricated and the design

was also handed over to the Fisheries Department.



Fabrication of FRP fishing vessel

FRP fishing vessels for reservoir fishing

FRP fishing vessel of size 4.6 m x 1.4 m x 0.33 m for reservoir fishing was designed, mould was developed and five vessels were fabricated for the state of Meghalaya. Four vessels and one mould were handed over to Dept. of Fisheries, Meghalaya, and one vessel and one mould were handed over to Dept. of Fisheries, Assam.

FRP fishing vessels for traditional fishing operation in Manipur

Two fishing vessel designs in FRP were developed for the traditional and unique lift-net operation in Lok-tak area of Manipur, infested with weeds and floating *bhumtis*. Twenty boats of each design were





fabricated and handed over to the Dept. of Fisheries, Manipur for distribution among fishermen.

750 L PUF insulated FRP iceboxes for Assam

750 L PUF insulated FRP iceboxes was developed for preservation and long distance transport of fish in Assam. Twenty five iceboxes were fabricated and handed over to the Dept. of Fisheries, Assam for distribution among fishermen and traders.

100 L PUF insulated FRP iceboxes for NEH region

100 L PUF insulated FRP iceboxes were developed for preservation and transport of fish for the internal markets of NEH region. Thirty boxes were fabricated for Dept. of Fisheries, Assam and 15 boxes were fabricated for Dept. of Fisheries, Manipur.



Dr. S. Ayyappan, DDG (Fy) inspecting the fish meat-bone separator

Fish meat-bone separator

A fish meat-bone separator was designed and the prototype fabricated. The meat yield of the machine was about 60%. The machine is highly inexpensive compared to imported ones. The machine was installed at National Agriculture Science Centre, New Delhi and the operation was demonstrated to DG, ICAR, DDG (Fy), ICAR and Directors of all the fisheries research Institutes under ICAR.



Fish cutting table

Hygienic fish cutting table and vending system

A hygienic fish cutting table with provision for chopping board, splash guard, washing, waste collecting and drainage facilities was designed and developed.

A hygienic fish vending system suitable for modern fish markets consisting of food grade stainless steel trough, removable perforated trays, fish storage facility, ice storage facility, weighing system, lockable cash draw etc., was designed and developed.

Hygienic fish sorting table

A hygienic stainless steel sorting table to separate prawns, small fishes, aquatic weeds etc., of the stake net catch with washing facility was designed and developed.



Fish sorting table



Extension, Information and Statistics Division





Research projects handled

- ❖ Study on the adoption of hygienic and disease preventive practices in small scale fisheries
- ❖ Action research on community based coastal zone management with specific involvement of women
- ❖ Statistical and econometric evaluation of production and marketing of seafood products
- ❖ Impact of fuel cost on the economic viability of the fishing industry in India

Chief findings

- * The average awareness index among the fish pre-processors was quite high (98%) and the respondents were well aware about the 15 hygienic practices to be used in the prawn peeling units.
- * Out of the 15 improved practices measured among the fish pre-processors, practices such as the availability of drainage facilities, use of fly proof netting for doors, facilities for feet and hand washing, clean place for peeling, use of adequate potable water for washing, use of adequate quantity of soaps and detergents, use of recommended cleaning schedule, adequate lighting and ventilation, prompt system of waste disposal, toilet facilities and use of clean utensils for handling shrimps were adopted by most of the respondents.
- * The mean score of adoption index was about 81% among the small scale pre-processors, and among the factory controlled units, the mean adoption index was 100%.
- * On an average, each peeling unit had employed seven male workers and about 54 female workers. The mean investment in a small peeling unit was Rs. 1.45 lakhs.
- * The peeling units had handled about 220 tonnes of fresh shrimps per year per plant for an average of 253 days of operation.
- * The constraints in adoption of hygienic practices among the small scale units were found to be non-availability of skilled workers, increased electricity charges, seasonal nature of the activity, more investment, less profit, etc.
- * Among the aqua farmers studied in four districts of Kerala, the extent of adoption scores were higher for the following practices: (i) preparation of ponds (94%), (ii) eradication of predators/weeds (80.8%), (iii) use of organic manures and fertilizers (61.6%), (iv) use of PCR tested seeds (78.1%), and (v) use of recommended feeding schedule (71.2%).
- * Partial adoption could be seen in three practices such as the use of recommended stocking rate, water exchange and quality monitoring, and harvesting after prescribed days of culture.





- * Non adoption was more in two practices such as the use of aerators and use of probiotics.
- * Most of the aqua farms were less than two hectares in size (68.5%) and 72.6% of the respondents had availed consultancy services at the farm level.
- * Eighty eight percentage of the aqua farms in Kerala had reported the occurrence of virus diseases in their farms at least once during the last three years and the yield varied from 600 to 1600 kg/hectare in most of the farms depending upon the species cultured.
- * Increased cost of culture, risk due to mortality, water pollution and non-availability of quality seeds were reported as major constraints for aqua farming.
- * Average age of the fish marketing personnel was found to be 48 years with an average experience of 23 years in fish marketing and mean annual income of Rs.40,604/-.
- * Infrastructural facilities such as potable water, waste disposal facilities, and approach roads were available in all the ten markets studied and in five fish markets, the drainage channels, cemented floor and clean ground conditions were not available.
- * Mean awareness index was 98.28 and hence, most of the fish marketing personnel were aware about the hygienic practices to be used in the fish markets.
- * Most of the fish marketing personnel had adopted the hygienic practices such as: (i) use of clean containers or polythene sheets for keeping fish (87%), (ii) use of adequate water for washing (95%), (iii) sorting of fish in a clean place (87%), (iv) use of prompt methods of waste disposal (60%), (v) use of adequate ice (100%), and (vi) maintaining personal cleanliness and hygienic handling (83%). The mean adoption index was calculated as 92.16% with a standard deviation of 7.97.
- * Among the fishermen respondents, 42% had own fishing units, 51% were shareholders and 7% were labourers. Average number of fishing days in a year was estimated to be 243 days.
- * The awareness index scores ranged from 65 to 100% for the ten practices measured in the study. The extent of adoption of hygienic practices varied from 44.44 to 83.33% among the fishermen operating in the fish landing centres.
- * Socio-economic problems, lack of transport facilities, water scarcity, distance from house, and lack of infrastructural facilities were found to be the constraints of fishermen in the adoption of hygienic practices.
- * The fuel utilized by the mechanized fishing industry in Andhra Pradesh in 2004 was estimated at 53052 KL at 70% fishing capacity utilization. The total cost of fuel worked out to be Rs. 144.25 crores out of the total operational cost of Rs. 188 crores.





- * Assuming the same level of fishing capacity as in 2004, the loss to the primary producer during 2005 was estimated at Rs. 20 crores taking into account the increase in fuel prices, which is very substantial and adversely affecting the viability of the fishing industry.
- * Large mechanized trawlers operating off the west coast have registered a revenue of Rs. 20 lakhs per annum against the operational expenditure of Rs. 17.18 lakhs, with an operational profit of 16.41%. This indicates that capital recovery will be attained in seven years at the present rate, compared to five years in 2001.
- * The fisheries policies, including the fuel subsidy rates, adopted by the various maritime states have been compiled for a comparative evaluation of the same, and it has been observed that the policies significantly differ among different states.
- * Export-import scenario of the Indian seafood products during 2004-05 was studied in detail and it was observed that a total of 6437 MT of seafood valued at Rs. 63.76 crores was imported during 2004-05. The major component of seafood import was hilsa in fresh and chilled condition, the quantity being 2884 MT, valued at Rs. 29.23 crores. Other seafood imports included frozen squid, cuttlefish, lobsters etc. The quantity of seafood imported is meager compared to our exports of 4.61 lakh MT valued at Rs. 6646.69 crores and the unit value of import was Rs. 99/kg, against export unit value of Rs. 144.08/kg, thus registering a positive balance of trade.
- * Time series analysis of prices of squid and cuttlefish exported from India to EU was carried out and the seasonal variation has been found to be significant with demand being high during festival seasons especially during December-January.

Report of work done

Hygienic fish handling practices in fish pre-processing centres

During the period, data were collected from 20 pre-processing units in Alappuzha district. The data collected so far from 46 pre-processing units were tabulated. The results revealed that the average age of respondents was 49 years and they had 17 years of experience in prawn peeling. On an average, each peeling unit had employed 6-8 male workers and about 54 female workers. The mean investment in a peeling unit was Rs. 1.45 lakhs among small scale units and the investment in factory controlled units varied from Rs. 4 lakhs to Rs. 6 lakhs. These peeling units had handled about 220 tonnes of fresh shrimps per year per plant for an average of 253 days of operation. The average training need index score among the pre-processors was 57.3%.

The average awareness index among the fish pre-processors was quite high (98%) and the respondents were well aware about the 15 hygienic practices to be used in the prawn peeling units. Of the 15 improved practices measured among the fish pre-processors, practices such as the availability of drainage facilities (86.95%), facilities for feet and hand washing (91.30%), clean place for peeling (80.43%), use of adequate potable water for washing (95.65%), use





of adequate quantity of soaps and detergents (71.74%), use of chlorinated water for washing (71.74%), use of recommended cleaning schedule (65.22%), adequate lighting and ventilation (93.48%), prompt system of waste disposal (56.52%), toilet facilities (93.47%) and use of clean utensils for handling shrimps (89.13%) were adopted by most of the respondents.

The adoption index mean score was about 81% among the small scale pre-processors and among the factory controlled units, the mean adoption index was 100%. The constraints in adoption of hygienic practices among the small scale units were found to be non-availability of skilled workers, increased electricity charges, seasonal nature of the activity, more investment, less profit etc.

Hygienic and disease preventive practices by aqua farmers

Data were collected from 25 aqua farmers from Ernakulam, Alappuzha, Trichur and Kannur districts in Kerala. Including the earlier data, the data collected from 73 aqua farmers were tabulated. The results revealed that the aqua farmers had an average experience of 12 years and 72.6% of the



Data collection from aqua farmers

respondents had availed expert services at the farm level. Most of the aqua farms were less than two hectares in size (68.5%). The source of water supply for all the respondents were found to be either backwater or river canals near their farms.

The extent of adoption was measured for ten improved practices and the adoption scores were higher for the following practices: (i) preparation of ponds (94%), (ii) eradication of predators/weeds (80.8%), (iii) use of organic manures and fertilizers (61.6%), (iv) use of PCR tested seeds (78.1%), and (v) use of recommended feeding schedule (71.2%). Partial adoption was seen in three practices such as use of

recommended stocking rate, water exchange and quality monitoring, and harvesting after prescribed days of culture (pre-mature harvesting due to viral attack after 60 days). Non-adoption was more in two practices such as the use of aerators and use of probiotics.

About 88% of the aqua farmers in Kerala region had reported the occurrence of virus diseases in their farms at least once during the last three years and the yield varied from 600 to 1600 kg per hectare in most of the farms depending upon the species cultured (*Penaeus indicus*/*P. monodon*) due to the use of traditional prawn farming techniques. This could be compared with the extent of adoption in Tanjore region of Tamil Nadu where 85% of the recommended practices were adopted by the aqua culturists and the yield of shrimp (*P. monodon*) harvested varied from 1.5 to 3.5 tonnes per hectare. Most of the respondents in Kerala had perceived the sources of virus infection as seeds/feeds/water and the stage of disease occurrence was found to be between 40-80 days. Further, the aqua farmers had reported increased cost of culture, risk due to mortality, water pollution and non-availability of quality seeds as major constraints.





Hygienic fish handling practices in fish markets

Data were collected from 25 fish marketing personnel. The average age of the respondents was found to be 48 years with an average experience of 23 years in fish marketing. The main season for heavy landings of fish was reported from September to October every year and the off-season was found to be during June to August, though the respondents had fish sale on all days throughout the year. The average annual income of fish marketing personnel was Rs. 40,604/-. The types of fishes sold during the main season were seer fish, sardine, shark, snapper, mackerel, catfish, rays, sea breams, shrimp, anchovies, tuna, caranx, pomfret, river fishes etc.

Availability of infrastructural facilities such as cemented floor, clean water, drainage channels, waste disposal facility, clean ground condition and approach roads were evaluated in ten fish markets.

Infrastructural facilities such as potable water, waste disposal facilities (though in backwater canals) and approach roads were available in all the ten markets and in five fish markets, the drainage channels, cemented floor and clean ground conditions were not available.

The results revealed that the mean awareness index was 98.28 and most of the fish marketing personnel were aware about the hygienic practices to be used in the fish markets. The results also revealed that most of the fish marketing personnel had adopted the hygienic fish handling practices such as: (i) usage of clean containers or polythene sheets for keeping fish (87%), (ii) usage of adequate water for washing (95%), (iii) sorting of fish done hygienically in a clean place (87%), (iv) usage of prompt methods of waste disposal (60%), (v) usage of adequate ice (100%), and (vi) maintaining personal cleanliness and hygienic handling (83%). The mean adoption index was calculated as 92.16% with a standard deviation of 7.97. The constraints in adoption were found to be the lack of infrastructural facilities such as the lack of space, free supply of potable water, proper waste disposal and government/locals bodies support.

Hygienic practices in the fish landing centres

During the period, data were collected from 40 fishermen in eight fish landing centres. The data collected so far from 70 respondents were tabulated. Out of the total, 42% had own fishing units, 51% were share holders and 7% were labourers. Average number of fishing days in a year was found to be 243 days. The average training need index score was found to be low (28.5%).



Data collection from marketing personnel



A comparatively hygienic fish market





A fish landing centre at the peak hour

The awareness index scores ranged from 65 to 100% for the ten practices measured in the study. The extent of adoption varied from 44.44 to 83.33%. The extent of adoption of six hygienic practices were: (i) use of adequate water for washing fish (85.7%), (ii) maintaining personal cleanliness in the landing centre (75.7%), (iii) prompt system of waste disposal in the landing centre (82%), (iv) use of adequate ice onboard the craft (41.4%), (v) sorting of the catch in a clean place (77.1%), and (vi) use of clean containers for fish handling (98.5%).

The average impact perception index was 55.3% among the fishermen respondents. Socio-economic conditions of fisher folk, inadequate infrastructural facilities, distance of fish landing centres, lack of transport facilities, and cost of the innovative practices were found to be the major constraints for adoption of hygienic practices.

Community based coastal zone management with specific involvement of women

Preliminary investigations revealed that the degradation of coastal zone occurred due to human interference such as housing and other developmental activities, and also due to natural calamities such as cyclone and sea erosion. Further, poor socio-economic conditions among villagers, use of traditional production technologies and lack of environmental awareness necessitated the intervention of the appropriate programme for desirable changes over a period of time. Coastal zone management interventions including educational and awareness programmes, and development of community based coastal zone management model could be successfully carried out in the selected locality.

Activities involving women and children in coastal zone management



Shri Mohankumar, Chairman, MPEDA inaugurates the childrens camp

Children's camp: The main thrust of the project was developing an action plan for coastal zone management with specific involvement of women and children. With this objective, four summer camps were conducted for 60 school children, from 1st April to 25th May 2005 at Chellanam. The objectives of the camps were to sensitize children on the issues concerning coastal zone protection and make them aware of their role in the management of natural resources. The camp provided work experience to the children by exposing them to various aspects relating to coastal zone management.



The training session during the camp consisted of lectures, demonstrations, field visits and group discussions.

One hour theory class followed by the interactive session on the subjects like Importance of mangroves, Mesh size of fishing nets, Preparation of mushroom bed, Importance of local fauna and flora and Indigenous Technical Knowledge were conducted.

Based on the principle of learning by doing, demonstrations on Mushroom bed preparation, Paper bag making, Preparation of herbarium of locally available economically important plants, Testing of PH of water and soil, Testing of water samples, Fish silage preparation, Setting of vermicompost, Fish cutlet preparation, and Square mesh making (fishing net) were arranged.

Field visits are the most effective method of sensitizing people to the natural situations. In connection with Children's camp, field visits were arranged to give exposure to the listed aspects of Coastal Zone Management such as Mangrove nursery, Local fauna and flora, Sea erosion, Coastal pollution, Paddy cum shrimp farming and Water and soil pollution.

The field visits provided opportunity to the children to identify the natural resources including local fauna and flora, the causes of the pollution of water bodies as well as the soil, and the coping up strategies towards natural calamities besides exchanging their knowledge and interaction with local people. The group was divided into two sub groups with one group leader for monitoring the field trip. The group members visited the identified places, made observations, met the local people and interviewed them, collected information and recorded in a specially developed activity sheet.

Group discussion is the effective method of exchange of ideas within a limited time. In order to express the viewpoints of the participants, four group discussions were arranged on the topics like Relevance of paddy culture, Advantages and disadvantages of paddy cum shrimp farming, Need of the protection of natural resources and Role of children in coastal zone management.

After the completion of the field visit and group discussion, each group prepared their report containing their comments, findings, suggestions and role of children etc. and presented the report for discussion and finalization. The project team consolidated and documented the findings and suggestions of the children.

Oral cancer screening camps: Oral cancer screening camps were organized jointly with Amritha Institute of Medical Sciences, at Chellanam panchayath during 15th, 22nd and 29th July, 2005.

The total number of persons who attended the camp were 492, out of which 221 were male, 195 female and 76 were children.

A majority of those who attended the camp (213 persons) were found to have dental problems like dental caries and periodontal disease. They were referred to



Doctors examining patients in cancer screening camp





Amritha Dental College for free treatment. A few patients with ulceration in the oral cavity and abscess were also seen. About 10 cases of oral pre-cancers, two new cases of oral cancer, and two cases of recurrences of oral cancer were identified in the camp. All were referred to Head and Neck Institute of AIMS for further confirmation by biopsy. Among them, only one patient diagnosed as tongue cancer in early stage, turned up and his biopsy result confirmed the malignant status of the oral lesion.

'Aayiram Kandal' (Thousand Mangroves): Chellanam panchayath is one of the coastal villages of Kerala that always bares the brunt of rough seas with sea erosion being a regular occurrence. The sea wall constructed 40 years ago has crumbled in many places thereby increasing the threat due to sea erosion. The CIFT joined hands with Chellanam panchayath in a unique initiative to guard the shores by planting 1000 mangrove saplings on the coastal stretch from Kandakadavu to South Chellanam. The programme was held on 17th



Community planting of mangroves

August 2005 on the occasion of the farmers day ('Chingam' 1st of the local calendar). The need for protecting the coastal zone from erosion emerged from the participatory rural appraisal programmes conducted on the theme of natural resource management. This is also of special significance as the recent Tsunami has increased the awareness about the role played by mangroves in protecting our shores from natural disasters. The post monsoon period was identified as the ideal time for planting the saplings as wave action was less during this period. Six areas in six wards were selected for mangrove planting. Local people suggested the areas where planting had to be taken up and they

were actively involved in organizing the programme with the help of the panchayath and CIFT. The 'Kudumbashree' (Self Help Groups) leaders voluntarily took charge of various groups and carried out the planting.

Women's camp: Four winter camps of Six days each were conducted for 60



Dr. S. Ayyappan, DDG (Fy) interacting with camp participants

coastal women, from 21st November to 17th December 2005. The objectives of the camps were to create awareness among the coastal women, the major stakeholders of coastal zone, and involve them in coastal zone management activities by providing them work experiences on the issues related to coastal zone management. The women's camp consisted of field visits, group discussions, demonstrations and training programmes. Initially, a detailed account of the coastal zone management was given and the major concepts in coastal zone management were explained. Field visits provided direct exposure to the current





situation. An important objective of the field visits was to give them a first hand experience regarding the problems related to their coastal zone. It also helped them in recording the natural resources besides exchanging their knowledge and interacting with local people in a structured way. Through discussions, the participants had identified and analyzed the current situation, their management, and implementation factors of successful scaling up, as well as specific weaknesses and opportunities for improvement. The outcomes of the visits were discussed in the final sessions of the camp. A training cum demonstration on responsible fishing methods and training on value added fisheries products from low cost fish were arranged in the camp.

Statistical and econometric evaluation of production and marketing of seafood products

Analysis of source and price of raw material: Preliminary analysis about the source and price of raw material at the first stage in the channel, i.e., the landing centre and pre-processing centre was done. The main varieties pre-processed include - Poovalan, Karikadi, Pullan, Deep sea and Naran of shrimp, cuttlefish, squid, octopus and red snapper. The source of supply was largely from local harbours and also from neighbouring states of Karnataka and Andhra Pradesh. The average unit price of raw material per kg was for Poovalan-Karikkadi mix Rs. 66/-, Pullan: Rs. 35/-, Squid: Rs. 51/- and Cuttle fish: Rs. 128/-.

Analysis of frozen shrimp exports from India: In 2005 it was observed that there is a good demand for Kolkatta black tiger in Osaka market and it is being preferred over Vietnam black tiger. Demand was also high during new year and festival seasons like Sakura and O'bon. For the processors in Japan peeled Black Tiger shrimp was preferred for making value added products like battered and breaded products in accordance with changing life styles of Japanese, especially in the urban area. Presently, only 4.2% of shrimp exports are in the value added IQF form.

Comparative price analysis of Indian shrimp with shrimp from other countries imported into the US market: An analysis of the prices realized by Headless Black Tiger shrimp and PD shrimp exported by India, Indonesia, Thailand, Vietnam and Bangladesh were compared for the popular grades Un/15, 16/20, 21/25 and 26/30. It was found that Indian shrimp exports of Headless Black Tiger shrimp realized more or less same price as that of Bangladesh. In comparison with Indonesia, Thailand and Vietnam, the prices realized by Indian exports were lesser. The PD shrimp is exported from India in tail-on and tail-off form. The major competing countries for PD shrimp exports to USA are Vietnam and Thailand.

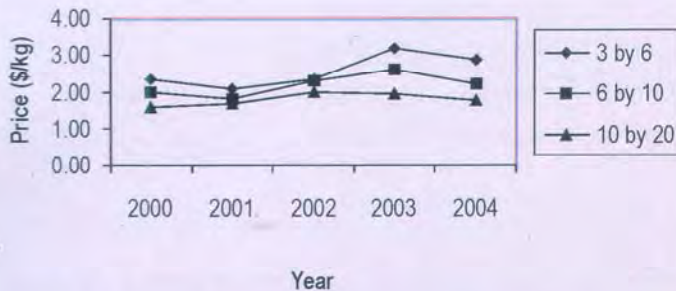
Analysis of Indian seafood exports to EU countries: European Union has emerged as the largest market for Indian marine products in 2004-05, its share having increased to 25.52% in quantity and 27.37% in terms of value. The product mix from India to EU includes squid, cuttle fish, octopus, crab, shrimp, scampi, lobster, reef cod fillets and gutted, ghol gutted, snapper-whole, IQF, gutted and fillets, silver pomfret, baraccuda, rohu, sea braem, seer fish, shark steaks, tuna steaks, anchovy, croaker, dried Bombay Duck, King fish, Mackerel, Mullet, Parrot fish, Pearl spot, Ribbon fish, baigai and clam. The products are in frozen form (block or IQF). The main shrimp products include PUD, HL, Blanched PUD, Blanched and Peeled Shrimp (IQF), PUD Cooked Shrimp, PUD





cut, cooked PUD, Peeled and cooked shrimp (IQF), Deveined cooked PUD shrimp (IQF), HO Shell-on BT etc. Squid products included whole Squid, Whole Cleaned Squid Rings (IQF), Squid Whole, Squid Tentacles (IQF), Cleaned Squid 10% and

Average price realised by whole squid export to EU



20% Glaze, Whole Squid (IQF), Squid tentacles Blanched, Squid Rings Blanched, Cooked Squid Rings etc. The average unit price realized by squid exported to EU was US \$ 2.05 per kg. CF is exported to Belgium, Cyprus, France, Germany, Greece, Italy, Netherlands, Portugal and Spain. The consumer preference is for medium sized CF in EU and the raw material size for this falls in the range of 250 gms. The average value realization for CF products (grouped) was US \$ 2.82. The average price realized by whole squid grades 3/6, 6/10 and 10/20 are presented in the graph.

Revenue loss of the primary producer in Kerala and Andhra Pradesh: The revenue loss of the primary producer was assessed *vis-à-vis* the price escalation in fuel. This was based on the assumption that the effort remains unchanged. The annual average consumption in Andhra Pradesh was 70677 KL in 2003-04. The price escalation for fuel has been 30% during 2004-05 over 2003-04 resulting in a net loss of Rs. 55.20 crores to the primary producer. The annual fuel utilized in Kerala was 97204 KL in 2002-03 and with a price escalation of 36% the expenditure increase on fuel has been Rs. 75.92 crores.

Analysis and documentation of the existing fisheries policies on fuel and other subsidies in Tamil Nadu: Tamil Nadu Fisheries Development Corporation operates 23 diesel outlets in the Fishing Harbours and jetties like Chennai, Mallipattinam, Thoothukudi, Pazhayar, etc., for the benefit of mechanised fishing boat operators and fishermen. During 2004-2005, a total quantity of 18,525 KL (upto December 2004) of diesel and oil was sold and earned a commission of Rs. 78.18 lakhs. Subsidy has been raised from Rs. 10,000 to Rs. 20,000 for motorization of traditional crafts for purchase of outboard motors. This scheme will be continued during the Annual Plan 2005-2006. Excise duty paid as subsidy towards the purchase of High Speed Diesel (HSD oil) is reimbursed to mechanised fishing boat operators. As per the present norms, the State Government offers a sum of Rs. 0.30 per litre and the Central Government offers a sum of Rs. 1.20 per litre and a total sum of Rs.1.50 per litre towards diesel subsidy is paid to the fishermen. During 2004-2005, the Government have sanctioned a sum of Rs. 457.80 lakhs for implementation of the scheme including the State share of Rs. 91.56 lakhs. Nearly 5000 families were benefited. This scheme will be continued during 2005-06 availing the assistance from Government of India. A 100% exemption of payment of Sales Tax for the purchase of HSD oil by fishermen to be used for fishing activities is provided. Accordingly, the price paid by fishermen for diesel is reduced by Rs. 5.33 for every litre of diesel purchased by fishermen for operation of mechanized boats and motorized traditional crafts.



VISAKHAPATNAM RESEARCH CENTRE





Research projects handled

- ❖ Development studies on responsible trawl systems
- ❖ Studies on environment-friendly, high yielding semi-pelagic trawl for exploitation of fishery resources of east coast of India
- ❖ Optimization and upgradation of traditional fishing systems for inland and marine sectors
- ❖ Technological studies on processing of freshwater and marine fish and shell fishes of east coast with special emphasis on product development and quality standards
- ❖ Genomic investigations on aquatic and fish microorganisms and development of molecular diagnostic methods for pathogens
- ❖ National risk assessment programme for fish and fish products for domestic and international markets
- ❖ Extraction of carotenoprotein and protein isolate from shrimp process waste: Development of an easy method and its scale up

Chief findings

- * The codend mesh sizes for commercially important fin fish for adult retention and juvenile escapement was optimized.
- * The parameters to exploit the semi-pelagic fishery resources were standardized.
- * Nutritionally rich, edible fish powder was developed from small sized fresh water major carps without de-boning the fish.
- * The results of the study on the quality of post-Tsunami seafood off the coast of Visakhapatnam, Andhra Pradesh, suggest that there was no major deviation in the seafood quality during the post-Tsunami period.

Report of work done

Responsible trawl systems

Experimental fishing operations were conducted with demersal trawl for whole trawl gear selectivity and codend selectivity. Square mesh codends of 30 mm, 35 mm, 40 mm and 50 mm were evaluated. Morphometric data of fish in cover and square mesh codend were collected and retention percentage and escapement of fishes from square mesh codends analysed. Almost fifty percent (45.8%) of catch had escaped from the codend when the experimental trawl was attached with 50 mm square mesh codend while 54.18% of the catches was seen retained. A good percentage (72.34%) of catch was retained by the 30 mm square mesh codend with only 13.82% fishes escaping. *Upeneus vittatus* species in the size range 80-100 mm were seen escaping from 30 mm square mesh codend while fishes in the size range 100-130 mm were retained. *Lepturacanthus savala* of 210-260 mm was observed to escape through the 50 mm square meshes while fishes of size 470-580 mm were retained. Regression analysis was done for *L. savala*, *Trichiurus lepturus*, *Nibea maculata*, *Otolithes*





cuveiri, *U. vittatus*, *U. sulphureus*, *Stolephorus indicus*, *S. commersonii*, *Sphyraena jello*, *Nemipterus japonicus*, *Rastrelliger kanagurta*, *Saurida tumbil*, *Megalaspis cordyla*, *Dussumieria acuta*, *Leognathus dussumieri*, *L. bindus*, *Gazza minuta*, *Secutor insidiator* and *Apogon* spp. The data were analysed and the trawl selectivity curves and selectivity factors for the commercially important fishes obtained.

Semi-pelagic trawl studies

Two designs of semi-pelagic trawls with head rope length of 27 m and 30 m were field tested at various depths and the parameters suitable for semi-pelagic trawling standardized for the above two designs. The CPUE pertaining to 27 m semi-pelagic trawl was recorded as 36 kg/hr. The CPUE yielded by 30 m semi-pelagic trawl was 38 kg/hr. The catches were mainly dominated by ribbon fishes (30%) comprising of only two species namely *Lepturacanthus savala* and *Trichiurus lepturus*. Upenoids were the second dominant group (20%). The upenoid catches mainly comprised of *Upeneus vittatus* and *U. sulphureus*. The other dominant groups were scaienids (10%) comprising of *Nibea maculate* and *Otolithes cuveiri* and mackerel (*Rastrelliger kanagurta*) (8%). There were sizeable catches of silver bellies (20%) and anchovies (5%) dominated by *Stolephorus indicus* and *S. commersonii*. Database for the semi-pelagic trawl resources of Visakhapatnam coast was prepared. Comparative studies of the catches and operational parameters of semi-pelagic trawls with demersal trawls were also carried out. The studies revealed that the amount of non-target species landed by semi-pelagic trawls was much less than that of demersal trawls.

Upgradation of traditional fishing systems

Comprehensive studies on artisanal fishing methods and resources prevailing were carried out at Pedajalaripeta, Kothajalaripeta, Muvvalavanipalem and in and around Bheemlipatnam. During the period under report, fishermen mainly operated troll lines targeting tunas and sailfishes. Polyamide multifilament gill nets of twine size 210 D x 1 x 2 and mesh sizes ranging from 20 to 30 mm were used to catch sardines, anchovies, lesser sardines and ribbon fishes. The nets were of two categories in terms of overall dimensions. The first group had an average length of 360 m and depth of 10 m, with a mesh size of 30 mm to catch ribbon fishes and seer fishes. The second group was smaller with an average length of 25 m, depth 3 m and mesh size 20 mm. Nylon (210/1/2) gill nets targeting mainly sardines and anchovies with a mesh size of 10-15 mm were also used. Monofilament gill nets with mesh size of 50 to 60 mm targeted to catch mackerels, were also operated.

Operations were carried out with Polyamide multi-filament trammel nets with inner layer of 20 mm mesh size and two outer layers of 100 mm mesh size. White prawns, scaienids, silver bellies, upenoids and crabs dominated the catches.

Two types of vertical troll lines were operated, one targeted to catch seer fish and the other targeted tuna. The unit used for seer fish was attached with No.9 mustad hook. Anchovies and sardines were used as baits. The second unit for tuna was attached with No. 4 mustad hook with small mackerels as bait.

Development of value added products from marine and fresh water fish

Edible fish powder was prepared from the locally abundant small sized





fresh water fish, Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*), Catla (*Catla catla*), Common carp (*Cyprinus carpio*), small marine prawn (*Acetes indicus*) and medium sized Ribbon fish (*Lepturacanthus savala*) without deboning the fish.

Storage studies of the edible fish powder prepared from Rohu, Mrigal and small marine prawn were completed. The products stored at room temperature were acceptable upto four months, three months and three months respectively.

The yield of edible fish powder prepared from different fishes varied between 10 to 12% with respect to whole fresh fish. The chemical composition of freshly prepared edible fish powder from Mrigal was as follows:

Moisture	-	2.16%
Protein	-	72.62%
TVN	-	20.52 mg/100 gm
Fat	-	4.75%
Phosphorus	-	1933.59 mg/100 gm
Calcium	-	213 mg/100 gm
Sodium	-	354 mg/100 gm
Potassium	-	02 mg/100 gm
Iron	-	5.25 mg/100 gm

Freshly prepared powder was free from *E. coli*, spoilage bacteria and Coagulase positive Staphylococci. The fresh powder had a water activity (a_w) of 0.259.

The chemical composition of freshly prepared edible fish powder from seasonal surplus of marine small prawn is given below:

Moisture	-	2.99%
Protein	-	70.04%
TVN	-	30.42 mg/100 gm
Fat	-	5.91%
Calcium	-	631 mg/100 gm
Phosphorus	-	1452.12 mg/100 gm
Sodium	-	945 mg/100 gm
Potassium	-	53 mg/100 gm
Iron	-	13.88 mg/100 gm

The fresh powder had a water activity (a_w) of 0.39.

Changes in biochemical and microbiological parameters were noted during storage of fish powder at room temperature and were found to be within acceptable limits. The edible fish powder was found to be rich in protein, Calcium and Phosphorus and can be used as a fortifying agent to improve the food value and taste of different food items while cooking.





Fungi in salted and dried fish

A dip in 0.2% Potassium sorbate for 2 hrs prior to sun drying could control fungal growth in salted and dried goat fish even after storage for four months at ambient temperature, while visible fungal colonies appeared in treated (1 hr, 0.2% K-sorbate) and untreated samples within a period of two months of storage. Aeromycological studies showed that common contaminants were *Aspergillus flavus*, *Fusarium* sp. and *Polypaecilum pisce* during October to December. Loss of residual sorbate and increase of total volatile base Nitrogen content in fish muscle were noticed during the above storage.

Histamine in fish

During brining of mackerel (40-50 gm each), in the process of preparation of salted and pressed product, the Histamine content in muscle increased from 5 mg% to 13.1 mg% in three days in saturated brine followed by a decreasing trend during the remaining part of brining up to six days. The Histamine forming bacteria count in muscle became nil within 72 hrs. The presence of Histamine forming bacteria was monitored during the storage of salted and pressed mackerel at ambient temperature. The samples treated in 0.1 or 0.2% Propionic acid had longer shelf life with lesser Histamine content.

Protein extract from crab shell waste

Commercial papain at the level 0.2% could extract protein up to 75%. The standardization of the process parameters in extraction of protein from small crab waste is in progress.

Fish gel from fresh water fish meat

Biochemical composition and gel formation capacity of fresh meat of all major and exotic carps were studied in detail. Gel strength (1 cm thick disc) of mrigal (*C. mrigal*) meat was highest, i.e. 450 gcm and above. The darkest band of myosin was noticed in the PAGE pattern of salt soluble extract of mrigal meat. During frozen storage (-18°C) of degutted mrigal (*C. mrigal*) and common carp (*C. carpio*), the gel strength decreased slowly in six months and then remained almost same during the remaining part of storage up to one year. Fading of protein bands in PAGE of fish protein was noticed during frozen storage. The changes in hypoxanthin content, salt extractables, Nitrogen content and TVBN content were monitored during the storage.



A good catch of crabs

Pathogenic and toxigenic bacteria in fish, fishery products and fishery environments

Post-Tsunami quality of marine fish and shrimp procured from Visakhapatnam fisheries harbour was analyzed. Forty post-Tsunami seafood samples comprising of 28 species of marine fish, four species of shrimp and one species of squid were procured from the Visakhapatnam fisheries harbour at regular intervals after the Tsunami of 26th December 2004 and analyzed for microbiological and chemical quality. The quality of post-Tsunami seafood *vis-a-vis* spoilage as indicated by the levels of total plate count (TPC), H₂S producing





bacteria, total volatile base Nitrogen (TVBN) and peroxide value (PV) was good. The quality of post-Tsunami seafood *vis-a-vis* faecal indicator bacteria was similar to the pre-Tsunami quality, both having levels higher than the maximum permissible limit. Coagulase positive *Staphylococci* were detected in post-Tsunami and pre-Tsunami seafood. Only 2.5% of post-Tsunami seafood samples had TPC levels above the permissible limit and all post-Tsunami seafood samples had acceptable levels of TVBN and PV. Human pathogens namely *Salmonella* and *Vibrio cholerae* were absent in all the post-Tsunami seafood samples. The results suggest that there are no major deviation in the seafood quality during the post-Tsunami period.

Surveillance of crustaceans for shrimp viruses and Vibrios

Eleven samples of post larvae (PL) from *Penaeus monodon* hatcheries and seven samples of *P. monodon* procured from culture farms were tested for the presence of White Spot Syndrome Virus using nested PCR. Two out of eleven PL were positive for the presence of WSSV: both in the first and second step of nested PCR.

Five samples each of water, sediment and *P. monodon* from aquaculture farms were analysed for total Vibrio load. Shrimp head portion had relatively higher counts of Vibrios (3.5×10^4 cfu/g) than shrimp muscle portion (1.4×10^4 cfu/g). Halophilic Vibrios were higher in shrimp head (2.1×10^3 cfu/g) than shrimp muscle (1.2×10^3 cfu/g). Pond waters (150 cfu/ml) had relatively lesser loads of Vibrios than hatchery waters (2400 cfu/ml). Halophilic Vibrios were not detected in pond waters. Sucrose non-fermenting Vibrios were higher in shrimp head portion (59%) while more than 90% of the Vibrios in pond water, pond sediment and shrimp muscle portions were sucrose fermenters. In the case of halophilic Vibrios, sucrose non-fermenting Vibrio loads were very less. Eleven percent of Vibrios from shrimp head portion were non-sucrose fermenting halophilic Vibrios.

National risk assessment programme for fish and fish products for domestic and international markets

Studies were carried out to assess the microbial risks associated with fresh water fishes, fresh water prawn and brackish water shrimp produced in Andhra Pradesh. A total of 43 samples comprising of 19 *Labeo rohita*, 10 *Catla catla*, seven *Macrobrachium rosenbergii*, six *Penaeus monodon* and one *P. indicus* were analyzed. Fresh water prawn had relatively higher Total Bacterial loads and *E. coli* counts. *Vibrio cholerae* and *Salmonella* were not detected in any of the samples. The antibiotic resistance pattern of 166 *E. coli* isolates obtained from *Labeo rohita*, *C. catla*, *M. rosenbergii* and *P. monodon* samples was also studied.

Carotenoprotein from shrimp waste

In order to improve the recovery of carotenoprotein from the head portion of shrimp, the optimum process conditions for each enzyme are being studied. The recovery of carotenoids from the head waste of culture tiger prawn and white prawn was 67.0% and 84% respectively during extraction of 2 hr. at 45°C by Pepsin, while the same was 55% and 77% respectively during the same period of extraction at ambient temperature (27-30°C). Similarly, Trypsin and Papain gave higher carotenoid yield at optimum temperature 45°C and 55°C respectively in comparison with the yield at ambient temperature. Further studies are in progress.



**VERAVAL
RESEARCH CENTRE**





Research projects handled

- ❖ Development and application of appropriate processing technologies for better utilization of marine and fresh water fishery resources of Gujarat
- ❖ National risk assessment programme for fish and fish products for domestic and international markets
- ❖ Development studies on responsible trawl systems
- ❖ Optimization and upgradation of traditional fishing systems for inland and marine sectors
- ❖ Investigations on the effect of bottom trawling on the benthic fauna of Saurashtra coast (Gujarat)
- ❖ Marine fisheries appraisal of Maharashtra
- ❖ Marine fisheries appraisal of Gujarat

Chief findings

- * In an analysis of more than 800 samples of Squid, Cuttlefish and Octopus for various heavy metals, about 2% of the samples were found to contain more than 1.0 ppm of Cadmium which is above the permissible limit. The main reason for Cadmium contamination is storage/transport/soaking in ink contaminated water.
- * In Saurashtra region of Gujarat, the problem of contamination of heavy metals was observed only in cephalopods particularly Squid/Cuttlefish tentacles and Octopus.
- * Comparatively higher levels of Histamine were observed in Skipjack Tuna from the region, as compared to Big eye, Yellow fin and Long tail tuna and Indian Mackerel.
- * *Listeria monocytogens*, a potential human pathogen was found to be absent in all the 300 samples of different fish and fishery products analyzed from Saurashtra region.
- * Frozen storage studies of *Octopus cyaneus*, processed and stored at -18°C , were carried out and organoleptic, chemical and bacteriological indices were found to be good even after six months.
- * Processing and quality parameters of some innovative byproducts prepared from gills, bones, vertebral column, skin and intestinal parts of big size fishes like Ghol, Koth, Sail fish etc. were standardized. Many of these products are processed commercially and marketed internally and exported.
- * Trails with 18 m semi-pelagic trawl fitted with 50 mm and 70 mm codend showed that semi-pelagic trawling is a highly efficient, low drag trawl system in comparison to the highly destructive bottom trawling.
- * Various diversity indices like Shannon-Wiener Index (H'), Margalef's Index (d), Pielou's Evenness Index (J') etc. were worked out for catches of bottom and semi-pelagic trawling systems and results show that the biodiversity impact of semi-pelagic trawling is very less compared to the bottom trawling.





- * Studies conducted at different landing centres of Saurashtra coast showed that HDPE is slowly replacing the PA gillnets along the entire stretch of Saurashtra.
- * Tuna gillnetting is becoming common during January till the end of May. Large mesh HDPE gillnets locally called 'Jadajal' with a mesh size that varies from 200-250 mm are employed. The depth of operation varies from 75-150 m and the catches are exclusively Tunas and bill fishes.
- * Initial findings of a study on the impact of bottom trawling on the benthic fauna of Saurashtra coast revealed increased macrobenthos population along the trawled corridor, indicating profound alterations in the distribution of benthic communities.
- * Preliminary estimations revealed that the quantum of bycatch generated by trawlers operating along the Saurashtra coast is in the range of 500-750 kg for multi-day fishing and 100-150 kg for single day fishing.
- * Initial studies on characterization of bycatch landed along Saurashtra coast showed that juveniles of high value species are seen more towards the beginning of the fishing season (September) and towards the fag end, the bycatch mostly comprised of low value fish and crab species.
- * Near real time fishing data was collected from Department fishing vessel, Sagar Kripa and also from private boats fishing in Potential Fishing Zones (PFZ). Satellite images derived from IRS-P4 OCM and AVHRR were validated with these data.
- * Preliminary results from the commercial trawlers showed improved catches from identified PFZ areas, when compared to non-PFZ areas. The results were found to be more consistent at depths of 100-200 m than to near shore areas of depths up to 50 m.

Report of work done

Processing technologies for better utilization of marine and fresh water fishery resources

Samples of cephalopods like *Octopus cyaneus*, Cuttlefish (*Sepia brevimana*) and Squid (*Loligo duvauceli*) were collected and analyzed for biochemical composition and heavy metal residues. The composition of Squid in both body meat and tentacles comprises of moisture content in the range of 80-85% and protein 11-15%. In Cuttlefish moisture and protein are 80% and 15% respectively and in Octopus, the contents are 84.5% and 12.5% respectively. At the same time, the lipid and mineral content were less than 1%. A study on processing and quality aspects of Octopus was also completed. The total plate count was about 9×10^4 /g. Parameters like TVBN and TMAN increased from 5.11 mg% to 13.66 mg% and 2.07 mg% to 5.46 mg% respectively. The food borne pathogens were found absent.

Studies on processing parameters, quality aspects, proximate composition, etc. of Blue whiting (*Micromesistius pontassou*) were conducted. The fish is reprocessed with value addition as fillets and frozen block of 10 kg were exported to Poland and other EU countries. Import of fish, its reprocessing and export after value addition will be the beginning of a new trend from the region.





Peak bone stone



Processed fish vertebrae

The innovative and unconventional products processed at the Centre includes Peak bone stone, Fish vertebra, Shark head and jaw bone, Fish gut lining, Squid meal etc. Utilization of waste in byproducts can minimize problems of waste disposal and generate additional income to fishermen.

Studies were initiated on analysis of shrimps (*Acetes*) locally known as Jawala prawn for nutritionally and pharmaceutically important compounds like Chitin, Chitosan, Glucosamine, essential amino acids, Astaxanthin pigments and minerals like Calcium and Phosphorous. Storage studies of commercially available dried Jawala prawn and laboratory dried prawn are being carried out.

Lean variety fishes like *Nemipterus japonicus* and *N. randali* used for Surimi production were analyzed for proximate composition and salt soluble nitrogen. The study revealed that the protein content was 18.12% and 19.13% respectively. Fat was less than 2%. Storage studies of ready to fry, dried, convenient products prepared from Bombay duck were carried out. The product stored up to four months at room temperature was found to be in good condition. The product has a moisture content of 14-16% and low bacterial count.

National risk assessment programme for fish and fish products for domestic and international markets

Analysis of different fish and fishery products from various processing industries for the presence of heavy metals was carried out. The species analyzed were: Cuttlefish (*Sepiella inermis*, *Sepia prashadi*, *S. pharonis*), Squid (*Urotenthis (Photoligo) duvauceli*), Octopus (*Octopus vulgaris*, *O. cynaeeus*, *O. membranaceus*), Shrimps (*Acetes indicus*, *Metapenaeus monoceros*, *M. affinis*, *M. kutchensis*, *Solenocera crassicornis*, *Trachypenaeus curvirostris*), Crabs (*Charybdis feriatus*, *Portuns sanguinolentus*), Fishes like Pomfret (*Pampus argenteus*, *Parastromateus niger*), Seerfish (*Scomberomorus commerson*, *S. guttatus*), Ribbon fish (*Trichiurus lepturus*, *Lepturacanthus savala*, *Fupleurogrammus muticus*), Dhoma (*Otolithus rubber*, *O. cuvieri*, *Johnius glaucus* and *Pennahia anea*).

It was noted that Cadmium was present in frozen cuttlefish whole cleaned (0.05 – 1.35 ppm), frozen squid whole cleaned (0.04 – 0.41 ppm), frozen octopus (0.21 – 1.68 ppm) and frozen squid tubes, skewers and squid rings showed Cadmium concentration below 0.5 ppm. Eight percentage had the Cadmium content between 0.5 – 1.00 ppm and only 2% of the samples had more than 1.0 ppm. Cadmium was very negligible in edible tissues of fishes like Ribbon fish,





Sciaenids, Pomfrets, Bombay duck and Catfish. Other metals such as Arsenic, Lead, Mercury, Chromium and Zinc were well below the acceptable levels in all the samples analyzed.

Different species of Tunas, Seer fish, Indian Mackerel, Horse Mackerel etc. were analyzed for the presence of Histamine. Among Tuna species, *Thunnus albacares* (Yellow fin tuna), *T. tonggol* (Long tail tuna) and *Katsuwonus pelamis* (Skipjack tuna) were analyzed for Histamine content and it was found that in Skipjack tuna the level of Histamine was in the range of 0 – 93.0 ppm.

Development studies on responsible trawl systems

In the 18 m semi-pelagic trawl fitted with 70 mm codend, the retention percentage is worked out to be $51.86 \pm 5.73\%$ in terms of weight and $17.84 \pm 1.91\%$ in terms of numbers. Similarly, the escapement is observed to be $48.14 \pm 5.73\%$ in terms of weight and $82.16 \pm 1.91\%$ in terms of numbers. Semi-pelagic trawl net with 50 mm codend mesh size gave the following observations:

Mean retention CPUE (kg/h)	–	14.92 ± 3.51 S.E.
Mean escapement CPUE (kg/h)	–	9.01 ± 2.73 S.E.
Highest individual catch (retention)	–	63.09 kg
Highest individual escapement	–	39.95 kg
Average percentage of escapement	–	35.13 ± 6.25
Average percentage of retention	–	64.87 ± 6.25
Average number of species retained	–	13
Average number of species escaped	–	9

In the 34 m bottom trawl fitted with 70 mm codend, the retention percentage was worked out to be $35.68 \pm 6.89\%$ in terms of weight and $12.0 \pm 2.52\%$ in terms of numbers. Similarly, the escapement is observed to be $64.32 \pm 6.89\%$ in terms of weight and $88.0 \pm 2.52\%$ in terms of numbers. Bottom trawl with 40 mm codend, gave the following observations:

Mean retention CPUE (kg/h)	–	17.89 ± 2.58 S.E.
Mean escapement CPUE (kg/h)	–	17.59 ± 6.08 S.E.
Highest individual catch (retention)	–	60.58 kg
Highest individual escapement	–	336.20 kg
Average percentage of escapement	–	39.61 ± 3.53
Average percentage of retention	–	60.39 ± 3.53
Average number of species retained	–	10
Average number of species escaped	–	8

Remote sensing and GIS for marine fisheries resources management

Under the collaborative research project with Space Application Centre (SAC), Ahmedabad, data on real time fishing was collected from fishermen operating along the Gujarat coast for validation of PFZ developed from satellite





data. The parameters used for the identification of PFZ were temperature, ocean colour and the wind data. Data on fish catches, species composition and physico-chemical parameters of water from the identified persistent features along Veraval coast were collected by trawling experiments using fishing vessel 'Sagar Kripa'. Attempts were made to characterize and quantify the phytoplankton pigments along the PFZ areas.

Preliminary results from the commercial trawlers showed improved catches from identified PFZ areas when compared to 'no-PFZ areas'. The results were found to be more consistent at depths of 100-200 m than to near shore areas of depth up to 50 m. Ancillary data to be included in the Geographical Information System was collected from the Fisheries Departments of Veraval and Diu.

Upgradation of traditional fishing systems for inland and marine sectors

A survey was conducted along the different landing centres of Gujarat like Okha, Dwarka, Porbandar, Navibunder, Mangrol, Veraval and Diu to study the different fishing systems practiced in the region. Field data collection on the harvesting methods in Hiren reservoir –II coming under the small reservoir category (1000 m²), was carried out. The fishing system mostly comprises of gill netting and occasional hook and lines. Gill nets used are exclusively made of PA multi-filament. A Co-operative Society has leased the rights for fishing and operates 12 boats for fishing. All the boats are made up of tin and galvanized iron with stray pieces of wooden fittings with an overall dimension of 12 ft LOA and 5 ft beam. The CPUE of the reservoir was found to be 12-15 kg of fish per fishing unit (i.e. gill net) obtained after 10-12 hours of soaking. Because of predominant use of multi-filament gill nets, the technical efficiency as well as economic performance of the fishing gears are observed to be quite low. The catch mostly comprised of *Catla catla*, *Cirrhinus mrigala*, *Labeo rohita*, *Puntius* spp., *Wallago attu* and minor carps. For experimental trials in Hiren reservoir, one set each of HDPE and PA gill nets with a mesh size of 150 mm and length of 25 m was fabricated.

To study different types of gears used in aquaculture farms, the shrimp culture units at Diu were visited and details regarding seine nets, cast nets, net screens and scoop nets were collected.



BURLA RESEARCH CENTRE





Research projects handled

- ❖ Post harvest technologies of fresh water fish in Orissa, adjoining states and NEH region
- ❖ Exploration of potential fishing zones (PFZ) of major reservoir systems

Chief findings

- * Significant difference was observed in occurrence of hygiene indicator bacteria in waters of Hirakud reservoir collected during pre and post monsoon periods.
- * Variation in occurrence of faecal Coliforms and faecal Streptococci near and off shore waters of Hirakud reservoir was noted.
- * There was marked difference in surface (skin and meat) and intestinal microflora of commercially sold fresh water fishes.
- * Eight community fish smoking kilns (CoFiSmki) were successfully erected for the benefit of fishermen community in West Bengal, Assam and Orissa.

Report of work done

Fishing operations with trammel nets and hook line

Fishing operations were carried out with trammel nets of inner mesh sizes of 50, 55, 60, 65, 70, 75 and 80 mm bar and a total of 26 observations made during the period. Nineteen operations were undertaken with hook line of hook sizes of 18, 19 and 20 and 38 operations with H.T.M. simple gill net in the Hirakud reservoir.

Bacteriological studies of Hirakud reservoir water

Occurrence of hygiene indicator bacteria during and after monsoon period and also between water samples collected from near shore and off shore waters of Hirakud reservoir varies. The isolates obtained from right and left dyke areas were purified for further characterization.

Physical, bacteriological and biochemical analyses of 30 smoked fish samples were completed. Out of these, 29 samples were collected from Kurumkel, Rampaluga, Burla, Sambalpur and Sapne around Hirakud reservoir and the other from samples smoke-cured using Community Fish Smoking Kiln (CoFiSmKi) during the TCD program conducted at Kurumkel.

Quality analysis of commercial fresh water fishes collected from local fish markets

Twenty samples collected from various markets of Sambalpur were tested for quality parameters which included moisture, fat, TVN, alpha-amino Nitrogen, peroxide value, TPC, Coliforms, *E. coli*, total Staphylococci, coagulase positive Staphylococci and sensory characteristics.

Occurrence of Salmonella in commercial freshwater fishes

Six samples were screened for Salmonella and other bacteria in edible meat portions and viscera. Marked difference is seen in occurrence of these bacteria





in the parts. Suspected Salmonella (>20 strains) were isolated for further characterization. Samples were screened by employing traditional as well as rapid detection methods.

Extension activities

The Centre organized the following training programmes during the year:

- Training cum demonstration programmes on Post harvest utilization of freshwater fish and demonstration of eco-friendly fishing gear for the benefit of fisherman community of Dhama, a fishing village adjoining Mahanadi river.
- Training cum demonstration programmes on Post harvest utilization of freshwater fish and demonstration of eco-friendly fishing gear for the benefit of fisherman community of Sapne, Sambalpur dist., Rampuluga, Jharsuguda dist., Kurumkel, Bargarh dist., Thebra, Jharsuguda dist., and Pujaripalli (Jampali), Jharsuguda dist., Orissa as part of village adoption programme.

Eight community fish smoking kilns (CoFiSmki) were successfully erected for the benefit of fishermen community which included one in Junput, Kontai, East Midnapur, West Bengal, two in NEH Region, viz. Amranga (Kamrup district) and Morigaon (Nawgaon district) in Assam and five in the remote fishing villages adjoining Hirakud reservoir viz., Kurumkel, (Bargarh district), Pujaripalli (Jampali), Thebra and Rampaluga all three in Jharsuguda district and Sapne in Sambalpur district of Orissa.

Surveys undertaken

As a part of preparatory work to conduct training cum demonstration programs, staff of the Centre visited remote fishing villages in the Upper Reaches of Hirakud reservoir to carry out survey work. Survey work was also carried out in Diamond Club fresh fish market, Ulubari, Guwahati. A survey work was also undertaken on traditional fishing gear operated in West Bengal, mainly in 24 Parganas North, South Hoogly and Nadia district.



Handing over keys of 'CoFiSmki' to the village Head & Secretary, SHG of Women at Pujaripalli



MUMBAI RESEARCH CENTRE





Research project handled

- ❖ Chemical and microbiological evaluation of marine and inland fish and fishery products of Maharashtra

Chief findings

- * Shelf life studies of dried Ribbonfish (*Trichiurus lepturus*) samples from market stored under laboratory conditions were concluded after 28 weeks.
- * Analysis of 31 samples of fresh fish from Vashi retail markets indicated that overall quality of fresh fish is good except for the presence of fecal indicator organism, *Escherichia coli* in 12 samples.
- * Good quality fish wafers can be prepared from 'Karali' (*Chirocentrus dorab*) using corn flour and sago powder. Addition of tomato puree gave good flavor and pleasant colour to the product.
- * Presence of fecal Coliforms in ice and water samples is a cause for concern since it can cause cross contamination in fresh fish.

Report of work done

Studies on storage of dry fish

Studies on bulk storage of Ribbonfish (*Trichiurus lepturus*) under laboratory conditions in plastic drums were concluded after 28 weeks of storage. During storage at ambient temperatures, insect infestation (*Dermestes* sp.) developed which progressed during storage. After 24 weeks, mite infestation was also observed disintegrating dried fish into powdery mass. Quality deteriorated rendering it unfit for human consumption.

Quality of fresh fish from retail market

A total of 31 samples of fresh fish belonging to 27 species from Vashi retail market were analyzed for bacterial quality including fecal indicator organisms and for the presence of pathogens. Total Bacterial Count was lowest in *Chilocellium indicum* (41,108 TBC/g) while it was highest in *Lacterius lacterius* (380,000 TBC/g). Twelve samples had TBC less than 1,00,000. *E. coli* was detected from 11 samples and counts of more than 20 were detected in two samples (*Lacterius lacterius* count of 160 and *Harpodon hereius* count of 720). Fecal Streptococci were detected in Boi (*Mugil cephalus*) sample. Pathogens such as Coagulase positive Staphylococci, Salmonella and *V. cholera* were absent in all the samples analyzed. Based on organoleptic, biochemical and bacterial parameters, overall quality of market samples were found to be good except presence of fecal indicator organisms in some samples denoting poor sanitation and hygienic conditions prevalent in retail markets.

Quality of ice and water from retail market

Analysis of five samples of ice and water showed that three samples of ice and three samples of water were contaminated with fecal Coliforms. *E. coli* was present in one ice sample. T.B.C. of more than 100/ ml. was observed in





three ice and two water samples. *V. cholera* was absent in all samples analyzed. The results are tabulated below:

Sample No.	Sample	T.B.C.	Fecal Coliforms	<i>E. coli</i>	<i>V. cholera</i>
1	Water	91	Nil	Nil	Absent
2	Watr	34	Nil	Nil	Absent
3	Water	261	42	Nil	Absent
4	Water	58	3	Nil	Absent
5	Water	118	17	Nil	Absent
6	Ice	164	17	Nil	Absent
7	Ice	38	Nil	Nil	Absent
8	Ice	182	62	Nil	Absent
9	Ice	89	Nil	Nil	Absent
10	Ice	104	17	Nil	Absent

Value added fishery products

Fish wafers/flakes: Wafers were prepared from two fish species. It is observed that wafers from *Chirocentrus dorab* locally called as 'Karali' were of



Fish wafers

better quality in crispness and flavour and taste than from Ribbonfish *Trichiurus lepturus*. Three different combinations were used. In first combination corn and rice flour was used, in second, rice flour was replaced with sago powder and in third, *Nachani* (Ragi) was used in place of sago. Wafers with second combination i.e. using fish meat, corn flour and sago powder had best swelling properties as well as crispness. It is observed that product made using tomato puree has better colour and flavour. Composition of formula for making a good product is worked out.

Fish sauce: Fish sauce is prepared from Sardines (*Sardinella longiceps*) and golden anchovy (*Coilia dussumieri*) locally called as Mandeli by salt fermentation. Fish to salt ratio was maintained at 3:1. The fermentation was carried out at ambient temperature (R.T.) and at 45°C. Proximate composition of sauce after six months was as follows:

Sample	Moisture	Protein	Fat	Ash	TVBN	TMAN	Salt
Sardine at R.T.	69.49%	7.9%	0.99%	18.15%	10.3%	2.5%	24.6%
Golden anchovy at R.T.	67.74%	6.2%	1.36%	17.74%	8.7%	Nil	25.3%
Sardine at 45°C	68.68%	8.1%	1.69%	17.68%	10.5%	2.8%	24.8%
Golden anchovy at 45°C	68.35%	6.4%	1.70%	17.36%	9.0%	Nil	26.2%





Sauce from golden anchovy was better than that from Sardine based on organoleptic quality.

Pickle from non-penaeid prawn: Prawn pickle was prepared using non-penaeid prawn, locally called as 'Karadi'. They are small non-penaeid prawns of *Palaemon* species, which are used for drying and found to fetch less value. The flavour and taste is good. The pickle is stored at room temperature in glass bottles and shelf life studied. It is found to be in good condition up to six months.

Proximate composition and heavy metals in fish samples

Proximate composition of four fish samples and two cephalopods samples was carried out. Four samples of fresh fish were tested for presence of heavy metals.

Heavy metals in ppm level on original weight basis were as follows:

Name	As	Cd	Cu	Pb	Zn	Fe
<i>Tachysurus sona</i>	58,66	ND	4.046	ND	ND	2.34
<i>Harpodon nehereus</i>	7.576	ND	ND	ND	ND	2.566
<i>Leiognathus splendens</i>	ND	0.042	1.098	ND	ND	6.615
<i>Pomadasys maculates</i>	106.02	ND	ND	0.921	2.677	6.717

ND : Analyzed but less than detection level and hence reported as not detected

Analysis of industrial samples

Analysis of ice and water: A total of 20 samples of ice were analyzed for bacterial quality. Twenty four samples were analyzed for IS 4257 or as "E" parameters of EU requirement or as per 98/83/EEC based on request from a processing unit.

Analysis of seafood from fish processing factories: Fifty eight samples of fish, crustaceans and cephalopods were analyzed for total bacterial count, *E. coli* count, fecal Coliforms count, coagulase positive Staphylococci count and for the presence of Salmonella, *V. cholera*, *V. parahaemolyticus* and Listeria.

Chemical analysis of commercial samples: Six samples of frozen fish were analyzed for T.V.B.N. and one sample was analyzed for presence of T.M.A.

Salt samples: Ten samples of salt were analyzed for presence of *Staphylococcus aureus* and Sulphite reducing *Clostridium*.



CALICUT RESEARCH CENTRE





Research projects handled

- ❖ Processing and product development from oceanic and deep-sea fishes
- ❖ Improvement and value-addition of traditional fish products

Chief findings

- * During the storage period of three months, reprocessed samples of commercial dry fish, subsequently treated with 1% Acetic acid, and, (2) 1% Chitosan solution in 1% Acetic acid, prior to drying and packing, showed better mycological and bacteriological characteristics than the control samples.
- * Only 40% of the representative samples of packaged dry fish sold through super markets in Calicut city had moisture content below 25%. 96% of the samples analyzed had acid insoluble ash below 1%. Only 44% of the samples were graded average and above.
- * A total of 293 fungal cultures were isolated from samples of dried fish collected from Calicut Central Market, which have been brought from outside Kerala State. The species were *Aspergillus glaucus* group (48.12%), *Aspergillus niger* (08.53%), *Polypaecilum* sp. (15.36%), *Penicillia* (05.12%) and *Rhizopus/Mucor* sp. (22.87%).

Report of work done

Studies on fungi in dry fish

The quality parameters of 35 samples of dried fish brought to Calicut Central Market, as detailed below, were estimated.

Sl. No.	Place of origin	Species	No. of samples
1	Porbunder	Shark	1
		Silver belly	1
		Golden anchovies	1
		Prawn	1
		Sole	2
2	Mumbai	Prawn	5
3	Mangalapuram	Sole	3
		Silver belly	6
		Shark	3
		Ray	1
		Prawn	1
		Lactarius	3
4	Chennai	Sole	1
		Lactarius	2
5	Andhra Coast	Sole	1
6	Orissa	Shark	3
		TOTAL	35





Out of the samples 293 cultures were isolated which belonged to *Aspergillus glaucus* group (48.12%), *Aspergillus niger* (08.53%), *Polypaecilum* sp. (15.36%), *Penicillia* (05.12%) and *Rhizopus/Mucor* (22.87%).

Studies on packaged dry fish

Consumer packs of diverse species of salted/dried fish are lately being sold through various super markets in the Calicut city under different brands. It was felt that periodical collection of samples and subsequent assessment of quality was necessary to monitor such products.

During the period 25 samples (Sole, Prawn, Shark, Silverbelly, Shrimp and Chutney Powder) were collected and analyzed for organoleptic, chemical, bacteriological and mycological parameters. These products were branded as: Be Sea Foods, Calicut-20, C-Boat, SeaMum Fisheries, Calicut-21, "Western" Pee Cee Sea Food Supplier, Calicut-21.

The chemical characteristics were as follows:



Fish drying on raised platform

Characteristics	Range
Moisture %	12.00 - 54.26
Salt %	01.10 - 21.90
Ash %	07.40 - 32.60
Acid insoluble ash %	00.11 - 01.90
Protein % (wwb)	23.50 - 34.10
TVB mg %	31.8 - 560
aw	00.49 - 00.79

Depending on the organoleptic quality of the samples, they were graded on a scale of 1 - 10 as shown below:

Grading (on scale of 1 - 10)	Number of samples (out of 25)
7	1
6	4
5	7
4	8
3	5





The microbiological characteristics of the samples were as follows:

Type of fungi	Range of fungal load in the samples/g
<i>Aspergillus</i> sp.	0.30×10^2 - 8.00×10^3
<i>Polypaecilum</i> sp.	0.10×10^2 - 1.60×10^5
<i>Rhizopus/Mucor</i>	0.10×10^2 - 2.00×10^2

Improvements in curing

Trials were initiated to evaluate the efficacy of using Chitosan as a preservative agent in dried/cured fish. Due to scarcity of suitable fresh fish on account of the onset of monsoon, commercial samples of dried silver belly purchased from the Central Market were used for reprocessing and subsequent treatment as detailed below:

1. Market sample was washed thoroughly in potable water three times to get rid of adhering salt and grit.
2. The washed sample was kept soaked in potable water for 1 hour to reduce the residual salt content further. The sample is drained completely and divided into three lots.
3. Each lot was given dip-treatment in one of the following baths:
 - a) 10% Sodium chloride brine
 - b) 10% Sodium chloride brine in 1% Acetic acid
 - c) 1% Chitosan solution in 1% Acetic acid containing 10% Sodium chloride

Each lot was given dip-treatment for 30 minutes and drained. The samples were dried initially in an air oven maintained at 50 - 55°C and then under the sun. The dried samples were packed in polythene bags (50 g each) for storage studies.

The experimental samples were found to be in good condition during the storage period of three months. Mycological and bacteriological qualities were better in samples (b) and (c) compared to sample (a). The control sample (washed and dried commercial product) was found to be spoiled within one month. The same treatment regime will be followed for processing fresh fish, depending on the availability of fish commonly used for salting and drying.

Trials on salting of sardines

Studies on using extracts of ginger and turmeric in salting of sardines were continued by conducting further trials. Preliminary trials had shown encouraging results. Salted sardines, treated with ginger extract, turmeric extract, and combination of both with Ascorbic acid were packed in wooden barrels with provision for drainage of self-brine formed, so that the samples remained in a semi-dried condition. Even though physical and organoleptic qualities were found to be good, the samples became infested with flies after one month. Therefore, the samples were discarded.



Transfer of Technology





Transfer of Technology Programmes in NEH Region

Regional Workshop

A two-day workshop on 'Hygienic fish handling and preparation of value added fish products' was held at the auditorium of Institution of Engineers (India), Guwahati on 15th and 16th February 2005. The programme was jointly organized by CIFT and Department of Fisheries, Govt. of Assam. The objectives of the workshop were to assess the status of post harvest fisheries in NEH region, to create awareness on hygienic handling and value addition and to identify the technology transfer programmes to be carried out in future. The workshop was inaugurated by Dr. N. Islam, Hon'ble Minister for Fisheries, Assam. About 120 delegates including the officials from other NEH States and different districts of Assam attended the workshop.



Inauguration of Workshop by Dr. N. Islam,
Fisheries Minister, Assam

The sale of value added fish products prepared by the members of Self Help Group, 'Kaibartapara Yuba Atmasahayak Got', Gargara village, Kamrup district, Assam, was launched by the Minister. The product (hygienically prepared fish pickle) was prepared by CIFT trained members of the SHG, under the technical guidance of CIFT and launched at the workshop with the brand name of 'Apurba'.

Training programme

A training programme on 'Hygienic fish handling and preparation of value added fish products' was conducted at Regional Fisheries Training Institute (RFTI), Amranga, Assam from 17th to 19th February 2005. The programme was jointly organized by CIFT and Department of Fisheries, Assam. The training programme followed the two-day North East Regional Workshop on 'Hygienic fish handling and preparation of value added fish products' held at Guwahati on 15th and 16th February 2005. A batch of 28 trainees representing Self Help Groups and NGOs from different districts of Assam viz., Golaghat, Kamrup, Dhemaji, Cachar, Barpeta, Nalbari, Majuli, Lakhimpur, Nagaon, Dhuibari, Jorhat, Darrang and Marigaon participated in the training programme. Subjects like nutritional status of fish, importance of hygienic handling of fish, significance of hygiene and sanitation to be maintained at the landing centres and markets, improved processing methods of drying and smoking of fish, preparation of value added fishery products, packing and marketing were dealt-with. Practical demonstration was given on preparation of hygienically smoked fish products like fish pickle, fish wafers, fish balls and fish cutlets using the 'Community fish smoking kiln (CoFiSmKi-Burla model)'.





Another two days' training programme on 'Production of fish ensilage based cattle feed' was held at the Regional Centre of ICAR Research Complex at Imphal, Manipur on 18th and 19th February 2005. The programme was jointly organized



Demonstrating the production of cattle feed from fish waste

by CIFT and Department of Fisheries, Govt. of Manipur. A batch of 26 trainees representing officials from the Dept. of Fisheries, Govt. of Manipur, NGOs and farmers participated in the programme. The objective of the programme was to enable the farmers and local self government to profitably use fish waste generated from farm site and market places into a product with acceptable odour which can be used in differential farming system like piggery, poultry and for weaning calves (if permitted). The programme has generated lot of interest in all NEH states. Many states are making steps to introduce this in local

fish markets to cleanup markets and at the same time generating feed for chicken/pig.

Campaign on responsible fishing methods

A campaign on 'Responsible fishing methods and fisheries extension' was organized at five different locations in Manipur and one location in Nagaland during 4-11 March 2005 as detailed below:

Date	Venue	Beneficiaries
4 March 2005	District Fishery Office, Imphal West, Manipur	47 Fishery Extension Officers
5 March 2005	Thangu, Bishnupur dist., Manipur	40 fishermen
7 March 2005	Mayang Imphal, Imphal West dist., Manipur	42 fishermen
9 March 2005	District Fishery Office, Imphal East, Manipur	40 Fishery Extension Officials
10 March 2005	Dimapur, Nagaland	50 fishermen
11 March 2005	Thoubal, Manipur	40 fishermen

ToT on FRP based programmes in Assam

Under the ToT programme on FRP canoes and fishing vessel for fast flowing rivers and FRP ice boxes, the following programmes were conducted at Guwahati, Assam from 13th March till the end of September 2005:

- Fabrication of 35 numbers of ice boxes of 700 litres capacity and 30 numbers of 50 litres capacity for different NEH states
- Design and fabrication of motorized FRP canoes (27 ft-one mould and three boats) and non-motorized boat (21 ft-one boat) for fast flowing Brahmaputra river, Assam





- Design and fabrication of fishing canoes for the States of Meghalaya (18ft- two moulds and four boats) and Manipur (18 ft- two moulds and four boats)
- Plug, mould and canoes were fabricated

ToT on FRP based programmes in Manipur

During the period September to December 2005, one mould and 34 boats in the size range of 18-27' were fabricated and distributed at a programme organised at Manipur in addition to 15 numbers of ice boxes of 50 litres capacity each.



Fabrication of FRP canoes in progress

Training on preparation of North-East fish curry

A training programme on 'Standardization and popularisation of ready-to-serve North-East fish curry' was held at College of Fisheries, Central Agricultural University, Agarthala during the period 17-18 April 2005. The following special lectures were also delivered:

- Modified atmosphere package of fish - Dr. T.K. Srinivasa Gopal
- Packaging of fish and fish products - Dr. C.N. Ravishankar

Training on production of value added fishery products

A two-days training programme on the development of value added products from freshwater fish was conducted at ICAR Research Complex for NEH Region, Barapani, Meghalaya during 22-23 September 2005. Officers of the Department of Fisheries, Meghalaya and Tripura along with Scientists of ICAR Research Complex, Barapani participated in the programme. The training was mainly on the development of value added products such as fish balls, fish cutlets, fish fingers, fish fillets, fish pickle and fish silage from fishery waste. Information on packaging of fish products was also provided. The fish products prepared were evaluated by the Director, Joint Director and other staff members of the Research Complex and they have expressed their appreciation.

Village Adoption Programmes

Training programmes on hygienic preparation of smoke cured fresh water fishes and prawns and eco-friendly fishing gear for sustainable fisheries were conducted at remote fishing villages adjoining Hirakud reservoir as part of village adoption programmes. The programmes included delivering lectures, preparation/demonstration of fish pickles, fish wafers, eco-friendly fishing gears and exhibition of the technologies/products developed at the Institute. Handouts prepared in local language (Oriya) were distributed to the participants. Feedbacks were obtained at the end of every session.





Details of programmes conducted are given below:

- For the benefit of fishermen community of Dhama, a fishing village adjoining Mahanadi river during the period 18-19 January 2005. The beneficiaries included 120 men and women belonging to SC community, out of which 61.66% were males and 38.33% females. Among males and females, 90.76% and 57.77% respectively were literates.
- At Pujaripalli (Jampali) and Rampaluga in Orissa on 17th and 18th and 24th and 25th December, 2005, respectively. The beneficiaries included a total of



Twine distribution at Pujaripalli

- 79 people in Pujaripalli, among which 81% were SC, 10% ST and 9% belonging to other categories, while in Rampaluga 83 trainees were benefited comprising 41% SC and 59% ST. In each village, twines were distributed to 30 active fishermen. Awareness programmes and free health checkup programmes were also conducted in the villages.
- At Sapne, Sambalpur, Orissa, on 5th and 6th March 2005. This village is located in the Lower Reaches of Hirakud reservoir (Left Dyke). Among the beneficiaries, 52% were males and 38% females belonging to SC while 48% males and 62% females belonged to ST categories, respectively. About 93 and 66 percent males and females respectively, were literates.
- At Rampuluga, Jharsuguda, Orissa, on 10th and 11th March 2005. This village is located in the Middle Reaches of Hirakud reservoir (Left Dyke). Among the beneficiaries, 87% males and 93% females belonged to SC while 13% males and 7% females belonged to ST categories, respectively. A total of 94% males and 85% females were literate.
- At Kurumkel, Bargarh, Orissa, on 12th and 13th March 2005. This village is located in the Upper Reaches of Hirakud reservoir (Right Dyke). Among the beneficiaries, 11% males and 31% females belonged to SC while 89% males and 69% females belonged to ST categories, respectively. About 97 and 53 percent males and females respectively were literate. On 30th April 2005, a training programme on hygienic preparation of smoked products using low cost freshwater fish was demonstrated. As part of the demonstration of eco-friendly gear, twines were distributed for net mending purposes. The beneficiaries included 30 fishermen among which 57% were ST, 30% OBC and 13% belonged to SC categories.
- At Thebra, Jharsuguda, Orissa, on 16th and 17th March 2005. This village is located in the Upper Reaches of Hirakud reservoir (Left Dyke). Among the beneficiaries, 30% males and 23% females belonged to SC while 70% males and 77% females belonged to ST categories, respectively. About 96 and 78





percent males and females respectively were literate.

- At Pujaripalli (Jampalli), Jharsuguda, Orissa, on 18th and 19th March 2005. This village is located in the Upper Reaches of Hirakud reservoir (Left Dyke). Among the beneficiaries, 84% males and 68% females belonged to SC while 16% males and 32% females belonged to ST categories, respectively. About 85 and 45 percent males and females respectively were literate.

The Visakhapatnam Research Centre organised three training programmes on Post harvest fish handling on-board fishing vessels and improved hygiene and sanitation practices at three remote fishing villages, Mangamaripeta, Pudimadaka and Revupolavaram during the period February-March 2005. About 100 fishermen and also local prominent leaders, attended the programmes at each of the villages. Printed brochures in Telugu were also distributed among the participants.



On-board training at Pudimadaka

Island Development Programmes

During the period 28 January - 23 February 2005, nylon gill nets of 100 and 125 mm mesh size were operated off Agatti island from a private fishing vessel. Collapsible lobster traps were also operated using different baits. On 24 February 2005, a function was held at Agatti in which Dr. K. Devadasan, Director, CIFT distributed gill nets to five entrepreneurs who had undergone training. Dr. B. Meenakumari, Head, Fishing Technology Division explained the advantages of this eco-friendly fishing method. The Lakshadweep Panchayat Executive Officer, Shri K. Muhamed Koya, Asst. Director of Fisheries, Shri C.G. Koya and the Fisheries Supdt., Shri Koya were also present during the function.



General Information





Training Programmes Conducted

Sl. No.	Subject	No. trained / Beneficiary	Venue and Date
1.	Effect of curd on the chill storage of <i>Thryssa</i> species	1	Cochin 1 January - 28 February 2005
2.	Bacteriological analysis of fish and fishery products	1	Cochin 3 January - 25 February 2005
3.	HACCP concepts	1	Cochin 6-11 January 2005
4.	Laboratory techniques for microbiological examination of seafoods	8 (Students)	Cochin 10-22 January 2005
5.	Post harvest fish handling onboard fishing vessel	15 (Fishermen)	Naigaon 15 January 2005
6.	Microbial quality of fishes of Cochin and its environment	1	Cochin 15 January - 11 March 2005
7.	Comparison of quality characteristics of silage prepared from <i>Thryssa</i> species using different acids	1	Cochin 17-29 January 2005
8.	Comparative study of biochemical and functional properties of fish protein hydrolysates (FPH) using different enzymes	1	Cochin 17-29 January 2005
9.	Post harvest fish handling on-board fishing vessel	15 (Fishermen)	Khochiwade 15 January 2005
10.	Fish processing technology	2 (Students)	Cochin 20 January - 3 February 2005
11.	Pelagic gill net operation	12 (Fishermen)	Agatti, Lakshadweep 28 January -12 February 2005
12.	Post harvest fish handling on-board fishing vessel	15 (Fishermen)	Arnala 15 January 2005
13.	Fishing technology	11 (Students from Tripura)	Cochin 29 January - 7 February 2005
14.	HACCP concepts	1	Cochin 7-10 February 2005
15.	HACCP concepts	1	Cochin 8-10 February 2005
16.	Post harvest fish handling onboard fishing vessels	100 (Fishermen)	Mangamaripeta (A.P.) 10 February 2005
17.	Seafood quality assurance	2	Cochin 14-26 February 2005





Post harvest fish handling on-board fishing vessel



Post harvest fish handling on-board fishing vessel



Fish processing technology



HACCP concepts



Microbial quality of fishes



Seafood quality assurance





18.	Preparation of value added fish products	10 (SHG members)	Cochin 16-17 February 2005
19.	Post harvest fish handling on-board fishing vessels	100 (Fishermen)	Pudimadaka (A.P.) 17 February 2005
20.	Hygienic fish handling and preparation of value added fish products	28 (Members of SHGs & NGOs)	Guwahati, Assam 17-19 February 2005
21.	Production of fish silage based cattle feed	26 (Fish farmers and fisheries officials)	Imphal, Manipur 18-19 February 2005
22.	Laboratory techniques for microbiological examination of seafoods	1	Cochin 21 February - 5 March
23.	Preparation of fish wafers and dry fish products	1	Cochin 23-24 February 2005
24.	Studies on proximate composition of two species of fish	1	Cochin 28 February - 5 March 2005
25.	Responsible fishing methods and fisheries extension	47 (Fishery Extension Officials)	Imphal West, Manipur 4 March 2005
26.	Responsible fishing methods and fisheries extension	87	Cochin 4-10 March 2005
27.	Responsible fishing methods and fisheries extension	40 (Fishermen)	Thanga, Bishnupur dist, Manipur 5 March 2005
28.	Responsible fishing methods and fisheries extension	42 (Fishermen)	Mayang Imphal, Imphal West, Manipur 7 March 2005
29.	Responsible fishing methods and fisheries extension	40 (Fishery Extension Officials)	Imphal East, Manipur 9 March 2005
30.	Responsible fishing methods and fisheries extension	50 (Fishermen)	Dimapur, Nagaland 10 March 2005
31.	Responsible fishing methods and fisheries extension	40 (Fishermen)	Thoubal, Manipur 11 March 2005
32.	Preparation of prawn chutney powder	1	Cochin 11 March 2005
33.	Post harvest fish handling on board fishing vessels	100 (Fishermen)	Revupolavaram (A.P.) 11 March 2005
34.	Fish processing and production of value added fish products	3 (Officials from NRC for Women in Agriculture, Bhubaneswar)	Cochin 14-19 March 2005





Preparation of value added fish products



Laboratory techniques in microbiological examination of seafood



Seafood quality assurance



Fishing technology, fish processing and quality control aspects



Hygienic preparation of smoke cured fish



Processing of mussel meat into diverse products





35.	Laboratory techniques for microbiological examination of seafood	1	Cochin 14-31 March 2005
36.	HACCP concepts	1	Cochin 15-18 March 2005
37.	Packaging of fish and fish products	3	Cochin 21 March - 2 April 2005
38.	Production of value added fish products	25 (Women sponsored by Aryad Block Devt. Office)	Cochin 21-22 March 2005
39.	Seafood quality assurance	1	Cochin 28 March - 8 April 2005
40.	Chemical and microbiological analysis of water	1	Cochin 28 March - 8 April 2005
41.	Detection and enumeration of public health indicator organisms in fishery products	1	Cochin 1 April - 18 May 2005
42.	Detection and enumeration of public health indicator organisms in fishery products	1	Cochin 5 April - 26 May 2005
43.	Responsible fishing methods	15 (School Children)	Chellanam 7 April 2005
44.	Seafood quality assurance	3	Cochin 11-26 April 2005
45.	Laboratory techniques in microbiological examination of seafoods	1	Cochin 11-30 April 2005
46.	Fishing methods	15 (Fishermen from H.P.)	Cochin 16-17 April 2005
47.	Fabrication of FRP boat and ice box	3	Guwahati 19 April - 6 June 2005
48.	Fishing technology, fish processing and quality control aspects	29 (Fishermen from H.P.)	Cochin 20-29 April 2005
49.	Laboratory techniques in microbiological examination of seafoods	4	Cochin 2 - 18 May 2005
50.	Advanced course on seafood HACCP (under auspices of CIBA and Society of Aquaculture Professionals, Chennai)	16	Chennai 4-7 May 2005
51.	Production of fish fingers, balls, cutlets, pickle and fried prawns	2	Cochin 10-12 May 2005
52.	Fish processing	1	Cochin 10-24 May 2005





53.	Production of prawn pickle	1	Cochin 11 May 2005
54.	Chemical and microbiological analysis of water	1	Cochin 12-21 May 2005
55.	Fabrication of fishing gear	15 (Fisherwomen)	Chellanam 21 May 2005
56.	Preparation of fish products	24 (SHG members)	Ambalapuzha 3 - 8 June 2005
57.	Biochemical analysis and instrumentation	1	Cochin 3-10 June 2005
58.	Production of value added fish products	3	Cochin 6-10 June 2005
59.	Laboratory techniques in microbiological examination of seafood	2	Cochin 13-25 June 2005
60.	Biochemical analysis and instrumentation	1	Cochin 15-25 June 2005
61.	Mineral water analysis - Chemical and microbiological aspects	1	Cochin 15 June - 7 July 2005
62.	Extraction and estimation of proteases from typical aerobic bacteria from fish	2	Cochin 17-18 June 2005
63.	HACCP audit	17	Cochin 22-25 June 2005
64.	Production of fish cutlet	1	Cochin 22 July 2005
65.	HACCP concepts	M.Sc. students of Christ College, Irinjalakuda	Cochin 26 July 2005
66.	Method for detection of anti-bacterial substances by using four plate method	3	Cochin 27-29 July 2005
67.	Seafood quality assurance	16	Cochin 25 July - 6 August 2005
68.	Modern analytical techniques in Biochemistry (HPLC, GC & AAS)	1	Cochin 27 July - 4 August 2005
69.	Production of fish pickle	1	Cochin 29 July 2005
70.	Fish processing, seafood quality assurance and management	17	Cochin 2-31 August 2005
71.	Production of fish pickle	1	Cochin 8 August 2005
72.	TVBN analysis	1	Cochin 10 August 2005





73.	Modern analytical techniques in Biochemistry (HPLC, GC & AAS)	2	Cochin 16-26 August 2005
74.	Quality assurance in seafood industry	15 (Technologists)	Mumbai 17-31 August 2005
75.	Estimation of Sulphur dioxide in fish samples	1	Visakhapatnam 18-20 August 2005
76.	HACCP concepts	M.Sc. students of MES College, Ponnani	Cochin 22-24 August 2005
77.	Seafood quality assurance	M.Sc. students of St. Albert's College, Ernakulam	Cochin 18-31 August 2005
78.	Post harvest technology and fisheries extension	20 (MPEDA officials)	Cochin 22 August - 9 September 2005
79.	HACCP concepts	1	Cochin 23-25 August 2005
80.	Instrumental techniques in biochemical analysis	4	Cochin 31 August - 3 September 2005
81.	HACCP concepts	15	Cochin 5-8 September 2005
82.	Post harvest technology and fisheries extension	7 (MPEDA officials)	Cochin 19-24 September 2005
83.	Laboratory techniques in microbiological examination of seafood	6	Cochin 19 September - 1 October 2005
84.	Laboratory techniques in microbiological examination of seafood	4	Cochin 19 September - 1 October 2005
85.	Seafood quality assurance	1	Cochin 19 September - 3 October 2005
86.	HACCP concepts	9	Cochin 1-5 October 2005
87.	Fish processing	3	Cochin 3-15 October 2005
88.	Microbiological analysis of food and water	2	Cochin 17-22 October 2005
89.	Value added fishery products	1	Cochin 17-22 October 2005
90.	Design and operation of responsible fishing gear	3 (Fisheries Inspectors from Sri Lanka)	Cochin 17 October - 23 December 2005
91.	Processing of mussel meat into diverse products	10	Kodikkal Beach, Payyoli 18-20 October 2005





92.	Demonstration on TED	130	Baleswar, Chandipur, Dhamra, Paradeep & Astaringi (Orissa) 2-10 November 2005
93.	HACCP concepts	1	Cochin 5-9 November 2005
94.	Introduction to basic techniques in fishery microbiology	9	Cochin 14-19 November 2005
95.	Introduction to basic techniques of fishery microbiology	8	Cochin 21-25 November 2005
96.	Chemical and microbiological quality analysis of food	6	Cochin 1-31 December 2005
97.	Seafood quality assurance	13	Cochin 5-17 December 2005
98.	Fish processing innovations and extension methods	11	Cochin 12-17 December 2005
99.	Biochemical analysis of fishery products	1	Cochin 12-24 December 2005
100.	Chemical quality analysis of seafood products	1	Cochin 15 December 2005- 2 January 2006

Training on hygienic preparation of smoke cured fresh water fishes and prawns and eco-friendly fishing gear for sustainable fisheries

Training programmes on Hygienic preparation of smoke cured freshwater fishes and prawns and eco-friendly fishing gear for sustainable fisheries were conducted at remote fishing villages adjoining Hirakud reservoir as a part of village adoption programs. Details are given elsewhere in the report under the heading 'Transfer of Technology'.

Training on preparation of North-East fish curry

A training programme on Standardization and popularisation of ready-to-serve North-East fish curry was held at Central Agricultural University, Agarthala during the period 17-18 April 2005.

Training on processing of mussels

A training programme on processing of mussels and product development was organised for members of 'Aiswarya' Self Help Group at Kadaloor, Payyoli, Calicut during 18-20 October 2005.

Trainers' Training

A training course on Fish processing innovations and extension methods was conducted from 12 -17 December 2005 for 11 fisheries officials sponsored by the State Fisheries Departments of Andhra Pradesh, Kerala, West Bengal, Punjab, Union Territory of Lakshadweep and Marine Products Export Authority (MPEDA), Cochin. The specific objectives of the training course were: i) to popularize the use of selected fish processing innovations, ii) to impart





Training on innovations and extension methods

knowledge and skills on the use of selected fisheries extension methods, iii) to increase the extent of adoption of various fish processing innovations among the different categories of clients, and iv) to strengthen the linkages between the CIFT and the State Fisheries Departments so as to facilitate quicker dissemination of innovations using the state resources.

The training schedule consisted of both theoretical and practical aspects of various subjects/innovations. The subject areas such as post harvest handling and chilled storage of fish, freezing and frozen storage of fish products, canning preservation of fish and shellfish, curing of fish, value added fish products, fishery by-products, retort pouch processing and packaging materials, extension methods, extension programme development and adoption of innovations, technology transfer in fisheries, harvest and post harvest losses in fisheries, and coastal zone management and evaluation methods were included in the training schedule. Lecture, group discussion, demonstration, case study analysis, and field visits were the training methods used. Training course manuals and course certificates were distributed to the trainees.

Training to foreign officials

Training was imparted to Shri. Sunil Welengoda, Fisheries Inspector, Dept. of Fisheries and Aquatic Resources, Matara, Sri Lanka, in Design and operation of responsible fishing gear from 17 October to 23 December 2005 under the Colombo Plan.



Giving away participation certificates to Shri. Sunil





Technologies Assessed and Transferred

- ❖ Designs of wooden fishing vessels in the size range of 7.6 m – 15.2 m
- ❖ Designs of steel fishing vessels of size 15.5 m, 20 m and 24 m OAL
- ❖ Design of an 18 m steel trawler, developed as part of the consultancy offered by Ministry of Agriculture, Govt. of India, provided to a private entrepreneur on trial basis. Construction of vessel completed with technical assistance of CIFT
- ❖ Designs of Aluminium craft for inshore waters and FRP pole and line fishing vessels for Lakshadweep
- ❖ Substitution of wooden boats by FRP canoes and treated rubber wood canoes for use in backwaters and near-shore waters
- ❖ Dual preservative treatment for low valued species of timbers for boat construction and formulation of indigenous preservatives for traditional fishing craft
- ❖ Painting schedules for Aluminium-Magnesium alloy and FRP sheathing for under water hulls of fishing vessels
- ❖ Development of toxic wood plastic composites (TWPC)
- ❖ Antifouling and anticorrosive paints for protection of fishing craft
- ❖ Protective coating for cast iron propeller
- ❖ Specifications for different types of synthetic materials for fabrication of different types of fishing gear
- ❖ Designs of different types of fishing gear such as trawls for demersal, pelagic and semi-pelagic applications, gill nets, purse seines and traps for exploitation of the different fishery resources
- ❖ Otter boards of different sizes and designs to suit demersal trawl fishing operations and variable depth fishing
- ❖ V-form steel otter boards for demersal trawls
- ❖ Combination wire rope for deep sea fishing
- ❖ Bycatch Reduction Devices (BRD) such as square mesh cod end and fish eye for reduction of bycatch, especially juveniles and young ones, in shrimp trawls
- ❖ Turtle Excluder Devices (TED) for conservation of marine turtles
- ❖ Designs of dryers such as tunnel dryer, rotary fish meal dryer and electrical fish dryer for cottage scale operation
- ❖ Designs of deep fat fryer, cutlet moulding machine, inboard/outboard drive, electro thermal smoke kiln, mechanized processing table and mechanical fish cleaner for sprats
- ❖ Fuel efficient propeller for fishing vessels
- ❖ Other fuel saving devices such as propeller nozzle
- ❖ Biogas plant from water hyacinth
- ❖ Fishing accessories including trawl winch, power take-off clutch and gurdy





- ❖ Refrigerated sea water plant of 150 kg capacity
- ❖ Design of shark liver oil/fish oil plant to handle 1000 kg raw material per day
- ❖ Specific requirements in setting up fish processing plants
- ❖ Electronic instruments for application in fishing technology, fish processing technology, aquaculture, marine environmental monitoring, agricultural investigations etc.
- ❖ Improved methods for freezing, freeze drying, canning, drying and curing different types of fish and shellfish
- ❖ Hygienic drying of anchoviella on raised platform
- ❖ Cleaning schedules for fish processing establishments and boat decks and preparation of deodorant and antiseptic ointment
- ❖ Methods for production of value added products such as wafers, pickles and soup powder from fish/shellfish
- ❖ Ready-to-use isinglass from fish maws
- ❖ Chlorine level indicator paper for instant reading of chlorine level in water used in fish processing plants
- ❖ Design of effluent treatment plant
- ❖ Specifications for various types of seafood, process water and ice
- ❖ Procedure for implementation of HACCP
- ❖ Methods for extraction of Chitin/Chitosan from prawn shell waste and their application in textile and poultry industry and in the medical field
- ❖ Method for extraction of shark fin rays and processing shark cartilage
- ❖ An 18 h depuration method to eradicate pathogenic bacteria and grit from bivalves, especially clams and mussels
- ❖ High gel strength agar from sea weeds
- ❖ Improved packaging materials for transportation and storage of fish
- ❖ Production of retort pouch packed fish products
- ❖ Collagen-Chitosan film from fish skin, bone and air bladder for treatment of burns and as a material in guided tissue regeneration (GTR) in dentistry
- ❖ Fine grade absorbable surgical sutures from fish gut
- ❖ Bacteriological culture media for, 1) direct detection and enumeration of the potent spoiler bacterium *Alteromonas putrefaciens*, and 2) estimation of total plate count of cured/semi preserved/salted fishery products by preventing swarming of *Bacillus* sp.
- ❖ Polymerase Chain Reaction (PCR) technique for detection of white spot disease syndrome in farmed shrimp
- ❖ Method for isolation of squalene from shark liver oil for use in cosmetics
- ❖ Method for preparation of n-3 poly unsaturated fatty acid (PUFA) concentrates from fish oils
- ❖ Device for drawing uniform samples from frozen fish blocks for microbiological evaluation





Outreach Programmes Conducted

Reply to technical queries

Queries continued to be received from various quarters of the country as well as abroad on topics related to harvest and post harvest technology of fish, training programmes, assistance in setting up production units etc. A total of 325 such queries were received during the year.

Exhibitions

The Institute participated in the following exhibitions during the period:

- ❖ Exhibition cum Sales Fest 2005, organized by Corporation of Calicut and District Industries Centre at Kandamkulam at Calicut (16-25 February 2005)
- ❖ Exhibition organized by Swadeshi Science Movement, in connection with Prithvi 2005 Global Eco Meet at Thiruvananthapuram (19-28 February 2005)
- ❖ Trade Fair 2005, organized by Ernakulam District Panchayat at Ernakulam (25 February – 2 March 2005)
- ❖ Exhibition in connection with SUSTAIN FISH 2005 – International Symposium on Improved sustainability and fish production systems and appropriate technologies, Cochin (16-18 March 2005)
- ❖ Fisheries Expo 2005 - Exhibition in connection with National Symposium on Management challenges in rivers and associated eco-systems – Issues and strategies, organised by CICFRI at Barrackpore (16-17 April 2005)
- ❖ AGRI INTEX 2005 (International Agricultural Exhibition), organized by CODISSIA (Coimbatore District Small Industries Association), TNAU and Sugarcane Breeding Institute, at Coimbatore (11-16 August 2005)
- ❖ Exhibition in connection with International Boat Show, at Cochin (30 September – 2 October 2005)
- ❖ Swasraya Bharath 2005, in connection with National Self Reliance Week celebrations, organized by Swadeshi Science Movement, Kerala at Cochin (14 – 20 October 2005) (was adjudged Best S & T stall)
- ❖ Science exhibition for Bharatheeya Vidya Niketan CBSE schools at Elamakkara, Ernakulam (7 November 2005)
- ❖ Exhibition held in connection with Golden Jubilee celebrations of Devagiri St. Joseph's College, Calicut (7-12 November 2005)
- ❖ FISHRIMP 2005 – exhibition organized as part of Seventh Indian Fisheries Forum, at Hebbal Campus of Karnataka Veterinary Animal Sciences and Fisheries University, Bangalore (9-11 November 2005)
- ❖ Agri Horti Industrial Exhibition 2005, organised by Alappuzha Zilla Agri-Horticultural Society, at Alleppy (22-28 December 2005)
- ❖ Annual Kumbalangi Fest, organized by Kumbalangi Model Tourism Development Society (KMTDS) at Kumbalangi (30 December 2005-1 January 2006)





Dr. Mangala Rai, DG and Dr. S. Ayyappan, DDG (Fy), ICAR in CIFT stall at CICFRI exhibition



Tamil Nadu Minister visiting CIFT stall at CODISSIA



CIFT stall in India International Boat Show



Sri Lankan Minister visiting CIFT stall at CODISSIA



Swasraya Bharath - 2005



School children visiting CIFT stall at Devagiri St. Joseph's College





Production of video films

The following video films were produced during the period:

- ❖ 'Convenience foods from fish'
- ❖ 'HACCP implementation in food processing plants'

Radio talks

The following radio talks were broadcast during the period:

- ❖ Hook and line fishing methods of Visakhapatnam coast (in Telugu)
- *Dr. G. Rajeswari*
- ❖ Fishermen training – role of CIFT (in Telugu) - *Dr. G. Rajeswari*

TV telecast

- ❖ Coverage of activities of Burla Research Centre by ETV

Academic activities

Classes were taken for participants of refresher courses, training programmes and students of educational institutions in which the Scientists and Technical staff of the institute, both at the Headquarters and Research Centres actively participated. A number of students are also carrying out their dissertation work on various topics related to fishing and fish processing under the supervision of Scientists of the Institute.

Agricultural Technology Information Centre

The Agricultural Technology Information Centre (ATIC) serves as a single window system with an objective to help both the farmers and stake holders to provide solution to their problems and make available all technological information along with technology products for their testing and use. The Centre provides on-the-spot display of the latest available technologies for all groups of people including traditional users and those in search of new technologies for new ventures. It covers all technologies related to harvest and post harvest technology of fish and related aspects. A large number of students, farmers and other stake holders from the fishery industry visited ATIC during the period for the facilities such as:

- ❖ Training
- ❖ Diagnostic services
- ❖ Purchase of fishery products
- ❖ Purchase of publications
- ❖ Advisory services



Visitors from AIMS, Cochin in ATIC





Post Graduate Programme

Scientist-In-charge : Dr. Jose Joseph, Principal Scientist
Member, P.G. Cell : Dr. T.V. Sankar, Senior Scientist

M. F. Sc. students of 2003-2005 batch had appeared for the final examination in August 2004 and all of them secured very good grade. The outgoing students and their Overall Grade Point Average are given below:

Kum. S. Tanuja : 8.87

Shri Chintu M. Raju : 8.25

Shri K.V. Anoop : 8.13

Kum. S. Tanuja received the gold medal for the best student in Post Harvest Technology. The 2004-2005 batch of M. F. Sc. students joined CIFT in March 2005 for their Second Semester after completing their First Semester at CIFE, Mumbai. After completing their Second Semester in August 2005, they did their dissertation during September 2005 to February 2006. The area of research and the major advisor/guide of each student are as follows:

Name of student	Topic of research	Major advisor/Guide
Shri Abbas A. Rahim	Studies on the effect of hydrocolloids on functionality of batter coating systems	Shri A.C. Josep
Kum. V.R. Devi	Solubility and functionality of fish protein as affected by ionic strength	Dr. T.V. Sankar
Kum. Maja Jose	Studies on the occurrence of enterotocin producing <i>Enterococcus</i> species in fish and fishery products	Dr. Nirmala Thampuran
Shri T. Obulesu	Studies on the occurrence of enterotocin producing <i>Enterococcus</i> species in fish and fishery products	Dr. Nirmala Thampuran
Kum. B. Sanitha	Metabolic modification by β -glucan in <i>Penaeus monodon</i> (Fabricius) infected with white spot syndrome virus	Dr. Suseela Mathew
Kum. Trincy Rose Johns	Partial purification and comparative studies of characteristics of alkaline protienase from viscera of three different fishes	Dr. P.T. Mathew

The following scholars of Ph. D. 2002-2005 batch submitted their thesis. The details of their thesis are given below:

Name of student	Topic of research	Name of the guide
Smt. M. Rajalakshmi	Protein stabilizing and gel enhancing effects of chitosan on the myofibrillar protein concentrate from threadfin beam (<i>Nemipterus japonicus</i>)	Dr. P.T. Mathew
Shri Jiten Sarma	Effect of cryoprotectants on biochemical and functional properties in common carp surimi, <i>Cyprinus carpio</i>	Dr. Jose Joseph





Smt. M. Rajalakshmi has become eligible for Ph. D. on 3 December 2005.

The following Ph. D. 2003-2006 batch students are in their third year and their Ph. D. work are in progress: Shri Arunkumar Mallick, Kum K.H. Sabeena Farvin, Shri A. Surendra Raj and Shri A.A. Zynudheen.

2004-2007 batch students started doing their Ph. D. work from November 2005 onwards. They completed the course work in the First and Second Semester. The grade point average obtained by them at the end of Second Semester are as follows : Shri C.O. Mohan – 8.08, Kum. Sneha Susan Simon – 7.77.

The area of work and the names of the Chairman of the 2004-2007 batch Ph. D. students are given below:

Name of student	Topic of research	Name of the Chairman
Shri C.O. Mohan	Shelf-life extension of fishery products by active packaging methods – O ₂ scavenger, CO ₂ emitter and antimicrobial packaging	Dr. C.N. Ravishankar
Kim. Sneha Susan Simon	Ecology of psychrotrophic pathogens in packed refrigerated seafoods	Dr. K.V. Lalitha

Two students (2004-2007 batch), Kum. S. Tanuja and Shri I.P. Lakshmisha joined for Ph. D. during October 2005.

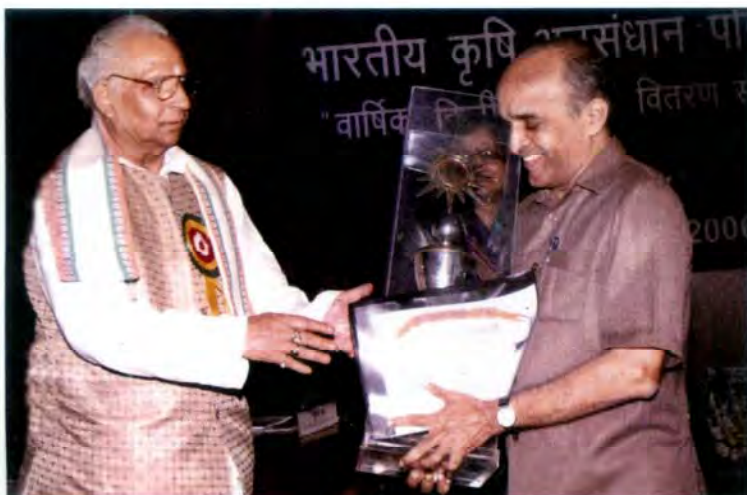
Analytical Services

The Headquarters and Research Centres of the Institute undertook testing samples of different types of raw materials and products received from various organizations. State and Central Govt. Departments and entrepreneurs and issued reports on their quality. The samples tested included fresh and frozen fish and shellfish products, by-products, prawn larvae from hatcheries, swabs from processing tables and workers' hands, chemicals, salt, water, ice, packaging materials etc. A total of 1780 such samples were tested during the year. Type testing of marine diesel engines was also carried out and performance certificates issued to the concerned manufacturers in addition to calibration of 72 nos. of mercury, alcohol and digital thermometers received from different fish processing plants and the industry.

Awards/Degrees/Recognitions

- ❖ Smt. Suseela Mathew, Scientist (SG), was awarded Ph. D. in Fish Processing Technology from the Central Institute of Fisheries Education, Mumbai. She carried out research on the 'Biochemical changes associated with white spot viral infection in tiger prawn' under the guidance of Dr. K. Devadasan, Director, CIFT.
- ❖ Smt. G. Usharani, Technical Assistant (T-4), was awarded Ph. D. in Marine Biology by the Annamalai University for her thesis titled 'Distribution of heavy metals in the Cochin estuary (south-west coast of India) and their effect on mud crab (*Scylla serrata* (Forsk.) (Decapods: Crustacea)'. She carried out her studies under the guidance of Dr. S. Ajmal Khan, Professor, CAS in Marine Biology, Annamalai University and Dr. V.K. Pillai, Principal Scientist & Head (Retd.), FEM Division, CMFRI, Cochin.





Dr. K. Devadasan, Director receiving the Ganesh Sankar Vidyarthi Award from Shri Ratnakar Pandey



The award winning team (From Left: Shri S. Sabu, Shri T.R. Jibin Kumar, Dr. M.R. Boopendranath and Dr. P. Pravin)



Dr. Saly N. Thomas receiving the award from Shri Sharad Pawar, Union Minister for Agriculture

❖ Shri M. Baiju, Technical Officer (T5), was awarded Ph. D. by the Cochin University of Science and Technology, Cochin, for his thesis titled 'A study on the riverine fishing gears of central Kerala' under the guidance of Prof. (Dr.) C. Hridayanathan, former Director, School of Industrial Fisheries, CUSAT, Cochin.

❖ Jaladhi – the in-house journal of the Institute in Official Language - was the first recipient of the prestigious Ganesh Sankar Vidyarthi Agricultural Journal in Hindi Award instituted by ICAR. This was the first award for a Hindi House Journal.

❖ A paper entitled 'Group farming for sustainable aquaculture' authored by Krishna Srinath, Manpal Sridhar, P.N.R. Kartha and A.N. Mohan and published in the journal Ocean and Coastal Management was nominated for the NAGA Award 2004 instituted by the World Fish Center, Malaysia.

❖ A research team from the Institute comprising Dr. M.R. Boopendranath (Principal Scientist), Dr. P. Pravin (Sr. Scientist) and two Senior Research Fellows, Shri T.R. Gibin Kumar and Shri S. Sabu were awarded the International Smart Gear Award-2005 instituted by the WWF (World Wildlife Fund) under the category Other non target species (including fish). The award was conferred for the development of a fishing device that provides facilities for escapement of juvenile fish and shrimp sorting in bottom operated commercial shrimp trawl nets. Dr. Boopendranath received the award on behalf of the team, at a function held at Washington on 21 April, 2005.

❖ Dr. Saly N. Thomas, Sr. Scientist received the Jawaharlal Nehru Award for P.G. Agricultural Research 2004 instituted by ICAR. The award is given for the best Ph. D. thesis in fisheries. The work was on the 'Technological and operational aspects of gill nets of the Kerala coast'.

❖ A team comprising Dr. T.K. Srinivasa Gopal (Principal Scientist), Dr. C.N. Ravishankar (Sr. Scientist) and Smt. J. Bindu,





Scientist (Sr. Scale) received the K. Chidambaram Memorial Annual Award-2005 for outstanding work done on Development of value added fishery products in India. The award was conferred on the team by the Fisheries Technocrats Forum, Chennai at function held at Chennai on 14 May 2006.

ICAR Sports

The Institute participated in the ICAR Inter Zonal Sports Tournaments held at NDRI, Karnal during 25-30 September 2005. In the tournaments, Smt. M.V. Valsala of Calicut Rresearch Centre emerged as Athletics Champion (Women). She stood first in 100 M and 200 M running race, Long jump and Javelin throw. Smt. Valsala has become the ICAR Champion for the 5th time.



Smt. M.V. Valsala, the Athletics Champion (Women)

Patents Obtained/Filed/Under Filing

Patents obtained

- ❖ Antifouling paints for ship bottom – *A.G.G.K. Pillai, K. Ravindran & R. Balasubramanyan*
- ❖ Production of absorbable fine grade surgical sutures from fish gut collagen – *M.K. Mukundan, P.D. Antony & K. Devadasan*

Application for patents filed with Patent Authority

- ❖ Development of collagen based membrane for periodontal application – *M.K. Mukundan, Suseela Mathew & T.V. Sankar*
- ❖ Fibreglass sheathed rubber wood canoe - *Leela Edwin & B. Meenakumari*
- ❖ Fishing canoes from treated rubber wood - *Leela Edwin, Saly N. Thomas & B. Menakumari*
- ❖ Shelf stable fish sausages in indigenous synthetic casings - *C.N. Ravishankar, T.K. Srinivasa Gopal, K.G. Ramachandran Nair & K. Devadasan*
- ❖ Ready-to-serve pearl spot moilee in retortable pouches - *T.K. Srinivasa Gopal, C.N. Ravishankar, K.G. Ramachandran Nair & K. Devadasan*
- ❖ Process for the production of high bulk density Chitosan - *K.G. Ramachandran Nair, George Ninan & P.T. Mathew*
- ❖ Mesh gauges : A devise for easy measurement of fishing net mesh size - *U. Sreedhar*
- ❖ A package of practice for improving the bacterial quality and food safety of farmed freshwater scampi (*Macrobrachium rosenbergii*)- *K.V. Lalitha & P.K. Surendran*
- ❖ Production of edible fish powder from small bony fish by thermal processing using perforated Aluminium trays – *A.K. Chattopadhyay, B. Madhusudana Rao, Sibsankar Gupta & R. Chakraborti*





Application for patent under filing

- ❖ Rapid test kit for identification of white spot disease and stress in shrimps - *Suseela Mathew, K. Ashok Kumar, R. Anandan, P.G. Viswanathan Nair & K. Devadasan*
- ❖ A process for the production of high purity Glucosamine hydrochloride from shrimp shell waste - *K.G. Ramachandran Nair, K.A. Martin Xavier & K. Devadasan*
- ❖ Isolation of squalene from shark liver oil - *T.K. Thankappan*
- ❖ A shell bead nucleus production system - *P.N. Joshi*
- ❖ A molluscan shell cutting system - *P.N. Joshi*
- ❖ Micro algae concentration monitor - *K. Vijayabharathi*
- ❖ A tunnel fish drier – *P.N. Joshi*
- ❖ Water activity meter - *K. Vijayabharathi*
- ❖ Effluent treatment system for seafood processing plants – *M.K. Mukundan, K. Ashok Kumar & M. Nasser*
- ❖ Package of practices for pathogen free chilled fish for export - *M.K. Mukundan, K. Ashok Kumar, P.R.G. Varma & Francis Thomas*
- ❖ Collapsible fish trap - *M.P. Remesan, P. Pravin, P. George Mathai & B. Meenakumari*
- ❖ Collapsible lobster trap - *P. Pravin & B. Meenakumari*

Interaction and Linkages

Local Institutions in the area other than ICAR Institutes

- ❖ Marine Products Export Development Authority
- ❖ Export Inspection Agency
- ❖ Naval, Physical and Oceanographic Laboratory
- ❖ Fishery Survey of India
- ❖ National Institute of Oceanography
- ❖ Central Institute of Fisheries Nautical Engineering and Training
- ❖ Matsyafed
- ❖ Integrated Fisheries Project
- ❖ Kerala State Pollution Control Board

National Institutions and Agricultural Universities

- ❖ Agricultural Universities
- ❖ Ministry of Agriculture
- ❖ Ministry of Food Processing Industries
- ❖ Department of Ocean Development
- ❖ Department of Biotechnology
- ❖ Department of Science and Technology





- ❖ Department of Electronics
- ❖ Indian Institute of Technology, Chennai/Kharagpur
- ❖ State Fisheries Departments
- ❖ Union Territory of Lakshadweep
- ❖ Kerala Water Authority
- ❖ ICAR Institutes
- ❖ Science and Technology Entrepreneurship Development Project (STED)
- ❖ Bureau of Indian Standards
- ❖ Industries Department, Andaman & Nicobar Administration
- ❖ Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram
- ❖ Fisheries College, Mangalore

International Institutions

- ❖ Natural Resources Institute (NRI), U.K.
- ❖ Food and Agriculture Organization (FAO), Rome
- ❖ Bay of Bengal Programme (BOBP)
- ❖ Asia Pacific Fisheries Commission (APFC)
- ❖ University of Bristol (U.K.)
- ❖ INFOFISH

Extension and Development Agencies

- ❖ Central Social Welfare Board
- ❖ Kannur District SC/ST Women Industrial Fish Products Manufacturing Co-operative Society Ltd.
- ❖ South Indian Federation of Fishermen Societies (SIFFS), Thiruvananthapuram
- ❖ Amala Mahila Samajam, Puthuvypu, Cochin
- ❖ AFPRD, Hyderabad
- ❖ Kanyakumari District Fishermen Sangam's Federation
- ❖ Madonna Rural Development Society, Kumarakom
- ❖ Centre for Research and Training in Poverty Alleviation and Women Welfare (CRATPAW), Cochin
- ❖ Centre for Management Development, Thiruvananthapuram
- ❖ Bharat Sevak Samaj, Thiruvananthapuram
- ❖ Small Industries Development Bank of India (SIDBI)
- ❖ Matsya Mahila Vedi, Chellanam
- ❖ Alleppey Diocesan Charitable and Social Welfare Society, Alleppey
- ❖ Vanitha Matsya Thozhilali Bank, Neendakara
- ❖ Kerala Industrial and Technical Consultancy Organisation (KITCO)
- ❖ Avani Agro Society, North Paravur, Ernakulam
- ❖ Common Facility Service Centre, Changanacherry
- ❖ Kerala State Women's Development Corporation Ltd., Thiruvananthapuram





- ❖ Chellanam Panchayat SC/ST Co-operative Society
- ❖ Fishermen Youth Welfare Association, Gangavaram P.O., A.P.
- ❖ Development Action through Self Help Network (DARSHN)
- ❖ Agency for Development of Aquaculture in Kerala (ADAK)

Technical guidance/Consultancy

Technical guidance/consultancy on various topics related to the fishery industry were offered to interested entrepreneurs as shown below:

Name of the party	Consultancy offered/taken-up
M/s Forstar Instafoods Division of Forstar Frozen Foods Pvt. Ltd. Taloja, Navi Mumbai - 410 208	Technical guidance and assistance relating to HACCP implementation, advice and certification of their curry packing unit
M/s Anns' House of Sweets Cathedral Church Road Pala - 686 575	Retort pouch technology for production of ready-to-serve fish products
Department of Animal Husbandry Govt. of Kerala	Assistance in modernisation of livestock and marine products inspection-cum-certification laboratory at Ernakulam
Kerala Livestock Development Board Mattupetty	Technical guidance and assistance relating to HACCP certification
M/s Prismack Biotechnics Ltd. Eluru P.O. Guntur Dist., A.P. - 522 124	Production of fishmeal and oil
Administration of U.T. of Lakshadweep	Design and supervision of construction of 50 passenger boats for inter-island transport at Lakshadweep
M/s Himalaya Fisheries, 216, Viswadeep Building, District Centre, Janakpuri, New Delhi	Production of value added fishery products



Consultancy to M/s. Anns' House of Sweets



Consultancy to Department of Animal Husbandry, Govt. of Kerala





Consultancy to Kerala Livestock Development Board



Consultancy to M/s. Prismack Biotechnics Ltd.

Committies

Grievance Cell

Chairman: Dr. K. Devadasan, Director, CIFT

Members:

Dr. K.G. Ramachandran Nair, Head, Division of FP
Sr. Administrative Officer

Asst. Finance and Accounts Officer

Dr. T.K. Thankappan, Principal Scientist

Shri P.A. Josi Augustine, T-4

Shri P. Mani, UDC

Shri T.A. Gopalakrishnan, Bearer (Auxiliary)

Shri V. Deepak Vin, SSG III

Nominated Member Secretary

Smt. M.A. Prasanna, Asst. Admn. Officer

Research Advisory Committee

Chairman: Dr. K. Gopakumar

Former DDG (Fisheries)

28/863, Cheruparambath Road

Cochin - 682 020

Members:

Prof. P.K. Salian, Former Director

C/o Shri Rakesh Salian

301 Kristal Amber Apartment

7th Main-14th Cross

B.T.M. 2nd Stage, Bangalore - 560 076



RAC meeting in progress



RAC members inspecting the Solar Tunnel Dryer





Dr T.S.G. Iyer,
Former HOD, Fish processing
Patteri Madh, Boys High School Road
Tripunithura - 682 301

Dr. R.P. Kachroo
Former ADG (Engineering)
303, D.K. Railbow Chuna Bhattu
Kolar Road, Bhopal - 462 016 (MP)

Dr. Anil Kumar Tyagi
Professor of Biochemistry

Department of Biochemistry
South Delhi Campus
Delhi University, Delhi

Prof. B.P.N. Singh (Retd.)
FIE, FNAAG, A-1555
Indira Nagar, Lucknow - 226 016

Member Secretary

Dr. P.K. Surendran
Principal Scientist, CIFT

Management Committee

Chairman: Dr. K. Devadasan, Director, CIFT

Members:

Dr. M.P. Dileep
Project Director
Kerala Reservoir Fisheries Development Project
Fisheries Complex
Dr. Salim Ali Road
Cochin - 682 018

Director of Fisheries
Govt. of Tamil Nadu
Administrative Office Buildings
DMS Complex
Teynampet, Chennai - 600 006

Dr. D.D. Namboodiri
Dean, Faculty of Fisheries
Kerala Agricultural University
College of Fisheries
Panangad P.O.
Cochin - 682 506

Dr. A.D. Diwan,
Asst. Director General (M. Fy.)
ICAR, Krishi Anusandhan Bhavan II
Pusa Gate, New Delhi - 110 012

Shri Lal Phanindra Bhushan Pal
Vill & Post Ahra, Dist. Basti
Uttar Pradesh

Shri S. Somnath Pillai
TC 13/287(4), ENS Nagar
Pattoor, Vanchiyoor P.O.
Thiruvananthapuram

Sr. Finance & Accounts Officer
CMFRI, Cochin - 682 014

Dr. Nirmala Thampuran
HOD, MFB, CIFT

Dr. P.N. Joshi
Head, Division of Engg., CIFT

Dr. P.T. Mathew
Principal Scientist, FP Division
CIFT

Dr. R. Sathiadas
Principal Scientist &
HOD, SEETID, CMFRI, Cochin - 682 018

Member Secretary

Sr. Administrative Officer, CIFT

Institute Joint Staff Council

Chairman: Dr. K. Devadasan, Director, CIFT

Members: (Official side)

Dr. K.G. Ramachandran Nair, HOD, FP
Dr. P.G. Viswanathan Nair, HOD, B&N
Dr. B. Meenakumari, HOD, FT
Shri A.C. Joseph, Principal Scientist
Shri K.S. Sreekumaran, AF&AO

Secretary: (Official side)

Shri K.P.S. Gautam, SAO

Members: (Staff side)

Shri K.U. Sheikh, T-5 (Technical Officer)
Shri V.S. Ambasuthan, UDC
Shri K. Das, UDC
Shri C.D. Parameswaran, SSG-III
Shri T.D. Bijoy, SSG-II

Secretary: (Staff side)

Shri P.S. Nobi, T-1-3





Participation in Training Programmes

Sl. No.	Name(s) of participant(s)	Training attended	Venue and date
1	Dr. G. Rajeswari	Winter School on Remote sensing and GIS applications in fisheries research and management	CIFE, Mumbai 5 - 25 January 2005
2	Dr. M.K. Mukundan Dr. P.N. Joshi Smt. J. Bindu (as resource persons)	Winter School on Recent advances in mussel and edible oyster farming and marine pearl production	CMFRI, Cochin 11 - 31 January 2005
3	Shri V.R. Madhu	Developing potential fishing zones from satellite derived data	SAC, Ahmedabad 17 - 20 January 2005
4	Shri P.T. Sebastian	Effective technical assistance in management of agricultural research	NAARM, Hyderabad 3 - 9 February 2005
5	Shri V. Radhakrishnan Nair Shri M. Baiju	Introduction to ARCGIS software	NIIT GIS Ltd., Bangalore 14 - 18 February 2005
6	Dr. Toms C. Joseph Dr. B. Madhusudana Rao	Molecular techniques for genome analysis and gene mapping	NBAGR, Karnal 16 - 25 February 2005
7	Shri Moka Swamy Kumar (as resource person)	Introduction of gill nets and monolines for large pelagics	Agatti, Lakshadweep 24 February 2005
8	Dr. P.T. Lakshmanan	Certificate course on Industrial water treatment and conservation	NCTD, Pune 4 - 6 March 2005
9	Shri S.P. Damle (as resource person)	MPEDA extension programme for pre-processing and processing factory workers	Mumbai 21 - 24 March 2005
10	Dr. G. Rajeswari Dr. R. Raghu Prakash	Awareness programme on FADs	Pudimadaka 3 April 2005
11	Smt. J. Bindu Shri K.A. Martin Xavier	Sensory analysis of processed foods by sensory and instrumental methods	CFTRI, Mysore 18 - 20 April 2005
12	Dr. Saly N. Thomas Shri P. Muhamed Ashraf	Chemometric software	Bangalore 27 April 2005
13	Dr. T.V. Sankar	Assessor training course	NABL, New Delhi 2 - 5 May 2005
14	Smt. K. Vijayabharathi	Temperature calibration and uncertainty calculation	FCRI, Kanjikode 30 - 31 May 2005
15	Smt. J. Bindu	Texture analysis of processed foods by sensory and instrumental methods	CFTRI, Mysore 1 - 3 June 2005
16	Shri J. Charles Jeeva	Refresher course on Information technology in agriculture	NAARM, Hyderabad 1 - 21 June 2005





17	Dr. M.K. Mukundan Dr. K. Ashok Kumar (as resource persons)	Testing quality of fresh fish and shellfish	Cochin 20 July 2005
18	Dr. M.K. Mukundan Dr. K. Ashok Kumar (as resource persons)	Hygiene and sanitation for food handlers and processors (in connection with birth centenary conference of J.R.D.Tata)	Cochin 9 August 2005
19	Dr. A.R.S. Menon	Management development programme on Performance assessment of agricultural research organizations	NAARM, Hyderabad 20 - 24 September 2005
20	Shri V. Radhakrishnan Nair	Refresher course on Probability, stochastic processes and applications	CUSAT, Cochin 26 September - 7 October 2005
21	Shri C.K. Suresh	Testing and evaluation of packaging materials and packages	CFTRI, Mysore 3 - 7 October 2005
22	Dr. Nikita Gopal Dr. V. Geethalakshmi (as resource persons)	Training of Field investigators for All India Co-ordinated Research Project on post harvest losses	Kelappaji College of Agrl. Engg. & Technol., Tavanur 5 October 2005
23	Shri P. Muhamed Ashraf Dr. L.N. Murthy	Winter School on Modern techniques for fish and fish products	CIFT, Cochin 19 October - 8 November 2005
24	Dr. K.V. Lalitha Dr. Nikita Gopal Dr. V. Geethalakshmi	Winter School on Current trends in packaging of fish and fishery products	CIFT, Cochin 17 November - 7 December 2005
25	Shri K.D. Jos Shri C. Subhash Chandran Nair	Managing video production	NAARM, Hyderabad 22 November - 3 December 2005
26	Shri K.S. Sreekumaran Smt. M.A. Prasanna	Improving administrative efficiency and financial management	NAARM, Hyderabad 2 - 9 December 2005

Visits Abroad

Dr. M.R. Boopendranath, Principal Scientist visited Washington on 21 April 2005 to receive the International Smart Gear Award - 2005 under the category Other non-target species (including fish) instituted by the WWF (World Wildlife Fund). He represented a team of four researchers from the Institute comprising himself, Dr. P. Pravin (Sr. Scientist) and two Sr. Research Fellows, Shri T.R. Gibin Kumar and Shri S. Sabu. The award was conferred for the development of a fishing device that provides facilities for escapement of juvenile fish and shrimp sorting in bottom operated commercial shrimp trawl nets.





Participation in Symposia/Seminars/ Workshops etc.

Sl. No.	Name(s) of participant(s)	Symposia/Seminars/Workshops etc. attended	Venue and Date
1	Smt. R. Thankamma Smt. J. Bindu	National Workshop on Women friendly technologies	Cochin 20 - 22 January 2005
2	Dr. Krishna Srinath Dr. G.R. Unnithan Dr. Nikita Gopal Dr. V. Geethalakshmi Shri V. Radhakrishnan Nair	58th Annual Conference of Agricultural Statistics and Symposium on Fishery statistical systems in India	CMFRI, Cochin 20 - 22 January 2005
3	Smt. J. Bindu	Seminar on Rural enterprises for processing of marine products	Cochin 31 January 2005
4	Dr. T.K. Srinivasa Gopal (as resource person)	Entrepreneurship development programme	Cochin 1 February 2005
5	Dr. Nikita Gopal	Workshop on Diversification of labour and income as well as possibilities of fish processing and marketing cooperatives in fisheries	Cochin 5 February 2005
6	Dr. M.K. Mukundan Dr. G.R. Unnithan Dr. Nikita Gopal Dr. V. Geethalakshmi Dr. P.T. Lakshmanan	Seminar on Understanding anti-dumping	Cochin 7 February 2005
7	Dr. K. Sobha	Workshop on Skill enhancement	KSPC, Kalamassery 9 February 2005
8	Shri J.K. Bandyopadhyay (as resource person)	Workshop on Hygienic fish handling and preparation of value added fish products	Amaranga 15 February 2005
9	Dr. K.G. Ramachandran Nair Dr. Krishna Srinath Shri Sibsankar Gupta Dr. T.K. Thankappan Shri J.K. Bandyopadhyay Shri J. Charles Jeeva	North east regional workshop on Hygienic fish handling and preparation of value added fish products	Guwahati 15 - 16 February
10	Shri P. Shankar	Regional Official Language Workshop	Bangalore 15 - 16 February 2005
11	Dr. K. Devadasan	7th Agricultural Science Congress of NAAS	Pune 16 - 17 February 2005
12	Dr. P.N. Joshi	International Seminar on Non-conventional energy, renewables, energy efficiency and conservation	Thiruvananthapuram 20 - 21 February 2005





13	Dr. A.R.S. Menon	International Seminar on Sustainable agriculture	Thiruvananthapuram 20 - 21 February 2005
14	Dr. S. Balasubramaniam	National Seminar on Extension pluralism for rural development	TNAU, Coimbatore 25 - 26 February 2005
15	Dr. P.K. Surendran Dr. Toms C. Joseph	Indo-Australian Conference on Biotechnology in infectious diseases	KMC, Manipal 1 - 3 March 2005
16	Dr. Nikita Gopal	Workshop on Strategies and preparedness for trade and globalization in India with regard to fisheries sector	Cochin 4 March 2005
17	Dr. K. Ashok Kumar	Workshop on Uncertainty of measurements	CIPET, Bhubaneswar 6 - 7 March 2005
18	Smt. R. Thankamma	Symposium on Women - Designing new careers	Cochin 8 March 2005
19	Shri S.S. Gupta Dr. G. Rajeswari Dr. R. Raghu Prakash Shri U. Sreedhar	Seminar on Sashmi grade Tuna	MPEDA, Visakhapatnam 9 March 2005
20	Dr. A.R.S. Menon	Workshop for Nodal Officers of Personnel Information Management System Network (PERMISnet)	IASRI, New Delhi 15 March 2005
21	Dr. Krishna Srinath Dr. P.K. Surendran Dr. M.R. Boopendranath Shri P.R.G. Varma Dr. Nirmala Thampuran Dr. K.V. Lalitha Dr. T.V. Sankar Dr. C.N. Ravishankar Dr. Saly N. Thomas Smt. J. Bindu Dr. Nikita Gopal Dr. V. Geethalakshmi Shri M.P. Remesan Dr. Toms C. Joseph Shri George Ninan Dr. Sanjoy Das Shri A.A. Zynudheen Smt. Ancy Sebastian Shri K.A. Martin Xavier Shri S. Sabu Shri T.R. Gibin Kumar Shri Mukund Mohan Shri P. Sivaperumal Ms. Dhanya Ramachandran Ms. O.K. Sindhu Shri Gipson Edappazham	SUSTAINFISH 2005 - International Symposium on Improved Sustainability of fish production systems and appropriate technologies for utilization	Cochin 16 - 18 March 2005





22	Smt. Mary Thomas Dr. Leela Edwin Shri George Ninan Shri J. Charles Jeeva Dr. Jessy Joseph	National Workshop on Creative writing in science and technology for media	CUSAT, Cochin 18 - 19 March 2005
23	Shri V. Radhakrishnan Nair	Second meeting of the inter-institutional network programme on Development of farmer/fishermen friendly technology information base	CIBA, Chennai 7 - 8 April 2005
24	Shri Santhosh Alex Shri P. Shankar	National Seminar on Hindi and translation in media	Hyderabad 21 - 23 March 2005
25	Shri P.K. Vijayan	Workshop on the area investors	Malappuram 15 April 2005
26	Dr. M.M. Prasad Shri M.P. Remesan	National Seminar on Management challenges in rivers and associated eco-systems - Issues and strategies	CIFRI, Barrackpore 16 - 17 April 2005
27	Dr. P.N. Joshi	International Workshop on Entrepreneurship development in the renewable energy sub-sector in Asia (organized by Institute of Small Enterprises and Development)	Cochin 19 - 20 April 2005
28	Dr. K. Devadasan Dr. B. Meenakumari Dr. P. Pravin Shri M.V. Baiju	Workshop on Road map for developing fisheries in Andamans	CMFRI, Cochin 20 - 21 April 2005
29	Dr. B. Meenakumari Dr. Leela Edwin	36th Annual Conference of the International research group on wood protection, Stokoholm, Sweden	IIWS, Bangalore 24 - 28 April 2005
30	Dr. K.G. Ramachandran Nair	Brain storming session on Development of processing and value addition in freshwater fishes	GB Pant Univ. of Agri. & Technol., Pantnagar 25 April 2005
31	Dr. K.G. Ramachandran Nair	National Seminar on Food quality and safety standards of agricultural raw and processed produce	New Delhi 26 - 27 April 2005
32	Dr. P.T. Mathew Dr. S. Sanjeev Dr. T.V. Sankar Dr. C.N. Ravishankar Dr. Leela Edwin	Capacity building Workshop on Globalized agricultural economy	NAARM, Hyderabad 29 - 30 April 2005
33	Dr. G.R. Unnithan	National Consultation on marine fisheries	Visakhapatnam 2 - 3 May 2005
34	Shri P. Mohd. Ashraf Smt. Usha Bhagirathan	Kerala Environmental Congress	Cochin 6 - 7 May 2005





35	Shri J. Charles Jeeva Shri Rakesh Kumar	Seminar on Disease management	Cochin 8 May 2005
36	Dr. K. Sobha (as resource person)	Hindi Workshop (organized by Customs and Central Excise)	Cochin 16 May 2005
37	Dr. B. Meenakumari	Technical Workshop (organized by West Hill Polytechnic, District Industrial Centre and Theeradesha Raksha Social Welfare Society)	Calicut 11 June 2005
38	Shri K. George Joseph	Seminar on Marine satellite information system (MARSIS)	Calicut 11 June 2005
39	Dr. K. Sobha Shri P. Shankar	Inter-lingual Conference (organized by Sree Sankaracharya Univ. of Sanskrit, Kalady)	Kaladi 19 - 21 June 2005
40	Shri Santhosh Alex	Kabir Jayanti (organized by East Coast Railways)	Visakhapatnam 22 June 2005
41	Dr. K. Sobha (as resource person)	Hindi Workshop (organized by Cochin Shipyard)	Cochin 28 June 2005
42	Dr. K. Sobha (as resource person)	Hindi Workshop (organized by Export Inspection Agency)	Cochin 23 - 24 June 2005
43	Dr. K.G. Ramachandran Nair (as resource person)	Seminar on waste utilization	YMCA, Cochin 16 July 2005
44	Shri K. George Joseph	Seminar on Protection of fisheries sector and conservation of coastal zone	Mahe 17 July 2005
45	Dr. K. Sobha (as resource person)	Hindi Workshop (organized by Vijaya Bank)	Cochin 19 July 2005
46	Dr. M.R. Boopendranath Shri George Ninan	Seminar on Recent trends in mariculture	Kolencherry 19 - 20 July 2005
47	Shri Santhosh Alex	Seminar held in connection with Premchand Jayanti, East Coast Railways	Visakhapatnam 31 July 2005
48	Dr. B. Meenakumari Dr. Saly N. Thomas Shri M.V. Baiju	1st Planning Meeting of Integrated Perspective Plan for development of fisheries in Lakshadweep	CMFRI, Cochin 3 August 2005
49	Dr. K. Devadasan (inaugurated the function)	Workshop in connection with National Remote Sensing Day	CUSAT, Cochin 12 August 2005
50	Dr. S. Balasubramaniam	3rd Meeting of the Scientific Advisory Committee of Krishi Vigyan Kendra	CMFRI, Cochin 12 August 2005
51	Dr. P.N. Joshi	Workshop on Best practices in energy conservation	CPRI, Thiruvananthapuram 18 - 20 August 2005
52	Dr. Nirmala Thampuran (as resource person) Dr. Toms C. Joseph	National Seminar on Animal disease control strategies	Thiruvananthapuram 24 - 25 August 2005





53	Dr. Krishna Srinath Dr. M.R. Boopendranath Dr. K. Ashok Kumar Dr. V. Geethalakshmi Shri V. Radhakrishnan Nair Shri T.R. Gibin Kumar Shri S. Sabu	Seminar on IT@FISH	CMFRI, Cochin 1 - 2 September 2005
54	Dr. M.K. Mukundan Dr. P.T. Lakshmanan Shri. K P. Antony	Workshop on Food safety	Cochin 27 September 2005
55	Shri Sib Sankar Gupta	Workshop on Strategy and preparedness for trade and globalization with regard to fishing sector	Visakhapatnam 4 October 2005
56	Dr. P.T. Mathew Dr. P. Pravin	Brainstorming session on Disaster management in fisheries and aquaculture	ICAR, New Delhi 6 - 7 October 2005
57	Dr. K. Devadasan Dr. M.K. Mukundan Dr. P.K. Surendran	Seminar on Food production and processing	Cochin 15 - 20 October 2005
58	Dr. K.G. Ramachandran Nair	Seminar (organized by Rajagiri College of Social Sciences)	Kalamassery 22 October 2005
59	Dr. Krishna Srinath	Shastri Applied Research Programme Dissemination Workshop	CUSAT, Cochin 27 - 28 October 2005
60	Dr. P.K. Surendran Kum. O.K. Sindhu	XV Swadeshi Science Congress	Thalassery 5 - 7 November 2005
61	Dr. L.N. Murthy Shri S. Hari Senthil Kumar Shri S. Santhosh Shri Baiju John Shri Mukund Mohan Kum. Dhanya Ramachandran Shri P. Sivaperumal Shri K.A. Martin Xavier Shri Jyothish Barman Shri P.G. Sreenath Shri Deepajyothi Baruah Shri T.R. Gibin Kumar Shri Gipson Edappazham Shri S. Sabu Kum. O.K. Sindhu Shri M. Ajit Peter Kum. A. Sreeja Smt. Usha Bhagirathan Shri S. Santhosh	7th Indian Fisheries Forum	Bangalore 8 - 12 November 2005
62	Dr. S. Balasubramaniam	Workshop on Livelihood strategy under the Tsunami Assistance Emergency Project	Cochin 11 November 2005





63	Dr. P.T. Mathew	Meeting of ICAR Regional Committee No.7	Goa 18 - 19 November
64	Dr. K.G. Ramachandran Nair	Capacity development Workshop on Applying innovations systems concept to agricultural research	ICRISAT, Patancheru 22 - 24 November 2005
65	Dr. K.G. Ramachandran Nair Dr. P.T. Lakshmanan Shri V. Radhakrishnan Nair	National Workshop on Quality improvement of fisheries sector through professionals	Fisheries College, Panangad 24 - 25 November 2005
66	Shri P. Shankar	Regional Official Language Conference	Thiruvananthapuram 2 - 3 December 2005
67	Smt. Usha Bhagirathan Shri T.R. Gibin Kumar	National Workshop on Application of informatics in marine biodiversity conservation	NIO, Goa 5 - 7 December 2005
68	Dr. T.K. Srinivasa Gopal	Workshop on Value addition to foods, process engineering and product innovation	Bangalore 9 - 10 December 2005
69	Dr. M.K. Mukundan Dr. S. Balasubramaniam	Workshop on Consultancy and services sector: Challenges and prospects (organized by Consultancy Devt. Centre, New Delhi, in association with CII)	Cochin 19 December 2005
70	Dr. Nirmala Thampuran Dr. S. Balasubramaniam Dr. K.V. Lalitha Dr. Nikita Gopal Dr. V. Geethalakshmi Dr. Sanjoy Das Shri George Ninan	Seminar in Official Language on Harvest, post harvest and marketing of fish	Cochin 21 December 2005
71	Dr. M.M. Prasad	National Symposium on Environmental biotechnology and biodiversity conservation	Sambalpur 24 - 25 December 2005
72	Dr. P.N. Joshi	All India Energy efficiency capacity building programme	Kalamassery 27 - 29 December 2005
73	Dr. C.N Ravishankar (as resource person)	National Seminar on Better packaging for better foods	TNAU, Madurai 28 - 30 December 2005





Special Days and Events

National Science Day

The Visakhapatnam Research Centre observed National Science Day on 28 February 2005. The Centre was kept open to students as well as the general public. An exhibition was arranged in which photographs, specimens and models of various technologies developed were displayed. Students from two local colleges who visited the Centre were also exposed to the research activities being carried out at the Centre in which they showed great interest.



National Science Day at Visakhapatnam

The Veraval Centre also celebrated the Day on 21 February 2005. Talks were delivered on different topics related to fisheries and an exhibition organised. Two audio visual presentations, one on 'Fascinating world of fishes' and another on Albert Einstein, in commemoration of the International Year of Physics, were also arranged. A number of students from local schools as well as fishermen visited the Centre on the day.

International Women's Day

The Women's Cell at Cochin observed International Women's Day on 7 March 2005. The Chief Guest of the day, Hon'ble Justice (Retd.) Smt. Sreedevi gave a talk on 'Today's Women'.



Justice Sridevi delivering the talk

Release of publications

The following publications were released during the year:

- ❖ Handout on hygiene and sanitation in fish processing (released by Dr. K. Devadasan, Director, CIFT).
- ❖ Proceedings of Seminar on Sustainable fisheries development: Focus on Andhra Pradesh (released by Shri S. Chellappa, IAS, Principal Secretary (Fisheries), Govt. of Andhra Pradesh at a function held at Visakhapatnam on 31 August 2005). Shri J.V.H. Dixitulu, Editor, 'Fishing Chimes', received the first copy.



Shri Chellappa addressing the gathering





Dr. Mangala Rai, DG, ICAR launching ready to serve fish products



Dr. S. Ayyappan, DDG (Fy), ICAR inaugurating the fish kiosk



Shri Kallan Pokkoodan inaugurates 'Aayiram Kandal' programme

Product launch

Dr. Mangala Rai, Director General, ICAR launched the ready-to-serve fish products processed by M/s Forstar Insta Foods, Mumbai, under the technical guidance of CIFT, on 14 July 2005 at New Delhi.

Inauguration of kiosk

A fish kiosk for sale of value added fish products was set up at Azheekal, Vypeen, the village adopted by CIFT under its women empowerment programme. The kiosk which was launched by Dr. S. Ayyappan, DDG (Fy) on 19 January 2005, is being operated by members of Kumarandayogam Mahilasamajam as a Self Help Group activity. In addition to various seafood products, other food items are also being sold through the kiosk.

The kiosk was designed and developed by the Engineering Division of CIFT.

Planting of saplings

As part of the DST project 'Community based coastal zone management', planting of mangrove saplings, which will serve to protect the coastal belt from sea erosion, was inaugurated by Smt. Kusumam John, President, Chellanam Grama Panchayat, on 18 January 2005. Dr. S. Ayyappan, DDG (Fy), ICAR and Dr. K. Devadasan, Director, CIFT planted saplings on the occasion.

On 17th August 2005, an 'Aayiram Kandal' (Thousand mangroves) programme, jointly organized with the Chellanam Grama Panchayat, was inaugurated at Kandakadavu by the well known environmentalist Shri Kallan Pokkoodan under which about 1000 mangrove saplings were planted in different wards stretching along the coastline from Kandakadavu to South Chellanam. The women of the village actively participated in these programmes.

Aluminium craft launch

Shri P.M.A. Hakeem, Secretary, Ministry of Agriculture, Dept. of Animal Husbandry and Dairying, Krishi Bhavan, New Delhi launched the fishing craft made of Aluminium alloy developed by CIFT, at a programme held at Cochin on 20 August 2005. Dr. K. Devadasan, Director, CIFT presided over the function.





Light weight, corrosion resistance, toughness and resilience make Aluminium alloy a good material for construction of marine craft. This new material avoids expenditure on paints etc. and gives good resale value. A pioneer in this direction is 'Kayal', the prototype craft developed by the Institute which is of 5.20 m LOA and 1.10 m breadth, with a seating capacity for two. Trials carried out with this craft in the backwaters have given good results. Approximate cost of the boat, without engine, is Rs. 1,20,000/-.



Shri P.M.A. Hakeem launching the Aluminium craft

The prototype constructed by a leading metal works firm is under CIFT supervision.

CIFT Trainees' Hostel

The foundation stone laying ceremony/ Bhoomi Pooja of the CIFT Trainees' Hostel was held on 2 July 2005 at the CIFT Residential Campus. Dr. Mohan Joseph Modayil, Director, CMFRI, Cochin was the Chief Guest of the function.



Foundation stone laying ceremony of trainees hostel

Women in Agriculture Day

All the five Centers of CIFT and the Head Quarters celebrated 'Women in Agriculture Day' in the first week of December 2005. The Visakhapatnam Centre observed the Day on 3 December at Pedajalripeta village to create awareness about hygiene and sanitation among the fisherwomen. The Mumbai Centre arranged the programme on 3 December in a small fishing village named Uttan in Thane district. At the Burla Centre, an awareness programme was held on 4 December wherein two lady doctors addressed the women on the importance of nutritional diet and child care. The Calicut Centre arranged a training programme on Traditional and value added products from fish and shellfish during 5 - 9 December. The Veraval Centre observed the Day on 3 December where women workers from various fish processing plants were briefed about the importance of sanitation and hygiene in post harvest operations.



Women in Agriculture Day celebrations at Visakhapatnam

At Cochin 'Women in Agricultural Day' was observed on 3rd December at Chellanam. Fifteen fisherwomen participated in the programme in which field





Dr. E.G. Silas inaugurating the Winter School



Prof. K.V. Peter inaugurating the Winter School



Cancer screening camp in progress

visits and lectures were arranged on natural resources management, environmental pollution and waste disposal.

Winter Schools conducted

A Winter School on 'Modern techniques for the analysis of fish and fish products' was inaugurated on 19 October by Dr. E.G. Silas, former Vice Chancellor, Kerala Agricultural University. Twenty five scientists from ICAR institutes, other Central Govt. organizations, Veterinary Colleges, State Fisheries Departments etc. attended the Winter School which extended up to 8 November 2005. The Chief Guest of the valedictory function was Dr. K. Gopakumar, former DDG (Fy), ICAR, New Delhi.

Another Winter School on 'Current trends in packaging of fish and fishery products' which extended from 17 November to 7 December 2005 was inaugurated by Prof. K.V. Peter, Vice Chancellor, Kerala Agricultural University. Twenty seven participants from Agricultural Universities, Central Govt. organisations and State Departments of Fisheries all over the country participated in the Winter School which provided theoretical and practical training in current trends in packaging of fish and fish products. Prof. P.K. Abdul Aziz, Vice Chancellor, CUSAT, Cochin was the chief guest of the valedictory function.

Oral cancer screening camp

CIFT jointly with Amritha Institute of Medical Sciences, Cochin organized an oral cancer screening camp at Chellanam on 29 July 2005. A total of 492 persons attended the camp. Out of this 213 persons were found to have dental problems. About 10 cases of oral pre-cancers, two new cases each of oral cancer and recurrences of oral cancer were identified in the camp.





Administration

The Administration Section deals with recruitment, service and policy matters, discipline, staff welfare, land and building, procurment of stores, budget expenditure, settlement of claims etc.

During the period under report, the following Committees met for the purposes as shown below:

1. Departmental Promotion Committee : 5 times
2. Departmental Selection Committee : 10 times
3. Assessment Committee : 5 times
4. Career Advancement Committee : Once

Cases considered by the Departmental Promotion Committee

Category	Promotion	Declaration of probation	Confirmation
Scientific	2 cases	Nil	4
Technical	40 cases	Nil	Nil
Administrative	7 cases	Nil	6
Supporting	5 cases	Nil	1
Auxiliary	Nil	Nil	Nil

Staff position as on 31 - 12 - 2005

Category	Sanctioned	Filled
Scientific	101	69
Technical	143	132
Administrative	91	86
Supporting	86	84
Auxiliary	5	5
Total	426	376

Technical Section

The Technical Section monitored the following technical matters of the Institute during the reported period:

Compilation of Research Project Programmes document

The Research Project Programmes of the Institute for the year 2005-06 comprising of new projects, ongoing projects and summary of concluded projects were compiled as per the recommendations of the Project Advisory Committee and Research Advisory Committee and brought out for distribution to all HODs, SICs and Principal Investigators.





Preparation and submission of technical reports

Monthly reports on the important activities of the Institute, significant research findings, training programmes, seminars/symposia/workshops etc. conducted and attended by the staff, important policy decisions taken, information on new projects/programmes initiated, visit of officers abroad and visit of foreign delegates to the Institute, details of extension activities etc. were compiled and sent to ICAR regularly for inclusion in the ICAR monthly report to the Cabinet Secretariat.

Submission of quarterly feedback to DG, ICAR

Quarterly reports on targets and achievements of plan/non-plan expenditure, outstanding advances, infrastructural works carried out, research/development/technology and human resource development, extension activities and target for the following quarter are regularly compiled and furnished to ICAR.

The quarterly out-put, out-come report of all the fisheries research Institutes under ICAR such as CIFT, Cochin, CMFRI, Cochin, CIBA, Chennai, CIFE, Mumbai, CIFA, Bhubaneshwar, NRC on Cold Water Fisheries, Bhimtal and NBFGR, Lucknow were collected, compiled and forwarded to DG's Office.

Further, six monthly targets and achievements of all the individual scientists of the Institute were furnished to the Council for the periods ending January-June and July-December 2005.

Publication of scientific papers

The scientific papers including research notes, popular articles etc. for publication in journals and papers meant for presentation at Symposia/Seminars etc. received from scientists for approval of the Director were arranged to be presented before the Scrutiny Committee and approval of the recommended papers communicated.

Participation of scientists and others in Seminars/Symposia/Workshops/ Short term training courses

Requests for participation of scientists and others in various seminars, symposia, workshops and short term training courses were processed and papers routed through the Section.

Staff Research Council

Arrangements were made for conducting the Staff Research Council meeting on 26 June 2005 to review the progress achieved in the ongoing research projects of the Institute for the year 2004-05 and to discuss the research project proposals for the year 2005-06. Dr. A.D. Diwan, ADG (M. Fy), ICAR, attended the meeting as Council's representative. Shri A.C. Joseph, Principal Scientist acted as Member Secretary of the SRC.

Updating project files

Project Leaders' files of all ongoing research projects of the Institute were maintained up-to-date by collecting the consolidated Quarterly/Annual/Final reports from the concerned Principal Investigators for the relevant periods.

Publication of quarterly Fish Technology Newsletter

Four issues of Fish Technology Newsletter (bilingual) were published during the period.





PERMISnet

The Section helps in the maintenance of Personal Management Information System network of ICAR. The personal biodata of each and every staff member is computerized and updated every month and forwarded to IASRI, New Delhi through online.

Other technical matters

The Technical Section continued to answer queries on various technical matters received from other organizations and individuals. Matters related to awards/fellowships/tour reports of scientists and other staffs were regularly monitored. Further, material for ICAR News, ICAR Reporter, Agri-News, Fishing Chimes, MPEDA Newsletter, Seafood News and other journals were forwarded regularly, many of which have been published.

The Hindi translation work of the entire Institute is entertained by the Section.

The entire publicity related and extension oriented activities are regularly presented in the monthly meeting of Inter-Media Publicity Coordination Committee of Ministry of Information and Broadcasting, Govt. of India.

The Technical Section also functions as the Office for implementing Right to Information Act-2005 at the Institute.

Library

Acquisition

A total of 303 books were purchased by the Library during the year. A total of 35 Foreign and 40 Indian scientific periodicals were subscribed during the period. International Databases like ASFA (Aquatic Science Fisheries Abstracts), FSTA (Food Science and Technology Abstracts), Fish and Fisheries World Wide (NISCF&FWW), Food and Human Nutrition (FHN), Biotechnology Abstracts, Indian Standards on CD-ROM and Oceanic Abstracts have also been acquired. At present the library holds 10,363 books and 5,623 bound volumes of journals and 300 CD-ROMs.

Services

During the year 4,816 bonafide readers visited the Library and 1,867 books were issued and retrieved. Reprographic unit of the Library supplied copies of 6,00,000 pages of documents on requisition. CD-ROM based information access facility through LAN and access to J-gate have been provided. Issues of Current Contents were brought out fortnightly. The Library in association with NIO, Goa continued to act as a national input center of ASFA database.





Scientific/Technical Talks

Subject	Speaker	Venue and Date
New drug discovery to new drug application - Special reference to small molecules, biologics, new target identification and latest screening techniques	Dr. C.N. Ramchand Kemen Nutritional Technologies (India) Pvt. Ltd. Chennai	Cochin 11 January 2005
Role of HRD in scientific research	Ms. Hema Ravichander Sr. Vice President, HRD, Infosys Ltd., Bangalore	Cochin 10 February 2005
Nano Biotechnology for therapeutics: Some deliveries - A broad overview	Dr. Jayesh R. Bellare Prof., Dept. of Chemical Engineering, IIT, Mumbai	Cochin 17 June 2005
Emerging areas of research in fisheries	Dr. D. Dileep Kumar Director, CIFE, Mumbai & Dr. Madan Mohan Director, NRC on Cold Water Fisheries, Bhimtal	Cochin 9 December 2005



Director introducing Dr. Jayesh Bellare



Ms. Hema Ravichander delivering the talk

Representation in Committees

The following officials represented the Institute in various Committees/Board panels etc. in different capacities:

Dr. K. Devadasan, Director

As Expert Member

- Agricultural Services Recruitment Board





As Member

- Academic Council of CIFE, Mumbai
- Senate of Cochin University of Science and Technology, Cochin
- Extension Council of CIFE, Mumbai
- Governing Body of National Institute of Fisheries Administration and Management, Ernakulam
- Forum of Fisheries Professionals, Visakhapatnam

As Fellow

- National Academy of Agricultural Sciences (NAAS), New Delhi

Dr. K.G. Ramachandran Nair, Head, Fish Processing Division

As Member

- Departmental Promotion Committee, CMFRI, Cochin
- Committee for approval of M. Sc. Food Science, M.G. University, Kottayam

Dr. P.G. Viswanathan Nair, Head, Biochemistry & Nutrition Division

As Member

- Committee constituted by APEDA, New Delhi for purchase of advanced equipments for various laboratories
- Committees for modernization of Livestock products Inspection Laboratory, Cochin, Dept. of Animal Husbandry, Govt. of Kerala

Dr. M.K. Mukundan, Head, Quality Assurance & Management Division

As Principal Member

- Supervisory Audit Team for approving seafood exports to EU
- Bureau of Indian Standards Sectional Committee for formulation of standards for fishery products
- Bureau of Indian Standards Sectional Committee for formulation of standards for sanitation and hygiene in food processing units

As Member

- PRMC, TIFAC, New Delhi

Dr. S. Balasubramaniam, Head, Extension, Information & Statistics Division

As Member

- Committee on extension and training constituted by MPEDA

Dr. P.N. Joshi, Head, Engineering Division

As Member

- Committee constituted by MPEDA, Cochin for technical scrutiny of Subsidy Schemes to modernize the seafood processing industry in India
- Marine Engineering and Safety Aids Section Committee, Bureau of Indian Standards, New Delhi





- Expert Committee for scrutinizing the Global tender for the counter pressure retort at IFP, Cochin
- Scheme for providing assistance for installation of insulated fish hold onboard fishing vessels, MPEDA, Cochin

Dr. Nirmala Thmapuran, Head, Microbiology, Fermentation and Biotechnology Division

As Member

- Inter Departmental Panel of EIC of India, New Delhi

Dr. B. Meenakumari, Head, Fishing Technology Division

As Principal Member

- Textile Materials for Marine Fishing Purpose: Sectional Committee TX 18, Bureau of Indian Standards, New Delhi
- Expert Committee to look into the result and impact of trawl ban and conservation of existing fisheries wealth, Govt. of Kerala

Shri S.S. Gupta, Scientist-in-Charge, Visakhapatnam Research Centre

As Member

- Inter Departmental Panel for approval of fish processing plants in Andhra Pradesh, Orissa and West Bengal for export to EU

Dr. R. Badonia, Scientist-in-Charge, Veraval Research Centre

As Chairman

- Nagar Rajya Bhasha Karyanvayan Samiti (TOLIC), Veraval of the Dept. of Official Language

As Member

- Inter Departmental Panel of experts for approval of seafood processing plants for EU
- Consultative group of Porbandar Base of Fishery Survey of India
- Board of Studies, Junagadh Agricultural University, Junagadh

Shri D.K. Garg, Scientist-in-Charge, Mumbai Research Centre

- Consultative Committee of Mumbai Base of Fishery Survey of India

Shri K. George Joseph, Scientist-in-Charge, Calicut Research Centre

As Member

- Committee constituted by EIA for reassessment of technologists of EU approved FFP units
- Inter Departmental Panel for approval of fish processing plants for export to EU

Dr. P.T. Mathew, Principal Scientist

As Member

- Board of Studies in Food Technology, University of Calicut, Calicut





Dr. T.K. Srinivasa Gopal, Principal Scientist

As Member

- Sub group on 'National Food Policy' of Ministry of Food Processing, Govt. of India, New Delhi
- Collaborative project by MPEDA, CIFT and IFP on Upgradation of seafood packaging
- Assessment Committee for scientists, CFTRI, Mysore

Shri A.C. Joseph, Principal Scientist

As Member

- Supervisory Audit Team, Govt. of India for approval of fish processing establishments for export to EU
- Committee constituted by MPEDA, Cochin for scrutinizing applications for releasing subsidy for Flake/Chip/Tube ice making machines and refrigerated trucks/insulated transport containers

Dr. Jose Joseph, Principal Scientist

As Member

- Committee constituted by MPEDA, Cochin for scrutinizing applications for releasing subsidy for large cold storages

Shri P.K. Vijayan, Principal Scientist

As Member

- Staff Selection Committee of MPEDA, Cochin

Shri P.R.G. Varma, Principal Scientist

As Alternate Member

- Bureau of Indian Standards Committee of Hygiene and Sanitation
- Bureau of Indian Standards Section Committee for fish and fishery products

Dr. P.T. Lakshmanan, Principal Scientist

As Member

- Supervisory Audit Team for approving seafood export to EU
- Inter Departmental Panel of Experts of EIA for approval of seafood processing plants for EU

Dr. S. Sanjeev, Principal Scientist

As Member

- Inter Departmental Panel of Experts of EIA for approval of seafood processing plants for EU
- Expert Group on Export of live bivalve mollusks – constituted by EIC of India
- Assessment Board for the approval of technologists of MPEDA at Cochin and Chennai





Shri K.P. Antony, Principal Scientist

As Member

- Assessment Board for the approval of technologists of MPEDA at Cochin and Chennai

Shri M. Nasser, Principal Scientist

As Member

- Transport Engineering Division Council of Bureau of Indian Standards, New Delhi
- Inland Harbour Crafts and Fishing Vessel Sectional Committee, Bureau of Indian Standards, New Delhi
- Marine Engineering and Safety Aids Sectional Committee, Bureau of Indian Standards, New Delhi
- Multi-disciplinary team, State Planning Board, Govt. of Kerala for review of long pending infrastructure projects in fisheries sector

Dr. K.V. Lalitha, Principal Scientist

As Member

- Inter Departmental Panel of EIC of India, New Delhi

Dr. M.R. Boopendranath, Principal Scientist

As Member

- Commission of experts constituted by Govt. of Kerala to study ecological/ environmental impact of dredging at Vaduthala Kayal by Travancore Cements Ltd.
- Committee for Career Advancement Programme, Kerala Agricultural University, Thrissur

Dr. D.I. Khasim, Principal Scientist

As Alternate Member

- Inter Departmental Panel of Experts for approval of seafood processing plants for EU

Dr. C.N. Ravishankar, Senior Scientist

As Member

- Inter Departmental Panel of Experts for approval of seafood processing plants for EU
- Collaborative project by MPEDA, CIFT and IFP on Upgradation of Seafood packaging

Dr. K. Ashok Kumar, Senior Scientist

As Member

- Inter Departmental Panel of Experts for approval of seafood processing plants for EU
- Assessment Board for the approval of technologists at MPEDA, Cochin and Chennai





Dr. Saly N. Thomas, Senior Scientist

As Alternate Memembr

- Textile material for marine fishing purpose, Sectional Committee TX18, Bureau of Indian Standards, New Delhi

Shri S.P. Damle, Senior Scientist

As Member

- Inter Departmental Panel of Experts for approval of seafood processing plants for EU
- Regional Committee of MPEDA for evaluation of assistance in acquisition of GPS, Fish Finder, Radiotelephone and Fish holds to fishermen of Mumbai

Shri George Ninan, Scientist (Sr. Scale)

As Member

- Inter Departmental Panel of Experts for approval of seafood processing plants for EU

Dr. B. Madhusudana Rao, Scientist (Sr. Scale)

As Member

- Inter Departmental Panel of Experts for approval of seafood processing plants for EU

Shri V.R. Madhu, Scientist

As Member

- Regional Committee of MPEDA for evaluation of assistance in acquisition of GPS, Fish Finder, VHF and Fish hold onboard mechanized fishing vessels

Dr. A.R.S. Menon, Technical Officer (T9)

As Member

- Inter Media Publicity Coordination Committee (Kerala), Ministry of Information and Broadcasting

Shri M.V. Baiju, Technical Officer (T6)

As Member

- Committee for conversion of trawlers to tuna long liners subsidy scheme of MPEDA, Cochin





Visitors

The following are some of the dignitaries who visited the Institute during the year:



Dr. Dehadrai having disussion with officials

❖ Shri Ajay Bhattacharya IAS, Jt. Secretary (Ministry of Agriculture), GoI (Visakhapatnam Centre)

❖ Shri S. Chellappa IAS, Principal Secretary (Fisheries), Govt. of Andhra Pradesh (Visakhapatnam Centre)

❖ Shri Sanjoy Nandan, IAS, Commissioner of Fisheries, Govt. of Gujarat (Veraval Centre)

❖ Dr. P.V. Dehadrai, Former DDG (Fisheries), ICAR (Veraval Centre)

❖ Dr. S. Pathak, Former Director, CRIJAF, Junagadh (Veraval Centre)

❖ Dr. M.S. Basu, Director, NRCG, Junagadh (Veraval Centre)



Release of Jaladhi (L-R : Dr. Madan Mohan, Dr. K. Devadasan and Dr. D. Dileep Kumar)

❖ Shri P.M.A. Hakeem, Secretary, Dept. of Animal Husbandry and Dairying, Govt. of India (Cochin)

❖ Shri Kanhaiya Choudhary, Under Secretary, NATP, New Delhi (Cochin)

❖ Shri P.K. Bansal, IAS, Addl. Director (Fisheries), Govt., of Tamil Nadu (Cochin)

❖ Dr. E.G. Silas, Former VC, KAU, Thrissur (Cochin)

❖ Prof. K.V. Peter, VC, KAU, Thrissur (Cochin)

❖ Prof. P.K. Abdul Aziz, VC, CUSAT, Cochin (Cochin)

❖ Dr. D. Dileep Kumar, Director, CIFE, Mumbai (Cochin)

❖ Dr. Madan Mohan, Director, NRCCWF, Bhimtal (Cochin)

❖ Dr. H.P. Singh, VC, RAU, Pusa, Bihar (Cochin)

❖ Dr. D.B. Gupta, NATP, New Delhi (Cochin)

❖ Prof. Jayesh Bellare, IIT, Mumbai (Cochin)

❖ Shri N. Jayaraman, Chairman, Kamarajar KVK, Pondicherry (Cochin)

❖ Dr. D.S. Ananth, Member, ICAR Society (Cochin)

❖ Dr. V. Rajagopal, Director, CPCRI, Kasaragod (Cochin)



Dr. V. Rajagopal, Director, CPCRI speaking to the scientists





On-going Research Projects

Institute Projects

Sl. No.	Name of project	Principal Investigator	Location of project		Co-investigators
1	Toxicity induced stress on the metabolism of fish and distribution of toxic contaminants in fish and shellfish	Dr. T.V. Sankar	Cochin		Dr. Suseela Mathew Dr. R. Anandan Smt. K.K. Asha
2	Study on adoption of hygienic and disease preventive practices in small scale fisheries	Dr. S. Bala subramaniam	Cochin		Dr. Krishna Srinath Smt. Mary Thomas Shri J. Charles Jeeva
3	Microbial ecology, seafood safety and molecular methods for detection of pathogens and toxins	Dr. Nirmala Thampuran	Cochin		Dr. P.K. Surendran Dr. K.V. Lalitha Dr. Toms C. Joseph Shri Rakesh Kumar Dr. Sanjoy Das
4	Studies on post harvest aspects of freshwater fish in Orissa, adjoining states and NEH region	Shri J.K. Bandyo padhyay	Burla & Cochin	Burla Cochin	Dr. M.M. Prasad Dr. T.V. Sankar
5	Chemical and microbiological evaluation of marine and inland fish and fishery products of Maharashtra	Shri D.K. Garg	Mumbai		Shri S.P. Damle
6	Design and development of eco-friendly fish dryers and indigenous electronic instruments for the Indian fisheries	Dr. P.N. Joshi	Cochin		Smt. K. Vijaya bharathi
7	Processing and product development for bycatch and deep sea fishes	Shri P.K. Vijayan	Cochin & Calicut	Cochin Calicut	Shri A.C. Joseph Dr. Jose Joseph Shri K.George Joseph
8	Development and application of appropriate processing technologies for better utilization of marine and fresh water fishery resources of Gujarat	Dr. R. Badonia	Veraval		Dr. D.I. Khasim Dr. L.N. Murthy
9	Technological studies on processing of fresh water and marine fish and shellfishes of east coast with special emphasis on product development and quality standards	Shri S.S. Gupta	Viskaha patnam		Shri A.K. Chatto padhyay Dr. R. Chakrabarti Dr. B. Madhusudana Rao





10	Development studies on responsible trawl systems	Dr. M.R. Boopendranath	Cochin Visakha patnam & Veraval	Cochin Visakha patnam Veraval	Shri P. George Mathai Shri V. Vijayan Dr. P. Pravin Shri M.P. Remesan Dr. G. Rajeswari Dr. R. Raghu Prakash Shri U. Sreedhar Dr. S.K. Panda Shri V.R. Madhu
11	Optimization and upgradation of traditional fishing system for inland and marine sector	Dr. P. Pravin	Cochin Visakha patnam & Veraval	Cochin Visakha patnam Veraval	Dr. B. Meenakumari Shri P. George Mathai Dr. Saly N. Thomas Shri M.P. Remesan Shri U. Sreedhar Dr. S.K. Panda Shri V.R. Madhu
12	Studies on environment friendly high yielding semi pelagic trawls for exploitation of fishery resources of east coast of India	Dr. G. Rajeswari	Visakha patnam		Dr. R. Raghu Prakash Shri U. Sreedhar
13	Studies on biodeterioration and material upgradation for marine applications	Dr. Saly N. Thomas	Cochin		Dr. Leela Edwin Shri P. Muhamed Ashraf
14	Genomic investigations on aquatic and fish microorganisms and development of molecular diagnostic methods for pathogens	Dr. P.K. Surendran	Cochin & Visakha patnam	Cochin Visakha patnam	Dr. Nirmala Thampuran Dr. K.V. Lalitha Dr. Toms C. Joseph Dr. Sanjoy Das Dr. B. Madhusudana Rao
15	Studies on the level of sanitation and hygiene in fishing boats, fish landing centers, transport and domestic markets for hazard control	Dr. M.K. Mukundan	Cochin		Shri P.R.G. Varma Shri V. Muraleedharan Dr. P.T. Lakshmanan Dr. S. Sanjeev Shri K.P. Antony Dr. K. Ashok Kumar Dr. D. Muthuchelvan
16	Statistical and econometric evaluation of production and marketing of seafood products	Dr. G.R. Unnithan	Cochin		Dr. Nikita Gopal Dr. V. Geetha lakshmi Shri V. Radha krishnan Nair
17	Improvement and value addition of traditional fish products	Dr. K.G. Rama chandran Nair	Cochin & Calicut	Cochin Calicut	Shri P.K. Vijayan Shri P.R. Nair Shri K.George Joseph





18	Development of novel products from fresh water fish and their preservation	Dr. Jose Joseph	Cochin		Shri A.C. Joseph Dr. P.T. Mathew Shri George Ninan Smt. J. Bindu
19	Development of nutraceuticals and high value products from fishery waste and low cost fish	Dr. P.T. Mathew	Cochin		Dr. K.G. Rama chandran Nair Dr. T.K. Thankappan Smt. R. Thankamma Shri George Ninan Shri Rakesh Kumar Dr. R. Anandan
20	Modern technologies for packaging of fish and fishery products	Dr. T.K. Srinivasa Gopal	Cochin		Shri P.R. Nair Dr. C.N. Ravishankar Shri A.C. Joseph Dr. K.V. Lalitha Smt. J. Bindu
21	Biochemical and bioequivalence studies of different natural bio-active substances as immunostimulants in <i>P. monodon</i>	Dr. P.G.Viswa nathan Nair	Cochin		Dr. Suseela Mathew Dr. K. Ashok Kumar Smt. K.K. Asha
22	Isolation and characterization of obligate halophiles from marine ecosystem and salt pans: Identification of genes regulating halophilicity	Dr. P.K. Surendran	Cochin		Dr. Nirmala Thampuram Dr. Toms C. Joseph
23	Development of add-on protruding bows for small fishing vessels to reduce fuel consumption	Shri M. Nasser	Cochin		
24	Development of geographic information system on fisheries technology	Shri V. Radha krishnan Nair	Cochin		Dr. V. Geethalakshmi
25	Impact of fuel on the economic viability of the fishing industry in India	Dr. G.R. Unnithan	Cochin		Dr. Nikita Gopal Dr. V. Geethalakshmi

ICAR Ad-hoc Projects

Sl. No.	Name of the project	Principal Investigator	Location of project	Co-investigators
26	Bycatch reduction devices for selective shrimp trawling	Dr. M.R. Boopendra nath	Cochin	Dr. P. Pravin Shri S. Sabu* Shri T.R. Gibin Kumar*
27	Impact of Copper Chrome Arsenic (CCA) wood preservative on the aquatic environment	Dr. Leela Edwin	Cochin	Kum. A. Sreeja* Shri M. Ajith Peter*
28	Standardization of fishing gear materials and fishing accessories	Dr. Saly N. Thomas	Cochin	Shri Baiju John* Shri Gipson Edappazham*





29	Isolation and characterization of fish lipases for commercial applications	Dr. R. Anandan	Cochin		Dr. T.V. Sankar Shri S. Hari Senthil Kumar* Kum. K.S. Shiny*
30	Improved fishing craft and gear for NEH region	Dr. P. Pravin	Cochin & Guwahati	Guwahati	Shri Deepjyoti Baruah* Shri Jyotish Burman*
31	Development of eco-friendly technologies for the production of biodegradable membranes from chitosan	Dr. P.T. Mathew	Cochin		Dr. T.K. Thankappan Smt. R. Thankamma Dr. C.N. Ravishankar Smt. T.K. Sini* Smt. M. Rajalekshmi* Shri S. Santhosh*
32	Suitability of polymer coated tin free steel cans for canning fish and fish products	Dr. C.N. Ravishankar	Cochin		Dr. T.K. Srinivasa Gopal Shri. P.K. Vijayan Smt. J. Bindu Shri P.G. Sreenath* Shri K.A. Martin Xavier*
33	Functional properties of protein from marine, brackish water, fresh water and deep sea fish of India	Dr. T.V. Sankar	Cochin		Dr. R. Anandan Shri Mukund Mohan* Kum. Dhanya Ramachandran*
34	Development of extruded products utilizing low value fishes	Dr. T.K. Srinivasa Gopal	Cochin		Dr. K.G. Rama chandran Nair Dr. C.N. Ravishanker Shri C.K. Kamalakanth* Shri Jones Varkey*
35	Identification and characterization of bacterial genes imparting osmo-tolerance and their validation in plants	Dr. Toms C. Joseph	Cochin		Dr. Nirmala Thampuran Shri L. Anburajan*
36	Development of gene constructs for producing WSSV resistant Penaeid shrimp and its validation in shrimp cell culture systems	Dr. Toms C. Joseph	Cochin		Kum. Roswin James*
37	Chemical residue management in farmed and wild fish and shellfish of India	Dr. P.T. Lakshmanan	Cochin		Kum. K.M. Swapna* Shri R. Rajesh
38	Assessing the impact of fisheries research in India	Dr. S. Bala subramaniam	Cochin		Dr. Nikita Gopal Dr. S. Ashaletha
39	Investigations on the effect of bottom trawling on the benthic fauna of Saurashtra coast, Gujarat	Dr. B. Meenakumari	Cochin & Veraval	Cochin Veraval	Smt. Usha Bhagirathan* Shri Deepak Kumar* Shri T. Vaghela*





40	Resource assessment and biology of deep sea fishing along the continental slope of Indian EEZ	Dr. P.G. Viswanathan Nair	Cochin Visakhapatnam		Shri U. Sreedhar
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Space Application Centre Project

Sl. No.	Name of the project	Principal Investigator	Location of project		Co-investigators
41	Application of remote sensing and GIS for marine fisheries resource management	Dr. B. Meena Kumari	Cochin & Veraval	Veraval	Shri Nimit D. Joshi*

Department of Biotechnology Project

Sl. No.	Name of the project	Principal Investigator	Location of project		Co-investigators
42	In-service Training Programme in Molecular Biology for Fisheries Scientists	Dr. P.K. Surendran	Cochin		Dr. Nirmala Thampuran Dr. Toms C. Joseph Shri Rakesh Kumar

Network Project

Sl. No.	Name of the project	Principal Investigators	Location of project		Co-investigators
43	National risk assessment programme for fish and fish products of domestic and internal market	Dr. P.K. Surendran Dr. Nirmala Thampuran	Cochin Veraval & Visakhapatnam	Cochin Veraval Visakhapatnam	Dr. P.G. Viswanathan Nair Dr. T.V. Sanker Dr. Nirmala Thampuran Kum. O.K. Sindhu* Dr. R. Badonia Dr. B. Madhusudana Rao Kum. G. Padmaja*

Department of Science and Technology Project

Sl. No.	Name of the project	Principal Investigator	Location of project		Co-investigators
44	Action research on coastal zone management with special involvement of women	Dr. S. Balasubramaniam	Cochin		Shri P. George Mathai Dr. P. Pravin Dr. Nikita Gopal

Sponsored/Collaborative Project (MPEDA/CMFRI/CIFT)

Sl. No.	Name of project	Principal Investigator	Location of project		Co-investigators
45	Participatory management and conservation of lobster resources along the south west coast of India	Dr. B. Meenakumari	Cochin		Dr. P. Pravin

Sr. Research Fellow *





Papers Published in Refereed Journals

- ❖ Ansar Ali, A. Sudhir, B. & Srinivasa Gopal, T.K. (2005) – Effect of heat processing on the texture profile of canned and retort pouch packed oil sardine (*Sardinella longiceps*) in oil medium - *J. Food Sci.* **70** (5): 350-354.
- ❖ Boopendranath, M.R. & Pravin, P. (2005) - Trawl selectivity – *Fish Technol.* **42** (1): 1-10.
- ❖ Chakrabarti, R., Madhusudana Rao, B. & Viswanathan Nair, P.G. (2004) – Suitability of soluble protein concentrate from tuna liver for the growth of sulphate reducing *Clostridia* – *J. Food Sci. & Technol.* **41** (4): 405-408.
- ❖ Jayaprakash Babu, U.S., Madhusudana Rao, B., Imam Khasim, D. & Ramachandran Nair, K.G. (2005) – Biochemical changes and microbiological quality of formic acid silage and lactobacillus fermented fish silages – *Fish. Technol.* **42** (2): 163-170.
- ❖ Kumar, R. & Surendran, P.K. (2005) – Phenotypic characterization and antibiotic resistance of *Pseudomonas* spp. from seafood and aquaculture farm environment – *Fish Technol.* **42** (2): 203-208.
- ❖ Lalitha, K.V. & Gopakumar, K. (2005) – Influence of temperature and pH on growth and toxin production from spores of *Clostridium botulinum* – *J. Aquatic Food Prod. Technol.* **14**: 39-50.
- ❖ Lalitha, K.V., Sonaji, E.R., Manju, S., Leema Jose, Srinivasa Gopal, T.K. & Ravishankar, C.N. (2005) – Microbiological and biochemical changes in pearl spot stored under modified atmosphere - *Intl. J. Appl. Microbiol.* **99**: 1222-1228.
- ❖ Lalitha, K.V. & Surendran, P.K. (2005) – Bacterial flora of black clam (*Villorita cyprionides* var. *cochinensis*) from Vembanad lake in Kerala (India) – *Fish Technol.* **42** (2): 183-190.
- ❖ Leela Edwin & Hridayanathan, C. (2005) – Over fishing – a study with reference to the ring seine fishery – *Indian J. Fish* **51** (3): 265-267.
- ❖ Leela Edwin, Saly N. Thomas & Meenakuamri, B. (2005) – Utilization of rubber wood for fishing canoe construction – *Fish Technol.* **42** (1): 41-46.
- ❖ Majumdar, R.K., Basu, S. & Anandan, R. (2005) – Biochemical and microbiological characteristics of salt fermented hilsa (*Tenualosa ilisha*) – *Fish Technol.* **42**(2): 67-70.
- ❖ Nirmala Thampuran, Surendraraj, A. & Surendran, P.K. (2005). Prevalence and characterization of typical *Escherichia coli* from fish sold at retail markets in Cochin, India – *J. Food Protect.* **68**: 2208-2211.
- ❖ Partiban, F., Sankar, T.V. & Anandan, R. (2005) – Changes in the functional properties of tilapia (*Oreochromis mossambicus*) protein during storage in ice – *Fish. Technol.* **42**(2): 155-162.
- ❖ Pravin, P. & Ravindran, K. (2005) – Harvesting techniques in traditional shrimp culture. *Fish. Technol.* **42**(2): 111-124.
- ❖ Ramesan, M.P. & Ramachandran, A. (2005) – Mini trawl for estuarine fishing in Kasaragod district – *Fish. Technol.* **42**(1): 41-46.





- ❖ Ramesan, M.P. & Ramachandran, A. (2005) – Gill nets for inland fishing in north Kerala – *Fish. Technol.* **42**(2): 125-134.
- ❖ Sabeena Farvin, K.H., Anandan, R., Sankar, T.V. & Viswanathan Nair, P.G. (2005) – Protective effect of squalene isoproterenol-induced myocardial infarction in rats – *J. Clin. Biochem. Nutr.* **37**: 55-60.
- ❖ Sankar, T.V. & Ramachandran, A. (2005) – Thermal stability of myofibrillar protein from Indian major carps – *J. Sci. Food Agric.* **86**(4): 563-568.
- ❖ Shiny, K.S., Harisenthilkumar, S., Sabeena Farvin, K.H., Anandan, R. & Devadasan, K. (2005) – Protective effect of taurine on myocardial antioxidant status in isoproterenol induced myocardial infarction in rats - *J. Pharm. Pharmacol.* **57**: 1313-1317.
- ❖ Santhosh, S., Anandan, R., Sini, T.K., Mathew, P.T. & Thankappan T.K. (2005) – Biochemical studies on the antiulcer effect of glucosamine on antioxidant defence status in experimentally induced peptic ulcer in rats – *J. Clinic. Biochem. Nutr.* **37**(2): 61-66.
- ❖ Sini, T.K., Santhosh, S. & Mathew, P.T. (2005) – Study of the influence of processing parameters on the production of carboxymethyl chitin – *Polymer J.* **46**: 3128–3131.
- ❖ Srinivasa Gopal, T.K. & Ravishankar, C.N. (2005) – Modified atmosphere packaging – A review – *Fish. Technol.* **42**(2): 91-110.
- ❖ Surendra Raj, A., Nirmala Thampuran & Surendran, P.K. (2005) – Levels of *Escherichia coli* in seafood in domestic trade and their antibiotic resistance pattern – *Fish. Technol.* **42**(2): 209-216.
- ❖ Zynudheen, A.A. & George Ninan (2005) – Ice storage studies of Jawala (*Acetes* sps.) – *Fish. Technol.* **42**(2): 231-232.

Publications Brought Out

In English

Proceedings

- ❖ Sustainable fisheries development – Focus on Andhra Pradesh

Folders

- ❖ Improved method of fish curing
- ❖ Utilization of prawn shell waste: Chitin, Chitosan and Glucosamine hydrochloride

CIFT Technology Advisory Series

- ❖ CIFT Technology Advisory Series 16- Mussel meat products

CIFT Special Bulletin

- ❖ CIFT Special Bulletin No.13- Rubber wood for marine applications

Booklets

- ❖ Training programmes of CIFT (revised)
- ❖ Development of convenience foods from fish - NATP success story
- ❖ Gillnets in marine fisheries of India- Monograph





Project documents

- ❖ Assessment of harvest and post harvest losses – Inland Fisheries
- ❖ Assessment of harvest and post harvest losses – Marine Fisheries

Training Manual

- ❖ Manual of biochemical methods for determining stress and disease status in Crustaceans

Winter School Manuals

- ❖ Modern techniques for the analysis of fish and fishery products
- ❖ Current trends in packaging of fish and fishery products

In Hindi

Book

- ❖ Jaladhi

Booklets

- ❖ Gillnets in marine fisheries of India - Monograph
- ❖ Packaging of fish and fishery products
- ❖ Frozen squid and cuttlefish
- ❖ Biochemical composition of fish and shellfish
- ❖ CIFT – TED
- ❖ Wood preservation for marine application
- ❖ Fish collagens
- ❖ Indigenous fishing gear of Saurashtra and Kachchh
- ❖ Commercially viable fishery based technologies recently developed by CIFT
- ❖ Harvest and post harvest fisheries in India - problems and prospects
- ❖ Post harvest handling and transportation of fish

Folders

- ❖ Rubber wood canoe
- ❖ Processing Bombay duck
- ❖ Technology for production of Isinglass
- ❖ Production of shark fin rays
- ❖ Cholesterol in prawns
- ❖ Production of masmin
- ❖ Processing of beche-de-mer
- ❖ Shark skin leather

In Marathi

Folders

- ❖ Importance of sanitation and hygiene in the fish processing industry
- ❖ Handling, processing and preservation of fish
- ❖ Preparation of exotic value added fish products





- ❖ Commercially viable fishery based technology recently developed by CIFT – Fishing craft
- ❖ Commercially viable fishery based technology recently developed by CIFT – Fishing gear
- ❖ Commercially viable fishery based technology recently developed by CIFT – Fish processing
- ❖ Commercially viable fishery based technology recently developed by CIFT – Fish by-products
- ❖ Seafood is heart food
- ❖ Fish balls
- ❖ Fish fingers
- ❖ Fish/prawn pickle
- ❖ Fish wafers
- ❖ Fish cutlet
- ❖ Fish soup powder
- ❖ Ready-to-serve fish curry in flexible pouches
- ❖ Surgical sutures from fish gut collagen
- ❖ Fish collagen-chitosan membrane

Booklets

- ❖ Better handling leads to better quality of fish
- ❖ Processing and value addition in fish

In Gujarati

Technical Bulletin

- ❖ Jellyfish processing and export potential

In Tamil

Special Bulletin

- ❖ CIFT-TED for turtle safe trawl fisheries – A success story in responsible fishing

Folder

- ❖ Improved methods of fish curing and drying

In Malayalam

Booklet

- ❖ Hygiene and sanitation in fish processing
- ❖ Livestock feed from cephalopod processing waste

Leaflet/Folder

- ❖ Specialty products from mussels
- ❖ Processing and preparation of value added products from mussel meat

In Telugu

Folder

- ❖ Hygienic handling of fish on-board the fishing vessel





In Assamese

Folders

- ❖ Smoke curing of fish
- ❖ Fish ensilage by fermentation method
- ❖ Fish maws
- ❖ Fish pickle
- ❖ Fish soup powder
- ❖ Fish cutlet
- ❖ Improved method of fish curing
- ❖ Post harvest handling and transportation of fish
- ❖ Rack drying of fish
- ❖ FRP coated rubber wood canoe
- ❖ FRP canoe for traditional fishing

In Bengali

Folders

- ❖ Smoke curing of fish
- ❖ Fish ensilage by fermentation method
- ❖ Fish maws
- ❖ Fish pickle
- ❖ Fish soup powder
- ❖ Fish cutlet
- ❖ Improved method of fish curing
- ❖ Post harvest handling and transportation of fish
- ❖ Rack drying of fish
- ❖ FRP coated rubber wood canoe
- ❖ FRP canoe for traditional fishing

In Nepali

Folders

- ❖ Smoke curing of fish
- ❖ Fish ensilage by fermentation method
- ❖ Fish maws
- ❖ Fish pickle
- ❖ Fish soup powder
- ❖ Fish cutlet
- ❖ Improved method of fish curing
- ❖ Post harvest handling and transportation of fish
- ❖ Rack drying of fish
- ❖ FRP coated rubber wood canoe
- ❖ FRP canoe for traditional fishing





List of Personnel in CIFT

(as on 31 December 2005)

Managerial Personnel

Director : Dr. K. Devadasan

Heads of Divisions

Fish Processing Division	: Dr. K.G. Ramachandran Nair, Principal Scientist
Biochemistry & Nutrition Division	: Dr. P.G. Viswanathan Nair, Principal Scientist
Quality Assurance & Management Division	: Dr. M.K. Mukundan, Principal Scientist
Extension Information & Statistics Division	: Dr. S. Balasubramaniam, Principal Scientist
Engineering Division	: Dr. P.N. Joshi, Principal Scientist
Microbiology, Fermentation & Biotechnology Division	: Dr. Nirmala Thampuran, Principal Scientist
Fishing Technology Division	: Dr. B. Meenakumari, Principal Scientist

Scientist-Incharge of Research Centres

Veraval Research Centre	: Dr. Rajendra Badonia, Principal Scientist
Visakhapatnam Research Centre	: Shri Sibsankar Gupta, Principal Scientist
Burla Research Centre	: Dr. M.M. Prasad, Senior Scientist
Mumbai Research Centre	: Shri Dinesh Kumar Garg, Senior Scientist
Calicut Research Centre	: Shri K. George Joseph, Principal Scientist

Administrative & Accounts

Senior Administrative Officer	: Shri K.P.S. Gautam
Assistant Finance & Accounts Officer	: Shri K.S. Sreekumaran

Other Personnel

HEAD QUARTERS, COCHIN

Scientific Personnel

Principal Scientist

1. Dr. P.K. Surendran
2. Dr. Krishna Srinath
3. Dr. P.T. Mathew
4. Dr. T.K. Srinivasa Gopal
5. Shri A.C. Joseph
6. Dr. Jose Joseph
7. Shri P.R. Girija Varma
8. Shri V. Muraleedharan
9. Shri P.K. Vijayan

10. Dr. T.K. Thankappan
11. Shri P. George Mathai
12. Smt. Mary Thomas
13. Dr. M.R. Boopendranath
14. Dr. S. Sanjeev
15. Dr. P.T. Lakshmanan
16. Shri P. Ravindranathan Nair
17. Smt. K. Vijayabharathy
18. Dr. G. Rajagopalan Unnithan
19. Dr. K.V. Lalitha
20. Shri K.P. Antony
21. Shri M. Nasser





Senior Scientist

1. Dr. Leela Edwin
2. Dr. C.N. Ravisankar
3. Dr. K. Ashok Kumar
4. Dr. T.V. Shankar
5. Dr. Saly N. Thomas
6. Dr. Pravin Puthra
7. Dr. V. Geethalakshmi

Scientist (Selection Grade)

1. Smt. R. Thankamma
2. Dr. Suseela Mathew
3. Shri M.P. Ramesan

Scientist (Sr. Scale)

1. Smt. J. Bindu
2. Shri P. Muhamed Ashraf
3. Dr. Nikita Gopal
4. Shri George Ninan
5. Shri A.A. Zynudheen
6. Dr. Toms C. Joseph
7. Dr. R. Anandan

Scientist

1. Shri V. Radhakrishnan Nair
2. Shri J. Charles Jeeva
3. Shri Rakesh Kumar
4. Dr. D. Muthuchelvan
5. Smt. K.K. Asha
6. Dr. Sanjoy Das

Technical Personnel

T-9 (Technical Officer)

1. Shri K.J. Francis Xavier
2. Dr. A.R.S. Menon

T-4

1. Shri C. Rajendran
2. Shri M.K. Asokan
3. Shri K.D. Jos
4. Shri B. Ganesan

T-6 (Technical Officer)

1. Shri M.V. Baiju

T-5 (Technical Officer)

1. Shri P.T. Sebastian
2. Shri N.M. Vasu
3. Shri C.R. Gokulan
4. Shri V. Gopalakrishna Pillai
5. Shri M.M. Devassia
6. Shri G. Ramadas Kurup
7. Shri G. Ratnakaran Nair
8. Smt. K.B. Beena
9. Dr. K. Sobha
10. Shri T.N. Sukumaran
11. Shri P. Feroz Khan
12. Shri E.K. Balakrishnan
13. Smt. K. Sarasamma
14. Shri P.M. Joseph
15. Smt. P.K. Shyma
16. Dr. M. Baiju
17. Dr. G. Usha Rani
18. Shri Jose Kalathil
19. Shri K.B. Thilakan
20. Shri P. Bahuleyan
21. Smt. K.K. Sumathy
22. Shri P.A. Josi Augustine
23. Smt. T. Silaja
24. Shri K.B. Thampi Pillai
25. Smt. V.C. Mary
26. Shri. K.P. Vijayan
27. Shri D. Padmanabhan
28. Shri T.R. Sreekumaran
29. Smt. M.K. Sreelekha

- : Refrigeration Mechanic
: Deckhand
: Field Assistant
: Animal House Keeper





5.	Smt. K.G. Sasikala	:	Junior Laboratory Assistant
6.	Smt. K.K. Kala	:	Technical Assistant
7.	Shri Sibasis Guha	:	Photographer-cum-Artist
8.	Shri P.S. Babu	:	Senior Field Assistant
9.	Shri V.N. Dileepkumar	:	Engine Driver
10.	Shri P. Shankar	:	Hindi Translator
11.	Smt. Ancy Sebastian	:	Technical Assistant
12.	Shri G. Omanakuttan Nair	:	Junior Laboratory Assistant
13.	Smt. G. Remani	:	Junior Laboratory Assistant
12.	Smt. M. Rekha	:	Field Assistant
13.	Shri P.N. Sudhakaran	:	Net Making Supervisor
14.	Shri Aravind S. Kalangutkar	:	Senior Field Assistant
15.	Shri T. Balan	:	Deckhand
16.	Shri E.K. Chinnappan	:	Deckhand
17.	Smt. K.P. Leelamma	:	Junior Laboratory Assistant
18.	Shri P.S. Raman Namboodiri	:	Junior Laboratory Assistant
19.	Shri A.A. Kunjappan	:	Field Assistant

T-II-3

1.	Shri K.K. Narayanan	:	Boilerman
2.	Shri P.T. Viswambharan	:	Electrician

T-3

1.	Shri A.K. Unnikrishnan	:	Cook
2.	Shri Arockia Sami	:	Deckhand
3.	Smt. P.K. Geetha	:	Junior Laboratory Assistant
4.	Shri C. Subash Chandran Nair	:	Projector Operator

T-I-3

1.	Shri Tomy Rebellow	:	Boiler man
2.	Smt. K.S. Mythri	:	Junior Laboratory Assistant
3.	Shri P.S. Nobi	:	Net Making Supervisor

T-2

1.	Shri T. Mathai	:	Junior Laboratory Assistant
2.	Smt. N. Lekha	:	Junior Laboratory Assistant
3.	Shri R.N. Sahoo	:	Driver (Launch)
4.	Shri P.N. Sukumaran Nair	:	Field Assistant
5.	Shri P.D. Padmaraj	:	Junior Laboratory Assistant
6.	Shri N. Sunil	:	Plant Attendant
7.	Shri Sajith K. Jose	:	Draughtsman





8.	Shri P.V. Sajeevan	: Draughtsman
9.	Smt. P.A. Jaya	: Junior Laboratory Assistant
10.	Shri V.K. Siddique	: Refrigeration Mechanic
11.	Shri R. Rangaswamy	: Driver
12.	Shri V.A. Sudhakaran	: Plumber
13.	Shri Umesh D. Aroskar	: Driver
14.	Shri K.V. Mohanan	: Driver
15.	Shri K. Nakulan	: Driver
16.	Shri T.B. Assisse Francis	: Driver
17.	Shri G. Gopakumar	: Carpenter
18.	Shri K.S. Babu	: Turner
19.	Smt. Bindu Joseph	: Media Assistant
20.	Shri C.K. Suresh	: Machine Operator
21.	Smt. N.C. Shyla	: Field Assistant
22.	Shri N. Krishnan	: Junior Laboratory Assistant
23.	Shri V.T. Sadanandan	: Junior Laboratory Assistant
24.	Shri K.D. Santhosh	: Junior Laboratory Assistant
25.	Shri K. Dinesh Prabhu	: Plant Attendant
26.	Smt. Tessy Rony	: Field Assistant
27.	Shri P.A. Shanmughan	: Tindal
28.	Shri P.S. Sunil Kumar	: Driver

T-1

1.	Shri T. Jijoy	: Junior Laboratory Assistant
2.	Shri K.C. Anish Kumar	: Junior Laboratory Assistant
3.	Shri K.A. Martin Xavier	: Field Assistant

Administrative Personnel

1.	Smt. K. Usha	: Administrative Officer
2.	Shri R. Anil Kumar	: Asst. Admn. Officer
3.	Shri A. George Joseph	: Asst. Admn. Officer
4.	Smt. M.A. Prasanna	: Asst. Admn. Officer
5.	Shri P.K. Sreedharan	: Asst. Admn. Officer
6.	Shri K.S. Sreekumaran	: Asst. Fin. & Accts. Officer
7.	Dr. C. Jessy Joseph	: Asst. Director (Official Language)
8.	Shri K. Ravindran	: Private Secretary
9.	Shri P.P. Anil Kumar	: Jr. Accounts Officer





Assistant

1. Smt. C.G. Marykutty
2. Shri V.R. Kesavan
3. Smt. K.R. Gita Rani
4. Smt. N. Prabhavathy Amma
5. Smt. Pushpalatha Viswambharan
6. Shri T.M. Ramaraj
7. Smt. M. Jully
8. Shri Y. Philipose
9. Shri R. Viswanathan
10. Smt. T.K. Susannamma
11. Smt. K. Gracy
12. Shri P. Krishna Kumar
13. Smt. P.C. Kamalakshy
14. Shri P.V. Venugopalan
15. Smt. N.I. Mary
16. Shri K.B. Sabukuttan
17. Smt. M.S. Susanna
18. Shri P.P. Varghese
19. Smt. T.D. Usheem

Personal Assistant

1. Smt. N.K. Saraswathy
2. Smt. R. Vasantha
3. Smt. V.P. Vijayakumari
4. Shri P.K. Raghu
5. Smt. S. Kamalamma
6. Smt. N. Leena
7. Shri K.V. Mathai
8. Shri R.D. Goswamy

Stenographer Grade III

1. Smt. Anitha K. John
2. Shri T. Viswanathan

Upper Division Clerk

1. Shri P.K. Thomas
2. Smt. P.K. Thankamma
3. Smt. A.A. Cousallia
4. Shri K.K. Sasi

5. Shri P. Padmanabhan
6. Smt A.R. Kamalam
7. Smt. T.K. Shyma
8. Shri V.S. Ambasadhan
9. Smt. V.S. Aleyamma
10. Smt. G.N. Sarada
11. Shri C.K. Sukumaran
12. Smt. Lillykutty George
13. Shri P.K. Somasekharan Nair
14. Shri P. Mani
15. Smt. Jaya Das
16. Shri P. Bhaskaran
17. Smt. K. Renuka
18. Smt. P.R. Mini
19. Smt. V.K. Raji
20. Shri M.N. Vinodh Kumar
21. Shri K. Das
22. Shri T.N. Shaji
23. Smt. A.R. Raji

Lower Division Clerk

1. Smt. E. Jyothilekshmy
2. Smt. Shiji John
3. Shri P.G. David
4. Shri Santhosh Mohan

Cook

1. Shri V. Ramachandran

Supporting Personnel

Supporting Staff Grade IV

1. Shri T.V. Manoharan
2. Shri K.N. Mukundan
3. Shri P. Gopalakrishnan
4. Shri K.B. Bhaskaran
5. Shri M.R. Bharathan
6. Shri M.T. Mani
7. Shri T.T. Thankappan
8. Shri P.R. Unnikrishna Panicker





Supporting Staff Grade III

1. Shri A.R. John
2. Shri P.A. Sivan
3. Shri C.D. Parameswaran
4. Smt. C.G. Radhamoney
5. Shri E. Damodaran

Supporting Staff Grade II

1. Shri P.P. George
2. Shri P.V. Raju
3. Shri A.V. Chandrasekharan
4. Shri M.M. Radhakrishnan
5. Shri K.K. Karthikeyan
6. Smt. C. Ammini
7. Smt. P. Ammalu
8. Shri M.N. Sreedharan

Auxiliary Personnel

1. Shri K.C. Mohanan
2. Shri T.A. Gopalakrishnan
3. Shri M.V. Rajan

9. Smt. U.K. Bhanumathy
10. Shri T.K. Rajappan
11. Shri M.T. Udayakumar
12. Smt. P.T. Mary Vineetha
13. Shri O.P. Radhakrishnan
14. Shri P. Raghavan
15. Shri T.M. Balan
16. Shri V. Deepak Vin
17. Shri T.D. Bijoy

Supporting Staff Grade I

1. Shri K.R. Rajasaravanan
2. Shri P.N. Nikhil Das
3. Shri A. Vinod
4. Shri K.S. Ajith

- : Tea Maker
: Bearer
: Bearer

VERAVAL RESEARCH CENTRE

Scientific Personnel

Principal Scientist

1. Dr. D. Imam Khasim Saheb

Scientist

1. Dr. L. Narasimhamurthy
2. Shri V.R. Madhu
3. Dr. S.K. Panda

Technical Personnel

T-6 (Technical Officer)

1. Shri J.B. Paradwa

T-5 (Technical Officer)

1. Shri K.U. Dholia
2. Shri Thomas Teles
3. Shri K.U. Sheikh

T-3

1. Shri G.M. Vaghela
2. Shri K.C. Gopalan

T-2

1. Shri H.V. Pungera
2. Shri G. Kingsely
3. Shri S.H.U. Bhai

Administrative Personnel

Assistant

1. Shri M.M. Damodara
2. Shri S.B. Purohit

Upper Division Clerk

1. Shri D.P. Parmar

Lower Division Clerk

1. Shri Arockia Shaji





Supporting Personnel

Supporting Staff Grade IV

1. Shri P.A.G.A. Rehman

Supporting Staff Grade III

1. Shri B.M.A. Khokhar
2. Shri D.B. Chudasama
3. Shri K.J. Damor
4. Smt. Chandrika C. Tank

Supporting Staff Grade II

1. Smt. Gangaben N. Chorwadi
2. Shri D. Khoda Viram
3. Shri J.B. Malamdi
4. Shri R.N. Gosai
5. Shri A.M. Vala

6. Shri M.K. Kana
7. Smt. Harshaban A. Joshi
8. Shri N.K. Masani
9. Smt. Pushpaben P. Chudasama
10. Smt. Motiben K. Fofandi

Supporting Staff Grade I

1. Shri K. Thinakaran
2. Shri D. Ramesh Kumar

Auxiliary Personnel

Wash Boy

1. Shri J.K. Khodidas

Coffee/Tea Maker

1. Smt. Veena Sreedhar Narkar

VISAKHAPATNAM RESEARCH CENTRE

Scientific Personnel

Principal Scientist

1. Shri A.K. Chattopadhyay
2. Dr. R. Chakraborti

Scientist (Sr. Scale)

1. Dr. G. Rajeswari
2. Shri U. Sreedhar
3. Dr. R. Raghu Prakash
4. Dr. B. Madhusudana Rao

Technical Personnel

T-6 (Technical Officer)

1. Shri A. Veeranjanyulu
2. Shri V.V. Ramakrishna
3. Shri M.S. Kumar

T-5 (Technical Officer)

1. Shri C. Srihari Babu
2. Shri K.V.S.S.S.K. Harnath
3. Shri U. Alagumalai

T-4

1. Shri Santhosh Alex

2. Shri K. Prakasa Rao
3. Shri N. Venkata Rao

T-3

1. Shri M. Venkateswara Rao
2. Shri P. Radhakrishna

T-1

1. Shri V. Kamaraju

Administrative Personnel

Assistant Administrative Officer

1. Shri G.C. Adhikari

Assistant

1. Smt. B. Hemalatha

Personal Assistant

1. Smt. D.A.L. Satyanarayanamma
2. Shri Trilochan Rout

Upper Division Clerk

1. Shri Y. Kanakaraju
2. Shri G. Chinna Rao





Supporting Personnel

Supporting Staff Grade IV

1. Shri Orilika Heman
2. Shri C. Kamaraju

Supporting Staff Grade III

1. Shri B. Sivanadham
2. Shri K. Appa Rao
3. Shri S. Appa Rao

4. Shri S. Chakram
5. Shri V. Venkata Ramana

Supporting Staff Grade II

1. Shri G. Bhushanam

Supporting Staff Grade I

1. Shri M.S. Prabhakara Rao
2. Smt. Nalla Naveena
3. Shri P. Ramakrishna
4. Smt. Neelima Besra

BURLA RESEARCH CENTRE

Scientific Personnel

Senior Scientist

1. Shri J.K. Bandyopadhyay

Technical Personnel

T-5 (Technical Officer)

1. Shri B.K. Pradhan
2. Shri B.K. Panda
3. Shri A.K. Panigrahi
4. Shri P.M. Pattanayak

T-4

1. Shri Kirtan Kisan
2. Shri Sathrugan Kumara
3. Shri Damodar Rout
4. Shri A.K. Naik

T-2

1. Shri H.S. Bag

T-1

1. Shri S. Dishri

Administrative Personnel

Assistant

1. Shri Udekar Pandey

Upper Division Clerk

1. Shri Laxminarayan Badi
2. Shri Premlal Panda

Lower Division Clerk

1. Shri K.C. Naik

Supporting Personnel

Supporting Staff Grade IV

1. Shri Gajendra Karali
2. Shri Santhosh Banchor
3. Shri Satrugan Seth
4. Shri S.C. Mehar

Supporting Staff Grade III

1. Shri B.N. Guru
2. Shri Jaisingh Oram
3. Shri S. Mirdha
4. Shri G.B. Mahanandia
5. Shri D.L. Pattanaik

Supporting Staff Grade II

1. Shri T.N. Banchor
2. Shri S.N. Dash
3. Shri B.K. Deo
4. Shri Nande Oram
5. Shri Sanyasi Ganik

Supporting Staff Grade I

1. Smt. Gyananetri Nag
2. Shri Amit Vengaraj
3. Shri S.K. Mehar





MUMBAI RESEARCH CENTRE

Scientific Personnel

Senior Scientist

1. Shri S.P. Damle

Technical Personnel

T-6 (Technical Officer)

1. Smt. Sangeetha D. Gaikwad
2. Smt. Triveni Gopal Adiga

T-5 (Technical Officer)

1. Shri P.S. Gadankush

T-1

1. Shri P.B. Bait
2. Shri T.A. Waghmare

Administrative Personnel

Assistant Administrative Officer

1. Shri M.S. Bhatkar

Assistant

1. Smt. Smitha K. Shirishkar

Upper Division Clerk

1. Shri A.N. Agawane

Supporting Personnel

Supporting Staff Grade III

1. Shri B.M. Ghare
2. Shri C.B. Kolvalkar
3. Shri V.S. Salvi

CALICUT RESEARCH CENTRE

Technical Personnel

T-5 (Technical Officer)

1. Smt. Tara Karupalli
2. Smt. M.K. Sreelekha

T-3

1. Shri T. Gangadharan

T-2

1. Smt. M.V. Valsala

2. Shri T.P. Balakrishnan

Administrative Personnel

Assistant

1. Shri K.P. Velayudhan

Supporting Personnel

Supporting Staff Grade II

1. Shri P. Rajeev

