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ANNUAL REPORT
1991 – '92

Central Institute of Fisheries Technology

(Indian Council of Agricultural Research)

MATSYAPURI P.O. COCHIN - 682 029

वार्षिक रिपोर्ट

ANNUAL REPORT

1991—92

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

Published by :
Director, CIFT

Compiled by :
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Cover, Photography & Layout :
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Secretarial Assistance :
P.C. Kamalakshy, Sr. Clerk (Ad-hoc)

Typeset at :
Carmel Industries, Market Road

Printed at :
Anaswara, S.R.M. Road

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.

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

BRIEF HISTORY

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

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

ORGANISATIONAL SET-UP

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

The research work of the Institute is carried out by the following research divisions.

1. Fishing Technology Division
2. Fish Processing Division
3. Bio-Chemistry, Nutrition & Microbiology Division
4. Engineering & Instrumentation Division
5. Extension, Information & Statistics Division

RESEARCH ACCOMPLISHMENTS

HEADQUARTERS, COCHIN

Fishing Technology Division

Scientists/Technical Officers associated

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

Chief findings

Feedback data on the initial design of an 18m OAL multipurpose steel trawler were collected and the lines finalised for further design development.

Under a project sponsored by the Dept. of Science and Technology, two more 7.6 m. fibreglass pole and line fishing vessels for the Union Territory of Lakshadweep were got fabricated incorporating new features, the same tested and trial fishing conducted successfully.

Developed and popularised the following designs of deep sea demersal trawls for the exploitation of the EEZ.

1) *38m HSDT*
2) *51m large mesh HSDT*
3) *48m rectangular trawl*

Productive areas along the south west coast on EEZ were identified.

Flexible floats with the advantage of convenient stacking can replace hard conventional floats for rigging trawls.

The effectiveness of square mesh cod end as a conservative measure was further established.

Selection factors and selective length for important species of fin fishes and prawns were worked out.

The 50 m high opening trawl developed by CIFT was found suitable for catching off bottom fishes along EEZ.

50 mm trammel net was found effective for capture of prawns at Poovar, a fishing village in Trivandrum District.

Research Projects Handled

C-8/89(5) - Design development and construction of a 15 to 20m OAL multi-purpose steel fishing vessel for operation in the Indian EEZ

G-24/91(3) - Conservation and exploitation of demersal fishery resources of Indian EEZ

G-25/91(4) - Studies on microfouling

G-26/91(3) - Harvesting techniques for semi pelagic resources

G-21/89(5) - Low energy fishing techniques

Report of Work Done

Fishing craft

The mechanical strength properties of common boat building timbers like *Artocarpus* sp. *Anttaris* sp. and *Terminalia* sp., both treated with arsenic copper chrome compositions of varying retentions, as well as untreated controls, were studied.

The rate of corrosion, tensile strength and Young's modulus of HAL 5052 aluminium were determined.

The applicability of Butler-Volmer equation to linear polarisation was extended to determination of absolute corrosion rate of metals embedded in wood.

The bio-deterioration of structural timbers in tropical sea is a serious economic problem confronting the maritime activities. The deterioration is usually assessed qualitatively by visual examination and counting the number of surface borer holes. This gives a totally misleading picture of the real internal damage and strength loss suffered by the structural member. The Institute is currently engaged in quantitatively assessing both internal damage and the residual compressive strength by radiographic examination and mechanical strength determination of inservice structural members. This method also *inter alia* provides a means for quantitative grading of the

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 trawl, 51m large mesh high speed 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. *Trichiurus auriga*, 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, Sepia* 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. *Arius* 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 analysts of larger fishing vessels*
5. *Further studies on microfoulting*

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

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

Chief findings

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

Ottolithes 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 thelly prawn was found suitable for preparation of battered and breaded products.

Anchoviella 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 haemostatic and wound healing property of chitosan was compared with adrenaline, tannic acid and isotonic saline in gingivectomy wounds. Adrenaline was reported to be the most potent haemostatic agent followed by chitosan.

A significant increase in weight gain was observed in pigs fed with a chitin incorporated diet for 3 months.

A method was developed for pelletization of fish feed incorporating chitosan solution during the mixing and homogenisation of the ingredients.

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

Optimum conditions were worked out for preparation of surimi from mackerel, deep sea prawn, jew fish and lizard fish. A method for determination of gel strength of the surimi products using Universal Testing Machine was also standardised.

Method was evolved for preparation of a paste fishery product from lean fish meat.

Deep sea lobsters yielded better quality battered and breaded products compared to deep sea prawns.

Listeria monocytogenes *is viable in frozen storage (-18° C) for more than a year. It could however survive in fish ensilage for less than a day only.*

The pre-dominant fungi in dried fish were identified as A. niger, A. flavus, Rhizopus *and* Mucor.

Of different packaging materials tried for dried fish, metallised polyester was seen to ward off insect penetration for considerably long periods.

Research Projects Handled

1. *P-44/91(3) - Low temperature preservation of fish-Processing and product development*
2. *P-38/90 (5) - Development of heat-processed fish products in modern containers*
3. *P-41/91 (5) - Upgradation of technology in the utilisation of prawn and tuna waste*
4. *P-30/87 (5) - Utilization of deep sea resources and fish mince for product development*
5. *P-42/91 (5) - Studies on pollution, contamination and quality evaluation in seafood handling and processing*
6. *P-43/91 (3) - Studies on the modern packaging systems for fish and fish products*

Report of Work Done

Freezing

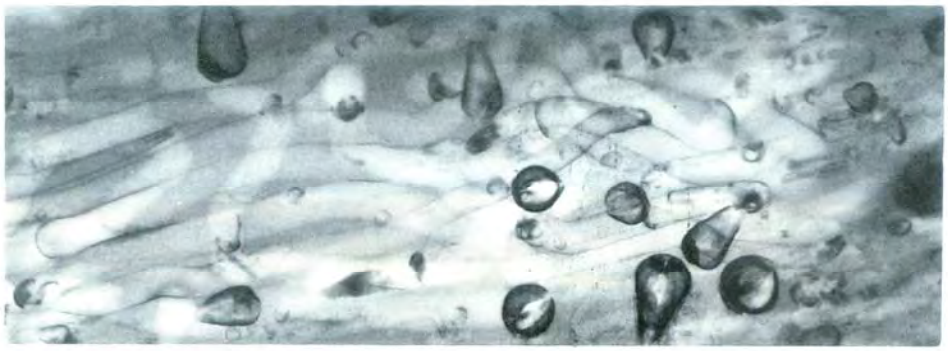
Studies were carried out on the iced storage characteristics of cultured fresh water prawn *Macrobrachium rosenbergii* and cultured brackish water prawn *Penaeus monodon*. Both samples in fresh, pre-rigor condition were slightly tough, not juicy nor very sweet. But during iced storage, the samples became tender, juicy and sweet, the characteristics further reducing with increased storage. *M. rosenbergii* remained in acceptable condition for a period of 9 days, whereas *P. monodon* had an iced storage life of 12 days.

Comparative studies on the freezing of *Ottolithes argenteus* in different forms, viz whole gutted, fillets and mince, were carried out. While frozen whole gutted fish and fillets remained in acceptable condition for more than 9 month at -20° C, the frozen minced sample became unacceptable after 7 months. Protein denaturation and changes in fat content were faster and loss of water holding capacity maximum in the minced meat compared to the other samples.

The composition and protein fractions of *Katelysia opima* were studied. Just like *Velloritta* sp. this species also had higher sarcoplasmic protein than myofibrillar protein. The connective tissue nitrogen was found to be only 3.8 mg/100g. while the glycogen content was high.

Studies were continued on the effect of natural spices/preservatives in extending the frozen shelf life of fishes. Perch chunks treated with clove, frozen and stored at -20° C were found to be in acceptable condition even after 12 months' storage. Compared to the treated samples, the untreated control samples showed higher peroxide and TBA values and became unacceptable after 8 months'

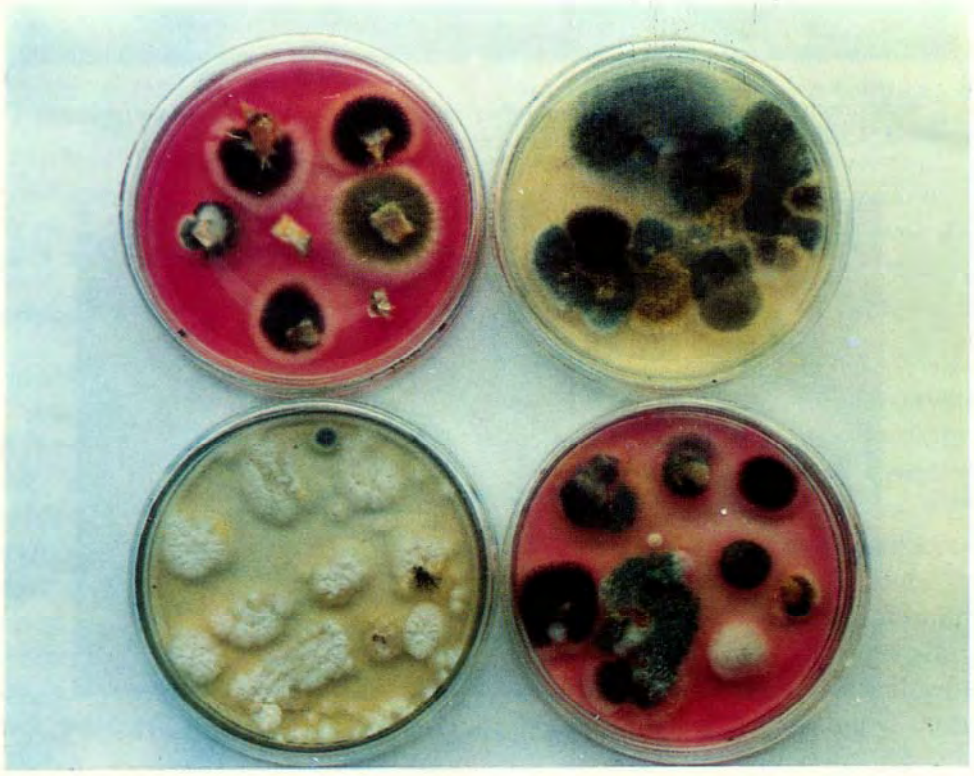
The 3.5 FRP row boat specified by CIFT for fishing in Thariode and Pookot lakes of Wynad District



Radiograph of a wooden (*Mangifera indica*) panel bored by *Martesia striata* (piddock) 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 (thelly) 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 *Actnetobacter* (35%), *Bacillus* (15%) *Corynebacterium* (15%) *Aeromonas* (15%), *Moraxella* (5%) and Yeast (15%). The flora of *Priacanthus* consisted of *Pseudomonas* (20%), *Aeromona* (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 aminoacid profile of the meat powders determined. The products were seen to possess good nutritional quality.

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

Fish fingers prepared from *Johnius 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 *Lactbacillus plantarum* was assessed periodically. *Bacillus subtilis, B. megaterium, B. firmus, B. litchenformis* 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.

Method was standardised for preparation of a paste-like product from lean fish meat. The product with soft and smooth consistency can be used as a bread spread.

Shrimp analogues were prepared using washed mince from jew fish and 'pallikora'. The cooked shrimp analogues were almost similar to cooked prawn in flavour and texture.

Optimum conditions for preparation of surimi from mackerel, deep sea prawn, jew fish, *Saurida tumbil* and lizard fish with maximum enrichment of the myofibrillar protein and minimum protein loss during washing were worked out. The best texturised surimi could be prepared from mackerel by washing the mince with 0.5% sodium bicarbonate followed by 0.5% citric acid and from others by washing for two minutes twice in water in the ratio 1:2.

A method was standardised for determination of gel strength of surimi products using the Universal Testing Machine. Stabilised surimi from catfish was prepared by addition of sorbitol and sucrose in different proportions and storage studies carried out. Surimi with gel strength 5.59 N was also prepared from *Saurida tumbil*.

Processing surimi involves several steps of washing and a sizeable portion of soluble proteins is washed off. An effective process was worked out for the recovery of water soluble proteins from these washings. About 80-85% of protein recovery was achieved. The protein so recovered had low fat concentration with 95% pepsin digestibility and could be utilised for preparation of bread spread and other products.

Various combinations of barracuda and prawn surimi in the ratios 90:10, 85:15 and 80:20 without salt and 95:5 and 75:25 with salt were tried to improve the gel strength of barracuda surimi and to get an acceptable prawn flavoured product. Addition of 15% and 20% prawn surimi improved the flavour, gel strength, water retention and folding strength and reduced cooking loss. Among the products processed with salt, 75:25 barracuda:prawn rated best.

Studies were carried out on the effect of washing and addition of 2% salt for improving the qualities of lizard fish mince, effect of addition of cryoprotectants like sucrose and sorbitol at 4% and 2% levels and changes in quality of the mince during storage at -20°C. Washing for two minutes twice with chilled water (mince to water ratio 1:2) and mixing with 2% salt gave a product with good textural properties. A combination of 2% sorbitol and 2% sucrose gave a better product than when used alone. The washed and treated

mince could be stored for 2 months at -20°C without reduction in textural properties.

Battered and breaded products were prepared from Kilimeen mince, jew fish mince, deep sea lobster and deep sea prawn. Specially prepared batter mix was used and the effect of single and double coats studied.

Incorporation of sodium glycerophosphate, glycine and monosodium glutamate inparted good flavour and texture to the products. Storage studies on fish medallions and fish bites from jew fish mince revealed quality deterioration in the prepared and frozen stored products after 4 months storage at -20°C, whereas battering, breading and frying of the original fish mince frozen stored as such gave a product with good flavour. Deep sea lobster gave better products compared to deep sea prawns.

Quality control

Seventy seven samples of frozen shrimp of export trade collected from processing factories were monitored for the incidence of *Listeria monocytogenes*. The pathogen was absent in all the samples. The organism was inoculated into shrimp and shrimp homogenate and kept in cold storage at -18°C. The viability of the organism was monitored at periodic intervals. The organism was viable for more than a year. However, when inoculated into fish ensilage (both acid ensilage and fermented), the organism did not survive for more than a day.

About ninety samples of dried fish collected from the local market were tested for the presence of fungi. The dominant fungi belonged to the species *Aspergillus niger, A. flavus, Rhizopus* and *Mucor.*

Thirty six samples of effluents were collected from eight different seafood processing factories. All the samples were free from pathogens and heavy metals like mercury, chromium and cadmium. Biological oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS), total supended solids (TSS), phenolic substances, detergent residues etc. were also estimated.

Studies on the glaze up-take and thaw drip loss in IQF shrimp have shown that in commercially processed products, glaze up-take generally varies from 7.6 to 23.7% and thaw drip loss from 4.3 to 6.19%.

Packaging of fish and fishery products

Seer fish steaks sealed in 12 micron plain PEST with 230 gauge LDPE remained acceptable upto 31 days when stored in modified atmosphere containing 80% CO_2:20% O_2 and 80% CO_2:20% air at 0-2°C, whereas the control packs having 100% air had a shelf life of only 15 days.

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% CO_2 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% Co_2 and 50% air), stored at ambient temp. and their storage characteristics studied. Although ini-

tially the MAP samples rated better organoleptically, after 3 weeks, both the packs were found to be the same organoleptically and remained acceptable for about a month.

The storage life of fried thelly prawns, with and without treatment was studied. The prawns, dried, treated with salt and citric acid and then fried could be kept for more than 3 weeks in acceptable condition at ambient temperature when packed in flexible, plain polyester/LDPE pouches. On the other hand, the product obtained after drying followed by frying without being subject to any treatment could be kept for only 2 weeks.

Different types of salted and dried fish, dry shell-on prawns and prawn pulp were packed in different types of packaging materials and stored under ambient conditions to study the efficiency of various packaging materials. Metallised polyester was found to prevent insect penetration upto 5 months. 12μ plain polyester/150 gauge LDPE was found to resist insect penetration upto 4 months.

Research Contemplated

1. *Studies on cultured prawns*
2. *Freezing and storage of fish in different forms*
3. *Freezing and storage of raw and cooked meat from* Katelysia opima
4. *Effect of natural preservatives/ spices in extending frozen shelf life of fish*
5. *Development of diversified products from fish*
6. *Preparation of surimi from shark and less utilized fish*
7. *Screening different species of fish/ shell fish with special reference to their amenability for processing in different containers*
8. *Development of new recipes for ready-to-consume fish based products*
9. *Studies on processing requirements with reference to maintenance of quality*
10. *Survey on existing canning facilities in the country, types of products available, their production, distribution etc*
11. *Quality evaluation of chitin/ chitosan and their derivatives*
12. *Studies on sodium alginate and chitosan*
13. *Chitosan films, powders and their properties*
14. *Chitin/Chitosan as an additive in animal feeds*
15. *Utilization of waste from canneries*

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 isoelecric 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.*

Aeromonas hydrophila was isolated and identified as one of the causative agents of the Epizootic Ulcerative Syndrome of the fresh water fishes of Kuttanad in Central Kerala.

Although Clostridium botulinum type D cultures were present in the mud and water samples collected from the brackishwater culture ponds near Cochin, all the cultures were non-toxigenic.

Surface contamination of dry fish with Salmonella serotype could be completely destroyed by proper sun-drying.

Prawns collected from the brackishwater culture ponds at Chellanam were seen to harbour Vibrio parahaemolyticus.

Research Projects Handled

BCN-12/91 (4) - Nutritional aspects of lipids, proteins and enzymes and minor constituents of fish and shell fish

BCN-13/91 (3) - Studies on modified fish proteins

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

Report of Work Done

Fish enzymes

Many fishes and shellfishes were screened for the presence of digestive enzymes. Of the samples, Rohu recorded highest amylase activity of 40 units/g wet weight, and prawns the lowest of 1.8 units, the content of enzyme being related to the feeding habits.

The protease activity in the pH range 2-4 was low immediately after ensilation but was quite high and stable after 24 hrs. of ensilation, the reverse being the case with neutral and alkaline proteases. Mackerel showed high autolytic activity at pH 2 to 3 and 8 to 9.

Nutrition

The amino acid as well as fatty acid composition of various samples of fish formulations were worked out and food products from deep sea fishes were evaluated for their nutritional quality. The immediate effect of salting was oxidation of lipids in oil sardine, FFA release being affected only marginally.

Pollution monitoring

The distribution of pesticides and toxic metals in fish and shell fish caught around Cochin showed their

level to be too low to cause any concern.

Fish proteins

The effect of temperature and duration of drying on the biochemical and nutritional characteristics of fish muscle proteins were investigated. Samples were drawn at different periods of drying at 50° C and 60° C and the changes in solubility in different extractants viz. water, 0.6M Nacl, 1.5M and 8M urea, 1% SDS and also the effect of pH from 2 to 10 determined. Discontinuous SDS-PAGE of the extracts of these proteins with water, 1.5M urea and 1% SDS were also carried out. The NPU, PER and BV of the samples dried at each of these temperatures for 24 hours, were determined using male albino rats. Samples dried at 60° C showed better values -viz. PER 5.65, NPU 77.6 and BV 89. Samples dried at 70° C had PER 2.69, NPU 61 and BV 73.8 only. Pepsin digestibility of the samples decreased from 78% (for fresh fish) to 68% for fish dried at 50° C for 24 hours.

Drying curves were similar upto 8 hrs. of drying after which samples at 60° C recorded lower moisture values. Solubility of the proteins was minimal at pH 4-5 and showed little change with drying at 50° C. But the minimum solubility increased slightly as the drying progressed at 60° C.

In the pH extremes of 2 and 10, solubility decreased as drying progressed. The sulphydryl content showed an initial increase during the first 4 hrs. in the case of samples dried at 50° C, but decreased with drying time after this. At 70° C, decrease in SH was noted after 2 hrs. drying. After 24 hrs. the value was 14% of the original value.

Modification of fish muscle fibrillar proteins by acetylation and succinylation was tried in order to improve their functional properties. Attempts to modify the whole soluble muscle proteins did not give very satisfactory results though different extraction and modification procedures were tried for this purpose. Removal of sarcoplasmic proteins and subsequent extraction of myofibrillar proteins for further modification resulted in poor yield of myofibrillar proteins due to reduced extraction from the residue after extraction of the sarcoplasmic proteins. Initial washing off of the sarcoplasmic proteins without blending and subsequent extraction could help to overcome this problem partially. The proteins extracted in this way from lean as well as fatty fishes of fresh water and marine origin were then modified by acetylation/succinylation by gradual addition of an equal amount of the corresponding anhydride at 0-4° C and at a constant pH of 7.5. Excess anhydride and salts were dialysed off

to separate the modified fish proteins and their properties were studied. Viscosity and emulsifying capacity were generally found to increase substantially as a result of modification. Electrophoretic patterns also showed considerable variations. Succinylation was found to yield better products than acetylation. 73% of the free amino groups could be succinylated by this procedure.

Changes in solubility characteristics of fish proteins at different pH values as a result of modification were also studied. Of the species studied, mackerel proteins alone differed from the others in their behaviour during and after modification.

Surgical sutures

A laboratory model of a device which forces water through fish gut was designed and tried for cleaning the guts for preparation of surgical sutures from fish. Efforts are being made to conduct detailed studies on the use of the sutures prepared from fish guts on human volunteers in order to ascertain their absorbability, tissue reaction and other characteristics.

***Listeria* in fish/fishery products**

Fresh fish/shell fish/cured fish samples of local trade were examined for the emergent pathogen *Listeria monocytogenes* and related pathogens. Of the 1270 presumptive cultures isolated, 338 were identified as *Listeria* spp. They comprised mainly of *Listeria innocua, L. seeligeri, L. grayii and L. ivanovii*. None of the cultures was identified as *L. monocytogenes*. Since *L. innocua* differed from *L. monocytogenes* only in beta-haemolysis, six chosen cultures of *L. innocua* isolated from fish/shell fish were tested for the virulence factors in the Institute for Genetic Microbiology, Germany and it was reported by them that these strains were lacking virulence associated genes and hence were non-virulent.

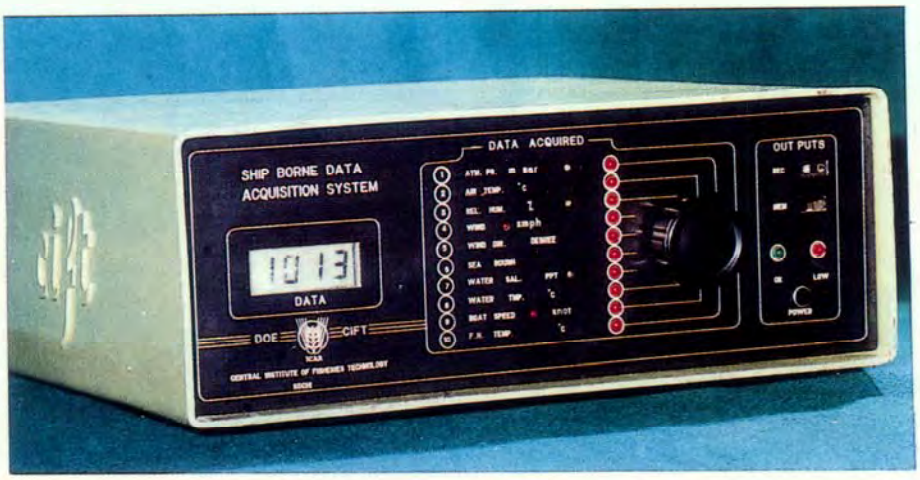
Epizootic Ulcerative Syndrome (EUS) in fresh water fishes of Kuttanad

The fish disease-Epizootic Ulcerative Syndrome-that ravaged the fresh water fishes of Kuttanad lake was investigated. Fiftyfive fish samples, both affected and apparently healthy, belonging to 9 different species, namely snake heads (*Channa striatus*), pearl spot (*Etroplus suratensis*), perch and attuvala (*Wallago attu*) from eleven locations from the affected area were collected. Water and mud samples were also taken. On an average, 15 to 20% of the catch from each net were found affected, based on visual observations. Detailed microbiological and chemical investigations were also made.

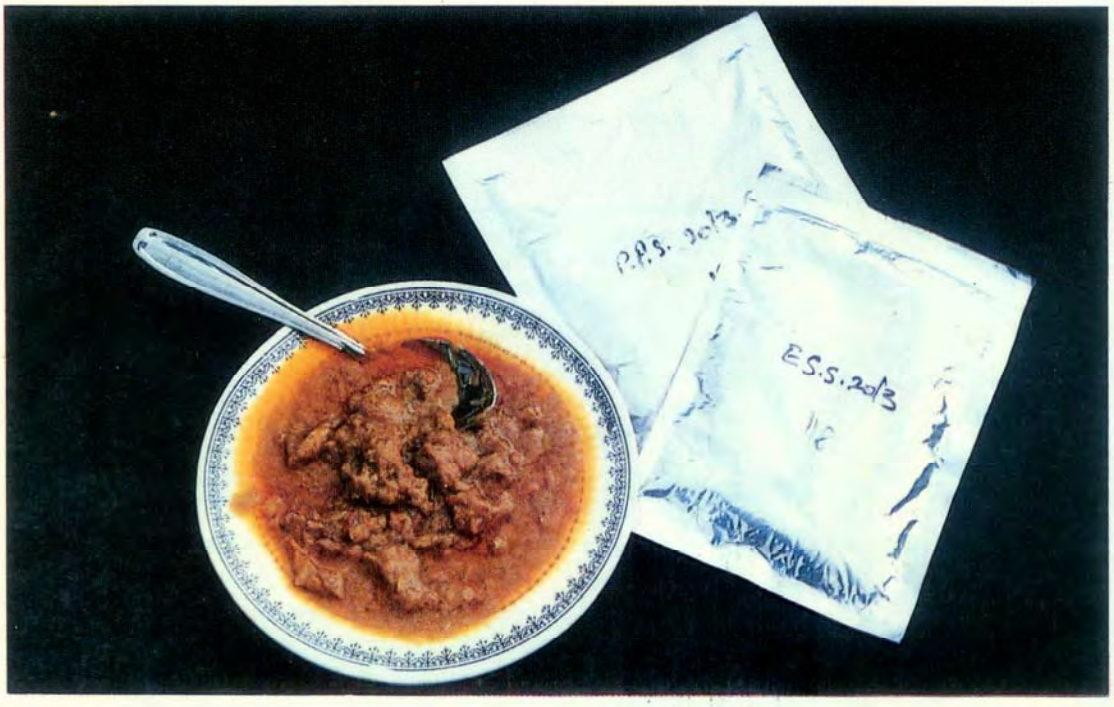
From the lesion and affected tissues of the fish and internal organs like liver and kidney, hundreds of

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

pure cultures were isolated, of which 53 cultures were distinct. The dominant Gram-negative group among these cultures was *Aeromonas*. The *Aeromonas* group was mainly constituted by *Aeromonas hydrophila* (40% of 53 cultures). Two very distinct characteristics of these *A. hydrophila* cultures were that they were very highly proteolytic and beta-haemolytic. *A. hydrophila* is a well known fish pathogen. Further, high proteolytic and beta-haemolytic potential is quite essential for ulceration of tissues. *A. hydrophila* cultures isolated were sensitive to antibiotics like gentamycin, Kanamycin, neomycin and nalidixic acid. They were readily destroyed by $KMno_4$ at levels of 2 to 5 ppm and chlorine levels of 3 to 10 ppm. Lime, paddy husk, ash and wood ash at 100 to 500 ppm had no effect on the bacteria. They were destroyed at pH below 3 and above 10. Also, salt concentration above 5% caused death to the bacteria.

The hydrographic conditions of the water were as follows:

Salinity - 0.12 ppt to 0.3 ppt
pH - 4 to 6.5
Dissolved oxygen - 2.6 mg/litre to 3.8 mg/litre

Heavy metal concentrations like cadmium (Cd) and mercury (Hg) were within tolerable limits in water and fish tissues. In water, Cd was upto 0.177 ppm, in fish 0.038 to 0.165 ppm and in prawn 0.139 to 0.278 ppm. Hg content of water was 0.05 ppm, in fish tissue 0.29 to 0.38 ppm and in prawn 0.09 to 0.41 ppm.

Since *Aeromonas hydrophila* is known to cause enteric diseases in man, a series of studies were initiated regarding survival and susceptibility of *A. hydrophila* to heating, cooking and frying of cultures as well as inoculated fish. Based on these investigations, it has been concluded that *Aeromonas hydrophila* cells are completely destroyed when heated for 5 min. at 80° C in saline (0.85% NaCl) and tap water. The bacterial cells were also completely destroyed in 10 minutes, when the inoculated (10^6/gm fish muscle) fish fillets were cooked in 2% salt solution, 2% salt-tartaric acid solution, and in curries and also when deep-fried in vegetable oil.

Aeromonas in fresh fish

Twenty four samples of marine and brackish water fish from internal trade were examined for the presence of the emerging food poisoning bacteria, *Aeromonas* spp. with particular reference to *A. hydrophila* using both direct plating technique using starch ampicillin agar (SAA) and MPN technique using trypticase soy ampicillin broth (TSAB). *Aeromonas* were generally low in the

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± 3° 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-toxigenic.

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

Histamine producing bacteria

Fresh fish/shellfish from local trade were surveyed for the presence of histamine producing bacteria. Of the 107 presumptive cultures isolated, 32 produced appreciable amounts of histamine in in-vitro systems. They were characterised as *Aeromonas* (60%) *Enterobacteriaceae* (20%) and *Vibrio* (12%).

Halophilic bacteria

Dried/cured fish/shellfish samples of commerce were examined for halophilic bacteria. Of the 132 halophilic bacterial cultures tolerating 20% sodium chloride, 96 were red halophiles. They belonged to the genus *Halobactertum.* Thirty non-pigmented cultures present belonged to *Micrococcus* sp.

Lipolytic bacteria

Seventysix bacterial cultures isolated from fresh/processed/dry/cured fish samples were screened for the production of lipolytic enzymes. Of these, 19 cultures produced appreciable quantities of lipases. Eight cultures of the lipolytic bacteria were identified as *Pseudomonas.*

Lactic acid bacteria and fish fermentation

Three series of experiments of fish fermentation were carried out in which both natural fermentation and inoculated lactic acid bacterial fermentation were allowed. *Lactobacillus plantarum* was the culture used. Sodium chloride at various concentrations (20 to 25% w/w) were used with fishes like oil sardine and silver bellies. It was found that at the end of the fermentation, lactic acid bacteria did not survive. Residual flora was predominated by halophilic *Bacillus* spp. like *Bacillus subtilis, B. megaterium, B. licheniformis, B. firmus, B. circulans* and *B. laterosporus.*

Research Contemplated

1. *Screening of enzymes, proteinases, carbohydrases, nucleotidases in fishes and shell fishes*
2. *Distribution of chlorinated pesticides and heavy metals in fishes and shellfishes with particular reference to cultured prawns and products*
3. *Amino acid composition of cultured fishes and shellfishes and fish feeds*
4. *Loss of lipid fraction of fatty acids in oil sardines; oxidatives and hydrolytic rancidity in salted oil sardines*
5. *Modification of fish proteins by heat treatment under varying conditions*
6. *Chemical and biochemical changes in proteins and lipid*

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 incoroporated 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. Sivadas, P.K. Chakraborty, K. Sreedharan Namboodiri, P.N. Joshi, K. Ramakrishnan, K. Vijayabharathi, N. Subramonia 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 on 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

information on fuel consumption. Data are under collection.

The propeller nozzle designed and developed at the Institute was installed by one boat owner in his boat for studying its efficiency in decreasing fuel consumption.

The development work on the first model of the ship borne data acquisition system built entirely out of indigenous components was completed for operation in small vessels. The instrument will monitor ten important parameters related to marine environmental conditions, water quality and performance of the craft.

Sensors and electronic circuits for salinity and temperature measurements were developed for incorporating in the instrument 'Salinity, Temperature, pH, DO Meter'.

Sensors for relative humidity, solar radiation and temperature measurements were fabricated as part of the instrument 'Data Acquisition System for Intensive Aquaculture'.

Research Contemplated

1. *Development of low cost flue gas dryer and smoke chamber*
2. *Design of suitable drying system for production of prawn shell meal*
3. *Design of craft for efficient motorisation for the artisanal fishing sector*
4. *Development of device for measurement of fuel consumption*
5. *Development of instruments for aquaculture*
6. *Development of ship borne data acquisition system in three models*

Extension, Information & Statistics Division

Scientists associated

K. Krishna Rao, M.K. Kandoran, H. Krishna Iyer, A. K. Kesavan Nair, S. Balasubramaniam, Mary Thomas, G.R. Unnithan, 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, jewfish and small shrimp were some of the species used for drying. The production in 17 centres between Ponnani nd 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 segementation 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*

5. *Innovativeness and decision making behaviour of traditional fishermen*
6. *Studies on technological gaps among traditional fishermen*
7. *Collection of data on production and marketing information on dry fish*
8. *Price behaviour of fresh and dry fish*
9. *Consumer preference studies*

VERAVAL RESEARCH CENTRE

Scientists associated

K.K. Solanki, P.G. Viswanathan Nair, 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, Trichiurus* 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 bycatches were analysed for the quantitative composition of the species. The main components were *Acetes,* small crabs, *Coilea,* 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.*

Other pathogens were absent. Some water samples also showed high count of coliforms.

Research Contemplated

1. *Studies on escapement of fishes in trawls for conservation of resources*
2. *Standardisation of curing procedures for commercial adoption*
3. *Quality assessment of commercially cured shell fish, shark fins, air bladder etc. and their marketing aspects*
4. *Study on the present status of the curing yards and commercial practices of drying fish*
5. *Packaging and storage studies of semi-dried products at different temperatures*

KAKINADA RESEARCH CENTRE

Scientists associated

C.C. Panduranga Rao, G. Narayanappa, Sib Sankar Gupta, Subrata Basu, D. Imam Khasim Saheb, R. Chakraborthi, M.M. Prasad, S.V.S. Ramarao, J. Sitaramarao.

Chief findings

The rope trawl continued to give better catches than the bulged belly trawl with the catch being dominated by silver bellies and ribbon fishes.

Ready to-cook convenience dry fish products were prepared from marine cat fish as well as from small size Sciaenids. *The product prepared from cat fish remained in good condition even after 6 months' storage.*

Salted and dried Decapterus *had longer storage life than the dried, unsalted fish.*

Proptonic acid treated, pressed and salted Decapterus *packed in 200 gauge polythene bag was acceptable for 65 days at ambient temperature compared to the untreated sample which was acceptable only for 28 days under similar conditions.*

Research Projects Handled

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

Report of Work Done

Fishing gear

Comparative fishing experiments were continued with the improved high opening trawl and the so called BOBP trawl to assess their relative efficiency. The operations were carried out in the depth range 10-25m. As in the previous year, the catch rate per hour of trawl was better than that of the BOBP trawl. Analysis of the catch composition showed that anchovies constituted

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, marinaded 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. colt,* 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 murrels 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*

4. *Screening of fish/shell fish for pathogens*
5. *Effect of cold shock on cultured fishes*
6. *Development of meat separation unit*
7. *Examination of fish and shell fish for hazardous chemicals including heavy metals, pesticide residue and poly-aromatic carbons*
8. *Development of various products and by-products*

BURLA RESEARCH CENTRE

Scientists associated

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

Chief findings

An 8.5m midwater trawl with four otter bords 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 fishing technique for the exploitation of reservoir fishery resources*
2. *P-39(B)/90 (5) - Studies on fish preservation and development of appropriate packaging for processed 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

field trials initiated with a view to arriving at an optimum mesh size and twine size combination for exploitation of the major carp and other minor fishery resources.

Fish processing and preservation

R. cotio packed with crushed ice in the ratio 1:1 in plastic carry bags with inside insulation of polyethylene foam sheet stored in excellent condition for 17 and 22 hrs. when the insulation thicknesses were 10mm and 20mm. respectively.

The storage condition of major carps packed in bamboo baskets with three different inner linings was also studied. The fish, pre-chilled to about 0-2°C and packed in 1:1 crushed ice, was packed in three bamboo baskets, each with a different inner lining, viz. sal leaves, double layer 300 gauge LDPE film and 20mm. thick polyethylene foam sheet, before being transported to Howrah by rail. Of the three lots, the condition of the fish packed in baskets lined inside with the polyethylene foam sheet was seen to be the best when examined after 26 hours at the receiving end.

Processes were evolved for preparation of cutlets and fish loaf from minced meat of *W. attu*. The products were block frozen and the blocks cut to 10mm thick slices, packed in 200 gauge pouches individually and stored at -10°C. Quality studies show that the frozen stored cutlet and loaf are acceptable for 6 months and 4 months respectively.

Fresh *M. tolae*, a locally available small variety of fresh water prawn, was packed in 300 gauge LDPE pouches in 50g. portions and stored under crushed ice. The fish could be ice stored for seven days in acceptable condition. The ice storage period could be enhanced to ten days if fish is treated with water at 70°C for 10 seconds prior to packing in 300 gauge LDPE pouches. In the case of *R. cotio*, the ice storage period was extended to 11 days if treated with water at 60°C for 30 seconds prior to packing compared to the 8 days for the untreated, control sample.

Comparative storage studies were also carried out with *S. silondia* mince washed once and five times with potable water before packing in 300 gauge LDPE pouches and storing at -10°C. The sample washed once had a storage life of 6 months compared to $4^1/_2$ months of the control and 5 months of that washed five times.

Research Contemplated

1. *Efficiency of two board and four board midwater trawl*
2. *Scope ratio studies*

3. *Studies on availability of fishes at surface and column zones*
4. *Standardisation of mesh size/twine size combination for major carp and minor fishery resources*
5. *Light fishing*
6. *Evaluation of existing packages/ development of new ones for fresh/ processed fish products*
7. *Packaging and storage of live fish*
8. *Development of value added products from low cost fresh water fishes*
9. *Shelf life studies of iced and frozen fresh water fish and prawn*

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 'kashi' and belongting to family Mullidae *and* Priacanthidae *was 42-45% and 35% respectively.*

The shelf life of frozen stored fish belongting 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 acceptable 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

and coagulase positive *Staphylococci* were prevalent in the pre-processing, peeling and landing centres of Bombay. Salmonella content in samples of water collected from pre-processing centres was seen to be more during the year when compared to the previous year. NAG type *V.cholerae* was isolated from raw shrimp. *V.cholerae* O.1 group was however not detected. *Listeria monocytogenes* was also not found in any sample of cooked frozen squid and cuttlefish.

Research Contemplated

1. *Studies on the occurrence and survival of pathogens with respect to* V. parahaemolyticus *and* L.monocytogenes
2. *Survey on the presence of* V.cholerae *and* L.monocytogenes *in IQF shrimp and lobster*
3. *Studies on value added products such as minced meat, mixed fish frozen in small pouches etc.*

CALICUT RESEARCH CENTRE

Scientists associated

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

Chief findings

Survey on retail marketing and quality of cured fish in Wayanadu Dist. was taken up and completed.

Thermal treatment of refined and preservative treated commercial cured fish followed by packing in polythene bags or in gunny bags sprayed externally with pyrethrum, gingelly oil or hydnocarpus oil delayed insect infestation considerably.

Good quality beche-de-mer could be prepared from salted Holothuria

Fishes like 'choodai', 'netholi' and small Indian oil sardine can be preserved for 1-2 days with added preservative.

Addition of a few drops of cashewnut shell liquid to the surface of the fish and covering the container with gunny sprayed with hydnocarpus oil or gingelly oil delayed blowfly infestation of fish in brine pickle in commercial curing sheds.

Fish curry can be stored in acceptable condition for 2 weeks at room temperature when packed in 75µ LD/BA/Nylon/BA/Primacor bags.

Processes were standardised for preparation and storage of fried prawn meat, fied fish slices and fish 'thoran' for 3 months, 2-4 weeks and 5 days respectively. Process details for preparation of ready-to- eat cooked, smoked and dried mackerel fillets with a storage life of 3 months have also been worked out.

Cooked, flaked, smoked and dried tuna flakes of quality similar to masmin were prepared from Euthynnus affinis *by a simpler process involving only one third the time required for preparing the traditional masmin.*

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 12μ 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 75μ 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. Mhalathkar, 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:

Cruise No	*Period*	*Participants*
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

99	10 March-10 April '92	P.A. Panicker S.V.S. Ramarao M.D. Varghese M.V. Baiju M.R. Boopendranath N. Subramonia Pillai M.S. Fernando M.S. Rajan A.K. Jaisingh K. George Joseph P.R. Girija Varma K. Viswambharan A.A. Kunjappan

M.V. Saraswathy:

91/11	14 - 20 Jan. '92	V.C. George P. George Mathai A.K. Jaisingh
91/12	21 Jan-1 Feb. '92	V. Vijayan A.K. Jaisingh
91/13	9-18 Feb. '92	M.D. Varghese

EXTENSION AND CONSULTANCY

Training and demonstration

In-plant training in Refrigeration and Airconditioning was given to three candidates sponsored by Govt. Polytechnic, Kalamassery, from 1 April to 29 June 1991.

Training programmes in Quality Control were organised by the Quality Development Centre of the Export Inspection Agency, Madras, in collaboration with CIFT for the benefit of participants of the 13th, 14th, 15th and 16th Fish Processing Technologists Training Courses held from 16-23 April 1991, 5-12 August 1991, 9-16 Dec. 1991 and 23-30 March 1992 respectively. In all, fifty technologists attended the training programmes.

Training in Quality control testing methods of fishing gear materials was imparted to three candidates sponsored by Fish Net Making Plant, Tungabhadra Board, Bellary Dist., Karnataka from 4-16 Sept. 1991.

Training in Quality control of seafoods was held from 21 Oct. to 2 Nov. 1991 in which eight candidates sponsored by fish processing establishments in and around Cochin participated.

Training-cum-demonstration was held for the benefit of participants of training course on Fish processing technology organised by Trainers' Training Centre, Narakkal, in collaboration with CIFT from 4-12 Dec. 1991.

Training in Production of value added fish products was held at Thumpoly, Alleppey Dist., Kerala from 16-19 Dec. 1991 in which nine coastal women participated. The programme was sponsored by MATSYAFED.

Training in Production of fish pickle was imparted to a candidate sponsored by Science and Technology Entrepreneurship Devt. (STED) Project, Balasore, Orissa on 21 & 22 Dec. 1991.

Training was imparted to ten girls sponsored by Ernakulam Social Service Society in Production of value added fish products from 3-6 March 1992.

Training in Fishing and fish processing was held for the benefit of eight officials of the South Indian Federation of Fishermen Societies (SIFFS) Trivandrum, from 16-20 March 1992.

A few training programmes were also organised by the Institute at Quilon in association with MPEDA as shown below.

1) Hygienic handling and processing of oysters/mussels

2) Hygienic handling and processing of octopus

3) Hygienic handling and processing of lobsters

4) Hygienic handling and processing of crabs

5) Fish filleting

The Kakinada Research Centre organised training programmes on Processing laminated Bombay duck, frozen pomfret and frozen ribbon fish at Digha and Calcutta from 21-24 Jan. 1992 in collaboration with MPEDA, Calcutta, in which seventyfive candidates participated.

The Centre also conducted the following training programmes in association with MPEDA, Visakhapatnam.

1) Hygienic handling of raw material at pre-processing Centres-at Kakinada, Vizag, Pamarru and Bhimavaram : No. of participants, 200

2) Hygienic handling of prawns/ fishes on board the vessel-at Kakinada and Machilipatnam : No. of participants, 80

3) Re-orientation programme for processing workers/graders in processing plants-at Kakinada, 22-25 Jan. 1992.

In association with MPEDA, Bhubaneswar, the Centre organised training-cum-lectures on Hygienic handling of prawns/fish, filleting of fish, processing of shark fin rays and fish maws at Paradeep, Puri and Bhubaneswar.

At Burla Centre, twentyfour in-service trainees deputed by FTI, Balugaon, were trained in two batches in Sept. 1991 and Feb. 1992 in the different aspects of Improved fishing gear and post harvest technology of fish. The Centre also demonstrated the operation of the improved gill net for reservoir fishing for the benefit of fishermen engaged in fishing in Aliyar reservoir, T. Nadu from 14-24 Nov. 1991.

At the Bombay Centre, training was given to ten candidates in the general aspects of Quality control and microbiological analysis of fish and fishery products for a period of fifteen days.

Demonstrations were also conducted on handling shrimp, squid, cuttle fish and lobster as also general sanitation and hygiene of the fish graders and peelers of fish processing establishments at Thane and Vashi, New Bombay.

The Calicut Centre imparted training to a local party on re-processing and retail packaging of commercial cured fish. A prospective entrepreneur was also given training in the preparation of fried mussels.

Technical Guidance/Consultancy

A feasibility report was prepared on the use of ice boxes for fish transportation supplied by BOBP Madras. Among the different materials used for fabrication of the ice boxes, HDPE was seen to give the best results with regard to thermal insulation as also transport worthiness tests like drop test, rolling test and vibration test.

Technology on production of chitin was given to M/s. India Seafoods, Cochin who have since adopted the technique and started commercial production and export.

A scheme for production of value added fish products was supplied to MATSYAFED, Trivandrum.

A feasibility report on Stabilized Feed Technology for Small Scale Production of Shrimp/Fish Feed was prepared and issued to M/s Alsa Marine & Harvests Ltd., Madras, one of the leading agriculturists in Nellore (A.P).

Under the technical assistance of the Institute, the sales of 'Surya' brand fish products of Vanitha Fish Processing Unit (DWCRA Group, Kannur Block) was inaugurated on 11 April 1991. The products are being prepared as per process know-how released by the Institute.

The Institute undertook stage-wise inspection and appraisal of deep sea and distant water fishing vessels constructed under the financial assistance scheme extended by various financing institutions. Assistance was also offered to the boat building industry in different aspects of boat building.

Theory and practical classes continued to be held for post graduate students of Cochin University B.F.Sc students of Fisheries College, Panangad, and State Govt. Officials.

The Scientists were also called upon on many occasions to deliver lectures for the benefit of participants of various training programmes/Refresher courses held from time to time by the Institute, the State and Central Govt. Organisations.

Reply to Technical Queries

Technical queries continued to be received from different parts of the country as well as abroad on various aspects related to fishing, fish processing, fisheries engineering and allied aspects. Some of the topics on which queries were received are listed below.

Fishing Technology

— On the use of cashewnut shell liquid for preparation of marine paints

— Corrosion of propellers-possible causes and remedial measures

— On potable and composite type instruments developed at the Institute for use in pisciculture, operation of hatcheries and survey of reservoirs

— On fabrication of tuna long line

— Requirements for a fishing gear laboratory, electronic and equipment laboratory and a survey of fishing vessels laboratory

— Impact of fishing activities in the backwaters of Kerala

— Information on various types of fishes caught in the Indian and adjacent waters, areas from where caught, peak fishing periods, expected yield, recommended methods of fishing, areas where foreign vessels are located etc.

Fish Processing Technology

— Yield of different varieties of prawns, wastage of raw material etc. in prawn processing establishments

— Quality of water used for fish processing

— On the viability of liquid nitrogen freezing

— Estimate for setting up a fish market and retail stall

— Information on processing fish surimi, clam meat handling and processing

— On processing jelly fish and comments on steps to be taken to overcome effects of jelly fish venom

— Comments on utilisation of prawn head and shell waste for conversion into useful products

— Comments on suitability of application of chitosan coating on duplex board to improve its quality

— Method for preparation of chitosan solution

— Scheme for production of value added products

Comments on converting solid wastes into dried products for controlling environmental pollution

Analysis of Fishery Products/ Materials

The Institute at its Headquarters undertook analysis of samples of fish and fishery products, raw materials, craft and gear materials etc. received from indigenous processors and manufacturers and issued analysis reports with comments on improvement of quality wherever required. Details of samples analysed are given below

Particulars of samples	*No. analysed*
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.

	Publications	*No. issued*
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

Exhibitions

The Society of Fisheries Technologists (India), in collaboration with the Institute, held an exhibition at the Govt. High School, Narakkal, in connection with World Literacy Day on 8 Sept. 1991. More than 1000 students visited the exhibition. A few films were screened on the occasion. An exhibition was also held at the Institute in connection with the National Workshop on Low Energy Fishing organised by the Society.

Exhibits comprising fish products were supplied for display at an exhibition at Kaitharam, N. Parur.

Samples of fish products, a few photographs and charts were sent to Council for display at two exhibitions organised by the Govt. of India-one in connection with Commonwealth Parliamentary Conference held in Sept. 1991 and the other held in connection with a Workshop on Technical Cooperation in Developing Countries in Oct. 1991.

The Institute actively participated in the All India Agricultural, Industrial and Cultural Exhibition held at Quilon during Dec. '91 - Feb. '92.

A few fish products were sent for display at a Science Exhibition held at Govt. Girls High School, Kodungallur, from 11-19 Jan. 1992. The Exhibition was organised by the Kerala Sastra Sahitya Parishad.

In connection with inauguration of the 'Fish-Tech' Cooperative Society Ltd-a SC/ST Women's organisation set up with technical assistance of CIFT and financial support of Dist. Industries Centre, Govt. of Kerala - the Institute organised a mini exhibition at Malipuram on 31 Jan. 1992.

The Institute set up a stall at the 9th Indian Seafood Trade Fair held at Cochin on 7, 8 & 9 Feb. 1992. The Fair was organised by the Marine Products Export Development Authority in association with the Seafood Exporters' Association of India and the Taj Group of Hotels.

Summer Institute

A Summer Institute on Modern Techniques of Testing Fish and Fishery Products for Food and Feed was held at this Institute for a period of three weeks from 6-25 May, 1991. The 'Institute' was organised to impart knowledge on the latest testing techniques adopted in the western laboratories for testing the quality of food products and feeds prepared from marine products. Thirty participants comprising food technologists. University teachers and researchers participated in the 'Institute'.

Radio/TV. Talks, Press Release etc.

Ten radio talks on various topics as shown below were broadcast over All India Radio, Trichur/Cochin, during the year:

1. Innovations in fishing technology and processing - Shri. K.C. Purushothaman
2. Basic factors in adopting new scientific recommendations by the farmers/fishermen - Dr. M.K. Kandoran
3. Low cost technologies and job orientation programmes of CIFT - Shri. K.C. Purushothaman
4. Value added products from low cost fishes - Shri. P. Madhavan
5. Extension programmes of CIFT for development of the fishery industry - Shri. K. C. Purushothaman
6. Fishing methods - An interview with Dr. B. Meenakumari
7. Modern trends in mechanised fishing - Dr. K. Gopakumar
8. Different types of fishing nets - Shri. V.C. George
9. Proper preservation methods for fish - an interview with Dr. K. Gopakumar
10. Development of the fishery industry - role played by CIFT - Dr. K. Gopakumar

Dr. P.K. Surendran, Sr. Scientist, participated in a T.V. discussion programme on 'Fish Epidemic in Kuttanadu' telecast by Doordarshan Kendra, Trivandrum, on 11 Oct. 1991.

A number of press releases were also made during the year on various activities/achievements of the Institute as also topics of interest related to the fishery industry.

TRAINING/DEPUTATION OF SCIENTISTS

Within the country

Shri. K. Ramakrishnan, Scientist (SG) participated in training course on Electronics and Instrumentation in Flow Measurements conducted by Fluid Control Research Institute Palghat, 24-26 Sept. 1991.

Shri. V.C. George, Principal Scientist, attended Course on Agricultural Research Project Management at NAARM, Hyderabad, 8-19 Oct. 1991.

Shri. K.V. Mohan Rajan, Scientist (SG) attended Course on Training of Trainers at NAARM, Hyderabad, 15-16 Oct. 1991.

Shri. H. Krishna Iyer, Principal Scientist, attended training course on Information Management and Research Communication in Agriculture at NAARM, Hyderabad, 26 Nov. - 6 Dec. 1991.

Dr. P.T. Mathew, Sr. Scientist, attended training programme on Processing Beche-de-mer organised by MPEDA at Thirupalakudi, Ramnad Dt., T. Nadu, 18-20 Feb. 1992

Abroad

Dr. K. Gopakumar, Director, attended 7th Session of the FAO - IPFC Working Party on Fish Technology and Marketing at Indonesia, 24-27 Sept. 1991 and presented seven papers.

Shri. A.G. Radhakrishnan, Scientist (SG) attended training course on Pesticide Residue Analysis in the Pesticide Management Section of Natural Resources Institute (NRI), Chatham, Kent, U.K., 2 Sep. 1991 - 10 Jan. 1992. While there, he attended two Seminars, viz.

1) Accreditation of laboratory work and good laboratory practice at NRI, U.K.

2) High resolution chromatography at the Royal Society of Chemistry Auditorium, London.

Dr. K.G. Ramachandran Nair, Sr. Scientist and Shri. A. Vasanth Shenoy, Scientist (SG) were also deputed to NRI, UK, for the training course on Handling and Quality of Fish in Tropics, 9 Sept. - 29 Nov. 1991.

Shri. P.A. Perigreen, Scientist (SG) worked as National Consultant to BOBP in their project on Cleaner Fishery Harbours. A base line survey was conducted of the present status of three major fishery harbours in the Bay of Bengal region, viz. Tuticorin, Madras and Kakinada.

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. Madhavan, Principal Scientist, participated in the Seminar on Aquaculture at Madras, 30 Sept. 1991.

Dr. D. Imam Khasim, Sr. Scientist, participated in National Workshop on Kolleru Lake Environment Information System at J.N.T.U. Hyderabad, 4 & 5 Oct. 1991 and presented a paper.

Dr. T.S.G. Iyer, Principal Scientist, attended Technical Workshop on Processed Food Sector under Indo-EEC Co-operation Programme organised by Bureau of Indian Standards, Cochin, 28 Oct. - 1 Nov. 1991.

Shri. G.R. Unnithan, Scientist (SG) attended Summer Institute on Forecasting Technology organised by Indian Agricultural Statistics Research Institute, N. Delhi, 11-30 Nov. 1991.

Dr. T.S.G. Iyer, Principal Scientist, Dr. P.T. Lakshmanan, Dr. P.K. Surendran, Sr. Scientists and Sh. P.D. Antony, Scientist (SG) attended Scientific Conference on Fish Disease in Kerala, organised by State Committee on Science and Technology, Cochin, 22 Nov. 1991. A paper was presented at the Conference.

Dr. P.T. Mathew, Sr. Scientist, participated in the All India Symposium on Algal Resources, their Management, Biology, Chemistry and Utilization, Trivandrum, 25-27 Nov. 1991 and presented a paper.

Dr. T.K. Sivadas, Principal Scientist, participated in the IEEE Conference at Trivandrum, 29 & 30 Nov. 1991 and gave an invited talk on Electronics and instrumentation for agriculture and ocean sciences.

Dr. T.K. Sivadas also participated in the National Symposium on Electronics for Rural Development organised by Institution of Electronics and Telecommunication Engineers at CSIO, Chandigarh, 5 & 6 Dec. 1991 and gave an invited talk on Electronics and instrumentation for agricultural field investigations.

Dr. T.K. Sivadas and Smt. K. Vijayabharathi, Scientist (SG) participated in National Symposium on Ocean Electronics 1991 organised by Cochin University of Science & Technology, 18-20 Dec. 1991. Dr. Sivadas gave an invited talk on Electronic instrumentation for fisheries and ocean sciences.

Dr. K.G. Ramachandran Nair, Principal Scientist, attended Workshop on Prawn Farming for Farmers organised by Choice Canning Co. at Cochin, 11 Jan. 1992 and gave a talk on prawn feed.

Dr. K. Gopakumar, Shri. P. Madhavan and Dr. M.K. Mukundan attended National Symosium on Application of Biotechnology in Medicine, Trichur, 11 & 12 Jan. 1992.

Dr. K. Gopakumar also attended Seminar on Modernisation of Food

Processing Industries organised by Confederation of Indian Food Trade and Industry, New Delhi, 16 Jan. 1992.

Shri. M.V. Baiju, Technical Officer, participated in Seminar on Fuel Conservation in Fishing Vessels conducted by Bharat Petroleum at Munambam, 23 Jan. 1992.

Dr. C.C. Panduranga Rao, Shri. G. Narayanappa, Principal Scientists and Dr. D. Imam Khasim participated in National Seminar on Strategies for Development of Fisheries in Andhra Pradesh, conducted by Andhra Pradesh Agriculture University, Kakinada, 30 & 31 Jan. 1992. A paper was also presented at the Seminar.

Dr. T.K. Sivadas participated in International Technology Congress (WISITEX '92) at Delhi, 5-8 Feb. 1992 and gave an invited talk on Instrumentation systems for ecological studies.

S/Shri. P.A. Panicker and V.C. George, Principal Scientists, participated in Colloquium on Impact of Motorisation of Fishing Units in Kerala, conducted by Kerala Fisheries Society at Centre for Development Studies, Trivandrum, 6 Feb. 1992.

Shri. S. Ayyappan Pillai, Principal Scientist, participated in Seminar on Conservation of Diesel and Lubricants for Fishing Boat/Trawler Operators organised by Indian Oil Corpn. Ltd. Trivandrum and held at Quilon, 11 Feb. 1992 and presented a paper.

Shri. Ayyappan Pillai also participated in the Awareness Programme on Conservation of Diesel and Lubricants for Fishing Boats organised by Indian Oil Corpn. Ltd., Cochin, 16 Feb. 1992 and presented a paper.

Shri. T.K. Srinivasa Gopal, Scientist (SG), attended Round Table Conference on Progress in Food Processing through Aluminium Packaging, organised by the Aluminium Assn. of India in collaboration with Indian Institute of Packaging, Bangalore, 13 Feb. 1992.

Smt. K.V. Lalitha, Scientist (SG) participated in the 4th Kerala Science Congress organised by State Committee on Science, Technology and Environment, Kerala, at Trichur, 27-29 Feb. 1992 and presented a paper.

Dr. K. Gopakumar, Director, S/ Shri. V.C. George, K.K. Balachandran, Principal Scientists and Shri. V. Annamalai, Scientist, attended Fishermen Development Seminar conducted by Alleppey Diocesan Charitable and Social Welfare Society, Alleppey, 14 & 15 March 1992. Three papers were presented at the Seminar. Dr. Gopakumar also presented the Keynote paper on Problems of fishermen of Kerala in the fish processing industry.

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 CIFNET

Consultative Committee of Integrated Fisheries Project, Cochin

Management Committee, Krishi Vigyan Kendra, CMFRI, Narakkal

Extension Council, CIFE, Bombay

Board of Examiners, CIFE Bombay

Rural Programme Advisory Committee, AIR, Trichur

Committee on granting subsidy for improving and upgrading the cold storage and freezing units, MPEDA, Cochin

Working party of the Indo-Pacific Fisheries Commission

Working Committee of the International Union of Nutritional Sciences, IUFOST/IUNS Committee III/9

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

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

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

As Reviewer

Asian Fisheries Fellowship Award (Post-Harvest Technology)

Shri. P.V. Prabhu, *Principal Scientist*

As Principal Member

BIS, AFDC- 27:5, Fish Meal Sub Committee

Shri. P. Appukutta Panicker, *Principal Scientist*

As Principal Member

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

As Member

Consultative Committee of Fisheries Survey of India, Cochin zone

Working Group of Sagar Sampada

Expert Committee of MPEDA on Evaluation of Fishing Vessel Projects

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

Committee for Review of Registration of Fishing Vessels

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

Expert Committee on Stake/ Chinese Dipnet Fishery of Kerala

Committee on the Fuel Requirements of Deep Sea Fishing Sector

Committee on Licensing of Fishing Gear for Deep Sea Vessels

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

Committee of DOD on Antarctica Krill Programme of FORV Sagar Sampada

As Advisor

UPSC Selection Board for Fisheries

Dr. K. Ravindran, *Principal Scientist*

As Member

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

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

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

As Expert

Advisory panel constituted by Govt. of Kerala to study the impact of ban on bottom trawling imposed during the monsoon in Kerala

As TIFACLINE Expert

Dept. of Science and Technology, Govt. of India

As Examiner and Subject Expert

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

As Research Guide

Kerala University and Cochin University of Science & Technology

As Honorary Consultant

International Ferrocement Research Centre, Bangkok, Thailand

Shri. V.C. George, *Principal Scientist*

As Advisor

UPSC Selection Board for Fisheries

As Examiner

Engineer, Fishing vessels course at CIFNET

Shri. S. Ayyappan Pillai, *Principal Scientist*

As Member

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

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

Committee on Agro-forestry for aforestation 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

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

As Member

ICAR Regional Committee Zone V

Dr. T.S. Gopalakrishna Iyer, *Principal Scientist*

As Member

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

Board of Studies, Cochin University of Science and Technology

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

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

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

As Supervising Guide

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

Dr. T.K. Sivadas, *Principal Scientist*

As Member

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

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

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

Implementation Committee of DOD for Scientific Instruments on board Sagar Sampada

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

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

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

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

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

Shri. Cyriac Mathen, *Principal Scientist*

As Member

Selection Committee, Mangalore and Calicut Centres of CMFRI

Shri. K.K. Balachandran, *Principal Scientist*

As Principal Member

BIS, AFDC - 27: 1, Canned Fish Products Sub-Committee

As Member

Vidyalaya Management Committee, Kendriya Vidyalaya, Ernakulam

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

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

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

Regional Selection Committee, Navodaya Vidyalaya Samiti, Hyderabad Region

As Research Guide

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

Dr. K. Devadasan, *Principal Scientist*

As Examiner

Different Selection Committees of CMFRI

As Member

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

As Supervising Guide

Ph.D Programme of Cochin University of Science and Technology

Shri. H. Krishna Iyer, *Principal Scientist*

As Member

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

Dr. M. Arul James, *Principal Scientist*

As Member

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

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

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

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

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

As Member

Selection Committee of CTRI, Rajahmundry

Consultative Committee, FSI, Visakhapatnam and Madras

Shri. T. Joseph Mathai, *Scientist (SG)*

As Member

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

Dr. K.N. Kartha, *Sr. Scientist*

As Member

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

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

As Member

Consultative Committee of FSI Mormugao Zone

Town Official Language Implementation Committee

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

As Member

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

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

Dr. P.K. Surendran, *Sr. Scientist*

As Subject Expert

Doctoral Committee, Cochin University of Science and Technology

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

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

As Supervising Guide

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

Dr. P.T. Lakshmanan, *Sr. Scientist*

As Supervising Guide

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

As Subject Expert

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

Dr. M.K. Mukundan, *Sr. Scientist*

As Subject Expert

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

As Member

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

As Supervising Guide

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

As Examiner

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

As Guest Lecturer

M.Sc. Mariculture of Cochin University of Science & Technology conducted by CAS of CMFRI

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

Dr. Jose Stephen, *Sr. Scientist*

As Member

Board for assessing progress of Ph.D. candidates

As Supervising Guide

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

As Examiner

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

Shri. 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

Shri. Sib Sankar Gupta, *Scientist (SG)*

As Member

Panel of Experts, EIA, for approval of processing plants

Selection Committee, CIFA, Kakinada

Dr. N. Unnikrishnan Nair, *Sr. Scientist*

As Subject Expert

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

As Member

Task Force on Biological Sciences, State Department of Science, Technology 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

Shri. K.V. Mohan Rajan, *Scientist (SG)*

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

Dr. M.D. Varghese, *Sr. Scientist*

As Subject Expert

Doctoral Committee, Cochin University of Science and Technology

Shri. M.M. Prasad, *Scientist*

As Member

Panel of Experts, EIA, for approval of processing plants

Dr. P.J. Cecily, *Technical Officer*

As Life Member

Indian Science Congress Association, Calcutta

As Member

Asian Fisheries Society, Indian Branch

Smt. K. Radhalakshmi, *Technical Officer*

As Alternate Member

BIS TXDC-18 Textile Materials for Marine/Fishing Purposes

NATIONAL SCIENCE DAY

The sixth National Science Day was observed on 28 February 1992. A training programme on Composition and Nutritional Quality of Fish was organised for the benefit of post graduate students drawn from various educational institutions. Twenty students from two local colleges attended the training. The topics covered included nutrient composition of fish, fish muscle proteins and their nutritional significance, and lipids and lipid soluble vitamins in fish and their nutritional significance. Demonstration was also conducted of the various equipments/facilities for nutritional evaluation available at the Institute.

'WOMEN IN AGRICULTURE' DAY

The 'Women in Agriculture' Day was observed at Cochin on 4 Dec. 1991. A mini exhibition was organised at Manasseri, a fishing village near Cochin, at which a number of speciality and value added fish products, fish by-products, fishing gear materials and catching devices etc. were displayed. A film show was also conducted. These programmes attracted a large number of men, women and children of the village who evinced keen interest in the various developmental activities of the Institute.

OFFICIAL LANGUAGE IMPLEMENTATION

The OLIC programmes of the Institute for the year 1991-92 were implemented as per the instructions laid down by the Ministry of Home Affairs.

The quarterly OLIC meetings reviewed the implementation activities of the Institute. The monthly/quarterly reports of implementation pertaining to the Headquarters and Research Centres were sent to both Council and Official Language Dept. for inclusion in the report to the Secretariate.

Hindi Workshops were organised at the Headquarters from 22-27 April, 1991, 1-6 July 1991, 16-21 Sept. 1991 and 20-25 Jan. 1992. Fifty seven members participated in these Workshops. Certificates, Course materials etc. were distributed to the participants. These Workshops have proved beneficial as many of the staff have started writing notings in Hindi in the files.

Hindi Week and Bhasha Divas were celebrated at the Headquarters from 6-12 Sept. 1991 with various competitions and prizes, along with certificates distributed to the winners.

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

The Institute also actively participated in the Joint Hindi Week celebrations conducted under the auspices of Cochin Town Official Language Implementation Committee from 9-13 Sept. 1991.

The Asst. Director (OL) of the Institute delivered lectures at Hindi Workshops conducted by various Govt. and public undertakings at Cochin.

The Burla Research Centre celebrated Hindi Day on 13 Sept. 1991. Various competitions were held and prizes distributed.

At Calicut Centre, a one day Hindi Workshop was organised on 16 Aug. 1991 for the benefit of the staff of the Centre.

A Hindi Workshop was also conducted at the Veraval Centre for two days, on 6 & 7 Feb. 1992.

The Second Sub-committee of Committee of Parliament on Official Language visited the Veraval Centre on 8 Feb. 1992 and reviewed the progress of the Hindi Implementation Programme.

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.

c. For updating the International Directory of Sources, the required information pertaining to the Institute such as objective, functions, areas of research etc. was furnished to Ministry of Environment & Forests, New Delhi.

d. The particulars such as name, date of birth, qualification, discipline, field of specialisation etc. in respect of all Scientists and Technical Officers of the Institute in the grade of Rs. 3000-5000 and above in the prescribed proforma were sent to the Union Public Service Commission, New Delhi for maintaining the 'Panel of Experts' in various disciplines.

e. A list of Scientists deputed abroad for training and attending various courses, Symposia, Seminars etc. during the last two years and information on their placement or deployment and other useful work done by them after training in the respective Institutes was forwarded to Council as desired by the Ministry of Agriculture.

f. For the preparation of a comprehensive Fisheries Diary, the particulars of all the Scientists and Technical personnel in the grade T-6 and above were furnished to the Editor, Fishing Chimes, Visakhapatnam.

g. A list of continuing and completed projects of the Institute for the past five years was prepared and sent to CFTRI, Mysore for the preparation of Data Base in Food Science & Technology.

h. For compilation of Directory of Agricultural Scientists and Technologists in the SAARC Region, the requisite information such as name, date of birth, qualification, training, field of specialisation, appointments, No. of publications, honours/awards received etc. in respect of all the Scientists in the grade Scientist (SG) and above and Technicians in the grade T-7 and above was furnished in a prescribed format to the Information Systems Officer, Agril. Research Information Centre (ICAR), New Delhi.

Compilation of abstracts of CIFT publications :

Work relating to the compilation of abstracts of CIFT publications containing names of authors, title of publication with number, volume and year along with key words, was prepared for the compilation of computerised data on scientific publications of the Institute.

The Technical Section also rendered assistance to the Centre for Research and Training in Poverty Alleviation and Women Welfare (CRATPAW), a voluntary organisation, in the preparation of a project on Establishment of Production Unit and

Marketing of Diversified Fish Products for Employment Generation of Coastal Women. Assistance was also rendered to training women under a scheme sponsored by the Dept. of Science & Technology, Govt. of India, for establishing market channels for diversified fish products and for their participation in various exhibitions, Food Festivals etc. by opening counters and selling diversified products as per quality standards prescribed by CIFT.

Publication of research papers :

Fortytwo scientific papers were processed and Director's permission obtained for publication of 40 papers was communicated to the authors concerned. Sixtyfive papers submitted by Scientists belonging to various disciplines were approved for presentation at Workshops, Seminars, Conferences etc. conducted during the period.

Staff Research Council meeting

During the period under report, the Staff Research Council met three times to review the progress of research projects handled at the Institute Headquarters and Research Centres. The proceedings of Staff Research Council was prepared and sent to Council as also the follow-up action on the recommendations collected from the concerned Scientists.

Five Yearly Assessment/Reassessment of ARS Scientists :

With regard to 5 yearly assessment/reassessment of Scientists, it has been informed by Council that as a result of the adoption of the U.G.C. pay package, the practice of five yearly assessment came to an end w.e.f. 1.1.1986 and that the benefit of assessment shall be admissible only upto 31.12.1985.

COLLABORATIVE/SPONSORED PROGRAMMES & AD-HOC RESEARCH PROJECT PROGRAMMES

Under the collaborative project on Handling, Processing and Marketing of Anchoviella in the East Coast undertaken by BOBP, Madras, in association with this Institute, fishing villages of Ramnad and Kanyakumari Districts in Tamil Nadu were surveyed for the possibility of scope of production of dried anchoviella on raised platform. Kovalam was found most suitable. Double deck platforms (racks) were constructed and method of production of quality dried anchoviella demonstrated to members of the Fishermen Sangam at Kovalam. Training was also given at a few other fishing villages in Kanyakumari District, viz. Keezhemanakkudy, Melemanakkudy and Melmadalam, on production of anchoviella flakes from

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. coramandelensis)* 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 forwarded 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.

c. Establishment of marketing infrastructure for prawn/fish seed, modern fishing gear and value added fish products.

A project proposal entitled 'Quality Upgradation in the Seafood Industry' was sent to Council in accordance with the Cabinet decision for upgrading the quality centred activities of the various laboratories under the Ministry of Agriculture.

Another project proposal viz. 'Integrated Utilisation of Cultivable Fresh Water Fishes for the Production of Food, Feed and Pharmaceutical Products' was sent to Council for forwarding the same to the Planning Commission for consideration under OECF (Japan) loan assistance.

The Burla Research Centre in consultation/collaboration with the Govt. of Orissa State Fisheries Officials has drawn up a joint programme for harvesting the reservoir fishery resources of Orissa.

An ad-hoc research scheme entitled "Reduction of Losses in Durable Fishery Products of Bombay Coast During Storage" undertaken from Bombay Research Centre of CIFT is progressing as per schedule.

LIBRARY

The Scientific and Technical staff of the Institute, Research Scholars, Students from various Universities, Scientists from other Institutes and Technologists from the Industry continued to avail the library and documentation service facilities provided by the Institute. During the year, 137 books were added to the collection and at present there are 7192 books and 3849 bound volumes of scientific journals. Eightyeight journals were subscribed during the year. A total of 2929 bonafide readers visited the Library and 3749 publications were issued and returned during the period under report. The reprographic Unit of the Library made copies and supplied 63000 pages of documents on requisition. The Library also continued to issue the 'Current Contents on Fishery Technology' (fortnightly) for the benefit of the users.

ADMINISTRATION

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

The Research Centres continued to function in rented buildings. Addresses of the Research Centres are given in Appendix-I. List of staff under Scientific, Technical, Administration, Auxiliary and Supporting Categories as on 31.3.1992 is given as Appendix-II.

Details of budget provision and actual expenditure for the year 1991-92 are given as Appendix-III.

MANAGEMENT COMMITTEE

The Management Committee of the Institute reconstituted with the following personnel for a period of 3 years from 18.12.1989 continued to function during the period.

Chairman

The Director, CIFT, Cochin.

Members

1. The Director of Fisheries
   Fisheries & Ports (A) Deptt.
   Government of Kerala
   Trivandrum.
2. The Director of Fisheries
   Department of Fisheries
   Govt. of Orissa
   Cuttack.
3. The Dean
   College of Fisheries
   Kerala Agricultural University
   Panangad.
4. Shri. Chikka Basappa
   Port Birur Dist., Chikamangalur
   Karnataka.
5. The Asst. Director General
   (Marine Fisheries) ICAR
   Krishi Bhavan
   New Delhi.
6. The Sr. Finance & Accounts Officer
   CMFRI, Ernakulam
   Cochin.
7. Shri. P.A. Panicker
   Principal Scientist
   CIFT, Cochin.
8. Dr. T.S. Gopalakrishna Iyer
   Principal Scientist
   CIFT, Cochin.
9. Shri. Percy Dawson
   Scientist (S.G.)
   Burla Research Centre of CIFT
   Burla.
10. Dr. P.T. Lakshmanan
    Sr. Scientist
    CIFT, Cochin.

Member Secretary

The Administrative Officer
CIFT, Cochin.

The Committee met twice during the period of report.

INSTITUTE JOINT COUNCIL

The Institute Joint Council which was constituted with the following

members w.e.f. 27.1.1990 for a period of three years continued to function during the period.

Chairman

The Director
CIFT, Cochin.

Members - Official side

1. Shri. P. Vasudeva Prabhu
   Principal Scientist (From 1.8.'91)
2. Dr. M.K. Kandoran
   Principal Scientist
3. Shri. V.C. George
   Principal Scientist
4. Dr. P.K. Surendran
   Sr. Scientist
5. Sr. Administrative Officer
6. Asst. Finance & Accounts Officer

Members - Staff side

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

Secretary - Official side

Dr. P.K. Surendran, Sr. Scientist

Secretary - Staff side

Shri. M.K. Kuttykrishnan Nair T-2

Three meetings of the IJC were held during the year.

MONITORING CELL

The Monitoring Cell was re-constituted with the following members w.e.f. 27.8.'91 to 31.12.'91 and until further orders.

Chairman

1. The Director
   CIFT, Cochin

Members

1. Shri. P. Vasudeva Prabhu, Principal Scientist
2. HOD, Fishing Technology
3. HOD, Biochemistry, Nutrition & Microbiology
4. HOD, Engineering & Instrumentation
5. HOD, Extension, Information & Statistics
6. Dr. N. Unnikrishnan Nair, Sr. Scientist
7. Dr. M.K. Mukundan, Sr. Scientist

8. Sr. Administrative Officer
9. Administrative Officer
10. Asst. Finance & Accounts Officer
11. Asst. Administrative Officer (Admn.)

Member Secretary

Asst. Administrative Officer (Bills)

No meeting was held during the year.

GRIEVANCE COMMITTEE

The Grievance Committee constituted for both the Gazetted and Non-Gazetted categories of staff of this Institute with the following members w.e.f. 22.1.1990 continued to function during the period. The tenure of the Committee was two years.

Chairman

The Director, CIFT, Cochin

Members

1. Shri. P. Vasudeva Prabhu, Principal Scientist
2. Sr. Administrative Officer
3. Asst. Finance & Accounts Officer
4. Shri. M.K. Kuttykrishnan Nair, T-2
5. Shri. K.K. Appachan, Sr. Gest. Operator
6. Shri. T.M. Ramraj, Sr. Clerk
7. Shri. P.A. Thomas, SSG. III
8. Shri. Braj Mohan, Scientist

Member Secretary

Administrative Officer

No meeting was held during the year.

VISITORS

As in previous years, many foreign and Indian dignitaries, Scientists from other organisations, State and Central Govt. Officials and others connected with the fishery industry visited the Institute during the period. These included:-

1. Mr. Ross Shotton DFO, Halifax, Canada, Mr. John Wood, Budapest and Mr. W.J. Guckian, Italy - members, World Bank Team
2. Mr. Jaya Raj, Spl. Correspondent, UNI, N. Delhi
3. Mr. Sukumar Das, Director of Fisheries, Govt. of West Bengal
4. Miss Sevaly Sen & Mr. Jock Campbell - members, ODA Evaluation Team

5. Dr. Malaviya, Dy. Director & Shri. R. Ravindran Nair, Jt. Director, Central Social Welfare Board, N. Delhi

6. Japanese delegation comprising Mr. Kanae Bito, Mr. Junzo Omoro, Mr. Iwao Mizuishi, Mr. Takashi Wakamatsu and Mr. Yayoi Shirai

7. Mr. Nick Willoughby, NRI Fisheries Project Manager and Mr. Collin Ford Divers, ODA

8. Dr. A.K. Bandyopadhyay, Director & Shri. K. Dorairaj, Principal Scientist, Central Agricultural Research Institute, Port Blair

9. Dr. A.K. Seth, Research Officer, Dr. (Mrs.) Ravindra Dang, Principal Scientific Officer and Mr. B. Radhakrishnan, Asst. Research Officer - members, Research Team of ICAR Project : Work Environment in ICAR Institutions

10. Mr. Sujit Banerji, Secretary (Fisheries), Govt. of West Bengal

11. Mr. Stephen Ridgway, Humberside International Fisheries Research Institute, U..K.

12. Mr. Sunil Sud, Secretary-in-Charge of Fisheries, Govt. of Gujarat

13. Study Group of Committee of Agriculture consisting of 8 MPs and two officials of the Lok Sabha

14. Admiral O.S. Dawson, Former Chief of Naval Staff

15. Seven member Chinese Delegation led by Mr. Chen Yaobang, Vice Minister of Agriculture, Beijing People's Republic of China

16. Shri. Ratnakar Chopdekar, Hon. Minister for Fisheries, Govt. of Goa and Chairman, Select Committee on Goa Brackish Water Fish Foundry Regulation Bill 1990 and 4 members of the Committee

17. Four member USFDA Team comprising Mr. Joseph Slavin, Mr. Bob Becker, Mr. Gary Putnam and Mr. Glen Kiehl

The comments/suggestions of some of them are reproduced below:

"Very impressive research work of practical utility. Should be able to give a new thrust to marine exports" - *Mr. Jaya Raj.*

"This Institute can bring a quick economic change in coastal state of West Bengal. We require the close contact and continuous assistance of an Institute of this type. Govt. of India should consider opening a branch of this Institute in West Bengal" - *Mr. Sukumar Das.*

"There is a lot that fisheries in Gujarat has gained from the work at CIFT. I am sure that we will continue to benefit." - *Mr. Sunil Sud.*

"..... your Institute has achieved a great deal in modern fisheries research. Many of the achievements

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 remarkable....." - *Shri. Ratnakar Chopdekar.*

" ..... an informative and educative 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 propects 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 *Katsuwomus 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 commemmoration 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 CO_2 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

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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/MATSYAOUDYOGIKI, COCHIN

HEADS OF DIVISIONS

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

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 161-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 Scientst (SG)

APPENDIX - II

List of Personnel in CIFT as on 31st March 1992

HEADQUARTERS, COCHIN

DIRECTOR (Officiating)
Dr. K. Gopakumar

SCIENTIFIC PERSONNEL

Principal Scientist

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

Senior Scientist

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

Scientist (Selection Grade)

1. Shri. P.A. Perigreen
2. Shri. P.D. Antony
3. Shri. K.A. Sadanandan
4. Shri. A.C. Joseph
5. Shri. K.K. Kunjipalu
6. Smt. A. Lekshmy Nair
7. Shri. T.K. Srinivasa Gopal
8. Shri. A.G. Radhakrishnan
9. Shri. P.R. Girija Varma
10. Shri. P.K. Vijayan
11. Shri. Francis Thomas

12. Smt. Mary Thomas
13. Shri. P.N. Joshi
14. Shri. V. Muraleedharan
15. Shri. M.R. Boopendranath
16. Shri. N. Subramonia Pillai
17. Shri. V. Narayanan Nambiar
18. Shri. T.K. Thankappan
19. Shri. K.V. Mohan Rajan
20. Shri. G.R. Unnithan
21. Shri. V. Vijayan
22. Smt. K.V. Lalitha
23. Smt. K. Vijayabharathy
24. Shri. K. Ramakrishnan
25. Shri. P. George Mathai
26. Shri. S.K. Bhattacharyya

Scientist (Sr. Scale)

Shri. M. Nasar

Scientist

1. Smt. K. Ammu
2. Shri. K.P. Antony
3. Smt. R. Thankamma
4. Shri. V. Annamalai
5. Shri. A.C. Kuttappan (On deputation to CIFNET, Cochin)
6. Smt. Saly N. Thomas
7. Smt. Leela Edwin
8. Dr. A. Ramachandran (0n deputation to Cochin University of S & T)
9. Shri. T.V. Sankar
10. Shri. M. Syed Abbas
11. Shri. Braj Mohan

TECHNICAL PERSONNEL

Technician T-8 (Technical Officer)

1. Shri. K.S. Ganesan
2. Dr. P.J. Cecily
3. Smt. K. Radhalakshmy

Technician T-7 (Technical Officer)

1. Shri. K.C. Purushothaman
2. Shri. M.S. Fernando
3. Shri. K.J. Francis Xavier
4. Shri. N.A. George
5. Shri. T.M. Sivan

Technician T-6 (Technical Officer)

Shri. K. Vasudevan Nair

Technician T-5 (Technical Officer)

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

17. Shri. Thomas J. Mammoottil
18. Shri. V. Gasper
19. Shri. P.T. Sebastian
20. Shri. N.M. Vasu
21. Shri. P.S. Alias

Technician T-4

1. Shri. M.L. Anslem
2. Shri. M.K. Sasidharan
3. Shri. B. Anandan
4. Shri. T.K. David
5. Shri. V. Gopalakrishna Pillai
6. Shri. C.R. Gokulan
7. Shri. M.M. Devassya

Technician T-II-3

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

Technician T-I-3

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

Animal House keeper

Shri. B. Ganesan

Technician T-2

1. Shri. K.N. Rajagopalan
2. Shri. K.K. Narayanan
3. Shri. V.V. John
4. Smt. T. Silaja
5. Shri. P.S. Nobi
6. Shri. N.R. Gopan Nair
7. Shri. M.K. Kuttykrishnan Nair
8. Shri. K.B. Thambi Pillai
9. Smt. K.P. Leelamma
10. Smt. V.C. Mary
11. Shri. P.S. Raman Namboodiri
12. Smt. K.G. Sasikala
13. Shri. P.T. Viswambharan

14. Shri. Tommy Rebello
15. Shri. A.A. Kunjappan
16. Shri. K.D. Jos
17. Shri. K.A. Gopinath

Technician T-1

1. Shri. K.K. Sudhanandan
2. Shri. G. Omanakuttan Nair
3. Smt. K.S. Mythri
4. Smt. G. Ramani
5. Shri. Kirtan Kisan
6. Shri. J. Samarajan
7. Shri. P.N. Sukumaran Nair
8. Shri. T. Mathai
9. Smt. N. Lekha

ADMINISTRATIVE PERSONNEL

Sr. Administrative Officer

Shri. V.K. Sridhar (upto 29.2.'92)

Administrative Officer

Shri. P. Bapaiah

Asst. Finance & Accounts Officer

Shri. P.A. Uthup

Asst. Director (O.L)

Smt. C. Jessy Joseph

Asst. Administrative Officer

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

Superintendent

1. Shri. S. Naveen Chandra Prabhu
2. Smt. Alice M. Joseph
3. Shri. M. Subramaniam
4. Shri. R. Anil Kumar
5. Shri. T.M. Padmanabhan (Ad-hoc)

Senior Stenographer

Shri. K.J. Thomas

Assistant

1. Smt. N.K. Sulochana
2. Smt. T.K. Sarala
3. Shri. R.S. Shanmughan
4. Shri. A.L. John
5. Shri. A. George Joseph
6. Shri. M. Gopalakrishnan
7. Smt. M.S. Susanna
8. Shri. V.N. Rajasekharan Nair
9. Shri. M.T. Joseph
10. Shri. A.K. Venugopalan
11. Smt. Annamma Varghese (Ad-hoc)

Stenographer

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

Jr. Stenographer

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

Senior Clerk

1. Smt. 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-I-3

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

Technician T-1

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

ADMINISTRATIVE PERSONNEL

Superintendent

Shri. P. Vasudevan

Sr. Clerk

Shri. Veersingh

Junior Clerk

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

Junior Stenographer

Shri. Ramesh Kumar Dhirendrapuri Goswami

AUXILIARY PERSONNEL

Hindi Translator

Shri. Shitala Prasad Thiwari

Deck Hand

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

Cook

Shri. G.L. Tandel

Driver

Shri. Sida Hanif Ummer Bhai

SUPPORTING PERSONNEL

Supporting Staff Grade -III

Shri. P.A. Abdul Rahman

Supporting Staff Grade - II

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

Supporting Staff Grade - I

1. Shri. B.M.A. Khoker
2. Shri. D.P. Parmer
3. Shri. D.B. Chudasama
4. Shri. K.J. Damer
5. Shri. P.N. Chudasama
6. Shri. H.V. Pungera
7. Smt. Chandrika C. Tank
8. Smt. Gangaben Naren Chorwadi
9. Shri. Dodiya Khodia Viram

KAKINADA RESEARCH CENTRE

SCENTIFIC PERSONNEL

Principal Scientist

1. Dr. C.C. Panduranga Rao
2. Shri. G. Narayanappa

Senior Scientist

Dr. Imam Khasim Sahib

Scientist (Selection Grade)

1. Shri. Sibsankar Gupta
2. Shri. S.V.S. Rama Rao

3. Shri. Rupshankar Chakraborthy

Scientist

Shri. M.M. Prasad

TECHNICAL PERSONNEL

Technician T-4

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

Technician T-II-3

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

Technician T-I-3

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

Technician T-2

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

Technician T-1

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

ADMINISTRATIVE PERSONNEL

Assistant

Shri. G.C. Adhikari

Junior Stenographer

Smt. D.A.L. Satyanarayanamma

Senior Clerk

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

Junior Clerk

1. Shri. Nirmala Raju P.
2. Shri. Y. Kanakaraju
3. Shri. G. Chinna Rao

AUXILIARY PERSONNEL

Deck Hand

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

Cook

Shri. G. Subba Rao

Driver

Shri. M. Venkateswara Rao

SUPPORTING PERSONNEL

Supporting Staff Grade IV

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

Supporting Staff Grade III

1. Shri. Thirupathi Rao
2. Shri. N. Gnanaranjana Rao
3. Shri. O Heman
4. Shri. K. Appa Rao

Supporting Staff Grade II

1. Shri. C. Kamaraju
2. Shri. V. Kamaraju

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. Sathrughan Kumara

Technician T-2

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

Technician T-1

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

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

2. Shri. Laba Nag

Supporting Staff Grade - II

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

Supporting Staff Grade - I

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

BOMBAY RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

Dr. M. Arul James

Scientist (Sr. Scale)

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

TECHNICAL PERSONNEL

Technician T-II-3

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

ADMINISTRATIVE PERSONNEL

Assistant

Shri. Milind S. Bhatkar

Sr. Clerk

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

AUXILIARY PERSONNEL

Driver

Shri. B.B. Pinjari

SUPPORTING PERSONNEL

Supporting Staff Grade - III

Shri. A.T. Waghmare

Supporting Staff Grade - II

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

Supporting Staff Grade - I

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

CALICUT RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

Shri. Cyriac Mathen

Scientist (Selection Grade)

1. Shri. T.S. Unnikrishnan Nair
2. Shri. P. Ravindranathan Nair

3. Shri. K. George Joseph

TECHNICAL PERSONNEL

Technician T-5 (Technical Officer)

Shri. T. John

Technician T-2

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

ADMINISTRATIVE PERSONNEL

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	Revised Estimate	Expenditure
1. Establishment Charges	213.00	212.16	212.16	—	—	—
2. Travelling Allowance	5.00	4.50	4.30	1.50	2.00	1.09
3. Other Charges	52.00	43.34	43.54	40.00	—	—
4. Works	—	—	—	37.50	42.00	24.00
5. Other Items	—	—	—	1.00	34.00	7.41
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 जोडे गए ट्राल गुणता मछलियों के अधिक किशोरों को अवतारित करता है।

पारंपरिक डायमन्ड जाल कोड एन्डों की अपेक्षा स्कवायर जाल कोड एन्डों से भरे जाल किशारों 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 पकडाव 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 तकनॉलजी,आन्ध्रप्रदेश के प्रमुख जलीय संवर्द्धज्ञों को स्थानांतरित किया गया।

दंत शल्यचिकित्सा के लिए प्रयुक्त विभिन्न हेमोस्टाटिक एजन्टों 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 जोडे हुए फफूदें 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 पिरेथ्रम, जिंजिली औरहिड्रनोकार्पस तेल छिडकाते हुए गणनात्मक रूप में दीर्घ अवधि तक कीडाणु नाशन को रोकता है।

बेची-डी-मेर के उत्पादन तकनॉलजी को विस्तृत अनुसंधान के अधीन किया और उसकी तैयारी और विशेषताओं के सुधार के लिए तरीकाएँ कान्यान्वित किया। शुष्क मछली के लिए प्रयुक्त विभिन्न संवेष्ठन सामग्रियों में धात्विक पॉलीस्टर, कीडाणु बाधा को दीर्घ अवधि तक रोकते हुए दिखाई पडा।

बर्फित मछली को परिवहित करने के लिए पॉलीथीन फार्म अवरोधित प्लास्टिक थैलि को विकसित किया गया।

शाल्य सविनों को बनाने के लिए मत्स्य औंतो की सफाई का एक उपकरण को अभिकल्पित किया और विकसित किया।

एपिसूटिक अलसेरेटिव सिन्ड्रों नामक मछली रोग केलिए ऊतरदायी मछली रोगाणु है *ऐरामॉनस हाइड्रोफिला*।

के. एफ. स्ट्रप्टाकॉकल अगर की तुलना में कन्यामैसिन एसुलिन असाइड अगर, हिमीकृत मात्स्यकी उत्पन्नों के फेकल स्टेप्टोकॉकी से उच्च रोगमुक्ति प्रदान करता है।

तापमान नियंत्रण से युक्त एक तेल भुनाई को अभिकल्पित किया और विकसित किया।

कुटीर व्यवसाय के लिए अनुयोज्य 50 की. ग्रा की क्षमता से युक्त स्वचालित बिजली मस्य शुष्कक की अभिकल्पना की।

उद्यमों के लाभार्थ संस्थान द्वारा विकसित विभिन्न तकनीकी जानकारी के प्रभावकारी प्रयोग के लिए संस्थान ने अन्य संघटनों से सक्रिया रूप में, सहयोग दिया।

खाघ और खाने के लिए मछली और मात्स्यकी उत्पन्नों के आधुनिकतम तकनीकी परीक्षणों संबंधी एक ग्रीष्मकालीन संस्थान आयोजित किया गया। विश्वविद्यालय के अध्यापक, तकनीकी कार्मिक आदि से युक्त 30 अधिकारी लोग ग्रीष्मकालीन संस्थान में भाग लिए।

(के. गोपकुमार)
निदेशक

मुख्य उपलब्धियाँ

मुख्यालय, कोचिन

मत्स्यन तकनॉलजी डिवीज़न

18 एम ओ ए एल बहुद्देश्य इस्पात ट्रॉलर के प्रारंभिक अभिकल्प पर पुनर्निवेशन आँकडा इक्ठ्ठा किया और बाद के अभिकल्प विकास के लिए लाइनों को अंतिम रूप दिया।

विज्ञान व तकनॉलजी विभाग द्वारा प्रावर्तित एक प्रोजक्ट के अंतर्गत लक्षद्वीप के संघीय राज्यक्षेत्र के लिए नये विशेषताओं को समावेशित करके 7.6 एम फाइबर ग्लास खम्भा और लाइन मत्स्यन से युक्त 7.6 एम के दो और यानों

की संरचना की और उसका जॉच व परीक्षणात्मक मत्स्ययन विजयप्रद रूप में संचालित किया।

इ इ इज़ड के अवशोषण के लिए अगाध समुद्री तलमज्जी ट्रालों के निम्न अभिकल्पों को विकसित और प्रचार किए।

1. 38 एम एच डी टी
2. 51 एम दीर्घ पाश एच डी टी
3. 48 एम आयताकार ट्रॉल

इ इ इज़ड के दक्षिणी पश्चिमी तट के पास के उत्पादन क्षेत्रों को पहचान किया। ट्रालों के रिगन के लिए कठोर परंपरागत प्लव के स्थान पर उपयुक्त गर्रो डिब्बा के नम्य प्लव प्रयोजनशील है।

एक संरक्षणात्मक मापन के रूप में स्कव्यर मेश एन्ड की प्रभावकारिता को बाद में स्थापित किया गया।

फिन मछलियों के और झींगों के प्रमुख जातियों के लिए वरण घटकों और वरणात्मक दैर्घ को परिकलित किया गया।

के. मा. प्रौ. सं. द्वारा विकसित 50 एम उन्नत खुलाव ट्राल इ इ इज़ड के साथ तल के मछलियों को पकडने के लिए अनुयोज्य दिखाई पडा।

तिरुवनंतपुरम जिला के पूवार मत्स्ययन गांव के झींगों के पकडाव केलिए 50 एम एम ट्रामल जाल प्रभावकारी दिखाई पडा।

मत्स्य संसाधन डिवीज़न

सुसंस्कृत *माक्रोब्रचियम* रोसेन बेरगी और *इनेयस मोनोडन* हिम संग्रहण में क्रमश : 9 से 12 दिनों तक स्वीकृत अवस्था में रहते हैं।

ऑटोलिथस आरजेन्टस को आँते और फिलेटों सहित पूर्ण रूप में -20° सी में 9 महीनों की शेलफ जीविका होती है जहाँ वही मछली के हिमीकृत कीमा मांस 7 महीनों के संग्रहण के बाद स्वीकार्य योग्य नहीं होता है।

-20° सी में हिमीकृत और संग्रहित लवंग में संसाधित पेर्च टुकडों को 12 महीनों के संग्रहण के बाद भी स्वीकृत अवस्था में दिखाई पडता है जहाँ अनुपचारित नियंत्रण नमुनों को -20° सी में 8 महीनों के बाद अस्वीकृत दिखाई पडता है।

थेल्ली झींगों के मांस से तैयारित फार्मड स्कॉपी, थोडे और टुकडे किए उत्पन्नों की तैयारी के लिए अनुयोज्य निकल पडा।

भभका भट्टियों में ताप को अकेले या करि माध्यम में संसाधन करने पर ऑकोवियल्ला एक स्वीकृत उत्पन्न बन जाता है।

अलुमनियम डिब्बों की अपेक्षा आर टी भभकों में तुरंत खाने या झींगी या करि से बनाए गए उत्पन्नों, स्वीकार्य उत्पन्न के रूप में दिखाई पडता है। परंपरागत पूर्व उपचार के स्थान पर क्षार उपचार द्वारा उन्नत जेल शक्ति के

अगर समुद्री अपतृण जेलिडियल्ला स्पी. से तैयारित किया गया।

मसूडा शोथ घावों में कैटोसन के हीमोस्टाटिक और घाव को स्वस्थ करने के गुण को अड्रिनालिन, टानिक अम्ल और आइसोटाणिक सलाइन से तुलना किया।

3 महीनों तक कैटिन समावेशित खाद्य को खिलाए गए सुअरों में भार में हुई खास बढ़ाई का निरीक्षण किया गया।

उपादानों के मिश्रण और समांगीकरण की अवधि में कैटोसन घोल समावेशित मछली खाद्य के गुटिकायन की तरीका को विकसित किया।

नेमीटरस पैरास्कोलोपिस अस्पिनासो से तैयारित संव्यूतित मांस पर संग्रहण अध्ययन पूरा किया गया।

वॉंगडा, अगाध समुद्री, ज्यू मछली और लिसाड मचली से तैयारित सुरुमी की अनुकूलतम अवस्था को प्राप्त किया गया। यूनिवेर्सल परीक्षण मशीन को प्रयुक्त करके सुरमी उत्पन्नों के जेल शक्ति निर्धारिण के लिए एक तरीका को भी माननीकृत किया। बेचरबी से पेस्ट मात्स्यकी उत्पन्नों की तैयारी की तरीका को विकसित किया गया। अगाध समुद्री झींगों की तुलना में अगाध समुद्री लॉबस्टरों से श्रेष्ठ गुण के तोडे और ब्रड किए उत्पन्नों का उत्पादन करते हैं।

लिस्टीरिया मॉनोसाइटोजेनस हिमीकृत संग्रहण (-18°सी) में एक वर्ष से अधिक जीवनक्षम है। फिर भी वह मछली साइलों संरक्षण में केवल एक दिवस में ही जीवित रहता है।

शुष्कित मछली में पहचान किए गए प्रबल - फफूदें है ऐ *नाइजर, ए फ्लेवस* रिसोपस और म्यूकर।

शुष्कित मछली के लिए प्रयुक्त विभिन्न संवेष्ठन सामग्रियों में धात्विक बना दिए गए पॉलियस्टर, कीडाणुबाधा गणनात्मक रूप में दीर्घ कालावधि तक निवारित करते दिखाई पडता है।

जैव रसायन पोषण व सूक्ष्मजीवविज्ञान डिवीज़न

मुख्य उपलब्धियाँ :

मछली पेशितन्तुक प्रोटिनों के सक्सिनॉयलन उनकी विलेयता, विस्कासिता, मिश्रण क्षमता आदि क्रियाशील गुणों को सुधार करते हुए दिखाई पडा। यह असेटिलेशन से संशोधित श्रेष्ठ प्रोटीनों के उत्पाद करते हुए दिखाई पडा।

मछली शुष्कन के दौरान उन्नत मॉलीकुलर बज़न के प्रोटीन टुकडों को अधिक प्रभाव होता है। प्रोटिनों के समविधुत्त बिन्दुओं पर असर नहीं डालते लेकिन सम विधुत्त बिन्दुओं की विलेयता में थोडी सी वृद्धि दिखाई पडती है। एस एच ग्रूपों ने शुष्कन के वक्त छोटे प्रारंभिक बढ़ाव को दिखाता है और बाद में प्रबल कमी दिखाता है। उन्नत तापमान में शुष्कित मछली

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 सीवनों को बनाने के लिए मछली ऑतों 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।

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

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

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

मध्य केरला के कुटटनाडु के ताज़े जल मछलियों में दिखाई पडने वाले *ऐरामॉलस हाइड्राफिला* को एपिसूटिक अलसरेटिव सिन्ड्रों पहचानकर वियुक्त किया गया।

यद्यपि पंक से और कोचिन के समीप के खारेपानी तालाबों के संवर्द्धनों से संचयित जल नमुनों में *क्लास्टिरिडियम बोटुलिनम* संवर्द्धन मौजूद है लेकिन सभी संवर्द्धन अविषालु होते है।

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 झीगों में हारबर विब्रियो *पैरा हेमटो लिरिकस दिखाई पडा* ।

अभियांत्रिकी व यंत्रीकरण 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 उत्पन्नों के शुष्कन के लिए एक 50 की. ग्रा. क्षमता के स्वचालित विधुत मछली शुष्कक जो कुटीर व्यवसाय संचालन के लिए अनुयोज्य है, अभिकलपित किया गया।

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

विस्तार सूचना और सांख्यिकी डिवीज़न

आन्ध्रप्रदेश के देशज क्राफ्ट के मोटरीकरण तकनॉलजी अभिग्रहण के लिए नवाचार के उच्च दाम, ऋण के लिए आबंटित निधि और उन्नत सर्फिंग स्तर मुख्य प्रतिबंध दिखाई पडा।

यंत्रीकृत यानों को संचालित करने वाले मछुवारों के बीच के "ऑपीनियन लीडरर्स " और अयंत्रीकृत यानों को संचालित करने के बीच "फेल्लो फिशरमान" अधिक श्रेष्ठ सूचना देनेवाले स्रोत होते हैं।

उपलब्ध कई प्रकार के खण्डीकरण में शुष्क मछली के बाज़ारों का भौगोलिक खण्डीकरण अधिक श्रेष्ठ निकला।

शुष्क मछली के वितरण सारणी इस प्रकार होता है।

उत्पादक → अभिकर्ता → थोकदार → परचूनिया

वेरावल अनुसंधान केन्द्र

30 एम एम जाल आकार के कोड एन्डों से जोडे गए जालों की अपेक्षा 15 एम एम जाल आकार के कोड एन्डों से जौडे गए 20 एम छोटे जाल के स्पुटनिक ट्राल गुणता मछलियों के अधिक किशोरों का अवतारण करता है।

हिल्सा टॉली के लिपिड ऑक्सीकरण के अध्ययन ने दिखाया कि मछली के आकार और लिपिड अंश के बीच कोई संबंध नहीं है। मौसमिक भिन्नता के अनुसार लिपिड में कोई निश्चित प्रवृत्ति नहीं दिखाई पडता।

संसाधित मछलि उत्पन्नों में होनेवाले लाल अपवर्णन के उपचार, 70% और उससे निम्न आर एच के जैसे 90% और 100% आर एच में उत्पन्नों के गुणता को सुरक्षित रखने का कोई प्रभाव नहीं दिखाता है। फिर भी 80% आर एच परिष्कृत नमक से उपचारित करने पर साधारण नमकों की अपेक्षा श्रेष्ठ परिणाम को देता है।

काकिनडा अनुसंधान केन्द्र

उभरे उदर ट्रालों की अपेक्षा सिलवर बेल्लियों और रिबन मछलियों के पकड में रस्सी ट्राल श्रेष्ठ पकड देकर प्रबल हो रहा है।

समुद्री कैट मछली और सियानिड जैसे छोटे आकार की मछलियों से शीघ्र पकाने की सुविधा के मछली उत्पन्नों को तैयार किया गया। 6 महीनों के संग्रहण अवस्था होने पर भी कैट मछली से तैयारित उत्पन्न अच्छी अवस्था में रहते हैं।

शुष्कित और अलवणीकृत की अपेक्षा लवणीकृत, और शुष्कित डि काप्टेरस को दीर्घ संग्रहण जीविका होती है। प्रोपियनेट अम्ल से उपचारित, दबे, लवणीकृत, 200 गेज के पॉलीथीन थैलियों में संवेष्ठित डी काप्टेरस ऐसे शर्तों के अंतर्गत केवल 28 दिनों तक की स्वीकार्य अवस्था के अनुपचारित नमूनों की अपेक्षा उपवेशी

तापमान में 65 दिनों तक स्वीकार्य अवस्था में रहता है।

बुरला अनुसंधान केन्द्र

चार ऊद बोर्डों से युक्त 8.5 एम मध्यजलीय ट्राल दो बोर्डों से युक्त जाल की अपेक्षा श्रेष्ठ निष्पत्ति की।

करीब 3 की. ग्रा. बर्फित मछली को परिवहित करने के लिए पालीथीन अवरोधित प्लास्टिक थैलि को विकसित किया।

बर्फित मछलि के परिवहन के लिए पारंपरिक बॉस की थैलियों में सुधार किया गया।

गरम जलों से पूर्व उपचार, *आर कोटिया* और *एम ऑले* के, बर्फ संग्रहण जीविका को विकसित किया गया।

टुकडे की गयी ताजे जल कैट मछली एस. सिलोन्डिया एक बार जल से धुलाने पर हिमीकृत उत्पन्न की गुणता में सुधार करता है।

बंबई अनुसाधान केन्द्र

मुलिलडे और प्रिकानतिडाक के परिवार के "चिरि" और "कासी" नाम से स्थानीय रूप में पुकारित दो जातियों की मछलियों से उत्पादित मांस क्रमश : 42-45% और 35% होता है।

स्क्रोम्ब्रइडे परिवार के स्थानीय रूप में "पलाई" नाम से ज्ञात मछली की शेल्फ जीविका 28-30 हफ्ते दिखाई पडा और जिसके बाद उत्पन्न अस्वीकार्य बन जाता है। रिबन मछली 26 हफ्तों तक अच्छी अवस्था में रहता है।

कैलिकट अनुसंधान केन्द्र

वयनाडु जिले के परचून विपणन और संसाधित मछली की गुणता संबंधी सर्वेक्षण किया गया और जिसको पूरा किया गया।

परिष्कृत थेरमल और संरक्षकों से उपचारित पॉलीथीन या गन्नि थैलियों में बाहरीरूप में पिरेथ्रम जिंजिली और हिडनोकाप्पस तेल छिडके वाणीज्य संसाधित मछली जीवाणुबाधा को गणनात्मक रूप में विलंबित करता है।

नमीकृत होलोतुरिया से अच्छी गुणता के बेची-टी-मेर तैयार किया जा सकता है।

चुडे, नेथोली छोटे भारती ऑयल सारडीन आदि मछलियों को जोडे संरक्षकों में 1-2 दिनों तक सुरक्षित रखा जा सकता है।

मछली के सतह पर काज छिल्के के द्रव से कुछ बूँदों को जोडने और हिडनोकाप्पस ऑबल, जिंजली आयल से आवरण पात्रों या गन्नियों को छिडकना आदि वाणीज्य संसधन शेडों के लवण अचार में ब्लोफ्लाई कीडाणुबाध को रोकता है।

75/यू एल डी/बीए/नाइलॉन/बीए/प्रिमाकॉर थैलियों में संवेष्ठित मछली करी को कोष्ठ तापमान में 2 हफ्तों तक स्वीकार्य अवस्था में रखा जा सकता है।

भूने झींगों मांस, भुने मछली टुकडों और मछली थोरन को क्रमश : तीन महीनों, 2-4 हफ्ते और पाँच दिन तक तैयार और संग्रहण करने की प्रक्रिया को मानकीकृत किया।

तीन महीने की संग्रहण जीविका से युक्त शीघ्र-खाने के लिए पकायित, धूमित और शुष्किंत बॉगडा फिलेटों की तैयारी की प्रक्रियाओं का विवरण भी संचालित किया गया।

मासमिन के समान यूथिनस अफिनिस से पारंपरिक मासमिन को तैयार करने केलिए आवश्यक समय लेकर तैयारित सरल प्रक्रिया से पकाए, परत किए और धूमित और शुष्किंत ड्यूणा परतों को तैयार किया गया।

गोवा अनुसंधान केन्द्र

छोटे या माध्यमिक यानों के अनुकूलतम नौकर्षण गति 2.5 समुद्री मील निकला।

अधिकतम पकडाव के क्षेत्र अनुपात 1:5 प्राप्त हुआ।

नियंत्रण जाल की अपेक्षा प्लाटफार्म ट्राल श्रेष्ठ पकडाव को लगातार दिया गया।

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