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ICAR

ANNUAL REPORT

1991 - '92



Central Institute of Fisheries Technology

(Indian Council of Agricultural Research)

MATSYAPURI P.O. COCHIN - 682 029

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केंद्रीय मात्स्यकी प्रौद्योगिकी संस्थान

(भारतीय कृषि अनुसंधान परिषद)

मत्स्यपुरी पी.ओ., कोचिन - ६८२ ०२९

CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

MATSYAPURI P.O., COCHIN - 682 029

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Cover

- * *A fisherman with his catch*
- * *A fleet of mechanised fishing vessels*
- * *Training in production of fish cutlet*

DIRECTOR'S REPORT

The year 1991-92 witnessed one important change in the administrative control of the Institute. Shri. M.R. Nair who was at the helm of the Institute's activities as its Director since 12 Sept. 1984 retired on 30 June 1991 and I assumed charge as the officiating Director of the Institute.

Shri. V.K. Sridhar, Sr. Admn. Officer relinquished his post at the Institute on 29 Feb. 1992 to take up assignment as Chief Administrative Officer at IVRI, Izatnagar.

As in the previous years, the Institute's activities continued to progress steadily. Some of the salient research achievements as well as extension and education activities during the past one year are briefly outlined below.

Studies on conservation of fish catch have shown that trawls, fitted with cod ends of mesh size 15mm and below, landed a larger number of juveniles of quality fishes compared to trawls with 30mm mesh cod end. Nets fitted with square mesh cod ends however showed escapement of juveniles compared to the conventional diamond mesh cod ends.

Significantly good catches were obtained at an optimum towing speed of 2.5 knots from small and medium vessels operated along the coast of Goa.

High gel strength agar was prepared from the sea-weed Gelidiella sp.

A method was evolved for preparation of paste fishery product from lean fish meat.

The technology of incorporation of chitosan in fish feed to enhance its water stability was transferred to one of the leading aquaculturists in Andhra Pradesh.

Of various haemostatic agents tried for dental surgery, chitosan was found to be the most favoured agent of choice, taking into account its wound healing capacity, bio-compatibility and comfort of the patients.

*Fungi predominantly associated with dried fish were identified as *Aspergillus niger*, *A. flavus*, *Rhizopus* and *Mucor*.*

Refined and preservative treated commercial cured fish subject to thermal treatment followed by packing in polythene bags/gunny bags sprayed externally with pyrethrum, gingelly oil or hydnocarpus oil warded off insect infestation for considerably long periods.

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Technology of production of beche-de-mer was subjected to detailed investigation and methods worked out to improve its preparation and properties.

Of different packaging materials tried for dried fish, metallised polyester was seen to ward off insect infestation for longer periods of time.

Cooked, shredded, smoked and dried flakes similar in quality to masmin were prepared from Euthynnus affinis.

For carrying iced fish, a polyethylene foam insulated plastic bag was developed.

A laboratory model of a device for cleaning fish gut for preparation of surgical sutures was designed and developed.

The fish pathogen responsible for the fish disease - Epizootic Ulcerative Syndrome - was identified as Aeromonas hydrophila.

Kanamycin Aesculin Azide Agar was found to give better recovery of faecal Streptococci from frozen fishery products compared to KF Streptococcal Agar.

An oil fryer with temperature control for frying fish cutlets was designed and developed.

A 50 kg. capacity automatic electrical fish drier suitable for cottage scale operation was designed.

The Institute actively collaborated with other organisations to put to effective use the various technical know-hows developed for the benefit of the entrepreneurs.

A Summer Institute on Modern Techniques of Testing Fish and Fishery Products for Food and Feed was organised. Thirty officials comprising University teachers and Technical personnel participated in the Summer Institute.



*K. Gopakumar
Director*

efficacy of various commercial wood preservatives.

A mechanistic approach to fouling control technology was attempted through a study of chemosensors impregnated in porous ceramic plates exposed to natural sea water.

Based on the resinous product developed earlier as a base, a caulking compound was developed using poon seed oil, rubber and sawdust as a substitute for the traditional caulking compound used in fishing boats.

At the request of the Wynad District Collector, a detailed study was undertaken on the "Possibilities of fish harvesting and promotion of tourism in Wynad District". Two fibreglass boats of 3.5m length were specified for fishing and tourism in two lakes in the area viz. Thariode and Pookot. Boats as per the specifications recommended by CIFT have already been purchased and are now in operation in the lakes.

Demersal trawls

Three different trawl designs developed by the Institute, viz. 48m rectangular demersal trawl, 38m HSDT II and 32m bobbin trawl were put to extensive field trials from FORV 'Sagar Sampada'. A total of 30 fishing operations were conducted in the EEZ off West coast at depths ranging upto 450m. About 45t. of fish and shell fish were landed during the

operations, realising an average catch rate of 1850 kg/h, the maximum ranging upto 12000 kg/hr. Within 100-200m depth zone, *Nemipterus* sp. contributed to the bulk of the landing followed by *Priacanthus* sp. and *Saurida* sp. Economically important deep sea lobsters (*Puerulus sewelli*) and deep sea prawns formed 3.6% and 6.6% of the landings respectively from beyond 200m depth.

In yet another series of operations from 'Sagar Sampada' five different deep sea trawls were experimented with in the EEZ off west coast of India and the Wadge Bank at depths ranging upto 460m. The gears operated were 48m hybrid demersal trawl (HSDT II), 48m rectangular demersal trawl, 38m HSDT II and 50 m bobbin trawl. As in the earlier set of operations, *Nemipterus* sp., contributed to the bulk of the landings in the 100-200m depth zone followed by *Decapterus* sp., *Priacanthus* sp. and *Saurida* sp. In deeper waters beyond 200m. *Centrolophus* sp., *Chlorophthalmus* sp. *Trichturus aurtiga*, large elasmobranchs, deep sea prawns and lobsters dominated the catch. At depths below 100m, *Decapterus* sp. high value perches, cephalopods, catfish, mackerel and *Nemipterus* sp. were seen to be the dominant species.

Latitude-wise, along the West coast, maximum overall mean catch

rate of 4935 kg/h was obtained off Karwar, followed by off Mormugoa, off Quilon, off Ratnagiri-Malvan and off Ponnani. Lowest catch rate (50kg/h) was obtained in the grounds off Mahe-Tellicherry. Along the Wadge bank, a mean catch rate of 332 kg/h was obtained, the catches comprising *Decapterus* sp., *Saurida*, *Septia* and high value perches.

Observations were made on the selective properties of square mesh and diamond mesh using specially fabricated trouser cod ends. Both square mesh and diamond mesh of 40mm size were used on either leg respectively and attached to 48m hybrid and rectangular trawls. Relatively higher escapement was observed with square mesh compared to diamond mesh.

Flexible floats

Studies carried out on flexible floats have revealed their suitability as a headline lifting device. PVC coated nylon was found to be a more suitable material from the point of view of durability and rot resistance than the conventional cotton canvas for fabrication of the float. Nets rigged with these floats recorded an increase in the total catch. Besides, they also facilitate easy stacking.

Semi pelagic trawls

Fishing operations were carried out with 36.4m RMT 8p and 33.7

RMT 6E semi-pelagic trawls off Diu-head in depths ranging from 40-60m. The maximum catch recorded for both the nets was 335 kgs. and 257 kgs. respectively. *Pellona* sp. *Artus* sp., sharks, *Sciaenids*, *Trichiurus* sp. and pomfrets constituted the major portion of the catch.

In another series of experiments, CIFT designed semi-pelagic trawls 50m HOT and 33.7m RMT 6 EL were operated along the North-West coast of India believed to be a rich source of semi-pelagic fishes. The major species caught were *Decapterus* sp., *Upeneus* sp., ribbon fish, *Caranx* sp., cat fish and perches.

Low Energy Fishing

Gill Net

Field tests were conducted at Cochin with PA multifilament trammel nets of mesh sizes 34.0 mm, 38.0 mm, 40.0 mm and 50.0mm. The net with 34.0 mm mesh size was seen to be more efficient for capture of prawns than the other nets.

Trammel nets (of 50mm mesh size) operated along Poovar in Trivandrum Dist. were seen to be more productive than when operated in Cochin area.

Field trials were also carried out with PA monofilament simple gill nets of mesh sizes 50.0mm 52.0mm, 75.0mm, 90.0mm and 113.0mm and

PA multifilament trammel nets with identical inner mesh size.

Long lines

Field tests were carried out of different types of hooks, viz. round bent (Indian and imported) and indigenously made kirby bent and CZ to assess their relative efficiency.

Experiments for selectivity of hooks and snoods for small sharks have indicated the efficiency of cotton snoods followed by PP braided and PA monofilament twines.

Fabrication of CZ hooks of sizes 2, 5 and 9 as per CIFT design was completed and physical tests carried out.

Physical, chemical and corrosion tests of commercial samples of Limerick hooks were conducted. Hooks of sizes 9 and 12 were field tested in Cochin backwaters as well as at Lakshadweep.

Hand lines

Troll line fishing operations with artificial jigs from catamarans were initiated in Cochin and Kanyakumari areas.

Fish traps

Fishing experiments were carried out in Kanyakumari Dist. with fish traps fabricated with M.S. rod frame and welded mesh material.

Artificial reefs

Work on artificial reefs was initiated during the year. The reefs erected at Vizhinjom and Valiathurai (Trivandrum) were visited and preliminary details collected.

Microfouling

Studies were initiated on primary film formation. Test coupons of different materials such as GI, perspex and fibreglass were exposed to running sea-water in aquaria onboard fishing vessels and samples drawn at pre-determined intervals. Changes in electrical potential were monitored and the interactive influence of primary film formation on corrosion was studied by long-term exposure of GI and Al test panels.

Research Contemplated

1. Design and development of vessels exceeding 20 m OAL
2. Improvement in design of vessels 15-20 m OAL
3. Design development and construction of a fuel efficient 12.0 m OAL multipurpose FRP fishing vessel
4. Techno-economic analysis of larger fishing vessels
5. Further studies on microfouling

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6. *Studies on corrosion in fishing boats and its control*
7. *Studies on bio-deterioration of boat building timbers and its prevention*
8. *Fabrication of a 33 m semi-balloon shrimp trawl*
9. *Design and development of high opening trawls for operation from FORV Sagar Sampada for exploitation of demersal and off bottom fishery resources of the EEZ*
10. *Further studies on square mesh and diamond mesh cod ends*
11. *Fabrication of gear models for testing in IIT and Cochin backwaters*
12. *Continuation of works already in progress on artificial reefs and low energy fishing*
13. *Further studies on flexible floats*

Fish Processing Division

Scientists associated

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Chief findings

Cultured *Macrobrachium rosenbergii* and *Penaeus monodon* remained in acceptable condition in iced storage for 9 and 12 days respectively.

Otolithes argenteus when frozen as whole, gutted and fillets had a frozen shelf life of more than 9 months at -20°C whereas frozen minced meat from the same fish became unacceptable after 7 months storage.

Perch chunks treated with clove, frozen and stored at -20°C were found to be in acceptable condition even after 12 months' storage, whereas the untreated control samples became unacceptable after 8 months at -20°C .

Formed scampi prepared from meat of belly prawn was found suitable for preparation of battered and breaded products.

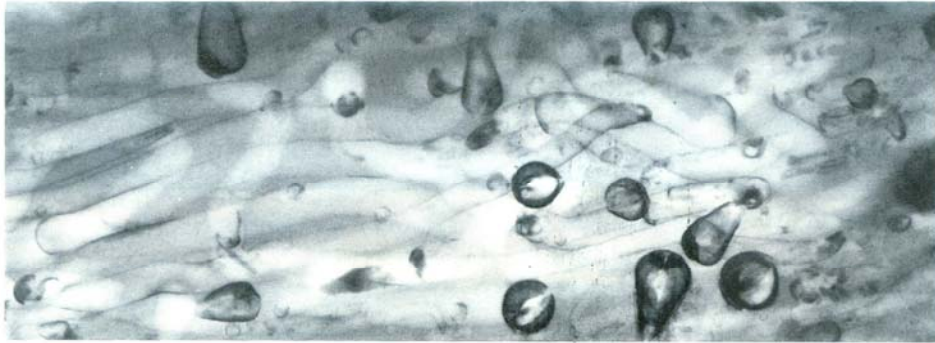
Anchoutella yielded an acceptable product when heat processed in retort pouches either alone or in curry medium.

Ready-to-consume type fish and prawn curry formulations were found to yield acceptable products in R.T. pouches as well as in aluminium cans.

High gel strength agar was prepared from the sea weed *Gelidiella* sp. by alkali treatment in place of the conventional acid pre-treatment.



The 3.5 FRP row boat specified by CIFT for fishing in Thariode and Pookot lakes of Wynad District



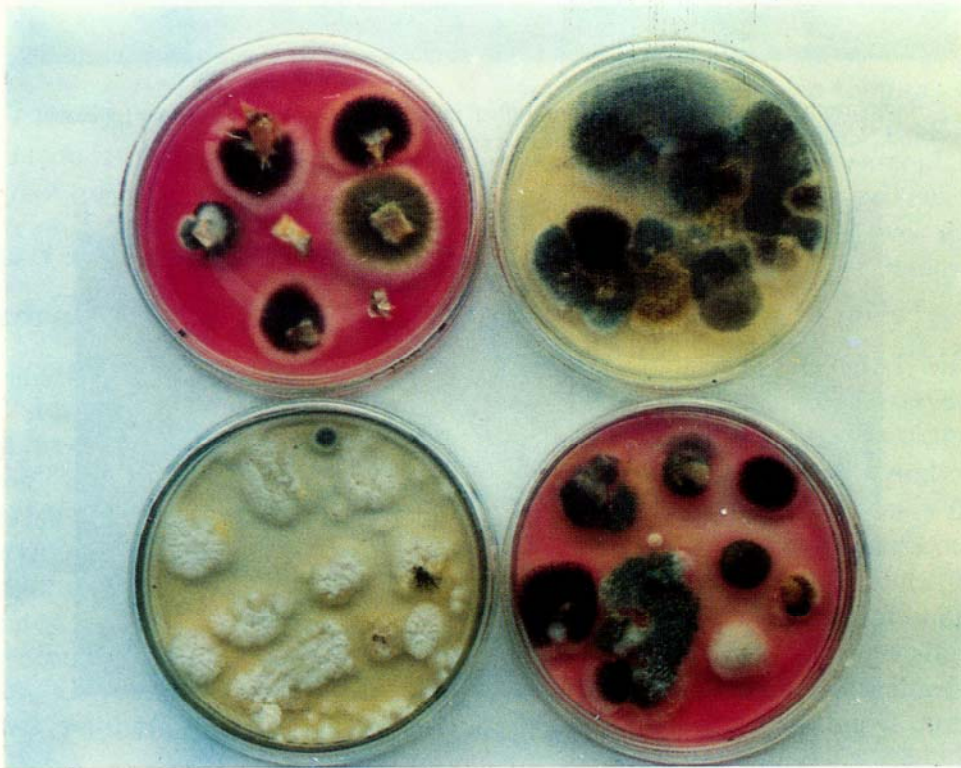
Radiograph of a wooden (*Mangifera indica*) panel bored by *Martesia striata* (pidcock) and *Nausitora hedleyi* Seepman (Shipworm)



Catch obtained by the 50M High opening (semi-pelagic) trawl designed by CIFT



High gel strength agar from seaweed, *Gelidiella* sp.



Predominant fungi in dried fish

storage. Samples treated with cardamom and ginger remained in acceptable condition upto 10 months at -20° C.

Different methods were tried for the preparation of scampi from the meat of small (thelley) prawns. Incorporation of small amounts (0.1%) of sodium tripolyphosphate along with 2% salt gave good results. The prawn meat was coarsely ground with other ingredients, chilled and formed in the shape of peeled scampi. This was then frozen, battered and breaded. The final product retained its good shape after frying in oil. Organoleptic characteristics of the product are also good.

Canning

Studies on screening different species of fish for their suitability for heat processing in retort pouches were continued. Anchoviella yielded a very good product when processed in curry sauce. When packed alone also it yielded an acceptable product. When seer fillets were processed in natural style, the resultant product was in the form of a lump.

Fish balls were prepared out of texturised meat incorporating corn starch, salt and monosodium glutamate. The balls so prepared were heat processed in SR lacquered cans as well as retort pouches using specially formulated curry medium. The product in SRL cans developed

slight bitter taste, and caused staining of the inside of the can body in 3 months. However, in RT pouches, the product remained good even after 6 months storage.

Use of aluminium cans in place of SRL tin plate cans for fish was also studied. Indigenously manufactured aluminium cans with plain and 'pull-tab' lid were used for the purpose. Fish in curry, fish in oil and fish in brine were processed in these containers. Neither the container nor the contents were in any way affected during the period of observation.

A survey was initiated on the canning facility, types of canned product etc. available in the country. Survey in Cochin and Goa area revealed that whatever facility remains is completely outdated with not much scope for modernisation. However, there is an increasing demand for canned products in urban markets like Bombay.

Fishery by-products

Chitosan samples were prepared from the head and shell waste of three species of prawns, *P. stylifera*, *P. monoceros* and *M. dobsoni* using three different concentrations of aq. caustic soda viz. 30,40 and 50% and molecular weights determined by viscosity measurement. The molecular weight of the prepared samples showed decrease with increase in alkali concentration.

High gel strength agar was prepared from the sea weed, *Gelidiella* sp. by alkali pretreatment instead of the conventional acid pretreatment. Alginic acid was extracted from Sargassum and converted to Sodium alginate. Carboxy methyl chitin was prepared from chitin and the yield was 85%.

The haemostatic and wound healing property of chitosan was compared with adrenaline, tannic acid and isotonic saline in gingivectomy wounds in the Dept of Periodontics, Dental College, Trivandrum. Adrenaline is reported to be the most potent haemostatic agent followed by chitosan. Taking into account the accelerated wound healing property, biocompatibility and comfort of the patients, chitosan is the haemostatic agent of choice for dental surgical procedures. Samples of chitosan powder, chitosan impregnated gauzes and films were prepared and supplied to Shri. Chitra Thirunal Institute of Medical Sciences, Trivandrum, College of Pharmaceutical Sciences, Trivandrum, Medical College, Trichur, IIT, Bombay and New Delhi, M/s Dynamic Orthopaedic, Alwaye and also to several Medical Practitioners for conducting research work on its applications in medicine.

Chitin in different levels was incorporated in pig diet and feeding experiments started in collaboration with College of Veterinary and Animal Sciences, Mannuthy. Results

showed a significant increase in weight gain in animals fed for a period of 3 months on chitin containing diet. Feeding experiments with chitin and chitosan for 90 days on rats fed on high fat diet lowered serum cholesterol and the lowering was more with chitosan than with chitin.

A survey was conducted on the availability of tuna processing waste in Lakshadweep and its composition studied.

Chitosan was used for increasing the water stability of fish feeds as part of a short term project at Natural Resources Institute, UK, during the training of one of the Scientists. A method was developed for pelletization or granulation of fish feeds using chitosan solution during the mixing and homogenisation of the ingredients. The mixed feed could be extruded without cooking as no gelatinisation of starch was needed for binding. The feed has good water stability, survival rate and growth rate. It can be made into any shape or size without the use of sophisticated equipment. The process can be made use of for the production of home made feeds by aquaculturists. The technology was transferred to M/s Alsa Marine and Harvests Ltd., Madras, one of the leading aquaculturists in Nellore, Andhra Pradesh. The technology of production of chitin was transferred to M/s India Sea Foods, Cochin who has adopted

the same and started commercial production and export.

Utilization of deep sea resources

Sixteen samples of fish/prawn were collected from the vessels of Fishery Survey of India and FORV 'Sagar Sampada' and analysed for yield of meat, fish mince as well as proximate composition of whole fish, edible meat and waste.

Two fresh fish samples, Kilimeen and *Priacanthus* sp. were analysed for their bacterial profile immediately after catch on board FORV 'Sagar Sampada'. Microflora of Kilimeen comprised of *Actinobacter* (35%), *Bacillus* (15%) *Corynebacterium* (15%) *Aeromonas* (15%), *Moraxella* (5%) and Yeast (15%). The flora of *Priacanthus* consisted of *Pseudomonas* (20%), *Aeromonas* (40%), *Vibrio* (10%), *Bacillus* (10%), and *Moraxella* (10%). Changes in the bacterial quality during freezing and frozen storage were also studied.

Studies were completed on the assessment of quality of edible fish powder prepared from perch, shark and *Decapterus russelli*. Edible meat portions were also separated from a few other species of fish like cat fish, *barracuda*, *Heterocarpus gibbosus* and *H. woodmasoni* and the proximate composition, bacteriological quality and amino acid profile of the meat

powders determined. The products were seen to possess good nutritional quality.

Storage studies on texturised meat prepared from *Nemipterus parascolopsts aspinosa* were also completed.

Fish fingers prepared from *Jobnitus dussumieri* was rated good organoleptically and retained its quality after storage for two months at -20° C. Fish wafers prepared from *J. dussumieri*, barracuda and *Heterocarpus woodmasoni* had good appearance and swelling property. Packed in sealed polythene covers, the wafers retained their quality for 3 months when stored at room temperature. Soup powder prepared from these species also rated good.

Quality of fish sauce prepared from sardine with and without the addition of *Lactobacillus plantarum* was assessed periodically. *Bacillus subtilis*, *B. megaterium*, *B. firmus*, *B. litchentformis* and *B. coagulans* were the main bacteria and *Penicillium citrinum*, *Aspergillus niger* and *A. wentri* constituted the main fungi present in the sauce.

Fish mince

Studies on the preparation, yield and chemical composition of minces from 21 different underutilised species of fishes were completed.

Similarly, *Argyrozona argyrozona* (sea bream) processed live on board FORV 'Sagar Sampada' could be organoleptically accepted upto 40 days in ice if packed in 80% CO₂ and 20% air while the control samples had a storage life of only 22 days in ice. *Clostridium botulinum* type D was present in the samples stored under modified atmosphere (MA), indicating that the oxygen tension in the MAP was not sufficient to inhibit the growth of anaerobes.

Survey of the different packaging materials used in IQF packaging has shown that most of the industries use 200-300 gauge LDPE, HM-HDPE, LLDPE and poly-coated duplex cartons as unit packaging. The bulk pack constitutes 5 ply CFB or 7 ply CFB.

Fish fingers prepared from barracuda and jew fish continued to remain in satisfactory condition even after 240 days of storage when packed in HD/LD and LD/Nylon, whereas the samples packed in LDPE, LLDPE and HM-HDPE were rejected after 160 days of storage at - 18° C due to rancidity and toughness. Control samples without any packaging also got rejected after 25 days due to the same reasons. Fish fingers prepared from picked meat of *Priacanthus hamrur*, a deep sea fish, were battered, breaded and flash fried and after cooling packed in PVC trays sealed with treated aluminium foil.

The packed materials were then stored at ambient temperature (24-33° C), +4.8° C, -6.8° C and -20° C. The samples stored at ambient temp. remained in good condition for 8 hours, whereas those stored at +4.8° C remained in good condition even after 10 days storage.

A survey was also undertaken of the containers used in Cochin and Quilon areas for fresh fish transportation in ice by cycle and head-load. It is observed that aluminium rectangular boxes of capacity 45-50 kg. are being used on two wheelers like luna, bamboo baskets reinforced with coir and plastic ropes as cycle load and plastic trays by tempo vans and fish lorries.

Spotted *Etroplus* fried in vegetable oil with salt alone (control) and also with salt and spices like chillie powder and turmeric powder were packed in PEST laminated PE bags and their storage characteristics at ambient temp. studied. While the control samples became unacceptable after 10 days, the spiced samples were seen to be acceptable even after 16 days storage. In order to study the suitability of different packaging materials, the fried fish were packed in multilayer film containing LD/BA/Nylon/BA Primacor as control and also in modified atmosphere (50% Co₂ and 50% air), stored at ambient temp. and their storage characteristics studied. Although ini-

16. *Yield and quality of deep sea fishes and their conversion to useful products*
17. *Nutritional evaluation of products developed from deep sea fishes*
18. *Preparation of minces from underutilised species, improvement in functional properties and product development*
19. *Quality assessment of seafoods using K value*
20. *Viability of *L. monocytogenes* in fish meal and during freezing and frozen storage*
21. *Fungi in dried fish*
22. *Inter-relationship between trace metals in seafoods*
23. *Studies on effluent discharge from seafood processing units*
24. *Indole formation in shrimps*
25. *Quality of IQF shrimp of export trade and packaging of IQF products*
26. *Fresh fish transportation*
27. *Modified atmosphere packaging*
28. *Packagings for various types of fishery products*

Biochemistry, Nutrition & Microbiology Division

Scientists associated

P.D. Antony, K. Devadasan, P.K. Surendran, Jose Stephen, M.K. Kandoran, Nirmala Thampuran, A.G. Radhakrishnan, Sanjeev Sreenivasan, V.N. Nambiar, K.V. Lalitha, K. Ammu, M.R. Raghunath, T.V. Sankar.

Chief findings

Succinylation of fish myofibrillar proteins was found to improve their functional properties like solubility, viscosity, emulsifying capacity etc. It was found to yield better modified proteins than acetylation.

Higher molecular weight protein fractions got more affected during drying of fish. Isoelectric points of proteins were not affected by drying but solubility at the isoelectric point showed a slight increase after drying. -SH groups showed a small initial increase followed by drastic reduction during drying. The onset of the decreasing trend in -SH was faster in the case of proteins of fish dried at a higher temperature.

Feeding trials and in vitro digestibility studies showed that fish dried at 60° C are nutritionally superior to that dried at 70° C.

A device for cleaning of fish guts, for making absorbable surgical sutures, was made and successfully tried.

The digestive system of *Robu* is seen to have high amylase activity compared to many other fishes and shell fishes.

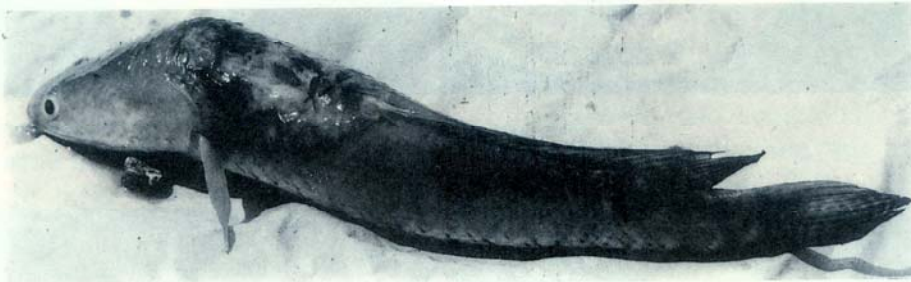
The acid protease activity of ensiled fish viscera, though low initially, showed gradual increase and stability, though the reverse was the case with neutral and alkaline proteases. Mackerel showed comparatively high proteolytic activity, at pH range 2 to 3 and 8 to 9.

Duration of salting time was seen to have an immediate positive effect on peroxide value but the release of FFA was only very gradual.

Listeria seeligeri, *L. grayii*, *L. innocua* and *L. ivanovii* were isolated from fresh fish/shell fish of internal trade.



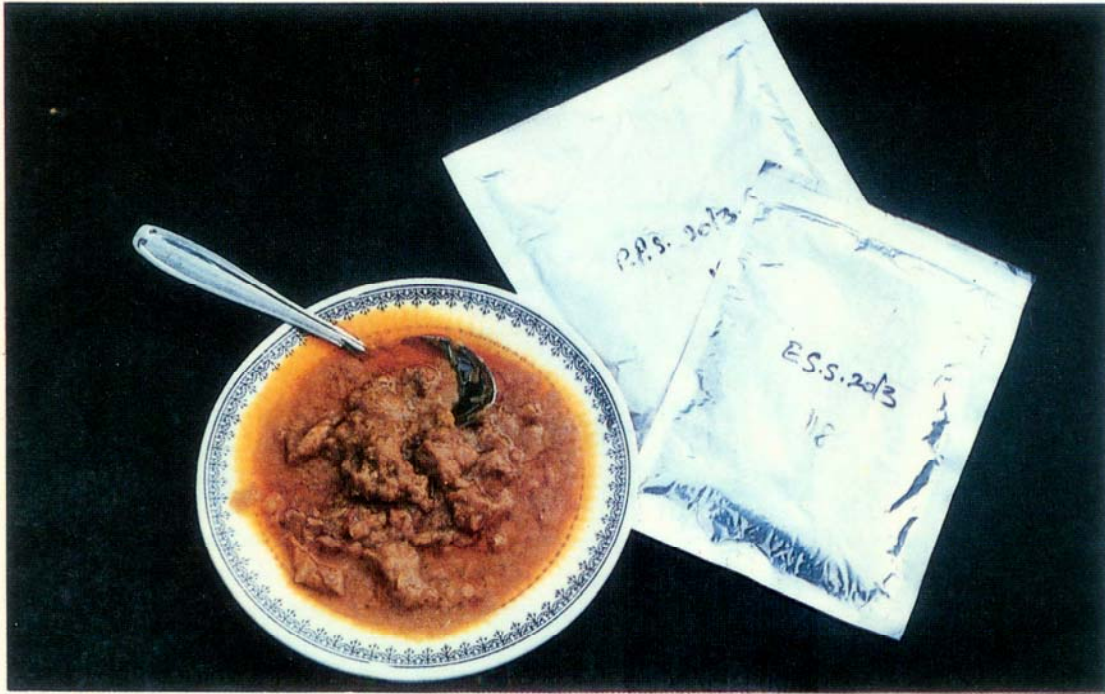
Investigation on EUS - the fish disease now prevalent in Kerala - in the Microbiology Lab



The EUS infected fresh water murrel (*Channa* sp.)



Model of the Ship Borne Data Acquisition System



Fish curry in R.T. pouch



At the inauguration of 'Fish-Tech' Co-operative Society Ltd. - a SC/ST Women's organisation set up with technical assistance of CIFT at Malipuram for production of value added fish products

samples examined. But it has been noted that in samples with very high total plate count and faecal indicator bacterial count, the *Aeromonas* count was also very high.

Salmonella

One hundred and seventy dry/cured fishes comprising of 18 different species were analysed for the incidence of *Salmonella* serotypes, vis-a-vis their water activity and salt content. In all cases where water activity (a_w) was less than 0.90, *Salmonella* was absent. The salt content varied between 2.7 and 31.79 and so the incidence of *Salmonella* apparently was not related to the salt level of the samples examined.

Studies on the effect of sun drying on the survival of *Salmonella* in fish indicated that, within 4 hours of proper sun drying, *Salmonella* serotypes artificially inoculated in fish could be completely destroyed.

Vibrio parahaemolyticus

When marine prawns having natural incidence of *Vibrio parahaemolyticus* were kept at ambient temperature ($28 \pm 3^\circ \text{C}$), there was 1 to 2 log. increase in its count. But when stored in ice, within the first 3 hrs, there was 1 to 3 log. reduction in the *V. parahaemolyticus* count. Within 24 hrs. of iced storage, *V. parahaemolyticus* was almost completely destroyed.

Two aquaculture systems-one fresh water culture pond and one brackish water culture pond-were investigated for the occurrence and distribution of *V. parahaemolyticus* and *V. cholerae*, vis-a-vis their total bacterial profile, pH and salinity. The water, mud and prawns from the fresh water culture pond were free from both *V. parahaemolyticus* and *V. cholerae*, but in brackish water pond, significant populations of *V. parahaemolyticus* were present in all the three, viz. mud, water and prawn. But *V. cholerae* were absent.

Clostridium botulinum

Survey on distribution of *Clostridium botulinum* in fish/fishery products was continued. Out of the 35 fresh fish samples of internal trade analysed for the incidence of the organism, 3 samples harboured *C. botulinum* type A, 2 samples *C. botulinum* type B, one sample *C. botulinum* type C and 5 samples *C. botulinum* type D. Type E was absent.

Survey of the brackish water culture pond at Chellanam (near Cochin) indicated the presence of *C. botulinum* type D, but all the sixty cultures isolated were non-toxicogenic.

Only 6 out of 95 dry/cured fish samples examined were found to have *Clostridium botulinum* (types C and D).

- fractions of heat treated fish muscle*
- 7. Influence of the mode of heat treatment and dehydration on the nutritional quality of fish muscle proteins*
 - 8. Influence of heat treatment on the availability of lysine in fish muscle*
 - 9. Studies on chemically modified structural proteins of fish*
 - 10. Preparation of acetylated and succinylated fish proteins-standardisation of conditions*
 - 11. Assessment of the extent of chemical modification and biochemical properties of modified fish proteins, their functional properties etc*
 - 12. Toxicological characteristics of chemically modified protein incorporated feed formulations-Animal feeding studies*
 - 13. Modified fish collagens and their possible applications*
 - 14. Preparation of collagen fibres from fish guts: development of suitable gut cleaning and pickling devices for commercial scale operations, evaluation of physical properties of the sutures etc.*
 - 15. Investigations on Listeria and Aeromonas in fish/shellfish*
 - 16. Incidence of histamine producing bacteria in fish/fishery products*
 - 17. Development of media for enumeration of bacteria of heat/salt processed fishery products*
 - 18. Effect of handling/processing on Salmonella/Vibrio parahaemolyticus/Staphylococcus aureus in fish/fishery products*
 - 19. Survey of aquaculture systems for pathogens like Salmonella/Vibrio cholerae*
 - 20. Incidence of Clostridium botulinum in fish/fishery products and their toxigenesis*

Engineering & Instrumentation Division

Scientists associated

S. Ayyappan Pillai, T.K. Swadas, P.K. Chakraborty, K. Sreedharan Namboodri, P.N. Joshi, K. Ramakrishnan, K. Vijayabharathi, N. Subramonta Pillai.

Chief findings

Design was developed of a device for drawing uniform samples from frozen fish blocks for microbiological evaluation.

An oil fryer for frying fish cutlets was developed.

A 50kg. capacity automatic electrical fish drier suitable for cottage scale operation for drying fish and fishery products was designed.

Development work on the first model of the ship borne data acquisition system was completed.

Research Projects Handled

ENGG-9/90 (5) - Development of equipment and machinery for harvest and post harvest technology of fish

IN-3/91 (5) - Development of electronic instruments for marine fisheries and aquaculture

Report of Work Done

An oil fryer with temperature control and provided with S.S. wire mesh handling trays for frying cutlets without causing damage to the product has been developed. The design is based on the principle of heating the oil medium using an oil immersion heater with thermostat control to

maintain uniform heat during the frying process.

With a view to improving air circulation and controlling the temperature of the drying chamber, modification was effected in the existing design of the solar dryer by incorporating a water proof exhaust fan with thermostatic control.

A survey was initiated to collect details on the size of boats now in operation, HP of the engine, type of gear box used, fuel consumption rate and fishing methods employed.

Comparative studies on fishing with different types of nets were carried out with a view to gathering

Extension, Information & Statistics Division

Scientists associated

K. Krishna Rao, M.K. Kandoran, H. Krishna Iyer, A. K. Kesavan Naik, S. Balasubramaniam, Mary Thomas, G.R. Umithan, V. Annamalai, Braj Mohan.

Chief findings

High cost of innovation, meagre funds allotted as loan and high level of surfing have been observed to be the major constraints in adoption of the technology of motorisation of indigenous craft in Andhra Pradesh.

'Opinion leaders' are seen to be the most credible source of information among fishermen operating mechanised craft and 'fellow fishermen' among those operating non-mechanised craft.

Of different types of segmentation possible, geographic segmentation of markets for dry fish was found to be most apt.

The distribution channel observed for dry fish is:

Producer → Agent → Wholesaler → Retailer → Consumer

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 products developed by CIFT

Report of Work Done

Tabulation and analysis of data collected on adoption of improved practices in sheathing wooden hulls of fishing boats were continued.

Seven fishing villages in Madras and Chinglepet Districts in Tamil Nadu were surveyed to study the role and status of fisherwomen. Data collected from Kanyakumari Dist. were tabulated.

Investigations on the decision making behaviour of fishermen have shown that decision making had no significant association with the extent of adoption of the different fishery technologies taken for study. However, inter-personnel sources were seen to have some influence in various stages of decision making.

Data on communication behaviour of fishermen have revealed that the motorised and non-motorised fishermen did not differ significantly with reference to the utilisation of communication sources. The information needs of the fishermen were assessed and the variables associated with the information needs determined.

The impact of motorisation of indigenous fishing craft in selected fishing villages in Andhra Pradesh was studied. The state was seen to lag far behind Kerala, Karnataka and Tamil Nadu in the adoption of this technology, the major constraint being high cost of innovation, meagre funds allotted as loan and high level of surfing.

Studies on communication behaviour of traditional fishermen have revealed that 'opinion leaders' are considered as the most credible source of information by fishermen operating mechanised craft and 'fellow fishermen' by those operating country craft.

Data on production, supply, demand and distribution channels of dry fish were collected from markets situated in Calicut, Alwaye, Cochin, Kottayam, Changanacherry, Alleppey, Quilon, Munnar and Devikulam. Oil sardine, mackerel, sharks, anchovies, ribbon fish soles, small carangids, silver belies, Sciaenids, dhoma, jew-

fish and small shrimp were some of the species used for drying. The production in 17 centres between Ponnani and Kasargod varied between 600-1500 tonnes annually. In markets at Alwaye and Kottayam, nearly 100-120 tonnes of dry fish reach on each market day depending on the season and are transported from far off places like Veraval, Porbander, Orissa, Bombay, Mangalore, Malpe, Tuticorin etc. The price varied from Rs. 4/- to Rs. 36/- per Kg. depending on the size and variety of the product. Although various types of segmentation are possible, geographic segmentation of markets for dry fish was found to be most apt as majority of the consumers are rural people. The distribution channel observed was Produce → Agent → Wholesaler → Retailer → Consumer.

Research Contemplated

1. Study on improved practices adopted for sheathing wooden hulls of fishing boats
2. Impact of motorisation of indigenous fishing craft
3. Role and status of women in fisheries field
4. Differential behaviour and communication behaviour of traditional fishermen

VERAVAL RESEARCH CENTRE

Scientists associated

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

Chief findings

20m. small mesh sputnik trawls fitted with cod ends with 15 mm mesh size landed more of juveniles of quality fishes than nets fitted with cod ends with 30 mm mesh size.

Studies on lipid oxidation in Hilsa toli have shown that there is no correlation between the size of the fish and the lipid content. Neither was any definite trend in seasonal variation of the lipid observed.

Treatment to offset reddening in cured fish products had no effect on the keeping quality of the products at 90 and 100% R.H. as well as at and below 70% R.H. However, at 80% R.H., treatment with refined salt gave better results than that with ordinary salt.

Research Projects Handled

1. G-16/85 (5) - Studies on demersal trawls
2. P(VR) 28/86 (5) - Studies on technological problems of commercial curing of important varieties of fishes of Saurashtra coast
3. BCNM/MB(2)/89(5) - Investigations on toxigenic and pathogenic bacteria associated with marine and cultured fish

Report of Work Done

Fishing gear

Studies on the escapement of juveniles from 20m small mesh sputnik trawls have shown that nets fitted with cod ends with 15mm mesh landed more of juveniles of quality fishes like pomfret, *Polynemus*, *Sciaenids*, *Trichurus* and prawns when compared to nets fitted with 30mm mesh cod end.

Fish processing

Heavily salted shark fillets were prepared using refined salt and ordi-

nary salt, semi dried for one day and their storage studies at different R.H. levels carried out. While the samples stored at 90% R.H. and 100% R.H. got spoiled within 15 days, very little difference was observed between the treated and untreated samples stored at 70% R.H. and below. However, at 80% R.H. refined salt was seen to have marked effect in warding off reddening compared to ordinary salt.

In the case of dhoma, ordinary salt gave better results, either if used after heat treatment or if the fish is first salted and then given heat treatment.

Several commercial samples of dried prawns and *Acetes* were analysed for their physical, chemical and microbiological qualities and their storage characteristics studied. Dried *Acetes* had better shelf life than the dried prawns.

Several batches of trawler by-catches were analysed for the quantitative composition of the species. The main components were *Acetes*, small crabs, *Collea*, dhoma, cuttlefish, puffer fish, ribbon fish as well as a large number of juveniles of quality fishes.

Samples of dhoma, horse mackerel, Bombay duck, seer, shark, squid, ribbon fish etc. were subjected to estimation of heavy metals. While mercury content was higher in dried Bombay duck (0.788 ppm) in other

fishes like horse mackerel, seer and shark it ranged from 0.135 to 0.176. In whole squid, both cadmium and copper content were on the higher side compared to their fillets.

A survey carried out on the production, packaging, transportation and marketing of different types of dried products processed at Veraval have shown that while semi-dried fish products from shark, ribbon fish, dhoma, *Lactarius* and ray are marketed exclusively to Kerala, dry fish is sent mainly to Assam, West Bengal and Tamil Nadu.

Lipid oxidation studies were initiated on *Hilsa toli*. Development of peroxides and free fatty acids were determined periodically. No correlation between the size of the fish and the lipid content was observed. The peroxide formation was slow initially and then sharply increased, remaining as such for about 2 weeks before gradually reducing.

A number of samples of fresh and iced fish from the local market, a few frozen products as well as water and ice samples from the processing plants were analysed for microbiological quality. While most of the frozen pomfret and prawn were free from *Listeria* and *Salmonella*, one sample was suspected for *V. cholerae* (NAG type). Some of the fresh and iced samples showed high count of *E. coli*, faecal *Streptococci* and coagulase positive *Staphylococci*.

23% of the catch in the case of the high opening trawl and ribbon fish and silver bellies 46%, whereas with BOBP trawl, the catches were 15% and 42%, respectively.

Comparative fishing operations were also continued with the rope trawl and the bulged belly trawl in the depth range 10-28m. The rope trawl consistently showed better performance with catch rate per hour being 21 kg. compared to the 15 kg. with the bulged belly trawl. The catches in the rope trawl were dominated by silver bellies and ribbon fish forming about 71% of the total catch whereas in the bulged belly trawl, silver bellies and ribbon fish constituted only 35%.

Fish processing

Dried and salted *Decapterus* always contained less histamine in the muscle than the dried unsalted one. In dried ungutted fish the histamine content was always higher than that in the dried gutted sample. The salted and dried *Decapterus* was also seen to have longer storage life than the unsalted dried sample.

Pelleted prawn feed with high protein content and high water stability was prepared using low priced fish. Feeding trials are in progress.

Studies on 'red' discoloration of cured fish have shown that the red halophilic bacteria present in the salt

used for curing fish can survive in the salt beyond two years at ambient temperature.

Sodium tripolyphosphate treated, cured and dried ribbon fish remained free of red discoloration as also insect infestation even after a year's storage.

Frozen storage studies of whole as well as headless tiger prawn subject to sodium metabisulphite treatment were continued. The percentage of brown discoloration in the head portion of the frozen whole prawn increased with length of storage, though the overall quality of the muscle was good. Retention of sulphur dioxide in the muscle of whole tiger prawn was considerably lower than that in the headless prawn.

Live *Chanos chanos* kept in ice immediately after catch exhibited prominent cold shock effect which lasted for 6-8 hours.

Studies were carried out to improve the texture of onboard frozen *Priacanthus* sp., a deep sea fish, further stored at -18°C. Brine treatment was seen to improve the texture in the initial period of frozen storage.

Selar crumtnophthalmus was found to be in acceptable condition even after 12 months frozen storage, but on cooking, the texture became hard with a little sweetish taste.

Biochemical, bacteriological and organoleptic qualities are being investigated.

Intermediate moisture fish cakes, marinated products and surimi based dried products prepared from low cost fish were found to be in acceptable condition upto six months when stored in polythene bottles at room temperature. All the samples were free from coliforms, *E. coli*, faecal *Streptococci* and coagulase positive *Staphylococci*.

None of the samples of seafoods collected from local markets revealed the presence of *Salmonella*. Some isolates resembling *Listeria* were however recovered.

Antibiotic sensitivity of isolates separated from Epizootic Ulcerative Syndrome (EUS) diseased murels when tested with eight commercially used antibiotics showed all isolates to be sensitive to the antibiotics but not to the 0/129 vibrio static compounds at 10 and 15µ g. levels.

Comparative studies were made between KF Streptococcal Agar and Kanamycin Aesculin Azide Agar in recovery of faecal *Streptococci* from frozen fishes. Preliminary tests show that the Kanamycin Aesculin Azide Agar, besides being easy to handle, also gave better results.

Different varieties of fresh water fishes from the polluted waters of Hussain Sagar, Patancheruvu (Hyderabad) as well as from fresh waters near Hirakud Reservoir and some marine fishes from a FSI vessel, Vizag base, were collected and digested for heavy metal analysis. Cultured prawns from local ponds around Kakinada, from Krishna and West Godavari Districts in Andhra Pradesh, scampi and other tiger prawns from areas around Calcutta as also some disease affected tiger prawns and fishes from nearby places were also collected for heavy metal analysis. As in the previous year, total mercury and toxic heavy metals like zinc, lead and cadmium were well within tolerance limits in all the cultured and marine prawns analysed. The total mercury accumulation in spiny eel (*M. armatus*) was more than in the other fresh water species, although it was within tolerance limit. Zinc level was high both in *Notopterus* sp. as also in *Acantherus* sp. caught off Andhra Pradesh coast.

Research Contemplated

1. *Studies on rope trawls and high opening trawls*
2. *Processing of cultured prawns and fresh water fishes*
3. *Control of insect infestation and red discoloration in cured fish*

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

An 8.5m midwater trawl with four otter boards performed better than a net with two boards.

A polyethylene foam insulated plastic bag was developed for carrying about 3 kg iced fish.

Improvements were effected in the traditional bamboo baskets for transport of iced fish.

Pre-treatment with warm water enhanced the ice storage lives of *R. cotio* and *M. iolae*.

Washing minced fresh water cat fish, *S. Silondia* once with water improved the quality of the frozen product.

Research Projects Handled

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

Report of Work Done

Mid-water trawl

Studies were initiated on the effect of use of two boards and four boards on the performance of an 8.5

m. midwater trawl. An upper pair of size 50x35 cm. and lower pair of size 101x50.5cm and weighing 9 kg. and 35 kg respectively were used. The net was operated in the middle reaches during the summer months. The performance of the gear with four boards was seen to be comparatively better than that with two boards.

Gill net

Fabrication of 22 units of simple gill nets/frame nets of mesh sizes ranging from 40-75 mm bar with an interval of 5mm was completed and

BOMBAY RESEARCH CENTRE

Scientists associated

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

Chief findings

The yield of meat from two species of fish locally called 'chiri' and 'kasbi' and belonging to family Mullidae and Priacanthidae was 42-45% and 35% respectively.

The shelf life of frozen stored fish belonging to family Scombroidae and locally known as 'palai' was observed to be 28-30 weeks after which the product became unacceptable. Ribbon fish remained in good condition upto 26 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 food fishes.

Report of Work Done

Freezing and frozen storage

Fish belonging to family Scombroidae and locally known as 'palai' were cut into uniform size chunks of 300 gms, quick frozen, packed and stored at -18°C. The shelf life of the frozen material was seen to be around 28-30 weeks beyond which the acceptability sharply declined.

Ribbon fish frozen as whole and stored at -18°C remained in accept-

able condition upto 26 weeks as judged from their physical, organoleptic and biochemical characteristics. The moisture level dropped to 72.45% from the initial level of 77.26% during the period whereas the total volatile basic nitrogen (TVBN) value rose to 22.5mg% from an initial value of 13.67mg%. Rancidity also increased from its initial level of 0.478 mg/1000 g. meat to 4.36mg/1000g. Alpha amino nitrogen value remained more or less the same upto 16 weeks of frozen storage.

Spoilage organisms

Hygiene and sanitation in fish processing establishments and landing centres of Bombay were monitored. Samples of fresh fish, shrimp, lobster, squid, cuttlefish, water and ice were studied. *E. coli*, coliforms

Research Project Handled

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

Report of Work Done

During the year, 54 retailers from 19 different places in Wyanadu Dist. were interviewed to collect information on marketing of cured fish and related aspects as per a questionnaire. A total of 108 samples were collected and tester for physical, chemical, bacteriological and sensory characteristics. Their shelf lives at ambient temperatures were also determined as well as a study made of the different methods of storage and display of the cured products. Information was also gathered on the profitability or otherwise of the business of the retailers. One important finding of the survey is the opinion of the retailers that a better product in a better package is undoubtedly more acceptable to the customer. A similar survey has also been initiated in Kannur District.

Studies on anti-insect treatment of cured products was completed during the year. Refined and preservative treated commercial cured shark exposed in a solar tent dryer and packed in gunny bags sprayed on the exterior with hydnocarpus oil or pyrethrum had an ammoniacal smell

after four months whereas in the non-heat treated samples, the smell was evident after three months. The product was also free of insect attack. Studies on sole fish also gave similar results. Heat treated samples packed in 200 gauge polythene bags remained free of insects for a greater period than the non-heat treated ones.

Studies on the storage life of mussels fried to different moisture levels have revealed moisture level to be a critical factor controlling the shelf life of the fried product. Moisture content of less than 10% is necessary to keep the product for 3 months whereas at 31% and 43% moisture levels it could be kept only for 8-10 days, fungal attack being the major problem.

The possibility of preserving fried fish at room temperature for extended periods with application of added preservatives and condiments was experimented with. Slices of seer fish, black kingfish, small Indian mackerel, 'choodai' and prawn meat were used for the study. While prawn meat kept for 3 months, the fried fishes kept for 2-4 weeks only. Here again, moisture level was seen to be a critical factor in controlling the shelf life of the product. The major deteriorative factor was fungal attack. At moisture content below 20%, the product stored for at least

two weeks. Packing in 12 μ plain polyester/175 gauge LDP also helped to extend the shelf life.

Processes were evolved for preparing fish curry, both with thick gravy and with thin gravy with and without addition of preservatives. After cooling, the curries were packed in 200 gauge polythene bags and in 75 μ LD/BA/Nylon/BA/Primacor bags and stored at room temperature. While the treated curries packed in polythene bags were acceptable upto 5-6 days, those packed in the laminated bags were acceptable for two weeks. Even after a month no softening or putrid odour was observed. Bacteriological examination showed total plate count of 10^5 after one day of preparation, 10^7 after 3 days, remaining as such for a long period, to become 10^6 after 30 days. No pathogens or bacteria of public health significance were noticed.

A method was evolved for preparation of fish "thoran" from small sized fresh fish which could keep well for 5-6 days at ambient temperature when prepared with added calcium propionate and sorbic acid.

Further studies were carried out on masmin prepared from *Euthynnus affinis* by the modified process. The product keeps well for a year or even more and is as good as the traditional product made from white meat tuna as revealed by evaluation studies of

the product carried out by a few consumers from Lakshadweep islands. The new product is tougher and yields 4% more of finished material than in the traditional process probably due to less loss of cooked muscle along with the skeleton as also less loss of water soluble proteins.

Normally, masmin is converted into shavings before incorporation into food dishes. The preparation time can be considerably reduced if the flakes are readily available. With this in view, a similar product was prepared from tuna cooked under steam pressure by shredding, smoking and drying. The whole process took only 3 days compared to the nearly 10 days for masmin.

Process was developed for preparation of cooked, smoked and dried mackerel fillets with a storage life of over 3 months.

As a part of the studies to evaluate the commercial pickling practices, two samples of Indian oil sardine and one of lesser sardine were collected along with brine from commercial curing tanks and their amenability to such preservation studied. While the oil sardines were rejected after two and four months respectively, the lesser sardine got spoiled after ten days due to heavy insect infestation.

Studies were continued on prevention of blowfly infestation of commercial brine pickled fish. Covering the mouth of the polythene buckets, in which the pickled fish are packed with brine and kept in commercial curing sheds, with gunny sprayed with hydnocarpus oil delayed insect infestation. Better protection was however obtained when few drops of cashewnut shell liquid were added to the surface of the pickle before covering with oil sprayed gunny.

Commercially available cured shark, jew fish, mackerel, sole and silver belly were found amenable to reprocessing and retail packaging and the process seen to be economically viable.

Studies carried out on processing of *Holothuria* to beche-de-mer have shown that salting of the sea cucumber for preservation followed by cooking in fresh water yielded a product similar in proximate composition and appearance to that prepared from fresh *Holothuria*.

Fresh 'choodai', 'netholi' and small Indian oil sardines could be preserved at ambient temperature for 1-2 days with added calcium propionate, sorbic acid, tartaric acid and low levels of salt. Small oil sardine mixed with 0.3% calcium propionate alone, without salt, yielded a very good product.

Studies were initiated on different types of fungi found in salted fish. Fifteen fungal isolates were identified from four dry fish samples collected from different centres in Wayanadu Dist.

Research Contemplated

1. Survey on retail marketing of cured fish in the State
2. Field trials on anti-insect treatments
3. Evaluation of commercial pickle curing and development of an anti-insect cover for fish curing tanks
4. Effect of different packaging materials on ready-to-cook/serve fish and fishery products
5. Processing *Holothuria* to beche-de-mer
6. Further studies on cooked-smoked dried products from tuna and other fishes
7. Technology of on-board curing of marine fishes
8. Monitoring incidence of red halophiles and fungi in dry fish processed outside the State but sold through Calicut Central Market
9. Determination of residual bacterial flora and preservatives in treated fish

GOA RESEARCH CENTRE

Scientists associated

H.N. Mbalathkar, T. Joseph Mathai

Chief findings

The optimum towing speed of midwater trawls for small and medium vessels was 2.5 knots.

Maximum catches were obtained at a scope ratio 1:5

The platform trawl continued to land significantly better catches than the control net.

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

For studying the escapement of fishes from cod ends of shrimp trawls, cod ends of mesh sizes ranging from 20 mm to 46.25 mm were fabricated as also cod end covers of 200x200 meshes of mesh size 12.5 mm.

Modifications were effected in the design of flat rectangular otter

boards to avoid digging in the mud and the same fabricated.

Three designs of off bottom trawls for operation from small and medium class vessels were developed, the nets fabricated and assembled and trial operations carried out.

Studies on optimum towing speed of midwater trawls for small and medium vessels were completed. Significantly higher catches were obtained at a towing speed of 2.5 knots.

Studies were also completed on optimum scope ratio. Significant catches were obtained at the scope ratio 1:5.

Studies on platform trawls have conclusively shown their superiority over the control net in landing better catches.

Research Contemplated

1. Cod end mesh selectivity studies in shrimp trawl
2. Operation of modified flat rectangular otter boards
3. Operation of off-bottom trawls from small and medium class vessels

FISHING CRUISES

Particulars of cruises undertaken on board the fishing vessels 'FORV' 'Sagar Sampada' and 'M.V. Saraswathy', during the period are given below:

FORV Sagar Sampada:

<i>Cruise No</i>	<i>Period</i>	<i>Participants</i>
89 A	16-20 May '91	Sajith Kumar
94	7-24 Sept. '91	M.S. Fernando
95	14 Oct. - 14 Nov. '91	M.S. Rajan
96	18 Nov. - 18 Dec. '91	M.S. Fernando
97 A	22 Dec. '91 - 8 Jan. '92	P. George Mathai K.K. Kunjipalu K. Ramakrishnan V. Muraleedharan V.C. George Francis Xavier
97 B	10 - 24 Jan. '92	P.A. Panicker M.R. Boopendranath M.V. Baiju M. Syed Abbas T.V. Sankar Leela Edwin Saly N. Thomas

<i>Particulars of samples</i>	<i>No. analysed</i>
Water	158
Ice	80
Frozen fishery products	137
Dried fishery products	19
Raw fish	5
Fish speciality products	3
Fish by products	12
IQF products	10
Packaging materials	33
Chemicals	2
Fishing gear materials	20
Fish nets	5
Fishing craft materials	14
Wire rope and cable	101
Steel tape	56
Steel rod	3
Marine paint	30
Aluminium alloy anode	1
Metal samples	32
Sanitary survey of factories	45

Analysis was also carried out at the Research Centres. Veraval Centre analysed a total of 372 samples of fish meal, water, ice, dried fish and frozen fish products. The Kakinada Centre analysed samples of water, prawn feed and fish meal. At Bombay, 59 samples of water, ice,

fresh and frozen fish and fishery products were analysed while at Calicut, 7 samples of water and dry fish products were analysed and reports issued in addition to conducting sanitary survey of a freezing plant.

Supply of Designs/ Publications

Designs of dryers, fishing gear and craft continued to be given to interested parties as also the various publications brought out by the Institute. Details of supply are given below.

<i>Publicattons</i>	<i>No. issued</i>
1. Quality Control in Fish Processing	15
2. Special Bull. No.8-Abstracts of CIFT Publications	1
3. Sp. Bull.No.9 -Indigenous Marine Fishing Gear & Methods of India-Part-I-Karnataka State	2

Designs

1. Designs of fishing boats	8
2. Designs of otter board	1
3. Tunnel dryer	9
4. Drum dryer	1



Prof. S. Balaraman, Pro-Vice Chancellor, Cochin University of Science & Technology inaugurates the Summer Institute on Modern Techniques of Testing Fish and Fishery Products



Gel chromatographic technique being explained to the participants of the Summer Institute



Members of Study Group of Committee of Agriculture,
Govt. of India, at the Institute



Members of Second Sub Committee of Committee of Parliament on Official Language
reviewing the progress of Hindi implementation at the Veraval Research Centre

DEGREE/AWARD

Shri. K. Ramakrishnan, Scientist (SG) was awarded degree in M.Tech. (Digital Electronics) from Cochin University of Science and Technology.

Shri. J.K. Bandhyopadhyay, Scientist (SG) obtained M.Tech. degree in Food Technology and Biochemical Engineering from Jadavpur University, Calcutta.

SYMPOSIA/SEMINARS/WORKSHOPS ATTENDED

Within the country

Dr. T.K. Sivadas, Principal Scientist, participated in the National Seminar on Hydrometeorology at Centre for Advanced Study in Agricultural Meteorology (CASAM) Pune, 2 & 3 May 1991 and presented a paper.

S/Shri. S.P. Damle and D.K. Garg, Scientists (SG) attended Seminar on Food Processing for Rural Development conducted at University Department of Chemical Technology, Matunga, Bombay, under the auspices of AFSI(I), Bombay Chapter, 5 July 1991.

A number of Scientific/Technical staff of the Institute attended the National Workshop on Low Energy Fishing organised by Society of Fisheries Technologists (India), Cochin, 8 & 9 Aug. 1991. Twenty two papers by the Institute staff were presented at the Workshop.

Dr. K. Gopakumar, Director, attended Seminar on Opportunities and

Challenges for the Development of Marine Industry organised by Seafood Exporters' Assn. of India and FCCI at Cochin, 17 & 18 Aug. 1991. He gave a talk on 'Major marine products for export-fresh, frozen and value added - from India'.

Dr. M.K. Kandoran, Principal Scientist, participated in Regional Workshop on Extension Training Programmes organised by Directorate of Extension, New Delhi and held at NDRI campus, Bangalore, 21-23 Aug. 1991.

Dr. Jose Joseph, Sr. Scientist, participated in Workshop on Marketing organised by BOBP, Madras for Kanyakumari Sangam Fishermen at Nagercoil, 21 & 22 Sept. 1991.

Dr. P.K. Surendran & Dr. M.K. Mukundan, Sr. Scientists, attended Workshop on Inland Fish Disease organised by Kerala Sastra Sahithya Parishat at Mankombu, Alleppey, 29 Sep. 1991. A paper was presented at the Workshop.

Shri. P.V. Prabhu, Principal Scientist, attended Seminar on Utilisation of Marine Waste in Animal Feeds organised by Kerala Veterinary Faculty Teachers Assn. of Kerala Agricultural University, Trichur, 11 March 1992 and delivered a Key note address on Chitin, chitosan and their uses.

Dr. M. Arul James, Principal Scientist, attended Seminar on ISO-9000 organised by Export Inspection Agency, Bombay, 27 March 1992.

Abroad

Dr. Chinnamma George, Sr. Scientist, participated in the International Symposium on Mud Crab Culture and Trade in the Bay of Bengal Region at Surat, Thani, Thailand, 5-8 Nov. 1991 and presented a paper. The programme was sponsored by BOBP.

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 U.N.

As Member

ICAR Regional Committee No. VIII.

ICAR Co-ordination Committee for 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 CIF-NET

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

Committee on Agro-forestry for afforestation programme

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 Division Council

Dr. C.C. Panduranga Rao,
Principal Scientist

As Member

Panel of Experts, EIA for approval of processing plants

Sbri. 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

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

Sbri. A.G. Radhakrishnan,
Scientist (SG)

As Member

M.F.Sc Thesis Evaluation Committee of College of Fisheries, Panangad

As Examiner

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

As Guest Lecturer

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

Sbri. 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

As Member

Task Force on Biological Sciences, State Department of Science, Tech-

nology and Environment, Government of Kerala, Trivandrum

Task Group on Environment, State Committee on Science, Technology and Environment, Government of Kerala, Trivandrum

Panel of Experts on Marine Biofouling and its Control, Indira Gandhi Centre for Atomic Research, Kalpakkam

National Registry of Experts on Marine Biofouling and Allied Problems, Indira Gandhi Centre for Atomic Research, Kalpakkam

As Research Guide

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

Dr. A.G. Gopalakrishna Pillai, Sr. Scientist

As Member

Board of Studies, Department of Industrial Fisheries, Cochin University of Science and Technology

Dr. D. Imam Khasim, Sr. Scientist

As Member

Selection Committee, CTRI, Rajamundry

Selection Committee, CIFA, Prawn Breeding Unit, Kakinada

TECHNICAL SECTION

Compilation of Research Project Programmes:

Research Project Programmes of the Institute for the year 1991-92 were compiled. Of the 24 total projects, 14 were ongoing and 10 new. A brief summary of ten projects which were completed during 1990-91 was also included in the Research Project Programmes.

Compilation of activity milestone of Research Projects for 1991-92:

The activity milestone of Research Projects 1991-92 was compiled fixing technical programmes for each individual Scientist for each quarter of the year.

Maintenance of/updating project files:

The Project Leaders' files relating to research projects were maintained up-to-date by collecting relevant quarterly, half yearly, annual reports from the Project Leaders/associates for the respective periods.

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,

exhibitions etc. were collected every month from various Divisions/Centres and the material compiled and sent to Council regularly for inclusion in the monthly report of DARE for programme implementation and Cabinet Secretariate.

Calendar of events :

Programmes on Meetings/Conferences/Workshops etc. proposed to be conducted by the Institute during the period from Jan. to June 1992 were compiled and sent to Council for inclusion in the ICAR Calendar of Events, 1992.

Data Bank :

The following Data Bank were prepared and sent to the respective organisations during the reported period.

- a. The Biodata of all the Scientists of the Institute updated as on 31.1.1992 were sent to the computer cell, ICAR, New Delhi.
- b. As desired by the Head, Human Resource Development Group, Council of Scientific and Industrial Research, New Delhi, a list of Experts of Scientific and Technical Personnel of CIFT with their area of specialisation was forwarded to them.

the dried product. More than 300 fisherwomen were trained under this project.

Other CIFT-BOBP collaborative consultancy programmes undertaken are :

- i) Method for drying flying fish (*H. coramandelensts*) roes. Drying was carried out in vacuum dryer at a temperature between 30-40°C. The product obtained was good with good keeping quality.
- ii) Cleaner fishery harbour programme (already reported elsewhere)

The CIFT in collaboration with Central Institute of Brackishwater Aquaculture (CIBA) has undertaken a study on the Quantitative Requirements of Essential Amino Acids and Fatty Acids for the Prawn *P. monodon* and Use of Additives in Grow Out Feeds for Improving Feed Efficiency and Growth Promotion. The project, funded by Dept. of Biotechnology, has a life of three years.

The Ministry of Agriculture, Govt. of India has entrusted the Institute with a sponsored study on the Supply and Demand of Fish Nets in India- A Projection upto 2000 AD.

Proposal for a project on Establishment of an Apex Fisherwomen Co-operative Based on Post-harvest Technology of Fish and Shell to be funded under a collaborative scheme with developed countries and for-

warded to Council for inclusion in the VIII plan proposal was revised as advised by Council to be included under Indo-Dutch Co-operation as 'Developmental Support for the Establishment of Primary Processing Centres in the Fisheries Sector'.

Another project proposal entitled 'Technological Studies on Production and Utilization of Fish Silage under Indian Conditions with Special Reference to Ensilation of Trawler By-catches and Processing Wastes' was sent to Council for inclusion under Indo-Dutch Co-operation in the Fisheries Sector;

A research project proposal entitled 'Development of Freezing Equipment Using Liquid Nitrogen Spray System for IQF Processing of Fishery Products' was submitted to Council for inclusion in the Engineering Panel for financial support from Cess funds.

At the request of the Central Social Welfare Board and as part of the socio-economic programmes of CIFT, three income generating profiles, as below, related to fisherwomen were prepared and sent for consideration and approval.

- a. Establishment of training and production centre for modern fishing gear.
- b. Establishment of training and production centre for value added fish products.



Smt. M.T. Padma, Hon. Minister for Fisheries, Rural Devt. & Registration at the exhibition arranged in connection with the National Workshop on Low Energy Fishing organised by SOFT (I).



A view of the CIFT Pavilion at the 9th Indian Seafood Trade Fair held at Cochin in Feb. 1992



The USFDA team at the Institute



Members of the Japanese delegation in discussion with Dr. K. Gopakumar, Director, CIFT



Members of the Chinese delegation in the Processing Lab

are new for which I would like to convey my congratulations” - *Mr. Chen Yaobang.*

“..... the Institute has done excellent work in the field of microbiology, biochemistry and processing as applied to the fishing industry. We are also very happy to know the pharmaceutical, medical and surgical applications of the fish by-products and fish wastes the development of various designs of fishing vessels and fishing nets, the development of various formulations for the maintenance and increasing the longevity of materials used in building vessels is re-

markable.....” - *Shri. Ratnakar Chopdekar.*

“ an informative and educational visit. Useful work is being done. What is now necessary is to transform the work done to commercial applications with appropriate marketing strategy” - *Mr. Sujit Banerji.*

“It is heartening to see the progress that has been made. What is most needed in institutions like these is the greater understanding of the problems and how best they can be solved, so that we do not miss out in harnessing the vast untapped resources in the sea” - *Admiral O.S. Dawson.*

ICAR SPORTS

The Institute bagged the first prize in Football in the ICAR Inter-Institute

Sports meet held at Hyderabad in September 1991.

PUBLICATIONS

1. Abbas, M. Syed, Mhalathkar, H.N., Manohardoss . R.S., Vijayan. V. & Joseph Mathai . T. (1991) - An improved bulged belly shrimp trawl for inshore waters - *Fish Technol.* 28 (2) : 93
2. Annamalai, V. (1992) - Alternate vocation for traditional fishermen - Paper presented at Fishermen Devt. Seminar organised by Alleppey Division Charitable and Social Welfare Society, Alleppey, March 14-15
3. Annamalai, V. & Kandoran. M.K. (1991) - Economic and behavioural trends in low energy fishing along the south coast of India - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
4. Annamalai, V. & Kandoran. M.K. (1990 - issued in 1991) - Motorising traditional craft : Problems and projects of the innovation - *Fish Tech. Newsletter* VI (2) : 5
5. Antony. K.P., Srinivasa Gopal. T.K. & Prabhu. P.V. (1991) - Survey on the properties of packaging materials for frozen shrimp export - Part II - *Fishing Chimes* 11 (6) : 62
6. Balachandran, K.K. (1992) - Employment opportunities for traditional fishermen in fish processing - Paper presented at Fishermen Devt. Seminar organised by Alleppey Diocesan Charitable and Social Welfare Society, Alleppey, March 14-15
7. Balachandran, K.K. - Post harvest handling and processing of fish - Paper presented at the Training Programme for Senior Bank of Baroda Officers, CMFRI, Cochin
8. Balasubramaniam. S., Braj Mohan, Kandoran, M.K. & Kesavan Nair, A.K. (1991) - Technological gaps among small and large craft fishermen - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
9. Balasubramaniam, S., Kandoran, M.K. & Braj Mohan (1991) - Communication of innovations among traditional fishermen - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
10. Balasubramaniam, S., Kandoran, M.K. & Braj Mohan (1992) - Decision making behaviour of traditional fishermen in relation to the adoption of improved fishery technologies - *Fish. Technol.* 29 (1) : 67

11. Basu Subrata, Gupta, S.S. & Kesavan Nair, A.K. (1992) - Control of blowfly larvae infestation in cured fish - *Fish. Technol.* 29 (1) : 82
12. Cecily, P.J. & (Samuel, C.T.) (1991) - Combination netting yarns for low energy fishing - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
13. Chakraborti, R., Gupta, S.S. & Panduranga Rao, C.C. (1991) Preparation of salted - pressed *Psenes indicus* and its storage characteristics - *Fish. Technol.* 28 (2) : 137
14. Chakraborti, R., Gupta, S.S., Rao, C.C.P. & Subrata Basu, (1992) - Control of black discolouration in raw shrimps from tropical region - *Fish. Technol.* 29 (1) : 84
15. Edwin Leela, Saly N. Thomas, Unnikrishnan Nair, N. & Ravindran, K. (1991) - Dual preservative treatment for small fishing vessels - observations on the biodeterioration of mango wood - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9.
16. George Chinnamma & Arul James, M. (1991) - Free amino acid composition of the red and white meat of tuna *Katsuwonus pelamis* - *Seaf. Exp. J.* XXIII (9) : 26
17. George Chinnamma & Gopakumar, K. (1991) - Modified method for the estimation of pentose sugar in clam and mussel meat - *Sci. & Cul.* 57 : 45
18. George Chinnamma, Gopakumar K. & Perigreen, P.A. (1990/91) - Frozen storage characteristics of raw and cooked crab segments, body meat and claws - *J. Mar. Biol. Assn. India* 32 (1 & 2) : 193.
19. George Chinnamma & Gopakumar, K (1991) - Technological aspects of preservation, processing and trade of crab *Scylla serrata* - Paper presented at National Seminar on Mud Crab Culture and Trade in the Bay of Bengal Region, organised by BOBP in Thailand, Nov. 5-8
20. George, V.C. (1992) - Fishing techniques - craft, gear and propulsion system-improving their efficiency - Paper presented at Fishermen Devt. Seminar organised by Alleppey Diocesan Charitable and Social Welfare Society, Alleppey, March 14-15
21. George, V.C., George Mathai, P., Kunjipalu, K.K., (Patil, M.R.), Boopendranath, M.R. & George, N.A. (1991) - Shark long lining experiments in the West coast of India - Paper presented at National Workshop on Low Energy Fish-

- ing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
22. Gopakumar, K. & Bhattacharya, S.K. (1991) - Measurement of water activity as an index of optimising salt concentration in brine used for wet curing of mackerel - Paper presented at 7th session of FAO - IPFC Working Party on Fish Technology and Marketing, Indonesia, Sept. 24-25
 23. Gopakumar, K. (1991) - Biochemistry of melanosis in shell fishes and its prevention - *Ind. Fisheries Assn. Annual* 7 : 17
 24. Gopakumar, K. (1991) - Major marine products for export - fresh frozen and value added from India - *Seaf. Exp. J.* XXIII (8) : 11
 25. Gopakumar, K. (1992) - Marine products processing industry in India - A case for modernisation - *Proc. Seminar on Modernisation of Food Processing Industries, organised by Confederation of Indian Food Trade and Industry, N. Delhi.* Jan. 16
 26. Gopakumar, K. (1992) - The prospects of irradiation as a method of fish preservation - Souvenir in commemoration of 9th Indian Seafood Trade Fair, Cochin, Feb. 7-9
 27. Gopal, T.K. Srinivasa, Thankamma, R., Ramachandran Nair, K.G., Prabhu, P.V. & Madhavan, P. (1991) - Use of chitosan adhesive for the manufacture of corrugated fibreboard - *Fish. Technol.* 28 (2) : 154.
 28. (Gore, P.S., Raveendran, O.,) Iyer, T.S.G., Varma, P.R.G. (& Sankaranarayanan, V.N.) (1992) - Bacterial contamination of mussels at Mahe estuary, Malabar coast - *Fish. Technol.* 29 (1) : 57
 29. Gupta, S.S., Subrata Basu, Panduranga Rao, C.C. & Chakraborti, R. (1991) - Preservation of mullets in CO₂ enriched gas-mixture at 6-7°C - *Fish. Technol.* 28 (2) : 125
 30. Gupta, S.S. & Subrata Basu (1992) - Studies on individually quick frozen and block frozen prawns - *Fish. Technol.* 29 (1) : 80
 31. Iyer, H. Krishna, Unnithan, G.R. & Kesavan Nair, A.K. (1991) - Idle capacity of canning and fish meal plants - *Fish Tech. Newsletter* VI (3) : 7
 32. Iyer, T.S.G., Varma, P.R.G., (Shaji Zaccharia & Agnes Joseph, M) (1990-issued in 1992) - Studies on contamination of fishery products with *V. cholerae* non 01 during different stages of handling & processing - *Mysore J. Agri. Sci.* 24 : 394
 33. Iyer, T.S.G. & Varma, P.R.G. (1991) - Viability of *Vibrio cholerae* in water subjected to different levels of chlorination - *Fish. Technol.* 28 (2) : 158

34. Joseph Jose, Chinnamma George & Perigreen, P.A. (1992) - Effect of spices on improving the stability of frozen stored fish mince - *Fish. Technol.* 29 (1) : 30
35. Khan, A.A., Kartha, K.N., Percy Dawson & George, V.C. (1991) - Fish harvesting system in Indian reservoirs - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
36. Khan, A.A., Percy Dawson, Kartha, K.N. & Sita Rama Rao, J. (1991) - Relative catch efficiency of newer fishing gear materials - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
37. Khasim, D. Imam & Panduranga Rao, C.C. (1991) - Status of heavy metal concentrations in fishes from Kolleru lake area - Paper presented at National Seminar on Kolleru Lake Environment Information System at JNTU, Hyderabad, Oct. 4-5
38. Kunjipalu, K.K., Boopendranath, M.R. & (Md. Zafarkhan) (1991) - Investigations on dolnets of Gujarat coast - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
39. Lakshmanan, P.T. (1990 - issued in 1992) - Technique evolved to improve colour and texture of frozen squid and cuttle fish - *Fish Tech. Newsletter VI* (2) : 1
40. Lalitha, K.V. & Surendran, P.K. (1992) - Prevalence of *Clostridium botulinum* in fresh retail fish - Paper presented at 4th Kerala Science Congress organised by State Committee on Science, Technology and Environment, Kerala, at Trichur, Feb. 27-29
41. Mathai, T. Joseph, Vijayan, V., Syed Abbas M., Manohardoss, R.S. & Krishna Iyer, H. (1991) - Mesh selectivity studies on mackerel gill nets - Paper presented at the National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
42. Mathen Cyriac, Unnikrishnan Nair, T.S. & Ravindranathan Nair, P. (1992) - Effect of some vegetable oils on insect infestation during storage of dry cured fish - *Fish. Technol.* 29 (1) : 48
43. Mathew, P.T., Prabhu, P.V. & Gopakumar, K. (1991) - Agar from *Geltdiella agarosa* by alkali treatment - Paper presented at All India Symp. on Algal Resources - their Management, Biology, Chemistry and Utilization, Trivandrum, Nov. 25-27

44. Meenakumari, B & Panicker, P.A. (1992) - Import substitution of combination wire rope - Part V- Specifications for combination wire rope for fishing purposes - *Fish. Technol.* 29 (1) : 9
45. Meenakumari, B., Radhalakshmi, K. & Panicker, P.A. (1991) - Netting materials for low energy fishing gear - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
46. (Nambudiri, D.D.) & Gopakumar, K. (1992) - AT Pase and Lactase Dehydrogenase activities in frozen stored fish muscle as indices of cold storage deterioration - *J. Fd. Sci.* 57 (1)
47. Nair, A. Lekshmy, Madhavan, P. & Prabhu, P.V. (1991) - Nutritional studies on the evaluation of the safety of squilla protein - *Fish. Technol.* 28 (2) : 142
48. Nair, K.G. Ramachandran, Prabhu, P.V., Madhavan, P. & Gopakumar, K. - A new method of production of low cost fish feed-*Infofish News* 6/91 : 37
49. Nair, N. Unnikrishnan, Pillai, A.G.G.K., & Ravindran, K. (1991) - Development of chemical preservatives and coatings to offset biodeterioration in traditional fishing craft - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
50. Nair, P.R., George Joseph, K., Nair, T.S. Unnikrishnan, Cyriac Mathen & Gopakumar, K. (1991) - Preservation process for ready-to-cook/serve fish and shell fish products at tropical temperatures - Paper presented at 8th session of the Working Party meeting on Fish Technology and Marketing of IPFC, Indonesia, Sept. 24-27
51. Nair, T.S. Unnikrishnan, Cyriac Mathen, Nair, P.R., George Joseph, K. & Gopakumar, K. (1991) - Reprocessing of commercial cured fish for better quality and shelf life - Paper presented at 8th session of the Working Party meeting on Fish Technology and Marketing of IPFC, Indonesia, Sept. 24-27
52. Narayanappa, G., Ramarao, S.V.S., Sitarama Rao, J. & Naidu, R.M. (1991) - Operation of multi-meshed gill nets in Kakinada Bay - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
53. Nassar, M. & Baiju, M.V. (1991) - FRP fishing vessels for pole and line fishing - Paper presented at National Workshop on Low Energy Fishing organised by the So-

75. Surendran, P.K. (1991) - Studies on the fish disease problem of Kuttanad - Paper presented at Workshop on Inland Fish Disease organised by Kerala Sastra Sahithya Parishat and held at Mankombu, Sept. 29
76. Thampuran Nirmala & Gopakumar, K. (1991) - Microbial profile of tropical prawn *Metapenaeus dobsont* during frozen storage - *J. Fd. Sci. Tech.* 28 : 371
77. Thampuran Nirmala & Gopakumar, K. (1991) - The microbial flora developing on Indian mackerel *Rastrelliger kanagurta* during thawing at different temperatures - Paper presented at 7th session of the FAO - IPFC Working Party on Fish Technology and Marketing at Indonesia, Sept. 24-27
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79. Thomas, N. Saly, Kuttappan, A.C., George, V.C., Varghese Paul & Krishna Iyer, H. (1991) - Relative efficiency of trammel nets and simple gill nets - A preliminary survey - Paper presented at National Workshop on Low Energy Fishing organised by the Society of Fisheries Technologists (India), Cochin, Aug. 8 & 9
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81. Varma, P.R.G., Iyer, T.S.G., (Shaji Zaccharia & Agnes Joseph, M) (1991) - Detection and isolation of *V. cholerae* from fishery products - *Curr. Res.* 20 : 202
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APPENDICES

APPENDIX - I

HEADQUARTERS

CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY

WILLINGDON ISLAND, MATSYAPURI. P.O.

COCHIN - 682 029, KERALA

TLX No. 0885 - 6440 - CIFT

Telephone : Office No. 6845 (8 lines), 340145 & 340146

Director (Per) - 6880, 69727

(Res) - 355456

Joint Director (Per) - 69039

(Res) - 355985

Sr. Admn. Officer (Per) - 6566

(Res) - 776571

Telegram : FISHTECH/MATSYAODYOGIKI, COCHIN

HEADS OF DIVISIONS

1. Fishing Technology Division : **Shri. P. Appukutta Panicker**
Prncipal Scienttst
2. Fish Processing Division : **Shri. P. Vasudeva Prabhu**
Prncipal Scienttst
3. Bio-Chemistry, Nutrition and Microbiology Division : **Shri. P.D. Antony**
Scienttst(SG)
4. Engineering and Instrumentation Division : **Shri. S. Ayyappan Pillai**
Prncipal Scienttst
5. Extension, Information and Statistics Division : **Shri. K. Krishna Rao**
Prncipal Scienttst

APPENDIX - 1 (contd.)
RESEARCH CENTRES

Sl. No.	Place	Address	Telephone/Telex	Telegram	Scientist-in Charge
1.	Veraval	Research Centre of CIFT Bunder Road, Veraval - 362 265 Gujarat.	Tel : 20297 Tlx : 0163-202 CIFT-IN	Fishtech/ Matsyaoudyogiki	Shri. K.K. Solanki Principal Scientist
2.	Kakinada	Research Centre of CIFT Door No. 2-11-1/4 Venkatanagar, Kakinada - 533 005 Andhra Pradesh.	Tel : 78436 Tlx : 0473-229 CIFT-IN	Fishtech/ Matsyaoudyogiki	Dr. C.C. Panduranga Rao Principal Scientist
3.	Burla	Research Centre of CIFT Burla - 768 017 Sambalpur Dist., Orissa.	Tel : 419 Tlx : 0634-211 CIFT-IN	Fishtech/ Matsyaoudyogiki	Shri. C.V.N. Rao Principal Scientist
4.	Bombay	Research Centre of CIFT 167-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	Fishtech/ Matsyaoudyogiki	Shri. Cyriac Mathen Principal Scientist
6.	Goa	Research Centre of CIFT 2nd Floor 'Shanta', *18th June Road, St. Inez, Panaji - 403 001, Goa.	Tel : 405905	Fishtech/ Matsyaoudyogiki	Shri. H.N. Mhalathkar Scientist (SG)

Senior Clerk

1. Smt. C.G. Marykutty
2. Smt. N. Prabhavathy Amma
3. Shri. C. Ravindran Nair
4. Smt. K.R. Gita Rani
5. Shri. T.M. Ramraj
6. Shri. G. Somappan
7. Smt. K. Gracy
8. Smt. M. Jully
9. Shri. Y. Philipose
10. Smt. M.A. Prasanna
11. Shri. R. Viswanathan
12. Shri. V.R. Kesavan
13. Smt. K.A. Nazeem
14. Shri. N. Venugopal
15. Shri. P.K. Sreedharan
16. Smt. T.K. Susannamma
17. Smt. P.C. Kamalakshy (Ad-hoc)

Jr. Clerk

1. Shri. P.V. Venugopalan
2. Smt. N.I. Mary
3. Shri. P.K. Thomas
4. Smt. P.K. Thankamma
5. Smt. A.A. Cousallia
6. Shri. K.K. Sasi
7. Shri. P. Padmanabhan
8. Smt. A.R. Kamalam
9. Smt. T.K. Shyma
10. Smt. T.D. Usheem
11. Smt. V.S. Aleyamma
12. Shri. V.S. Ambasuthan
13. Shri. A.P. Gopalan

14. Shri. S. Radhakrishnan Nair
15. Shri. K.B. Sabukuttan
16. Smt. G.N. Sarada
17. Smt. P.A. Sathy
18. Shri. P. Krishnakumar
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 Geoge
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. N.C. Bhaskaran
3. 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. Krishnan

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
5. Shri. E.S. Balachandra Pai

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. M.K. Thevan
6. Shri. P.M. Pakeer Mohammed

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. A.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 - 1

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. Shri. 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. Shri. P. Mohanan
21. Smt. P. Ammalu
22. Smt. U.K. Bhanumathi
23. Shri. T.A. Kuttappan
24. Smt. Tessy Francis
25. Shri. Shaji T.N.
26. Shri. T.K. Rajappan
27. Shri. P.D. Padmaraj
28. Kum. Jaya Das

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. Puthra Pravin

TECHNICAL PERSONNEL

Technician T-7 (Technical Officer)

Shri. D.C. Besra

Technician T-4

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

Technician T-3

1. Shri. K.V. Baladasan
2. 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

3. Shri. K. Kameswara Rao
4. Shri. Melladi Perraju
5. Shri. B. Sivanandham
6. Shri. Vassipilli 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

Principal Scientist

Shri. C.V.N. Rao

Senior Scientist

Dr. K.N. Kartha

Scientist (Selection Grade)

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

Scientist (Sr. Scale)

Shri. J.K. Bandhopadhyaya

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. Sathrugan Kumara

Technician T-2

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

Technician T-1

1. Shri. Ashok Kumar Naik
2. Shri. Rabinarayan Sahoo

ADMINISTRATIVE PERSONNEL

Assistant

Shri. Jatindra Kumar Mishra

Sr. Clerk

Shri. Udekar Pande

Jr. Clerk

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

AUXILIARY PERSONNEL

Driver

Shri. Narasingh Pande

SUPPORTING PERSONNEL

Supporting Staff Grade IV

Shri. Gajendra Karali

Supporting Staff Grade - III

1. Shri. K.C. Mehar

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

Sr. 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 - III

Shri. C.M. Gopalan

Supporting Staff Grade - I

1. Shri. K. K. Lakshmanan
2. Smt. M.V. Valsala

GOA RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Scientist (Selection Grade)

1. Shri. H.N. Mhalathkar

2. Shri. T. Joseph Mathai

TECHNICAL PERSONNEL

Technician T-I-3

Shri. A.B. Varghese

Technician T-2

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

ADMINISTRATIVE PERSONNEL

Sr. Clerk

Shri. A.B. Rodrigues

AUXILIARY PERSONNEL

Driver

Shri. Umesh D. Arosker

SUPPORTING PERSONNEL

Supporting Staff Grade - III

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 1991-92

(Rs. in lakhs)

	Non Plan		Plan	
	Budget Estimate	Revised Estimate	Expenditure	Budget Estimate
1. Establishment Charges	213.00	212.16	212.16	—
2. Travelling Allowance	5.00	4.50	4.30	1.50
3. Other Charges	52.00	43.34	43.54	40.00
4. Works	—	—	—	37.50
5. Other Items	—	—	—	1.00
Total	270.00	260.00	260.00	80.00
				78.00
				32.50

निदेशक की भूमिका

वर्ष 1991-92, संस्थान के प्रशासनिक संचालन परिवर्तन की साक्षी बन गया। श्री एम. आर. नायर जिन्होंने 12 सितंबर, 1984 से संस्थान के क्रियाकलापों के सुक्कान और निदेशक थे, 30 जून 1991 को सेवानिवृत्त हो गया और मैं ने संस्थान के पदेन निदेशक के रूप में कार्यग्रहण किया।

श्री वी. के. श्रीधर, वरिष्ठ प्रशा. अधिकारी ने 9 फरवरी 1992 में संस्थान से पदत्याग करके आई वी आर आई, इज़तनगर के मुख्य प्रशा. अधिकारी के रूप में कार्यभार संभाला।

पिछले वर्षों के समान संस्थान के कार्यकलापों में नियमित प्रगति हो रही है। गत एक वर्ष के कुछेक प्रमुख अनुसंधान उपलब्धियों और विस्तार व प्रशिक्षण क्रियाकलापों का संक्षिप्त विवरण नीचे दिया गया है।

मत्स्य अवतारण संरक्षण के अध्ययन ने दिखाया कि 30 एम एम जाल कोड एन्डों से युक्त ट्रालों की तुलना में 14 एम एम और उससे कम जाल आकार के कोड एन्डों से जोड़े गए ट्राल गुणता मछलियों के अधिक किशोरों को अवतारित करता है।

पारंपरिक डायमंड जाल कोड एन्डों की अपेक्षा स्क्वायर जाल कोड एन्डों से भरे जाल किशोरों के निकास सिद्ध करता है।

गोवा के तट में संचालित छोटे या माध्यमिक यानों से अनुकूलतम 2.5 गॉठ की नौकर्षण गति में खासकर अच्छे पकड़ाव प्राप्त होता है।

समुद्री तृण जलिडियल्ला स्पी. से उन्नत जेल शक्ति के अगर को तैयार किया गया।

लीन मछली मांस से पेस्ट मात्स्यकी उत्पन्न की तैयारी के लिए तरीका को अपनाया है।

मछली खाद्य में, उनकी जल स्थिरता की वृद्धि के लिए, कैटोसन के समावेशन संबंधी तकनीक, आन्ध्रप्रदेश के प्रमुख जलीय संवर्द्धकों को स्थानांतरित किया गया।

दंत शल्यचिकित्सा के लिए प्रयुक्त विभिन्न हेमोस्टाटिक एजेंटों में घाव शमन क्षमता, जैव संगतता और रोगियों के सुख-साधन के रूप में कैटोसन अधिक प्रभावकारी एजेन्ड निकला। शुष्क मछली के साथ उत्कृष्ट रूप में जोड़े हुए फफूदे है असपेरिजिलस नाइजर, ए फ्लेक्स रिसोपस और मुकर ।

परिष्कृत और संरक्षकों से उपचारित वाणिज्य रूप में संसाधित मछली को जो थेरमल उपचार करके पॉलीथीन या गन्नि थैलियों में बाहरी रूप में परिग्रम, जिंजिली और हिड्रोनोकार्पस तेल छिड़काते हुए गणनात्मक रूप में दीर्घ अवधि तक कीड़ाण नाशन को रोकता है।

के प्रोटीनों में - एस एच की घटती का स्वभाव अधिक तीव्र है।

पोषण करने के परीक्षण और पात्रे पचनीय अध्ययन ने दिखाया कि 70° सी में शुष्कित मछली से 60° सी में शुष्कित मछली पौष्टिक रूप में अधिक श्रेष्ठ है।

अवशोष्य शल्य सीवनो को बनाने के लिए मछली ओंठों की सफाई का एक उपकरण बनाया और विजयप्रद निकला।

कई अन्य मछलियों और सीपी मछलियों की तुलना में रोहू के पचनीय व्यवस्था में उन्नत एमिलेस प्रक्रिया दिखाई पडती है।

साइलेज की गयी मछली विसेरा में अम्ल प्रोटीएस प्रक्रिया प्रारंभ में निम्न होने पर भी क्रमिक वृद्धि और स्थिरता दिखाता है, लेकिन निष्क्रिय और क्षारीय प्रोटीएसो में यह उल्टा है। 2 से 3 और 8 से 9 पी. एच. रेंज में वौगडा तुलनात्मक रूप में उन्नत प्रोटीन अपघटक प्रतिक्रिया दिखाती है।

लवणन समय की अवधि पेरोक्साइड पर शीघ्र पौसीटीव प्रभाव डालता लेकिन एफ एफ ए की मुक्ति बहुत धीरे होती हैं।

आंतरिक वाणीज्य के ताजे मछली/सीपी मछली से लिस्टीरिया सीलीगिरी एल. ग्रेयी और एल इवानोवा को वियुक्त करते हैं।

मध्य केरला के कुटटनाडु के ताजे जल मछलियों में दिखाई पडने वाले ऐरामॉलस

हाइड्राफिला को एपिसूटिक अलसरेटिव सिन्ड्रो पहचानकर वियुक्त किया गया।

यद्यपि पंक से और कोचिन के समीप के खारेपानी तालाबों के संवर्द्धनों से संचयित जल नमूनों में क्लास्टरिडियम बोटुलिनम संवर्द्धन मौजूद है लेकिन सभी संवर्द्धन अविषालु होते हैं।

सालमोनेल्ला सीरम प्ररूप से शुष्क मछली का सतह प्रदूषण उचित सूर्य शुष्कन से दूर किया जा सकता है।

चेल्लानम के खारेपानी संवर्द्धन तालाबों से संचयित झींगों में हारबर विब्रियो पैरा हेमटो लिरिकस दिखाई पडा ।

अभियांत्रिकी व यंत्रिकरण डिवीज़न

सूक्ष्मजीवाण्वीय मूल्यांकन के लिए हिमीकृत मछली ब्लॉकों से एक रूप नमूनों के अलेखन के लिए एक उपकरण का अभिकल्प और विकास किया।

मछली कटलटों की भुनाई के लिए एक तेल शुष्कक को विकसित किया। मछली मात्स्यकी उत्पन्नो के शुष्कन के लिए एक 50 की. ग्रा. क्षमता के स्वचालित विद्युत मछली शुष्कक जो कुटीर व्यवसाय संचालन के लिए अनुयोज्य है, अभिकल्पित किया गया।

शिप बॉन ऑकडा अर्जन व्यवस्था के पहले नमुने के विकास कार्य की पूर्ति की गयी।

