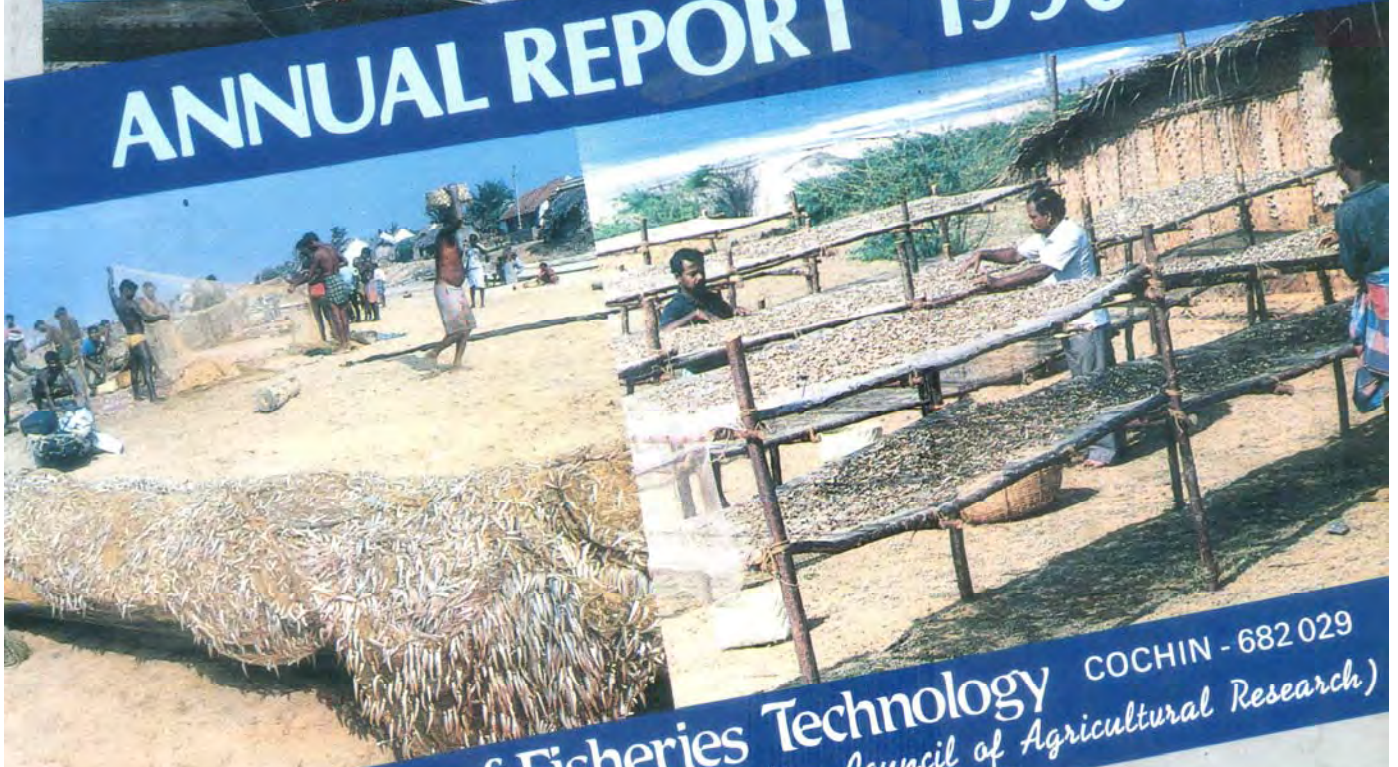




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Central Institute of Fisheries Technology COCHIN - 682 029
(Indian Council of Agricultural Research)



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केंद्रीय मात्स्यकी प्रौद्योगिकी संस्थान

भारतीय कृषि अनुसंधान परिषद

मत्स्यपुरी पी.ओ., कोचिन - ६८२ ०२९

CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

MATSYAPURI P.O., COCHIN - 682 029

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Salient Achievements in Hindi

Cover :

- Indigenous craft loaded with gill net.
- Bumper catch of anchoviella at Kovalam, a fishing village in Kanyakumari District.
- Demonstration of rack drying of anchoviella.
- Value added fishery products.

INTRODUCTION

The Institute continued to achieve steady progress in all fields of activities. Some of the achievements are highlighted below :

Test trials of CIFT designed 7.6m. fibreglass boat constructed for pole and line fishing at the request of Dept. of Science and Technology, U.T. of Lakshadweep, have shown the vessel to be sea-worthy.

Specifications were evolved for combination wire ropes on the same lines as for steel wire ropes.

60-100mm. mesh size accounted for 90% catch from multimesh gill nets.

*Surface set gill nets were found more effective for capture of **Catla catla** in reservoirs during winter months.*

Profitable fishing grounds for sharks were located in the South west area off Bombay.

20m. large mesh sputnik trawls proved more efficient than 20m. small mesh trawls for fishes seer and pomfret.

Incorporation of spices markedly retarded deteriorative changes in fishes frozen and stored as whole, as chunks and as fillets.

Mackerel in fillet form was seen best suited for processing in retort pouches.

A method that can be commercially adopted was developed for separating squalene from liver oil of shark.

Extent of lipid oxidation in pomfrets was more in smaller fish compared to larger fish irrespective of their lipid content.

Refined salt is found to give better protection to cured fish products against attack by moulds, fungi and red halophilic bacteria.

Low cost, ready-to-cook convenience products were prepared from small anchovies.

Pickle cured Indian oil sardine could be kept in brine in acceptable condition for more than a year compared to mackerel, sole and ribbon fish which had a storage life of only a month.

Alanine/proline ratio in test diets was found to have profound influence on cholesterol retention in rats, decreasing with increase in ratio.

*Chlorination of water used in processing factories to a residual level of 10 ppm provided full protection against **Listeria monocytogenes**.*

*Complete elimination of **Salmonella** cells from artificially contaminated fish/prawn meat was not possible even by repeated washing with chlorinated water.*

*Enterotoxigenic strains of **Staphylococcus aureus** could survive and grow in salt cured fish but were completely destroyed during 3 days sun drying.*

A dip load monitor for monitoring a load upto 200 kg. was developed.

Fish/prawn pickles penetrated consumer markets of Kerala significantly with a single processor contributing to the major share of the market.

Studies on the decision making behaviour of fishermen have revealed the positive association of variables such as education, ownership pattern and number of crew.

A Summer Institute on Packaging of Fish and Fish Products for Export and Internal Market was held in May 1990, in which candidates sponsored by various Agricultural Universities, State Fisheries Depts. and Govt. organisations participated.

A master plan incorporating details for setting up a boat building and repair yard, fish processing plant and fish curing and drying yard was prepared and supplied to Director of Fisheries, Pondicherry.

As a part of a collaborative programme with the Ministry of Food Industries, Govt. of India, a project report on 'Production Units for Utilization of Low Cost Fish' was prepared and forwarded to the Ministry.

Sd/-
(M.R. Nair)
Director

HISTORY

The Central Institute of Fisheries Technology, named at the time of its inception as Central Fisheries Technological Research Station, was set up following the recommendations of a high power committee constituted by the Ministry of Food and Agriculture, Govt. of India, in 1954. It was started in 1957 at Cochin 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 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.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. Radhalakshmi, M. Syed Abbas, M.V. Baiju.

Chief Findings :

The 7.6m fibreglass boat constructed for pole and line fishing was tested for seaworthiness and found suitable.

A method of test for the determination of UV (Ultra violet) deterioration of netting yarns was prepared and submitted to BIS for consideration as National Standard.

Specifications of combination wire ropes were prepared on the same line as steel wire rope (SWR) and submitted for consideration by BIS.

Multimesh gillnets were found to be effective for the capture of different varieties of fishes with 90% catch being got from nets with 60 to 100 mm mesh sizes.

Lucrative shark fishing grounds on the Angria Bank, West off Ratnagiri (South West off Bombay) at latitude 16°15'N - 16°47'N and longitude 71°45'E - 72°45'E - 72°18'E have been located for commercial exploitation of the fish.

Research Projects Handled :

1. C-8/88(5) - *Studies on the construction and maintenance of medium and large class of fishing vessels in wood and steel for the Exclusive Economic Zone.*
2. C-9/89(4) - *Development of protective treatment for wooden boats.*
3. G-20/87(3) - *Studies on gear materials*
4. G-16/85(5) - *Studies on demersal trawl*
5. G-17/85(5) - *Studies on midwater and semi pelagic trawls*
6. G-21/89(5) - *Low energy fishing techniques*

Report of Work Done :

Fishing Craft

Studies on medium class vessels with reference to material, cost and performance were carried out. Cost analysis showed that steel vessels cost more or less same as wooden trawlers of standard materials and good workmanship. Maintenance cost of steel vessels is also lesser than wooden vessels. Parametric ratios of wooden vessels were not found to be within the optimum range. Construction practices were also inferior in many cases. Propeller efficiency was found to be only about 29-34% during free running. Most of the vessels under study showed higher fuel consumption.

In the case of FRP boats, the construction cost was found to be only 30%

more than that of wooden boats when more than 5 boats were constructed from the same parental mould. The maintenance required for FRP boats was also lesser compared to wood.

Fouling and corrosion were found to be 5 to 6 kg/m³ and 0.1 to 0.2mm (pitting) per year in boats where the protective systems failed.

Preservative loading studies on timbers for boat building showed 32 kg/m³ copper chrome arsenic (CCA) and 320 kg/m³ of creosote as desirable.

A new resinous compound from oil and resin has been developed as a base for caulking compound in fishing boats.

Gear materials

Studies on photo-oxidation and deterioration of HDPE twines and nylon monofilament have been completed. Data is being analysed correlating period of exposure and retain strength for a given material.

Demersal trawls

Field experiments of square mesh cod ends were continued for confirmation of results and observations on the presence of juveniles during different periods of the year. More juveniles were present during pre-monsoon and monsoon seasons (May to July) in the inshore waters.

The following designs of demersal trawl developed for operation from FORV 'Sagar Sampada' for the exploitation of

EEZ were taken up for fabrication and pursued.

1. 41.5m Rectangular trawl
2. 56.4m High Opening trawl
3. 42.6m Six seam trawl

Midwater trawls

1/4 Scale models of 23.4m RMT-6E and 18m RMT-8P trawls were completed and field trials in the backwaters carried out. 1/4 scale model of rectangular otterboards of 1800 x 900mm size were used in combination with the gears. 1/5 scale model calculations of the above nets were completed and sent to IIT Madras for checking.

Fabrication, assembling and rigging of 33.7m RMT-6E, 36.4m RMT-8P and 64m rope trawl were completed for operation from FORV 'Sagar Sampada' and trial testing of the former two designs carried out.

Line fishing

Eighteen branch lines were fabricated with polypropylene braided twine and rigged with round bent hook no. 5, while forty lines were fabricated with circle hooks equivalent to the conventional hook No. 6. Hooks No. 3 and 4 with snoods of cotton, nylon monofilament and multifilament were tested for quality evaluation. While hook No. 4 with cotton snood had a hooking rate of 16%, hook No.3 with snoods of nylon multifilament and monofilament recorded a hooking rate of 8% each.

Studies on long lining for sharks have shown an overall hooking rate of 7.4% from Angria Bank situated west off Ratnagiri. This is comparable to the commercially viable hooking rates of any long line fishing. Indian round bent hooks have been found as effective as Norwegian round bent hooks of size 0/4.

Fish traps of dimension 100 x 70 x 60 cm were designed with frames of mild steel rod covered with welded square mesh and having a single funnel. Fabrication of the trap is in progress.

Comparative fishing experiments were carried out with polyamide multifilament trammel net and monofilament simple gill net of five mesh sizes ranging from 50 to 113 mm for scombroid fishes and four mesh sizes ranging from 34 to 50 mm for prawns. Both trammel and simple gill nets of 34 and 38 mm mesh sizes landed better catches of prawns. From the economic point of view, however, simple gill nets were found to be better. Further trials are underway.

Studies on the present status of gill net fishing along Kerala coast were carried out. Gill nets for sardine and mackerel are common along the coast whereas nets for anchovies are confined to Trivandrum and entangling nets for crustaceans to Quilon and Trivandrum. Polyamide monofilament as a gill net material for mackerel and sardine is popular in the northern parts of Kerala; but it is yet to become popular in the southern districts. 'Kollivala', an en-



A 7.64 m. fibreglass boat designed and developed at CIFT for pole and line fishing around Lakshadweep Islands.



A group of fishermen in the gear fabrication hall of the Institute.



Indigenous round bent hooks for shark fishing.

circling gill net used by the fishermen was replaced by ring seine along the entire coast of north Kerala with minor variation in depth end length at different centres.

Island Fishery Development Programme

Handlining using reels was carried out at Kalpeni Island using round bent, circle and swan bent hooks. The results were quite encouraging, the catch consisting mainly of perches and coral fishes.

Research Contemplated

1. Development of design of a medium class vessel in the range 15-20 m for exploiting resources of distant and deeper waters
2. Studies on microfouling
3. Studies on quantity and quality of fouling and corrosion profile in various classes of fishing vessels
4. Development of alternative caulking compound in place of conventional one
5. Studies on biodeterioration in timbers and its prevention
6. Field trials of bobbin trawl, hybrid trawl and rectangular trawl from FORV 'Sagar Sampada' and design and development of 33 m semi-balloon trawl for inshore waters
7. Field trials with square mesh and diamond mesh cod ends
8. Exploitation of semi-pelagic resources
9. Studies on entangling nets, long lines for sharks and other species, hand lines and traps

Fish Processing Division

Scientists Associated :

K. Gopakumar, S. Ayyappan Pillai, P.V. Prabhu, K.K. Balachandran, T.S.G. Iyer, P.K. Surendran, P. Madhavan, K.G. Ramachandran Nair, P.A. Perigreen, P.T. Mathew, A. Lekshmy Nair, A. Vasanth Shenoy, Chinnamma George, T.K. Thankappan, Jose Joseph, A.C. Joseph, T.K. Sreenivasa Gopal, V. Muraleedharan, Nirmala Thampuran, Jose Stephen, P.R.G. Varma, P.K. Vijayan, R. Thankamma, V. Narayanan Nambiar, K.P. Antony, G.R. Unnithan, S.K. Bhattacharyya, A. Ramachandran, P.T. Lekshmanan.

Chief Findings :

Incorporation of spices has been shown to have a marked effect in retarding deteriorative changes in fishes frozen and stored as whole, chunks and fillets. Mackerel in fillet form was found best suited for processing in retort pouches.

A simple and improved method was worked out for heat processing of retort pouches using laboratory model autoclave.

Different grades of chitosan have been produced by controlling the steam pressure.

Fresh shells of *Penaeus indicus* and *P. monoceros* gave higher viscosity chitosan compared to that prepared from *P. monodon* and *Parapenaeopsis stylifera*.

Chitosan of viscosity ranging from 15-150 cp was found most suited for making chitosan films.

A simple method which can be adopted commercially was developed for separation of squalene from liver of shark.

Incorporation of sorbitol at 4% level retained the water holding and textural properties of frozen barracuda mince for upto 40 weeks when stored at -20° C.

Method was standardised for preparation of fish medallion using minced fish, starch, salt etc.

Good quality soup powder was prepared from deep sea perch.

The yield of fish mince from fish collected from the west coast of India varied from 23.2 to 48.4%.

Listeria monocytogenes could survive for more than 50 days in water at refrigerated temperatures (5-10° C).

The water used for prawn/fish processing factories may have to be chlorinated to a residual level of 10 ppm to get full protection against **L. monocytogenes**.

LD/BA/Nylon/BA/Primacor and HM-LDPE packagings were found resistant to insect attack in consumer packaging of dry fish.

Suitable packaging materials were identified for packing fried white baits as well as white sardines.

Research Projects Handled :

1. P 38/90(5)- Development of heat processed fish products in modern containers
2. P 26/86 (5)-Studies on the use of chitinous waste, fermented fishery products and liver oils
3. P 36/89/ (3)- Technology of production, processing and shelf life assessment of fish mince
4. P 30/87 (5)- Utilisation of deep sea resources for product development
5. P 33/88(20)- Upgradation of quality in the seafood industry

6. P 29/87 (3)- Enhancement of shelf life and consumer appeal of fish and fishery products by appropriate packages

Report of Work Done :

Freezing

Studies were carried out on the effect of spices in retarding deteriorative changes in fishes when frozen and stored as whole, chunks and fillets. Mackerel as whole and perch as chunks and fillets were used as the raw materials. Periodical examination of the frozen stored samples before treatment showed that deteriorative changes

were more rapid in mackerel than in perches, possibly due to the characteristic enzyme action and action of bacterial flora present in the intestines. However, with treatment, definite improvement in quality was observed when compared to the control. Spices imparted a characteristic flavour to the product. Variation in the water holding capacity in the muscle was observed in all the samples, that in the treated samples being less marked. Texture hardening and rancidity development occurred to a greater extent in the control samples during six months of storage when compared to the treated samples. Loss in the characteristic sheen on the body surface and change in appearance of the eye lens was however noticed in all the samples after six months storage. Agar-agar treatment, which was also tried along with spices treatment, had very little effect in retarding the lipid oxidation leading to deterioration.

In the case of perch chunks and fillets, quality loss was less compared to mackerel. Spices, besides imparting the characteristic flavour to the flesh, also improved the sensory qualities and arrested deteriorative changes to a great extent.

Canning

Various experiments were tried to improvise a set-up for carrying out preliminary investigations on heat processing retort pouches making use of the equipments available in the laboratory. This was made possible by providing a non-return air valve on the lid of a laboratory

model autoclave through which air can be pumped in to maintain pressure over the pouches during the cooling phase. Such an over pressure of air will prevent the development of pressure inside the pouches once the steam is cut off preventing damage to the pouches which would otherwise be possible. Sufficient cooling of the pouches is also essential as otherwise the pouches will remain in a bulged condition increasing the risk of rupture. The chances of rupture can further be minimised by only half filling the pouches and removing as much air as possible from the head space by physical means. The system was found to function satisfactorily when a limited number of bags were processed.

Screening of different fishes for their suitability for retort pouch processing and style of processing was undertaken. As the versatility of sardines for processing in pouches by the natural pack method has already been established, the possibility of processing sardines in filleted form was investigated. Studies have shown that it is best to pack sardines in the natural style after dressing. As regards mackerel, it can be packed either as fillets or in the dressed form. However, fishes weighing above 200 g. were not found quite suitable for packing in dressed form as the pouches presented an over bulged appearance.

Fishery by products

The conditions worked out for preparing chitosan of very low viscosity (below 6 cp) in the laboratory were tried on

a semi-commercial scale in the M.S. reaction vessel. Samples of chitosan were prepared from fresh shells of medium size *P. stylifera* by de-acetylation in closed atmosphere under steam pressure of 35, 40 and 50 p.s.i.g. giving products of viscosity 10, 8 and 4 cps respectively showing that by controlling the steam pressure, the required grades of chitosan can be produced. Heating, when done open to atmosphere, increased the alkali concentration. Increased alkali concentration coupled with high temperature resulted in decrease in nitrogen content as well as viscosity of the chitosan produced. This decrease in nitrogen content was not so significant when deacetylation was done in closed atmosphere.

It has also been observed that for production of chitosan of very low viscosity, variation in the species of prawn did not have any significant effect. But for higher viscosity chitosan, shells of *P. indicus* and *P. monoceros* are found to be better than *P. monodon* and *P. stylifera*. Chitosan of high viscosities ranging from 500-1000 cp can be produced by demineralisation and deproteinisation at room temperature and de-acetylation below 70° C. Enzymatic hydrolysis for removal of protein also gave high viscosity chitosan. However, high acid concentration during demineralisation was seen to reduce the viscosity due to hydrolysis of chitin.

Shells from various parts of the crab body gave various grades of chitosan under identical conditions of preparation. Crab leg shell gave very high viscosity

chitosan followed by crab claw. Body shell of crab gave only very low viscosity chitosan. The reason for this variation can be attributed to the variation in concentration of mineral content in these parts. Higher the mineral content, lower will be the viscosity of chitosan produced from that part.

The molecular weight determination of chitin was done by intrinsic viscosity measurement of chitin solution in dimethyl acetamide containing 5% lithium chloride. The mol. weights of the samples tested were in the range of 1 to 1.5×10^5 . Similarly mol. wt. of chitosan was determined by measuring viscosity of chitosan solution in acetic acid using an Ubbelohde viscometer.

Chitosan of very low viscosity (below 6 cp) and high viscosity (above 500 cp) are not found suitable for making chitosan films since the films made from the former is brittle and that from the latter is very thin due to lower solid content. Therefore, for making films, chitosan of viscosity ranging from 15 to 150 cp has been found to be best suited. Dry and wet breaking strengths of chitosan films (0.0125 mm thick) made from 4% solution of 15 cp chitosan in formic acid were 800 kg/cm² and 100 kg/cm² respectively compared to the dry strength of 70 kg for low density polythene and 300 kg for high density polythene film (0.03125 mm thick).

Addition of chitin in chicken feed lowered the fat content of broiler meat. In one experiment, the fat content of muscle

of broiler chicken fed on 0.5% chitin diet for 8 weeks was 5.63% whereas that fed on chitin free control diet was 11.24%. Feeding experiments with high fat diet along with chitin on albino rats were continued. Liver, muscle, serum, kidney and heart of the rats fed on chitin diet were analysed. A reduction of 15% cholesterol was noticed in comparison with control animals.

Requirements of chitosan for medical and bio-medical uses have been specified. Chitosan films, micronised chitosan and chitosan impregnated gauzes were prepared and supplied to Trivandrum Medical College for conducting experiments in medical applications. Micronised chitosan was successfully tried by College of Pharmaceutical Sciences, Trivandrum in the slow release of Ibuprofen using chitosan in granulation. Samples of chitosan and literature on the subject were given to the same Institute for conducting experiments on micro encapsulation of Ibuprofen for controlled release. Chitosan powder, films and gauzes were also supplied to the Little Flower Hospital, Angamaly for studying the haemostatic mechanism of chitosan.

Chitosan prepared from prawn shell has been found to be very effective in the preparation of pelleted and granulated feeds for prawns and fish of different stages of growth. The feeds thus prepared have increased water stability thereby improving the feed efficiency and available oxygen in water.

The metal binding property of chitosan with respect to mercury, cadmium and copper was studied. Increase of pH decreases the absorption. Column treatment was more efficient than direct addition of chitosan to the solution. The absorption of heavy metal ions by chitosan was higher in the case of mercury than copper and cadmium.

Studies on the application of chitosan in corrugated fibre board production in place of starch adhesive were continued. Cartons made out of corrugated fibre boards produced using chitosan adhesive had similar characteristics as that prepared using starch adhesive during storage at -20°C for 7 months showing that chitosan can be used as adhesive for manufacture of corrugated fibre board for making cartons for low temperature storage.

Hydrolysate from squilla, a water soluble fraction from whole squilla, has been found to be a good growth promoting medium for bacterial enumeration. Protein powder from deep sea prawn was prepared and the amino acid profile was determined. *Decapterus russelli* and *Nemipterus japonicus* and filleting waste from cat fish and Kalava were prepared and a protein enriched food was made using these hydrolysates. They were rated good by sensory evaluation including that from cat fish. All these hydrolysates were found to have balanced amino acid profile. Feeding experiments were also carried out.

Liver oil from *Centrophorus scalpratus* was analysed for unsaponifiables and squalene content. An easy method was developed for commercial separation of squalene from liver oil of shark. Distillation of oil under reduced pressure gave squalene of high purity when tested in the latroscan.

Fish mince

Minces was prepared from eight species of low cost fish. The yield of mince and waste from these fishes and their chemical composition were determined. The yield of mince varied from 33% to 58% on the basis of whole fish. The maximum yield of mince was from *Saurida tumbil*. The fat content of the minces was in the range 0.54 to 2.18%.

Studies on the frozen storage characteristics of barracuda mince (frozen as blocks) have been completed. The frozen mince showed a shelf-life of 7 to 8 months at -20° C. The solubility of proteins decreased during frozen storage. Textural deterioration was also observed.

Studies on the effect of cryoprotectants like sucrose, sodium tripolyphosphate and sorbitol on the frozen storage characteristics of barracuda mince were continued upto 40 weeks at -20° C. Of the different cryoprotectants tried, sorbitol (4%) gave good results. The control samples became unacceptable after 32 weeks storage whereas the samples treated with 4%

sorbitol were in good condition showing good water holding and textural properties.

The intense odour and dull colour of mince from oil sardine could be removed by washing with chilled water (twice) and final washing with 0.1% NaCl and pressing. The washing loss was 20-25%. Flavour reversion was noticed during frozen storage of the washed mince.

The effect of salt concentration on texturisation of fish mince was studied and it was found that incorporation of salt at 2 to 2.5% level gave a good textured product with good water holding capacity and minimum loss on cooking. The cutlets prepared using texturised meat had better acceptability compared to the conventional product.

Method has been standardised for the preparation of fish medalion using minced fish, starch, etc. The battered and breaded medalion prepared showed good organoleptic qualities and acceptability. Frozen storage studies are in progress. Attempts were made to prepare a butter-like product using lean fish mince, hydrogenated fat, salt etc. Cooking the mince (after removing the connective tissue) and grinding/blending the meat with other ingredients did not give a very fine consistency to the product. However, the technique of solubilization of myosin with salt before cooking gave encouraging results.

Utilization of deep sea resources

Samples of deep sea fishes collected from the west coast of India were analysed for the yield of mince, proximate composition, mineral content, amino-acid profile and organoleptic characteristics. The yield of mince varied from 23.2 to 48.4%. The samples were rated good by organoleptic evaluation. Amino acid analysis of three of the fish samples was also carried out.

Edible fish powder was prepared from Kalava, shark, perch, cat fish, *Priacanthus* and *Decapterus russelli* and their properties studied.

Different varieties of deep sea fishes were also used for the preparation of fish wafers, fish fingers, texturised meat, edible fish powder, fish hydrolysate and fish meal. *Nemipterus parascloopsis aspinosa* was found suitable for production of texturised meat, edible fish powder and hydrolysate, but unsuitable for production of fish wafers and fish fingers, probably due to its high fat content. Hydrolysates were also prepared from *N. japonicus*, cat fish waste and *Decapterus russelli*. Proximate composition and amino acid profile of the samples have been evaluated.

Soup powder prepared from perch had excellent taste and flavour.

Fish meal was prepared from *Decapterus russelli* and its quality assessed by chemical and biological method. Fish

meals prepared earlier from filleting waste of *N. mesoprion* and *Priacanthus hamrur* were seen to possess lower nutritional quality than the reference protein casein.

Studies on the effect of *Lactobacillus plantarum* on the acceleration of fermentation process in fish sauce production have been taken up. Chemical indices and bacterial counts including halophilic bacterial counts and lactobacillus counts are being estimated periodically.

Yield of dressed fish and mince from goat fish (*Upeneus taeniopterus*), *Oreochromis mossambicus*, *Sphyræna* sp., *N. japonicus*, *Rastrelliger kanagurta*, *R. maculatus* and deep sea perches (*Epinephelus* sp.) was studied for their suitability for preparation of surimi. Nitrogen and lipid losses during different washing schedules and changes in the quality of the surimi stored at -20°C were studied. Additions of 2% sodium chloride and 2% corn starch improved the quality of the surimi.

Feeding trials were carried out on albino rats using samples of fish meal prepared from wastes of *Pentaprion longimanus* and *Nemipterus mesoprion* and edible meat powder from *P. longimanus*, *Gymnocranius robinsoni*, *Epinephelus malabaricus*, cat fish and shark. The intake of food and PER of meat from *N. mesoprion* waste was observed to be lower than that of casein. In all other cases, the PER of the samples was higher.

Quality control

About forty samples of dried fish collected from the local market were examined for fungi of which *Aspergillus* group was found to dominate.

Forty eight samples of frozen shrimp collected from the processing factories were screened for the presence of *Listeria monocytogenes*. The pathogen was absent in all the samples tested. The viability of this pathogen in water was also studied. The organism was found to have a viability of about 20 days in water at ambient temperature. However, in refrigerated temperatures (5-10°C), the organism was found to survive for more than 50 days.

The viability of the above organism in processing water during chlorination was also investigated. It has been observed that a) chlorination at 5ppm level is insufficient to get full protection against this pathogen, and b) chlorination to a residual level of 10ppm with a contact time of 5 min. is needed to destroy all the viable organisms.

Commercially frozen squid and cuttlefish continued to be examined in detail for various quality factors. Of the 24 samples examined, 4 samples were poor, 5 were fair and 15 good, organoleptically. There was good correlation between the organoleptic rating and hypoxanthene content. *Salmonella*, *V.cholerae* and *E.coli* were absent in all cases whereas faecal streptococci was present in all the samples tested.

The glaze pick-up and drip loss associated with IQF production were studied. In the case of HL shrimps, the drip loss was found to vary between 2.8 and 4% depending upon size grade whereas the glaze pick-up varied between 5.62 and 18.73% in PD shrimps. Such high percentage of glaze pick-up was found to be mainly due to the differences in the technique followed.

Under the FAO project on quality control, about 75 samples comprising contact surfaces, water and raw materials were tested for bacteriological quality. *E.coli*, *Salmonella* and *V.cholerae* were absent in all the cases.

Packaging of fish and fishery products

Studies were initiated on the development of suitable packaging materials for packing fish fingers. From the observations made so far it is seen that nylon/LD co-extruded film and HD-LD co-extruded film extended the shelf life of fish fingers upto 8 months compared to those packed in LDPE, LLDPE and HM-HDPE which had a shelf life of only 4-5 months.

Seer fish steaks packed in 150-170gm lots in 12 μ plain polyester/230 gauge LDPE are acceptable upto 28 days and 18 days when stored in modified atmosphere containing 80% CO₂ and 20% air and 50% CO₂ and 50% air respectively at 0-4°C. Similarly, seer fish steaks are acceptable upto 26 days when stored in modified atmosphere packaging containing 80% CO₂

and 20% O₂ at 0-4°C. In control samples without the gas mixture, the shelf life was only 13 days.

White baits fried with salt, turmeric powder and chillie powder can be stored for 20 days at ambient temperature and 40 days at 5°C when packed in multilayer film 90-100 LD/BA/Nylon/BA primacor pouches. Similarly, white sardines could also be stored from one week at ambient temperature and 2 weeks at 5°C when packed in similar pouches.

Studies have been conducted on the effect of frozen storage on the property of master cartons coated with wax on both sides, inside, outside and plain cartons without coating, duplex cartons and polythene film by simulating conditions of frozen shrimp storage at -20°C. Results indicate that there is an uptake of moisture in all the samples resulting in the decrease of strength properties, namely, bursting strength, puncture resistance, flat crush etc. during the course of one month itself.

Research Contemplated :

1. Studies on amenability of different species of fish for processing in different containers
2. Development of recipes for ready-to-consume type fish based products
3. Standardisation of methodology for the determination of quality of chitosan
4. Preparation of chitosan gel and comparison with calcium alginate
5. Preparation of chitin/chitosan derivatives
6. Complete utilisation of tuna waste from canneries
7. Yield and quality of deep sea fishes
8. Preparation of minces from underutilised species of fish and development of products from mince
9. Quality assessment of seafoods using 'K' value
10. Detection and identification of fungi from dried fish
11. Improvement of hygiene and sanitation in seafood products
12. Studies on effluent discharged from seafood processing factories
13. Modified atmosphere packagings for priced fish
14. Packagings for frozen/dried/fried fish products etc.
15. Studies on cultured prawns
16. Effect of natural preservatives/spices in extending shelf life of fish, fish fillets and chunks
17. Formed scampi from meat of tiny prawns



Packaging materials developed for various fish and fish products.

Fish fingers packed in nylon/LD co-extruded multilayer film.



Fish steaks stored in modified atmosphere packaging in 12 μ plain polyester laminated with 230 gauge LDPE.



Swarming of *Bacillus* species showing characteristic concentric zones of growth.



Handing over of the artificial fish dryer designed and developed at CIFT to Dr. E. G. Silas, Vice Chancellor of Kerala Agricultural University.

Biochemistry, Nutrition & Microbiology Division

Scientists Associated :

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

Chief Findings :

Alanine/proline ratio in test diets is found to have profound influence on the cholesterol retention in rats, decreasing with increase in the ratio.

Both toxic metals and pesticide residues in fish as well as brackish water prawns were far below the toxic levels.

Surgical sutures prepared from fresh water fishes showed variation in tensile strength with season.

*Of the **Listeria** species isolated from fresh fish and prawns, **L.innocua** constituted the major group.*

*Presence of micro-organisms viz. **E.coli**, **Staphylococcus aureus**, **Proteus** spp and **Bacillus** spp adversely affected the survival of **Salmonella** serotypes inoculated into the fish during frozen storage.*

*Enterotoxigenic strains of **Staphylococcus aureus** could survive and grow in salt cured fish but were destroyed during sun drying.*

***Clostridium botulinum** type D predominated in fresh fish samples from Cochin.*

***Aeromonas hydrophila**, a food poisoning bacterial species, has been isolated from fresh fish of local trade.*

*Complete elimination of **Salmonella** cells from contaminated fish was not possible even by repeated washing with chlorinated water.*

Research Projects Handled :

1. No. BCNM/BC (10)/88 (5) : Flavour bearing compounds of fish muscle and the effect of their possible interaction during processing
2. BCN-9/85/(5) : Nutritional and toxicological studies on fresh and processed marine products
3. BCNM/MB (II)/89 (5) : Investigations on toxigenic and pathogenic bacteria associated with marine and cultured fishes

Report of Work Done :

Fish flavours

The nature and extent of carbonyls developed in sardine oil at various temperatures and their contribution to flavour change as well as their interaction with fish muscle constituents were investigated. Lower fatty acids which can contribute to flavour were not detected in any of the tropical fresh water as well as marine fishes.

Nutrition

The amino acid composition of fishes including the deep sea fishes showed a balanced distribution of all essential amino acids. Studies have also shown that the alanine/proline ratio has significant influence on the cholesterol retention in the body.

The free amino acids of fishes were also analysed. It is noted that fresh water fishes contain appreciable level of free

histidine, and care should be taken in handling them to avoid formation of histamine.

Studies on the fatty acid composition of oil from sardine, mackerel, caranx, horse mackerel, white bait and prawns were carried out. A slight variation in the fatty acid composition was noted in prawns. Palmitic acid was observed to be the major fatty acid in fish lipids. The content of EPA (Ecosa pentaenoic acid) and DHA (Decosa hexaenoic acid) varied from 15 to 25% in fish lipids while EPA alone varied from 3 to 6%.

Toxic constituents

The content of chlorinated pesticides in marine fishes and brackish water prawns was less than 0.6µg/kg, the maximum value observed being in *Sphyræna*, where DDT showed a value of 0.7µg/kg.

The content of toxic heavy metals in all fishes analysed was estimated. The level was found to be far below the permitted level to cause any toxicity.

The analysis of histamine under chilled storage of catla, rohu and mrigal showed that within the period of acceptability, the content of histamine developed is too low to cause any toxicity.

Surgical sutures

As reported earlier, surgical sutures comparable in strength and firmness to conventionally used sutures could be prepared from guts of freshwater fishes. The

properties of the sutures is partly dependent on the condition of the fish with respect to season. The histopathological report is awaited from Haryana Agriculture University.

Listeria in fish/fishery products

Both FDA (Food & Drug Administration) and UVM (University of Vermont Medium) methods were compared for the recovery of *Listeria* from fish/shell fish/fishery products of local trade. Both methods gave comparable results in the isolation of *Listeria*, even though detection of the presence of *Listeria* was easier when UVM with Frazer's broth was used. Of the 240 samples of fish/shell fish/processed fishery products examined, 90 were presumptively positive for *Listeria*. Out of the 46 cultures isolated, 22 cultures were identified as *L. innocua* (12), *L. ivanovii* (6), *L. seeligeri* and *L. gravi* (2 each).

Aeromonas in fresh fish

Aeromonas hydrophila, a food poisoning bacterial species, has been isolated from fresh fish of local trade in Cochin. Both direct plating method using starch ampicillin agar (SSA) and the MPN method using trypticase soy ampicillin broth (TSAB) were tried. Of the 116 cultures isolated, 33 were identified as *Aeromonas*. TSAB was found to give better recovery of *Aeromonas* strains from fish.

Salmonella

Studies on the effect of the presence of the native flora of fish and other

microorganisms like *E. coli*, *Staphylococcus aureus*, *Proteus* and *Bacillus* on the survival and growth of *Salmonella* serotypes inoculated into fish/prawn meat homogenates showed that at $30 \pm 2^\circ\text{C}$ and refrigerated temperatures (5 to 10°C), these microorganisms had very little effect on the survival and growth of *Salmonella* serotypes, whereas during freezing and frozen storage at -10°C , the survival of *Salmonella* cells was adversely affected.

Effect of washing with tap water and chlorinated water on the elimination of *Salmonella* serotype from artificially contaminated fish/prawn meat was investigated. By washing with tap water, about 60-80% of the *Salmonella* cells was eliminated by the first washing and upto 90% by repeated washings; but complete removal was not possible. Washing with chlorinated water (5-20 ppm available chlorine) could eliminate 80-90% of the cells by first washing and by repeated washing, upto 99% of the cells could be removed. But even by raising the level of available chlorine to 50 ppm, it was not possible to completely eliminate the *Salmonella* cells from the fish/prawn meat.

Enterotoxigenic Staphylococcus

Studies were continued to detect *Staphylococcus* enterotoxin present in fish/fishery products by the application of Reverse Passive Latex Agglutination (RPLA) technique. It was observed that it is possible to detect enterotoxin at 0.3 to 0.6ng/

g. of fishery products using the SET-RPLA kit of the OXOID.

Enterotoxigenic *Staphylococcus aureus* strains were found to grow in fish during salt curing and these strains survived for 4 weeks in the cured fish. However, 3 days of sun drying could destroy all the *Staphylococcus* present in the cured fish.

Vibrio parahaemolyticus

Both enteropathogenic and non-pathogenic strains of *Vibrio parahaemolyticus* could survive in prawn homogenate with 3% added NaCl for 21 days, when frozen stored at -20°C, but in prawn homogenate without any added NaCl, they could survive only for 16 days.

During salt curing of fish, both types of *V. parahaemolyticus* could survive only upto 3 days.

Clostridium botulinum

Survey on the distribution of *Clostridium botulinum* in fish/fishery products from the local trade of Cochin showed the presence of *C. botulinum* types B, C and D in fresh fish samples. Among these types, *C. botulinum* type D was more prevalent. Out of the 10 dried/cured fish samples tested, *C. botulinum* was detected only in one sample.

Medium for enumeration of bacteria in canned/pickled/cured/fishery products

The newly developed plating medium-Peptide EDTA Desoxycholate Agar which could prevent spreading of colonies on culture plates was evaluated using 39 samples of canned/pickled/cured fishery products. The medium prevented swarming of colonies completely in the case of all samples tested and gave a higher recovery of bacteria. Qualitative studies showed that majority of the swarming bacteria belonged to *Bacillus subtilis*, *B. coagulans*, *B. alvei* and *B. circulans*. These bacterial species form characteristic zones of growth, a characteristic possessed by most of the swarming bacteria on ordinary plating media. This characteristic growth was however absent on the newly developed medium.

Halophilic bacteria

Dried/cured fish of commerce were examined for the presence of obligate halophilic bacteria, particularly the red halophiles. Forty six cultures were isolated from 32 samples. All the cultures produced red pigments, tolerated 20% NaCl and were found to belong to *Halobacterium* spp.

Lactic acid bacteria

Studies on the halophilicity of 30 cultures of lactic acid bacteria isolated from

sole, mackerel and tuna, showed that only four of them could tolerate 8% NaCl. All these cultures were psychotrophic.

Research Contemplated :

1. Screening of fishes for phosphorylases, ATPase and proteinases
2. Role of lipids in lipids metabolism and changes in lipid fractions during salting
3. Pesticides, hydrocarbons and other toxic components in fishes
4. Amino acid make-up of different fishes
5. Studies on modified fish proteins
6. Investigations on incidence of *Listeria monocytogenes* and *Aeromonas hydrophila* in fish/shell fish
7. Incidence of histamine producing bacteria in fish/fishery products
8. Development of media for enumeration of bacteria from processed fishery products
9. Effect of handling and processing on survival of *Salmonella* and *Vibrio parahaemolyticus*
10. Factors affecting toxin production by *Staphylococcus aureus* and its prevention
11. Studies on microbial flora of Veraval coast and related aspects

Engineering & Instrumentation Division

Scientists Associated :

S. Ayyappan Pillai, T.K. Sivadas, K. Sreedharan Namboodiri, P.K. Chakraborty, P.N. Joshi, K. Vijayabharathi, K. Ramakrishnan, N. Subramonia Pillai, T.K. Thankappan, K. Ammu.

Chief Findings :

The performance of the all weather type solar dryer was monitored during the rainy season and its heat absorption efficiency during the cloudy and rainy days studied. The dryer recorded reasonable temperature inside the drying chamber even during this season.

A dipnet load monitor was designed and developed for monitoring a load of upto 200 kg. The instrument is very compact and portable and consumes very little power.

Research Projects Handled :

1. Engg-9/90 (5)- Development of equipment and machinery for harvest and post harvest technology of fish
2. IN-2/84 (5)- Electronic aids for fishing and fisheries research

An improved unit of 'fishing log' for monitoring five important parameters of trawl system under water was fabricated and tested.

A 'dip net load monitor' was developed for monitoring a load of upto 200 kg in dip nets.

The sensor for the 'Juvenile counter' was designed and developed.

Report of Work Done :

Studies on smoking of fish were conducted at-45° C and samples drawn at one hour intervals. Changes in pH and total phenols were observed to be negligible after three hours while increase in carbonyls was observed upto five hours of smoking.

The performance of the environmental data acquisition system (EDAS) developed at the Institute was tested and evaluated by a Scientist of the Natural Resources Institute, U.K., Mr. Ansen Ward. The instrument was extensively used in

connection with his studies on solar drying of fish. The performance of two other models of EDAS which were subject to continuous extensive operation for five years has shown the suitability of the sensors and electronics for continuous and unattended operation. Data on the performance of other instruments developed and operated in the field are also being collected regularly.

Research Contemplated :

1. Fabrication of flue gas drier-cum-smoke chamber
2. Design and development of fish cutlet handling system
3. Development of pilot plant for production of bio-gas
4. Design and development of low cost small capacity fish drier
5. Development of liquid nitrogen spray system for freezing fishery products
6. Development of device for drawing uniform samples from frozen blocks for microbiological evaluation
7. Popularisation of propeller nozzle for use in fishing trawlers
8. Development of instruments for aquaculture

Extension, Information & Statistics Division

Scientists Associated :

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

Chief Findings :

Fish/prawn pickles have penetrated the consumer market of Kerala significantly with a single processor contributing to the major share of the market.

Regularity in gill net and trawl net landing of important fishes was observed at the Cochin Fisheries Harbour from April-Dec. 1990. During the period Jan.-March 1991, however, due to fuel shortage, landings were poor and consequently there was an increase in the price of fish.

*The yield rates of **M. dobsoni** in Vizag and Calcutta were estimated to be 52% and 59% from whole to meat and 81% and 85.5% from HL to meat respectively.*

Variables such as education, ownership pattern and no. of crew were seen to have a significant and positive association with the decision making behaviour of the traditional fishermen.

Research Projects Handled :

1. *Ext-16/90(4)- Product evaluation and marketing research of the products developed by CIFT*
2. *Ext-15/90 (5) - Technology transfer and its impact in fisheries*

Report of Work Done :

Market information was collected as per structured questionnaires specially prepared for the purpose for the products fish pickle, fish wafers and fish cutlets and the price structure of raw material and finished products studied. The consumer markets for these products were segmented into users and non-users. The users are further segmented into 'high', 'medium' and

'low'. It was observed that fish/prawn pickles have penetrated the consumer market in Kerala significantly with a single processor contributing to the major share (61%) of the market. Consumer acceptance studies of fish/prawn pickles have shown that 92% of the consumers were in favour of fish pickle.

Data on quantity of fish landed from gill net and trawl net operations were collected from the Cochin Fisheries Harbour. There was regularity in the landings of tuna and shark during the period April to December 1990. The quarter January to March 1991 registered very poor landing by trawlers, mostly due to fuel shortage. As a result, the price of fish shot up by 2 to 3 times compared to that which prevailed in June the previous year. High prices however did not mean good return since due to very low landings, the gross returns also remained low.

Compilation and analysis of data collected on yield rates of prawn from Vizag and Calcutta have been made. The percentage yield of whole to meat, whole to HL and HL to meat in the case of *M. dobsoni* were found to be 52%, 64% and 81% respectively at Vizag and 59%, 69% and 85.5% respectively at Calcutta.

A questionnaire was prepared for collecting information on adoption of improved methods of sheathing wooden hulls of fishing vessels, the same pre-tested and modified. Data so far collected were tabulated. Analysis is in progress.

The extent of association and influence of eight variables on the decision making behaviour of the traditional fishermen were studied. Variables such as education, ownership pattern and no. of crew were found to have significant and positive association with the decision making behaviour of the fishermen especially in relation to adoption of six fishery technologies viz. 1) Use of improved methods of fishing craft maintenance, 2) Use of synthetic fishing net materials 3) Use of ice and hygienic handling 4) Preparation of fishery products 5) Use of improved fish curing methods, and 6) Use of in-board/outboard engines. Analytical results indicate that among five sources studied, 'fellow fishermen' source was rated first followed by Govt. personnel, friends and neighbours, family members and independent decision making in that order.

Studies were continued on the impact of technological changes on the traditional fishermen. It was observed that 55.56% of those interviewed had increased their annual fish catch and 69.45% their annual income. It was also noticed that about 25% of the fishermen had increased their contact with outside agencies in general, and 16.67% had reported better relations with extension workers.

Regarding role and status of women in the fisheries field, ten fishing villages in Kanyakumari District were surveyed and information as per the proforma collected from 90 fisherwomen. Results are being consolidated.

Study on the impact of motorisation on traditional fishing craft in Karnataka region was continued. The study has revealed certain characteristic features of the fishing sector in this part of the country. In contrast to the individual approach to adoption of technology as found in Kerala, a team approach to adoption was seen to be the distinctive feature in the Karnataka region. This had the effect of spreading the risk of loss over a larger area minimising individual risk.

Another noteworthy feature was the combination of fishing enterprises, with a single team owning and operating both mechanised boat and motorised craft. Motorised craft are operated only for 90 days from July to October when the sea is rough and trawling risky, whereas the mechanised boat is operated after October till onset of next monsoon. This type of combination has brought out the following benefits :

- a) Number of fishing days is increased.
- b) Damage to craft, gear and machinery is minimised.

- c) Rate of return was maintained at 29% of investment on motorised craft and 24% of that on mechanised boat.

Another combination was seen in the ownership and operation of small and large country craft by the same team ensuring fairly good catch throughout the year.

Research Contemplated :

1. Marketing research on dry fish production
2. Pricing policy of raw materials
3. Improved practices adopted for protection of wooden hulls of fishing vessels
4. Impact of motorisation on indigenous fishing craft
5. Role and status of women in the fisheries field.
6. Communication behaviour of traditional fishermen
7. Decision making behaviour of traditional fishermen
8. Technological changes and their impact on the traditional fishermen

VERAVAL RESEARCH CENTRE

Scientists Associated :

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

Chief Findings :

20 m. large meshed Sputnik trawl was found to be more effective for seer and pomfret than the 20 m small meshed trawl.

Extent of lipid oxidation in pomfrets was more in smaller fishes compared to larger fishes irrespective of lipid content of the fish.

Semi-dried ribbon fish has better storage life at room temperature than at chilled room temperature.

Onset of pink discolouration in squid was quicker and more pronounced in that stored without direct contact with ice than in squid stored in direct contact with ice.

Treatment with at least 5-10% salt solution was found to enhance the keeping quality of fish by-catch.

Fish meal of satisfactory quality could be prepared from by-catch treated with 0.5 to 1% formalin.

Salting in saturated brine for 8-10 hours gave a product with better quality and longer shelf life.

Refined salt gave better protection to cured fish products against attack by mould, fungus and red halophilic bacteria.

Research Projects Handled :

1. G-16/85 (5) Studies on demersal trawls
2. P (VR)/27/86 (5) - Studies on the effect of pre-processing conditions on frozen storage characteristics of important varieties of fishes of Saurashtra coast
3. P (VR)/28/86 (5) - Studies on technological problems of commercial curing of important varieties of fishes of Saurashtra coast
4. BCNM/MB (II)/89 (5) - Investigations on toxigenic and pathogenic bacteria associated with marine and cultured fishes

Report of Work Done :

Fishing gear

Two 20 m sputnik trawls, one with small mesh and the other with large mesh were designed, fabricated and rigged for experimental fishing operations to study their comparative efficiency. Preliminary observations indicate the efficiency of the trawl with large mesh for effective catch of seer and pomfret compared to the net with the small mesh.

Fish processing

Study on susceptibility of pomfret lipids towards oxidation during different seasons was continued. One important observation made was that the extent of lipid oxidation is more in the smaller fish,

compared to the larger fish irrespective of the lipid content of the fish.

The effect of temperature on the rate of oxidation and hydrolysis in pomfret was studied. The rate of increase in peroxide value was comparable at 0° C and at 10°C during the initial stages. The peroxide value decreased at higher temperatures thereafter, whereas in the samples stored at lower temperature, the peroxide value increased upto the 14th day.

Trials on preservation of by-catch were conducted on-board and on shore. Of the various preservatives tried viz. 0.5% and 1% formaldehyde, 5%-10% sodium chloride, 100-200 ppm chlorine etc., 0.5% formalin was found to effectively prevent spoilage by flies and maggots.

Studies have been initiated on the utilisation of *Saurida tumbil*. The yield of mince was about 41% .

Barracuda yielded about 50% mince. Products prepared from the mince had very good organoleptic quality.

Studies were carried out on the discolouration of frozen tuna and ghol. In the case of tuna, green discolouration was observed in those samples with blood stains and exposed to room temperature for longer periods. Properly cleaned and freshly frozen samples were not affected significantly. In the case of ghol, samples which were not washed properly had a dull appearance, but no discolouration.

Changes in quality of squid stored in ice were also studied. Squid was stored in ice for seven days, in contact and out of contact with ice. Retention of texture, odour and flavour for longer periods was observed in those samples stored out of direct contact with ice. Loss of protein and non-protein nitrogen during storage was also less in these samples. Onset of pink discolouration was however quicker and more pronounced. Both the samples were however acceptable even at the end of seven days storage in ice.

Several commercial samples of semidried fish were collected and their quality assessed. Wide variations were observed in the products prepared from the same fish from the same curing yard but of different batches as also from one curing yard to another. The overall quality of the samples was quite satisfactory. The salt used in the commercial curing yards was also of good quality.

Semidried ribbon fish was prepared by wet and dry curing methods. Samples were packed in gunny bags and stored at room temperature and in chilled room. The samples stored at chilled storage temperature exhibited very little loss in weight but had a shorter storage life. Loss of weight was more pronounced in wet cured samples stored at room temperature. Both wet and dry cured samples were acceptable even after seven weeks storage.

Analytical studies were carried out of various samples of dhoma cured by different methods using commercial as well as refined salt. Dry salting was found to give a better product than brining.

Studies were also carried out to develop a simple method to prevent reddening especially due to halophiles in cured fish.

Research Contemplated :

1. Fabrication and field trials of locally available trawl nets and CIFT designed trawls
2. Studies on the rate of oxidation and hydrolysis at different temperatures in the commonly available fishes along Veraval coast
3. Quality assessment of commercially cured shell fish
4. Investigations on factors causing discolouration, including reddening, in cured products
5. Collection of information on present status of curing yards in and around Veraval
6. Studies on packaging and storage of semidried products from ribbon fish at different temperatures
7. Collection of data on packaging, marketing and transportation of cured/dried products from Gujarat

KAKINADA RESEARCH CENTRE

Scientists Associated :

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

Chief Findings :

The improved high opening trawl was found to perform better than the BOBP high opening trawl.

Rope trawls continued to land more catch per unit effort than the bulged belly trawl with decreased fuel consumption.

Marinated products were prepared from rainbow sardine, mackerel, Sciaenids and white baits.

Low cost, ready-to-cook convenience products were prepared from small anchovies.

The overall quality of dry fish available in Hyderabad market was found to be unsatisfactory.

*The histamine content in sun-dried, salted **Psenus** and **Decapterus** was found to decrease during storage at ambient temperature.*

Considerable loss of sulphur dioxide was noticed during pre-freezing steps in prawns treated with sodium metabisulphite.

Chemical treatment followed by super chilling were seen to enhance the storage life of fish in ice.

Increased storage life of cured, dried fish at ambient temperature was achieved by using salt subject to heat or treated with chemicals as compared to use of commercial salt.

Considerable decrease in faecal streptococci was observed in frozen fish stored at -18° C for five months.

Research Projects Handled :

1. G-16/85 (5) - *Studies on demersal trawls*
2. P-40 (K)/90/ (5) - *Investigations on handling, transport and processing of fish and fishery products in the East Coast of India*
3. BCN -9/85 (5) - *Nutritional and toxicological studies on fresh and processed marine products*

Report of Work Done :

Fishing gear

Field trials were continued with the improved high opening trawl. Initially the net was operated alone to standardise rigging and operation. Prawn catch was comparatively little, ribbon fish constituting a major percentage of the catch. Subsequently, comparative fishing trials were carried out with the improved design and the BOBP high opening trawl. The catch per hour of the improved high opening trawl and the BOBP trawl worked out to 18.50 kgs and 14.50 kgs respectively indicating the better performance of the former.

Field trials were continued with the rope trawl indicating the better catch rate with the 25m net. During the course of 53 hours trawling, about 22.7 kg. catch was obtained per hour on an average with pomfrets constituting 10% of the catch. Comparative field trials with the rope trawl and the bulged belly trawl also recorded better catch with the former. The oil

consumption was also slightly less, being 7.4 and 8.5 litres/hr. for the rope trawl and bulged belly trawl respectively.

Field trials were also continued with the rope trawl with hexagonal meshes in the fore part.

Fish processing

Intermediate fish cake was developed using cheap chemicals. Optimum concentration of different chemicals was determined. Storage study of the product at room temperature is also being carried out.

Trials were initiated to prepare fish sausage with improved texture. Effect of starch and other ingredients on the texture of the sausage has been evaluated.

Trials were also carried out to prepare semi-dried marinated products. Optimum concentration of salt and acid treatment were also determined. Shelf life studies are under way.

Studies have been conducted on the chemical treatment and super chilling of fish with a view to increase storage life. Mrigal treated with chemicals and super chilled in ice-salt mixture has shown enhanced ice storage shelflife.

Headless prawns were dipped in different concentrations of sodium metabisulphite solution, kept in crushed ice and then frozen at -40° C with glaze water in the plate freezer. The samples

registered slow loss of SO₂ during a storage period of six months.

Beheaded, degutted, salted and pressed *Decapterus* packed in 200 g. polythene bag, without vacuum was found free from mold growth and 'red' halophiles during a storage period of 4-6 weeks at ambient temperature whereas in the fish packed in vacuum and stored as above, mold growth and red halophiles appeared at a later stage. Further studies are in progress.

Studies on the histamine content in sundried, salted *Psenus* and *Decapterus* during storage were carried out. Both the samples contained histamine in the order of 50 mg/100 gm in the muscle at the initial stage. But towards the end of three months of storage, the histamine content decreased and both the samples became rancid.

Trials were initiated to preserve fish mince at room temperature using cheap chemicals.

One hundred and ten samples of fish and shell fish collected from Hussain Sagar lake in Hyderabad and cultured fishes/prawns from local fresh water and brackish water ponds were digested for heavy metal analysis. *Notopterus* sp., a species from the Hussain Sagar lake, showed high levels of zinc in the edible muscle and other tissues like tuna and gills. The total mercury content in the edible tissues of all the fishes from the lake was however within tolerance limit as also other heavy metals

like Pb, Cd, Zn. and Cu. The levels of mercury and other heavy metals were well below tolerance limits in the edible meat of fishes/prawns caught from the local fresh water and brackish water ponds. Some deep sea fishes caught off Andhra Coast also revealed low levels of heavy metals.

Seven fish samples examined for organochlor pesticides were found to contain α - BHC. Of these, two samples from Kolleru lake and two from Hussain Sagar were found to contain high levels of α - BHC.

On board frozen *Priacanthus* sp., a deep sea fish, stored at -18°C showed good overall quality of cooked meat even after 5 months storage, though the fish became soft, physically. Trials are under way to improve the texture of the flesh.

N. japonicus, frozen on board, remained in good condition even after a storage life of 6 months.

To prevent the incidence of belly bursting in rainbow sardine (*Dussumieria* sp.), the fish was dipped in 10% brine for one hour, frozen and kept in cold storage at -18°C. The treated fish was in acceptable condition even after 8 months of frozen storage.

Low cost, convenience, ready-to-cook dried fish products were prepared from small anchovies and Upenoid species and microbiological quality of the products assessed. The products were found suit-

able for frying as well as preparing curries.

Studies were also undertaken on the role of chemicals in eliminating 'red' halophiles from contaminated salt samples. The studies are in progress.

None of the thirty two samples of fish/shell fish screened for *Listeria* spp. revealed the presence of this organism.

Bacteriological studies carried out in association with on-board freezing followed by frozen storage have shown that the total bacterial count and faecal streptococcal counts decreased with increase in storage period.

Bacterial isolates resembling *Aeromonas hydrophila* were isolated from the skin lesions of ulcerative syndrome

occurring in murels caught from local ponds. Further studies are in progress.

Research Contemplated :

1. Further studies on high opening trawls and saving in fuel consumption
2. Examination of fish and shell fish for hazardous chemicals including heavy metals and pesticide residue
3. Studies on chemical preservation of frozen fish and enhancement of shelf life of ice preserved fish
4. Effect of cold shock on cultured fishes
5. Development of various products and by-products
6. Development of meat separation unit
7. Screening of fish/shell fish for human pathogens
8. Control of insect infestation and 'red' discolouration in cured fish

BURLA RESEARCH CENTRE

Scientists Associated :

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

Chief Findings :

Surface set gill nets were found to be more effective for harvesting *Catla catla* during winter months.

Tenderization of cat fish filets with papain before sun drying resulted in a product with better texture than the control, with a storage life of six months at ambient temperature.

A container with polyurethane foam insulation was constructed for storage of iced fish for more than three days.

Presence of oxygen and moisture absorbers in the consumer packs containing cured fish improved the quality of the 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 :

Midwater trawling

Studies were continued on the availability of fishes at various depths, performance of the midwater trawl and effect of different scope ratios. As observed earlier, *Mystus* sp., *R. chrysea*, *Sciaenid* and *A. coilea* continued to be available at depth range 15-20 m. whereas *R. cotio* and *W. attu* are seen at a depth range of 10-15 m. Attachment of detachable wings also considerably improved the ef-

iciency of the gear, yielding 36.84% more catch. This is in confirmation with the findings of the previous year. Of the various scope ratios tried, 1:4 was found most effective.

Newer fishing gear materials

Studies were also continued on the relative efficiency of newer gear materials. It was found that polypropylene nets are cost effective and efficient yielding significantly higher catch rates than nylon multifilament, nylon monofilament, HDPE twine and HDPE yarn.

Spatial distribution of *C. catla*

Experimental fishing operations to study spatial distribution of *C. catla* were conducted. Statistical analysis of the data gathered so far indicate that there is no significant difference in the number of fishes caught by surface and column set gill nets. But catch per 1000 sq.m. of the webbing of the surface and column set nets worked out to 4.2 kgs and 2.00 kgs. respectively.

Fish processing and preservation

Dry curing was found to be more suitable than wet curing in the case of *E. vacha*, but wet cured *L. bata* was found to be more acceptable than the dry cured fish.

Dry cured *E. vacha* and *R. cotio* can be stored in polythene pouches (of

150 gauge), at room temperature in acceptable condition for three months and five months respectively.

Storage studies on market samples of cured *Hilsa ilisha* packed in consumer bags (of LDPE 200 gauge) with oxygen and moisture absorbers in various combinations have been completed.

Storage studies of improved sundried products developed by controlled hydrolysis of cat fish fillets with papain before drying have been completed. The products with improved texture were organoleptically acceptable upto 6 months of storage at ambient temperature.

Improvements were effected in the traditional container (bamboo basket) by lining the inside with flexible 10 mm expanded polyethylene foam sheet in place of the traditional sal leaf lining. The thermal efficiency of the improved container was found to be 0.75 k cal/hour/C°/m² as against 2.3 of the traditional container.

A container with 5 cm polyurethane foam insulation was also developed for storage of 25 kg iced fish (1:1 ratio). Its thermal efficiency at ambient temperature was determined to be 0.35 K cal/hour/C°/m².

Research Contemplated :

1. Midwater trawling operations
2. Scope ratio studies

-
3. Field trials with simple gill nets of varying mesh sizes
 4. Light fishing
 5. Development of improved containers for fish transportation
 6. Studies on packaging and storage of live fish
 7. Development of consumer packages for processed fish products
 8. Studies on extension of shelf life of the processed products
 9. Development of value added products from minced meat of the low cost fresh water fishes

BOMBAY RESEARCH CENTRE

Scientists Associated :

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

Chief Findings :

The yield of meat from "Wakdi" a locally available fish, was about 40% of whole body weight.

The freezing and storage behaviour of the fish as frozen blocks of 1.0 kg indicated a shelf life of upto 35 weeks after which the organoleptic and biochemical qualities as well as acceptability sharply declined.

Research Project Handled :

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

Report of Work Done :

Freezing and frozen storage

Studies were carried out on the ice storage and frozen storage shelf life of "wakdi". The shelf life of the frozen material was observed upto 35 weeks at the end of which the acceptability sharply declined and the material was found unsuitable for consumption. The TVBN content increased by 5.6% after 34 weeks. Oxidative rancidity was insignificant due to the presence of low fat content. Samples of the meat

cooked in 2% brine exhibited a rubbery texture after 35 weeks of storage.

Studies on freezing and storage of ribbon fish have shown that the fish, even after storage upto 18 weeks, remained in an acceptable condition. After 18 weeks, however, pronounced rancid flavour and taste were detected.

Fish spoilage

The major spoilage microflora of fresh and frozen fillets of the above fishes were found to be *Pseudomonas*, *Vibrio* sp. *Flavobacter/Cytophaga* and *Micrococci*. *Clostridium* species was absent in these fish fillets.

Microbiological studies on fishery products for export as well as fish from landing centres were carried out. About

114 samples comprising fresh fish, frozen shrimp, lobster, squid and cuttle fish, water and ice were estimated for *E. coli*, coagulase positive *Staphylococci*, *V. cholerae*, *Salmonella* and *Listeria monocytogenes*. NAG type *V. cholerae* was present in the water and ice samples as also cooked frozen lobster. *L. monocytogenes* was however absent in the cooked frozen lobster sample.

Research Contemplated :

1. Further studies on the biochemical and microbiological aspects of fishes of family *Serranidae*
2. Studies on occurrence and survival of different pathogenic organisms with respect to *V. cholerae*, *V. parahaemolyticus* and *L. monocytogenes*
3. Studies on accumulation of lead, cadmium, copper and zinc in the liver, intestine and skin of low cost fishes

CALICUT RESEARCH CENTRE

Scientists Associated :

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

Chief Findings :

A shelf stable, ready-to-eat, fried product from mussel meat, with a storage life of at least 2 months at room temperature was developed.

*Initial studies on processing of **Holothuria** to beche-de-mer have shown that shrinkage of **H. scabra** is nearly 66% of whole live animal.*

Pickle cured Indian oil sardines were seen to keep in brine for more than a year in acceptable condition compared to mackerel, sole and ribbon fish which could not be stored for more than a month.

The process of refining, preservative treatment and retail packaging of commercial cured fish has been shown to be viable and cost effective.

Consumer acceptability studies on the refined and preservative treated commercial cured silver belly and shark have shown their acceptability at least upto four months of storage.

The refined and preservative treated silver belly when packed in gunny bags sprayed with pyrocon E on the exterior remained free of insect infestation for two months when stored in a highly infested commercial godown compared to the less than two weeks for the control sample. The insect free life could be further extended by packing the fish in gunny bags externally coated with hydnocarpus oil.

Addition of few split cashewnut shells to the fish in brine pickle stored in porcelain jars or covering the mouth of the jar with cloth sprayed with hydnocarpus oil prevented blowfly infestation.

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 :

The traditional process of preparing smoked product from tuna involves wrapping the raw fish fillets in coconut leaves, boiling for more than an hour in sea water followed by alternate drying and smoking to reduce the moisture content to less than 10%. This process was since modified. The modified process involved cooking the eviscerated, de-headed and brined fish in steam under pressure (121° C) for 20 mts., followed by cooling, filleting, smoking and drying. The product thus prepared has better flavour and is similar to the traditional product in all other aspects. The yield from whole mackerel tuna has been found to be 15%.

Fried mussel meat was prepared from steamed and shucked mussels treated with a preservative mixture of calcium propionate and sorbic acid and condiments like chillie powder, coriander powder, pepper powder, turmeric powder and common salt, the yield being 50% of the steamed meat. The product is crisp in texture, has very good flavour and has a shelf life of more than two months when packed in polythene bag. The product treated with the preservatives remained free

of fungal attack even at 30% moisture level.

Slight modifications were effected in the formulation of a preservative mixture worked out for treating fresh fish portions. The salt level was reduced to 2% from the original 5%, citric acid substituted by tartaric acid and another permitted preservative and sorbic acid also incorporated. The new formulation thus contains calcium propionate 0.3%, sorbic acid 0.2%, turmeric powder 0.2%, chillie powder 3% and common salt 2% by weight of the fish slices. Slices from several species of fresh fish could be stored for 1-3 days at room temperature after treatment with this formulation. Consumer evaluation has shown the product to be very good.

Survey was continued of the retail marketing of cured fish in the remote villages of Calicut district. A total of 40 stations was covered and information on retail marketing collected from 60 retailers. During the survey, 124 cured fish samples were collected and examined for general quality, proximate composition, bacteriological characteristics, quality indices and shelf life. The samples included shark, oil sardine, silver belly, mackerel, jew fish, sole, lactarius etc. Of the total samples collected, 19.4% were rejectable due to spoiled odour, while one of them showed presence of maggots. Most of the retailers were of opinion that better quality products packed in attractive contain-

ers would have better market and fetch better prices.

Studies were carried out on the shrinkage of *Holothuria* during processing of beche-de-mer.

Results indicate the following :

- a) *H. scabra* shrinks more than *H. spinifera* and shrinkage is more in the small sized pieces.
- b) Even among individual pieces of *H. scabra* of the same size, degree of shrinkage varies.
- c) Live *H. scabra* less than 20 cm. long yielded beche-de-mer of less than 7.5 cm in length.

Fish pickled in brine, either under commercial conditions or in porcelain jars

are usually infested with blowflies. Experiments have shown that addition of a few split cashewnut shells to the jar prevents blowfly infestation as also covering the mouth of the jar with cloth sprayed with hydnocarpus oil.

Research Contemplated :

1. Control of insect infestation - application of solar dryer and field trials with pyrocon E and hydnocarpus oil.
2. Development of products based on tuna
3. Retail marketing and quality of cured fish in Wynadu district
4. Processing of beche-de-mer from *Holothuria*
5. Technology of on-board curing of deep sea fishes

GOA RESEARCH CENTRE

Scientists Associated :

G. Narayanappa, T. Joseph Mathai, H.N. Mhalathkar

Chief Findings :

The catching efficiency of the platform trawl continued to be significantly superior to that of the control net.

Research Projects Handled :

1. G-17/85/(5) - Studies on midwater and semi-pelagic trawls
2. G-16/85 (5) - Studies on demersal trawls

Report of Work Done :

Midwater trawl

Analysis of the catch data with respect to platform trawls was continued. The catch data were converted into logarithm values for statistical analysis and paired 't' test employed for comparison of catches of both the platform trawl and the

control net. The comparisons were made separately for quality fishes, non-quality fishes and total catch. Results continued to show the catch of platform trawls to be significantly higher than that in the conventional net.

Research Contemplated :

1. Field trials with shrimp trawls having cod end of different mesh sizes and fitted with covers to study the escapement of fishes
2. Design, fabrication and field trials of modified flat rectangular otter boards with cushioned action to avoid digging in mud

EXTENSION AND CONSULTANCY

Training and Demonstration

In-plant training in Refrigeration and Air-conditioning was imparted to two post diploma students for a period of three months from 2 April 1990.

An in-house training programme in fishing gear technology was conducted for the benefit of scientists from Fishery Survey of India from 2-10 May 1990.

A six weeks training in microbiology, quality control and biochemical aspects was given to a Media supervisor of the Institute's Bombay Research Centre from 25 June to 6 Aug. 1990.

Training in instrumentation was imparted to six research scholars from Department of Aquatic Biology and Fisheries, University of Kerala, Trivandrum, from 30 July to 3 Aug. 1990.

A training programme was organised for the benefit of 11th batch of technologists attending the Fish Processing Technologists' Training Course organised by the Export Inspection Agency, Madras, from 6-13 Aug. 1990. Thirteen technologists attended the course. Similar training was also organised for the 12th batch of technologists from 12-30 Nov. 1990 in which eleven technologists participated.

Training in extension communication was conducted for the benefit of Agricultural Officers of Regional Agricultural Technology Training Centre, Vyttila, Cochin. The training was given twice, once on 24 September 1990 in which twenty five Agricultural Officers participated and a second time on 13 Nov. 1990 in which thirteen officers participated.

Training in quality control of seafoods was held at the Institute from 8-22 October 1990. Nine technical personnel representing fish processing establishments in and around Cochin participated in the programme.

Training in processing dry fish by improved method was held at Chellanam, a fishing village in Cochin, for the benefit of the coastal fishermen on 19 & 20 Oct. 1990. Sixty fisherwomen of the Chellanam Panchayat participated in the training programme.

Training was given to two ship technology students of Cochin University of Science & Technology (CUSAT) in different aspects of naval architecture.

The Institute associated itself in organising the following training programmes in collaboration with MPEDA.

- 1) Training in hygienic handling and processing of crabs-at Quilon on 11 Dec. 1990. No. of participants, 25

- 2) Training in hygienic handling and processing of squid/cuttlefish-at Quilon on 21 Dec. 1990. No. of participants, 30.
- 3) Training in hygienic handling and processing of lobsters-at Quilon on 15 Jan. 1991. No. of participants, 20.
- 4) Training in hygienic handling and processing of squid/cuttlefish
 - at Honavar on 23 March 1991. No. of participants, 20.
 - at Cochin on 27 March 1991. No. of participants, 28.

Two ladies sponsored by the Mahilasamajam, Minicoy, were given training in production of value added fish products from 21-25 Jan. 1991. The training was organised in collaboration with Lakshadweep State Social Welfare Advisory Board, Kavaratti.

Training in production of value added fish products was also conducted at Kannur from 22-25 Jan. 1991. The programme was organised in collaboration with Kannur Block Rural Development Dept., Government of Kerala under the DWCRA (Devt. of Women and Children in Rural Area) scheme for the benefit of 17 members of the Vanitha Fish Processing Unit, Azhikkal, P.O. Kannur.

A training course on fish processing technology (Post harvest technology in fisheries) was held as part of the train-

ing schedule of the Trainers' Training Centre of CMFRI at Narakkal from 11-21 March 1991. Seven trainees participated in the programme.

The Veraval Research Centre conducted a training programme at Jakhau (Kutch Dist) on processing shark fins and fish maws and hygienic handling of squid and cuttle fish in collaboration with MPEDA and the State Fisheries Department in January 1991. As an outcome of this training programme, a private party has started its own processing unit at Vishakhapatnam for processing shark fin rays.

The Kakinada Centre also carried out a few training programmes during the year in collaboration with MPEDA. These include:

- a) Hygienic handling of raw material for pre-processing workers at Kakinada on 23 & 24 Oct. 1990 and at Bheemunipatnam on 30 & 31 Oct. 1990.
- b) Hygienic handling of raw material on board fishing vessels at Kakinada on 11, 12, 13 & 14 Dec. 1990.
- c) Re-orientation programme for processing supervisors at Visakhapatnam, 22 March 1991.
- d) Handling, processing, filleting and packaging of fish, shark fins, fish maws and dried fish at Puri on 25 March '91, at Paradip on 26 March '91 and at Bhuvananeswar on 27 March '91.

The Burla Research Centre imparted training to twenty educated youth in fishing, handling and preservation of fish from 22 Oct. to 3 Nov. 1990.

It also organised a training programme on harvest and post harvest technology of fish for the benefit of reservoir fishermen of Himachal Pradesh from 3-15 Dec, 1990 under the Integrated Co-operative Development Project, Bilaspur, Himachal Pradesh. Seventeen fishermen from four Co-operative societies under the ICDP attended the programme.

A demonstration-cum-training programme was also organised by the Centre for members of Telugupara Mahila Samiti, Burla, in preparation of fish pickles and fish wafers on 26 & 27 March 1991. Twenty members of the Samiti participated.

The Centre also demonstrated/displayed improved fishing gear and products to sixteen trainees of the Central Fisheries Co-operative Training Centre (CIFE), Lucknow.

At Bombay Research Centre, training in general aspects of quality control and microbiological analysis of fish and fishery products was conducted for a period of fifteen days. Twentyone candidates attended the programme.

The Centre also carried out a demonstration on biochemical aspects in handling and processing with special reference to toxic effects of cadmium in fish and fishery products, in collaboration with the Marine Products Export Development Authority and the Export Inspection Agency.

A demonstration-cum-training was also conducted by the Centre in association with MPEDA on preparation of shark fins and fish maws.

At Calicut, a prospective entrepreneur was given training for five days in refining, preservative treatment and retail packaging of commercial cured fish.

Technical Guidance/ Consultancy

At the request of Director of Fisheries, Pondicherry, a master plan for setting up a boat building and repair yard, fish processing plant including chilling, freezing and cold storage facilities and fish curing and drying yard was prepared and supplied. Two feasibility project reports, viz. 1) On one tonne capacity fish dehydration plant and 2) on 5 tonne capacity raised platform solar drying yard for the production of fish meal/dried fish were also supplied to the Director of Fisheries.

Technical details for setting up a fish drying unit were given to a party from Calcutta.

An artificial Fish Dryer designed and fabricated by C.I.F.T. was handed over to Kerala Agricultural University for installation at its Rice Research Institute at Vyttila, Cochin. The dryer can produce 50kg. fish feed at a time. Cost of the dryer amounts to Rs. 36,000/-. The dryer was formally handed over to Dr. E.G. Silas, Vice Chancellor of the University at a simple function held at the C.I.F.T. on 25th February 1991.

A scheme for treatment of effluents from fish processing plants was prepared and supplied to M/s XL Seafoods, Cochin.

Report on the trial performance of a 16.5 m. wooden outrigger trawler was prepared and given to the concerned party.

The first, second and third stage inspection of construction of a 14 m (47ft) wooden fishing vessel was carried out and inspection reports furnished to the concerned party.

Other inspection reports furnished include 1) second stage inspection report of the 15.25 m wooden vessel being constructed at a private boat building yard at Alleppey. 2) first stage inspection report of a 14.2 m wooden vessel. 3) inspection report of a 16 m. steel trawler and 4) inspection report of a 16.46 m wooden outrigger trawler under construction at a boat yard at Aroor.

Layout and other details of modifications/requirements of fish processing units of Cochin Vanitha Fish Processing and Allied Industrial Co-op. Society, Malipuram were given at their request.

An estimate was prepared for setting up a fish market at Pangode, Trivandrum, and the same furnished to the Joint Director of Fisheries, Trivandrum.

Technical assistance in starting a fish processing plant for production of value added products was given at the request of the Vanitha Fish Processing Unit at Kannur.

Technical assistance on fabrication of gill nets was also rendered to members of the Theerapradesha Vanitha Vikasana Yatnam, a Society of coastal fishermen of South Chellanam.

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 Government officials.

The Scientists were also called upon on many occasions to deliver lectures for benefit of participants of various training programmes/refresher courses held from time to time by the State and Central government organisations.

Reply to Technical Queries

Technical queries continued to be received from new entrepreneurs, technical personnel working in fishing and fish processing establishments and others connected with the fisheries industry, both from within the country as well as outside. Some of the more important topics on which information was given are listed below.

Fishing Technology

- * Information on automated long line system - its prevalence and scope in the country
- * Suggestions on alternate methods for shrimp trawling with a view to effecting reduced fuel consumption
- * On gear suitable for use in reservoirs
- * On utilisation of cashewnut shell liquid (CNSL) for preparation of marine paints

- * On suitability of 5086 al.alloy for making aluminium cut tacks for marine vessels
- * Comments on engine recommended for a 13.6 m trawler
- * Comments on change in performance of an engine with change in the weight of the propeller

Fish Processing Technology

- * Cost estimate of a BOBP scheme on handling and processing anchoviella in Kanyakumari Dist. Tamil Nadu
- * Common edible fishes of India and their composition
- * Essential equipment and machinery for starting a fish processing unit at Azhikkal for production of value added fish products
- * Disadvantages of using sea water containing sodium chloride beyond prescribed limits for seafood processing
- * On the yield of rays from different varieties of shark fins
- * Comments on the molecular weight of chitosan, toxicity of chitosan and its medical applications
- * Composition of dried Indian fishes
- * Comments on the quality of water to be used in different stages of processing
- * On pollution control methods to be adopted at proposed fish harbour site at Pondicherry

- * Comments on the medical application of fish sutures
- * On the effectiveness of expanded polyethylene as insulation material for packing fish/shrimp with ice
- * Comments on setting up a fish processing unit at Andaman & Nicobar Islands
- * Recommendations of polypouches for IQF shrimp
- * On the establishment of a masmin production unit at Lakshadweep
- * Difficulties connected with converting the existing fishing vessels into factory ships

Fish by-products	13
Frozen fish and shell fish products	42
Rice bran	2
Chemicals	8
Packaging materials	35
Raw materials	4
Fishing gear materials	10
Fishing craft materials	16
Agar agar	1
Wire rope and cable	452
Marine engine	8
Outboard motor	1

The Veraval Centre analysed 200 samples comprising fishmeal, water, ice, dried fish, etc. while the Calicut Centre analysed two samples of water, nine of dried fish and one of fish oil.

Analysis of Fisheries Products/Materials

The Institute undertook analysis of samples of raw materials, finished products, fishing craft and gear materials etc. received from indigenous processors and manufacturers for assessment of their quality and test reports were issued to the concerned parties with suggestions for improvement wherever required. Details of samples tested are given below.

Product/ material	No. of samples analysed
Water	103
Ice	25
Dried fish products	29
Fish speciality products	9

Supply of Designs/ Publications

Copies of designs of fishing boats, nets and fish dryers were supplied to interested parties on request as also various publications brought out by the Institute. A list of such designs and publications issued during the year is given below.

Publications	No. issued
Quality Control in Fish processing	85
Special Bulletin - Indigenous Marine Fishing Gear and Methods of India-Karnataka State	4



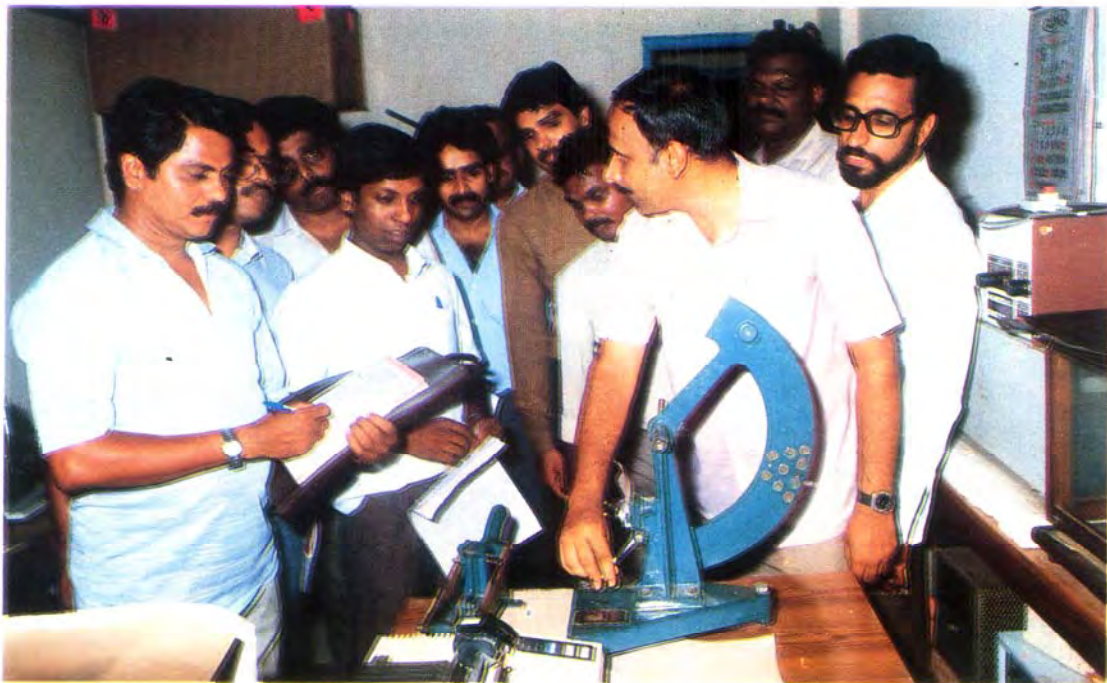
Participants of training course in quality control of seafoods in the quality control lab.



At the Agro-Industrial Exhibition at Cherpu, near Trichur.



Shri. M. R. Dasgupta, General Manager (Works) Hindustan Newsprints Ltd., Velloor inaugurates the Summer Institute on Packaging.



Participants of the Summer Institute keenly watch packaging materials being tested in the tearing strength tester.

Designs

Fishing gear designs	12 sets
Fishing craft designs	2 sets
Tunnel dryer	7
Rotary drum dryer	1
Fish processing unit	1

Exhibitions

The Institute set up a stall at the Agro-Industrial Exhibition organised at Cherpu, a village near Trichur from 6-8 April 1990 in connection with 23rd Anniversary of Farm & Home Unit of All India Radio, Trichur.

Samples of fish products were supplied to MPEDA for display at a mini exhibition organised in connection with inauguration of their new building on 11 June 1990.

Samples of products/by-products from mussel/mussel shell were supplied to a local school for display at the Dist. Science Exhibition held on 1 & 2 Nov. 1990.

Exhibits including fish products, charts and photographs were sent to Delhi for display in the ICAR stall at the AHARA '91 exhibition held at Pragati Maidan, New Delhi, from 18-23 Jan. 1991.

The Calicut Centre supplied samples of different dry cured products to a local school for display at the Kozhikode Edn. District Science Fair '90.

Summer Institute

A Summer Institute (short term course) on Packaging of Fish and Fish Products for Export and Internal Market was held at the Institute from 15 to 24 May 1990. Twentyone candidates sponsored by various Agricultural Universities, State Fisheries Departments and Central Government organisations participated in the 'Institute'. The course comprised of theory classes as well as practical demonstrations. The 'Institute' was inaugurated by Shri M.R. Dasgupta, General Manager (Works) Hindustan Newsprint Ltd., Velloor.

Radio Talks/Press Releases etc.

Seven radio talks were broadcast over All India Radio, Trichur/Cochin during the year. These included :

1. Talks by Shri M.R. Nair, Director, on a) 'Export oriented marine products', b) 'Modern trends in marine fishing' and c) 'Developments in the field of fishing'
2. Talk by Dr. K. Gopakumar, Principal Scientist, on 'How to generate entrepreneurship in fish processing'.
3. Talk by Dr. M.K. Kandoran, Principal Scientist, on 'Lab-to-Land Programmes of CIFT'.

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4. Talk by Shri K.C. Purushothaman, Technical Officer on 'Employment generation for fisherwo-men-various aspects'.
 5. Talk by Dr. T.K. Sivadas, Principal Scientist, on 'Fishery Engineering

and Instrumentation - A practical application'.

About half a dozen press releases were also made during the year on the various activities/achievements of the Institute.

COLLABORATIVE PROGRAMMES

As part of the training programmes undertaken by the BOBP, Madras in association with this Institute on Handling, Processing and Marketing of Anchoviella in the East Coast, especially Kanyakumari District, the following programmes were organised at Nagercoil during the period 22 Oct. to 16 Nov. 1990.

- a) Construction of a raised (double deck) platform for drying anchoviella on a commercial basis at Manakudy, Kanyakumari District.
- b) Demonstration of drying the fish on the platform.
- c) Technical assistance in construction of permanent ice box of 3 tonne capacity for storing iced fish by the Kanyakumari Fishermen Sangham.
- d) Demonstration of handling and ice storage of fresh fish in the permanent ice box.

Preliminary arrangements have also been made at Mandapam to construct a raised platform and demonstrate drying of the fish.

Mr. John Wignall, former Head of Process and Resources Development Section, Torry Research Station, Aberdeen, U.K. and Andrew Palfreman, Fisheries Economics

and Devt. Dept., Humberside International Fisheries Institute, University of Hull, U.K. visited the Institute to make a feasibility study on NRI-CIFT collaborative project on 'Retort Pouch Processing' with a view to erecting a pilot plant at CIFT.

As a part of the collaborative programme between CIFT and the Ministry of Food Processing Industries, Govt. of India for setting up a Pilot Plant for production of value added fish products, a survey was undertaken of the resources and location of fish processing plants at Veraval and Bombay and details on landings and marketing of the various products collected. A project report on Production Units for Utilization of Low Cost Fish was also prepared and sent to the Ministry realising a consultancy fee of Rs. 1 lakh.

The Department of Electronics, Government of India, has sanctioned a project on ship borne data acquisition system. The project has an initial life of 3 years. The project aims at developing SDAS in three models for installation and operation from small, medium and large fishing/survey vessels, acquisition of 10 channel data pertaining to meteorological and aquatic performance of fishing/survey vessels as well as development and establishment of five sets of calibration facilities of ocean parameters for use on a national level.

TRAINING/DEPUTATION OF SCIENTISTS

Within the Country

Dr. T.S.G. Iyer and Shri P.K. Chakraborty, Principal Scientists, attended training course in Agricultural Research Project Management from 17-28 July 1990 at NAARM, Hyderabad.

Shri Rajendra Badonia, Scientist (SG) participated in training programme on Filth Test By USFDA Procedure organised by Export Inspection Agency at Veraval, 27 July 1990.

Dr. P.J. Cecily and Shri K.C. Purushothaman, Technical Officers, were deputed for training course on Technical Information Management, Research Communication and Project Maintenance in Agriculture at NAARM, Hyderabad, from 31 July to 10 August 1990.

Shri C.V.N. Rao, Principal Scientist, attended training course on Human Resources Management at NAARM, Hyderabad from 20 August to 1 Sept. 1990.

Shri P. Ravindranathan Nair, Scientist (SG) participated in the fortieth FAO/INFOFISH Regional Training Course on Fish Inspection and Quality Assurance for Indo-Pacific Countries held in collaboration with MPEDA, at Cochin, 5-16 Nov. 1990. S/Shri P. George Mathai and N. Subramonia Pillai, Scientists (SG) served as Faculty members.

Abroad

Dr. Sanjeev S, Dr. Nimala Thampuran and Shri K. George Joseph, Scientists (SG) were deputed to Natural Resources Institute, Chatham, Kent, U.K. for training in Basic Food Microbiology from 2 April to 22 June 1990. They worked on detection of bacterial pathogens and bacterial toxins as well as isolation and identification of fungi.

Dr. P.T. Lakshmanan and Shri R. Chakraborti, Scientists (SG) attended a short course in Handling and Quality of Fish in the Tropics at the Natural Resources Institute, Chatham maritime, Kent, U.K. from 3 Sept. to 29 Nov. 1990 under the CIFT-NRI collaborative research programme. While there, Dr. Lakshmanan also participated in the International Symposium on Chilling and Freezing of New Fish Products at the Torry Research Station, Aberdeen (U.K.), 18-20 Sept. 1990.

Dr. A. Ramachandran, Scientist, was deputed to attend a training course on Marine Food Processing and Technology organised by Japan International Co-operation Agency (Govt. of Japan) from 1 Oct. 1990 to 24 May 1991. He secured first rank from among the participants from eight countries.

Shri V.K. Sridhar, Sr. Administrative Officer rejoined duty on 6 Oct. 1990

after undergoing a year's masters programme in Development Administration at the University of Birmingham, U.K.

DEGREE/AWARD

Dr. B. Meenakumari, Scientist (S.G.) was awarded the 5th JRB prize (Young Scientist Award) - 1989 instituted by the Academy of Environmental Biology for her outstanding contribution and research work in the field of Aquatic Environment and Fisheries. The award carried a gold medal, a citation and a cash price of Rs. 1000/-.

Shri S. Sanjeev, Scientist (SG) was awarded Ph.D. by Cochin University of Science and Technology for his thesis entitled "Studies on coagulase positive *Staphylococci* and *Vibrio parahaemolyticus* in selected items of fish, crustaceans and fishery products". He conducted his studies under the guidance of Dr. Jose Stephen, Scientist (SG) of the Institute.

Shri A.K. Chattopadhyay, Scientist (SG) obtained M. Tech. degree in Food

Technology and Biochemical Engineering from Jadavpur University, Calcutta.

Shri Jose Joseph, Scientist (SG) was awarded Ph.D. in the Faculty of Marine Sciences by the Cochin University of Science and Technology for his thesis entitled "Effect of raw material quality on the shelf-life of frozen stored fish and fishery products". He carried out his studies under the guidance of Dr. K. Gopakumar, Principal Scientist, CIFT.

Shri A. Ramachandran, Scientist, was awarded Ph.D. by the Cochin University of Science and Technology for his thesis entitled "Studies on production management in seafood processing industry in Kerala". He was guided in his work by Prof. (Dr.) C.T. Samuel, former Head of Department of Industrial Fisheries and Prof. N. Ranganathan, Director, School of Management Studies, Cochin University of Science and Technology.

Smt. K. Radhalakshmi, Technical Officer, was awarded M.Sc. degree by research by the Cochin University of Science and Technology.

FISHING CRUISES

Particulars of cruises undertaken on-board FORV 'Sagar Sampada' and 'M.V. Saraswathy' are given below :

FORV Sagar Sampada :

Cruise No.	Period	Participants
74	28-06-90 — 02-07-90	P. George Mathai, S (SG)
75	19-07-90 — 30-07-90	K.V. Mohan Rajan, S (SG)
76	04-08-90 — 14-08-90	N. Subramonia Pillai, S (SG)
77	18-08-90 — 27-08-90	M. Syed Abbas, S
78	20-09-90 — 04-10-90	A.C. Kuttappan, S-1
80	01-11-90 — 14-11-90	M.R. Boopendranath, S (SG)
81, 82	17-11-90 — 02-12-90	V.C. George, P.S. V. Vijayan, S (SG)
	07-12-90 — 20-12-90	M.V. Baiju, T.O. A.C. Kuttappan
Special Cruise		
83	27-12-90 — 11-01-91	M.D. Varghese, S (SG) P.A. Panicker, P.S.
84	19-01-91 — 01-02-91	M.Syed Abbas
85	01-03-91 — 14-03-91	N.A. George , T.O. Varghese Paul, T.O.

M.V. Saraswathy

107	04-11-90 — 07-11-90	M.D. Varghese, S (SG)
110	12-12-90 — 17-12-90	P. George Mathai
111	19-12-90 — 28-12-90	V. Vijayan

SYMPOSIA/SEMINARS/WORKSHOPS ETC ATTENDED

Shri P. Appukutta Panicker, Principal Scientist, attended Special Secretarial TCDC meeting at Ministry of Agriculture (Fish), New Delhi, 6 April 1990.

Smt. K. Vijayabharathi, Scientist (SG), S/Shri Puthra Pravin, Scientist and M.V. Baiju, Technical Officer attended Summer School on Marine Acoustic Systems and Instrumentation sponsored by Department of Electronics, Govt. of India, at NPOL, Cochin, 14-25 May 1990.

Dr. K. Ravindran, Principal Scientist and Shri M. Nasar, Naval Architect, attended meeting convened by the Petroleum Conservation Research Association, Ministry of Petroleum and Natural Gas, on Ways and Means of Conserving Petroleum Products in the Marine Sector, May 1990.

Dr. S. Balasubramaniam, Scientist (SG), participated in Summer Institute Course on Group Management Techniques for Agricultural Development at Central Training Institute, Kerala Agri. University, Trichur, 14 May-2 June, 1990.

Dr. A. Ramachandran, Scientist, attended the Summer Institute on Packaging of Fish and Fishery Products for Export and Internal Markets held at CIFT, 15-24 May 1990. Dr. A. Ramachandran also attended the Second Indian Fisheries Fo-

rum of Indian Branch of Asian Fisheries Society held at College of Fisheries, Mangalore, 27-31 May 1990, and presented three papers. Shri M.R. Nair, Director, chaired the technical session on Fish Processing. The forum was coupled with four Workshops held during the period. Shri M.R. Nair, Dr. K. Gopakumar, Dr. M.K. Kandoran, Principal Scientists and Dr. P.J. Cecily, Technical Officer, attended the Workshop on Women in Indian Fisheries on 29 May 1990 where another paper was also presented. Shri M.R. Nair, Director and Shri G.R. Unnithan, Scientist (SG) also attended the Workshop on Indian Fisheries Societies — Do they contribute for growth? on 30 May 1990.

Shri M.R. Nair Director, attended FAO/EIC Course on Manpower Development Techniques for Food Quality Control, 11 June 1990.

Shri V.C. George, Principal Scientist, participated in the meeting on Review of Technical Programmes of FORV Sagar Sampada on 13 & 14 June 1990 and Task Force meeting of FORV Sagar Sampada programme at Cochin, 16 June 1990.

Shri S. Ayyappan Pillai, Principal Scientist, attended two day Seminar on Cold Storages organised by Indian Society

of Heating, Refrigeration and Air-conditioning Engineers at Bangalore, 15 & 16 June 1990.

Shri V.C. George participated in National Workshop on Fisherfolk and VIIIth Plan-Challenge and Opportunities for Voluntary Sector organised by Trivandrum District Fishermen Federation and Voluntary Action Network, India, at Madras, 20 June 1990.

Shri M.R. Nair, Director, attended FORV Sagar Sampada Co-ordination Committee meeting at New Delhi, 21 June 1990.

Shri S. Ayyappan Pillai, Dr. M.K. Kandoran and Dr. T.S.G. Iyer, Principal Scientists, visited Trivandrum on 26 June 1990 and held discussions with Director of Fisheries, Kerala and the Mayor, Trivandrum Corporation, on construction of a modern wholesale fish market and on renovation of existing retail market at Trivandrum.

Dr. T.K. Sivadas, Principal Scientist and Dr. A.G.G.K. Pillai, Scientist (S.G.) attended Conference on Water Quality Status of Kerala organised by Centre for Water Resources Development and Management, Calicut at Cochin, 27 June 1990. Dr. Sivadas also presented a paper at the Conference.

Dr. K. Ravindran attended meeting of the Advisory Panel and Core Team to study the impact of ban on bottom trawl-

ing during monsoon period in Kerala convened by Secretary to Government of Kerala, Fisheries and Port Department.

Shri S. Ayyappan Pillai attended EIA panel meeting at Cochin, 18 July 1990.

Shri P.V. Prabhu, Principal Scientist, participated in National Workshop on Animal Biotechnology jointly sponsored by T. Nadu Veterinary and Animal Sciences University and Department of Science and Technology at Madras, 26-28 July 1990. He delivered a Key-note address on Post Harvest Technology in Inland Fisheries.

Shri K.K. Solanki, Principal Scientist, attended National Seminar on Food Technology for Rural Development sponsored by Indian institute of Engineers, Gujarat Branch, at Ahmedabad, 28 and 29 July, 1990.

Shri S. Ayyappan Pillai participated in the EIA panel meeting at Vizag to approve the IQF Units and assess their capacities.

Shri M.R. Nair Director, attended 1) meeting of Expert Group to undertake study on removal of stake/chinese dip nets from fishing in the brackish waters of Kovalam, 19 Oct. 1990. 2) Academic Council meeting of Kerala Agricultural University at Vellanikara, 25 July 1990 3) review meeting of proposed strategy for VIII Five Year Plan at Delhi, 7 and 8 Aug. 1990.

Shri P.A. Perigreen, Scientist (SG), attended Workshop on Marine Products and Allied Industries for Domestic/Export Market organised by Small Industries Service Institute, Madras, 30 Aug. 1990 and presented two papers.

Shri M.R. Nair, Director and Shri P. Madhavan, Principal Scientist, participated in Workshop on Exploration and Exploitation of Antarctic Krill Resources sponsored by Department of Ocean Development, Government of India at NIO, Goa, 31 Aug. 1990.

Shri P.V. Prabhu attended International Seminar on Food and Agro Based Industries at Hyderabad, 6-8 Sept. 1990.

S/Shri S.P. Damle and D.K. Garg, Scientists (SG) participated in Seminar on Traditional Indian Foods conducted by Association of Food Technologists (India), Bombay Chapter, in collaboration with University Department of Chemical Technology, Bombay, 20 Sept. 1990.

Shri G. Narayanappa, Principal Scientist, participated in Goa Town Official Language Implementation Committee meetings at Panaji, 25 Sept. 1990 and 18 Feb. 1991.

Shri M.R. Nair, Director, attended meeting of ICAR Scientific Panel for Fisheries at New Delhi, 9 and 10 Oct. 1990.

Dr. K.N. Kartha, Scientist (SG), attended National Seminar on Recent

Advances in Hydrobiology at Indore, 23-25 Oct. 1990, and presented a paper.

Shri M.R. Nair Director, attended National Symposium on Acoustics, Cochin, 7-10, Nov. 1990.

Shri K.K. Balachandran, Principal Scientist, participated as Resource Person in the Top Management programme on Deep Sea Fishing Enterprises organised by Indian Institute of Management, Ahmedabad at Visakhapatnam, 19-24 Nov. 1990.

Shri P. Appukutta Panicker, Principal Scientist, attended the following meetings in Nov. 1990 - 1) Second meeting of Textile Divisional Council, BIS. 2) Meeting of Committee for Review of Regulation Rules for Fishing Vessels at MPEDA Cochin, and 3) Second meeting of TXDC 18, BIS, Textile Materials for Marine/Fishing Purposes.

Dr. B. Meenakumari, Scientist (SG) and Smt. K. Radhalakshmi, Technical Officer also attended the Second meeting of TXDC 18, BIS, Textile Materials for Marine/Fishing Purposes, in Nov. 1990.

Shri P.A. Panicker attended three meetings of the Working Group on Revalidation of the Potential Marine Fisheries Resources of Exclusive Economic Zone of India held at Bombay and Cochin in Nov. & Dec. 1990 and Jan. 1991 as a Sub-committee Member.

Shri M.R. Nair and Shri P.A. Panicker attended Inter-agency Workshop on Utilization of DOD Research Vessels at NIO, Goa, 27 and 28 Nov. 1990.

Shri M.R. Nair attended National Symposium on Freshwater Prawn, *Macrobrachium* organised by Kerala Agricultural University, Cochin, 12-14 Dec. 1990.

Dr. T.K. Sivadas attended Second Transport Engineering Development Committee (TEDC) meeting of Bureau of Indian Standards, 19 Dec. 1990.

Shri P.V. Prabhu attended Workshop on Cruise programmes of research vessels, NIO, Goa.

Shri P. Panicker also attended meeting of Workshop Group for Review of Registration Rules of Fishing Vessels constituted by Government of India in Jan. 1991.

Shri K. Sreedharan Namboodiri, Principal Scientist and Shri P. George Mathai, Scientist (SG) attended Workshop on Development of Curricula of Vocational Courses conducted by NCERT New Delhi at Industrial Training Institute at Aundh, Pune, 7-11 Jan. 1991.

Shri M.R. Nair, Dr. K. Ravindran, S/Shri S. Ayyappan Pillai, P.K. Chakraborty, Principal Scientists and P.N. Joshi, Scientist (SG) attended Seminar on Conservation of Petroleum Products in Fish-

ing Boats/Trawlers organised by Indian Oil Corporation at Cochin, 9 Jan. 1991. A paper was presented at the Seminar.

Shri M.R. Nair attended International Food Festival organised by Department of Tourism, Government of Kerala, Rotary Club of Cochin and Kerala Tourism Development Corporation, Cochin, 10-14 Jan. 1991.

Shri T.K. Sivadas attended meeting on Electronic Instruments for 'Sagar Sampada' organised by Department of Ocean Development, at Goa, 15 Jan. 1991.

Dr. B. Meenakumari, Scientist (SG), attended 11th Annual Session of JEB Foundation at Marathwada University, Aurangabad in Jan. 1991.

Shri K.K. Balachandran and Dr. M. Arul James, Principal Scientists, attended National Seminar on Present Status and Future Strategies of Coastal Aquaculture in India, at Bombay under the auspices of MPEDA, Shipping Credit and Development Co. of India and Department of Fisheries, Government of Maharashtra, 21 and 22 Jan. 1991. A paper was also presented at the Seminar.

Dr. T.K. Sivadas attended Seminar on National Radar Council Technology Development Programme at SAMEER, Madras, organised by Development of Electronics, Government of India, 23-24 Jan. 1991.

Shri M. Nasar, Naval Architect, attended Workshop on Fuel Consumption in Fishing Vessels organised by Petroleum Conservation Research Association, Government of India in Jan. 1991.

Shri M.R. Nair chaired the inaugural session of the FAO/UNDP Training Course on Inspection and Quality Control of Food for Export, 11-16 Feb. 1991.

Dr. Subrata Basu, Scientist (SG) attended National Conference on Processed Foods in Rural Economy and Nutrition, Calcutta, 16 & 17 Feb. 1991.

Shri M.R. Nair and Dr. M.K. Kandoran attended National Seminar on the Fisheries Sector in Kerala: Resources. Harvesting, Pricing and Marketing, sponsored by Kerala Sastra Sahitya Parishad in connection with its 28th Annual Conference at Cochin, 23 Feb. 1991 in which Dr. Kandoran presented a paper.

Shri K.K. Balachandran participated in the Refresher Course in Scope for Development of Fish Processing Industry in Kerala organised for Managers of Industries Department, Government of Kerala, at Cochin, 27 Feb. 1991 as Faculty Specialist and presented a paper.

The Mahatma Gandhi University organised a Refresher course in Zoology for the benefit of college teachers during the period March-April 1991. The following Scientists served as faculty members.

Shri K.K. Balachandran
Dr. M.K. Mukundan
Dr. P.K. Surendran
Dr. K.G. Ramachandran Nair
Dr. T.K. Sivadas
Shri V.C. George

The subjects covered included fish processing technology, biochemistry, microbiology, fishery by-products and speciality products, instrumentation and fishing methods.

REPRESENTATION IN COMMITTEES

Shri M.R. Nair, Director, served on the following Scientific and allied bodies.

As Chairman

Indian Bureau of Standards, AFDC 27 (1) : Sectional committee - Fish and Fishery Products.

As Member

1. ICAR Scientific Panel for Fisheries
2. ICAR Co-ordination Committee for FORV 'Sagar Sampada'
3. ICAR Regional Committee No. VIII
4. Advisory Committee and core team to advise on ban on trawling in Kerala coast
5. Academic Council, Kerala Agricultural University

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6. Consultative Committee of CIFNET
 7. Consultative Committee of Integrated Fisheries Project, Cochin
 8. Management Committee, Krishi Vigyan Kendra, CMFRI, Narakkal
 9. Board of Studies C.I.F.E., Bombay
 10. Board of Examiners, CIFE., Bombay
 11. Board of Studies in Mariculture-Cochin University of Science and Technology
 12. Expert Committee to prepare Master Plan on Fisheries Education in Tamil Nadu Veterinary and Animal Sciences University
 13. Core group of Experts to prepare Action Plan to develop Ernakulam as Bio-technology District
 14. Tamil Nadu State Fisheries Council
 15. Rural Programme Advisory Committee, AIR, Trichur
 16. Working group for revalidating the potential yield of Fishery Resources in the EEZ estimated in 1977
 17. Technology Business Incubation Centre (TBIC) in Kerala
 18. Expert Committee on new labelling methods for marine products
 19. Expert Group to undertake an indepth study of removal of shark net/chinese dip nets from fishing in the backwaters of Kerala
 20. Committee for reviewing/framing the rules regarding registration of fishing vessels, restriction of areas of operation, vessels, gear, manning regulations, regarding life saving and fire fighting appliances and on board processing equipments
 21. Committee to look into requirement of HSD for deep sea fishing vessels
 22. Expert group to undertake indepth study on problems faced by the fishermen of Astamudi Lake in Kerala
 23. Committee to consider financial assistance for modifying fishing vessels
 24. Editorial Board, Indian Journal of Fisheries (ICAR)
- The following Scientists also represented the Institute in various committees.
1. Dr. K. Gopakumar,
Principal Scientist
- As Member**
- 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, Tamilnadu

Board of Examiners for Ph.D, University of Agricultural Sciences, Bangalore & Cochin University of Science & Technology

As Reviewer

Asian Fisheries Fellowship Award (Post-Harvest Technology)

2. Shri P.V. Prabhu
Principal Scientist

As Principal Member

BIS, AFDC - 27:5, Fish Meal Subcommittee

3. 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 FORV 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 Rules 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

4. Dr. K. Ravindran,
Principal Scientist

As Subject Expert

Faculty of Marine Sciences, Cochin
University of Science and Technology

As Member

Marine Cargo Movement and Pack-
aging Division Council (MCPDC, BIS)

Standing Working Committee on
Marine Cargo Movement and Packaging
(SWCMC, BIS)

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

Special Committee to Consider Sea
Duty Allowance

Working Group of FORV 'Sagar
Sampada'

5. Shri V.C. George,
Principal Scientist

As Advisor

UPSC Selection Board for Fisheries

As Examiner

Engineer, Fishing Vessels course at
CIFNET

6. 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 pro-
cessing plants.

DGTD Sub-committee on Food
Freezing and Preservation by Cryogenic
Fluids.

Committee on Agro-forestry for
afforestation programme.

Invention Promotion Committee.

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

As Alternate Member

BIS TEDC - Transport Engineering
Division Council

7. Dr. C.C. Panduranga Rao,
Principal Scientist

As Member

Panel of Experts, EIA, for approval
of processing plants

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8. 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

9. 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

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

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

10. 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, NAD, Alwaye

Vidyalaya Management Committee, Kendriya Vidyalaya, I, Naval Base, Cochin

As Research Guide

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

11. Dr. K. Devadasan,
Principal Scientist

As Examiner

Different Selection Committees of CMFRI

-
12. 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.

13. 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

14. Shri G. Narayanappa,
Principal Scientist

As Chairman

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

As Member

Consultative Group of Fishery Survey of India, Mormugao Zonal Base, Goa, set up to review the working of Madras and Visakhapatnam Base of Fishery Survey of India

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

As Member

Selection Committee of CTRI, Rajahmundry

Consultative Committee, FSI Visakhapatnam and Madras.

16. Shri. J. Sitaramarao,
Scientist (SG)

As Member

Selection Committee of CMFRI, Visakhapatnam and CTRI, Rajahmundry

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

As Member

Selection Committee of CMFRI, Karwar.

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

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

As Member

Auction Committee for FSI Fishing Vessel M.V. Meena Sitara

19. 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.

20. Dr. P.K. Surendran,
Scientist (SG)

As External Examiner

Evaluation Board, Ph. D. Thesis (Fish Processing Technology) University of Agricultural Sciences, Bangalore

Ph. D. Qualifying examination (Marine Microbiology) Cochin University of Science and Technology.

As Subject Expert

Doctoral Committee, Cochin University of Science and Technology.

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

As Supervising Guide

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

21. Dr. P.T. Lakshmanan,
Scientist (SG)

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.

22. Shri A.A. Khan,
Scientist (SG)

As Member

Purchase Committee of Fishing Gear and Boats for Fishermen Co-operative Societies, Hirakud.

Co-ordination Committee, Federation of Fishermen Co-operative Societies, Hirakud Reservoir, Sambalpur.

Regional Advisory Committee on Technical Science (RACTS) in the discipline of Fisheries constituted by NABARD, Bhubaneswar.

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23. Dr. Jose Stephen,
Scientist (SG)

As Research Guide

Ph.D. Cochin University of Science
and Technology

24. Shri Sib Sankar Gupta,
Scientist (SG)

As Member

Panel of Experts, EIA

25. Dr. N. Unnikrishnan Nair,
Scientist (SG)

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

26. Dr. A.G. Gopalakrishn Pillai,
Scientist (SG)

As Member

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

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

As Member

Consultative Group for Fishery Sur-
vey of India, Bombay and Porbander Bases

28. Dr. M.D. Varghese,
Scientist (SG)

As Subject Expert

Doctoral Committee, Cochin Uni-
versity of Science and Technology

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

As Life Member

Indian Science Congress Associa-
tion, Calcutta

As Member

Asian Fisheries Society, Indian Branch

30. Smt. K. Radhalakshmi,
Technical Officer

As Alternate Member

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

NATIONAL SCIENCE DAY

In connection with the Fifth National Science Day which fell on twentyeighth February 1991, the Institute organised a four day training programme for post-graduate students on Instrumental Methods of Chemical Analysis. A total of nine students from two local colleges attended the programme. The areas covered included amino acid analysis, atomic absorption spectrophotometry, . Iatro Scan (combined TLC-GLC analysis), high pressure liquid chromatography, gas liquid chromatography, flurometry and Kjeltach protein analysis.

The Institute in collaboration with the Society of Fisheries Technologists (India), also arranged a series of lectures on Science and Technology relevant to agriculture, fisheries and environment by eminent men of Science drawn from various organizations concerned with research, development and extension. The topics covered included Agricultural perspectives in Kerala, Investment opportunities in deep sea fishing, Sentinel organisms in pollution monitoring and People's involvement in agricultural development in Kerala State.

QAUMI-EKTA WEEK

The Qaumi Ekta week was observed from 19-25 Nov. 1990. A national integration pledge was taken to work with

dedication and preserve and strengthen the freedom and integrity of the nation.

WOMEN IN AGRICULTURE DAY

Various programmes were organised at the Institute in connection with observance of Women in Agriculture Day on 4 December 1990. At Cochin, a film show was held at South Chellanam, a fishing village, for the benefit of the fishermen, fisherwomen and their families. The films screened included those on the role of fishermen co-operative societies, hygiene on board fishing vessels, in peeling centres etc.

At the Institute's Centre at Veraval, an exhibition-cum-demonstration on preparation of fish products and by-products was held for the fisherwomen of Sutrapada village, 25 km away from Veraval.

The Burla Centre also organised an exhibition-cum-demonstration on improved fishing gear and various products developed. About 50 fisherwomen from Mahila Samitis in and around Burla participated in the programme.

At Calicut, eight girls from fishermen families were given training for a period of three days in scientific curing and preservation of fresh fish at ambient temperature using chemicals, preparation of pickles from fish and shell fish, room temperature preservation of ready-to-cook

fish slices and home-scale brine pickling of oil sardines.

OFFICIAL LANGUAGE IMPLEMENTATION

According to the instructions laid by the Ministry of Home Affairs, the Official Language Implementation Programmes of the Institute were implemented for the year 1990-91.

The quarterly OLIC meetings reviewed the implementation activities of CIFT.

The monthly/quarterly reports on the implementation pertaining to headquarters and Research Centres were sent to Council and OL Department for inclusion in the report to Secretariate.

Two Hindi Workshops were conducted from 12-3-1990 to 15-3-1990 and from 6-8-1990 to 10-8-1990 at the Headquarters. Sixteen members participated in these Workshops. Certificates, dictionaries etc. were distributed to the participants. These Workshops were quite beneficial as it enabled those who attended to start writing notings in files in hindi.

Hindi week and Raja Bhasha Divas were celebrated at the Headquarters from 10-9-1990 to 14-9-1990 with various competitions and cultural programmes. Prizes along with certificates were distributed to the winners of the competitions.

The Institute took active part in the Joint Hindi Week celebrated under the auspices of Cochin Town Official Language Implementation Committee from 26-11-1990 to 29-11-1990. The Institute was also the recipient of the Cochin TOLIC runners up trophy for the year 1990.

The Veraval Research Centre celebrated 14th September 1990 as Hindi Day jointly with CMFRI and MPEDA.

TECHNICAL SECTION

Compilation of Research Project Programmes :

The Institute's various research projects undertaken at the Headquarters and Research Centres for the year 1990-91 were compiled as per the recommendations of the Project Advisory Committee, Scientific Panel, Staff Research Council etc. The Research Project Programmes 1990-91 contained 26 projects including 11 ongoing projects, 8 extended projects and 7 new projects. Summary of 7 new projects completed in the year 1989-90 has also been given in the Research Project Programmes 1990-91.

Compilation of Activity Milestone of Research Projects 1990 - 91.

The Activity Milestone of all the ongoing research projects, fixing techni-

NATIONAL SCIENCE DAY



Students observe the working of amino acid analyser.



Shri. P. Sulochanan, Zonal Director, Fishery Survey of India, inaugurates the Raj Bhasha Divas.

'WOMEN IN AGRICULTURE' DAY



At the exhibition organised at Burla Research Centre.



Training in preparation of fish pickles at Calicut Centre.

cal programmes for each Scientist for each quarter of the year 1990-91, was also compiled and sent to Council on the specified date.

Six-Monthly Progress Report of Research Projects

The six monthly progress reports of research projects for the periods ending Sept. 1987 and March 1988 as per the technical programmes fixed for each Scientist in the Activity Milestone were collected from respective project leaders, compiled and kept as a permanent record of the Institute.

Five yearly Assessment/Reassessment/ Review of Assessment Results of ARS Scientists

The supplementary information proforma in respect of one S-1 Scientist for the years 1977 to 1985 (separately for each year) was sent to ASRB/Council for considering him for reassessment for the above period.

The individual project files and other relevant documents in respect of one S-3 Scientist, one S-2 Scientist and 5 S-1 Scientists were sent to the ASRB Assessment Committee in connection with their reassessment/review of assessment results.

The assessment result of one S-3 Scientist for the periods ending 31-12-1984

and 31-12-1985 and that of one S-2 Scientist for the period ending 31-12-1985 has been received from Council. The Board has recommended 'No Change' with respect to the assessment of the S-3 Scientist while the S-2 Scientist has been promoted to the next higher grade.

The Board has also recommended 'No Change' with respect to the assessment conducted earlier of 5 S-1 Scientists who have been reviewed for their assessment results for the periods ending 31-12-1981/31-12-1983.

The assessment result of one S-2 Scientist and one S-1 Scientist for the period ending 31-12-1985 is awaited.

Preparation and Submission of Technical Reports

a) Monthly Reports to DARE/ Cabinet Secretary

Materials for the preparation of monthly reports on the important activities of the Institute, significant research findings, training programmes, symposia, seminars, workshops etc. conducted, visits of dignitaries, radio talks, film shows, exhibitions etc. held were collected from various Divisions and compiled in the prescribed format and sent to Council regularly for inclusion in the monthly report of DARE for Programme Implementation/Cabinet Secretariat.

b) Quarterly Report to Council

Consolidated Quarterly Reports relating to the above activities of the Institute for each quarter were compiled in the prescribed format and sent to Council on the specified date.

c) Annual Action Plan - Quarterly Report

Consolidated quarterly report of the Institute research projects as per the Activity Milestone already targeted and evaluated by the PAC for each quarter of the year has also been sent to Council regularly as per the directives from the Cabinet Secretariat.

d) Reports for ICAR Regional Committees

Reports on the research and extension works carried out at the Institute Headquarters and Research Centres for the year 1989-90 were compiled and sent to Council at the appropriate time for inclusion in the respective agenda notes for the ICAR Regional Committee Meetings of Region No. V (Burla and Kakinada), VI (Veraval), VII (Goa and Bombay) and VIII (Cochin and Calicut).

Data Bank

The following Data banks were prepared and sent to the respective organizations during the reported period.

a) Data base regarding information on non-aligned and other developing countries were sent to the Agricultural Research Information Centre, New Delhi, furnishing relevant information on technologies available at CIFT for transfer, areas of specialization, nature of institutional activities etc.

b) Expert-base response sheets, furnishing biodata of all the Senior Scientists of the Institute were forwarded to the Area Co-ordinator, Food Science and Technology Information Service, CFTRI, Mysore, on request.

c) The relevant particulars on the activities of the Institute were sent to Council in the prescribed format for the TCDC programming exercise in the agriculture sector held in India in December 1990.

d) A questionnaire furnishing all the relevant matters pertaining to the Institute, was filled and sent to the Indian National Scientific Documentation Centre, New Delhi for publication of a Directory of Scientific Research Institutions in India being brought out by the Centre.

Calendar of Events

Programmes of Meetings/Conferences/Workshops etc. proposed to be conducted by the Institute during the period July to Dec. 1990 were compiled and sent to Council for inclusion in the Calendar of events, 1990.

Maintenance and Updating Project Files

The Individual project files of eligible Scientists who were called for personal discussion with the ASRB Assessment Committee were thoroughly scrutinised and arranged for presenting the same before the ASRB Assessment Committee, as and when called for.

The project leaders' files of all the ongoing research projects were maintained upto date by collecting the relevant quarterly/Half-yearly/Annual/Final reports from the project leaders and associates for the respective periods.

Publication of Research Papers

Requests received from Scientists seeking permission for publication of scientific/technical papers were processed and arranged to be sent to the concerned referees for comments as desired by Director. The referees' comments were communicated to the authors for modification if any. During the reported period, 32 papers were processed and Director's approval for publication of 31 papers was communicated to the authors. Thirty three papers were approved for presentation at Workshops, Seminars, Conferences etc, conducted during the period.

Staff Research Council

The Annual SRC meeting was conducted on 24/3/1990 to approve the Research Projects for implementation in

1990-91. Two more quarterly SRC meetings were also conducted on 7-6-1990 and 26-7-1990 to review the progress of projects handled at Headquarters and Research Centres. The proceedings of the SRC was prepared and circulated among the Scientists and follow-up action taken on the recommendations of the SRC.

Projects for Women

A Scheme on 'Establishment of an Apex Fisherwomen Co-operative' at a cost of Rs. 8.5 crores was prepared and submitted to ICAR for implementation under Danish Support.

A detailed report on the scheme on Science and Technology for Women sponsored by the Department of Science and Technology (Govt. of India), under the project title 'Gainful employment for coastal women' was prepared with particular emphasis on community background, methodology, women's participation, impact on women's life, special features, replicability, constraints and suggestions and submitted to Department of Science and Technology.

Collaborative/Ad-hoc Research Programmes

The following research projects undertaken by the Scientists of the Institute were pursued for obtaining Council's concurrence and follow-up action during the period.

-
- a) Development of feed for cultured prawns — CIBA, CIFRI and CMFRI.
 - b) Development of cooking gas from water hyacinth — DST
 - c) Integrated utilization of cultivable freshwater fishes for the production of food, feed and pharmaceutical products — OECF assistance.
 - d) Technological studies on production and utilization of fish silage under Indian conditions with special reference to ensilation of trawler bycatches and processing wastes — Danish Aid
 - e) Reduction of losses in durable fishery products of Bombay coast during storage — ICAR Adhoc project.
 - f) Establishment of an Apex Fisherwomen Co-operative — Danish Aid
 - g) Collaborative Research Project on Fish Processing — NRI, U.K.
 - h) Joint Cruise Programme on 'Sagar Sampada' and 'Saraswathi' — CMFRI and CIFE

Preparation of Special Bulletin

The compilation of titles of research papers of Scientists and Technicians of CIFT has been initiated to update the Abstract of CIFT Publications.

Hindi Implementation

The bilingual technical correspondence to ICAR/Research Centres/other organizations was initiated in the Technical Section.

Registers and seals in bilingual were made ready during the period. A hindi pamphlet on 'Employment generation for coastal women' was also prepared during the period.

The staff of the Section also participated in various competitions connected with official language implementation and won several prizes.

LIBRARY

The Library continued to provide library and documentation service to the Scientific and Technical staff of the Institute, Research Scholars, students from various Universities, Scientists from other Institutes and technologists from the Industry. During the year, 155 books were added to the collection and at present there are 7055 books and 3337 bound volumes of Scientific journals. 92 journals were subscribed during this year. A total of 3190 bonafide readers visited the library and 4140 publications were issued and returned during the period under report. The reprographic unit of the Library made copies and supplied 43117 pages of documents on requisition. One new Plain Paper Copying

Machine has been purchased and installed in the Library. The Library continued to issue the 'Current Contents on Fishery Technology' (fortnightly) for the benefit of the users.

ADMINISTRATION

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

The Research Centre 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 31-3-1991 is given as Appendix - II.

Details of budget provision and actual expenditure are given as Appendix - III.

MANAGEMENT COMMITTEE

The Management Committee of the Institute was re-constituted with the following personnel for a period of 3 years from 18-12-1989.

Chairman

1. The Director, CIFT, Cochin

Members

1. The Director of Fisheries,
Fisheries and Ports (A) Department,
Government of Kerala, Trivandrum
2. The Director of Fisheries
Department of Fisheries
Government of Orissa, Cuttack.
3. The Dean.
College of Fisheries
Kerala Agricultural University,
Panangad - 680 506
4. Shri . Om Prakash Mahajan,
Ex-Minister,
Near Jahaj Pal, Hissar,
Haryana.
5. Shri Chikka Basappa,
Port Birur,
Dist. Chikamangalur,
Karnataka
6. The Asst. Director General
(Marine Fisheries), ICAR,
Krishi Bhavan, New Delhi - 1
7. The Sr. Finance and Accounts
Officer
CMFRI, Ernakulam, Cochin
8. Shri P.A. Panicker,
Principal Scientist,
CIFT, Cochin

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

10. Shri Percy Dawson, Scientist (SG)
Burla Research Centre of CIFT
Burla

11. Dr. P.T. Lakshmanan, Scientist (SG)
CIFT, Cochin

Member Secretary

The Sr. Administrative Officer,
CIFT, Cochin

The Committee met twice during the
period under report.

INSTITUTE JOINT COUNCIL

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

Chairman

The Director, CIFT, Cochin

Official Side Members

1. Dr. K. Gopakumar,
Principal Scientist
2. Dr. M.K. Kandoran,
Principal Scientist
3. Shri V.C. George,
Principal Scientist
4. Dr. P.K. Surendran, Scientist (SG)

5. Senior Administrative Officer
6. Asst. Finance and Accounts Officer

Staff Side Members

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

Secretary (Official Side)

Dr. P.K. Surendran, Scientist (SG)

Secretary (Staff Side)

Shri M.K. Kuttykrishnan Nair, T-2

Two meetings of the IJC were held
during the year.

MONITORING CELL

The Monitoring Cell was re-consti-
tuted with the following members on 25-
1-1990 to function up to 31-12-1991.

Chairman

The Director, CIFT, Cochin

Members

1. Dr. K. Gopakumar, Principal Scientist
2. HOD, Fishing Technology
3. HOD, Fish Processing
4. HOD, B, N and M

-
5. HOD, Engineering and Instrm.
 6. HOD, EIS
 7. Dr. A.G. Gopalakrishna Pillai, Scientist (SG)
 8. Shri P.A. Perigreen, Scientist (SG)
 9. Sr. Administrative Officer
 10. Administrative Officer
 11. Asst. Finance and Accounts Officer
 12. Asst. Adm. Officer (Bills)

Member Secretary

Asst. Adm. Officer (Admn.)

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 on 22-1-1990, also continued to function during the year.

The tenure of the Cell is two years.

Chairman

The Director, CIFT, Cochin

Members

1. Shri P. Vasudeva Prabhu, Principal Scientist
2. Sr. Administrative Officer
3. Asst. Finance and 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

Many foreign and Indian dignitaries, students from educational institutions, staff and trainees from State and Central Government organizations and others connected with the fishery industry visited the Institute to acquaint themselves with its activities. These included :

1. Mr. Vinay Varma, Ambassador of India, Bangkok
2. Mr. Yoshihidi Uchimura, President, Japan Fisheries Assn. Tokyo, Japan, accompanied by his wife, Mr. Hajime Nishimura, Director, International Division and Mr. Tat Suki Tabata, Fisheries Expert
3. High level Fisheries Delegation from Cambodia comprising Dr. Mok Mareth, Hon'ble Vice Minister of Agriculture, Dr. Ly. Kim Han, Director General of Fisheries, Mr. Touch Seang Tana, Administrator of Fisheries, State of Cambodia and Mr. M.C. Pereira, Agronomist of CIDSE in Cambodia
4. Appraisal Mission from Denmark comprising Mr. Mogens Brix-Haupt,

-
- Organizational Specialist, Mr. Jesper May, Marine Scientist, Mr. Mogens Busse, Equipment Engineer, Mr. Niek Fruland, Naval Architect and Ms. M.N. Kalavathy, Anthropologist (Fisheries Specialist)
 5. ODA Fisheries Team comprising Dr. Tarbit, ODA Fisheries Advisor, Dr. G. Ames of Natural Resources Institute, Mr. John Carpenter, Southern Asia Dept. ODA
 6. Prof. Alan J. Matty, Head, Nutrition Unit, University of Sterling, U.K. accompanied by his wife
 7. Dr. Cesario R. Pagdilao, Director, Marine Fish Division of Picarro, Phillippines
 8. Hon'ble Shri Shantilal P. Patel, Dy. Minister of Commerce
 9. Mr. John Wignall, Former Head, Process & Resources Devt. Section, Torry Research Station, Aberdeen, U.K.
 10. Mr. David Andrew Palfreman, Sr. Lecturer, Humberside International Fisheries Research Institute, Hull University, U.K.
 11. Mr. Stephen Bill, Principal Administrator, Directorate of EEC, Brussels.
 12. Mr. Patrick Laurent, Counsellor, Commercial and Economic Delegation of the Commission of European Communities
 13. Mr. A. Ghosh, Adviser, EEC Delegation, New Delhi
 14. Dr. Ray Winger, Food Technologist and Mr. Jon Cook, Economist-Members, Australian International Development Assistance Bureau (AIDAB) Canberra
 15. Mrs. K.P. Aiyappa, Shri V. Ramaiah and Shri H. Viswanath, Members, Board of Regents, University of Agricultural Sciences, Bangalore.

PUBLICATIONS

1. Antony, K.P., Srinivasa Gopal, T.K. and Prabhu, P.V. (1990) - Survey on the properties of packaging materials for frozen shrimp export - Part - I - *Fishing Chimes*, 10 (9) : 35
2. Balachandran, K.K. (1991) - Fish processing technology - principles and methods - Paper presented at Refresher Course for Zoology Professors, Mahatma Gandhi University, Cochin, 18 March
3. Balachandran, K.K. (1991) - Scope for development of fish processing industry in Kerala - Paper presented at Refresher Course for Managers of Industries Dept., Government of Kerala, Cochin, 27 Feb.
4. Balachandran, K.K. (1991) - Some aspects of post harvest handling and processing of cultured prawns - Paper presented at National Seminar on Present Status and Future Strategies for Coastal Aquaculture in India, organised by Department of Fisheries, Government of Maharashtra, Shipping Credit and Devt. Co. of India and MPEDA, Bombay, 21-22 January
5. Badonia Rajendra, Solanki, K.K. and Ramachandran, A. (1990) - By-catch of shrimp trawls in Gujarat - Paper presented at 2nd Indian Fisheries Forum, organised by Asian Fisheries Society, Mangalore, 27-31 May
6. Basu Subrata (1990) - Dried fish - cereal mixture - *Fish. Technol.* 27 (2) : 162
7. Bhattacharyya, S.K. and (Chaudhuri, D.R.) (1990) - Studies on storage characteristics of *Clarius batrachus* at different temperatures - *Fish. Technol.* 27 (2) ; 127
8. Cecily, P.J. (1990) - Employment for women - *Annual*, Department of Industrial Fisheries, Marine Sciences, Cochin University of Science and Technology
9. Cecily, P.J. (1990) - Fishery technology package for uplift of coastal women - Paper presented at Workshop on Women in Indian Fisheries organised by Asian Fisheries Society, Indian Branch, College of Fisheries, Mangalore, 27-31 May
10. Chakrabarti, R. (1991) - Histamine content in dried fish products from Kakinada Coast - *Fish. Technol.* 28 (1) : 67
11. Chakrabarti, R. and Khasim Saheb, D.I. (1989) - Effect of depuration of Indian cockle *Anadara granosa* - *Ind. J. Fish.* 36 (1) : 85
12. Damle, S.P., Garg, D.K. and James, M.A. (1990) - Fresh fish trade in Bombay - *Seaf. Exp. J.* XXII (9-10) : 15
13. Gopal, T.K. Srinivasa, Nambiar, V.N., Bhattacharyya, S.K., Jose Joseph and

- Prabhu, P.V. (1990) - Modified atmosphere storage of fresh water fish fillets (*Catla catla*) - Paper presented at the International Symp. on Chilling and Freezing of New Fish Products, organised by International Institute of Refrigeration, and held at Torry Research Station, Aberdeen, Scotland, U.K., 18-20 Sept.
14. Iyer, T.S.G. and Varma, P.R.G. (1990) - *Vibrio cholerae* and sea foods - *Industrial Fisheries Assn. Annual*. (Cochin University of Science and Technology), 7 : 21
 15. Iyer, T.S.G., Varma, P.R.G., (Sunil Gupta, John, P.C. and Saxena, S.N.) (1990) - *Salmonella mgulani* (38 : i: 1, 2) isolated for the first time in India - *J. Com. Dis.* 22 : 283
 16. James, M. Arul (1990) - Awareness and responsibilities of technologist in inprocess quality control system with fish processing industries - *Seaf. Exp. J.* XXII (6) : 21
 17. Joseph Jose, Chinnamma George and Perigreen, P.A. (1989) - Studies on minced meat storage and quality improvement - *J. Mar, Biol. Assn. India*, 31 (1 & 2) : 247
 18. Joseph Jose, Gupta, S.S. and Prabhu, P.V. (1990) - Handling and processing of freshwater prawns, *Macrobrachium rosenbergi* - Paper presented at Symposium on *Macrobrachium* organised by Fisheries College, Panangad, December, 1990.
 19. Joseph Jose, Perigreen, P.A., Surendran, P.K. and Gopakumar, K. (1990) - Iced storage characteristics of cultured major carps of India - Paper presented at International Symposium on Chilling and Freezing of New Fish Products organised by International Institute of Refrigeration, Commission C2 and held at Torry Research Station, Aberdeen, U.K., 18-20 Sept.
 20. Kandoran, M.K. and Nair, M.R. (1991) - Advances in harvesting and processing of fish in Kerala - Paper presented at National Seminar on Fisheries Resources of Kerala organised by Kerala Sastra Sahitya Parishat at Ernakulam, 23 Feb.
 21. Kandoran, M.K. and Prabhu, P.V. (1988, published in 1990) Survey on handling and processing of *Anchoviella* - *Fish Tech. Newsletter*, V (5-6) : 9
 22. Kartha, K.N. and (Rao, K.S.) (1990) - Limnological studies in Gandhisagar reservoir - Paper presented at National Seminar on Recent Advances in Hydrobiology, Indore, 23-25 Oct.
 23. Kartha, K.N., Kuttappan, A.C., Varghese, M.D., George, V.C., Rama Rao, S.V.S. and Krishna Iyer, H. (1990) - Design aspects of double rig shrimp trawls operated off Visakhapatnam - *Fish. Technol.* 27 (2) : 2

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24. Kartha, K.N. and (Rao, K.S.) (1990) - Length-weight and length-maximum girth relationship of *Catla catla* (Ham) in commercial landings of Gandhisagar reservoir - *Fish. Technol.* 27 (2) : 155
25. Kartha, K.N. and (Rao, K.S.) (1991) - Observations on experimental two-boat bottom and midwater trawling in Gandhisagar reservoir - *Fish. Technol.* 28 (1) : 11
26. Kartha, K.N. and (Rao, K.S.) (1991) - Selectivity of gill nets for *Catla catla* (Ham), *Cirrhinus mrigala* (Day) and *Labeo rohita* (Ham) in Gandhisagar reservoir - *Fish. Technol.* 28 (1) : 5
27. Khasim, D. Iman (1990) - The other side of value addition to low cost fish - *Fishing Chimes*, March : 27
28. Khasim, D. Iman, Chakrabarti, R. and Panduranga Rao, C.C. (1990) - Proximate composition, calcium and phosphorus contents of five varieties of deep sea fishes of Andhra Coast - *CMFRI Bull.* 44 : 478
29. Lakshmanan, P.T., Varma, P.R.G. and Iyer, T.S.G. (1991) - Studies on the quality changes of frozen fish in retail cold storage - *Fish. Technol.* 28 (1) : 42
30. Lalitha, K.V. and Mahadeva Iyer, K. (1991) - Isolation and characterization of a putrefactive anaerobe *Clostridium sporogenes* from fishes and shell fishes - *Fish. Technol.* 28 (1) : 38
31. Lalitha, K.V. and Mahadeva Iyer, K. (1990) - Isolation of *Clostridium botulinum* from tropical fish - *Letters in Appl. Microbiol.* 11, 179
32. Madhavan, P., Mathew, P.T. and Gopakumar, K. (1990) - Utilization of Krill - Paper presented at the Workshop on Exploration and Exploitation of Antarctic Krill Resources, NIO, Goa, 31 August
33. Mathai, T. Joseph, George, T.P., Sadanandan, K.A., George, N.A. and Kesavan Nair, A.K. (1990). Studies on prawn fishing by gill netting - *Fishing Chimes*, 10 (9) : 36
34. Mathen Cyriac, Unnikrishnan Nair, T.S., George Joseph, K. and Ravindranathan Nair, P. (1990) - A refining process for commercial dry cured fish - *Fish Tech. Newsletter* V (11 & 12) and VI (1) : 4
35. Mathew, P.T. and Balachandran, K.K. (1990) - Utilization of shark - *Fishing Chimes*, 10 (2) : 23
36. Nair, A.K. Kesavan and Krishna Iyer, H. (1990) - A survey on the catches of squilla along Kerala Coast - *Fish. Technol.* 27 (2) : 123
37. Nair, A.L., Jose Stephen and Gopakumar K. (1990) - Nutritional
-

- evaluation of three deep sea fish meals
- *Ind. J. Anim. Sci.* 60 (9) : 1146
38. Nair, A. Lakshmy, Jose Stephen and Gopakumar, K. (1991) - Nutritive value of edible meat powder and meal from three fatty deep sea fishes - *Fish. Technol.* 28 (1) : 63
39. Nair, A. Lakshmy, Ravindranathan Nair, P., Vasanth Shenoy, A. and Gopakumar, K. (1989 - issued in 1990) Fish sauce from tropical fish - *J. Mar. Biol. Assn. India* - 31 (1 & 2) : 190
40. Nair, K.G.R. (1991) - Chitin and chitosan - *Proc. Cochin College Chemistry Assn.*
41. Nair, K.G.R. (1991) - Chitin and important polysaccharides - *Annual Industrial Fisheries Assn., Cochin University of Science and Technology*
42. Nair, M.R. and Kandoran, M.K. (1990) - Technologies for employment generation for women in fisheries - Paper presented at Workshop on Women in Indian Fisheries held in connection with second Indian Fisheries Forum of the Indian Branch of Asian Fisheries Society at College of Fisheries, Mangalore, 27-31 May
43. Nair, P. Ravindranathan, George Joseph, K., Unnikrishnan Nair, T.S. and Cyriac Mathen (1990) - A preservation process for ready to cook fish portions at room temperature - *Seaf. Exp. J.* XXII (7-8) : 45
44. Nambiar V. Narayanan and Mahadeva Iyer, K. (1991) - Distribution of *Salmonella* serotypes in fish in retail trade in Kochi - *Fish. Technol.* 28 (1) : 33
45. (Nambiar, D.D.) and Gopakumar, K. (1990) - Effect of freezing and thawing of press juice on enzyme activity - *Proc. Conference on Chilling and Freezing of New Fish Products, International Inst. of Refrigeration Commission C2, Aberdeen, 18-20 Sep.*
46. Perigreen, P.A. (1990) - Modern trends in marine products processing - Paper presented at Workshop on Marine Products and Allied Industries for Domestic/Export Market organised by Small Industries Service Institute, Madras, 30 August
47. Perigreen, P.A. (1990) - Non-traditional fishery products for tiny and cottage industry - Paper presented at Workshop in Marine Products and Allied Industries for Domestic/Export Market organised by small Industries Service Institute, Madras, 30 August
48. Perigreen, P.A. and Gopakumar, K. (1991), - Handling and transportation of cultured fish - *Aquaculture Productivity* (Eds. V.R.P. Sinha and Srivastava) : 731
49. Prabhu, P.V. and Srinivasa Gopal, T.K. (1990) - Storage life of dry fish pickle (*Kowala coval*) packed in flex-

- ible packing material - Paper presented at Second Indian Fisheries Forum, Mangalore, 27-31 May
50. Pillai, S. Ayyappan (1990) - Development of IQF plants in India - *Seaf. Exp. J.* XXII (7-8) : 33
 51. Prabhu, P.V. (1990) - Industrial and export opportunities for marine products - Paper presented at the International Seminar-cum-Exhibition on Food and Agro-based Industries, Hyderabad, 6-8 Sept.
 52. Rajan, K.V. Mohan, Boopend-ranath, M.R., George Mathai, P. and Subramonia Pillai, N, (1990) - Studies on optimisation of bridle lengths for demersal trawls - *Fish. Technol.* 27 (2) : 87
 53. Rajan, K.V. Mohan, George Mathai, P., Manohar Doss, R.S. and Puthra Pravin (1991) - Studies on polypropylene gill nets - *Fish. Technol.* 28 (1) : 1
 54. Ramachandran, A. and Sankar, T.V. (1990) - Fins and fin rays from whale shark *Rhiniodon typus* (Smith) - *Fish. Technol.* 27 (2) : 138
 55. Ramachandran, A., Solanki, K.K. and Rajendra Badonia (1990) Observation on the preparation and storage of semi dried dhoma - Paper presented at 2nd Indian Fisheries Forum organised by Asian Fisheries Society, Mangalore, 27-31 May
 56. Rao, C.C. Panduranga, Basu, S., Khasim Saheb, D.I., Chakrabarti, R., and Gupta, S. S. (1990) - Utilisation of blood clam *Anadara granosa* - *CMFRI Bull.* 44 : 470
 57. Sivadas, T.K. (1990) - Instrumentation for monitoring water quality related to aquatic environment and the behaviour of biomonitoring indicators - Paper presented at National Symposium on Biomonitoring Indicators in an Aquatic Ecosystem, Erode, 24-26 Oct.
 58. Sivadas, T.K. (1990) - Instrumentation techniques for water resources monitoring based on CIFT findings - Paper presented at Conference on Water Quality Status of Kerala organised by Centre for Water Resources Development and Management, Calicut, 27 June
 59. Solanki, K.K. (1990) - Shark fin soup - *Fishing Chimes*, 12 (9) : 31
 60. Thampuran Nirmala and Mahadeva Iyer, K. (1990) - Production of hydrogen sulphide and other volatile sulphides by spoilage bacteria from fish - *Fish. Technol.* 27 (2) : 145
 61. Thankappan, T.K. and Gopakumar, K. (1991) - A rapid method of separation and estimation of squalene from

-
- fish liver oils using Iatroskan Analyser
- *Fish. Technol.* 28 (1) : 59
62. Thomas Francis and Cyriac Mathen (1988, published in 1990) - Collection of water samples for analysis with special reference to fish processing - *Fish Tech. Newsletter*, V (5-6) : 3
63. Thomas Francis and Cyriac Mathen (1991) - Collection of water samples for analysis - *Fishing Chimes*, 10 (12) : 21
64. Unnithan, G.R. (1990) - Role of Scientific Societies in India - Paper presented at Workshop on Women in Indian Fisheries organised by Asian Fisheries Society, Indian Branch, College of Fisheries, Mangalore, 27-31 May
65. Varma, P.R.G. and Iyer, T.S.G. (1990) - Viability of *Vibrio cholerae* in water - *Fish. Technol.* 27 (2) : 151
66. Vijayan, V., Syed Abbas, M. and Joseph Mathai, T.(1991) - One boat midwater trawling - *Fishing Chimes*, 10 (12) : 18
67. Vijayan, V., Varghese, M.D., George, V.C. and Unnithan, G.R. (1990) - Evolution of an improved trawl for traditional motorised craft - *Fish. Technol.* 27 (2) : 83
- Other publications brought out include:
1. Fish Technology Newsletter :
Vol. V, No. 7-10
Vol. V, Nos, 11, 12 and Vol. VI No. 1
 2. A Project Report on "Production Units for Utilization of Low Cost Fish" by K. Gopakumar, P.V. Prabhu, P.A. Perigreen, K.K. Balachandran, P. Madhavan, H. Krishna Iyer & A.C. Joseph
 3. Proceedings of Summer Institute (Short Course) on Indigenous Instrumentation for Agro-climatological Investigations. 6-14 June 1989
 4. Proceedings of Summer Institute on Packaging of Fish and Fish Products for Export and Internal Market, 15-24 May, 1990
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APPENDICES

APPENDIX - I

HEADQUARTERS

CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY
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TLX No. 0885 - 6440

Telephone : Office No. 6845 (10 lines)

Director (Per) - No. 6880
(Res) - No. 351034

Telegram : MATSYAODYOGIKI/FISHTECH, 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 - I (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 Telex :0163-202 CIFT-IN	Matsyaudyogiki	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 : 4436 Telex : 0473-229 CIFT-IN	Matsyaudyogiki	Dr. C.C. Panduranga Rao, Principal Scientist
3.	BURLA	Research Centre of CIFT Burla - 768 017 Sambalpur District Orissa	Tel : 19 Telex : 0634-211 CIFT-IN	Matsyaudyogiki	Shri C.V.N. Rao, Principal Scientist
4.	BOMBAY	Research Centre of CIFT 162-BPT Godown, Sassoon Dock, Colaba Bombay - 400 005 Maharashtra	Tel : 213892 Telex : 011-82464 CIFT-IN	Fishprocess (FT)	Dr. M. Anul James, Principal Scientist
5.	CALICUT	Research Centre of CIFT Beach Road, West Hill Calicut - 673 005 Kerala	Tel : 50627	Care 'Cadalmin'	Shri Cyriac Mathen, Principal Scientist
6.	GOA	Research Centre of CIFT 2nd Floor, 'Shanta' 18th June Road, St. Inez. Panaji - 403 001 Goa	Tel : 5905	Matsyaudyogiki	Shri H.N.Mhalathkar, Scientist (SG)

APPENDIX II

List of Personnel in CIFT as on 31st march, 1991

HEADQUARTERS, COCHIN

SCIENTIFIC PERSONNEL

DIRECTOR

Shri M.Rajendranathan Nair

Principal Scientist

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

Scientist (Selection Grade)

1. Shri P.D. Antony
2. Shri P.A. Perigreen
3. Dr. A.K. Kesavan Nair
4. Shri K.A. Sadanandan
5. Shri P. R. Girija Varma
6. Dr. A.G. Gopalakrishna Pillai
7. Shri A.G. Radhakrishnan
8. Dr. Chinnamma George

9. Dr. P.K. Surendran
10. Dr. K.G. Ramachandran Nair
11. Dr. M.K. Mukundan
12. Dr. P.T. Mathew
13. Dr. Jose Stephen
14. Dr. N. Unnikrishnan Nair
15. Smt. A. Lekshmy Nair
16. Shri V. Narayanan Nambiar
17. Shri T.K. Thankappan
18. Shri A.C. Joseph
19. Shri K.V. Mohan Rajan
20. Shri K.K. Kunjipalu
21. Dr. B. Meenakumari
22. Smt. Mary Thomas
23. Shri P.N. Joshi
24. Shri P.K. Vijayan
25. Dr. Jose Joseph
26. Dr. Nirmala Thampuran
27. Shri Francis Thomas
28. Dr. Sanjeev S.
29. Dr. P.T. Lekshmanan
30. Shri V. Muraleedharan
31. Shri M.R. Boopendranath
32. Shri N. Subramonia Pillai
33. Shri G. Rajagopalan Unnithan
34. Dr. M.R. Raghunath
35. Smt. K.V. Lalitha
36. Shri V. Vijayan

-
37. Dr. M.D. Varghese
 38. Shri S.K. Bhattacharyya
 39. Shri K. Ramakrishnan
 40. Smt. K. Vijayabharathi
 41. Shri T.K. Srinivasa Gopal
 42. Shri P. George Mathai

Senior Scientist

1. Shri M. Nasar

Scientist

1. Shri K.P. Antony
2. Smt. R. Thankamma
3. Shri V. Annamalai
4. Shri A.C. Kuttappan
5. Smt. Saly N. Thomas
6. Smt. Leela Edwin
7. Shri Braj Mohan
8. Dr. A. Ramachandran
9. Shri T.V. Sankar
10. Shri M. Syed Abbas
11. Smt. K. Ammu
12. Dr. S. Balasubramaniam

TECHNICAL PERSONNEL

T-8 (Technical Officer)

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

T-7 (Technical Officer)

1. Shri K.C. Purushothaman
2. Shri M.S. Fernando
3. Shri K.J. Francis Xavier
4. Shri Durgacharan Besara

T-6 (Technical Officer)

1. Shri N.A. George
2. Shri T.M. Sivan
3. Shri K. Vasudevan Nair

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. Vasudevan Nair
7. Shri K. Bhaskaran
8. Shri Varghese Paul
9. Shri C. Chandrasekharan
10. Shri N. Vareethiah
11. Shri G. Mohanan
12. Shri O. Subramanian
13. Shri P. Ravindranathan
14. Shri T.K. Syed Ali
15. Shri R. Gopalakrishnan Nair
16. Shri M.V. Baiju

Technician T-4

1. Shri A. Kassim Kunju
2. Shri M.L. Anslem
3. Shri P. Sadanandan
4. Shri M.K. Sasidharan
5. Shri P.T. Sebastian
6. Shri N.M. Vasu
7. Shri V. Gaspar
8. Shri Thomas J. Mammoottil
9. Shri P.S. Alias
10. Shri B. Anandan
11. Shri T.K. David

Technician - T-II-3

1. Shri G. Ramadas Kurup
2. Shri M.M. Devasya
3. Shri C.R. Gokulan
4. Shri V. Gopalakrishna Pillai
5. Shri V.K. Ramachandran
6. Shri V.V. Johni
7. Shri G. Ratnakaran Nair
8. Shri K.V. Baladasan

Technician T-I-3

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

Technician T-2

1. Shri K.N. Rajagopalan
2. Shri K.K. Narayanan

3. Shri V.V. John
4. Smt. T. Sailaja
5. Shri Nobi P.S.
6. Shri N.R. Gopan Nair
7. Shri M.K. Kuttykrishnan Nair
8. Shri Thambi Pillai K.B.
9. Shri Tommy Rebello
10. Shri A.A. Kunjappan
11. Kum. K.G. Sasikala
12. Smt. K.P. Leelamma
13. Smt. V.C. Mary
14. Shri P.S. Raman Namboodiri
15. Shri P.T. Viswambharan

Technician T-I

1. Shri K.K. Sudhanandan
2. Shri. Omanaikuttan Nair G.
3. Smt. K.B. Beena
4. Smt. K.S. Mythri
5. Smt. G. Remani
6. Shri Kirtan Kisan
7. Shri K.D. Jos
8. Shri J. Samarajan
9. Shri K.A. Gopinath
10. Shri P.N. Sukumaran Nair
11. Shri T. Mathai

ADMINISTRATIVE PERSONNEL**Sr. Administrative Officer**

Shri V.K. Sridhar

Administrative Officer

Smt. K.A. Devaky

Hindi Officer

Smt. Jessy Joseph C.

Asst. Finance & Accounts Officer

Shri P.A. Uthup

Asst. Administrative Officer

Shri S. Naveen Chandra Prabhu
Shri M. George Joseph

Superintendent

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

Sr. Stenographer

Shri K.J. Thomas

Assistant

1. Shri A. George Joseph
2. Smt. N.K. Sulochana
3. Smt. T.K. Sarala
4. Shri R.S. Shanmughan
5. Shri A.L. John
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

Stenographer

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

Senior Clerk

1. Smt. Annamma Varghese
2. Smt. C.G. Marykutty

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

Junior Clerk

1. Shri P.V. Venugopal
2. Smt. P.C. Kamalakshy
3. Smt. N.I. Mary
4. Shri P.K. Thomas
5. Smt. P.K. Thankamma
6. Smt. A.A. Cousallia
7. Shri K.K. Sasi
8. Shri P. Padmanabhan
9. Smt. A.R. Kamalam
10. Smt. T.K. Shyma
11. Smt. T.D. Usheem
12. Smt. V.S. Aleyamma
13. Shri V.S. Ambasuthan
14. Shri A.P. Gopalan
15. Shri S. Radhakrishnan Nair
16. Shri K.B. Sabukuttan
17. Smt. G.N. Sarada
18. Smt. P.A. Sathy
19. Shri P. Krishnakumar
20. Shri K.C. Baby
21. Shri C.K. Sukumaran
22. Shri V.C. Sunil

-
23. Shri P.P. Varghese
 24. Shri S.R. Vijayakumar
 25. Smt. Lillykutty George
 26. Shri P.K. Somasekharan Nair
 27. Kum. Ajitha K.S.
 28. Kum. Latha K.

Jr. Stenographer

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

Telephone Operator-cum-Receptionist

Shri P. Bahuleyan

AUXILIARY PERSONNEL

Senior Carpenter

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

Carpenter

1. Shri P. 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

Animal House Keeper

Shri B. Ganesan

Hindi Translator

Smt. K. Sobha

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 K.A. Kunjan
12. Shri T.T. Thankappan
13. Shri P.R. Unnikrishna Panicker
14. Shri R. Chellappan
15. Shri A.R. John
16. Shri C.N. Raghavan

Supporting Staff Grade -I

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

VERAVAL RESEARCH CENTRE

SCIENTIFIC PERSONNEL

Principal Scientist

1. Shri K.K. Solanki

Scientist (Selection Grade)

1. Dr. P.G. Viswanathan Nair
2. Shri Rajendra Badonia
3. Shri A. Vasanth Shenoy
4. Shri R.S. Manohar Doss

Scientist S - 1

Shri Puthra Pravin

TECHNICAL PERSONNEL

Technician T-4

1. Shri G.P. Vaghela
2. Shri J.B. Paradwa
3. Shri D.K. Ukhabhai

Technician T - II - 3

Shri K.V. Baladasan

Technician T- I - 3

1. Shri S.R. Jethwa
2. Shri M.M. Vara
3. Shri T. Gangadharan

Technician T - 2

1. Shri K.U. Sheikh
2. Shri D.R. Apamati

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
4. Shri Malam Bachu Sidi

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 N.N. Goswami
4. 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 Niren Chorwadi
9. Shri Dodiya Khodia Viram
10. Shri Druba Charan Bhoi

**KAKINADA RESEARCH
CENTRE****SCIENTIFIC PERSONNEL****Principal Scientist**

Dr. C.C. Panduranga Rao

Scientist (S.G.)

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

3. Shri Imam Khasim Sahib
4. Dr. Subrata Basu
5. Shri J. Sita Rama Rao

Scientist

1. Shri Ruspshankar Chakraborty
2. Shri M.M. Prasad

TECHNICAL PERSONNEL**Technician T - 4**

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

Technician T - II - 3

Shri K.V.S.S. Kusuma Hamath

Technician T - I - 3

1. Shri Laxmanadu
2. Shri Veera Raju

Technician T - 2

Shri B. Ramaiah

Technician T - 1

1. Shri K. Prakash Rao
2. Shri N. Venkata Rao
3. Shri Ramesh Singh

ADMINISTRATIVE PERSONNEL**Assistant**

Shri G.C. Adhikari

Junior Stenographer

Smt. Satyanarayanamma

Senior Clerk

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

Junior Clerk

1. Shri Nirmala Raju
2. Shri Kanakaraju
3. Shri Chinna Rao

AUXILIARY PERSONNEL**Deck Hand**

1. Shri K. Sarangadharadu
2. Shri Karri 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

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 K. Appa Rao

Supporting Staff Grade - I

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

**BURLA RESEARCH
CENTRE****SCIENTIFIC PERSONNEL****Principal Scientist**

Shri C.V.N. Rao

Scientist (Selection Grade)

1. Shri Anwar Ahmed Khan
2. Shri A.K. Chathopadhyay
3. Shri K.N. Kartha
4. Shri Percy Dawson
5. Shri J.K. Bandhopadhyaya

TECHNICAL PERSONNEL**Technician T - II - 3**

1. Shri Baikunta Pradhan
2. Shri Binod Kumar Pande
3. Shri Asok Kumar Panigrahi

Technician T - I - 3

1. Shri Gurudas Ram
2. Shri P.M. Pattanayak

Technician T - 2

1. Shri Radhu Pandey
2. Shri Sathrugan Kumara

Technician T - 1

1. Shri Damodar Rout
2. Shri Ashok Kumar Naik
3. Shri Rabinarayanan Sahoo.

ADMINISTRATIVE PERSONNEL

Assistant

Shri Jatindra Kumar Mishra

Sr. Clerk

Shri Udekar Pande

Jr. Clerk

Shri Laximinarayan Badi

AUXILIARY PERSONNEL

Driver

Shri Narasingh Pande

SUPPORTING PERSONNEL

Supporting Staff Grade IV

Shri Gajendra Karali

Supporting Staff Grade - III

1. Shri Laba Nag
2. Shri K.C. Mehar

Supporting Staff Grade - II

1. Shri Ratan Chand
2. Shri K.C. Nayak

3. Shri G.C. Mehar
4. Shri Sathrugan Seth
5. Shri S.C. Mehar

Supporting Staff Grade - I

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

**GOA RESEARCH
CENTRE**

SCIENTIFIC PERSONNEL

Principal Scientist

Shri G. Narayanappa

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

Jr. Clerk

Shri S.K. Dhabarde

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. Halemekar
2. Shri Gopisankar Chodankar
3. Shri Chandrakanth Kolvalkar.

**BOMBAY RESEARCH
CENTRE****SCIENTIFIC PERSONNEL****Principal Scientist**

Dr. M. Arul James

Scientist (Selection Grade)

1. Shri S.P. Damle
2. Shri Dinesh Kumar Garg
3. Shri H.K. Beri

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. Pijari

SUPPORTING PERSONNEL**Supporting Staff Grade - III**

Shri A.T. Waghmare

Supporting Staff Grade - II

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

Supporting Staff Grade - I

1. Shri Prakash B. Bait
2. Shri Vinod S. Salvi
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 - 4

Shri T. John

Technician T - 2

Smt. Tara Karupalli

Technician T - 1

Smt. N.K. Sreelekha

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.

APPENDIX - III

BUDGET/EXPENDITURE STATEMENT FOR THE YEAR 1990-91

Particulars	Rs. in lakhs					
	NON PLAN			PLAN		
	Budget Estimate	Revised Estimate	Expenditure	Budget Estimate	Revised Estimate	Expenditure
Establishment Charges	228.00	204.00	201.46	2.00	—	—
Travelling Allowances	4.50	4.50	4.31	2.00	1.80	1.00
Other Charges	40.70	51.50	45.02	46.00	53.20	39.99
Total	273.20	260.00	250.79	50.00	55.00	40.99

भूमिका

संस्थान ने कार्यकलापों की सभी क्षेत्रों में नियमित प्रगति बनायी रखी है। कुछेक उपलब्धियों का संक्षिप्त विवरण नीचे दिया गया है।

संघ राज्य लक्षद्वीप के शास्त्र और तकनॉलजी विभाग के अनुरोधानुसार पॉल व लाइन मत्स्यन के लिए निर्मित और के. मा. प्रौ. सं. द्वारा संरचित 7.6 एम के फाइबर ग्लास नाव का परीक्षणों से यह पाया गया कि नॉव समुद्र योग्य है।

लोहे की तारों के ठीक समान संयोग तारों के लिए विनिर्देशन भी विकसित किया गया।

विविध क्लोम जालों से 90% पकड़ सुनिश्चित करने के लिए 60-100 एम के जालों को विकसित किया।

जाड़े के महीनों के दौरान जलाशयों से कटला-कटला के अधिक पकड़ाव सतही क्लोम जालों से प्रभावकारी मालूम पडा।

षार्कों के लाभदायक मत्स्यन क्षेत्र बम्बई के दक्षिण-पश्चिमी भाग में पाया गया।

सियर और पोमफ्रेट मत्स्यों के लिए 20 एम छोटे जाल ट्रालों से भी अधिक सक्षम 20 एम बड़े जल स्पुटनिक ट्राल निकला है।

मसालों के समावेशन के शीतिक ओर टुकड़े किए या फीते या पूरे रूप में भंडारित मत्स्यों में स्पष्ट रूप में बिगाड दिखाई पडे।

भभका बैलियों में संसाधन करने के लिए मैकरॉल का फीता रूप अधिक उपयुक्त निकला।

षार्क के यकृत तेल से व्यावसायिक तौर पर स्वालीन निकालने की एक रीति विकसित किया गया।

पोमफ्रेट में लिपिट ऑक्सीकरण का विस्तार बड़े मत्स्यों से भी अधिक छोटे मत्स्यों में, उनके लिपिट मात्रा के लिहाज किए बिना, पाया गया।

शुद्धीकृत नमक, संसाधित मत्स्य उत्पन्नो को कवक, फफूदी और लाल लवणरागी जीवाणुओं से सुरक्षित रखने में अधिक सक्षम है।

छोटे ऐंचोवी से कम दाम और एकदम पकाने के सुविधाजनक उत्पन्नो को तैयार किया गया।

अचारित भारतीय तेल सार्डीन स्वीकार्य स्थिति के लवण-जल में, मैकरॉल, सॉल और फीता मत्स्य जिनके गोदाम जीविका केवल एक महीना है, की अपेक्षा एक वर्ष से अधिक समय तक रखा जा सकता है।

परीक्षण आहार क्रम के अलानैन/ब्रोलैन अनुपात चुहों में कॉलेस्ट्रॉल अवरोधन में बहुत अधिक प्रभावकरी दिखाई पडा।

संसाधन कारखानों में प्रयुक्त जल का 10 पी पी एम अवशिष्ट स्तर तक क्लोरिनीकरण करने से लिस्टीरिया मोनोसाइटोजीन से पूर्ण सुरक्षा मिलती है।

कृत्रिम तौर पर संदूषित मत्स्य/झींगे मांस से सालमोनेल्ला कोशिकों को संपूर्ण नाशन क्लोरिनीकृत जल से बार बार धोने से भी संभव नहीं है।

लवण में संसाधित मत्स्य में स्ट्राफिलोकोकस आरूयू के एन्टरोटोक्सोजेनिक प्रभेद जी सकते है और बढ़ भी सकते हैं, लेकिन 3 दिन के सूर्य शुष्कन से पूर्णतः विनाश हो जाती है।

मत्स्य कटलेटों को तलने के लिए एक विशेष उपकरण विकसित किया गया।

200 कि. ग्राम भार तक मोनिटर करने के लिए एक निमंज्जने भार मोनिटर विकसित किया गया।

मत्स्य/झींगे अचार केरल के उपभोग बाज़ार में व्याप्त हो गया है, केवल एक संसाधक

द्वारा बाज़ार के मुख्य हिस्सा प्रदान किया जाता है।

मच्छुवारों के निर्णय लेने की स्वभाव का अध्ययन करने पर, अध्ययन, स्वामित्व ढाँचा और कर्मीदल संख्या जैसे परिवर्तनशीलताओं के साथ सकारात्मक संबंध दिखाई पडा।

निर्यात और आंतरित बाज़ार के लिए मत्स्य और मत्स्य उत्पन्नो के पैकेजिंग पर एक ग्रीष्म कालीन संस्थान मई 1990 में चलाई गई, जिसमें विविध कृषि विश्वविद्यालय, राज्य मात्स्यकी विभाग और सरकार उपक्रमों से समर्थित उम्मेदवार भाग लिए।

एक मास्टर-प्लान, जिसमें यान निर्माण मर्मत यार्ड बनाने, मत्स्य संसाधन प्लांट और मत्स्य रोगमुक्ति और शुष्कन यार्ड आदि के विवरण समाविष्ट किया गया था, मत्स्यकी निदेशक, पांडिचेरी को दिया गया।

भारत सरकार के खाद्य उद्योग मंत्रालय के साथ एक सहयोगी कार्यक्रम के रूप में, "निम्न मूल्य मत्स्यों के उपयोग के लिए उत्पादन यूनिटों" पर एक परियोजना रिपोर्ट तैयार किया गया और मंत्रालय को भेज दिया गया है।

(निदेशक)

निदेशक

मुख्य उपलब्धियाँ

मत्स्यन तकनॉलजी डिवीज़न:

लग्गा और रज्जू मत्स्यन के लिए निर्मित 7.6 एम फाइबर गिलास नाव का समुद्रयोग्यता का परीक्षण किया और उपयुक्त पाया गया।

जाल तंतुओं के यू. वी. अल्ट्रा-वाइलेट नाशन के निघरिण के लिए परीक्षण की तरीका तैयार किया गया और राष्ट्रीय स्तर की विचार हेतु बी. आई. एस. को प्रस्तुत किया गया।

लोहे की तार रस्सियों (एस. डब्ल्यू. आर) के समान ही संयुक्त तार रस्सियों के विनिर्देशन भी तैयार किया गया और बी. आई. एस. के विचार हेतु प्रस्तुत किया गया।

विविध प्रकार के मत्स्यों के पकडाव के लिए बहुजाली क्लोमजाल प्रभावकारी दिखाई पडा, 60 से 100 एम एम जालियों से 90% पकडाव प्राप्त होते हैं।

ऐंग्रिया तट, रत्नगिरि के पश्चिम भाग (बम्बई के दक्षिण पश्चिमि भाग) अक्षांश 16° 15' उत्तर -16° 47' उत्तर और रेखांश 71° 45' पूर्व 72° 18' पूर्व पर प्रलाभी षार्क मत्स्यन स्थल, मत्स्यों के व्यावसायिक चूषण के लिए उपयुक्त है, पाया गया।

मत्स्य संसाधन डिवीजन

मुख्य उपलब्धियाँ :

मसालों को समाविष्ट करने से शीतित और पूर्ण रूप से गोदाम किए गए टुकडे और कतले किए मत्स्यों के नाशन प्रवृत्ति सुस्पष्ट रूप से मन्दित दिखाई पडता है। मैकेसेल, कतले किए गए रूप में, रिटोर्ट थेलियों में संसाधन करने के लिए अधिक उत्तम मालूम हुआ है।

प्रयोगशाला मॉडल ऑटोक्लेव का प्रयोग करके रिटोर्ट थेलियों का ताप संसाधन के लिए एक सीधा और सुधरित तरीका निकाला गया है।

भाप-दाव को नियंत्रित करके विविध प्रकार के कैटोसान का भी उत्पादन किया ।

पी. मोनोडल और पैरापिनेप्सिस सिलिफेरा से प्राप्त कैटोसान से भी उच्चतम लसीलापन गुण पीनियस इन्डिकस और पी. मोनोसियेस के ताजा खोलों से प्राप्त होता है।

15-150 सी. पी. लसीलापन के कैटोसान कैटोसान फिल्म बनाने में अधिक उपयुक्त है।

षार्क के जिगर तेल से स्क्वालीन को वियुक्त करने के लिए व्यासायिक तौर पर प्रयोग किए जाने योग्य एक लघु रीति विकसित किया गया।

4% स्तर तक सारबिटॉल की समावेशन से, शीतित बैरकुडा कीमे की जल अवरोधन और संरचना प्रवृत्तियाँ, जब - 20° सी में गोदाम किए जाए तो 40 हफ्ते तक संरक्षित रहते हैं।

कीमा किए गए मत्स्य स्टार्च और नमक आदि का प्रयोग करके तैयार किए जाने वाले मत्स्य गोलों का निर्माण तरीका मानकीकृत किया गया।

अथाह समुद्री पेच से अच्छे गुण का सूप पाउडर तैयार किया गया।

भारत के पश्चमी तट से इकट्ठे किए गए मत्स्य से प्राप्त मत्स्य कीमे की उत्पादन 23.2 से 48.4% तक परिवर्तित दिखाई पडा।

लिस्टीरिया मोनोसाइटोजेन्स प्रशीतित तापमान (5-10° सी) के जल में 50 दिन से भी अधिक दिन जीवित रह सकता है।

एल. मोनोसाइटोजेन्स से पूर्ण संरक्षण प्राप्त करने के लिए झींगे/मत्स्य संसाधन कारखानों में प्रयुक्त जल 10 पी पी एम के अवशिष्ट स्तर तक क्लोरिनीकृत किया जाना चाहिए। शुष्कित मत्स्य के उपभोक्ता पैकेजिंग के प्राणी आक्रमण के विरुद्ध एल डी/बी.ए./नाईलान/प्रिमाकोर और एच एम - एल डी पी ई पैकेजिंग अधिक प्रभावकारी दिखाई पडा।

भुने गए सफेद चारा और सफेद सार्डीन के पैकिंग के लिए उचित पैकेजिंग सामानों को चुन लिया गया।

जैव-रसायन, पोषण वा सूक्ष्मजीव विज्ञान डिवीज़न

मुख्य उपलब्धियाँ :

परीक्षण आहारक्रम में अलानाइन/प्रोलाइन अनुपात चूहों में कोलोस्ट्रॉल अवरोधन में अधिक प्रभावकारी निकला, अनुपात के वृद्धि के साथ कम होता जाता है।

मत्स्य और खारा पानी झींगों के टोक्सिक लोहे और प्राणिनाशन अवशिष्ट दोनों टोक्सिक स्तर के बहुत नीचे हैं।

ताजा जल मत्स्यों से तैयार किए गए शल्य सीक्न मौसमों के साथ तनन शक्ति में विविधता दिखाती है।

ताजा मत्स्य और झींगों से वियुक्त किए गए लिस्टीरिया जाति में एल इनोक्वा प्रमुख समूह बनता है।

सूक्ष्म जीवाणु जैसे, ई-कोली, स्टाफिलोकोकस अरयूस, प्रोद्यस एस पी पी और बासिल्लस एस.पी. पी. की उपस्थिति शीतित गोदाम के दौरान मत्स्य में टीका लगाने से सालमोनेल्ला सेटोटाईप

की जीवन के लिए विपरीत प्रभाव सा विकला है।

स्ट्राफिलोकोकस अरयूस के एन्ट्रो-टोक्सिजेनिक तन्तुएँ जीवित रह सकता है और लवणीकृत संसाधित मत्स्य में बढ़ सकता है लेकिन सूर्य शुष्कन के दौरान नष्ट हो जाता है।

कोचिन के ताज़ा मत्स्य नमूनों में क्लोसिट्रिडियम बोटूलिनम टाइप डी प्रभुत्व रखता है।

अभियांत्रिकी और यंत्रीकरण डिवीज़न

मुख्य उपलब्धियाँ:

मत्स्य कटलेटों को तलने के लिए एक विशेष उपकरण विकसित किया गया।

वर्षकाल के दौरान, सभी मौसम टाइप सूर्य शुष्कक का निष्पत्ति मानिटर किया गया और मेघावृत्त और वर्षा दिनों के दौरान उसके ताप अवशोषण क्षमता का अध्ययन किया गया। इस मौसम में भी शुष्कक ने शुष्कन प्रकोष्ठ में पर्याप्त तापमान अंकित किया।

200 कि. ग्राम. भार तक मानिटर करने के लिए एक निमज्जन जाल भार मानिटर को अभिकल्पना किया गया और विकसित किया

गया। यह उपकरण बहुत सुसंहत और सुवाह्य और बहुत कम बिजली का उपभोग करता है।

विस्तार, सूचना और सांख्यिकी डिवीज़न

मुख्य उपलब्धियाँ :

मत्स्य/झींगे अचार केरल के उपभोग बाज़ार में व्याप्त हो गया है, केवल एक संसाधक द्वारा बाज़ार के मुख्य हिस्सा प्रदान किया जाता है।

कोचिन मात्स्यकी बन्दरगाह के अप्रैल-डिसंबर 1991 से मुख्य मत्स्यों के क्लोम जाल और ट्राल जाल पकड़ की मियमितता का निरीक्षण किया गया। जनवरी-मार्च 1991 के अवधि के दौरान, इंधन कमी के कारण, पकड़ बहुत कमजोर था और फलस्वरूप मत्स्यों के दाम में वृद्धि हुई।

वैशाख और कलकत्ता में एम. डोबसोनी के उत्पादन दर पूरे से मांस तक 52% और 59% और एच एल से मांस तक 81% और 85.5% यथाक्रम आकलित किया गया।

मच्छुवारों के निर्णय लेने की स्वभाव का अध्ययन करने पर, अध्ययन, स्वामित्व ढाँचा और कर्मिदल संख्या जैसे परिवर्तनशीलताओं के साथ सकारात्मक संबंध दिखाई पडा।

वेरावल अनुसंधान केन्द्र

मुख्य उपलब्धियाँ

सिअर और पोमफ्रेट के लिए 20 एम छोटे जाल के ड्राल से अधिक प्रभावकारी निकला है, 20 एम बड़े जाल के स्मुटनिक ड्राल।

मत्स्य के लिपिड अंश के लिहाज किए बिना बड़े मत्स्यों की तुलना में छोटे पोमफ्रेटों में लिपिड ऑक्सीकरण की परिमाण ज़्यादा है।

शीतित कमरा तापमान से भी ज़्यादा गोदाम जीवन अध शुष्कित रिब्वन मत्स्य को कमरा तापमान में उपलब्ध है।

बर्फ के साथ सीधे सम्पर्क के बिना गोदाम किए गए स्विचड में बर्फ के साथ सीधे सम्पर्क में गोदाम किए गए स्विचड की अपेक्षा गुलाबी निरंगीकरण जल्द और सुस्पष्ट है। उप पकड़ाव के मत्स्यों की रखाव गुण बढ़ाने के लिए कम से कम 5-10% लवण घोल में परिचारित करना उचित है।

0.5 से 1% फोरमालिन के साथ परिचारित करने से संतोषप्रद गुण के मत्स्य मील उप पकड़ से तैयार किया जा सकता है।

8-10 घंटे तक संतृप्त लवण जल में लवणीकरण करने से उत्पाद का अच्छे गुण के

साथ दीर्घकालीन शेल्फ जीवन प्रदान करती है।

फफूँदी, कंकक, और लाल हॉलोफिलिक सूक्ष्मजीवाणु के आक्रमण के विरुद्ध संसाधित मत्स्य उत्पन्नों को शुद्धीकृत लवण अधिक सुरक्षा प्रदान करती है।

काकिनडा अनुसंधान केन्द्र

मुख्य उपलब्धियाँ :

बी ओ. बी पी उच्च खुले ड्राल से भी प्रभावकारी है सुधरित उच्च खुले ड्राल।

उभरे उदर ड्राल, जिसके कम इंधन उपभोग है, से भी अधिक पकड़ प्रत्येक यूनिट में रस्सी ड्राल लाते हैं।

इन्द्रधनुषी सार्डीन, मैकरॉल, स्क्रियानाईड और सफेद बेइटों से समुद्री उत्पन्नों तैयार किया जाता है।

छोटे अंकोवाइस से कम दाम के, बना-बनाया सुविधाजनक उत्पन्ने तैयार किये गए।

हैदराबाद बाज़ार में उपलब्ध शुष्कित मत्स्य की समग्र गुण संतोषप्रद नहीं है।

परिवेशी तापमान में गोदाम करने पर सूर्य-शुष्कित, नमकीकृत सीनस और डेकाप्टेरस का हिस्टामैन अंश कम दिखाई पजता है।

झींगों में पूर्व शीतन के दौरान, सोडियम मेटेटा बाई सल्फाइड से परिचारित करने पर गणनीय मात्रा में सल्फर डायोक्साईड का नष्ट दिखाई पड़ता है।

वर्ष में रखे मत्स्य के गोदाम जीविका, रसायन परिचरण के तुरंत बाद अति शीतन करने से बढ़ता हुआ दिखाई पड़ता है।

व्यावसायिक नमक के उपयोग की अपेक्षा नमक को गरम करने या रासायनिक वस्तुओं से परिचारित करने से परिवेशी तापमान में संसाधित, शुष्कित मत्स्यों की गोदाम जीविका बढ़ती दिखाई पड़ता है।

पाँच महीने तक - 18° सी में गोदाम करने पर शीतित मत्स्य में फेकल स्टेपटोकोक्काई के गणनीय कटौति दिखाई पड़ती है।

बुरला अनुसंधान केन्द्र

मुख्य उपलब्धियाँ :

शीत महीनों के दौरान कटला-कटला के पकड़ के लिए सतही बिछाए क्लाम जाल अधिक प्रभावकारी निकला है।

परिवेशी तापमान में छः महीने तक गोदाम जीविका के साथ वियत्रित रखने की अपेक्षा अच्छे तन्तु-विन्यास की उत्पन्न, सूर्य शुष्कन से पहले कैट मत्स्य टुकड़ों को पापाईन से, नरम करने से उपलब्ध होता है।

बर्फित मत्स्यों को तीन दिन से भी अधिक दिन के लिए भंडारित करने के लिए पौलीयूरितेन फॉम रोधन के साथ एक आधान पात्र का निर्माण किया गया।

संसाधित मत्स्य वाले उपभोक्ता थैलियों में ऑक्सिजन और आद्रता अवशोषक की उपस्थिति उत्पन्न की गुणता बढ़ाती है।

बंबई अनुसंधान केन्द्र

मुख्य उपलब्धियाँ :

"वाकडी", जो क्षेत्रीय तौर पर उपलब्ध मत्स्य है, से पूरे शरीर भाग के 40% मांस प्राप्त होता है।

1.0 कि.ग्राम के शीतित खण्डों के रूप में, मत्स्य के शीतीकरण और भंडारण स्वभाव, 35 हफ्ते तक की शेल्फ जीविका सूचित करता है और जिसके बाद इन्द्रियग्राही एवं जैवरासायनिक गुण और स्वीकार्यता भी एकदम कम हो जाता है।

कोषिकोड अनुसंधान केन्द्र

मुख्य उपलब्धियाँ :

दुढ़, बने-बनाए खाने योग्य, तले उत्पन्न सीपी मांस से, जिसके, परिवेशी तापमान में गोदाम जीविका कम से कम दो महीने है, विकसित किया गया।

होलोथूपिया टू बेचे-दी-मेर के संसाधन पर प्रारंभिक अध्ययन यह दिखाता है कि पूरे जीवित जंतू की 66% ही एच स्काब्रा संकूचन है।

अचारित भारतीय तेल सार्डीन लवण-जल में स्वीकार्य स्थिति में एक वर्ष से भी ज़्यादा दिन, जब मैकरॉल, सॉल और फीता मत्स्य की तुलना में, जिन्हें केवल एक महीने तक ही भंडारित किया जा सकता है, रख सकता है।

व्यावसायिक संसाधित मत्स्य के शुद्धीकरण, परिरक्षण उपचार और फुटकर पैकेजिंग की रीति अधिक जीवनक्षम और मूल्य योग्य दिखाता है।

शुद्धीकृत और संरक्षण परिचारित व्यावसायिक संसाधित सिल्वर बेल्ली और शार्क के उपभोक्ता स्वीकार्यता का अध्ययन, उनके गोदाम स्वीकार्यता कम से कम चार महीने तक दिखाता है।

नियंत्रित नमूने के लिए दो हफ्ते से कम समय के लिए रखे गए की अपेक्षा जब उन्नत जन्तुबाधित व्यावसायिक गोदाम में जब शुद्धीकृत और संरक्षण उपचारित सिल्वर बेल्ली गण्णी थैलियों में पिरोकोण छिड़काकर रखें तो दो महीने

तक ऊपर भाग कीट बाधा से बाधित नहीं होते। बाहरी भाग में हैडोकारपस तेल लगाए गण्णी थैलियों में मत्स्यों को पैक करने से जन्तु बाधाहीन जीविका और भी बढ़ा सकता है।

लवण जल में अचारित और चीनी-मिट्टी के बर्तनों में रखे गए मत्स्यों के साथ कुछ विभाजित काजू छिड़के डालने से या बर्तन/जार का मूँह हैडोकारपस तेल छिड़काए गए कपड़े से बाँध दें गुंजन मक्षी से संरक्षित किया जा सकता है।

गोवा अनुसंधान केन्द्र

मुख्य उपलब्धियाँ :

नियंत्रित जाल से भी अधिक पकड़ाव क्षमता प्लाटफार्म ट्राल में ही है।

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