Central Institute of Fisheries Technology

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

MATSYAPURI P. O., COCHIN - 682 029.

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वार्षिक रिपोर्ट
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केंद्रीय मात्स्यकी प्रौद्योगिकी संस्थान
(भारतीय कृषि अनुसंधान परिषद)

मत्स्यपुरी पी. ओ. कोचिन 682 029.

CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

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Compiled by	:	MARY THOMAS, SCIENTIST (SG)
Cover, Photography & Layout	:	K. BHASKARAN, TECHNICAL OFFICER
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Cover :
Feed for different stages of shrimp

Report of the Director

DURING the year the Institute continued its main thrust in the R & D activities on research projects approvedby the Management Committee of the Institute in addition to the successful implementation of various other programmes. I have also been fortunate to take over charge as Director of the Institute and I wish to record here my sincere appreciation to all my colleagues who helped me in striving to achieve the targets set for the Institute for the year.

Some of the major activities/achievements of the Institute during the year are highlighted in this compendium.

A computer software for designing three bladed and four bladed marine screw propellers was developed.

All the three 7.64m. fibreglass boats designed and developed for pole and line fishing in Lakshadweep waters were well accepted by the fishermen.

The high opening trawl designed for simultaneous and effective exploitation of both bottom and off bottom fishes gave better catch per unit effort compared to the BOBP trawl.

Indigenously produced aluminium cans were shown to be excellent containers for heat processed foods compared to the conventional tin cans.

A simple treatment using chitosan was worked out for treatment of effluents from seafood processing plants.

Design was developed of a container (of 100 kg capacity) for use on cycles/mopeds for fresh fish transportation.

Gunny bags and polythene woven sacs were seen to be ideal packaging materials for bulk storage of commercial samples of semi-dried 'dhoma'.

Medium viscosity chitosan was seen to be better suited for making films than low and high viscosity chitosan.

Methods were developed for preparation of dehydrated and texturised product and a frozen 'Kamaboko' type product from low cost freshwater fish mince.

Process was developed for preparation of collagen from fish maw collagen as well as its conversion to films for medical use such as covering burns and wounds.

Studies on the effect of salting, sundrying and storage on the survival and growth of Salmonella serotypes in fish have shown that at least 12 hours' sundrying to a water activity (a_w) below 0.75 is needed to completely eliminate the pathogen from cured fish.

Under the able supervision and technical assistance of the Engineers of the Institute, a 15.24m. multi-purpose wooden fishing vessel was constructed. The vessel was commissioned by Shri. S. Krishna Kumar, Hon: Minister of State for DARE.

Our Scientists who have gained extensive expertise in deep sea fishing on board the research vessel FORV 'Sagar Sampada' were able to make a record catch on their eleven day cruise along the west coast aboard a 110m. Japanese built factory trawler owned by a Visakhapatnam based company. Scientists of CIFT substantially modified the Japanese vessel's fishing gears and also changed the trawler's fishing strategy based on the shoaling behaviour of the target fish species. This resulted in improved performance of the vessel and record harvest.

The second of the three models of the Ship Borne Data Acquisition System (under a Dept. of Electronics sponsored project) was fabricated.

A powerful computer and digital EPABX telephone system were formally installed at the Institute during the year covered under this report.

After many years of working in a rented building, the Veraval Research Centre moved into its own permanent office-cum-lab building in March 1993.

It is also with profound grief that we record here the sudden and untimely demise of two of our young and upcoming Scientists, Shri. S.K. Bhattacharya and Dr H.K. Beri, who in their short span of life at CIFT made notable contributions to the field of Fish Processing. We also lost Shri. C.M. Gopalan, SSG., of our Calicut Research Centre. Our sympathies to their grieving families.

K. GOPAKUMAR
Director

BRIEF HISTORY

THE Central Institute of Fisheries Technology, named at the time of its inception as Central Fisheries Technological Research Station was set up in 1954 following the recommendations of a high power committee constituted by the Ministry of Food and Agriculture, Govt. of India. It started functioning at Cochin in 1957 under the Department of Agriculture and the then Ministry of Food and Agriculture with a small nucleus of staff for research work in fishing craft and gear. The Processing Division of the Institute was started in 1958 and the Extension, Information and Statistics Division in 1961. The Institute was given its present name in 1962. The administrative control of the Institute was brought under the Indian Council of Agricultural Research from 1st October 1967.

The Institute is the only national Centre in the country where research investigations are undertaken in all disciplines relating to fishing and fish processing.Research Centres located at Veraval (Gujarat), Kakinada (Andhra Pradesh), Burla (Orissa), Bombay (Maharashtra), Panaji (Goa) and Calicut (Kerala) cater to the specific regional needs.

ORGANISATIONAL SET-UP

The Institute is headed by a Director with whom all administrative and financial powers regarding Researchand Management of the Institute are vested. He is assisted by a Senior Administrative Officer, an Administrative Officer and two Assistant Administrative Officers for dealing with matters relating to General Administration and an Assistant Finance & Accounts Officer for looking after the financial accounting aspects as also internal audit of the Institute. One Technical Officer attends to the technical matters including those connected with research projects handled by the Institute at its Headquarters at Cochin and Research Centres.

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

1. Fishing Technology Division
2. Fish Processing Division
3. Bio-chemistry & Nutrition Division
4. Microbiology, Fermentation & Biotechnology Section
5. Engineering Division
6. Extension, Information & Statistics Division

RESEARCH ACCOMPLISHMENTS

HEADQUARTERS, COCHIN

FISHING TECHNOLOGY DIVISION

Scientists/Technical Officers associated

P. A. Panicker, V. C. George, K. Ravindran, K. A. Sadanandan, N. Unnikrishnan Nair, A.G.G.K. Pillai, K.K. Kunjipalu, B. Meenakumari, N. Subramonia Pillai, P. George Mathai, K.V. Mohan Rajan, M.R. Boopendranath, V. Vijayan, M.D. Verghese, M. Syed Abbas, Saly N. Thomas, Leela Edwin, N.A. George, K. Radhalekshmy, Varghese Paul

Chief findings

Indal M57 performed better with respect to pitting resistance than other aluminium alloy series.

A computer software was developed for designing 3 bladed and 4 bladed marine screw propellers.

A new trawl resource of small sciaenid species Atrobucca marleyi was located in deeper waters (112-128m) on the north west coast.

The 33.7m RMT 6E large mesh trawl yielded a CPUE of 900 Kgs of fish in 21° 16' Lat N and 69° 02' Long E.

Fishing experiments were conducted at Mandapam with crab pots developed at the Institute and the design finalised.

Survey undertaken on the performance of artificial reefs erected by the South Indian Federation of Fishermen Societies, Trivandrum, has revealed good concentration of perch, squid and miscellaneous fish landed by hand lines.

Research Projects Handled

1. C-10/92(5)	–	Design development and techno-economic analysis of fishing vessels in the size range of 15-20m and 20m and above for operation in the EEZ
2. G-21/89(5)	–	Low energy fishing techniques
3. G-24/91(3)	–	Conservation and exploitation of demersal fishery resources of Indian EEZ
4. G-25/91(4)	–	Studies on microfouling
5. G-26/91(3)	–	Harvesting techniques for semi-pelagic resources

Report of Work Done

Fishing craft

A techno-economic feasibility analysis of different classes of deep sea vessels was carried out and the engine power, propeller diameter, fish hold capacity and co-efficient for optimum performance arrived at based on the survey of the vessels in operation.

The three 7.64m. fibreglass boats designed and developed for pole and line fishing in the U.T. of Laccadives were well accepted by the fishermen.

The lines plan of 18.2m and 20.25m OAL improved type of fishing vessels was finalised.

A computer software for the design of 3 bladed and 4 bladed marine screw propellers was developed taking different operational parameters into consideration.

A comparative performance evaluation in relation to general corrosion and pitting was carried out in respect of 5000 series of aluminium alloys. Indal M57 S was seen to perform better than the others in the series.

Better retention of residual strength was noticed in *Antiaris toricaria, Artocarpus hirsuta and Terminalia tomentosa* subject to pressure impregnation by Ascu and creosote.

Studies on the influence of substrata configuration and chemicals employed in the initial settlement of biofoulers revealed that rough surface influences settlement of microfoulers.

Troll lines

Troll lines from 2mm dia PA monofilament and 3mm dia polypropylene along with different types of jigs were fabricated and experimental fishing carried out.

Artificial reefs

Artificial reefs erected at Mannar, Valiathura and Thumba were surveyed. Arrangements are underway to fabricate different types of reefs based on the performance of these reefs.

Gill nets

Studies on the length frequency of major species of prawns caught in stakenets and gill nets of Vypin and Perumpadappu have shown that at Vypin, *M. dobsoni, P. indicus* and *M. monoceros* predominated, *P. monodon* occurring mostly during the period January-March. Mean length of *M. dobsoni* ranged from 4.41 to 6.58. Lower length groups of this species were found to occur during January, February and July. Mean length of *P. indicus* ranged from 10.57 to 12.65 and that of *M. monoceros* from 7.69 to 9.26. *P. indicus* predominated the catches in the gill nets with mesh size ranging from 34.0 – 36.0mm., the size of the catch ranging from 10.3 – 11.4cm.

Trawls

Field trials were carried out from FORV 'Sagar Sampada' using 38m hybrid trawl, 51m large mesh high speed demersal trawl II and 50m high opening trawl. The average CPUE for the HSDT-II and 50m HOT was 1772 Kg and 812 Kg respectively. Fabrication of three 50m high opening trawls was also taken up and completed.

Field trials were carried out from FORV 'Sagar Sampada' with trouser cod ends of 30mm size square mesh fitted with covers to study the comparative escapement and retention. Studies were also done with trouser cod end fitted with diamond and square mesh of 40mm mesh size.

33m and 22m semi-pelagic balloon shrimp trawls having trouser cod ends of square mesh and diamond mesh of 20mm mesh size and fitted with covers were fabricated. Trials are to be undertaken.

A 24.6m demersal trawl for exploitation of cephalopod resources was designed and fabricated and initial trials undertaken from RV 'Cadalmin'.

A number of fishing experiments were also undertaken with different sizes of midwater trawls in combination with different types of otterboards, sweeps and bridles. Model testing of a 23.4m RMT 6E prototype with 5.85m bridles and 450 X 225mm suberkrub otter-boards is in progress in the Cochin backwaters. A 1/15th model of a 18.0m RMT 8P net with 149 X 66mm vertically curved boards and 1.2m sweeps was field tested at the IIT test bank in Madras. A 40.6m midwater trawl net was designed, fabricated and operated from FORV 'Sagar Sampada' in combination with 4.3m^2 vertically curved otter boards and 160m sweeps. The 33.7m RMT 6E yielded a CPUE of 900 Kg of fish. The 33.7m RMT 6E and 36.4m RMT 8P semi-pelagic nets in combination with 1.5t. perfect 'V' boards and 60m bridles when operated from FORV 'Sagar Sampada' yielded a CPUE of 58.5 Kg and 650 Kg respectively.

Microfouling

Study was continued on biofilm accumulation on different materials like glass, aluminium, stainless steel, tin, copper, brass and lead by gravimetric method. Total bacterial count on fibreglass, glass and perspex and identification of bacteria present on these materials was carried out from offshore waters, besides estimating the protein in the slime film collected from these waters. The micro-organisms other than bacteria settling on the surface of coastal waters were studied and it was observed that the pattern of settlement differed with difference in salinity.

Research Contemplated

1. Development of designs of vessels of size 18m and 24m OAL for deeper waters
2. Studies on entangling nets for prawns and crabs
3. Design and development of demersal and high opening trawls for the Indian EEZ
4. Model testing of semi-pelagic trawls
5. Assessment of biofilm formation and sequence of settlement on different substrata

FISH PROCESSING DIVISION

Scientists associated

P.V. Prabhu, T.S.G. Iyer, K.K. Balachandran, P.A. Perigreen, P. Madhavan, K.G. Ramachandran Nair, P.T. Mathew, A. Lekshmy Nair, Chinnamma George, P.K. Surendran, Jose Joseph, P.R.G. Varma, T.K. Srinivasa Gopal, A.C. Joseph, P.K. Vijayan, T.K. Thankappan, K.P. Antony, R. Thankamma, V. Muraleedharan, P.T. Lekshmanan, V.N. Nambiar, Francis Thomas.

Chief findings

Treatment of Lutjanus sp. with spices like clove and cardamom prior to freezing extended the frozen shelf life of the product by about 3 months (from 7½ to 11 months).

Addition of 2% NaCl in surimi prepared from ribbon fish and lizard fish improved the 'Suwari' phenomenon with a gel strength of 800-900 g.cm.

A palatable battered and breaded product with a shelf life of 6 months at -20°C was prepared from dressed anchovy.

Methods were standardised for preparation of fish paste from minces of sciaenids, red snapper and E. diacanthus as well as using meat from small crabs.

An unconventional product 'fish balls in curry sauce' packed in metal cans was developed and its shelf life studied. The product retained its acceptable organoleptic characteristics for 9 months.

Aluminium cans were found to be excellent containers for heat processed foods compared to tin cans.

Sodium alginate and chitosan behaved similarly in increasing the water stability of fish/prawn feed fillets with a protein content of 35% and above. But with lower protein levels the effect of chitosan in increasing the water stability was more than that of sodium alginate.

Medium viscosity chitosan was found better than low and high viscosity chitosan for making films.

A tentative formula was developed for preparation of prawn feed based on analytical data collected from imported feeds.

Listeria monocytogenes was viable in fish meal for 110 days at room temperature. The organism still continued to be viable in frozen shrimp even after a storage period of 16 months at -18° C.

Although the presence of indole in shrimp indicated decomposition, its absence did not ensure that the sample was of acceptable quality.

A simple treatment was worked out for treatment of effluents from seafood processing plants.

Suitable containers were designed and developed for use on cycles and mopeds for fresh fish transportation.

Battered, breaded and flash fried fish fingers prepared from different types of fish remained in good condition for periods extending upto 4 months when stored at -18 to -20° C.

Research Projects Handled

1. P-44/91(3) – Low temperature preservation of fish-Processing and product development
2. P-38/90(5) – Development of heat processed fish products in modern containers
3. P-41/91(5) – *Upgradation of technology in the utilization of prawn and tuna* waste
4. P-42/91(5) – Studies on pollution, contamination and quality evaluation in seafood handling and processing
5. P-43/91(3) – Studies on the modern packaging systems for fish and fishery products

Report of Work Done

Freezing and iced storage

Studies were continued on the iced storage characteristics of *Macrobrachium rosenbergii* and *Penaeus indicus*. It was noted that even after a shelf life of 11 days and 15 days respectively, Salmonella, *Vibrio cholera*, Coliforms and *E. coli* were absent in both the samples.

Lutjanus sp., treated with spices like clove and cardomom had a better storage life than the untreated fish. The frozen storage life of the treated samples was 11 months while that of the untreated samples was only $7^1/_2$ months.

Different species of yellow clams were collected and analysed for their chemical constituents. They were seen to differ in their protein structure and carbohydrate content. The meat from two *different species were taken and frozen as* raw as well as cooked and then frozen and the changes occurring during frozen storage studied. In the case of the cooked samples, slight hardening of texture, colour fading and loss of the characteristic sweet taste was observed, while in the raw frozen samples, oozing out of the juice was noticed.

A two stage low volume exchange was optimised for the preparation of surimi from ribbon fish and lizard fish. Addition of 2% NaCl was seen to improve the 'suwari' phenomenon with a gel strength of 800-900 g.cm. Preliminary studies were also carried out to standardise the washing regime for surimi from shark, *Priacanthus* and horse mackerel. The suitability of *Diacanthus* sp., *Johnius* sp. and *E. chlorostigma* subjected to delayed icing was studied for preparation of surimi. Although these fishes normally gave good quality surimi, delayed icing exceeding 8 hrs. resulted in low volume of water retention and gel strength with a protein loss ranging from 23-30%.

A palatable, battered and breaded product was prepared from dressed anchovy

and its quality characteristics studied. The frozen, pre-fried product remained in acceptable condition even after 6 months' storage at -20°C.

Coated fillets were prepared from horse mackerel, *Johnius* sp., *Ottolithes* sp. and threadfin bream. In the case of horse mackerel, rancidity was noticed after 2 months' storage at -20°C.

Method was standardised for preparation of fish paste from minces of Sciaenids, red snapper and *Epinephelus diacanthus*. The paste had good spreadability and organoleptic quality. No change in texture and spreadability was observed even after heating or freezing. Fish paste of good acceptability was also prepared from the meat of small crabs.

Canning

The suitability of different species of fish for processing in different types of retort pouches was continued. The different retort pouches studied were Paper Products pouch, Esselex pouch, Hitkari Potteries pouch and Metal Box pouch. Oil sardine was packed in these pouches as natural style and heat processed for evaluating the pouch performance. The Paper Products pouch possessed properties comparable to the Metal Box pouch and had no delamination or flex cracks. The Esselex pouch developed flex cracks on heat processing at 115°C resulting in poor shelf life. The Hitkari Potteries pouch had poor barrier properties against air/oxygen and caused rancidity. This pouch was however found suitable for boil in bag applications.

An unconventional product 'fish balls in curry sauce' was developed, packed in tin plate cans and its shelf life for 15 months studied. The product retained its acceptable organoleptic features for 9 months after which it deteriorated gradually.

Formulations were worked out for side dish curry preparations like 'fish in masala', 'prawn in masala' and 'prawn develle' and wholesome meals like 'prawn in rice' and 'fish in rice'. Aluminium cans were used for the curry preparations and retort pouches for the others. Their shelf life studies are in progress.

The bacterial and organoleptic characteristics of various fish products were studied for assessing their processing requirements. Products like mussel in oil and brine, fish in curry and mackerel in oil were packed in aluminium cans after 14 months of storage and their properties studied in comparison with similar products packed in tin cans. Studies have shown aluminium cans to be excellent containers for heat processed foods. Neither did the cans develop any staining or corrosion inside, nor did the contents acquire any metallic flavouring or staining. Tin cans on the other hand developed excessive staining as well as imparted metallic flavour to the meat. The sensory characteristics of the products packed in the aluminium cans were also far superior to that packed in tin cans.

Fishery by-products

In order to evaluate the quality of chitosan, the degree of deacetylation was determined by derivative spectroscopy. Chitosan prepared under identical condi-

tions from *P. monodon* and *P. dobsoni* had a degree of deacetylation between 80-85% and mol. wt. 2-2. 5 lakhs.

Agar was prepared from *Gracilaria* species of seaweed following the same process developed for *Gelidiella*. But the agar obtained had lower gel strength although it was more than that obtained in the conventional acid process.

More samples of carboxy methyl chitin were prepared from chitin by the method already developed. The product was seen to be readily soluble in water.

Glucosamine hydrochloride with 99.9% purity was prepared on a bench scale. Its quality compared with sigma sample when tested on Iatroscan.

Sodium alginate and chitosan behaved similarly in increasing the water stability of fish/prawn feed fillets with protein content 35% and above. But at lower protein levels (about 20%), the effect of chitosan in increasing the water stability was more than that of sodium alginate.

Medium viscosity chitosan was found better than low and high viscosity chitosan for making film. While films from low viscosity chitosan showed brittleness, it was difficult to make films from high viscosity chitosan due to air trapping.

Feeding experiments with 0.5% and 1.0% chitin incorporated diet on pigs done in collaboration with College of Veterinary and Animal Sciences, Mannuthy, Trichur were completed. Animals fed on chitin (0.5%) diet reached a marketable size (70 Kg.) within 5 months whereas the control required 7 months to gain the same weight. There was also decrease in deposition of fat and cholesterol in the muscle, backfat and internal organs. An interesting observation was the increase in unsaturation of fat in the chitin diet fed pig. Similar experiments have been initiated on albino rats.

Data were collected on the availability and composition of tuna waste in Lakshadweep. Red meat of tuna had 5 times haemoglobin and myoglobin compared to white meat. Tuna meal was prepared from the red meat and tried for making chutney powder. Red meat was also partially decolorised and used for preparation of cutlets. But the product was inferior in sensory qualities.

Meat particles adhering to crab shells thrown out from processing units were separated and a concentrate prepared. The concentrate prepared from deep sea crab had 57% protein and 10% moisture level. The water extractable matter from the crab shell on concentration gave a concentrate with characteristic flavour.

Experiments were carried out to arrive at a minimum size of sea-cucumber to process beche-de-mer of permitted size (length 7.5 cm) for export. Further studies are in progress.

A tentative formula was finalised for a grow out prawn feed based on the analytical data of imported feeds and feeding experiments conducted in a 2 ha. farm for *P. indicus*. Results so far obtained have been quite encouraging.

Quality control

A total of 128 samples of frozen shrimp and 26 samples of frozen cooked crab meat collected from processing factories were monitored for the incidence of *Listeria monocytogenes* . The pathogen was absent in all the samples.

Fish meal inoculated with *L. monocytogenes* was stored at room temperature and periodically drawn and tested for the organism. The organism was seen to be viable in fish meal for 110 days at room temperature. Viability of the organism in shrimp and shrimp homogenates frozen stored at -18°C. was continued. The organism was viable even after 16 months' storage.

About eighty dried fish samples were tested for the presence of fungi. *Aspergillus sp.* continued to predominate in all the samples.

Assessment of freshness of fish and shell fish, viz. mullet, *P. monodon* and *P. indicus* during iced storage and at room temperature using K value as quality index was continued. In shrimp, during iced storage, the K value increased from an initial 0% to 50% in two weeks' storage. In mullet, the K value reached 50% after 8 days' storage in ice and 46.5% in 8 hrs. at room temperature.

Four species of prawns were kept at ambient temperature and the indole content estimated at frequent intervals. Significant increase in indole content was noted only after 16 hrs by which time however the product got highly spoiled and became unacceptable. Studies are continued.

About twenty eight samples of squid and cuttle fish were screened to study the inter-relationship between toxic heavy metals.

Packaging

A U shaped box of 100 Kg capacity of dimensions 84 x 45 x 75 cm was designed and developed for use on cycles and mopeds for fresh fish transportation. Commercial production of the box using 25mm thick polyurethane is proposed to be taken up by a firm.

Seer fish steaks were sealed in 12 micron polyester laminated with 230 gauge low density polyethylene inoculated with *Clostridium botulinum* introduced with different concentrations of carbon dioxide, oxygen and air and kept at 0 to 4°C. Gas mixtures containing less than 30% oxygen permitted the growth of the organism as well as toxin production during storage, whereas gas mixtures containing 70% carbon dioxide and 30% oxygen prevented the growth.

Master cartons coated with chitosan dissolved in acetic acid and packed inside with duplex cartons containing ice to simulate conditions as for storing frozen prawns were stored at -20°C. The chitosan coating did not show much improvement in the retention of physical properties of the corrugated fibre board.

IQF shrimp prepared from *P. stylifera* and packed in different packaging materials like 200 gauge polythene, 250 gauge polythene, LD/Nylon/LLDPE and 12 micron polyester laminated with 150 gauge LDP remained in good condition for a

period of 6 months at -18 to -20°C. During storage, dehydrated pieces were 60%, 55%, 33% and 23% in the different packaging materials mentioned above, respectively.

Fish fingers were prepared from catla fish minced meat. The fingers were battered, breaded and flash fried for 20 seconds, packed in PVC thermoformed trays and stored at 4°C, -7 to -8°C and -20°C. The samples stored at 4° C became unacceptable after 11 days. Those kept at -7 to -8°C and –20°C remained in very good condition upto 13 weeks and 28 weeks respectively.

Similar product prepared from Kalawa fish mince remained in good condition upto 11 days. The samples stored at -7 to -8°C remained in acceptable condition upto 12 weeks and those kept at -20°C kept well for $3^1/_2$ months.

Seer fish curry prepared using Malabar tamarind, chilly powder, ginger and turmeric and packed in thermoformed containers like PVC and HDPE with a transparent pack at the top made of polyester/polythene laminate remained in good condition even after $6^1/_2$ months at -18 to -20°C. In the case of sardine fish curry packed and stored in a similar manner, the product remained acceptable only for a period of 4 months. During the fifth month the samples got spoiled.

Prawn chutney prepared and packed in LD/Nylon/BA/Primacor remained in acceptable condition even after 6 months' storage at ambient temperature. Loss of sweetness and slight rancidity were noticed during storage. The total bacteriological count during the period was 2.6×10^3/g. Gram positive sporeformers of the *Bacillus* type was observed in the samples.

Formed and fried slices of fish products of about 1 cm thickness prepared from fish mince, salt and spices and packed in LD/Nylon/BA/Primacor pouches showed incidence of fungal attack after one week storage at ambient temperature. The same product with slice thickness less than 0.5 cm remained free of fungal attack for about three weeks.

Insect penetration was observed in polyester/polythene laminate containing dry glass perch with 18% moisture and dry Kilimeen with 23% moisture after 203 days and 195 days respectively. No attack was noticed even after 220 days in metallised polyester/polythene laminate.

Research Contemplated

1. Further studies on cultured prawns
2. Freezing and frozen storage of freshwater fishes in different forms
3. Effect of natural preservatives/spices in extending frozen shelf life of fish
4. Studies on gel forming capacity of washed and unwashed flesh of fish
5. Development of battered and breaded products, paste fishery products and value added products from crab
6. Suitability of different fishes to processing in retort pouches

7. Development of new recipes for various fish based products
8. Studies on canning facilities existing in the country
9. Studies on processing requirements with reference to maintenance of organoleptic and bacterial quality
10. Standardisation of methodology for determination of quality of chitosan
11. Comparative study on effect of sodium alginate and chitosan on water stability of prawn feed
12. Preparation of chitin and chitosan derivatives
13. Effect of chitin/chitosan based feeds on rats and domestic animals
14. Utilisation of waste from canneries
15. Viability of *L. monocytogenes* in seafoods
16. On K value and indole content as quality index
17. Fungi in dried shrimp
18. Inter-relationship between trace metals in seafoods
19. Packagings for fresh, quality fishes, frozen, dried, fried and other ready-to-serve products

BIOCHEMISTRY & NUTRITION DIVISION

Scientists associated

P. Madhavan, K. Devadasan, P.D. Antony, Jose Stephen, M.K. Mukundan, A.G. Radhakrishnan, M.R. Raghunath, K. Ammu, T.V. Sankar, Suseela Mathew.

Chief findings

A suitable collagen film for covering burns and wounds was developed.

The content of all chlorinated pesticides examined was very low in deep sea fishes, not exceeding .07mg/Kg.

The temperature employed for drying of fish was found to have significant influence with regard to PER, NPU and BV. A temperature of 60°C was seen to be ideal, above which the quality of the material fell.

Oil sardine/mackerel and 'Kilimeen' (Nemipterus japonicus) guts were found to be a rich source of different hydrolases.

Research Projects Handled

1. BCN-12/91(4) – Nutritional significance of lipids, proteins and enzyme systems and minor constituents of fish and shellfish
2. BCN-13/91(3) – Studies on modified fish proteins

Report of Work Done

Fish enzymes

The viscera from a number of fishes were examined for their suitability for hydrolases, viz. proteinases, lipases and carbohydrates. Oil sardine (*Sardinella longiceps*), mackerel (*Rastrelliger kanagurta*), 'Kilimeen' (*Nemipterus japonicus*)and ribbon fish (*Trichiurus savala*) were found to be rich sources of these enzymes. Oil sardines were rich in protease and lipase, mackerel in protease and amylase and 'Kilimeen' and ribbon fish in proteases. The protease in ensiled ribbon fish showed high recoverable protease activity after 24 hr ensilation.

Pesticides and toxic metals

Distribution of chlorinated pesticides and heavy metals in fish tissue was investigated. The content of individual chlorinated pesticides in deep sea fishes was found to be between .02 to .07 mg/Kg. In the case of mussels, the total chlorinated pesticide was below 0.1mg/Kg and that in oyster 0.03mg/Kg. As regards heavy metals, bivalves were seen to contain comparatively higher levels of Hg, Cd and Pb compared to other fishes and shell fishes. The level of all these metals was however far below the toxic limits.

Modifications in fish proteins by heat treatment under varying conditions:

Biochemical changes in muscle proteins of 'Kilimeen' (*Nemipterus japonicus*) during drying at three different temperatures were followed systematically. Fresh 'kilimeen' was dried at three different temperatures viz. 50°C, 60° C and 70°C in a cross flow air drier and samples were drawn from each at 2 hour intervals to follow the changes during drying. After 8 hours, samples were drawn at 12 hrs and 24 hrs only. Changes in solubility of proteins in different buffers and denaturing extractants like 1% SDS, 1.5 M urea, 8 M urea etc. and at different pH values were followed in each case. -SH content electrophoretic patterns etc. were also studied. In all cases, with increase in drying temperature, there was a general decrease in solubility. But solubility at the isoelectric point (between pH 4 and 5) showed a small increase in samples dried at higher temperatures. Higher molecular weight components of the soluble proteins were more susceptible to denaturation as judged by changes in the electro-phoretic patterns. The -SH content showed an initial increase when dried, but after a particular stage, it recorded regular decrease. At 70°C, within 2 hrs of drying, this decrease was noted. After 24 hrs drying, only 14% of the original -SH remained. This suggests an initial uncoiling of protein chains exposing hidden -SH groups in the interior followed by formation of -S-S-bonds.

Invitro digestibility showed an initial increase during drying for 6 hrs at 60°C (74% – 79%). After 24 hrs it came down to 68%. At 70°C, this decrease was noted within 2 hrs itself.

Feeding trials using albino rats supported this trend. PER decreased from 3.65 in the case of samples dried at 60°C to 2.69 in samples dried at 70°C, NPU from 77.6% to 61%and biological value from 89% to 73.8%. Deep frying of dried fish further reduced its nutritional quality. Drying in the sun reduced the available lysine by 8.5%, whereas over drying led to a reduction of 17.7%. Frying in oil reduced available lysine by 25.5%.

Studies on chemically modified structural fish proteins:

Structural proteins of different fishes extracted from the residue after removal of sarcoplasmic proteins, using high ionic strength buffers, were modified by acetylation and succinylation. In general, succinylation yielded better modified proteins than acetylation.

There was some variation in the extent of modification, as followed by the ninhydrin test, between different species. Under similar conditions, the extent of modification was slightly lesser in prawns compared to fishes. Modification by both acetylation and succinylation, in general, improved the solubility of proteins. The proteins after modification had a slightly improved viscosity also.The isoelectric point showed a very small shift only after modification which was not very significant. Normal PAGE did not give clear patterns in the case of modified proteins. SDS PAGE gave clear patterns. Patterns showed perceptible changes after modification but these changes varied from species to species and it was not possible to draw clear conclusions of general nature.

The emulsifying capacity of the proteins increased after modification by acetylation as well as succinylation in most cases. In the case of proteins of sardine, jew fish and catla this was very clearly seen. However, in the case of mackerel and prawn proteins, the effect was not so clearly noticeable. In prawns this can be partly attributed to the lesser degree of modification. But in mackerel, the emulsifying capacity in fact showed a slight decrease. Changes in the Emulsifying Activity Index (EAI)and the Emulsion Stability (ES)were studied at varying protein concentration, homogenisation speed and time etc. In prawns, EAI did not show much change after succinylation but ES increased two fold. Mackerel was found to behave in a different way compared to other fishes, which was to be expected in view of the peculiar behaviour of mackerel proteins in other respects also.

Studies on modified collagens:

Chromicised surgical sutures prepared from fish guts by the standard methods were sent to M/s. FDC, Bombay and the surgery department of the Medical College, Trichur for trial on human volunteers. Preliminary results have been quite encouraging. Prior to trying finer grades for ophthalmic surgery, the Medical College have requested for more samples of thicker grade sutures. Report from M/s. FDC is awaited.

On the basis of trials carried out by the laboratory model of a simple device developed for cleaning fish guts, some improvements were effected in the design.

A process was developed to prepare collagen fibres from fish maws collagen by dissolving in suitable solvents at proper temperature etc. and making it into films of desired thickness. The membrane has been found suitable for covering burns and wounds and its storage characteristics were found satisfactory even after 6 months.

Research Contemplated

1. Concentration of enzymes already found feasible for exploitation
2. Evaluation of hydrolase, lipase, protease, amylase and catalase for commercial exploitation
3. Evaluation of chlorinated pesticide and heavy metals in fish and shell fish
4. Amino acid composition in fish and shell fish
5. Loss of lipid fractions in oil sardines during salting and oxidative and hydrolytic rancidity in salted oil sardine
6. Modification of fish proteins by dehydration under varying conditions
7. Studies on chemically modified structural proteins of fish
8. Modified fish collagens and their possible applications
9. Effect of Vitamin E supplemented fish oils on serum lipids and sugars in albino rats.

Collagen film from fish air bladder suitable for covering burns and wounds

A range of products developed at the Calicut Research Centre of CIFT from fish and shellfish

Proteolytic strains of Aeromonas spp. on Nutrient Casein agar

Record catch on board the Japanese built 110 m. factory trawler MFV Oriental Angel – an outcome of the consultancy service offered by CIFT Scientists

Smt. M. T. Padma, Hon. Minister for Fisheries, Rural Development and Registration in the CIFT pavilion at the "Aquafest – '93" held at Cochin

MICROBIOLOGY, FERMENTATION & BIOTECHNOLOGY SECTION

Scientists associated

P.K. Surendran, Nirmala Thampuran, V.N. Nambiar, Sanjeev, S., K.V. Lalitha, R. Badonia.

Chief findings

Aeromonas cultures producing high proteolytic enzymes were isolated.

Dried/cured fishes of commerce were seen to be free from Salmonella.

Contamination of fishes with Salmonella serotypes could be completely eliminated by proper sun-drying.

Lactobacillus cultures exhibiting anti-bacterial property have been isolated from fresh fish of commerce.

Freshwater culture ponds and fish therefrom were free from Vibrio parahaemolyticus.

Research Project Handled

BCNM/MB(2)/89(5)– Investigations on toxigenic and pathogenic bacteria associated with marine and cultured fishes.

Report of Work Done

Listeria in fish/fishery products:

Fish/fishery products and shellfish samples of local trade were examined for the presence of *Listeria monocytogenes* and related pathogens. Both FDA and UVM methods were used for pre-enrichment and Oxford and PALCAM selective agar for detection and isolation. Out of the 1493 presumptively positive cultures isolated, 546 were identified as *Listeria* spp. They belonged to *Listeria innocua, L. seeligeri, L. grayi* and *L. ivanova* . None were found to be *L. monocytogenes.*

Enteropathogenic Aeromonas in fresh fish:

Marine, brackishwater and freshwater fishes were screened for the presence of enteropathogenic *Aeromonas* spp. The population of motile aeromonads in these fishes ranged from 36 to 1.0 $\times 10^5$/g of muscle with skin. About 50% of the samples harboured motile aeromonads. Out of the 83 presumptive cultures studied, none was the enteropathogenic *Aeromonas hydrophila.* Also, 35 dried/cured fish samples of commerce were found to be free from *Aeromonas sp.*

Studies on fish pathogenic bacteria

Studies on the bacterial cultures isolated from the epizootic ulcerative syndrome (EUS) affected fishes from Kuttanad, were completed. *Aeromonas hydrophila* was found to be the major group, followed by *Pseudomonas, Escherichia, Acinetobacter, Arthrobacter* and *Bacillus.*

Two fish samples, belonging to *Mugil cephalus* and *Mugil parci,* which exhibited severe ulcerations on body surface were also examined. Out of the 16 cultures isolated from the ulceration and internal organs, 5 cultures belonged to *Aeromonas hydrophila,* 3 cultures to *Pseudomonas spp.,* 2 cultures to *Vibrio spp.* and one to *Enterobacter spp.*

Cultured freshwater fishes like mrigal and rohu from Muhamma farm (Alleppey District) and Poilakada farm (Trichur District) were surveyed for the fish pathogenic bacteria.One mrigal sample from Muhamma farm was found to carry *Aeromonas hydrophila* .

Salmonella

Studies were carried out on the effect of salting, sun-drying and storage on the survival and growth of Salmonella serotypes in fish. The fish were artificially contaminated with Salmonella cells before and after salting. Salting reduced the Salmonella by 90%. After 3 hours' sundrying, the water activity came down to 0.83 and about 97% Salmonella cells were destroyed. After 6 hours sun-drying, water activity was 0.79 and there was 99.9% destruction of Salmonella cells. Even after 9 hrs sun-drying (in two intervals), when water activity reached 0.77, Salmonella cells were not completely destroyed. However, after 3 more hours' (total 12 hrs sun-drying, (a_w-0.75) Salmonella was completely destroyed. The study has shown that at least 12 hrs' sundrying (on consecutive days) to a water activity below 0.75 is needed to completely eliminate *Salmonella* from cured fish.

Vibrio parahaemolyticus

Penaeus indicus and *P. monodon,* harnessed from brackishwater culture pond were found to harbour *Vibrio parahaemolyticus,* but, *Vibrio cholerae* (01) was not detected.

The gills, intestine and skin surface of rohu (*Labeo rohita*) from freshwater culture ponds from Muhamma (Alleppey District) and Trichur were also screened for both *V. cholerae* and *V. parahaemolyticus.* However, these were found free from these pathogens.

Clostridium botulinum

Out of the 37 fish samples caught by FORV 'Sagar Sampada', during her Cruises No.97 and 98 off the South West Coast of India, four samples were found to carry *Clostridium botulinum* type D. However, *C.botulinum* type E was not detected in any of the samples. Water, mud and prawn (*P. monodon*) from a brackishwater culture pond at Chellanam (Cochin) were found to harbour *C. botulinum* type D. Of the 97 cultures of *C. botulinum* type D isolated, 12 were found to be toxigenic.

Dried/cured fish samples of internal trade were frequently found to be contaminated with *Clostridium botulinum.* Out

of the 102 samples belonging to 15 different species, *C. botulinum* type C were detected in 13% of the samples and type D in 7% of the samples. The water activity (a_w) of these samples was in the range of 0.75 to 0.80, indicating that, even at these low a_w, spores of *C. botulinu* mtype C & D remained viable.

Lactic acid bacteria

Lactic acid bacterial cultures were isolated from fresh fish of local markets. They were screened for antibacterial activity against *Bacillus, Pseudomonas, Aeromonas, Escherichia* and *Staphylococcus* spp. Out of the 20 lactobacillus cultures tested, 4 exhibited antibacterial activity against the bacteria belonging to 4 of the above genera, except *Bacillus.*

Halophilic bacteria

Dry, salted and wet fish samples of commerce were examined for halophilic bacteria. Seventy eight halophilic cultures were isolated, of which 43 were obligate halophiles, belonging to *Halobacterium halobium sp.*

Lipolytic and proteolytic bacteria

Thirty eight lipolytic bacterial cultures were isolated from fish/shellfish. Eight of them were highly lipolytic and belonged to *Pseudomonas sp.* Eleven Aeromonas cultures isolated from freshwater fishes were found to produce large quantities of proteolytic enzymes.

Research Contemplated

1. Investigations on *Listeria* and *Aeromonas* in fish/shellfish
2. Bacterial enzymes
3. Studies on fish disease causing bacteria
4. Bio-active and antibiotic substances from micro-organisms
5. Microbial pollution of aquatic systems
6. Pathogenic and toxigenic bacteria, like *Salmonella, Bacillus cereus, Vibrio spp., Staphylococcus aureus & Clostridium* spp.
7. Lactic acid bacteria in fish preservation

ENGINEERING DIVISION

Scientists associated

K. Sreedharan Namboodiri, T.K. Sivadas, S. Ayyappan Pillai, P.K. Chakraborty, P.N. Joshi, K. Ramakrishnan, K. Vijayabharathi, M. Nasar .

Chief findings

The device developed for drawing uniform samples from frozen fish blocks for microbial evaluation was tested and found to be working satisfactorily.

A design was developed to treat effluents from fish processing factories.

A 15.24m multi-purpose wooden fishing vessel was constructed and launched.

The know-how of the Ship Borne Data Acquisition System developed at the Institute as part of A DOE sponsored project for monitoring 10 important parameters related to marine meteorology, water quality and performance of the vessel was transferred to M/s. Keltron for commercial production.

A 16 channel Data Acquisition System for intensive aquaculture was developed.

A water current meter was developed as per the specific needs of IARI, New Delhi and transferred to them for their investigations in water drainage studies.

Research Projects Handled

1. ENGG-9/90(5) – Development of equipment and machinery for harvest and post-harvest technology of fish
2. IN-3/91(5) – Development of electronic instruments for marine fisheries and aquaculture.

Report of Work Done

Fabrication of the device for drawing uniform samples from frozen fish blocks for microbiological evaluation was completed and trial operations carried out successfully.

Fabrication of the oil fryer was also completed and the unit installed in the fish cutlet production line. The equipment has been given on loan to a Govt. Department for commercial production trials.

Materials required for fabrication of a flue gas drier have been procured. Fabrication is in progress.

Design was prepared of a non-mechanical type tunnel dryer of 150 Kg/batch

capacity for production of prawn shell meal and estimate of materials required for its fabrication worked out. The drier is heated by flue gas generated by firing materials like coconut shell, pitch, husk and saw dust.

Field trials carried out with the newly designed propeller nozzle have given encouraging results with regard to saving in fuel consumption. Attempts are under way to popularise the same amongst boat owners.

Survey was conducted of the fisheries harbours at Tuticorin and Thiruchandur to collect details of the engines, fuel consumption and fishing details from trawlers of different sizes. A total of 32 boats of size ranging from 9.6 – 14.4m were 'studied' in this connection. Smaller vessels of size 9.6m and 9.9m are seen fitted with Ruston engine while the bigger vessels (10.8m and above) are fitted with Leyland engine of 90–125 HP. The Leyland engines were seen to perform better than the Ruston engines.

Study was also undertaken of the existing country crafts and the engines used for their propulsion with a view to improving their design. Based on this study, a new design of a country craft was prepared suited for efficient motorisation with an outboard motor. A private party has extended an offer to construct a prototype of this design using expanded PVC foam.

A 15.24m multi-purpose wooden fishing vessel was constructed and launched. The vessel has a main engine of 223 HP at 1800 rpm coupled to a 4 bladed propeller of 1000mm dia and pitch of 920mm. The vessel can accommodate 11 persons on board and has an insulated fish hold capacity of 5 tons. The endurance of the vessel is 4-5 days. Trawl winch drum capacity is 500m with 12mm dia. warp for each drum. The vessel is built entirely of good quality 'Anjali' and fasteners. The fish hold and wheel house top are lined with fibreglass.

Designing of circuits for data display and processing signals corresponding to fuel consumption was carried out. A software was also developed for converting binary data to decimal format.

Design and development of model B of Ship Borne Data Acquisition System was completed with provision for storing data using memory module and retrieval through PC. The instrument was operated in the research vessel FORV 'Sagar Sampada' and data collected.

The Data Acquisition System for intensive aquaculture was designed and developed. The instrument is equipped to monitor 16 environmental parameters with provision for storing the data collected using memory module. The acquired data would be very much useful for iinvestigations connected with fishery oceanography and agriculture in addition to aquaculture.

A water current meter was developed and supplied to IARI, New Delhi for field survey in Agri-Drainage estimations. This equipment is designed to monitor water current in rivers and canals with high sensitivity and accuracy at low as well as high speed ranges (10 to 400 cms/sec.).

Design was completed of a composite instrument to measure dissolved oxygen, pH, salinity and temperature for the benefit of aquaculture farmers. Development of sensors and electronics for measuring salinity and temperature was completed.

Field trials of the following equipments developed at the Institute were carried out:-

1. Ship Borne Data Acquisition System (First model) was operated on board 'Blue Fin' of CIFNET and valuable data collected.

2. Trawl Operation Monitor, the electronic instrument developed to monitor important parameters relevant to fishing technology was operated on board Departmental vessel and data collected in connection with the studies of model nets.

3. The Electronic Thermometer was operated continuously for studying the efficiency of several cold storages and technical assistance rendered to agencies for its installation and operation.

Research Contemplated

1. Establishment of design parameters for a 13.74m fishing vessel and preparation of detailed drawing for the fishing industry

2. Supervision of construction and performance of fishing vessels built by entrepreneurs as per CIFT design

3. Assembly and testing of electronic circuits for measurement of fuel consumption, development of system software and procurement and modification of fuel consumption sensor

4. Study on stability, speed, bollard pull, fishing efficiency, fuel consumption and costing of the newly constructed 15.24m CIFT vessel

5. Development of third model of Ship Borne Data Acquisition System.

6. Development of instruments for aquaculture

7. Field evaluation of Instruments and technology extension including commercialisation, demonstration and training

EXTENSION, INFORMATION & STATISTICS DIVISION

Scientists associated

M. K. Kandoran, K. Krishna Rao, H. Krishna Iyer, A. K. Kesavan Nair, S. Balasubramaniam, Mary Thomas, G. R. Unnithan, V. Annamalai, Braj Mohan, Bankey Bihari.

Chief findings

Low quality aluminium sheets, high price and expenditure on sheathing materials and non-availability of good quality antifouling paints are the major constraints faced by the fishermen using aluminium alloy sheathing for wooden boat hulls.

The technology of motorisation of fishing craft is seen to be better received in Maharashtra than in the other states like Kerala, Karnataka, Andhra Pradesh and Tamil Nadu.

The socio-economic status as well as some technological variables are seen to have positive association with the innovative behaviour of traditional fishermen.

Research Projects Handled

1. EXT-15/90(5) – Technology transfer and its impact in fisheries.
2. EXT-16/90(4) – Product evaluation and marketing research of the fishery products developed

Report of Work Done

Among the respondents interviewed for collecting data on adoption of improved practices in sheathing wooden hulls of fishing vessels, 96.5% of the fishermen were seen to have used aluminium for sheathing the hulls, while the remaining used copper and FRP as sheathing material. Only 11.6% used the painting schedules recommended by the Institute. The difficulties faced by these fishermen were low quality aluminium sheets, high price and expenditure on the sheathing materials and non-availability of good quality anti-fouling paints.

In order to study the differential adoption and communication behaviour of traditional fishermen, data were collected from 56 respondents in selected fishing centres of Kerala and Tamil Nadu. Preliminary analysis of the data reveal that the variables such as type of fishing, size of craft, total investment, number of crew and information need have some positive association with the adoption behaviour of the traditional fishermen.

Data for the study on the innovativeness and decision making behaviour of traditional fishermen were collected from

selected respondents in the villages of Kerala and Tamil Nadu.

Observations made so far reveal that the socio-economic status and some of the technological variables have a positive association with the innovative behaviour of traditional fishermen.

Study on the pattern of adoption of motorisation has shown that this technology was better received in Maharashtra than in the other states such as Kerala, Karnataka, Andhra Pradesh and Tamil Nadu. While diesel based inboard engines are used in Maharashtra, Kerosene based engines are being used in the other areas. The average investment on a fishing unit in this state is Rs.2.5 lakhs with high variability in the investment on fishing gear alone.

With a view to develop an attitude scale to measure the attitude of fishermen towards motorisation of traditional crafts, 33 edited statements were prepared and response from 28 experts obtained as suggested in the equal appearing intervals scale method. Data collection and scale development are in progress.

In order to measure the socio-economic status of fishermen, proformae were developed incorporating 20 components and sent to experts and data from 32 experts collected. Development of the socio-economic status scale is also in progress.

Study was carried out on the technological gaps among the motorised and non-motorised traditional fishermen. Data on the type and number of craft and gear owned and operated, materials used for their construction/fabrication and various methods of preservation were collected from a few fishing villages in Kerala.

Preliminary observations have revealed the need for extending institutional assistance and facilities to the traditional fishermen and strengthening the extension activities in order to bridge the technological gap among them.

About half a dozen fishing villages in Ramanathapuram District in Tamil Nadu were surveyed and data collected to study the role and status of the fisherwomen. From the data gathered it is observed that a good percentage of the women is engaged in some job or the other contributing to the family's income. Some have even expressed the desire to get training in some of the technologies developed at the Institute.

The dry fish market survey was continued during the period to confirm the findings arrived at the previous year. Important dry fish centres like Calicut, Alwaye, Kottayam, Changanacherry and Quilon were surveyed for the study. Materials were seen to arrive at these markets from far off places, including other states. The quality of dry fish arriving on each market day was also ascertained and the estimate for each centre arrived at. A 10% increase in price of different varieties of fish was observed during the year due to the hike in the variable cost of production and distribution. The study has also confirmed the earlier finding that geographic segmentation is appropriate for dry fish marketing.

Research Contemplated

1. Improved practices adopted for sheathing wooden hulls of fishing vessels
2. Role and status of women in fisheries field
3. Differential adoption and communication behaviour of traditional fishermen
4. Innovativeness and decision making behaviour of traditional fishermen
5. Motorisation of indigenous fishing craft
6. Study on technological gaps among traditional fishermen
7. Key communicators and their characteristics
8. Production, supply and demand of fishery byproducts
9. Study on seasonal variation of raw material resources and its impact on production in the processing plants

VERAVAL RESEARCH CENTRE

Scientists associated

K. K. Solanki, P. G. Viswanathan Nair, A. Vasanth Shenoy, Rajendra Badonia, R. S. Manohardoss, Puthra Pravin.

Chief findings

A newly designed 30m two seam demersal trawl with 20mm mesh size cod end landed less number of juveniles of commercially important fishes than nets fitted with 15mm mesh cod end.

Rate of lipid hydrolysis in Hilsa toli was maximum at minimum lipid content.

Gunny bags and polythene woven sacs were seen to be good packaging materials for bulk storage of commercial samples of semi-dried dhoma.

Treatment with calcium propionate did not significantly show any improvement in the storage life of the semi-dried fish.

Research Projects Handled

1. G-24/91(3) – Conservation and exploitation of demersal fishery resources of Indian EEZ
2. P(VR) 28/86(5) – Studies on technological problems of commercial curing of important varieties of fishes of Saurashtra
3. BCNM/MB(2)/89(5) – Investigation on toxigenic and pathogenic bacteria associated with marine and cultured fishes

Report of Work Done

Fishing gear

A 30m two seam demersal trawl was designed and fabricated with a major part of its body from wing to belly having a mesh size of 120mm. The trawl was fitted with a 20mm mesh cod end and comparative trials carried out with a trawl of the same design fitted with a 15mm mesh cod end. The trawl with 20mm mesh cod end landed less juveniles of commercially important fishes as well as trash varieties when compared to the trawl with 15mm mesh cod end. Comparative trials were also carried out with a 20m sputnik trawl.

Fish processing

Storage studies were carried out on commercial samples of semi-dried dhoma stored in gunny bags and polythene woven sacs after treatment with 1% calcium propionate at ambient temperature. All the samples remained in acceptable condition till 5 weeks' of storage after which yellow discolouration set in. Being a high moisture content product, the treatment with calcium propionate did not serve to enhance the storage life of the semi-dried product.

Comparative studies were carried out on the quality of cured prawn meat col-

KAKINADA RESEARCH CENTRE

Scientists associated

C.C. Panduranga Rao, C.V.N. Rao, Sib Sankar Gupta, D. Imam Khasim Sahib, R. Chakrabarti, M.M. Prasad, G. Narayanappa, S.V.S. Rama Rao

Chief findings

The high opening trawl continued to yield better catch per unit effort of bottom as well as off bottom fish when compared to the BOBP trawl.

Salmonella infantis was isolated for the first time from prawns of the species Penaeus indicus collected from the local market. S. newport was also isolated from the same species and S. typhimurium from poultry droppings being used as fish pond fertilizer near Kolleru lake.

Prawn feed of high water stability and more than 40% protein content was developed.

Combined treatment of cured and dried sciaenids and ribbonfish with sodium tripolyphosphate and neem kernel cake retarded growth of both red halophilic bacteria and insect infestation upto six months' storage. The overall quality was also much better compared to the untreated fish samples.

Research Projects Handled

1. G-24/91(3) – Conservation and exploitation of demersal fishery resources of Indian EEZ
2. P-40(K)/90(5) – Investigations on handling, transport and processing of fish and fishery products in the East Coast of India

Report of Work Done

Fishing gear

Studies were continued to evolve a suitable trawl design with more vertical mouth opening for simultaneous and effective exploitation of both bottom and off bottom fishes. The high opening trawl designed for the purpose continued to give better catch per unit effort when compared to the BOBP trawl. The operations were carried out in the depth range 10-30m. The catch per hour recorded was 16.6 Kg for the high opening trawl while for the BOBP trawl it was 14.8 Kg.

Studies were also continued at evolving an effective fish trawl with reduced resistance resulting in saving in fuel consumption.The rope trawl designed and experimented with continued to prove more efficient than the conventional bottom trawl, viz. the bulged

belly trawl. The catch per hour obtained with the rope trawl was 24.6 Kg which was nearly double that obtained from the bulged belly trawl, viz. 13.3 Kg. However, when small prawns dominated the catch, the bulged belly trawl proved more efficient. The rope trawl was more effective for the capture of fish in general, especially anchovies and silver bellies.

Fish processing

Salted and dried product prepared from shark meat using sodium tripolyphosphate was found to be superior in texture to the control sample. The treated sample remained in good condition even after eleven months' storage whereas the control sample developed reddening after three months.

Fresh rohu from Bhimavaram were individually frozen in brine immersion freezer after removing viscera and gills, treated with sodium tripolyphosphate and stored at -20°C for further shelf life studies.

Frozen ribbon fish fillets remained in acceptable condition even after 13 months' storage at -18°C.

No black spot formation was observed in headless brown prawn frozen stored for one year after treatment with sodium metabisulphite solution whereas the untreated sample showed presence of black spot.

Whole tiger prawn, *P. monodon* treated with sodium metabisulphite solution was acceptable even after 16 months' frozen storage with less brown discoloration and less loss of glossy appearance when compared to the control sample.

Prominent cold shock effect was noticed in freshwater dwarf variety catfish as well as the long type catfish when the live fishes were kept in ice immediately after catch.

Surimi was prepared from marine catfish and sciaenids. Frozen storage studies are in progress.

Feeding trials of *P. monodon* with the prawn feed developed at the Institute at the Brackishwater Fish Farm of CIFE, Kakinada have shown the feed conversion ratio to be below 1.2.

In screening seafoods for *Salmonella*, detection method by using Modified Semi-solid Rappaport Vasiliadis (MSRV) medium was found more effective than the traditional procedure of isolation.

Isolation of *Listeria* spp from fish/shell fish samples is in progress.

Cultured prawn samples from different brackishwater areas of Andhra Pradesh, freshwater fish samples from highly polluted areas of Patan Cheruv in Hyderabad, and Kolleru lake area and marine fish/prawn samples off Andhra Pradesh were collected and analysed for heavy metals using the Atomic Absorption Spectro-photometer. Cultured prawns *P. monodon* and *P. indicus* as well as shark, tuna and catfish collected from off Andhra Pradesh contained the toxic heavy metals like lead, cadmium, zinc, copper and nickel but within tolerance limits. Freshwater spiny eel (*M. armatus*) and *N. notopterus* from the Hirakud dam

area contained more of cadmium in the skin tissue. Analysis of pesticide residues of fish samples from Hussain Sagar and Kolleru lake showed more BHC levels.

During a survey of market samples, level of carcinogenic benzo pyrene in smoked prawn samples was seen to vary from 0.02 to 1 ppm.

Fifteen varieties of fish collected from a FSI vessel were analysed for proximate composition, nutritional mineral elements and trace elements. Sixty samples of frozen prawn and 40 of iced prawn from processing plants as well as 50 samples of fish from the local market and a prawn feed sample were screened for the presence of *Salmonella*.

Research Contemplated

1. Standardisation of operation of high opening and rope trawls
2. Examination of fish and shell fish for hazardous chemicals
3. Effect of cold shock on cultured fish
4. Development of meat separation unit
5. Screening of fish/shell fish for pathogens
6. Control of insect infestation and red discoloration in cured fish
7. Study on quality characteristics of dried fish
8. Development of various products and by-products

BURLA RESEARCH CENTRE

Scientists associated

C. V. N. Rao, A. A. Khan, K. N. Kartha, Percy Dawson, A.K. Chattopadhyay, J.K. Bandyopadhyay

Chief findings

In confirmation with earlier observations, during winter, A. coila is seen to move in shoals in the off bottom zone.

Fishes like G. chapra, Ambasis sp. and small prawns are attracted towards light.

Fresh water prawn M. malcomsonii had a shelf life of 13 days when packed in 150 gauge LDPE pouches and stored under ice in polyurethane foam insulated box. The headless prawn packed in 150 gauge LDPE pouches had a shelf life of 3 months when frozen stored at -10°C.

Live C. batrachus and H. fossilis could be kept under hibernated condition upto 4 hours by applying cold shock.

Methods were developed for preparation of dehydrated textured product and frozen 'Kamaboko' type product from low cost fresh water fish mince.

Research Projects Handled

1. G-23(B)/90(5) – Improved fishing technique for the exploitation of reservoir fishery resources
2. 39(B)/90(5) – Studies on fish preservation and development of appropriate packaging for processed fish and fishery products

Report of Work Done

Trawls

Comparative fishing experiments on midwater trawling using two and four otter boards were conducted in the middle reaches of the reservoir at different scope ratios. The performance of the gear with two boards was seen to be quite encouraging at a scope ratio 1:4. The catch per hour worked out to 42.33 Kg, with *R.cotio* dominating the catch followed by catfishes.

Gill nets

Field trials were conducted with gil nets of polypropylene twine of specification 450/1/2 and 180/1/2 and of mesh size ranging from 40 to 75mm bar.

To study the availability of *Catla catla* at different zones, two sets of nets of 10 units each were operated as column and surface nets at different depths and seasons. During the period, however, the catch of *C. catla* was generally very poor.

Light fishing

Studies on light fishing were carried out with 500 watt and 1000 watt bulbs used alternatively to attract fishes. A small purse seine was used as dragnet to catch the fish thus attracted. The catch comprised mainly of *G. chapra*. Other fishes caught were *Ambasis* sp., *Chela chela, R. cotio* and small prawns *(M. molae)*.

Fish processing

Storage studies of fresh water prawn, *M. malcomsonii* (10cm size) in indirect contact with ice were concluded. The prawns were packed in 150 gauge LDPE pouches and kept under crushed ice in a polyurethane foam insulated box. The product had a storage life of 13 days on the basis of physical, bio-chemical, bacteriological and organoleptic qualities. The headless prawn, frozen stored at -10°C had a shelf life of upto 3 months. The initial moisture content was 78.05% (w/w), TVN 12.23mg%, alpha amino nitrogen 20.36mg%, PV 32.6 meg/Kg fat and TBC 2.596 $x10^6$/gm while at the end of three months the values were, moisture, 76.71% (w/w), TVN 43.8mg%, alpha amino nitrogen 18.0mg%, P.V. 34.5 meg/Kg fat and TBC, 2.09 x 10^7/gm.

Experiments were conducted to study the time-temperature tolerance of live fish in the range 6 to 30°C. The temperature of the water (pH 8.2 or 6.45) containing live *C. batrachus* and *H. fossilis* was brought down in steps. Both the fishes attained pseudo-hibernation at around 6°C., in which condition, the fish remained for about four hours. In both cases, the fishes regained consciousness within 10 minutes. Citric acid was used to bring down the pH of the water. Further studies are in progress.

A dehydrated textured product was prepared from minced *M.aor*, wheat starch etc. using 3% sodium chloride. The pH of the mix was adjusted between 6.5 – 7.5. During mixing, calcium salt was added to get improved texture. The dough was cooked in boiling water bath and extruded as noodles. The product was sun-dried and packed in LDPF pouches. Storage studies are underway.

A 'Kamaboko' type product was also prepared from *M. aor* mince. The mince was repeatedly washed with water, blended with 2.5% sodium chloride for 10 mins. and the blended mass cooked for 15 mins. in a boiling water bath. The product was found to be highly acceptable.

Studies were carried out of packaging materials collected from seven prawn freezing plants in Orissa. The various parameters studied for the inner as well as master cartons have shown non-uniformity in the quality of the packagings used.

The quality of locally abundant freshwater fish *R. cotio* was ascertained using the Intelectron fish freshness tester. The instrument is being used to test the quality of other fishes too.

Research Contemplated

1. Efficiency of two board and four board operated mid-water trawls at different scope ratios and availability of fishes at different depth zones
2. Standardisation of twine size-mesh size in gill nets for major carp and minor fishery resources
3. Light fishing
4. Studies on spatial distribution of *C. catla.*
5. Development of value added products from low cost freshwater fish
6. Quality assessment of fishes using freshness tester
7. Comparison of qualities of fish stored in crushed ice and flake ice
8. Studies on pseudo-hibernation of fish.

BOMBAY RESEARCH CENTRE

Scientists associated

M. Arul James, S. P. Damle, D. K. Garg

Chief findings

The frozen shelf life of fillets of fish belonging to family Latidae and locally known as "Hekru" was observed to be 3 weeks.

Proximate and nutritional studies of essential amino acids of fish belonging to the species Mullidae and Sciaenidae have shown a good profile of the amino acid with special reference to lysine, methionine and cystine content.

Faecal organisms E. coli, Streptococci and coagulase positive Staphylococci could survive a frozen storage period of 30 weeks at -18°C., whereas Vibrio parahaemolyticus and Listeria monocytogenes could not survive under similar conditions for more than 4 weeks.

Research Project Handled

P-35(BM)/88(5) – Studies on technological aspects in the control of biochemical and microbiological changes during processing and storage of less important fishes

Report of Work Done

Freezing and frozen storage

Studies on the frozen storage behaviour of frozen fillets of fish belonging to family *Latidae* and locally known as "Hekru" were completed. Organoleptic and biochemical characteristics indicate that the fish has a frozen shelf life of 33 weeks. The water content of the fish declined from the initial level of 78.18% to 75.94%. The total volatile nitrogen (TVN) value came down from an initial value of 51.29 mgs% to 39.49 mgs% while the total volatile basic nitrogen (TVBN) content registered an increase from its initial level of 10.26 mgs% to 16.38 mgs%. The TBA value also increased from 0.64mg malonal-dehyde/Kg of meat to 2.58mgs malonal-dehyde/Kg. During this period the meat developed rancidity, the texture became spongy, and discoloration set in. The total viable count of the organisms per gram which was less than 1.0×10^5 initially rose to 1.8×10^6 after a frozen storage life of 20 – 24 weeks.

Of the 10 samples of fresh fish landed at Sassoon Dock that were analysed for *E. coli*, faecal *Streptococci* and coagulase positive *Staphylococci*, 2 samples showed the presence of faecal *Streptococci* and *E. coli* which was more than

1.0 x 10^3 /gm. Coagulase positive *Staphylococci* was present in all the samples at the rate of 1000/gm.

Study was initiated on the spoilage of microflora in *Mullidae* and *Latidae* families. The major flora in the frozen fillets was found to be *Pseudomonas, Micrococci, Flavobacterium, Cytophagia* and *Vibrio* sp.

Studies were continued on the hygienic standards followed by the various fish processing establishments and landing centres of Bombay. A total of 48 samples comprising fresh fish, shrimp, lobster, squid, cuttlefish, water and ice were studied. It is noted that in spite of repeated instructions to wash the environs with sufficient detergent and chlorine water, the processing factories do not follow the instructions. As a result, the hygienic conditions in these factories were far from satisfactory. Water and ice samples showed more numbers of *E. coli* and coliforms. Fresh fish samples collected both from the processing area as well as from the landing centre at Sassoon Dock showed high percentage of *Salmonella*. Although *Vibrio cholerae* 01 group organisms were absent in the raw materials taken at random for testing, non-agglutinable *V. cholerae* organisms were detected in some cases. One sample of frozen squid also showed the presence of this organism, although their frequency was more in slightly spoiled raw shrimp. Presence of *Listeria monocytogenes* in squid and cuttle fish was determined using the FDA method. With a view to improving the overall hygienic conditions, periodic demonstrations and lecture classes were held at various fish processing factories at Sassoon Dock, Colaba, Vashi – New Bombay and Ratnagiri. The necessity for use of chlorine in the preparation of various fishery products and the need for observing personal hygiene of peelers and graders was also emphasized.

Research Contemplated

1. Studies on the occurrence and survival of pathogenic organisms with special reference to *V. parahamolyticus, L. monocytogenes* and *V. cholerae*
2. Studies on biochemical and microbiological quality of value added products such as IQF fishery products
3. Studies on spoilage microflora of *Carangidae, Latidae* and *Mullidae*

CALICUT RESEARCH CENTRE

Scientists associated

Cyriac Mathen, T.S. Unnikrishnan Nair, K. George Joseph, P. Ravindranathan Nair

Chief findings

Survey on retail marketing and quality of cured fish in Kannur and Malappuram Districts was completed.

A delay in salting by more than two hours of freshly caught Decapterus sp. resulted in loss of quality and shelf life of the salted product.

Boiling eviscerated, headed and bled Euthynnus affinis in 2-4% brine was found better than boiling the fillets in the preparation of masmin with respect to labour, yield and quality.

Processes were standardised for preparation of chutney powders from masmin, ready-to-serve pickles from fish and mango and low salted, dried sole fish.

12 μ polyester/175 gauge LDP packing was found better than 200 gauge polythene packing for storage of fried mussels and fried fish slices at ambient temperature.

Aspergillus sp. predominated fungi isolated from dried fish.

Research Project Handled

P-38(CL)/89(5) – Technology of onboard curing, prevention of spoilage in cured fish and development of speciality products

Report of Work Done

Survey on retail marketing and quality of cured fish in Kannur and Malappuram Districts was initiated and completed during the year. A total of 17 stations in Kannur and 20 in Malappuram area were surveyed and in all, 43 and 35 composite samples, respectively, analysed. The chemical, bacteriological and sensory characteristics of all the samples were evaluated and the profitability or otherwise of the business assessed. Nearly 100% of those surveyed in Kannur and 90% in Malappuram were retailers and both reported a profitable business. 55% of the retailers in Kannur area and 79% in Malappuram reported highest sales during the monsoon period. The species of fish most preferred by the consumers in the two districts was shark and sole respectively.

Studies were initiated on on-board curing and effect of delayed salting on the quality and shelf life of marine fishes. While *Nemipterus* sp. and *Psenes* sp. could be stored in brine pickle for three

months and *Decapterus* sp. for two months, *Psettodes* sp. could be similarly stored only for 2- 3 weeks after which it got disintegrated. Effect of delayed salting of *Decapterus* sp. has shown that a delay of more than two hours before salting resulted in considerable loss in quality and shelf life of the product. Freshly salted and dried samples of the other three species of fish however could be stored in good condition for five months. Whereas the standard plate count of samples stored in pickle, both freshly salted as well as salted after exposure to room temperature for varying periods, was in the order of hundreds only, proliferation of halophilic bacteria was rather high.

In order to avoid the laborious process of winding green coconut palm leaves around strips of tuna fillets during preparation of masmin, the headed, eviscerated, bled and washed tuna were directly cooked in – 4% NaCl for 2 hrs. After cooling the fish in the brine overnight, separation of the meat became easier and the product yield as well as other characteristics were better than those of the traditional product.

Three ready-to-serve chutney powders were prepared based on masmin/masmin flakes. They had less than 10% moisture, nearly 45% protein, 4% NaCl and 10-30% fat and could be stored in glass bottles for 6 months.

Processes were developed for two pickles containing both vegetable and fish – one with tuna and mango and the other with mussels and tender mangoes. The storage life of both these products is under evaluation.

Small sole fish which is landed throughout the year in the Calicut region is mostly utilised in the fresh condition and also as dried product for poultry feed. A survey conducted recently has shown good demand for the salted product. Process was thus developed for a low salted, dried product with 8% NaCl, 25% moisture and 35% yield. The product is prepared by salting fresh sole in saturated brine containing 5% calcium propionate for 5 minutes followed by draining and sun-drying on stretched nylon net platforms for two days.

The samples prepared without treatment with calcium propionate got infected with fungus after a month whereas the treated samples remained unaffected even after two months.

Studies were continued on room temperature preservation of ready-to-serve fried mussel and fish slices. The fish slices mixed with preservative and condiments and packed in 12μ polyester/175 gauge LDP kept well for six months without fungal attack while at the same time retaining their crispness and flavour. Addition of 0.2-0.5% micropulverised chitosan, pasteurisation and refrigeration of the preservative treated ready-to-serve fish slices did not serve to extend their shelf life. However, chitosan was seen to be effective in reducing the volume of the exudate to 50%.

Of the 29 isolates of fungi obtained from dried fish and masmin, the dominant ones were *Aspergillus* sp. (50%), *Penicillia* sp. (20%), *Polypaecilum* sp. (17%), *A. niger* (6%) and filamentous field fungi (7%).

Research Contemplated

1. Survey on retail marketing of cured fish in Kerala
2. Development of speciality products like chutney powders, fish-vegetable pickles etc
3. Amenability of different marine species of fish to pickle curing and prevention of insect infestation in curing tanks
4. Extension of shelf life of preservative treated fish at ambient temperature
5. Isolation and identification of fungi in dried fish
6. Processing *Holothuria* to beche-de-mer
7. Field trials on anti-insect treatment

GOA RESEARCH CENTRE

Scientists associated

H.N. Mhalathkar, T. Joseph Mathai

Research Projects Handled

1. G-24/91(3) – Conservation and exploitation of demersal fishery resources of Indian EEZ
2. G-26/91(3) – Harvesting techniques for semi-pelagic resources

Report of Work Done

Trawls

The data collected under separator trawl studies were statistically analysed. Although the separation of shrimp and fish in the shrimp and fish cod ends was highly significant, there was not much significant difference in the separation obtained with 50mm and 60mm separator panels.

Research Contemplated

1. Cod-end mesh selectivity studies on shrimp trawls
2. Operation of modified flat rectangular otter boards to avoid digging in mud
3. Operation of off-bottom fish trawls for small and medium class vessels

FISHING CRUISES

Particulars of cruises undertaken on board 'FORV Sagar Sampada' during the period are given below:

Cruise No.	Period	Participants
99 C	3-10 April 1992	P.A. Panicker, M.D. Varghese, M. Syed Abbas P.N. Sudhakaran, M.S. Rajan, A.K. Jaisingh M.K. Asokan, T.N. Manibhadran, T.K. Dasan T. Balan
101	19 May – 5 June 1992	Francis Xavier
103	28 Aug. – 25 Sept.1992	K.K. Kunjipalu, P. George Mathai, M. Syed Abbas Francis Xavier, Dev Singh Panchpal, P.N. Sudhakaran
104 A	6 – 24 Nov. 1992	N. Subramonia Pillai, M.R. Boopendranath Dev Singh Panchpal, M.S. Rajan, D.G. Rao
105 B	28 Nov. – 15 Dec.1992	V. Vijayan, M.D. Varghese, M. Syed Abbas Francis Xavier, P.S. Nobi, P.N. Sudhakaran M.K. Asokan, T.N. Manibhadran, K.V. Baladasan A.K. Jaisingh, P.A. John

EXTENSION AND CONSULTANCY

Training and demonstration

In-plant training in Refrigeration and Air-conditioning was given to three candidates sponsored by Govt. Polytechnic, Kalamassery from 1 April to 30 June, 1992

Training in Identification of *Listeria monocytogenes* in Seafoods was imparted to two candidates sponsored by a processing establishment, 20 – 25 April 1992 and 27 April to 2 May 1992.

Training in Bacteriology and Quality Control of Fresh and Processed Freshwater and Marine Fish, with Special Reference to Determination of Heavy Metals and Pesticides in Fish Muscle was imparted to a candidate from 23 April to 11 May 1992.

Training in Production of Fish Pickle was given to a party, 14 & 15 June 1992.

Intensive training in Production of Value Added Fish Products was given to 20 members of the SC/ST Vanitha Fish Processing Society, Kannur, 18 & 19 June '92.

Training in Production of Shark Fin Rays was given to a candidate during the period 9-17 July 1992.

Training in Production of Fish Pickle, Fish Cutlet and Dried Fish was conducted for the benefit of nine trainees sponsored by the West Kallada Social Welfare Society, Quilon, 24 – 27 Aug. 1992.

An in-house training programme was conducted in Fishing Gear Technology for scientists from Fishery Survey of India, 2 - 8 Sept. 1992.

Training in Microbiological Methods was imparted to a candidate sponsored by the Rahara Research Centre of Central Institute of Freshwater Aquaculture, West Bengal, 1-17 Oct. 1992.

Training in Production of Fish Wafers, Fish Cutlet, Pickles, Dried Prawn etc. was imparted to nine coastal fisherwomen sponsored by the Centre for Research and Training in Poverty Alleviation and Women Welfare (CRATPAW), Cochin, 8-14 Oct. 1992.

Training in Production of Value Added Fish Products was also given to eight members of the Karunagapally Taluk Muslim Sadhu Samrakshana Samithi, Quilon, 19-22 Oct. 1992.

Training in Fish Processing was given to a candidate sponsored by a processing establishment at Port Blair for a period of one month from 26 Oct. 1992.

Demonstration in Production of Fish Wafers, Cutlet, Soup Powder, Pickle and Extraction of Fin Rays was held for the benefit of participants of the training course on Fish Processing Technology organised by Trainers' Training Centre, Narakkal, 2-10 Dec. 1992.

Training in Production of Value Added Fish Products was organised for the fisherwomen at Mahe in collaboration with the Fisheries Department, Govt. of Pondicherry, 19-22 Jan. 1993. Forty women participated in this programme.

A similar programme was organised at Tanur at the request of the District

Collector of Malappuram, 8-12 Feb. 1993. A total of 43 women belonging to Scheduled Castes and Muslim Community participated in this training programme.

At the Veraval Research Centre, training was imparted to a technologist from a fish processing factory in Microbiology and Chemical Analysis for a period of 15 days.

The Kakinada Centre organised the following training programmes in collaboration with MPEDA, Vizag at Andhra Pradesh:

1) Hygienic handling of cultured prawns at harvesting centres of Nellore District, Krishna District and West Godavari District.

2) Hygienic handling of marine products at landing centres of Krishna District, Vizag District and Nellore District.

3) Hygienic handling of marine products at pre-processing centres of Krishna District, East Godavari District and Vizag District.

4) Hygienic handling of marine products on board fishing vessels at Krishna District, East Godavari District and Nellore District.

5) Hygienic handling of marine products at Indus Foods, Pamaru, Amalgam Fisheries, Bhimavaram and Universal Cold Storage, Bhimavaram

A short term course on Small Scale Post Harvest Technology in Fisheries was conducted for the benefit of extension workers/officers of different voluntary organisations in collaboration with an international voluntary organisation, viz. Action for Food Production (AFPRO), Hyderabad Unit, 14-25 Sept. 1992.

A training programme on Freezing and Processing of Fresh Water Fish was organised in collaboration with MPEDA at Calcutta on 2 Feb. 1993 in which 25 people participated.

The Centre also conducted training in Handling, Processing, Filleting and Packing of Fish, Shark Fin, Fish Maws and Dried Fish in association with MPEDA at Bhubaneswar, 8-12 Feb. 1993.

The Bombay Research Centre conducted training in the General Quality Aspects of Fishery Products with Special Emphasis on Hygienic Handling of Fish and Microbial Enumeration Procedure for the benefit of three candidates for a period of two weeks.

The Centre also held two demonstrations for the benefit of graders and peelers of different fish processing factories at Ratnagiri and Vashi, in collaboration with MPEDA.

In Calicut, training in Re-processing Cured Fish and Production of Fish and Mussel Pickle was given to twelve fisherwomen belonging to two Fisheries Co-operative Units at Tanur area, 2-5 Dec. 1992.

Technical Guidance/Consultancy

Technical guidance was imparted under a consultancy arrangement to improve the fishing performance of 110m LOA, 5700 HP, 5460 GRT Japanese built factory trawler 'MFV Oriental Angel' owned by a Visakhapatnam based Indian Company, M/s Oriental Highseas Fisheries Ltd., as well as to study the onboard processing of surimi, fish meal and fish oil. The average daily landings rose to 90 tonnes, representing an eleven fold increase compared to pre-consultancy landings in the Indian waters.

At the request of M/s Golden Ahar Ltd., New Delhi, a project report was prepared on Integrated Fishing incorporating details on estimated potential of the major fishery resources of India and their present yield from the Indian EEZ, harvestable demersal stocks identified in depths beyond 50m and the deep sea trawl nets developed at the Institute.

Technical consultancy has been undertaken with M/s Technical Developments, Bombay, for production of chitin from prawn shell.

Technical consultancy was also undertaken with M/s F.D.C. LTD., Bombay, on production of medicinal grade chitosan from chitin.

The technology for producing high gel strength agar from seaweeds of *Gelidium* sp. was passed on to M/s. Marine Chemicals, Cochin. Industrial production of the product based on this technology has since started.

Technology for isolation and purification of squalene from shark liver oil was transferred to M/s Asha Biochem, Vadakara, on a consultancy basis.

The procedure for purification of waste water from fish processing plants was furnished to M/s Integrated Rubian Exports Ltd., Aroor.

Technical guidance was provided to M/s. India Sea Foods Ltd., Cochin, for production of chitin for export to Italy. Substantial quantity of the product has since been exported.

Reply to Technical Queries

The Institute continued to provide technical assistance by way of answering queries received from new entrepreneurs as well as those already in the field, both from within the country as well as from outside, on various aspects related to fishing, fish processing, fishery engineering and allied aspects. Some of the topics on which queries were received are listed below:

Fishing Technology

- Information on various tests conducted for fishing gear materials, specifications of nylon twines now in general use and viability of polypropylene as a fishing gear material
- Effect of mesh size on the efficiency of different types of nets
- Comments on a Project Report on Offshore Fishery received from a local private organisation

Mrs. Irmela Futhehali of M/s. Technical Developments, Bombay, signs consultancy agreement for production of chitin

Chitin produced as per CIFT know-how being packed for export by M/s. India Sea Foods, Cochin

Inauguration of the EPABX telephone system installed at the Institute – Dr. K. Gopakumar, Director, exchanges talk with Asst. General Manager, Telephones, Mr. A. G. Viswanathan Nair

Dr. A. K. M. Nuruzzaman, Member-Director (Fisheries), Bangladesh Agricultural Research Council, Dhaka, in CIFT

Fish Processing Technology

Status report on fish and shrimp feed manufacture and research in India with reference to CIFT

Comments on the difference in yield of agar from the same species of seaweed collected during different periods

Production of chitin, chitosan and their derivatives

Information on fish protein hydrolysate

On utilisation of squid waste as meal

Information on fish meal and sterilised meal, equipments needed for their production, major consumers of the products etc.

Method of separation of squalene from shark liver oil

Process details for production of shark skin leather and extraction of shark liver oil

Information on food additives normally permitted for use with foods in India

Essential items required for canning and process details for canning different varieties of fish

Information on cryogenic method of freezing and on 'sashmi'

Method for improving texture and colour of frozen cephalopods

Comments on occurrence of drip loss in frozen products

Comments on use of liquid nitrogen in freezing fishery products

On moisture level recommended for dried shark meal

- On precautions to be taken during preparation of anchoviella flakes
- On fatty acid composition of *Etroplus suratensis* and its nutritional quality
- On suitable packagings for fish wafers and the quality of oil to be used for fish pickles

Analysis of Fishery Products/ Materials

Samples of various types of fish and fishery products, raw materials, craft and gear materials and other miscellaneous items were analysed at the Institute and the analysis reports with suggestions for improvement of quality wherever required furnished to the concerned parties. Details of samples tested are given below:

Particulars of samples	No. analysed
Water	152
Ice	70
Frozen fishery products	200
Dried fishery products	3
Fish by-products	186
Fish speciality products	7
Packaging materials	40
Accelerated freeze dried products	1
Brine solution	2
Bacterial cultures	1
Marine samples	8
Raw fish samples	1
Fishing gear materials	213
Fishing gear	8

Particulars of samples	No. analysed
Fishing craft materials	2
Metal samples	11
Marine paint	1
Hardware fittings	2
Electrical fastenings & fittings	144
Confectionery items	2
Sanitary survey of factories	32

The Research Centres also carried out analyses of various samples received by them. The Veraval Centre analysed in all 213 samples of fish meal, dry fish, fresh fish, fish oil, pure chemicals, water and ice. The Kakinada Centre also analysed a fish sample. At Bombay, 47 samples of frozen fish and shellfish products, water and ice were analysed while the Calicut Centre analysed one sample of ice.

Supply of Designs/Publications

The following publications/designs were issued to interested parties on request:

Publications	No. issued
1. Quality control in fish processing	41
2. Special Bulletin No. 8 – Abstracts of CIFT Publications	2
3. Special Bulletin No. 9 – Indigenous marine fishing gear and methods of India – I – *Karnataka State*	9

Designs

1. Fishing boats	4
2. Tunnel dryer	3
3. Rotary drum dryer	1

Exhibitions

The Institute's activities/achievements were brought to the notice of the general public and those connected with and interested in fisheries and allied aspects through participation in various exhibitions as indicated below:

- International exhibition at Tehran/Budapest in Aug./Sept. 1992
- Exhibition held at Kanakakunnu Palace, Trivandrum in connection with inauguration of a 14 lakh fishery project for generating self-employment to coastal women sponsored by the Central Social Welfare Board and implemented by the State Social Advisory Board, 18 Sept. 1992
- Science exhibition at Marthoma College, Thiruvalla in connection with its Silver Jubilee Celebrations, 12-16 Oct. 1992
- All India Science Exhibition – Swadeshi Science Expo '92 – conducted by the Swadeshi Science Movement, Kerala, in connection with 2nd Swadeshi Science Congress and co-sponsored by the State Committee on Science, Technology and Environment (STEC), Kerala, Trivandrum, 2-11 Nov. 1992

India International Trade Fair, N. Delhi, 14-25 Nov. 1992

Science and Industrial Exhibition – Scinex '92 – to mark the 70th Anniversary of St. Berchman's College, Changanacherry, 16-29 Nov. 1992

Rashtriya Exhibition-cum-Mela, *"Mahila Shakti"* organised by Central Social Welfare Board, N. Delhi, 19-25 Nov. 1992

Exhibition on Science, Technology & Industry in connection with Fifth Kerala Science Congress, Kottayam, 26-31 Jan. 1993

'Aquafest 93' – an Aquarium – Aquaculture show and Exhibition organised by Industrial Fisheries Assn., Cochin, 24-28 Feb. 1993

'Indaqua' – Aquaculture Exhibition organised by MPEDA at Madras, 19-23 March 1993

Exhibition at Edible Oyster Harvest Mela organised by CMFRI at Tuticorin, 27 & 28 March 1993

The Kakinada Centre actively participated in the Kissan Mela celebrations conducted by Dept. of Fisheries, Andhra Pradesh Agricultural University, Kakinada, 27 Feb. 1993

Radio Talks

Nine radio talks on various topics connected with the fishery industry were broadcast during the year, as shown below:

1. Fish in nutrition - Dr Jose Stephen
2. Importance of science and technology for exploiting the fishery wealth – Dr K. Gopakumar
3. Innovation in fishing equipments – Shri. K.C. Purushothaman
4. Electronic aids for fishing – Dr T.K. Sivadas
5. Bacterial spoilage of fish – how it is controlled – Dr P.K. Surendran
6. Extension activities of CIFT for fisheries development – Shri. K. C. Purushothaman
7. Trawls: role of mesh in conservation – Dr M.D. Varghese
8. Value added products for export – Shri. K.K. Balachandran
9. Potentiality of fishing industry in Ernakulam District – Shri. K. C. Purushothaman

TRAINING/DEPUTATION

Within the country

Shri. H.N. Mhalathkar, Scientist (SG), attended Agricultural Research Project Management Course at NAARM, Hyderabad, 21 April – 1 May 1992.

Dr M.K. Mukundan, Sr. Scientist, attended training programme on Use and Application of Bioindicator Technology in Monitoring and Conservation of Biodiversity, sponsored by Dept. of Biotechnology, Govt. of India and organised by M. S. Swaminathan Research Foundation, Madras, 4 - 23 May 1992.

Shri. K. George Joseph, Scientist (SG), attended training course on Fumigation of Dried Fishery Products under the guidance of Dr Frank Robinson of Natural Resources Institute, Chatham, U.K. at Cochin, 7-13 May 1992.

Dr T. K. Sivadas, Principal Scientist, attended training course on Basic Principles and Practices in Flow Measurements organised by Fluid Control Research Institute, Palghat, 27 - 29 May 1992.

Shri. G. R. Unnithan, Scientist (SG), attended course on Computer Application in Agricultural Research at NAARM, Hyderabad, 14-24 July 1992.

Shri. K. C. Purushothaman, Technical Officer, attended Course on Planning and Management of Video Based Instructional System at NAARM, Hyderabad, 3-14 August 1992.

Dr N. Unnikrishnan Nair, Sr. Scientist, attended Course on Management of People at Work at NAARM, Hyderabad, 18 - 29 August 1992.

S/Shri. S.S. Gupta and R. Chakraborti, Scientists (SG), attended training programme on Management of Brackishwater Fish Farm organised by Central Institute of Fisheries Education at Kakinada, 19 Oct. 1992. They also attended the training programme on Brackishwater Fish and Prawn Farming organised by Dept. of Fisheries Science, A. P. Agricultural University at Kakinada, 20 Jan. and 17 Feb. 1993.

Shri. K. K. Solanki, Principal Scientist, attended a week's specialised training programme on IPQC and MIPQC inspection requirements for the Export Inspection Agency Panel Members.

Shri. T.V. Sankar, Scientist, participated in the practical training course on Site Directed Mutagenesis, a UNIDO sponsored programme organised by the International Centre for Genetic Engineering and Biotechnology, New Delhi, 2-19 March 1993.

Abroad

Shri. S.S. Gupta was deputed to Natural Resources Institute, Chatham, U.K. for training in Fisheries Microbiology, 23 March – 28 August 1992.

Dr K. Gopakumar, Director, attended Regional Meeting of the Working Party on Fish Technology and Marketing of the Indo-Pacific Fisheries Commission (FAO of the UN) at Bangkok, Thailand, 29 Sept. – 20 Oct. 1992.

DEGREE/AWARD

Shri. K. V. Mohan Rajan, Scientist (SG) was awarded Ph.D by Cochin University of Science and Technology under Faculty of Marine Sciences for his thesis entitled 'Studies on spiny lobster fishery of South West coast of India'. He carried out his work under the able guidance of Dr M. Shahul Hameed, Head of Department of Industrial Fisheries.

SYMPOSIA/SEMINARS/WORKSHOPS ETC. ATTENDED

Dr K. Gopakumar, Director, Dr T.S.G. Iyer, Dr K. Ravindran, Principal Scientists and Dr P.K. Surendran, Sr. Scientist, attended the First meeting of the Fish and Fisheries Products Sectional Committee FAD – 12 at Cochin, 23 & 24 April 1992.

Shri. K. K. Balachandran, Principal Scientist, participated in Workshop on Eco-Development and Training in Nature Conservation organised by Kerala Centre for Christian Higher Education at Cochin, 24-30 April 1992.

Dr T.K. Sivadas, Principal Scientist, participated in the meeting of Task Force on Agricultural Electronic Instruments organised by DST for evaluation of projects on agricultural electronics, 1 May 1992.

Shri. S. Ayyappan Pillai, Principal Scientist, attended Seminar on Transformers conducted by Indian Institute of Plant Engineers at Cochin, 15 & 16 May 1992.

Dr T. K. Sivadas attended meeting arranged at M/s Keltron, Trivandrum, for commercialisation of Ship Borne Data Acquisition System, 8 June 1992.

Dr P. K. Surendran and Shri. K. C. Purushothaman, Technical Officer, attended International Consultation on Epizootic Ulcerative Syndrome vis-a-vis the Environment and the People, organised by International Collective in support of Fish Workers (ICSF), Trivandrum, in co-operation with the Network of Aquaculture Centres in Asia-Pacific (NACA), Bangkok at Trivandrum, 25 & 26 May 1992.

S/Shri. D. K. Garg and S. P. Damle, Scientists (SG), attended National Seminar on Challenges to the Indian Food Industry – Widening of Exports and Domestic Markets conducted by the UDCT and AFST(I), Bombay Chapter, 29 May 1992.

A number of Scientists and Technical Officers of the Institute attended National Workshop on Development of Marine Fisheries for Higher Productivity and Export organised by Dept. of Agriculture & Co-operation, Govt. of India, Dept. of Fisheries, Govt. of Kerala in association with MPEDA, Ministry of Food Processing Industries, Shipping Credit and Investment Company of India Ltd., ICAR, Assn. of Indian Fisheries Industries and

Seafood Exporters' Assn. of India, at Cochin, 9 & 10 June 1992.

Dr V. C. George and Shri. P. Appukutta Panicker, Principal Scientists, attended meeting on board FORV Sagar Sampada in connection with performance of equipments, 14 June 1992.

Dr P. K. Surendran attended Workshop on Meaningful Learning as a Communication Process at NAARM, Hyderabad, 9-10 July 1992.

Dr N. Unnikrishnan Nair and Dr B. Meenakumari, Sr. Scientists, attended meeting on Recent Developments in the Control of Biofouling sponsored by American Institute of Biological Sciences, Bangalore, 13-17 July 1992.

Shri. Francis Thomas, Scientist (SG), participated in two day Workshop on ISO 9000 and IS 14000 series organised by M/s Quality Systems and Resources P. Ltd., Madras and held at Cochin, 1992.

Shri. Sib Sankar Gupta, Scientist (SG), attended meeting at NAARM, Hyderabad, as official member of Zonal Fund Committee for ICAR Golden Jubilee Merit Scholarship Welfare Fund.

Dr M. K. Kandoran and Shri. K. K. Balachandran attended Workshop on Traditional Prawn Culture in Kerala – Problems and Prospects, organised by Kerala Fisheries Society, Trivandrum at Cochin in 1992.

Shri. K. Ramakrishnan, Scientist (SG), attended Intervention meeting at IIT, Madras in connection with proposed Indo-US Workshop on Advanced Bioacoustics, 7 & 8 Sept. 1992.

Shri. K. K. Solanki, Principal Scientist, attended Workshop on Management of Agricultural Research Stations – Operational Part, at NAARM, Hyderabad, 22-25 Sept. 1992.

Dr P. K. Surendran participated in Platinum Jubilee Fisheries Seminar held under the auspices of the Jnanodayam Sabha at Cochin, 9 Oct. 1992 and presented a paper.

Dr T. K. Sivadas attended 8th Congress of the Asia and Pacific Division of the International Association for Hydraulic Research, Pune, 20 – 23 Oct. 1992.

S/Shri. T. S. Unnikrishnan Nair and K. George Joseph, Scientists (SG), attended meeting on Prawn Farming sponsored by MPEDA, Cochin, STED, Calicut and M/s Higashimaru Feeds India Ltd., Cochin, at Calicut, 31 Oct. 1992.

Dr P. K. Surendran participated in 2nd Swadeshi Science Congress at Trivandrum, 6 - 9 Nov. 1992 and presented a paper.

Dr K. Devadasan, Principal Scientist, attended National Workshop on Fisheries Planning and Management sponsored by the ODA of the UK and conducted by Humberside International Fisheries Institute, UK and College of Fisheries, Mangalore and held at Mangalore, 16-27 Nov. 1992.

Dr K. G. Ramachandran Nair and Dr P. T. Mathew, Sr. Scientists, attended VIII Carbohydrate Conference at Trivandrum, 18-20 Nov. 1992.

Dr M. Arul James, Principal Scientist, S/Shri. D.K. Garg and S. P. Damle participated in the deliberation on the National

Seminar on Irradiation of Food conducted by BARC, Bombay, 19 Nov. 1992.

Dr V. C. George attended meeting on Ring Seine Designs of Kerala Coast organised by SIFFS, Trivandrum at Cochin, 29 Nov. 1992.

Dr Sanjeev, S., Sr. Scientist, participated as an observer in the Learning Session of ISO 9000 for Executives at Cochin, 5 & 6 Dec. 1992.

Dr T. S. G. Iyer and Shri P. R. G. Varma, Scientist (SG), attended Workshop on HACCP Principles sponsored by MPEDA and EIA, Cochin as Faculty Members, 13 & 14 Jan. 1993.

Dr T.K. Sivadas participated in the Working Group meeting of Instrumentation Division of National Institute of Hydrology, Roorkee, 18 Sept. 1992 and 19 Jan. 1993.

Dr S. Balasubramaniam, Sr. Scientist, attended Regional Workshop for Southern Zone on Planning Agricultural Extension Training to Broad Base Extension organised by the Directorate of Extension, N. Delhi, at Trichur, 19-21 Jan. 1993.

Dr T. S. G. Iyer attended 5th Kerala Science Congress at Kottayam, 28-30 Jan. 1993.

Dr V. C. George participated in meeting of National Task Force on Krill Exploitation covered by DOD at Visakhapatnam, 6 Feb. 1993.

Dr M. Arul James actively participated in the deliberations of the Seminar on ISO 9000 organised by the MPEDA at Bombay, 27 Feb. 1993.

A good number of Scientists of the Institute attended Seminar on Women in Fisheries organised by Centre for Research & Training in Poverty Alleviation and Women Welfare (CRATPAW) and sponsored by United Nations Development Fund for Women at Cochin, 27 Feb. 1993.

Dr V.C. George, Shri. P. Appukutta Panicker, Dr T.S.G. Iyer and Shri. M.R. Boopendranath, Scientist (SG), attended an inter-agency Workshop on Finalisation of Cruises of FORV Sagar Sampada for 1993-96 at Cochin, 1& 2 March 1993.

Dr N. Unnikrishnan Nair attended Seminar on Aquaculture and Environment organised by Shipping Credit and Investment Company of India Ltd. at Hyderabad, 5 March 1993.

S/Shri. P.R.G. Varma and P.K. Vijayan, Scientist (SG), attended Edible Oyster Harvest Mela organised by CMFRI, Cochin and NABARD, New Delhi and held at Tuticorin, 27 March 1993.

REPRESENTATION IN COMMITTEES

Dr K. Gopakumar, Director, served on the following scientific and allied bodies:

As Chairman

Indian Bureau of Standards – FADC 12, Sectional Committee – Fish and Fishery Products

As President

Society of Fisheries Technologists (India)

As Editorial Consultant

'Fish Tech News' published by Food and Agricultural Organisation of the UN

As Member

ICAR Regional Committee No.VIII

ICAR Co-ordination Committee for FORV 'Sagar Sampada'

ICAR Scientific Panel for Fisheries

Tamil Nadu Fisheries Research Council

Organising Committee – Second Workshop on Scientific Results of FORV 'Sagar Sampada'

Expert Committee to study fish disease in Kerala constituted by Govt. of Kerala

Committee to consider financial assistance for modifying fishing vessels

Consultative Committee of CIFNET

Consultative Committee of Integrated Fisheries Project, Cochin

Management Committee, Krishi Vigyan Kendra, CMFRI, Narakkal

Extension Council, CIFE, Bombay

Board of Examiners, CIFE, Bombay

Rural Programme Advisory Committee, AIR, Trichur

FAO Expert Committee on EC Consultancy on utilisation of less utilized fish

Expert Committee on trawl ban – Assessment of fish wealth during trawl ban and non-ban period, Directorate of Fisheries, Kerala

Working party of the Indo-Pacific Fisheries Commission

Committee III/9 of the International Union of Nutritional Sciences, Netherlands (IUFOST/IUNS Working Group) – Influence of drying and smoking on the nutritional and functional properties of fish

Board of Studies in the Faculty of Fisheries, Kerala Agricultural University, Vellanikara

Board of Studies in Marine Biology, Cochin University of Science & Technology

Advisory Committee (Processing Technology) of the Institute for Artemia Research and Training, Madurai, Kamaraj University Research Centre, Muttom, Tamil Nadu

As Reviewer

Asian Fisheries Fellowship Award (Post-Harvest Technology)

Shri. P.V. Prabhu, Principal Scientist

As Principal Member

BIS, AFDC – 27:5, Fish Meal Sub Committee – Shri P. Appukutta Panicker, Principal Scientist

As Principal Member

BIS, TXDC – 18, Textile Materials for Marine/Fishing Purposes

As Member

Consultative Committee of Fisheries Survey of India, Cochin Zone

Working Group of Sagar Sampada

Expert Committee of MPEDA on Evaluation of Fishing Vessel Projects

Sub-Committee of Working Group on Revalidation of the Potential Marine Fisheries Resources of Exclusive Economic Zone of India

Committee for Review of Registration of Fishing Vessels

Committee for Consideration of Applications for the Scheme on Assistance for Diversified Fishing

Expert Committee on Stake/Chinese Dipnet Fishery of Kerala

Committee on the Fuel Requirements of Deep Sea Fishing Sector

Committee on Licensing of Fishing Gear for Deep Sea Vessels

Committee on Formulating Norms of Import of Deep Sea Fishing Vessels of 100% Export Oriented Scheme of Ministry of Food and Agriculture

Committee of DOD on Antarctica Krill Programme of FORV Sagar Sampada

As Advisor

UPSC Selection Board for Fisheries

Dr K. Ravindran, Principal Scientist

As Member

Fishing Vessel Sectional Committee TED – 21 of the Bureau of Indian Standards, New Delhi

Expert Committee appointed by Govt. of Kerala to study the problems of ban on trawling during monsoon period

Board of Studies, Dept. of Industrial Fisheries, Cochin University of Science & Technology

National Registry of Experts on Marine biofouling and allied problems, Indira Gandhi Centre for Atomic Research, Kalpakkam

As TIFACLINE Expert

Dept. of Science and Technology, Govt. of India

As Examiner and Subject Expert

Ph.D, M. Phil., M.Sc and B.Tech. degree of the Cochin University of Science & Technology

As Research Guide

Kerala University and Cochin University of Science & Technology

Shri. P. Madhavan, Principal Scientist

As Member

Subsidy Committee of MPEDA

Dr V.C. George, Principal Scientist

As Examiner

Staff trainees of Directorate of Fisheries, Kerala

Shri. S. Ayyappan Pillai, Principal Scientist

As Member

Advisory Committee constituted by MPEDA for technical scrutiny of subsidy applications for installation of generating sets and IQF machinery in seafood processing plants

DGTD Sub-Committee on Food Freezing and Preservation by Cryogenic Fluids

Invention Promotion Committee

Expert panel constituted by FIA for approving and assessing the capacity of IQF units in seafood processing plants.

As Alternate Member

BIS, TEDC-Transport Engineering Divn. Council

Dr C.C. Panduranga Rao, Principal Scientist.

As Member

Panel of Experts, EIA for approval of processing plants

Shri. C.V.N. Rao, Principal Scientist

As Member

ICAR Regional Committee Zone V

Dr T.S. Gopalakrishna Iyer, Principal Scientist

As Member

Panel of Experts for approval of seafood processing factories under the QCIA/ IPQC systems of inspection

Board of Studies, Cochin University of Science and Technology

FAD 12, Bureau of Indian Standards, New Delhi

Expert Committee for detection of cholera organisms in shrimps exported to Japan

Inter-departmental Team of Experts for assessment of laboratories of the Export Inspection Agency and the processing factories on the infrastructure facilities for detection of *V. cholerae*

Sub-Committee for Marine Products ISO : 9000 series, Ministry of Commerce, New Delhi

As Supervising Guide

Ph.D Degree (Faculty of Marine Sciences), Cochin University of Science and Technology

Dr T.K. Sivadas, Principal Scientist

As Member

Expert Committee for Development of Marine Instruments constituted by Department of Ocean Development, Government of India

Committee for Promotion of Application of Electronics in Agriculture during VIII Five Year Plan, constituted by Department of Electronics, Government of India

Committee on Hydraulic Instruments constituted by Ministry of Water Resources, Govt. of India

Implementation Committee of DOD for Scientific Instruments on board FORV Sagar Sampada

Working Group Committee of Hydrological Instrumentation Division of National Institute of Hydrology, Roorkee

Transport Engineering Division Council (TEDC) of the Bureau of Indian Standards

Indian National Committee on Hydrology (INCOH), Ministry of Water Resources, Govt. of India

Task Force/Monitoring Committee on Agri-Electronic Instruments constituted by Govt. of India, Department of Science & Technology, New Delhi

Sectional Committee on Marine Instruments and Safety Aids of Bureau of Indian Standards

Shri. Cyriac Mathen, Principal Scientist

As Member

Staff Selection Committee, Mangalore Centre of CMFRI

Shri. K.K. Balachandran, Principal Scientist

As Member

Vidyalaya Management Committee, Kendriya Vidyalaya, Ernakulam

Vidyalaya Management Committee, Kendriya Vidyalaya, No.I, Cochin-4

Vidyalaya Management Committee, Kendriya Vidyalaya No.II, Cochin-4

Vidyalaya Management Committee, Kendriya Vidyalaya, INS Dronacharya, Fort Cochin

Regional Selection Committee, Navodaya Vidyalaya Samiti, Hyderabad Region

As Research Guide

M.F.Sc. Processing Technology Programme of College of Fisheries, Panangad.

Dr K. Devadasan, Principal Scientist

As Supervising Guide

Ph.D. Programme of Cochin University of Science and Technology

Shri. H. Krishna Iyer, Principal Scientist

As Member

BIS-AFDC-57. Expert Panel for preparation of Draft Indian Standards and Methods for Sampling of Fish and Fishery Products

Dr M. Arul James, Principal Scientist

As Member

State level Committee for Co-ordination of work on Marine Fisheries, Maharashtra

Panel of Experts for Approval of Fish Processing Factories under QCIA and IPQC.

Inter-departmental team of experts to assess facilities available in IPQC Units at Bombay and Goa for testing *V. cholerae* in accordance with international standards

Selection Committee of Fishery Survey of India, Bombay

Inter-departmental panel on export of marine products to Belgium, Netherlands, Spain and Italy

As Subject Expert

Faculty of Marine Sciences and Dept. of Industrial Fisheries, Cochin University of Science and Technology.

As Examiner

M.Sc. (FM) in CIFE (Deemed University), Bombay

Shri. S.V.S. Ramarao, Scientist (SG)

As Member

Selection Committee of CTRI, Rajahmundry Consultative Committee, FSI, Visakhapatnam and Madras

Dr T.K. Srinivasa Gopal, Sr. Scientist

As Member

Advisory Committee constituted by MPEDA for the selection of fish boxes for fresh fish transportation

Shri. T. Joseph Mathai, Scientist (SG)

As Member

Joint Official Language Implementation Committee of Goa Research Centre of CIFT and FSI, Mormugao

Shri. H.N. Mhalathkar, Scientist (SG)

As Member

Consultative Committee of FSI Mormugao Zone

Town Official Language Implementation Committee

Shri. T.S. Unnikrishnan Nair, Scientist (SG)

As Member

BIS AFDC-27:3 Dry Fish Products Sub-Committee

Panel of Experts for IPQC/MIPQC scheme of Export Inspection Agency, Cochin

Dr P.K. Surendran, Sr. Scientist

As Subject Expert

Doctoral Committee, Cochin University of Science and Technology

M.F.Sc. (Processing Technology) Programme, Kerala Agricultural University

Committee constituted by Director of Vocational Higher Secondary Education, Kerala State, for preparation of text books on Fishery Science

As Supervising Guide

Ph.D. Degree (Faculty of Marine Sciences), Cochin University of Science and Technology

As External Examiner

Ph.D. Degree (Fish Processing Technology), University of Agricultural Sciences, Bangalore

As Guest Lecturer

Faculty Development Programme, Mahatma Gandhi University, Kottayam

Dr P.T. Lakshmanan, Sr. Scientist

As Supervising Guide

Ph.D Degree (Faculty of Marine Sciences), Cochin University of Science and Technology

As Subject Expert

Doctoral Committee (Faculty of Marine Sciences), Cochin University of Science and Technology

Dr M.K. Mukundan, Sr. Scientist

As Supervising Guide

Ph.D Programme of Cochin University of Science and Technology

As Supervising Guide & Examiner

M.F.Sc. Processing Technology Programme of College of Fisheries, Panangad

Dr Jose Stephen, Sr. Scientist

As Member

Board for assessing progress of Ph.D candidates

As Supervising Guide

Ph.D Programme of Cochin University of Science and Technology

As Examiner

M.Sc. Industrial Fisheries, Cochin University of Science and Technology

Dr B. Meenakumari, Sr. Scientist

As Subject Expert

Faculty of Marine Sciences, Cochin University of Science and Technology

Shri. Sib Sankar Gupta, Scientist (SG)

As Member

Panel of Experts, EIA, for approval of processing plants

Selection Committee, CIFA, Kakinada

Dr N. Unnikrishnan Nair, Sr. Scientist

As Subject Expert

Faculty of Marine Sciences and Faculty of Environment, Cochin University of Science and Technology

Dr A.G. Gopalakrishna Pillai, Sr. Scientist

As Member

National Registry of Experts on marine biofouling and allied problems, Indira Gandhi Centre for Atomic Research, Kalpakkam

As Subject Expert

Faculty of Marine Sciences, Cochin University of Science and Technology

As Supervising Guide

Cochin University of Science and Technology

Dr D. Imam Khasim, Sr. Scientist

As Member

Selection Committee, CMFRI, Kakinada Centre

Shri. R.S. Manohardoss, Scientist (SG)

As Member

Consultative Committee for Fishery Survey of India, Bombay and Porbander Bases

Committee for stepping up exports by increased productivity of mechanised fishing vessels, MPEDA Branch, Veraval

Dr K.V. Mohan Rajan, Sr. Scientist

As Member

Consultative Group for Fishery Survey of India, Bombay and Porbander Bases

Dr M. D. Varghese, Sr. Scientist

As Subject Expert

Doctoral Committee, Cochin University of Science and Technology

Shri. V. Vijayan, Scientist (SG)

As Examiner

MFVC Course, CIFNET, Cochin

Dr P.J. Cecily, Technical Officer

As Life Member

Indian Science Congress Association, Calcutta

As Member

Asian Fisheries Society, Indian Branch

Smt. K. Radhalakshmi, Technical Officer

As Alternate Member

BIS TXDC-18 Textile Materials for Marine/Fishing Purposes

NATIONAL SCIENCE DAY

The National Science Day was observed this year also. The Institute organised a training programme on Biochemical and Microbiological Aspects of Fish from 25-27 Feb. 1993 in which thirty one post-graduate students drawn from a local college participated.

'WOMEN IN AGRICULTURE' DAY

The 'Women in Agriculture' Day was celebrated on 4 Dec. 1992. Programmes were organised at Puthuvypu, a fishing village in Cochin, in association with members of the Amala Mahila Samajam. More than sixty women participated in these programmes which included a talk on the role of fish in nutrition, a film show and a mini exhibition.

At Veraval, the method of preparation of prawn pickle was demonstrated to twelve women belonging to the fishermen community and the economic viability of preparing pickles from locally available, cheaper red variety of prawns explained to them. Method of preparation of coloured fish scales and fabrication of trawls was also demonstrated to the participants. The participants were also apprised of the method of reading the trawl design, fabrication and rigging of the gear as well as rigging of gill nets. A mini exhibition was also held for the benefit of the local public.

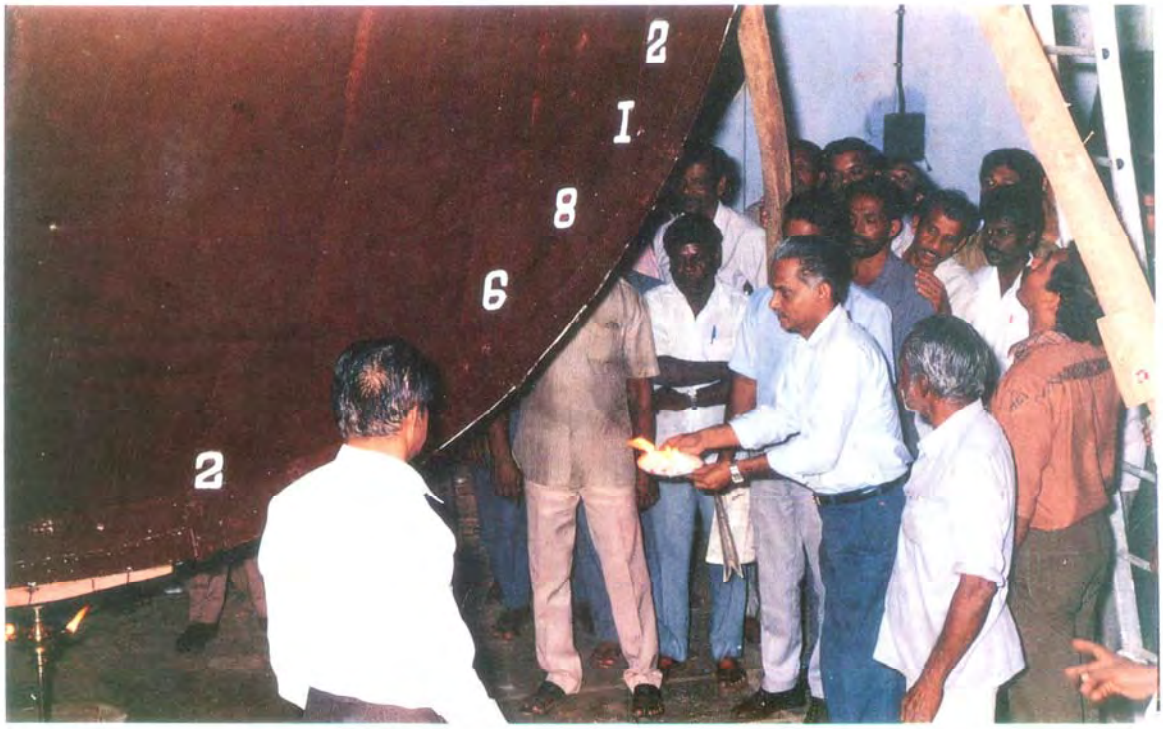
At Calicut, training programmes were organised in collaboration with the Block Development Officer, Tanur. Twelve women from local co-operative fish processing units were trained in reprocessing of commercial cured fish for retail marketing and preparation of pickles from fish and mussel.

POPULAR SCIENCE LECTURES

A series of popular science lectures on bio-technology was conducted at the Institute during April 1992. These lectures centred around the application of chitin/chitosan in various fields and production of surgical sutures from fish collagen. Three such lectures as shown below were delivered during the period.

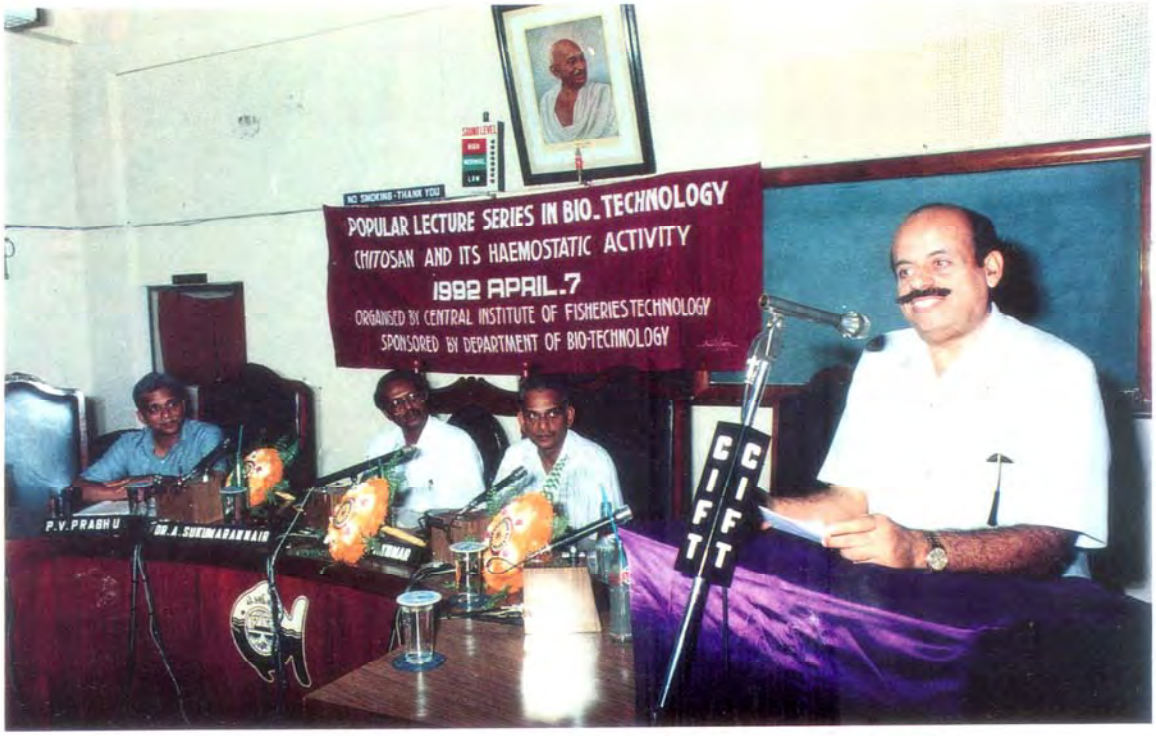
1. Chitin and its haemostatic activity (by Dr M. Sambasivan, former Vice Principal of Trivandrum Medical College)
2. Surgical sutures from fish gut collagen (by Dr M.K. Mukundan, Sr. Scientist, CIFT, Cochin.)
3. Chitin, chitosan and their novel applications (by Shri. P. Madhavan, Principal Scientist, CIFT, Cochin.)

The lectures were sponsored by the Dept. of Bio-technology, Ministry of Science and Technology, Govt. of India.



Launching of the 15.24 m. multi-purpose wooden fishing vessel 'Sagar Shakti', constructed at CIFT, by Dr. K. Gopakumar, Director

A view of the vessel



Dr. M. Sambasivan, former Vice-Principal of Trivandrum Medical College, delivers his talk on Chitosan and its haemostatic activity in the popular lecture series on bio-technology organised by CIFT

A group song in progress at the Hindi Day celebrations at Cochin

OFFICIAL LANGUAGE IMPLEMENTATION

According to instructions laid by the Ministry of Home Affairs, the Official Language Implementation Committee Programmes of the Institute were implemented for the year 1992-93.

The quarterly OLIC meetings reviewed the implementation activities of CIFT.

The monthly/quarterly reports on the implementation pertaining to Headquarters and Research Centres were sent to Council and Official Language Department for inclusion in the report of the Secretariate.

Hindi Workshops were conducted at the Headquarters from 15-19 June 1992, 17-21 Aug. 1992 and 23-27 Nov. 1992. These Workshops were beneficial as those who attended have started writing and noting in the files in Hindi. Certificates and course materials were distributed to the participants of the Hindi Workshops.

Hindi Week and Raj Bhasha Divas were celebrated at the Headquarters from 14-18 Sept. 1992 with various competitions and prizes distributed to the winners. The Calicut Research Centre celebrated Hindi Day on 19 Sept. 1992.

Cash awards were distributed to staff members of the Institute for their commendable work done in Hindi.

The Institute took active part in the Joint Hindi Week celebrations conducted under the auspices of Cochin TOLIC from 21-25 Sept. 1992.

The In-charge of Official Language of the Institute delivered lectures at Hindi Workshops conducted by various public undertakings and Banks at Cochin.

TECHNICAL SECTION

Compilation of Research Project Programmes:

The Research Project Programmes of the Institute for the year 1992-93, comprising of 22 ongoing projects and one new, were compiled as per the recommendations of the Project Advisory Committee, Staff Research Council, Institute Management Committee, ICAR Regional Committee and Scientific Panel. A brief summary of two projects completed in 1991-92 was also included. As a special feature, the activity milestone of Research Projects, fixing technical programmes for individual Scientists for each quarter of the year was also compiled and incorporated in the respective research projects.

Collaborative/Ad-hoc Research Project Programmes:

During the reported period, four Collaborative/Ad-hoc research projects submitted by the Scientists were pursued for obtaining Council's concurrence and follow-up action.

Preparation & Submission of Technical Reports:

a). Monthly reports to DARE/Cabinet Secretariate

The important activities of the Institute, significant research findings, training programmes, seminars, workshops etc. conducted, visits of dignitaries, radio talks, film shows and exhibitions etc. organised were collected every month from various Divisions/Research Centres, compiled and sent to Council regularly for inclusion in the monthly report of DARE for Programme Implementation and Cabinet Secretariate.

b). Annual Action Plan 1992-93

The quarterly progress report on activities undertaken pertaining to the Institute was compiled and sent to Council regularly for inclusion in the Annual Action Plan of ICAR/DARE.

Five Yearly Assessment of Scientists:

The assessment documents consisting of the proformae and individual project files of Shri. P. D. Antony for the year ended 1982 and the late P. N. R. Kaimal for the period 1977-84 were thoroughly scrutinised and made available to ASRB Assessment Committee, on date, for reconsideration. In the light of the personal discussion held on 24-7-1992 at ASRB, New Delhi, Shri Antony was promoted to S-3 grade with retrospective effect from 1-1-1983 instead of 1-1-1986.

The assessment of the late P.N.R. Kaimal, Scientist S-1 belonging to the discipline Agricultural Extension was held on 20-7-1992 and he was granted two advance increments w.e.f. 1-7-1982.

Maintenance, updating and submission of Research Project files:

The Project Leaders' files of all the ongoing research projects handled at the Institute Headquarters and Research

Centres were updated and maintained in the Section as a permanent record of the Institute.

Staff Research Council Meeting:

During the period under report, the SRC met twice to review the progress of research projects being undertaken at the Institute. The SRC proceedings were prepared and sent to Council. The follow-up action on the recommendations of the SRC was collected from the concerned Scientists and presented.

Regional Committee Meeting :

Director and Dr K. Devadasan, Principal Scientist, who has been nominated to look after the Regional Committee meetings and follow-up actions, attended the 'Action Plan Meeting' (pertaining to Regional Committee Region No.8) held on 9-2-1993 at Sugarcane Breeding Institute, Coimbatore.

Reports on the research and extension work carried out at the Research Centres for the year 1991-92 were collected, compiled and sent to Council at the appropriate time for inclusion in the respective Agenda Notes of the ICAR Regional Committee Meetings of Regions No. V (Burla and Kakinada), VI (Veraval) and VII (Goa and Bombay).

Biodata of ARS Scientists:

The biodata format received from Council in respect of two Scientists who joined the Institute in 1992 were updated and forwarded to the Computer Cell of ICAR.

Data Bank:

The following Data Bank were prepared, furnishing relevant information pertaining to the Institute and sent to various organisations on request:

a). Information to update the International Directory of Sources by the Ministry of Environment and Forest, New Delhi

b). List of Scientists and Technical Officers of the Institute in the grade Rs. 3000-5000/- and above in the prescribed proforma for inclusion in the Panel of Experts/Advisers in various subjects by UPSC, New Delhi.

c). List of Scientists deputed abroad for training with details about course attended, area of work, deployment etc. for the past two years.

d). Information to update the Directory of Social Science Organisations/Institutions in India brought out by Indian Council of Social Science Research, New Delhi.

e). List of R&D Personnel of CIFT in the prescribed format to National Council of Applied Economic Research, New Delhi.

f). List of Principal Scientists and Senior Scientists of CIFT to prepare Indian Directory of Marine Biologists and Biotechnologists by National Institute of Oceanography, Goa.

g). Particulars pertaining to the Institute for the preparation of Directory of Scientific Research Institutions in India by

Indian National Scientific Documentation Centre, New Delhi and also for the preparation of Directory of Fisheries & Allied Industries, Bombay.

Publication of Research Papers:

During the reported period, 37 scientific papers received in the Section, seeking Director's permission for publication were processed and Director's approval for publication of 35 papers was conveyed to the respective authors.

Calendar of Events:

Programmes of Meetings/Conferences/ Workshops etc. proposed to be conducted by the Institute during the period Jan. to June 1993 were compiled and sent to Council for inclusion in the ICAR Calendar of Events 1993.

Women Programmes:

Assistance was rendered to groups of women/co-operative societies and voluntary organisations in the preparation of project reports, establishment of production units and marketing of their products for employment generation. Assistance was given to State and Central Social Welfare Board in projecting the work of Women Co-operatives in Mahila Sakti at New Delhi. Guidance was also rendered for their participation in food festivals, Sadhya International and in conducting a Workshop on Women in Fisheries inter-acting with Scientists & Administrators of Fisheries and Rural Development Institutions.

SPONSORED/COLLABORATIVE PROJECTS

An all India study on 'Supply and demand for fishnets in India –A projection upto 2000 AD' was undertaken by the Institute during the second and third quarters of the year 1992. The study was sponsored by the Dept. of Agriculture and Co-operation, Ministry of Agriculture, Govt. of India. The objectives of the study were to assess the status of the net making industry in the marine and inland states of India including the Union Territories, to get an estimate of the demand and supply of fishnets with projection upto 2000 A.D., to estimate the requirement of additional units of net making machines to meet the demand, and to explore the possibility of export of fishnets from India. The study was completed in September 1992 and the final report sent to the Ministry in January 1993.

Under a collaborative project on Fish Processing, Dr Frank Robinson of the Natural Resources Institute (NRI), U.K. carried out fumigation trials of dry fish and residue analysis of fumigation in order to check insect infestation in stored dry fish. Dr Anita Eves, also of NRI, worked on carbohydrate metabolism of dry fish.

COLLABORATIVE PROGRAMME WITH BOBP

As a part of the collaborative programmes with BOBP, two training programmes were organised during the period in fishing villages in and around Nagercoil, Tamil Nadu, on handling and processing of anchoviella including drying and flake making. About 50 people in all participated in these programmes held during the months of June and July 1992.

Dr M.K.Kandoran, Principal Scientist, attended the Intensive Workshop/Training on Flake Making held at Nagercoil on 28 June 1992.

Dr Jose Joseph, Sr. Scientist, participated in the Workshop on Marketing and Handling of Anchoviella also organised by BOBP at Nagercoil on 25 and 26 July 1992.

LIBRARY

The Library continued to provide library and documentation service to the Scientific and Technical staff of the Institute, Research Scholars, students from various Universities, Scientists from other Institutes and Technologists from the Industry. During the year 172 books were added to the collection and at present there are 7469 books and 4119 bound volumes of Scientific Journals. Eightyeight journals were subscribed during this year. A total of 2929 bonafide readers visited the library and 3749 publications were issued and returned during the period under report. The reprographic unit of the Library made copies and supplied 65000 pages of documents on requisition. The library continued to issue the 'Current Contents on Fishery Technology' (fortnightly) for the benefit of the users.

ADMINISTRATION

This Division deals with recruitment, service, policy matters, discipline, staff welfare, land, buildings, procurement of Stores, budget, expenditure, settlement of claims, etc.

The Research Centres, except the Veraval Centre which moved into its own permanent office-cum-lab building during the year, continued to function in rented buildings. Addresses of the Research Centres are given in Appendix–I. List of staff under Scientific,Technical, Administration, Auxiliary and Supporting categories as on 31-3-1993 is given as Appendix–-II.

Details of budget provision and actual expenditure for the year 1992-93 are given as Appendix-III.

MANAGEMENT COMMITTEE

The Management Committee of CIFT, Cochin which was re-constituted for a period of 3 years from 18-12-1989 continued to function with the following personnel as members:-

Chairman

The Director, CIFT, Cochin

Members

1. The Director of Fisheries,
   Fisheries & Ports (A) Dept.,
   Government of Kerala,
   Trivandrum

2. The Dean,
   College of Fisheries,
   Kerala Agricultural University,
   Panangad

3. Shri. Chikka Basappa,
   Post Birur,
   Dist. Chikamangalur,
   Karnataka

4. The Asst. Director General,
   (Marine Fisheries), ICAR,
   Krishi Bhavan,
   New Delhi

5. The Sr. Finance & Accounts Officer,
   CMFRI,
   Ernakulam, Cochin

6. Shri. P.A. Panicker,
   Principal Scientist,
   CIFT, Cochin

7. Dr T.S. Gopalakrishna Iyer,
   Principal Scientist,
   CIFT, Cochin

8. Shri. Percy Dawson,
   Scientist (S.G.)
   Burla Research Centre of
   CIFT

9. Dr P.T. Lakshmanan,
   Sr. Scientist,
   CIFT, Cochin

Member Secretary

The Administrative Officer,
CIFT,
Cochin

The Committee met once during the year.

INSTITUTE JOINT COUNCIL

The Institute Joint Council which was constituted with the following members w.e.f. 27-1-1990 continued to function during the period. The tenure of the IJC was three years.

Chairman

The Director, CIFT, Cochin

Members- Official side

1. Shri. P. Vasudeva Prabhu, Principal Scientist (from 1-8-'91)
2. Dr M.K. Kandoran, Principal Scientist
3. Dr V.C. George, Principal Scientist
4. Dr P.K. Surendran, Sr. Scientist
5. Senior Administrative Officer
6. Asst. Finance & Accounts Officer

Members – Staff side

1. Shri. M.K. Kuttykrishnan Nair, T-II-3
2. Shri. M.K. Sasidharan, T-4
3. Shri. V.V. Ramakrishna, T-4
4. Smt. C.G. Marykutty, Sr. Clerk
5. Shri. T.M. Ramaraj, Sr. Clerk
6. Shri. P.A. Thomas, S.S.G.III
7. Shri. Krishna Chandra Mahar, S.S.G.III

Secretary – Official side

Dr P.K. Surendran, Sr. Scientist

Secretary – Staff side

Shri. M.K. Kuttykrishnan Nair, T-II-3

Two meetings of the IJC were held during the period.

The IJC was re-constituted on 29-1-'93 with the following members. The tenure of the IJC will be three years.

Chairman

The Director, CIFT , Cochin

Members – Official side

1. Shri. P. Vasudeva Prabhu, Joint Director
2. Dr V.C. George, Principal Scientist
3. Shri. K.K. Balachandran, Principal Scientist
4. Dr M.K. Mukundan, Sr. Scientist
5. Sr. Admn. Officer/Admn. Officer
6. Asst. Finance & Accounts Officer

Members – Staff side

1. Shri. M.K. Kuttykrishnan Nair, T-II-3
2. Shri. M.M. Vara, T-I-3
3. Shri. G. Somappan, Sr. Clerk
4. Shri. Y. Kanaka Raju, Jr. Clerk
5. Shri. P.A. Thomas, S.S.G.III
6. Shri. Krishna Chandra Mahar, S.S.G.III

Secretary- Official side

Dr M.K. Mukundan, Sr. Scientist

Secretary – Staff side

Shri. M.K. Kuttykrishnan Nair, T-II-3

No meeting was held before 31-3-1993.

MONITORING CELL

The Monitoring Cell which was re-constituted with the following members w.e.f. 27-8-1991 to 31-12-1991 and until further orders also continued to function.

Chairman

The Director, CIFT, Cochin

Members

1. Shri. P. Vasudeva Prabhu, Principal Scientist
2. HOD, Fishing Technology
3. HOD, Biochemistry & Nutrition
4. HOD, Engineering
5. HOD, Extn., Information & Statistics
6. Dr N. Unnikrishnan Nair, Sr. Scientist
7. Dr M.K. Mukundan, Sr. Scientist
8. Sr. Administrative Officer
9. Administrative Officer
10. Asst. Finance & Accounts Officer
11. Asst. Administrative Officer (Admn.)

Member Secretary

Asst. Administrative Officer (Bills)

Two meetings of the Monitoring Cell were held during the year.

GRIEVANCE COMMITTEE

The Grievance Committee constituted for both the Gazetted and Non-Gazetted categories of staff of this Institute with the following members w.e.f. 25-5-1992 continued to function during the period.

The tenure of the Committee is two years.

Chairman

The Director, CIFT, Cochin

Ex-Officio Member

Shri. P.Vasudeva Prabhu, Joint Director

Members

1. Shri. P.A. Panicker, Principal Scientist
2. Shri. P. Bapaiah, Adm. Officer
3. Shri. P.A. Uthup, AF&ACO
4. Dr K.N. Kartha, Sr. Scientist (Scientific)
5. Shri. C. Rajendran, T-I-3 (Technical)
6. Shri. T.M. Ramaraj, Sr. Clerk (Admn.)
7. Shri. K.K. Appachan, Sr. Gest. Operator (Auxiliary)
8. Shri. P.A. Thomas, SSG.III (Supporting)

Member Secretary

Smt. K.A. Devaky, Asst. Admn. Officer

No meeting was held during the year.

National Science Day – Students in the Biochemistry laboratory

'Women in Agriculture' Day –
participants view some of the products on display

Shri K. C. Lenka, Hon. Minister of State for Agriculture, Govt. of India, with Dr. K. Gopakumar, Director

Members of Parliamentary Consultative Committee of Ministry of Agriculture in the fishing technology lab. of the Institute

VISITORS

A number of dignitaries, both from within the country as well as abroad, visited the Institute to acquaint themselves with its activities. These included:

1. Mr Romulus Whitaker, Madras Crocodile Bank, Tamil Nadu
2. Dr A. K. M. Nuruzzaman, Member – Director (Fisheries), Bangladesh Agricultural Research Council, Dhaka
3. Shri. K. Karunakaran, Chief Minister of Kerala
4. Shri. R.L. Meena, Commissioner of Fisheries,Govt. of Gujarat
5. Lt. Gen. Ranjit Singh Dyal, Lt. Governor, Andaman & Nicobar Islands
6. Mr.Crick Carleton, ITC/UNDP Consultant, Nautilus Consultants, U.K.
7. Mr H. Matsuda, Dy. General Manager in India and Mr Rajinder Malhotra, Dy. Manager, M/s C. Itoh & Co. Ltd., Delhi
8. Mr Alan Rew, ODA Consultant, Professor & Director, Centre for Development Studies, University of Wales, U.K.
9. Shri. Kanhu Charan Lenka, Union Minister of State for Agriculture, Govt. of India.
10. Consultative Committee of Ministry of Agriculture
11. Mr Ali Reza Firoozi, Chairman,Fisheries Research Centre of Oman and Dr Zazayarl, Director of the Centre
12. Dr A.R. Foreland and Miss Anne-Brit Olsson, Gaustad University of Oslo, Norway
13. Ms Anna Larsson and Ms Marika Ogrelius, Swedish Consultants
14. Dr Byron Mook and Dr G.L. Kaul, International Service for National Agricultural Research (ISNAR), Netherlands
15. Shri. S.L. Kapur, Secretary, FPI
16. Smt. K.B. Valsala Kumari, Director of Fisheries, Kerala
17. Dr P.K. Salian, Director of Instruction, Fisheries College,Mangalore

Here is what some of them had to say:

"Finally managed to visit CIFT. Am most impressed and grateful to see the practically applied research and development here ....." - *Romulus Whitaker*

"..... wish we could establish an Institute like this in Bangladesh in the very near future. I would highly appreciate if collaborative (bilateral) efforts are taken up by the two countries (India and Bangladesh for the welfare of the millions of protein starved humans ....." - *A.K.M. Nuruzzaman*

".....The Scientists of CIFT are doing commendable work. It can do much more service if various agencies involve CIFT in more and more innovative projects for proper utilisation of the fisheries resources. Their training facilities can be utilised for more advanced training in fisheries technology." - *R. L. Meena*

".....A tremendous work is being done by the most dedicated people. – *Ranjit Singh Dyal*

"Impressive array of products with significant commercial potential – *Crick Carleton*

"It is an unique Institution of our country. I am happy to know that the Scientists of the Institution have been asked to evolve new technology developing traditional methods of fishing. But this technology should be transferred to the doorsteps of the fishermen. – *Kanhu Charan Lenka*

"This visit was an eye-opener. The Institute is doing wonderful work..... – *S.L. Kapur*

"..... I think the good, useful work being done here should be taken to the field; should be popularised..... – *K. B. Valsala Kumari*

PUBLICATIONS

1. ANNAMALAI, V. (1991 – (issued in 1992) – An organisational frame-work for fisherwomen industries – *Fish Tech. Newsletter* VI(4):4

2. ANNAMALAI, V. (1992 – State support to technology and its inter-regional variations – *Fish Tech. Newsletter* VI (5-7) : 12

3. BALACHANDRAN, K.K. (1992) – Marine products: processing and exports – Paper presented at Workshop on Eco-Development and Training in Nature Conservation organised by Kerala Centre for Christian Higher Education, Cochin, 24-30 April 1992

4. BALASUBRAMANIAM, S., BRAJ MOHAN & KANDORAN, M.K. (1993) – Communication behaviour of traditional fishermen – *Fish. Technol.* 30(1):67

5. GEORGE CHINNAMMA (1992) – Seminar on mud crab culture and trade – *Fish Tech. Newsletter* VI(5-7):17

6. GEORGE, V.C. & AYYAPPAN PILLAI, S. (1993) – Energy consumption and conservation in Indian fisheries – *INFOFISH* 2/93:62

7. GOPAKUMAR, K., VARMA, P.R.G. & IYER, T.S.G. *(1993) – Quality control of* molluscan shell fish – Paper presented at Edible Oyster Harvest Mela organised by CMFRI at Tuticorin, 27 March

8. GOPAKUMAR, K., VIJAYAN, P.K. (WOOD, C.D. & AMES, G.R.) (1992) – The *prospects of retort pouch technol*ogy in the Indian Seafood Industry – *Trop. Sci.* 32:153

9. IYER, H. KRISHNA (1993) – Economics of operation of fishing vessels for low energy fishing – *Proc.*, National Workshop on Low Energy Fishing at Cochin, 8 - 9 Aug. 1991: 262

10. IYER, T.S.G. & VARMA, P.R.G. (1993) – Technological research inputs for quality upgradation in the seafood industry – *Exp. Insp. J.* IX:3

11. JOSEPH, A.C., PRABHU, P.V. & NARAYANAN NAMBIAR, V. (1993) – Storage characteristics of ready to serve fried thelly prawns (*Metapenaeus dobsoni*) at ambient temperature – *Fish. Technol.* 30(1):31

12. JOSEPH, K.GEORGE, RAVINDRANATHAN NAIR, P., UNNIKRISHNAN NAIR, T.S. & CYRIAC MATHEN (1992) – Retail marketing and quality of salted fish in remote villages of KozhikodeDistrict, Kerala – *Fishing Chimes* 12(4):21

13. JOSEPH, J., VIJAYAN, P.K. & GOPAKUMAR, K. (1992) – Flying fish: Spoilage at ambient temperature and in ice and its processing – *Trop. Sci.* 33:17

14. KANDORAN, M.K. & PRABHU, P.V. (1992) – Rack drying of anchoviella – *Fish Tech. Newsletter* VI (5-7):10

15. KARTHA, K.N. & (RAO, K.S.) (1993) – A study on the piscifauna of Gandhi-sagar Reservoir with particular reference to the abundance of commercial varieties of fish – *Fish Technol.* 30(1) : 11

16. KUNJIPALU, K.K., SUBRAMONIA PILLAI, N., BOOPENDRANATH, M.R. & KRISHNA RAO, K. (1992) – Effect of horizontal

opening of bottom trawl on fish catch – *Fish. Technol.* 29(2):91

17. LAKSHMANAN, P.T.; (BROWN, R.T. & AMES, G.R.) (1993) – Studies on nucleotide degradation on rainbow trout muscle to assess quality change – *Trop. Sci.* 33:75

18. MADHAVAN, P. (1992)–Chitin, chitosan and their novel applications – *Popular Science Lecture Series* – Sponsored by Dept. of Biotechnology

19. MADHAVAN, P. (1992) – High cost products from low cost fishes – *Beverages and Food World* 20:24

20. MADHAVAN, P. (1991 – issued in 1992) – High cost products from low cost fishes – *Fish Tech. Newsletter* VI(4):1

21. MADHAVAN, P. (1992) – Production and uses of chitin and chitosan (in Malayalam) – Paper presented at Swadeshi Science Congress, Trivandrum, Nov.

22. MANOHARADOSS, R.S., GEORGE MATHAI, P., PRAVIN, P. & MOHAN RAJAN, K.V. (1993) – Effect of heavy bridles on the performance of demersal trawls – *Fish. Technol.* 30(1):6

23. MATHAI, T. JOSEPH (1992) – Monofilament nets – the silent revolution in the coastal drift net fishery – *Seaf. Exp. J.* XXIV (8):11

24. MATHEN CYRIAC (1993) – New methods of fish preservation (Malayalam) –*Vanitha* 17(23):46

25. MATHEW, P.T. & GOPAKUMAR, K. (1992) –Effect of incorporation of vegetable colour from red sandal (*Ptero-carpus santalinus*) on acceptability, colour development and growth of Tilapia (*Tilapia mossambica* – *Fish Technol* . 29(2):124

26. MATHEW, P.T., PRABHU, P.V. & GOPAKUMAR, K. (1992) – An improved method for production of high quality agar from Indian sea-weeds – *Proc., VIII Carbohydrate Conf.*, Trivandrum, 18-20 Nov.

27. MEENAKUMARI, B. & (BALAKRISHNAN NAIR, N.) (1992) – Effect of slime film in the settlement of barnacles – *Proc.*, Indo-US Consultancy meeting on recent developments in the control of biofouling, Bangalore, 13-17 July

28. MUKUNDAN, M.K. (1992) – Surgical sutures from fish gut collagen – *Popular Science Lecture Series* – Sponsored by Dept. of Biotechnology

29. NAIR, K.G. RAMACHANDRAN & MADHAVAN, P. (1992) – Chitin, chitosan and their derivatives, production and applications – *Proc., VIII Carbohydrate Conf.*, Trivandrum, 18-20 Nov.

30. NAIR, K.G. RAMACHANDRAN, MATHEW, P.T., MADHAVAN, P. & PRABHU, P.V. (1993) – Effect of feeding chitin on poultry – *Fish. Technol.* 30(1):24

31. NAIR, N. UNNIKRISHNAN (1992) – Chemical preservation techniques for traditional wooden fishing craft – *Fish Tech. Newsletter* VI (5-7): 14

32. NAIR, N. UNNIKRISHNAN & RAVINDRAN, K. (1992) – Studies on chemosensor induced substrate modifications on the control of biofouling dynamics – *Proc.*, Indo - US Consultancy

meeting on recent developments in the control of biofouling, Bangalore 13-17 July

33. NAIR, P.G. VISWANATHAN (1993) – Lipid peroxidation in silver pomfret muscle at 0 and 10° C– *Fish. Technol.* 30(1):28

34. NAIR, P.G. VISWANATHAN & SANKAR, T.V. (1992) – Seasonal variation in the susceptibility of pomfret lipids to autoxidation – *Fish. Technol.* 29(2):140

35. (PILLAI, V.K.K.) & PERIGREEN, P.A. (1992) – Fishery harbours of Kakinada, Madras and Tuticorin – Bay of Bengal Programme (Cleaner Fishery Harbours in the Bay of Bengal), BOBP/WP/82:7

36. PERIGREEN, P.A. (1993) – Value added marine products and their packaging – *Fish Packaging Technol.*, Concept Publishing Co., N. Delhi

37. PRABHU, P.V. (1992) – Application of cryogenics in fish processing – Paper presented at Meeting on Application of Cryogenics, organised by Dept. of Science & Technology, N. Delhi, 21 Sept.

38. PURUSHOTHAMAN, K.C. (1992) – Industrial chemicals from prawn shells and surgical sutures from fish guts – *Fish Tech. Newsletter* VI (5-7):1

39. RAGHUNATH, M.R. (1993) – Enzymatic protein hydrolysate from tuna canning wastes – standardisation of hydrolysis parameters – *Fish. Technol.* 30(1):40

40. RAGHUNATH, M.R. (1992) – Pumping profits from the deep – *Fish Tech. Newsletter VI* (5-7):17

41. RAGHUNATH, M.R. (1992) – The coral is not just an ornament – *Fish Tech. Newsletter VI* (5-7):9

42. RAMACHANDRAN, A. & GOPALAKRISHNA IYER, T.S. (1992) – Processing and quality standards of surimi in Japan – *Fishing Chimes* XXIV(2):5

43. RAO, C.C. PANDURANGA, CHAKRABORTI, R. & GUPTA, S.S. (1992) – Control of black spot in tropical shrimps – *Fishing Chimes* 12(7):39

44. SANJEEV, S. & JOSE STEPHEN (1992) – Antibiotic sensitivity of Kanagawa positive and Kanagawa negative strains of *Vibrio parahaemolyticus* isolated from fishes marketed in Kochi – *Fish. Technol.* 29(2):162

45. SANJEEV, S. & JOSE STEPHEN (1993) – Incidence of *Vibrio parahaemolyticus* in fish and shellfish marketed in Cochin –*Ind. J. Mar. Sci.* 22:70

46. SANJEEV, S. & SURENDRAN, P.K. (1993) –Effect of storage on enterotoxigenic *Staphylococcus aureus* in cured fish –*Fish. Technol.* 30(1):79

47. SANJEEV S. & SURENDRAN, P.K. (1992) – Evaluation of Reversed Passive Latex Agglutination test kits for the detection of staphylococcal enterotoxins A, B, C & D in fishery products – *J. Fd. Sci. Technol.* 5:311

48. SANJEEV, S. & SURENDRAN, P.K. (1992) – Fate of enterotoxigenic *Staphylococci* in fish subjected to curing – Paper presented at the Poster session at 1992 IAMFES

Annual Meeting at Toronto (Canada), 26-29 July

49. Sankar, T.V. (1992) – Sea urchins – the spiny attractions from sea – *Fish Tech. Newsletter VI* (5-7:13

50. Sankar, T.V., Ramachandran, A. & Solanki, K.K. (1992) – Preparation and shelf life of semi-dried fish cake from Dhoma (*Otolithus* sp.) – *J. Fd. Sci. Technol.* 29(2):123

51. Sivadas, T.K. (1992) – Automatic sedimentation analyser for quick and automatic analysis of sediment samples – Paper presented at 8th Congress of the Asia and Pacific Division of the International Association for Hydrolic Research, Pune, 20-23 Oct.

52. Sivadas, T.K., Vijayabharathi, K. & Ramakrishnan, K. (1992) – Development of Ship Borne Data Acquisition System for fisheries and oceanographic investigations – Paper presented at CSIR Golden Jubilee Symposium on Ocean Technology conducted by National Institute of Oceanography, Goa, 27-29 Aug.

53. Surendran, P.K. (1992) – Development in technology and fisheries workers – Paper (in Malayalam) presented at the Platinum Jubilee Fisheries Seminar held under the auspices of Jnanodayam Sabha at Cochin, 9 Oct.

54. Surendran, P.K. (1992) – Isolation of *Aeromonas hydrophila* from the EUS affected fishes of Kuttanad and effect of various chemicals and pH on those cultures – Paper presented at the International Consultative on Epizootic Ulcerative Syndrome (EUS)vis-a-vis the Environment and People, Trivandrum, 25 & 26 May.

55. Thampuran Nirmala & Surendran, P.K. (1993) – A medium for enumeration of bacteria in foods containing swarming *Bacillus* spp. – *Letters in Applied Microbiology*, 16:277

56. Varghese, M.D., Khan, A.A. & George, V.C. (1993) – Activity periods of certain fishes in Hirakud reservoir – *Fish. Technol.* 30(1):9

The following are the publications brought out by the Institute during the period:-

1. Fish Technology Newsletter Vol. VI No.2, No.3, No.4, No.5-7

2. Feasibility report on Reprocessing of Commercial Cured Fish for Better Quality and Shelf Life Suitable for Retail Marketing – T.S. Unnikrishnan Nair, Cyriac Mathen, P. Ravindranathan Nair & K. George Joseph

3. Indian Food Fishes – Biochemical Composition – edited by Dr K. Gopakumar

4. Proceedings of National Workshop on Low Energy Fishing, Aug. 8 & 9, 1991. (Organised by Society of Fisheries Technologists (India) in association with CIFT).

5. Supply and Demand of Fish Nets in India – A Projection upto 2000 AD – A report on a study sponsored by Dept. of Agriculture & Co-operation, Ministry of Agriculture, Govt. of India.

APPENDICES

APPENDIX - I

HEADQUARTERS

CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY
WILLINGDON ISLAND, MATSYAPURI P.O.
COCHIN – 682029, KERALA

FAX	:	91 484 668212
TELEX No.	:	0885 - 6440 - CIFT
TELEPHONE Office No.	:	666845 (8 lines), 668145 & 668146
Director (Per)	:	666880, 667727
(Res)	:	315456
TELEGRAM	:	FISHTECH / MATSYAOUDYGIKI, COCHIN

HEADS OF DIVISIONS/SECTION

1. Fishing Technology Division	:	**Dr V. C. George,** *Principal Scientist*
2. Fish Processing Division	:	**Dr T. S. Gopalakrishna Iyer,** *Principal Scientist*
3. Biochemistry & Nutrition Division	:	**Shri. P. Madhavan,** *Principal Scientist*
4. Engineering Division	:	**Shri.K. Sreedharan Namboodiri,** *Principal Scientist*
5. Extension, Information & Statistics Division	:	**Dr M.K. Kandoran,** *Principal Scientist*
6. Microbiology, Fermentation & Biotechnology Section	:	**Dr P.K. Surendran,** *Senior Scientist*

APPENDIX - I (Contd.)

RESEARCH CENTRES

Sl. No.	Place	Address	Telephone/ Telex	Telegram	Scientist-in-Charge
(1)	(2)	(3)	(4)	(5)	(6)
1.	VERAVAL	Research Centre of CIFT Matsya Bhavan, Bhidia, Veraval - 362 269 Gujarat	Tel: 20297 Tlx: 0163-202 CIFT IN	Matsyaoudyogiki/ Fishtech	Shri K. K. Solanki Principal Scientist
2.	KAKINADA	Research Centre of CIFT Door No. 2-II-1/4 Venkat Nagar Kakinada - 533 003 Andhra Pradesh	Tel: 78436/75902 Tlx: 0473-229 CIFT IN	Matsyaoudyogiki/ Fishtech	Shri C. V. N. Rao Principal Scientist
3.	BURLA	Research Centre of CIFT Burla - 768 017 Sambalpur Dt. Orissa	Tel: 4190 Tlx: 0634-211 CIFT IN	Matsyaoudyogiki/ Fishtech	Shri Anwar Ahmed Khan Scientist (S. G.)
4.	BOMBAY	Research Centre of CIFT 162-BPT Godown Sassoon Dock, Colaba, Bombay-400 005 Maharashtra	Tel: 2183892 Tlx: 011 82464 CIFT IN	Fish Process (FT)	Dr. M. Arul James Principal Scientist
5.	CALICUT	Research Centre of CIFT Beach Road, West Hill Calicut - 673 005 Kerala	Tel: 50627	Matsyaoudyogiki/ Fishtech	Shri Cyriac Mathen Principal Scientist
6.	GOA	Research Centre of CIFT 'Shanta', 2nd Floor 18th June Road, St. Inez Panaji - 403 001, Goa	Tel: 45905	Matsyaoudyogiki/ Fishtech	Shri H. N. Mhalathkar Scientist (S. G.)

APPENDIX – II

List of Personnel in CIFT as on 31st March 1993

HEADQUARTERS, COCHIN

SCIENTIFIC PERSONNEL

DIRECTOR : **Dr K. Gopakumar**

Principal Scientist

1. Shri. P. Vasudeva Prabhu
2. Dr K. Ravindran
3. Dr V.C. George
4. Dr T.S. Gopalakrishna Iyer
5. Shri. P.A. Panicker
6. Dr K. Devadasan
7. Shri. P. Madhavan
8. Dr T.K. Sivadas
9. Shri. H. Krishna Iyer
10. Shri. S. Ayyappan Pillai
11. Shri. K.K. Balachandran
12. Shri. K.S. Namboodiri
13. Shri. K. Krishna Rao
14. Dr M.K. Kandoran
15. Shri. P.K. Chakraborthy
16. Shri. P.D. Antony

Senior Scientist

1. Dr Jose Stephen
2. Dr P.K. Surendran
3. Dr P.T. Lakshmanan
4. Dr M.D. Varghese
5. Dr M.K. Mukundan
6. Dr A.G. Gopalakrishna Pillai
7. Dr N. Unnikrishnan Nair
8. Dr Chinnamma George
9. Dr K.G. Ramachandran Nair
10. Dr A.K. Kesavan Nair
11. Dr Nirmala Thampuran
12. Dr M.R. Raghunath
13. Dr P.T. Mathew
14. Dr B. Meenakumari
15. Dr S. Balasubramaniam
16. Dr Jose Joseph
17. Dr Sanjeev S.
18. Dr K.V. Mohan Rajan

Scientist (Selection Grade)

1. Shri. P.A. Perigreen
2. Shri. K.A. Sadanandan
3. Shri. A.C. Joseph
4. Shri. K.K. Kunjipalu
5. Shri. T.K. Srinivasa Gopal
6. Shri. A.G. Radhakrishnan
7. Shri. P.R. Girija Varma
8. Shri. P.K. Vijayan
9. Shri. Francis Thomas
10. Smt. Mary Thomas
11. Shri. P.N. Joshi
12. Shri. V. Muraleedharan
13. Shri. M.R. Boopendranath

14. Shri. N. Subramonia Pillai
15. Shri. V. Narayanan Nambiar
16. Shri. T.K. Thankappan
17. Shri. G.R. Unnithan
18. Shri. V. Vijayan
19. Smt. K.V. Lalitha
20. Smt. K. Vijayabharathy
21. Shri. K. Ramakrishnan
22. Shri. P. George Mathai

Scientist (Sr. Scale)

Shri. M. Nasar

Scientist

1. Smt. K. Ammu
2. Shri. K.P. Antony
3. Smt. R. Thankamma
4. Shri. V. Annamalai
5. Shri. A. C. Kuttappan (On deputation to CIFNET, Cochin)
6. Smt. Saly N. Thomas
7. Smt. Leela Edwin
8. Dr A. Ramachandran (on deputation to Cochin University of S&T)
9. Shri. T.V. Sankar
10. Shri. M. Syed Abbas
11. Shri. Braj Mohan
12. Dr C.N. Ravishankar
13. Dr K. Asok Kumar
14. Smt. Suseela Mathew
15. Shri. Bankey Bihari

TECHNICAL PERSONNEL

Technician T- 8 (Technical Officer)

Dr P.J. Cecily

Technician T- 8 (Technical Officer)

1. Shri. K.S. Ganesan
2. Smt. K. Radhalakshmy
3. Shri. K.C. Purushothaman
4. Shri. K.J. Francis Xavier

Technician T- 7 (Technical Officer).

1. Shri. M.S. Fernando
2. Shri. N.A. George

Technician T-6 (Technical Officer)

Shri. K. Vasudevan Nair

Technician T- 5 (Technical Officer)

1. Shri. M.S. Rajan
2. Shri. N. Sriharshan
3. Shri. V.K. Ibrahim
4. Smt. T.T. Annamma
5. Smt. Annamma Mathew
6. Shri. K. Bhaskaran
7. Shri. Varghese Paul
8. Shri. C. Chandrasekharan
9. Shri. N. Vareethiah
10. Shri. G. Mohanan
11. Shri. O. Subramanian
12. Shri. P. Ravindranathan
13. Shri. T.K. Syed Ali
14. Shri. R. Gopalakrishnan Nair
15. Shri. M.V. Baiju
16. Shri. A. Kassim Kunju
17. Shri. Thomas J. Mammoottil
18. Shri. V. Gaspar
19. Shri. P.T. Sebastian
20. Shri. N.M. Vasu
21. Shri. P.S. Alias

Technician T-4

1. Shri. M.L. Anslem
2. Shri. M.K. Sasidharan
3. Shri. B. Anandan

4. Shri. T.K. David
5. Shri. V. Gopalakrishna Pillai
6. Shri. C.R. Gokulan
7. Shri. M.M. Devassya

Technician T-II-3

1. Shri. G. Ramadas Kurup
2. Shri. V.K. Ramachandran
3. Shri. V.V. Johni
4. Shri. G. Ratnakaran Nair
5. Smt. L.S. Rajeswari
6. Smt. K.B. Beena
7. Shri. Dev Singh Panchpal
8. Shri. K.V. Baladasan
9. Shri. M.K. Kuttykrishnan Nair

Animal House Keeper

Shri. B. Ganesan

Technician T-I-3

1. Shri. K.J. Augustine
2. Shri. A.K. Jaisingh
3. Shri. K.E. Mani
4. Shri. P.M. Joseph
5. Shri. A.R. Dharaneedharan
6. Shri. E.K. Balakrishnan
7. Smt. K. Sarasamma
8. Shri. M. Shanmughavel
9. Shri. C. Rajendran
10. Shri. Jose Kalathil
11. Shri. K.V. Madhavan
12. Shri. K.K. Pappukutty
13. Shri. T. Gopalakrishnan
14. Shri. P.A. John
15. Shri. C.C. Sivan
16. Shri. T.N. Manibhadran
17. Shri. T.K. Bhaskaran
18. Shri. K.B. Thilakan
19. Smt. K.K. Sumathy
20. Smt. G. Usharani
21. Shri. P.A. Josi Augustine
22. Shri. P.N. Sudhakaran

Technician T-2

1. Shri. K.N. Rajagopalan
2. Shri. K.K. Narayanan
3. Shri. V.V. John
4. Smt. T. Silaja
5. Shri. P.S. Nobi
6. Shri. N.R. Gopan Nair
7. Shri. K.B. Thambi Pillai
8. Smt. K.P. Leelamma
9. Smt. V.C. Mary
10. Shri. P.S. Raman Namboodiri
11. Smt. K.G. Sasikala
12. Shri. P.T. Viswambharan
13. Shri. Tommy Rebello
14. Shri. A.A. Kunjappan
15. Shri. K.D. Jos
16. Shri. K.A. Gopinath

Technician T-1

1. Shri. G. Omanakuttan Nair
2. Smt. K.S. Mythri
3. Smt. G. Ramani
4. Shri. J. Samarajan
5. Shri. P.N. Sukumaran Nair
6. Shri. T. Mathai
7. Smt. N. Lekha
8. Shri. P.D. Padmaraj
9. Smt. P.K. Geetha
10. Shri. Harjivan Vasta Pungera

ADMINISTRATIVE PERSONNEL

Sr. Administrative Officer

Shri. Varghese Paul.

Asst. Finance & Accounts Officer

Shri. P.A. Uthup

Asst. Director (O.L.)

Smt. C. Jessy Joseph

Asst. Administrative Officer

1. Smt. K.A. Devaky
2. Shri. M. George Joseph (Ad-hoc)

Superintendent

1. Shri. S. Naveen Chandra Prabhu
2. Smt. Alice M. Joseph
3. Shri. R. Anil Kumar

Senior Stenographer

Shri. K.J. Thomas

Assistant

1. Shri. T.M. Padmanabhan
2. Smt. N.K. Sulochana
3. Smt. T.K. Sarala
4. Shri. R.S. Shanmughan
5. Shri. A.L. John
6. Shri. A. George Joseph
7. Shri. M. Gopalakrishnan
8. Smt. M.S. Susanna
9. Shri. V. N. Rajasekharan Nair
10. Shri. M.T. Joseph
11. Shri. A.K. Venugopalan
12. Shri. P.K. Sreedharan

Stenographer

1. Shri. K. Ravindran
2. Smt. N.K. Saraswathy
3. Smt. R. Vasantha
4. Smt. V.P. Vijayakumari

Jr. Stenographer

1. Shri. P.K. Raghu
2. Smt. N. Leena
3. Smt. S. Kamalamma
4. Shri. K.V. Mathai
5. Kum. Anitha K. John

Senior Clerk

1. Smt. Annamma Varghese
2. Smt. C.G. Marykutty
3. Smt. N. Prabhavathy Amma
4. Shri. C. Ravindran Nair
5. Smt. K.R. Gita Rani
6. Shri. T.M. Ramaraj
7. Shri. G. Somappan
8. Smt. K. Gracy
9. Smt. M. Jully
10. Shri. Y. Philipose
11. Smt. M.A. Prasanna
12. Shri. R. Viswanathan
13. Shri. V.R. Kesavan
14. Smt. K.A. Nazeem
15. Shri. N. Venugopal
16. Smt. T.K. Susannamma
17. Shri. P. Krishna Kumar

Jr. Clerk

1. Smt. P.C. Kamalakshy
2. Shri. P.V. Venugopalan
3. Smt. N.I. Mary
4. Shri. P.K. Thomas
5. Smt. P.K. Thankamma
6. Smt. A.A. Cousallia
7. Shri. K.K. Sasi
8. Shri. P. Padmanabhan

9. Smt. A.R. Kamalam
10. Smt. T.K. Shyma
11. Smt. T.D. Usheem
12. Smt. V.S. Aleyamma
13. Shri. V.S. Ambasuthan
14. Shri. A.P. Gopalan
15. Shri. S. Radhakrishnan Nair
16. Shri. K.B. Sabukuttan
17. Smt. G.N. Sarada
18. Smt. P.A. Sathy
19. Shri. K.C. Baby
20. Shri. C.K. Sukumaran
21. Shri. V.C. Sunil
22. Shri. P.P. Varghese
23. Shri. S.R. Vijayakumar
24. Smt. Lillykutty George
25. Shri. P.K. Somasekharan Nair
26. Kum. K.S. Ajitha
27. Kum. K. Latha
28. Kum. P.P. Radhadevi
29. Shri. G. Thulaseedharan Nair

Telephone Operator

Shri. P. Bahuleyan

AUXILIARY PERSONNEL

Senior Carpenter

1. Shri. V.S. Augustine
2. Shri. Philip Durom

Carpenter

1. Shri. Joseph Paul
2. Shri. M. Sankara Panicker

Staff Car Driver

Shri. M.G. Narayanan Nair

Driver

1. Shri. R. Rengaswami
2. Shri. K.V. Mohanan
3. Shri. K. Nakulan
4. Shri. G. Jyothi Kumar
5. Shri. O.K. Xavier

Plant Attendant

1. Shri. C.C. Gandhi
2. Shri. K.R. Kesavan

Deck Hand

1. Shri. K.K. Lekshmanan
2. Shri. T. Balan
3. Shri. P.K. Pushpangadan
4. Shri. T.K. Dasan
5. Shri. E.K. Chinnappan
6. Shri. M.K. Asokan
7. Shri. D.G. Rao

Cook

Shri. E.R. Krishna

Plumber

Shri. V.A. Sudhakaran

Sr. Gestetner Operator

Shri. K.K. Appachan

Jr. Gestetner Operator

Shri. K.K. Madhavan

Hindi Translator

Smt. K. Sobha

Projector Operator

Shri. C. Subash Chandran Nair

SUPPORTING PERSONNEL

Supporting Staff Grade IV

1. Shri. K.K. Radhakrishnan
2. Shri. O.C. Lonan
3. Shri. O.A. Krishnan
4. Shri. E.S. Sreedharan

Supporting Staff Grade III

1. Shri. P.A. Thomas
2. Shri. K. Balakrishna Pillai
3. Shri. P.J. George
4. Shri. A.G. Vasu
5. Shri. P.M. Pakeer Mohammed
6. Shri. E.S. Balachandra Pai

Supporting Staff Grade II

1. Shri. S. Rajan
2. Shri. T.V. Manoharan
3. Shri. T.T. Velayudhan
4. Shri. C.A. Krishnan
5. Shri. P.A. Shanmughan
6. Shri. K.N. Mukundan
7. Shri. P. Gopalakrishnan
8. Shri. P.D. George
9. Shri. K.B. Bhaskaran
10. Shri. K.K. Karthikeyan
11. Shri. K.A. Kunjan
12. Shri. T.T. Thankappan
13. Shri. P.R. Unnikrishna Panicker
14. Shri. R. Chellappan
15. Shri. A.R. John
16. Shri. C.N. Raghavan

Supporting Staff Grade I

1. Smt. P.L. Rosily
2. Shri. K.N. Velayudhankutty
3. Shri. T.G. John
4. Shri. P.T. Anthappan
5. Shri. P.A. Sivan
6. Smt. C.G. Radhamony
7. Shri. N. Krishnan
8. Shri. C.D. Parameswaran
9. Shri. V.T. Sadanandan
10. Shri. P.P. George
11. Shri. A.V. Chandrasekharan
12. Shri. P.V. Raju
13. Shri. M.N. Sreedharan
14. Shri. E. Damodaran
15. Shri. M.M. Radhakrishnan
16. Shri. K.K. Karthikeyan
17. Shri. K.D. Santhosh
18. Shri. K. Dinesh Prabhu
19. Smt. C. Ammini
20. Smt. P. Ammalu
21. Smt. U.K. Bhanumathi
22. Shri. T.A. Kuttappan
23. Smt. Tessy Francis
24. Shri. Shaji T.N.
25. Shri. T.K. Rajappan
26. Kum. Jaya Das
27. Shri. M.T. Udaya Kumar

VERAVAL RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

Shri. K.K. Solanki

Senior Scientist

Dr P.G. Viswanathan Nair

Scientist (Selection Grade)

1. Shri. Rajendra Badonia
2. Shri. A. Vasanth Shenoy
3. Shri. R.S. Manohar Doss

Scientist

Shri. Pravin Puthra

TECHNICAL PERSONNEL

Technician T-7 (Technical Officer)

Shri. D.C. Besra

Technician T-5 (Technical Officer)

1. Shri. G.P. Vaghela
2. Shri. J.B. Paradwa

Technician T-4

Shri. K.U. Dholia

Technician T-1-3

1. Shri. S.R. Jethwa
2. Shri. M.M. Vara
3. Shri. T. Gangadharan
4. Shri. K.U. Sheikh
5. Shri. D.R. Aparnati

Technician T-2

Shri. V.N. Dileep Kumar

Technician T-1

1. Shri. A.P. Joshi
2. Shri. G.M. Waghela

ADMINISTRATIVE PERSONNEL

Superintendent

Shri. P. Vasudevan

Senior Clerk

Shri. Veersingh

Junior Clerk

1. Shri. S.B. Purohit
2. Shri. M.M. Damodara
3. Shri. T. Viswanathan

Junior Stenographer

Shri. Ramesh Kumar Dhirendrapuri Goswami

AUXILIARY PERSONNEL

Hindi Translator

Shri. Shitala Prasad Thiwari

Deck Hand

1. Shri. G.B. Tandel
2. Shri. H.M. Kotiya
3. Shri. G.R. Bhogte

Cook

Shri. G.L. Tandel

Driver

Shri. Sida Hanif Ummer Bhai

SUPPORTING PERSONNEL

Supporting Staff Grade III

Shri. P.A. Abdul Rahman

Supporting Staff Grade II

1. Shri. K.C. Fofandi
2. Shri. K.A. Massani
3. Shri. Harbhajan

Supporting Staff Grade I

1. Shri. B.M.A. Khoker
2. Shri. D.P. Parmer
3. Shri. D.B. Chudasama
4. Shri. K.J. Damer
5. Shri. P.N. Chudasama
6. Smt. Chandrika C. Tank
7. Smt. Gangaben Niren Chorwadi
8. Shri. Dodiya Khodia Viram
9. Shri. Jitendra Bachubhai Malamdi
10. Shri. Ramjilal Nathalal Gosai

KAKINADA RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

1. Shri. C.V.N. Rao
2. Shri. G. Narayanappa

Senior Scientist

Dr Imam Khasim Sahib

Scientist (Selection Grade)

1. Shri. Sibsankar Gupta
2. Shri. S.V.S. Rama Rao
3. Shri. Rupshankar Chakraborthy

Scientist

Shri. M.M. Prasad

TECHNICAL PERSONNEL

Technician T-4

1. Shri. A. Veeranjeneyulu
2. Shri. V.V. Ramakrishnan
3. Shri. Srihari Babu

Technician T-II-3

Shri. K.V.S.S. Kusuma Harnath

Technician T-1-3

1. Shri. S. Laxmanadu
2. Shri. V. Veera Raju
3. Shri. B. Ramaiah

Technician T-2

1. Shri. K. Prakash Rao
2. Shri. N. Venkata Rao
3. Shri. P.S. Babu

Technician T-1

1. Shri. N. Ramesh Singh
2. Shri. P. Radhakrishna

ADMINISTRATIVE PERSONNEL

Assistant

Shri. G.C. Adhikari

Junior Stenographer

Smt. D.A.L. Satyanarayanamma

Senior Clerk

1. Shri. Ch. Satyanarayana
2. Smt. B. Hemalatha

Junior Clerk

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

AUXILIARY PERSONNEL

Deck Hand

1. Shri. K. Sarangadharadu
2. Shri. Kari Gangaraju

Cook

Shri. G. Subba Rao

Driver

Shri. M. Venkateswara Rao

SUPPORTING PERSONNEL

Supporting Staff Grade IV

1. Shri. B. Suryaprakash Rao
2. Shri. Koppada Gandhi

Supporting Staff Grade III

1. Shri. B. Thirupathi Rao
2. Shri. N. Gnanaranjana Rao

Supporting Staff Grade II

1. Shri. C. Kamaraju
2. Shri. V. Kamaraju
3. Shri. K. Kameswara Rao
4. Shri. Melladi Perraju
5. Shri. O. Heman
6. Shri. B. Sivanandham
7. Shri. K. Appa Rao
8. Shri. Vasippilli Yelliah

Supporting Staff Grade I

1. Shri. S. Chakram
2. Shri. S. Appa Rao
3. Shri. Venkata Ramana
4. Shri. G. Bhushanam

BURLA RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Scientist (Selection Grade)

1. Shri. Anwar Ahmed Khan
2. Shri. A.K. Chattopadhyay
3. Shri. Percy Dawson

Senior Scientist

Dr K.N. Kartha

Scientist (Sr. Scale)

Shri. J.K. Bandhopadhyay

TECHNICAL PERSONNEL

Technician T-4

Shri. Baikunta Pradhan

Technician T-II-3

1. Shri. Binod Kumar Pande
2. Shri. Asok Kumar Panigrahi

Technician T-1-3

1. Shri. Gurudas Ram
2. Shri. P.M. Pattanayak
3. Shri. Sathrughan Kumara

Technician T-2

1. Shri. Radhu Pandey
2. Shri. Damodar Rout

Technician T-1

1. Shri. Ashok Kumar Naik
2. Shri. Rabinarayan Sahoo
3. Shri. Kirtan Kisan

ADMINISTRATIVE PERSONNEL

Assistant

Shri. Jatindra Kumar Mishra

Senior Clerk

Shri. Udekar Pande

Junior Clerk

1. Shri. Laxminarayan Badi
2. Shri. Premlal Pande

AUXILIARY PERSONNEL

Driver

Shri. Narasingh Pande

SUPPORTING PERSONNEL

Supporting Staff Grade IV

1. Shri. Gajendra Karali
2. Shri. K.C. Mehar

Supporting Staff Grade III

1. Shri. Laba Nag
2. Shri. Santhosh Banchor

Supporting Staff Grade II

1. Shri. G.C. Mehar
2. Shri. Ratan Chand
3. Shri. Sathrughan Seth
4. Shri. K.C. Nayak
5. Shri. S.C. Mehar

Supporting Staff Grade I

1. Shri. Satyanarayan Mirdha
2. Shri. Badrinarain Guru
3. Shri. Jaisingh Oram
4. Shri. P.K. Bhangaraj
5. Shri. Dibyalochan Pattanayak
6. Shri. Godabari Mahanandia
7. Shri. Surjananda Dishri
8. Shri. Karfulla Bag
9. Shri. Dhruba Charan Bhoi

BOMBAY RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

Dr M. Arul James

Scientist (Selection Grade)

1. Shri. S.P. Damle
2. Shri. Dinesh Kumar Garg

TECHNICAL PERSONNEL

Technician T-II-3

1. Smt. S.S. Patnekar
2. Smt. Thriveni

ADMINISTRATIVE PERSONNEL

Assistant

Shri. Milind S. Bhatkar

Senior Clerk

1. Shri. Y.W. Mhadgut
2. Smt. Smita K. Shirishkar

AUXILIARY PERSONNEL

Driver

Shri. B.B. Pinjari

SUPPORTING PERSONNEL

Supporting Staff Grade III

Shri. A.T. Waghmare

Supporting Staff Grade II

1. Shri. B.S. Tambe
2. Shri. B.M. Ghare

Supporting Staff Grade I

1. Shri. Vinod S. Salvi
2. Shri. Prakash B. Bait
3. Shri. Bandu Nini Patel

CALICUT RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

Shri. Cyriac Mathen

Scientist (Selection Grade)

1. Shri. T.S. Unnikrishnan Nair
2. Shri. P. Ravindranathan Nair
3. Shri. K. George Joseph

TECHNICAL PERSONNEL

Technician T- 5 (Technical Officer)

Shri. T. John

Technician T-2

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

ADMINISTRATIVE PERSONNEL

Senior Clerk

1. Shri. M. Ravindran
2. Shri. K.P. Velayudhan

AUXILIARY PERSONNEL

Driver

Shri. T.P. Balakrishnan

SUPPORTING PERSONNEL

Supporting Staff Grade IV

Shri. E. Gangadharan Nair

Supporting Staff Grade I

1. Shri. K.K. Lakshmanan
2. Smt. M.V. Valsala
3. Shri. P. Rajeev

GOA RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Scientist (Selection Grade)

1. Shri. H.N. Mhalathkar
2. Shri. T. Joseph Mathai

TECHNICAL PERSONNEL

Technician T-1-3

Shri. A.B. Varghese

Technician T-2

1. Shri. Koruth George
2. Shri. Aravind S. Kalungatkar

ADMINISTRATIVE PERSONNEL

Senior Clerk

Shri. A.B. Rodrigues

AUXILIARY PERSONNEL

Driver

Shri. Umesh D. Arosker

SUPPORTING PERSONNEL

1. Shri. D.D. Naik
2. Shri. R.D. Padnekar
3. Shri. Vasudev G. Kubal

Supporting Staff Grade II

1. Shri. Menino Souza
2. Shri. P.S. Morajkar
3. Shri. C.B. Shirodhkar

Supporting Staff Grade I

1. Shri. V.P. Halernekar
2. Shri. Gopixenkar Chodankar
3. Shri. Chandrakanth Kolvalkar

APPENDIX – III

BUDGET/EXPENDITURE STATEMENT FOR THE YEAR 1992 - 93

(Rs. in lakhs)

Particulars	NON-PLAN			PLAN		
	Budget Estimate	Revised Estimate	Expen-diture	Budget Estimate	Revised Estimate	Expen-diture
1. Establishment Charges	232.16	254.16	252.59	—	—	—
2. Travelling Allowance	4.00	4.00	4.00	1.30	1.30	1.30
3. Other Charges	25.84	35.84	37.45	18.20	18.20	31.84
4. Works	—	—	—	41.50	41.50	6.81
5. Equipments	—	—	—	30.00	30.00	31.05
TOTAL	**262.00**	**294.00**	**294.04**	**91.00**	**91.00**	**71.00**

निदेशक का रिपोर्ट

वर्ष के दौरान संस्थान, कई अन्य योजनाओं के विजयप्रद कार्यान्वयन के अतिरिक्त उसका मुख्य दबाब संस्थान की प्रबंध समिति द्वारा अनुमोदित अनुसंधान प्रोजक्टों पर आर एन्ड डी क्रियाकलापों पर डालने लगा। मुझे, संस्थान के निदेशक के रुप में कार्यभार संभालने का भाग्य भी हुआ और वर्ष में संस्थान की लक्ष्य प्राप्तियों के लिए मेरी सहायता किए गए अपने सहयोगियों से सच्चा आभार प्रकट करना चाहता हूँ।

संस्थान के मुख्य क्रियाकलापों - उपलब्धियों के बारे इस सार-संग्रह प्रकाश डालता है।

समुद्री स्क्रू प्रोपल्लरों के तीन ब्लेड और चार ब्लेडों की अभिकल्पना के लिए एक कमप्यूटर सोफ्ट वेयर को विकसित किया।

लक्षद्वीप जलों में लग्ग व लाइन मत्स्यन के लिए विकसित 7.64 एम के तीन फाइबर ग्लास नावों की संरचना की और विकसित किया जिसकी स्वीकृति मछुवारों द्वारा हुई। तल और तल के नीचे मछलियों के एककालिक और प्रभावकारी शोषण के लिए अभिकल्पित उन्नत खुलाव का ट्रॉल, बी ओ बी पी ट्राल की तुलना में प्रति यूनिट के लिए उन्नत पकड को ज़ारी रखा।

ताप संसाधित खाद्यों के लिए पारंपरिक लोहा डिब्बों की तुलना में देशी रुप में निर्मित अलुमिनियम डिब्बाएँ श्रेष्ठ स्थापित हुआ।

समुद्री खाद्य संसाधन के लिए साइकिल व लुना फेरीवालों के लिए अनुयोज्य (पात्रों 100 की. ग्रा. क्षमता) की अभिकल्पना और विकास किया।

अर्ध शुष्कित डोमा के वाणीज्य नमुनों के थोक संग्रहण के लिए गन्नी थैलियाँ और पॉलीथीन बुनावट की थैलियाँ श्रेष्ठ संवेष्ठन साम्रग्री निकल पडी।

फिल्मों के निर्माण में निम्न और उन्नत श्यानता कैटोसन की अपेक्षा माध्यमिक श्यानता के कैटोसन श्रेष्ठ निकला।

निर्जलीकृत और गठित उत्पन्न और कम दाम, के ताजे जल मछली से कामाबोको किस्म के उत्पन्न की तैयारी की तरीकाओं को विकसित किया।

मछली जबडे कैलोजन से कैलोजन की तैयारी और ज्वलन व घावों को आवरित करने के चिकित्सा उपयोग के लिए आवश्यक फिलमों के रूप में परिवर्तन प्रक्रिया को विकसित किया।

मछली में सालमोनेल्ला सीरम प्ररूपों के उत्तरजीवन व बढ़ाव के लिए नमकीकरण सूर्यशुष्कन और संग्रहण संबंधी अध्ययन ने दिखाया है कि संसाधित मछली से जीवाणु की पूरी दूरीकरण के लिए कम से कम 12 घण्डों तक 0.75 से कम जलीय क्रियाशलिता ए. डब्लयू तक के सूर्यशुष्कन की आवश्यकता है।

संस्थान के अभियंताओ के समर्थ निरीक्षण और तकनीकी सहायता से 14.24 एस के एक बहुद्देशीय काष्ठ मत्स्यन यान की संरचना हुई। यान को श्री. एस. कृष्ण कुमार, डेयर के वहु. राज्यमंत्री द्वारा चालू किया गया।

हमारे वैज्ञानिक, जो बोर्ड पर के अनुसंधान यान फोरव सागर संपदा में अगाध जल मत्स्यन करने के लिए व्यापक सुविज्ञता प्राप्त है, पश्चिमी तट में बोर्ड पर विशाखपटनम के एक कंपनी के स्वामित्व के 10 एम जापानियों द्वारा निर्मित कारखाना ट्रालर द्वारा ग्यारह दिवसीय सूमुद्रीय यात्रा पर एक रेकोड पकडाव के लिए योग्य बने।

के.मा.प्रौ.सं. के वैज्ञानिक, जापनी यानों के मत्स्यन गियरों का पर्याप्त मात्रा में संशोधन किया और मछली जातियों के लक्ष्य के झुण्ड बनाने के आचरण के आधार पर ट्रॉलर की मत्स्यन अनुकूलता को भी परिवर्तित किया। यह यानों के सुधरे निष्पादन और रेकोर्ड फसल का कारण बना।

शिप बॉन ऑकडा अर्जन प्रणाली के इलट्रानिक विभाग दारा प्रवर्तित प्रोजक्ट तीन नमुनों में दूसरी की संरचना की गयी।

रिपोर्टाधीन वर्ष के दौरान संस्थान में एक शक्तियुक्त कमप्यूटर और डिजिटल इ.पी.ए.बी. एक्स. टेलिफॉन प्रणाली का औपचारिक रूप में व्यवस्थापन हूआ।

कई वर्षों में भाटे के मकान में कार्य भार करते हूए, वेरावल अनुसंधान केन्द्र उसके अपने कार्यालय व प्रयोगशाला मकान में मार्च 1993 को स्थानांतरित किया।

हमारे दो युव और होनहार वैज्ञानिक, श्री. एस. के. भट्टाचार्या और डा. एच. के. बेरी, जिसने सिफ्ट के उनके छोटे जीवन में मत्स्यन संसाधन क्षेत्र में उल्लेखनीय योगदान दिया था, के आकस्मिक और असामयिक निधन के प्रति हमारा गहरा दुख भी रिकोर्ड करना चाहता है। हमारे कालिकट अनुसंधान केन्द्र के गोपालन भी हमसे बिछुड हुए।

उन सबों के दुखी परिवार के प्रति हमारी संवेदनाएँ।

(डॉ. के. गोपकुमार निदेशक)

मुख्य उपलब्धियाँ

मुख्यालय, कोचिन

मत्स्यन प्रौद्योगिकी डिवीज़न

अन्य अलुमिनियम अलॉय वर्गों की अपेक्षा इन्डल एम 57 एस गर्तन प्रीतरोध में श्रेष्ठ निकला।

तीन ब्लेड के और चार ब्लैड के समुद्री स्क्रू प्रोपल्लरों की अभिकल्पना के लिए एक सोफ्टवेयर कमप्यूटर को विकसित किया।

छोटी सियानिट जाती अड्रोबुका मारलेय के नये ट्राल ग्रोत, उत्तरी पश्चिमी तट के गम्भीर जलों में 112-128 मी स्थापित किया।

33.7 एम आर टी 6 इ दीर्घ मेश 21°16 एन और 69°02 हीर्घ ई ने 900 की ग्राम मछली सी पी इ यू को उत्पादित किया।

संस्थान में विकसित कर्कट बर्तन से मंडपम में मत्स्यन परीक्षणों को संचालित किया और अभिकल्प को अंतिम रूप दिया।

मछुवार समितियों के दक्षिण भारतीय महासंघ तिरूवनंतपुरम द्वारा निर्मित कृत्रिम बलुई भित्ति की निष्पति के सर्वेक्षण हान्ड लाइन द्वारा पेर्चे, स्किवड और फुटकर मछलियों के अच्छा समाहार स्थापित किया।

मत्स्य संसाधन डिवीज़न

लटेजनेस जातियों को शीतन के पहले लंवग और इलायची आदि सुगन्ध द्रव्यों से संसाधन, उत्पन्नों की हिमीकृत शेलफ जीविका को करीब 3 महीने तक ($7^1/_2$ से महीनों तक) बढ़ाता है।

रिबन मछली और लिसाड मछली से तैयारित सुरिमी में 2% सेडियम क्लोराइड जोडने पर, 800-900 ग्राम सी एं के जेल शक्ति के सुवरी प्रतिभास को सुधारित करतो है।

परिसाधित ऑकोवी से - 20° सी में 6 महीनों तक की शेल्फ जीविका के स्वादिष्ठ तोडे और ब्रैड किए उत्पन्न को तैयारित किया गया।

सियानिड रेड स्नाप्पर और इ डयाकन्तस की कीमों और छोटे कर्कटों के मॉस से मछली पेस्ट की तैयारी की तरीकाओं को मानकीकृत किया।

लोहा डिब्बों में संवेष्ठित एक अपारंपरिक उत्पन्न यानी करी सालन में मछली बॉलों को उसकी शेल्फ जीविका के अध्ययन करके विकसित किया उत्पन्न को 9 महीनों तक स्वीकृत इन्द्रियग्राही विशेषताओं सहित सुरक्षित रहता है।

लौहा डिब्बाओं की तुलना में ताप संसाधित खाद्यों के लिए अलुमिनियम डिब्बाएँ श्रेष्ठ निकला।

35% और उससे अधिक प्रोटीन अंश से युक्त मछली झीगे खाद्य फिलेटों में जलीय स्थिरता को बढ़ाने में सोडियम अलजिनेट और कैटोसन एक समान व्यवहार करता है। लेकिन निम्न प्रोटीन स्तरों में जलीय स्थिरता को बढ़ाने में कैटोसन का प्रभाव सोडियम अलजिनेट की अपेक्षा अधिक है।

फिल्मों के निर्माण में निम्न और उन्नत श्यानता कैटोसन की अपेक्षा माध्यमिक श्यानता के कैटोसन श्रेष्ठ निकला।

आयात किए गये खाद्यों से संचयित विश्लेषण आँकडों के आधार पर झींगे खाद्यों की तैयारी के लिए एक प्रयोगात्मक सूत्र विकसित किया।

कोष्ठ तापमान 110 दिनों तक मछली खाद्य में लिस्टीरिया मोनो सैटोजनेस जीवन क्षम है। -18° सी में 16 महीनों तक संग्रहण अवधि के बाद भी हिमीकृत झींगों में जीवाणु जीवन क्षम निकल पडा है।

यद्यपी, झींगी में इंडोल की उपस्थिति अपघटन की सूचना देता है। फिर भी उनकी अनुपस्थिति यह निश्चित न किया जाता है कि नमूना स्वीकृत गुण के है।

समुद्री खाद्य संसाधन संयत्रों में बहि: स्रावों के उपचार के लिए एक सरल उपचार को परीक्षित किया।

ताजे मछली संवहन के लिए साइकिल और लूना फेरीवालों के लिए अनुयोज्य पात्रों की अभिकल्पना और विकास किया।

विभिन्न प्रकार की मछलियों से तैयारित तोडे, ब्रड किए और भुने मछली फिंगरों को - 18° से - 20° सी में अच्छी अवस्था में अवधी को बढ़ाकर 4 महीनों तक रखा जा सकता है।

जैव रसायन व पोषण डिवीज़न

ज्वलन व घावों को आवरित करने के लिए एक अनुयोज्य कैलोजल फिलमों को विकसित किया।

जाँच किए गए सभी कीडक नाशियों के अंश गंभीर समुद्री मछलियों में 0.7 एम. जी. की. ग्रा. से अधिक नही है।

पी इ और, एन. पी. यू. और बी. वी. के संबंध में मछली को सूखने के लिए नियुक्त तापमान में विशेष प्रभाव है। 60° सी के तापमान को आदर्श माना है उसकी अधिकता से सामग्री बुरी हो जाती है।

ऑयल सारडीन - दॉगडा और किलीमीन नेमीजटेरेस जापानिक्स के आँतों में विभिन्न हाइड्रालेसों के उन्नत श्रोत दिखाई पडता है।

सूक्ष्म जीव विज्ञान, किण्वन और जैव तकनॉलजी अनुभाग

उन्नत प्रोटियालिटिक एनजाइमों को उत्पादित ऍरोमॉनास संवर्द्नों को वियुक्त किया।

शुष्कित वाणीज्य के संसाधित मछलियों, सालमोनेल्ला से मुक्त दिखाई पडती है।

उचित सूर्य-शुष्कन द्वारा सालमोनेल्ला सीरम प्ररूपों से मछलियों का दूषण पूरी तरह से दूर किया जा सकता है।

वाणीज्य की ताज़ी मछलियों से प्रति-जीवाण्वीय गुणों को प्रदर्शित लैक्टा बासिलस संवर्द्नों को वियुक्त किया जाता है।

ताजे जल संवर्द्न तालाब और वहाँ की मछलियाँ विब्रियो पैरा हेमोलिटिकस से मुक्त है।

अभियांत्रिकी डिवीज़न

सूक्ष्म जीवाण्वीय मूलयांकन के लिए हिमीकृत मछली ब्लॉकों से एकीकृत नमूनों को तैयार करने के लिए एक उपकरण को विकसित किया और जिसका परीक्षण तृप्तिजनक निकला।

मछली संसाधन कारखानों से नि स्रावों उपचार के लिए एक अभिकल्प को विकसित किया।

15.24 एम के बहुद्देशीय काष्ठ मत्स्यन यान की संरचना की और अवतारित किया।

समुद्री मौसम विज्ञान, जलीय गुणता और यानों के कार्य निष्पादन से संबंधित 10 प्रमुख पैरा मीटरों के मानिटरिंग

के लिए डी आ इ द्वारा प्रवर्तित प्रोजक्ट के भाग के रूप में संस्थान द्वारा विकसित शिप बॉन ऑकडा अर्जन प्रणाली को वाणीज्य अत्पादन के लिए मेसर्स केलट्रॉन को स्थानांतरित किया।

तीव्र जलीय संवर्द्धन के लिए 16 चैनल के ऑकडा अर्जन प्रणाली विकसित किया।

आइ ए आर आई के विशेष आवश्यकता के अनुसार एक जल धारा मीटर को विकसित किया और जल निकास अध्ययन संबंधी परीक्षणों के लिए उनको स्थानांतरित किया।

विस्तार सूचना एवं सांख्यिकी डिवीज़न

निम्न गुण के अलुमिनियम परतें आवरण सामग्रियों के उन्नत दाम और खर्च, अच्छी गुणता के प्रति-संदूषण पेन्टों की अनुलब्धता आदि काष्ठ नाव आवरण के लिए अलुमिनियम अलॉय आवरण को प्रयुक्त करनेवाले मछुवारों द्वारा सामना करने वाले मुख्य प्रतिबंध है।

केरल, कर्नाटका, आन्ध्र प्रदेश और तमिलनाडु आदि राज्यों की अपेक्षा महाराष्ट्रा मे मत्स्यन यानों के यंत्रीकरण तकनॉलजी बढिया रूप में मिलता है।

पारंपरिक मछुवारों के परिवरर्तित आचरण के लिए, सामाजिक आर्थिक स्थिति और परिवर्तन शील प्रौधोगिकी का स्वीकारात्मक संयोग देखा जा सकता है।

वेरावल अनुसंधान केन्द्र

15 एम एम मेश कोड एन्ड जोडे जालों की अपेक्षा 20 एम एम मेश आकार कोड एन्ड के एक नये रूप में अभिकल्पित 30 एम वो सीवन तलमज्जी ट्राल वाणीज्य रूप में प्रमुख मछलियों के किशोरों की संख्या को बहुत कम रूप में अवतारित करता है।

लघुतम लिपिड अंश में हिल्सा टोली में लिपिड हाइट्रोलिसिस के लिपिड का दर अधिकतम है।

अर्ध शुष्कित डोमा के वाणीज्य नमूनों के थोक संग्रहण के लिए गन्नी थैलियाँ और पॉलीथीन बुनावट की थैली श्रेष्ठ संवेष्ठन सामग्रियाँ निकली।

अर्ध शुष्कित मछली के संग्रहण जीविका में कालसियम प्रोपियनेट से उपचार विशेष सुधार नहीं दिखाता है।

काकिनडा अनुसंधान केन्द्र

बी ओ बी पी ट्राल की तुलना में उन्नत खुलाव ट्राल प्रति युनिट श्रम में तल व तल के नीचे की मछलियों के श्रेष्ठ पकड को ज़ारी रखा।

स्थानीय बाज़ारों से संचयित पेनास इन्डिकस जातियों के झींगों से पहली बार सालमोनेल्ला इन्फान्टीस को वियुक्त किया। वही जातियों से एस. न्यूपोर्ट की वियुक्ति भी की और मछली तालाब खाद के रूप में कुक्कुड गोबर से वियुक्त एस-टिप्पिमुरियम को कोल्लेस झील में प्रयुक्त किया।

उन्नत जल स्थिरता और 40% से अधिक प्रोटीन अंश से युक्त झींगा खाद्य को विकसित किया।

संसाधित व शुष्कित सियानिडों और रिबन मछलियों में सोडियम ट्रिपॉली फॉसफेट और नीम दाना के क से संयुक्त उपचार, लाल हैलाफिलिक जीवाणु और कीडाणुबाधा दोनों की बढ़ती को छः महीनों की संग्रहण जीवीका तक रोकती है। अनुपचारित मछली नमूनों की तुलना में समस्त गुणता भी अधिक श्रेष्ठ होता था।

खुरला अनुसंधान केन्द्र

पिछले निरीक्षणों के पुष्टीकरण के रूप में ऐ. कॉलिया वर्षकाल के समय तल के निचले भाग में झुण्ड बनकर चलती दिखाई पडती है।

जी. चापरा, अम्बासिस रूपी और छोटी झींगी आदि मछलियों प्रकाश की ओर आकर्षित है।

ताज़े जल झींग एम मॉलकमसोनी को 150 गेज एल डी पी इ मट्टियों में संवेष्ठित करने और पॉलीयुरथेन फॉर्म अवरोधित बक्सों में संग्रहित करने पर 13 दिनों की संग्रहण जीविका होती है। 150 गेज एल डी पी इ मट्टियों में संवेष्ठित सिरहीन झींगों को - 10° सी में हिमीकृत संचयित करने पर 3 महीनों की शेल्फ जीविका होती है।

शीत प्रघात देकर जीवित सी बार्ट्रेचस और एच फॉसिलस को शीत निद्रा की अवस्था में 4 घण्डों तक रखा जा सकता है।

निम्न दाम के ताज़े जल मछली कीमा से निर्जेलीकृत गीठत उत्पन्न और कामाबोको किस्म के उत्पन्न की तैयारी की तरीकाओं को विकसित किया।

बंबई अनुसंधान केन्द्र

स्थानीय रुप में ' हेक्रु ' पुकारित लाटिडे कुटुम्ब से संबंधित मछलियों के फिलेटों की हिमीकृत शेल्फ जीवीका 33 हफ्ते दिखाई पडा।

मुल्लिडे और सियानिडे जातियों से संबंधित मछली के आवश्यक अमिनो अम्लों के प्रत्यक्ष और पौष्टिक आध्ययन ने लाइसिन, मेथियोनिन और सिस्टिन अंश के विशेष संदर्भ में अमिनो अम्ल का अच्छा पार्श्वक को दिखाया।

विष्ठा जीव इ कॉली, स्टप्टोकोकी और कोआगुलेस पॉसीटीव स्टाफिलाकॉकी को - 18° सी में 30 हफ्ते की अवधी तक हिमीकृत संग्रहण द्वारा सुरक्षित रखा जा सकता है और जहाँ विब्रियो पैरा हैमोलिटिकस और लिस्टीरिया मॉनोसैटोजनों को वही अवस्थाओं में 4 हफ्तो से अधिक सुरक्षित नहीं रखा जा सकता है।

कालिकट अनुसंधान केन्द्र

कण्णूर और मलप्पुरम जिलों में संसाधित मछलियों के फुटकर विपणन और गुणता संबंधी सर्वेक्षण पूरा हुआ।

ताजे रूप में पकडे डीकाप्टेरस जातियों को नमकीकरण करने में हुए दो से अधिक घण्डे के विलंब, नमकीकृत उत्पन्न के गुण और शेलफ् जीविका ह्रास के कारण बना।

मासमिन तैयारी में फिलेटों को क्वथित करने की अपेक्षा, 2-4% लवणजल में ऑते निकाले, सिर युक्त, रक्त निकाले क्वथित एथिन्स अफिनिस, श्रम उत्पन्न और गुणता के संदर्भ में श्रेष्ठ निकला।

मासिमीन से चटनी पाउडरों, शीघ्र परोसने के अचारें और आम व कम नमक में शुष्कित साले मछली की तैयारी के लिए प्रक्रिया को मानकीकृत किया।

उपवेशी तापमान में भुने मसलों और भुने मछली टुकडों के 200 गेज पॉलीथीन संवेष्ठन में हिम संग्रहण की अपेक्षा 12 पोलीस्टर 175 गोज एल डी पी संवेष्ठन श्रेष्ठ निकला।

शुष्क मछली से असपेरीजलस स्पी. प्रबल फफूँदों को वियुक्त किया।

गोवा अनुसंधान केन्द्र

सेपरेटर ट्राल अध्ययन से संचयित आँकडों का सांख्यिक विश्लेषण किया गया।