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annual report

1998-99

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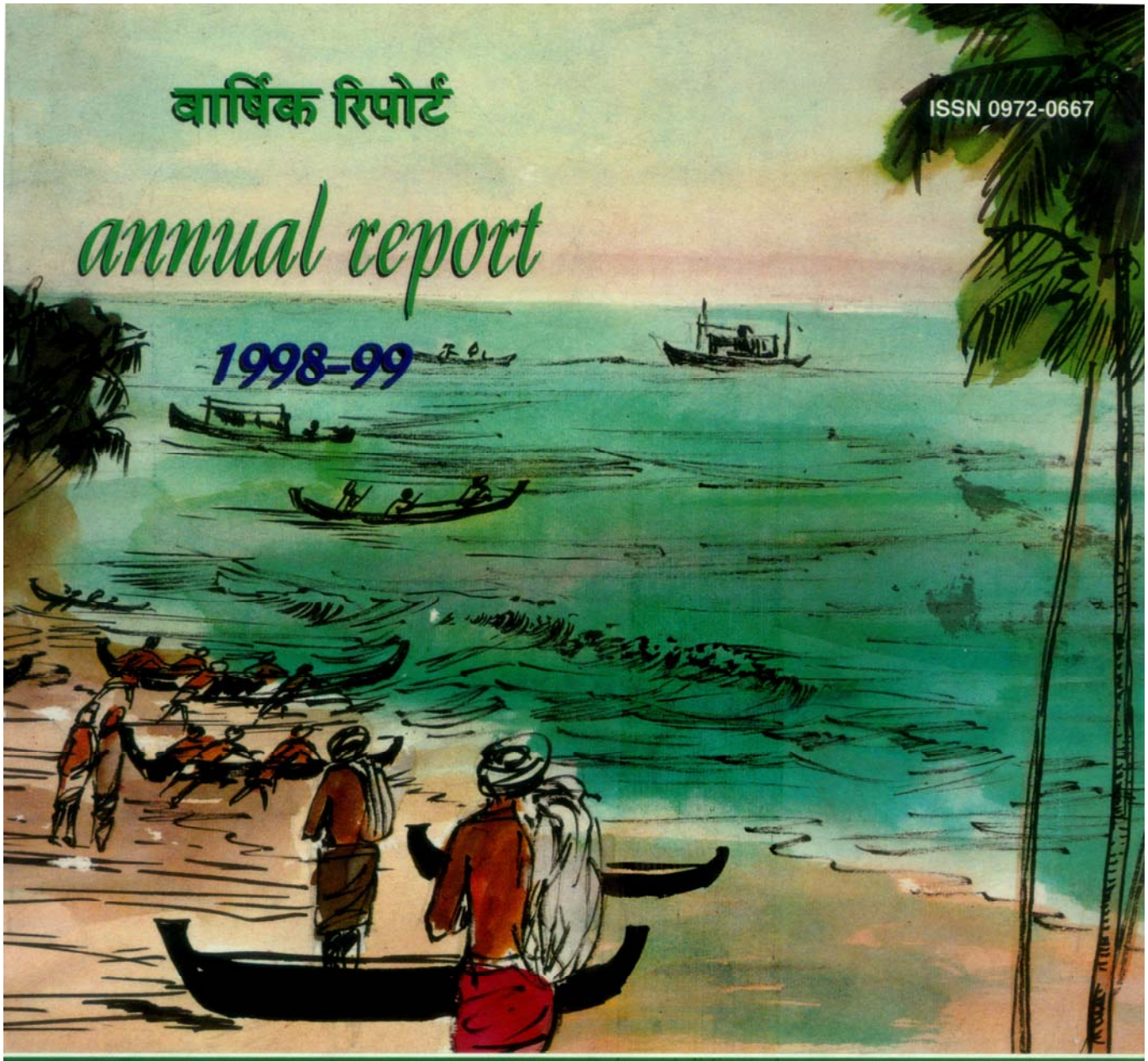

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CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

annual report

1998-99

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

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contents

Preface

Equipping the fishing and fish processing industry to catch up with sustainability and international trade requirements is a major challenge the country is facing today. The Central Institute of Fisheries Technology has taken up these challenges and accordingly the R & D activities of the Institute are reoriented towards suggesting responsible fishing methods and assuring total quality in fish capture and utilisation.

Design and construction of a 15.5 m fuel-efficient steel fishing vessel suitable for commercial fishing and development of resource-specific and fuel efficient trawls are an important milestone achieved by the Institute in fishing technology research. Research in biochemistry and nutrition could throw more light on cholesterol lowering property of fish oils and also could prove the usefulness of cross linked and chromicised collagen-chitosan membrane which has received wide acclaim from dental and plastic surgeons as a potential and badly needed product in the market. The Institute could also standardise the method of production of ready-to-serve fish curry in retortable pouches which is under test marketing.

Two new state-of-the-art laboratories were added to the already impressive research facilities of the Institute this year, the Quality Assurance and Management laboratory and Microbiology, Fermentation and Biotechnology laboratory. These were formally inaugurated by Dr. R.S. Paroda, Director General, ICAR on 8 December, 1998. These facilities help the Institute to support the industry through training in concepts of HACCP and in-plant sanitation, technology transfer, analytical services, consultancy and upgradation of seafood industry for ensuring implementation of international standards in quality control.

A national symposium on Advances and Priorities in Fisheries Technology was jointly organised by the Society of Fisheries Technologists (India) and CIFT during 11-13 February 1998 as part of the Golden Jubilee celebrations of India's independence. About 250 delegates from India and abroad participated in the symposium.

I have great pleasure in placing before you the Annual Report 1998-99 of the Central Institute of Fisheries Technology containing the reports on R & D and extension programmes and administrative ac-tivities during the period.

(Dr. K. Ravindran)
Director

EXECUTIVE SUMMARY

The Institute maintained steady progress in the various R&D activities as briefly mentioned below:

A cod end of mesh size 25 mm and above has been shown to be effective for better conservation and management of inshore fishery resources.

Large size groups of prawns (except *Parapenaeopsis stylifera*) were seen more in nets with square mesh cod ends than in nets with diamond mesh cod end.

Gill nets of high tenacity monofilament of 30 mm mesh bar size showed better catch than other mesh sizes.

A combination of water borne copper-chrome-arsenic (CCA) and oil borne creosote preservative showed maximum resistance to biodeterioration in rubber wood (*Hevea brasiliensis*) under atmospheric, soil and marine conditions

Regular monitoring of water and soil parameters of aquaculture ponds and their effluent discharge sites have revealed that the present culture practices at Cochin do not pose a threat to a pollution free environment.

Method was developed for canning farmed shrimp in curry medium.

Methods were standardised to prevent fungal attack in dried products and for ready-to-eat mackerel in curry packed in retortable pouch.

A water stable vitamin C preparation was made incorporating chitosan.

Sodium tripolyphosphate was shown to exhibit antioxidant properties controlling rancidity in cured fish to some extent.

Shelf life of green chilli could be significantly increased by packing in chitosan coated paper bags.

A fish feed with soya flour as the main protein source was formulated.

Method was developed for recovery of wastes during production of chitin from crustacean shell.

Collagen-chitosan membranes were found useful in covering wounds and burns for preventing fluid and blood loss. The cross-linked and chromicised membranes were also found useful in treatment of infra bony and supra bony periodontal defects in dentistry.

Proteins of fresh water fishes and shellfishes in general were found rich in glycine but poor in tryptophan.

Shellfishes collected from different areas along Kerala coast were seen to be free of paralytic shellfish poison (PSP).

Toxic levels of free ammonia was found to be the chief cause of mass fish kill in the Chitrapuzha river of Ernakulam District.

Samples of fresh finfish, shellfish and frozen fishery products collected from local landing centres and factories were found free of the enteric pathogen Shigella and staphylococcal enterotoxins.

Fish processing factories in Kerala were found to utilise only twenty eight per cent of their installed capacity, non-availability of raw material being the main reason for the under-utilisation.

The hull construction of the 15.5 m fuel efficient steel fishing vessel was completed and propulsion system installed.

A net height meter for measuring vertical opening of trawls nets was developed.

INTRODUCTION

BACKGROUND

The Central Institute of Fisheries Technology, named at the time of its inception as Central Fisheries Technological Research Station was set up in 1954 following the recommendations of a high power committee constituted by the Ministry of Food and Agriculture, Government of India. It started functioning at Cochin in 1957 under the Department of Agriculture of the then Ministry of Food and Agriculture with a small nucleus of staff for research work in fishing craft and gear. 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 1 October, 1967.

The Institute is the only national centre in the country where research in all disciplines relating to fishing and fish processing is undertaken. Research Centres function at Veraval (Gujarat), Visakhapatnam (Andhra Pradesh), Burla (Orissa), Mumbai (Maharashtra), Calicut (Kerala) and Hoshangabad (Madhya Pradesh).

MANDATE

The Institute functions with the following mandate:

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

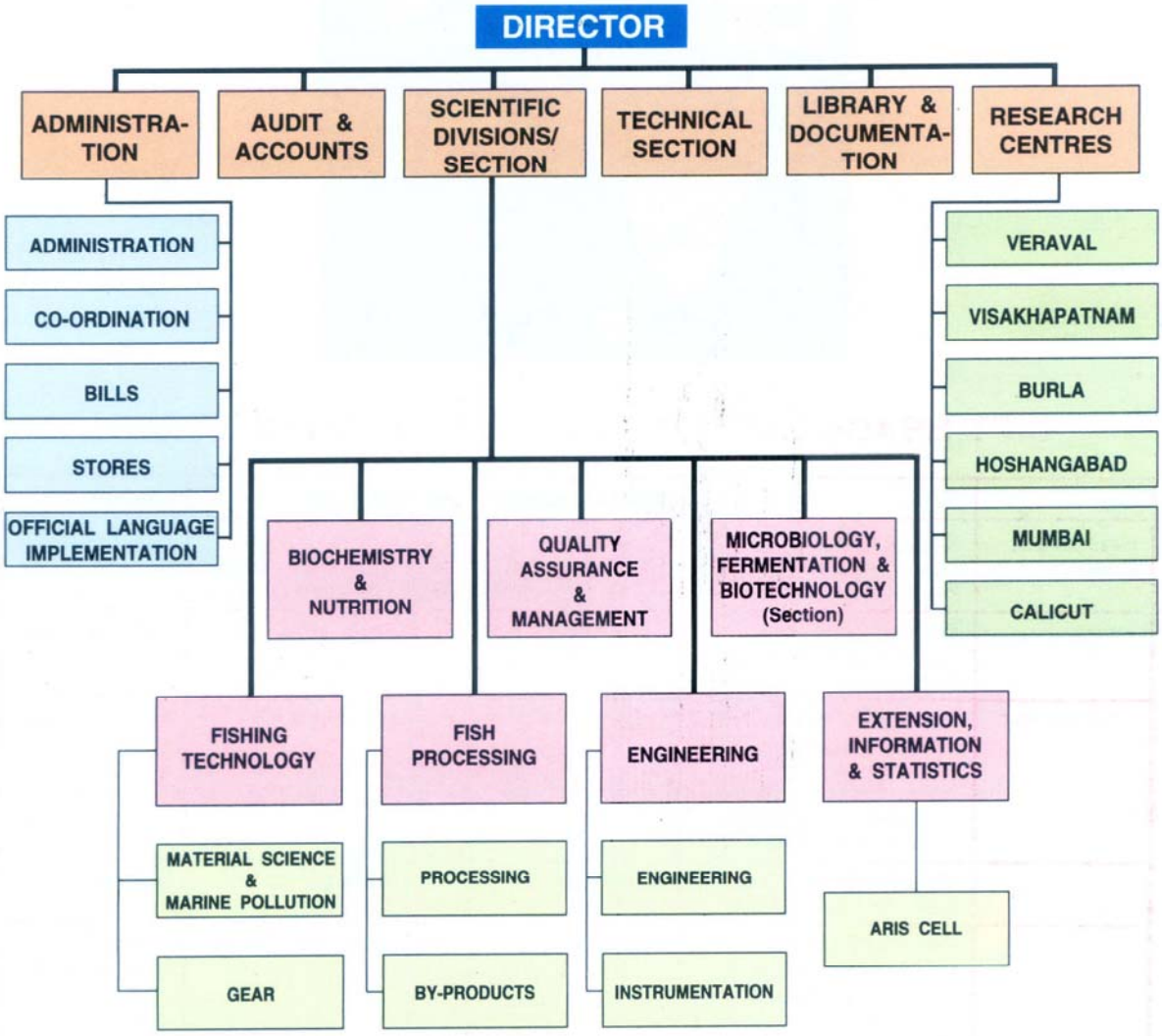
ORGANISATION AND STRUCTURE

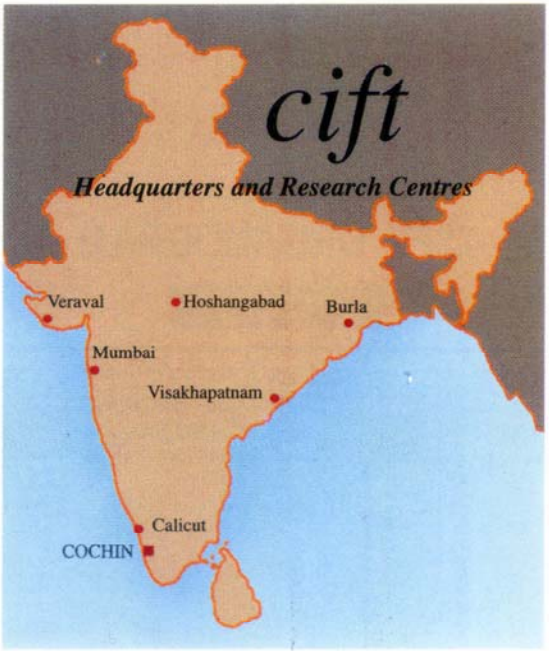
The Institute is headed by a Director with whom all administrative and financial powers regarding research and management of the Institute are vested. He is assisted by a Senior Administrative Officer, Administrative Officer and three Asst. Administrative Officers for dealing with matters relating to general administration and two Assistant Finance and Account Officers for looking after the financial accounting aspects as also internal audit of the Institute. One Senior Scientist attends to the technical matters including those connected with research projects handled by the Institute.

The research work at the Institute is carried out by the following Research Divisions/ Section.

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

CIFT ORGANOGRAM





CIFT HEADQUARTERS AND RESEARCH CENTRES

Place	Address	Telephone Number	Fax/Telex/E-mail	Telegram
Headquarters, **Cochin**	Matsyapuri P.O. Cochin - 682 029 KERALA	0484 - 666845 (14 lines)	Fax : 091-484-668212 Telex : 0885-6440 CIFT IN E-mail : root@cift.ker.nic.in	Matsyaoudyogiki/ Fishtech
Veraval	Research Centre of CIFT Matsya Bhavan, Bhidia plot Veraval - 362 269, GUJARAT	02876- 20297	Fax : 02876-41576	Matsyaoudyogiki
Visakhapatnam	Research Centre of CIFT Ocean View Layout Pandurangapuram Andhra University P.O. Visakhapatnam- 530 003 ANDHRA PRADESH	0891-567040	Fax: 0891-567040	Matsyaoudyogiki
Burla	Research Centre of CIFT Burla - 768 017, ORISSA	0663-430419	Telex : 0634-211 CIFT IN	Matsyaoudyogiki
Mumbai	Research Centre of CIFT CIDCO Administrative Bldg. (Ground Floor) Sector I, Vashi Mumbai - 400 703 MAHARASHTRA	022-7826017	Telex : 0131-1221 CIFT IN	Fishtech/ Fishprocess (FT)
Calicut	Research Centre of CIFT Beach Road, West Hill Calicut - 673 005, KERALA	0495-50627	Nil	Matsyaoudyogiki
Hoshangabad	Research Centre of CIFT Kothi Bazar Hoshangabad - 461 001 MADHYA PRADESH	Nil	Nil	Fishtech/ Matsyaoudyogiki

A QUICK GLANCE AT PAST ACHIEVEMENTS

Maximum utilization of the marine and inland resources has been one of the main aims of the activities of the Institute. One important step taken in this direction is the surveys conducted by the Institute on-board the DOD owned research vessel *Sagar Sampada for* exploring both demersal and semi-pelagic fishery resources. So far, the entire area from the North-West to North-East coast has been covered. Ten specialized nets, to name a few, high speed demersal trawl, hybrid trawl, high opening trawl and semi-pelagic trawl, have been designed to replace the imported nets presently being operated from this vessel. A large number of designs of various types of gear such as gill nets, purse seines, lines and traps have also been developed for exploitation of the fishery resources. Development of a combination wire rope for deep sea fishing, which is an import substitution, is another notable achievement of the Institute.

Designs of mechanised wooden fishing vessels in the size range 7.67 - 15.25m OAL have been developed. The CIFT has also embarked upon designing large resource - specific vessels of 20m OAL and above, in order to meet the ever increasing demand for exploiting the deep sea waters of the country. Painting schedules and methods have been developed for protection of the crafts. Designs of fuel efficient vessels have also been developed and commercially adopted.

The Institute has also developed a number of electronic equipments for commercial fisheries, research as well as environmental studies. Some of them are trawl depth meter, solar processing monitor, environmental data acquisition system, freezer temperature monitor, warp load meter and salinity temperature meter.

Chlorination of water is normally practised to reduce bacterial contamination for which sodium chlorite is used. CIFT has developed a chlorine level indicator paper called 'cloritest' for instant reading of chlorine level. Other products developed for the fish processing industry are antiseptic ointment for use by prawn handlers and deodorant for masking the foul odour emanating from processing plants.

To meet the new demands for products and processing techniques, emphasis was shifted from block freezing of fish

and shellfish to development of individual quick frozen products like battered and breaded products, including fish fingers, fish cutlet and fish sticks. A number of packagings for various types of fish products as well as technologies for transportation of live fish and shellfish have also been developed at the Institute.

The important value-added products developed by CIFT which are in demand at present within the country and abroad are fish wafers, fish soup powder, fish pickles and hygienically dried fish. Shark fins and fin rays are very costly commodities, process for extraction of which has been developed at the Institute. Another value added product developed is fish curry processed in flexible pouches which can remain at room temperature without any change for over a year. Other sophisticated items developed are masmin prepared after smoking having high demand in internal and external markets and squalene obtained from oils of certain species of sharks. Process has also been developed and commercialised for processing shark cartilage.

Suitable media for culture of different types of bacteria and methods for their enumeration and isolation have been developed.

Surgical sutures are presently imported involving considerable expenditure for the country. The CIFT has successfully developed pharmacological products from fish waste, a noteworthy one being absorbable surgical sutures from fish gut collagen. Field trials with the product have been very encouraging. Two other important products from fish waste developed by the Institute are chitin and chitosan which have been adopted both in the national and international levels. Six national agencies and three international agencies have so far adopted this technology.

Transfer of technology through technical consultancy programmes is a major activity of the Institute. Many entrepreneurs have benefited by the services rendered by the Institute leading to establishment of a number of processing units for fish waste utilization and improvement in fish catch. Outreach programmes targeting the weaker sections of the community and rural women such as conduct of training courses and field level extension programmes have also been organised.

STAFF POSITION AS ON 31 DECEMBER, 1998

DIRECTOR

HEADQUARTERS - COCHIN

Scientific

Head of Division / Section	5
Principal Scientist	12
Senior Scientist	40
Scientist (Senior Scale)	8
Scientist	8

Technical

T-8 (Technical Officer)	2
T-7(Technical Officer)	2
T-6(Technical Officer)	5
T-5(Technical Officer)	14
T-4	5
T-II-3	32
T-I-3	18
T-2	12
T-1	29

Administrative

Sr. Admn. Officer	1
Administrative Officer	1
Asst. Admn. Officer	3
Asst. Fin. and Accts. Officer	2
Asst. Director (O.L.)	1
Senior Personal Assistant	1
Superintendent	2
Assistant	22
Stenographer	8
Junior Stenographer	2
Senior Clerk	22
Lower Division Clerk	13
Sr. Gestetner Operator	1

Auxiliary 4

Administrative Non-Ministerial 1

Supporting

Supporting Staff Gr. IV	6
Supporting Staff Gr. III	13
Supporting Staff Gr. II	16
Supporting Staff Gr. I	8

VERAVAL RESEARCH CENTRE

Scientific

Principal Scientist	1
Senior Scientist	1
Scientist	6

Technical

T-5 (Technical Officer)	3
T-II-3	1
T-I-3	3
T-2	1
T-1	2

Administrative

Asst. Admn. Officer	1
Assistant	1
Senior Clerk	2
Lower Division Clerk	1

Auxiliary 2

Supporting

Supporting Staff Gr. IV	1
Supporting Staff Gr. II	7
Supporting Staff Gr. I	8

VISAKHAPATNAM RESEARCH CENTRE

Scientific

Senior Scientist	4
Scientist (Sr Scale)	1
Scientist	2

Technical

T-5 (Technical Officer)	2
T-4	2
T-II-3	3
T-I-3	8
T-2	1
T-1	1

Administrative

Assistant	1
Stenographer	1
Senior Clerk	3

Supporting

Supporting Staff Gr. IV	2
Supporting Staff Gr.III	5
Supporting Staff Gr.II	7

BURLA RESEARCH CENTRE

Scientific

Senior Scientist	3

Technical

T-5 (Technical Officer)	1
T-4	2
T-II-3	1
T-I-3	4
T-2	1
T-1	1

Administrative

Assistant	1
Senior Clerk	1
Lower Division Clerk	1

Supporting

Supporting Staff Gr. IV	3
Supporting Staff Gr. III	3
Supporting Staff Gr. II	6
Supporting Staff Gr. I	5

HOSHANGABAD RESEARCH CENTRE

Scientific

Scientist	1

Technical

T-6 (Technical Officer)	1

Administrative

Senior Clerk	1

Supporting

Supporting Staff Gr. IV	1

MUMBAI RESEARCH CENTRE

Scientific

Senior Scientist	2

Technical	
T-4	2
T-1	1
Administrative	
Assistant	2
Lower Division Clerk	1
Supporting	
Supporting Staff Gr. III	1
Supporting Staff Gr. II	4
Supporting Staff Gr.I	1

CALICUT RESEARCH CENTRE

Scientific	
Senior Scientist	1
Scientist	1
Technical	
T-II-3	2
T-I-3	1
T-1	2
Administrative	
Assistant	1
Senior Clerk	1
Supporting	
Supporting Staff Gr. II	1
Supporting Staff Gr.I	2

Budget Expenditure Statement for the year 1998-99

(Rs. in lakhs)

Sl. No.	Particulars	Non-plan			Plan		
		B.E.	R.E.	Exp.	B.E.	R.E.	Exp.
1.	Estt. Charges	510.70	672.00	672.11	2.00	2.00	1.05
2.	T.A.	7.00	7.00	7.00	5.00	5.00	5.00
3.	Other charges	15.60	40.00	40.00	432.00	168.00	168.00
4.	a) Works (Original)	—	—	—	75.00	37.00	31.54
	b) Special Repairs	—	—	—	25.00	3.00	2.66
	Total	**533.30**	**719.00**	**719.11**	**539.00**	**215.00**	**208.25**

RESEARCH ACCOMPLISHMENTS

HEADQUARTERS, COCHIN

Research projects handled

1. Title of Project	:	**Development of ecofriendly demersal trawls and resource specific trawls for demersal fishing**
Project leader	:	Shri K.K. Kunjipalu
Location of project	:	Cochin, Visakhapatnam and Veraval
Associates at Cochin	:	Dr B. Meenakumari, Shri T. Joseph Mathai and Shri R.S. Manoharadoss
2. Title of Project	:	**Management measures in trawling with reference to conservation and reduction of by-catch**
Project leader	:	Shri N. Subramonia Pillai
Location of project	:	Cochin and Visakhapatnam
Associates at Cochin	:	Dr M.D. Varghese, Shri T. Joseph Mathai and Shri S.V.S. Rama Rao
3. Title of Project	:	**Fishing techniques for migratory fishes**
Project leader	:	Shri P. George Mathai
Location of project	:	Cochin
Associates	:	Shri V. Vijayan, Shri N. Subramonia Pillai and Shri Percy Dawson
4. Title of Project	:	**Development of resource specific trawl gear system and assessment of commercial trawling practices**
Project leader	:	Shri V. Vijayan
Location of project		Cochin, Veraval and Visakhapatnam
Associates at Cochin	:	Shri P. George Mathai, Dr M.D. Varghese, Shri Percy Dawson, Shri R.S. Manoharadoss and Shri K. Ramakrishnan
5. Title of Project	:	**Selectivity of trawl nets with respect to commercially important species of fin fish and shellfish caught off Cochin, South-West Coast of India**
Project leader	:	Dr M.D. Varghese
Location of project	:	Cochin
Associates	:	Shri R.S. Manoharadoss and Dr A.K. Kesavan Nair

6. Title of Project	:	**Studies on the material conservation, environmental quality, ecosystem and the sustainable use of coastal zone of India**
Project leader	:	Dr A.G. Gopalakrishna Pillai
Location of project	:	Cochin and Veraval
Associates at Cochin	:	Dr B. Meenakumari, Dr Leela Edwin and Shri P. Muhamed Ashraf

★ Chief findings

- ★ Studies conducted on rubber wood (*Hevea brasiliensis)* using different preservatives showed that a combination of water borne copper-chrome-arsenic (CCA) and oil borne creosote preservative showed maximum resistance to bio-deterioration under atmospheric, soil and marine conditions.
- ★ Series 5000 of aluminium alloys were free from pitting and crevice corrosion after a period of 180 days of exposure in harbour waters.
- ★ Regular monitoring of water and soil parameters of aquaculture ponds and their effluent discharge site showed that the present prawn and fish culture practices at Cochin do not cause pollution to the environment.
- ★ Cod end mesh size studies in demersal trawls showed that 80% of all juvenile fishes escaped from 30mm and 25mm square mesh cod ends, suggesting a cod end mesh size of 25mm and above for demersal trawls for better conservation and management of inshore fishery resources.
- ★ Larger size groups of prawns except *Parapenaeopsis stylifera* were seen more in nets with square mesh cod ends than in nets with diamond mesh cod ends.
- ★ Semi-baloon trawls (22m and 33m) developed for prawn fishing was found efficient and suitable for catching prawns.
- ★ Large mesh demersal trawls (40m and 32m) and high opening trawls were found efficient for exploiting quality fin fishes and cephalopods.
- ★ Assessment of quantity and composition of by-catch showed that the by-catch accounted for 70 to 90 per cent with about 30 per cent comprising juveniles and young ones.
- ★ Escapement of catch from stake nets with 12mm mesh cod end was practically nil indicating that the commercially used 10mm mesh size can further be increased.

Report of work done

Fishing craft

Data on the corrosion rate of steel, yellow brass, copper and aluminium were collected for a period of one year after periodic surface immersion of the panels at the oil tanker jetty and their retrieval. The test results of the panels after a period of 378 days were as follows:

Rate of corrosion of copper	:	0.031 microns / year
Rate of corrosion of aluminium	:	0.011 microns / year
Rate of corrosion of brass	:	0.058 microns / year
Rate of corrosion of steel	:	Completely pitted

The growth of foulers on the aluminium and steel panels was above average. This was because of the high salinity of the backwaters during the period after the monsoon season. Other panels were free from fouling. The maximum salinity recorded during the period was 30.9%. The dissolved oxygen ranged from 3.2 to 6.8 ml/l. Other rate factors were normal during this period.

Data were also collected for the same period for panels immersed in the vertical position. Moderate fouling was noted on all aluminium and steel panels which were non toxic to fouling organisms. Brass and copper panels were free from corrosion.

A study was undertaken with a view to assessing the changes in the pattern of settlement of fouling organisms in the Cochin backwaters due to anthropogenic activities during the past ten years. Glass panels immersed at the jetty of the Integrated Fisheries Project were retrieved at monthly intervals to study the community structure. Biomass (wet weight) was also noted for different months.

The monitoring of pollution inside the modified extensive type of aquaculture systems and their effluent discharge sites showed that the hydrographic parameters, soil characteristics, nutrient profile and the benthic population were not adversely affected by the culture practices followed at present. Eutrophication studies of eleven aquaculture ponds in and around Cochin and analysis of soil samples indicated that loosely bound P was negligible (0-0.02ppm) in all the soil samples. The Al bound P, Fe bound P, Ca bound P, inorganic P and total P concentration are 31-68, 16-159, 38-428, 339-633 and 363-705 ppm respectively.

Pollution due to plastic litter along some of the beaches of Kerala showed that maximum pollution was due to polystyrene foam and HDPE.

Studies were undertaken on copper chrome arsenic (CCA) treatment on *Salmalia malabaricum* used for catamaran construction. Results showed that pressure impregnation as well as immersion for about 20 days in 7.5% CCA solution brought about complete penetration with an average retention of 4 kg/ m^3

Fishing gear

31.6m shrimp trawl and 34.0m large mesh high opening trawl were fabricated. Cod ends of mesh size 40, 50, 70, 90 and 110mm (square and diamond mesh) were prepared and provided with covers.

Field observations were continued with trawls fitted with 20, 30 and 40mm mesh size cod ends. The various species obtained in the cod ends and their covers were identified and the total length of important fishes recorded.

Studies on the percentage of escapement and retention in nets with square and diamond mesh cod ends have shown that 20mm square mesh retained more *P. stylifera* than diamond

mesh. In 30mm, the percentage of escapement was more for *P. stylifera* and *M. affinis*. The percentage of retention of *J. dussumieri* was more in diamond mesh. In 40mm cod end, better escapement was observed for *Caranx* sp. from diamond mesh.

Selection ogives were drawn in respect of *M. affinis, P. stylifera* and *Leiognathus* sp. The L_{50} selection length was more for *M. affinis* and less for *Leiognathus* sp. in 30mm square mesh. In the case of *P. stylifera* also, the selection length was more in 30mm diamond mesh.

Four ecofriendly demersal trawls and resource specific trawls were designed and developed for demersal fishing, viz. 22m balloon trawl for shrimp, 33m balloon trawl for shrimp, 32m demersal trawl for fish and 33m balloon trawl for fish.

Field trials were conducted with the 22m balloon trawl in combination with 'V' form steel otter boards and 20m double bridles.

Design and fabrication of a 33.7m mega mesh trawl and a 18.0m large mesh trawl were completed. Design was also prepared of a 1500 x 890mm 'V' shaped otter board.

Field trials were continued with 23.0m long base jib RMT 6E and 18.0m RMT 8P semi-pelagic trawls in combination with 1350 x 1000mm high aspect ratio suberkrub otter boards and 20m double bridles.

Four types of by-catch reduction devices (BRD) were developed – viz. 1) square mesh window, 2) radial escapement device, 3) fish eye and, 4) grid attachment with escape opening. Two numbers each of oval shaped and spherical grids and a fish eye escapement device were fabricated for experimental purposes. Field trials with the different types showed a reduction of by-catch varying from 10-30 per cent without reduction in shrimp catches. Preliminary trials were carried out with the radial escapement device with a 80.0mm square mesh panel attachment. 32.0m shrimp trawls with and without the BRD atttachment were operated for evaluation. Further studies are in progress. A turtle excluder device (TED) was also fabricated for carrying out field trials.

By-catch reduction device showing the escaped catch through the device

The data collected from stake nets operated with 12, 14 and 16mm mesh cod ends and 10mm mesh cover were analysed statistically. The length frequency distribution tables of *M. dobsoni* sampled from the catches retained in the inner cod end which subsequently escaped into the cover were prepared separately for the 12, 14 and 16mm mesh sizes.

Analysis of catch composition of commercial landings showed *Nemipterus* sp., *Sepia* sp., *Saurida tumbil, Pampus argenteus* and *Trichiurus* sp. in the order of abundance. In the case of prawns, *P. stylifera, M. dobsoni* and *M. affinis* were dominant during April – June.

Research projects handled

1. Title of Project	:	**Processing and product development from cultured and deep sea fish and shellfish**
Project leader	:	Dr Jose Joseph
Location of project	:	Cochin
Associates	:	Shri V. Muraleedharan, Shri A.C. Joseph, Shri T.S. Unnikrishnan Nair, Shri K.K. Balachandran, Shri P.K. Vijayan, Shri K.P. Antony and Dr T.S. Gopalakrishna Iyer
2. Title of Project	:	**Development of viable technologies for the utilisation of crustacean wastes, fishery by-products and sea weeds**
Project leader	:	Dr K.G. Ramachandran Nair
Location of project	:	Cochin
Associates	:	Shri P. Madhavan, Dr Chinnamma George, Dr P.T. Mathew, Dr T.K. Thankappan and Ms R. Thankamma
3. Title of Project	:	**Development of environmental friendly feed for *M. rosenbergii*, ornamental fishes, cat fishes (*Clarias garipenase* and *C. batricus*), *Lates calcarifer*, *Lutjanus argentimaculatus* and other important fishes**
Project leader	:	Dr P.T. Mathew
Location of project	:	Cochin
Associates	:	Dr K.G. Ramachandran Nair, Dr Jose Stephen and Dr Suseela Jose*
4. Title of Project	:	**Appropriate packaging for fish and fish products**
Project leader	:	Dr T.K. Srinivasa Gopal
Location of project	:	Cochin
Associates	:	Shri K.K. Balachandran, Shri P. Madhavan, Shri P.K. Vijayan, Dr C.N. Ravi Shankar, Shri P.R. Nair, Shri A.C. Joseph, Shri A.V. Shenoy, Shri V.N. Nambiar, Shri T.S. Unnikrishnan Nair and Dr P.T. Mathew

** Associate Professor, College of Fisheries, Panangad*

★ Chief findings

- ★ The frozen storage shelf life (-20°C) of farmed *Penaeus monodon* reduced with increased storage in ice.
- ★ The batter composition and coating method for the preparation of coated products in different forms and styles from cultured *Penaeus monodon* was standardised.
- ★ Developed a method for canning farmed shrimps in curry medium.
- ★ Developed a method to improve the texture of canned cultured fresh water fishes.
- ★ Prepared myofibrillar protein concentrate in powder form from black meat of tuna.
- ★ Methods were standardised to prevent fungal attack in dried products.
- ★ Chitin was deacetylated under controlled conditions to get chitosan of very low viscosity having application in cosmetic industry.
- ★ Chitosan can be successfully used for removing the toxic heavy metals, namely Pb and Cd from water as well as for removal of α BHC giving high purity water.
- ★ A water stable vitamin C preparation was made incorporating chitosan.
- ★ Curry preparations having crab taste were formulated by incorporating 10% protein extract from crab shell.
- ★ Noodles made by incorporation of surimi from red snapper retained its prime quality even after two months of storage at ambient temperature. It had a rehydration property 110% which was more than that of the commercial popular brands.
- ★ Shelf life of green chilly could be significantly increased by packing in chitosan coated paper bags.
- ★ Methodology was developed for recovery of wastes during the production of chitin from crustacean shell.
- ★ Protein was recovered from shrimp shell by enzymic hydrolysis which can be used as protein supplement and food flavour.
- ★ A feed containing 30% protein with soya flour as the main protein source was formulated.
- ★ Process was standardised for ready-to-eat mackerel in curry packed in retortable pouches.
- ★ Dried barracuda packed in 12 m plain polyester laminated with 150 gauge LDPE under vacuum had a shelf life of 200 days, whereas control samples packed in air remained in good condition only for 35 days. Similarly, frozen PD tiger shrimps in similar packs had shelf lives of 330 days and 150 days respectively and frozen seer fish, 12 months and 10 months respectively.
- ★ Seer fish fried and mixed with spices and packed in pouches made of 12m plain polyester laminated with 118 LD-HD co-extruded film under vacuum had a shelf life of one month at room temperature. Air packed samples were rejected after one week.

Report of work done

Fish processing

Studies were carried out on the frozen storage characteristics and shelf life of farmed *Penaeus monodon* frozen after storing in ice for 1, 4 and 7 days and packed individually and as block and stored at -20°C. All the IQF samples showed dehydration after storage for 3 months and the dehydration increased on further storage. The dehydration was least in one day iced samples and proportionately increased depending on the iced storage period. The pink colouration on cooking was more in 7-days iced and frozen stored samples than in the other two. Iced storage was found to affect the juiciness and tenderness of the samples. Seaweed odour was more pronounced in the one-day iced samples and was least in 7-days iced and frozen samples. Block frozen samples were acceptable organoleptically and chemically for 18 months at -20°C.

Battered and breaded products were prepared using farmed *P. monodon* in cooked, peeled and deveined and cooked round tail-on forms. The batter composition to get good adhesion and improvement in flavour was standardised. The battered and breaded prawns remained in acceptable condition for 15 months at -20°C.

A curry medium suitable for canning farmed *P. monodon,* retaining most of the flavour characteristics was developed. Canning was however found to affect the texture. The studies are being continued.

Studies were conducted on heat processing of curry from farmed *Labeo rohita*. Without pre-processing the canned curry samples were found to be soft with a sticky consistency. The texture was found to improve on partial drying or light frying.

A functional fish protein powder was prepared from the black meat of *Euthynnus affinis*. The minced black meat was washed in cold water three times and a dispersion of the resultant myofibrillar protein was carried out in acetic acid. The suspension on spray drying yielded a cream coloured powder. Myofibrillar protein dispersions could be stored at -20°C for 12 weeks whereas dispersions treated with cryoprotectants like poly-phosphate and sorbitol reduced denaturation and increased shelf life.

Dehydrated surimi from tuna after one month's storage at ambient temperature

The characteristics such as water holding capacity, protein binding property, gelling, elasticity and compressibility of myofibrillar proteins obtained from farmed rohu were studied. This was dispersed in water to different dilutions to study the changes in viscosity, water retention and thermal stability. Dilution increased the sensory qualities but reduced protein stability and water retention.

The effect of dipping cured samples of tuna in 1% calcium propionate solution and drying and also dusting calcium propionate on the cured and dried samples was studied with reference to fungal growth. Both samples stored well for 6 weeks without any fungal growth. The effect of moisture level on cured barracuda was also studied. The samples with moisture content of 47-50 per cent were affected by fungus in 20-25 days.

Fish products and by-products

In order to prepare solutions of higher concentrations of chitosan for application in cosmetics and textiles, very low viscosity chitosan is required. By adjusting the conditions of deacetylation, chitosan of viscosity below 5 cp (1 per cent solution in 1 per cent acetic acid) with molecular weight 3.35×10^4 Daltons could be produced.

Presence of toxic heavy metals such as cadmium and lead, even in micro quantities, in water, is detrimental to health. When chitosan was added to water containing cadmium and lead salts they were completely removed by chitosan. From an initial concentration of 30 ppm, lead was completely removed whereas in the case of cadmium, from 10 ppm only 99.7 per cent was absorbed. Further studies are in progress to standardise the conditions for treatment of water to ensure complete removal of these toxic metal ions.

Even traces of pesticides are not permitted in potable water and water used for processing of food and pharmaceuticals. Studies showed that from an initial concentration of 1 ppm, complete removal of α BHC with chitosan is possible. Detailed studies are under way to develop procedures for application in commercial operation.

Studies were continued on incorporation of different concentrations of chitosan, such as 0.5 per cent, 1.0 per cent, 1.5 per cent and 2 per cent in the experimental standard diets of albino rats. In the case of rats fed on diet containing 2 per cent chitosan, there was significant decrease in the growth rate as well as fat content in serum and internal organs. Serum cholesterol was also significantly decreased in the case of animals fed on diet containing 2 per cent chitosan compared to the control group.

Vitamin C was mixed with moistened chitosan and vacuum dried. The product on keeping in water released only 25 per cent Vitamin C within 30 minutes and 50 per cent within 3 hours. This product can be used in formulation of fish and shrimp feeds.

Protein from crab shell was extracted with dilute alkali and precipitated by neutralisation. The product was spray dried to get an almost white powder having pleasant odour and taste of crab. When different concentrations were used in curry preparations, a formula containing 10 per cent crab shell protein extract gave very good taste of crab and was highly acceptable.

Surimi from red snapper was mixed with flour and extruded through the baby extruder. By providing heating facility in the extruder, the required cooking was accomplished. The product had very good texture and flavour and better rehydration property (110 per cent) compared to the popular commercial brands. It retained the original characteristics and remained bacteriologically safe for more than two months at ambient temperature when packed in polythene bags.

Fresh green chilli was packed in paper bags coated with 0.5 per cent, 1 per cent, 1.5 per cent and 2 per cent concentration chitosan solution and stored in the refrigerator along with samples packed in plain paper bags. Chilli packed in plain paper bags not only began to deteriorate even from the second day, but also

Chillies packed in plain paper bag and in 2 per cent chitosan coated paper bag

lost colour and appearance after one week. Chilli stored in 2 per cent chitosan coated paper bags retained colour without loss of appearance for more than 4 weeks. Moisture loss was also marginal.

In the production of chitin from prawn shell, the maximum recovery of chitin is less than 15 per cent. The acid solubles and alkali solubles were mixed and neutralised and allowed to settle. The supernatent liquid was allowed to drain and the residual slurry mixed with rice bran and dried. A product having 25 per cent protein along with considerable quantity of calcium was obtained by the process. Further studies are required to establish its suitability in animal feeds.

The normal procedure adopted for deproteinisation of prawn shell is by alkaline hydrolysis. For recovery of the protein, the alkali extract has to be neutralised by acid. This requires concentration and drying which also involves retention of salt. All these processes adversely affect the nutritional value as well as acceptability of the product. Alkalase enzyme was tried for hydrolysis of the prawn shell to recover protein. Preliminary trials were conducted to identify conditions for maximum recovery of protein. More than 70 per cent protein was recovered by this process. The product had light colour, less bitterness and acceptable appearance.

Tank feeding experiments were conducted on mrigal fingerlings with three formulated diets having protein content 20, 25 and 30 per cent respectively with soya flour as the main protein source. The feed with 30 per cent protein was found to provide better growth rate and survival.

Feeding experiments were conducted on mrigal and rohu stocked in 1:1 ratio at a stock density 5000/ha with the formulated feed containing 30 per cent protein. Gross production was 2210 Kg/ha/5 months.

Two feeds with 25 per cent and 35 per cent protein were formulated and processed into water stable fillets. Feeding experiments were initiated on *Chanos chanos* in ponds of Fisheries Research Station at Puthuvypu under the Kerala Agricultural University.

Packaging

Suitability of two different types of retortable pouches manufactured indigenously as well as imported pouches for production of heat processed seer fish curry was studied. The pouches were heat processed to an F_o value of 8.5. The indigenous pouches developed flex crack, whereas the imported ones did not develop any defect with good retention of colour and taste. Sterility tests conducted on these pouches showed that they were sterile after incubation at 37°C for 2 weeks. Even though flex cracks were seen on the indigenous pouches, they were also sterile. The product in the indigenous pouches had good texture and flavour.

Several fish products like seer fish in curry medium, kalawa in curry, sardine in curry and prawn in white sauce were processed. Sterility checks in the above products showed an F_o value of above 7.0 as the optimum for providing safety from a bacterial point of view. In case of kalawa, even with this minimum F_o value (7.0) the fish pieces disintegrated owing to the softness of the flesh.

A semi commercial operation of the pouch line for the production of mackerel fish curry in association with MPEDA and M/s. Abad Fisheries, Cochin was carried out. Flexible retort pouch was manufactured by M/s Paper Products, Mumbai as per the configuration specified by CIFT. Thirteen batches of mackerel fish curry processed to an F_o value of 8.5 were brought out using indigenous pouches made of 12 micron plain polyester laminated with 12 micron aluminium foil laminated with 300 gauge cast poly-

propylene. M/s Abad Fisheries, Cochin, have evinced keen interest in the process and 500 pouches have been handed over to them by the MPEDA for test marketing.

Studies were continued on dried headless barracuda packed in 12 micron plain polyester laminated with 150 gauge low density polythene in air and under vacuum and stored at ambient temperature. The air packed samples were rejected after 35 days while samples packed under vacuum kept in good condition for 200 days.

Fish chutney prepared from white bait and packed in 12m polyester laminated with LD-HD co-extruded film in air, nitrogen and vacuum and stored at ambient temperature was studied. The product was in acceptable condition even after 21 months of storage. Biochemical and organoleptic parameters of the product packed in air, nitrogen and vacuum were more or less the same. Gram +ve spore forming Bacillus species were detected in all the samples.

Frozen PD tiger prawns were packed in 12m plain polyester laminated with 150 g LDPE after glazing and were vacuum packed. Control samples were packed in air. All the samples were frozen at -20°C. The control samples showed a shelf life of 90 days, whereas the samples packed under vacuum had a shelf life of 330 days.

Seer fish steaks were packed in 12 micron plain polyester laminated with 300 gauge LDPE and vacuum sealed. Control sample (i) was prepared using the above laminate but packed in air. Another control sample (ii) was also prepared by using 250 gauge LDPE. After packing in the above mentioned packaging films, the samples were frozen using a plate freezer. The frozen samples were kept in the frozen storage at -20°C. The initial samples were subjected to organoleptic, chemical and microbiological studies. Initial sensory evaluation showed that the cooked samples had very good texture, colour and flavour. Biochemical and organoleptic characteristics of the product packed in air and vacuum were more or less same after two months of frozen storage.

Fresh seer fish fillets fried in oil with spices, salt and calcium propionate were packed in 12μ plain polyester laminated with 118μ LD/HD co-extruded pouches in air and under vacuum and studied for their shelf life. The control samples had 8 days of shelf life, whereas the samples packed under vacuum were in acceptable condition for 20 days at room temperature.

Green mussels *Perna viridis* collected from the natural beds near Calicut were depurated and the meat shucked. The gut contents were removed from the shucked meat and cleaned well. The cleaned meat was deep fried in refined groundnut oil and mixed with dried spices mixture comprising chilli powder, turmeric powder, pepper powder, salt and ascorbic acid, so as to bring down the moisture level to around 25%. They were packed after cooling under vacuum as well as in air in 12 micron polyester laminated with 118 micron LD-HD co-extruded pouches. The raw material and the product were subjected to preliminary analysis. The packed products were subjected to storage studies at room temperature.

Research projects handled

1. Title of Project	:	**Biochemical, nutritional and functional properties of fish constituents**
Project leader	:	Dr P.G. Viswanathan Nair
Location of project	:	Cochin
Associates	:	Dr K. Devadasan, Dr M.R. Raghunath, Ms. K. Ammu, Ms. Suseela Mathew and Dr Imam Khasim Saheb
2. Title of Project	:	**Nutrients, toxicants, pollutants and growth promoters in aquaculture system and processed marine products**
Project leader	:	Shri A.G. Radhakrishnan
Location of project	:	Cochin
Associates	:	Dr M.R.Raghunath, Dr Jose Stephen, Ms Suseela Mathew, Dr Imam Khasim Saheb and Dr K.Ashok Kumar
3. Title of Project	:	**Production and evaluation of biopolymers and biochemicals from aquatic organisms**
Project leader	:	Dr M.K. Mukundan
Location of project	:	Cochin
Associates	:	Dr K.Devadasan and Ms Suseela Mathew
4. Title of Project	:	**Autolytic activity in mackerel and squid mantle muscle**
Project leader	:	Dr M.R.Raghunath
Location of project	:	Cochin
Associates	:	Ms Leema Jose and Ms P. Seema Nair
5. Title of Project	:	**Pilot plant studies on absorbable surgical sutures from fish gut collagen**
Project leader	:	Dr M.K. Mukundan
Location of project	:	Cochin
Associates	:	Dr K.Devadasan and Ms M.K. Seema

★ Chief findings

- ★ Lipids of some species of fish such as tuna, mullet etc. from the east coast were found to be rich in polyunsaturated fatty acids (PUFA), especially docosa hexaenoic acid (DHA).
- ★ Addition of vitamin E to diets supplemented with free PUFA was not found to give any noticeable beneficial effects as far as the hypolipidemic action of PUFA is concerned.
- ★ Defatted fish powder was found to have significant hypolipidemic properties in albino rats. It lowered serum total cholesterol and raised the proportion of high density lipo protein (HDL).
- ★ Incorporation of gelatinised starchy materials like corn starch, potato and tapioca in fish meat at 20 per cent level was found to improve the functional properties of dried products.
- ★ When mackerel was cured in brine or dry salt, autolytic activity in the tissue was found to increase rapidly in the initial stages of curing, but was largely inhibited later as salt content of muscle increased. When squids were cured similarly, autolytic activity was inhibited without any initial activation.
- ★ Studies using crude muscle homogenates showed that autolytic proteinases in mackerel active at acid pH (pH4) were activated by sulfhydryl reagents. Proteinases active at alkaline pH (pH 9and10) were strongly inhibited by dithio threitol (DTT) and ethylene diamine tetra acetic acid (EDTA Na2). In squid, the acid pH proteinases (pH 3 and 4) were strongly activated by DTT and EDTA while the neutral and alkaline pH (pH 7 and 8) proteinases were inhibited by serine proteinase inhibitors such as phenyl methyl sulphonyl fluoride (PMSF) and the trypsin inhibitor tosyl lysyl chloromethyl ketone (TLCK).
- ★ Fresh water fishes collected from in and around Cochin were found to contain organo chlorine pesticides (OCP) and poly aromatic hydrocarbons (PAH) below 1.5 ppm and 1.5 ppb respectively. Naphthalene was the main PAH detected.
- ★ Proteins of fresh water fishes and shellfishes in general were found to be rich in glycine but poor in tryptophan.
- ★ Collagen-chitosan membranes prepared using fish air bladder collagens and chitosan from prawn shell were found to be useful for covering wounds and burns to prevent fluid and blood loss and also to prevent infection. Cross-linked and chromicised membranes were found useful for treatment of infra bony and supra bony periodontal defects in dentistry.

Report of work done

Testing pharmacological effects of n-3 PUFA

Studies on the effect of the addition of vitamin E to PUFA supplemented diets on the serum lipid levels in albino rats showed that serum cholesterol levels of the rats fed on vitamin E-diet were not significantly different from that of the group which was not fed with diet supplemented with vitamin E, indicating that vitamin E does not significantly enhance the hypocholesterolemic properties of PUFA. The levels of total lipids and cholesterol in liver and heart were higher in the rats given added vitamin E in the diet. The effect of vitamin E on serum triglyceride levels was also not favourable.

PUFA supplementation of diets is found to reduce serum cholesterol levels in rats only after 3 months feeding. Subsequent withdrawal of PUFA from the diet was not found to increase serum cholesterol levels significantly for another 2 months.

The effect of dietary PUFA on the digestibility of fat and protein and also on growth of the animals is under study.

Hypolipidemic effects of fish proteins

Effect of fish proteins on serum cholesterol levels in albino rats was studied by comparing two groups fed on identical diets differing only in the dietary proteins. While the control group had casein as the sole source of protein, the experimental group had defatted fish powder as the protein source. Serum cholesterol was lowered by about 9 per cent after one month and by 15 per cent after 2 months in the group given defatted fish powder as compared with the control group (casein). The proportion of HDL cholesterol increased by about 11 per cent and triglyceride levels were lowered by about 7 per cent in the experimental group. Feed consumption and weight gain were also higher in this group.

Experiments are in progress to study the role of specific amino acids in the lowering of serum lipid levels in albino rats.

Cholesterol in fish

Studies on seasonal variations in cholesterol content of various species of prawns were continued. Samples of seven species (*P. monodon, M. rosenbergii, P. indicus, M. mo-noceros, M. dobsoni, P. stylifera* and *M. affinis)* were analysed every month for lipid, NS matter and cholesterol contents.

Functional properties of fish proteins

Influence of added starch component on the functional properties of dried fish proteins was studied in detail. Corn starch was mixed with fish mince at 20 per cent and 40 per cent levels and dried to see its effect on functional properties such as bulk density, solubility and rehydration. Ungelatinised starch did not significantly improve any of the functional properties. But gelatinised corn starch as well as cooked potato and tapioca when mixed with fish mince at 20 per cent level and dried, lowered the bulk density markedly and improved rehydration in comparison with fish mince dried without starch. Among the starch sources, corn starch and tapioca improved the fun-ctional properties better than potato.

Fatty acid composition of lipids of fish from the east coast

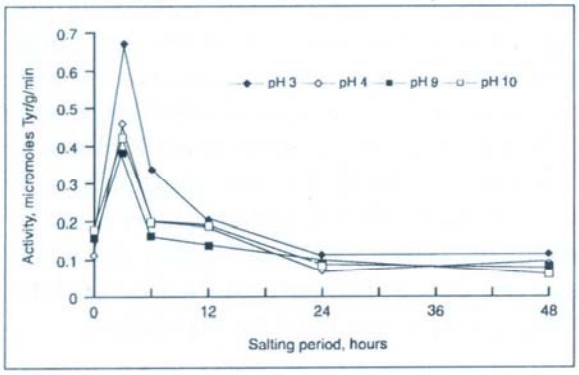
Twenty samples of lipids of fish from Visakhapatnam area were analysed to determine their fatty acid composition. The general pattern of fatty acids was similar to that of other fish from Indian waters. In some species, the proportion of DHA, which is nutritionally very important, was unusually high (40 per cent of total fatty acids). The proportion of eicosa pentaenoic acid (EPA) was generally low (less than 10 per cent).

Nutrients, pollutants and toxicants in fishes and shellfishes

Proteins of fresh water carps and prawns are found to contain high levels of glycine but are poor in tryptophan. Water and cultured fresh water fishes from different areas in and around Cochin were analysed for their content of organo chlorine pesticides (OCPs) and poly aromatic hydrocarbons (PAHs). In general, OCPs and PAHs in all these samples were below 1.5 ppm and 1.5 ppb respectively.

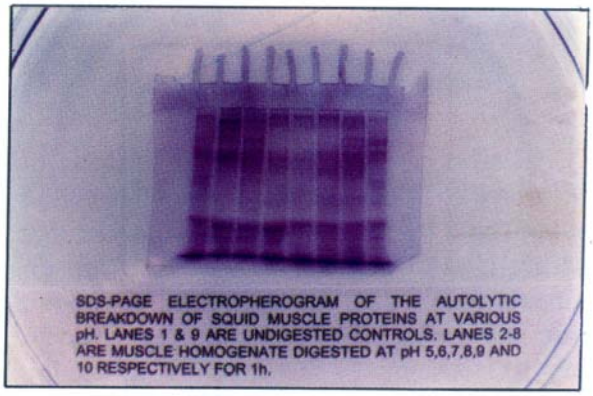
Autolytic proteinases in mackerel and squid mantle muscles

Mackerel muscle had proteinases active at acid pH (pH4) as well as alkaline pH (pH 9 and 10). The acid pH proteinases were activated in sulfhydryl reagents. The alkaline pH proteinases were inhibited by dithio threitol (DTT) and ethylene diamine tetra acetic acid (EDTA).



Activation and subsequent inhibition of tissue proteinase activity at different pH when Indian mackerel (*Rastrelliger kanagurta*) is dry salted.

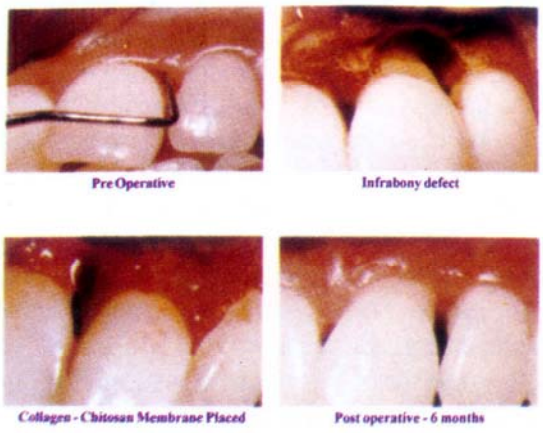
Squid mantle muscle proteinases active at acid pH (pH 3 and 4) were strongly activated by DTT and EDTA, while the alkaline pH proteinases were inhibited by phenyl methyl sulphonyl fluride (PMSF) and tosyl lysyl chloromethyl ketone (TLCK). Changes in the autolytic activity of mackerel and squid muscles during curing and frozen storage were followed in detail.



SDS-PAGE ELECTROPHEROGRAM OF THE AUTOLYTIC BREAKDOWN OF SQUID MUSCLE PROTEINS AT VARIOUS pH. LANES 1 & 9 ARE UNDIGESTED CONTROLS. LANES 2-8 ARE MUSCLE HOMOGENATE DIGESTED AT pH 5,6,7,8,9 AND 10 RESPECTIVELY FOR 1h.

Studies on collagen-chitosan membranes

Absorbable membranes prepared from collagens from fish air bladders and impregnated with chitosan were found to act as good artificial skin during healing of wounds and burns preventing fluid and blood loss and also infection. Clinical trials of this product are continuing in medical and veterinary colleges. Results are encouraging. They are found useful in the treatment of infra bony and supra bony periodontal defects in dentistry as is seen from the reports recovered from the Dental College Trivandrum. Detailed reports on their use in plastic surgery conducted at Medical College, Calicut and Veterinary College, Trichur are awaited.



Guided tissue regeneration in dental surgery using collagen-chitosan barrier membrane

Research projects handled

1. Title of Project	:	**Quality assurance and management in seafoods**
Project leader	:	Shri P.R. Girija Varma
Location of project	:	Cochin, Veraval and Visakhapatnam
Associates at Cochin	:	Dr T.S.G. Iyer, Dr M.K. Mukundan, Shri Cyriac Mathen, Dr Francis Thomas, Dr Sanjeev S., Dr P.T. Lakshmanan and Dr K. Ashok Kumar
2. Title of Project	:	**Occurrence, effect of processing and survival of halophilic pathogenic vibrios in fishery products of the export trade**
Project leader	:	Dr T.S.G. Iyer
Location of project	:	Cochin
Associates	:	Shri P.R.G. Varma, Dr Sanjeev S., Ms Leejee James, and Ms N.R. Smitha
3. Title of Project	:	**Selective bio-accumulation of toxicants in cephalopods (viz. squid and cuttlefish) and changes in quality, its upgradation and safety of processed products**
Project leader	:	Dr P.T. Lakshmanan
Location of project	:	Cochin
Associates	:	Ms V. Prafulla and Ms Liju Francis

★ Chief findings

- ★ Screening of live shellfish from different locations of Kerala coast and over 50 commercial samples such as whelk, prawns, crab etc. from the seafood industries of the coastal states of India revealed that our shellfishes are free from paralytic shell fish poison (PSP).
- ★ Metallothionein type proteins were detected in the liver of squid and cuttle fish. Separation and examination of these proteins revealed the presence of 8μg/ml cadmium and 6μg/ml zinc for fractions corresponding to the metallothionein peaks.
- ★ Around 30 per cent of the frozen prawns analysed from the seafood industry showed a mean K-value of 25 per cent. Remaining 70 per cent showed K-value around 40 per cent indicating the prime quality of the seafood for export.
- ★ The spoilage index hypoxanthine was detected even in sea fresh mackerel to a level of 0.6 micro mole per gram.

- ★ Screening of more than 100 frozen samples of seafood meant for export comprising squid, cuttlefish, octopus different species of fish PUD, HL, CP and FD shrimps, revealed the absence of pathogens such as *Vibrio cholerae,* Salmonella and *Listeria monocytogenes* and the indicator organism *E. coli.* However, 10 per cent of the samples showed the presence of coagulase positive Staphylococci and faecal Streptococci.
- ★ Screening of 84 samples of fish and shellfish revealed the presence of pathogenic halophilic vibrios and their incidence varied from 1.9 per cent in the case of *V. metchnikovii* to 22.62 per cent of *V. cincinnatiensis.*

Report of work done

Evaluation of freshness of fresh and frozen fish and shellfish using K-value

Neucleotide degradation pattern and related quality changes were studied in experimentally frozen/farm fresh HL prawns. Physico chemical parameters like muscle pH, texture,volatile basic nitrogen (VBN) and sensory characteristics were evaluated for possible correlation with K-value. Unlike in finfish, prawn samples retained high levels of adenosine mophosphate (AMP) and inosine monophosphate (IMP) even after 12 months of frozen storage.

Studies on nucleotide degradation pattern in ice stored mackerel revealed that even in ocean fresh mackerel some amount of hypoxanthine is present. In the case of all other ocean fresh specimens of fish and shellfish, hypoxanthine level is found to be nil. The quality of squid and cuttlefish stored under various conditions mainly chilling with ice and salt and out of contact with ice (fish is packed in polythene and chilled by ice) was determined by measuring quality indices like K-value, total volatile basic nitrogen (TVBN), tri methyl amine (TMA) and sensory characteristics for a period of two weeks. Results revealed that K-value of fish samples packed in polythene and chilled with ice increased steadily and in correlation with sensory characteristics. In samples of squid and cuttlefish chilled with a mixture of ice and salt the rate of nucleotide degradation was slow compared to the samples chilled directly with ice. The lower concentration of nucleotide, TVBN and TMAN in samples chilled directly with ice may be due to the leaching effect of ice melt water. Evaluation of quality of commercial samples of frozen shrimp using K-value showed that the K-value ranged between 25 to 40 per cent, i.e. within acceptable and very good conditions.

Trace metals in marine and farmed fish and shellfish

Fifteen samples consisting of tuna, mackerel and prawns were analysed for trace metals such as mercury, zinc, cadmium, lead, iron, arsenic and selenium. All samples except squid and cuttlefish showed levels of these metals much below the permitted levels. In the case of squid and cuttlefish, the values for cadmium and zinc were higher and in certain instances higher than the permitted level. As part of monitoring of environment, the sea water was also screened for the presence of toxic metals such as cadmium, copper and zinc. The levels of cadmium, copper and zinc were less than .00125, less than .0213 and less than .078 ppb respectively.

Studies on mass fish kill in Chitrapuzha River

Following mass fish kill in the Chitrapuzha River, Ernakulam District, Kerala, a detailed investigation was undertaken at the request of the State Government to ascertain the cause of the mass fish kill. A detailed study by drawing water samples and fish samples from various locations in the river system and evaluation of the results of pH, phenolic compounds, cadmium, lead, chromium, copper, zinc, arsenic free and albuminoid ammonia revealed that the cause of the death was due to the presence of toxic levels of the free ammonia in the river system.

Studies on biotoxins

Investigations on biotoxins in shellfishes were initiated. Samples of clam and mussel collected from various locations of Kerala coast revealed that the incidence of paralytic shellfish poison (PSP) was absent. Some samples of shellfish recorded the presence of traces of diarrhetic shellfish poison (DSP). However, the levels were less than 1 mouse unit per gram. Fifty two commercial samples of shellfish consisting of prawns, crab and whelk were also analysed for PSP and DSP. None of the samples showed the presence of PSP; however two samples showed traces of DSP.

Influence of sodium chloride and potassium sorbate in ice on the shelf life of iced fish

Detailed investigations were carried out on the use of ice containing sodium chloride (3%) and potassium sorbate (.1%) for chilling prawn *P. indicus*. Repeated studies showed that the presence of sodium chloride and potassium sorbate are beneficial in increasing the shelf life of iced prawns by three days.

Microbial quality of seafood products

More than 100 samples of frozen seafood meant for export were collected from various seafood processing plants throughout the coastal states of India. The samples tested consisted of frozen squid, cuttlefish, octopus, different species of fish and prawns in different styles. All the samples tested were free from *E. coli, Vibrio cholerae,* Salmonella and *Listeria monocytogenes*. About 10 per cent of the samples were contaminated with either coagulase positive Staphylococci or faecal Streptococci. The total bacterial count ranged from 10^3 to 10^5 in squid and cuttlefish, 10^3 to 10^4 in fresh fish and 10^2 in cooked shrimps.

A similar number of samples consisting of fresh and frozen fish and shellfish were analysed for the presence of pathogenic halophilic Vibrios. The following species of Vibrios were detected as per the sample numbers and percentage given in the table below:

Sl. No.	*Vibrio* spp.	Incidence: No. of samples	Incidence: % of incidence
1.	*Vibrio alginolyticus*	9	10.71
2.	*V. cincinnatiensis*	19	22.68
3.	*V. fluvialis*	2	2.38
4.	*V. mimicus*	2	2.38
5.	*V. metchnikovii*	1	1.19
6.	*V. parahaemolyticus*	8	9.52
7.	*V. vulnificus*	6	7.14

The following non-pathogenic halophilic Vibrios were also isolated from the samples.

1. *V. anguillarum*
2. *V. campbellii*
3. *V. harveyi*
4. *V. logei*
5. *V. marinus*
6. *V. orientalis*
7. *V. pelagius*
8. *V. splendidus*

Method of storing cleaned utensils as per QAM norms

Five strains of enterotoxigenic *Staphylococcus aureus* were isolated from water and tested using RPLA technique. All the five strains were found to be producing enterotoxin.

The division undertook evaluation of 15 HACCP manuals submitted by the Export Inspection Agency. It also undertook inspection for approval of several seafood processing plants and freezer vessels for export of fish and fishery products to the European Union.

Research projects handled

1. Name of Project	:	**Design, construction, performance monitoring and popularisation of a new series of deep sea fishing vessels**
Project leader	:	Shri M. Nasar
Location of project	:	Cochin
Associates	:	Shri S. Ayyappan Pillai and Shri R.S. Manoharadoss
2. Name of Project	:	**Design and development of fishing vessels, fish processing equipment and machinery for fishery industry**
Project leader	:	Shri S. Ayyappan Pillai
Location of project	:	Cochin
Associates	:	Shri P.K. Chakraborthy, Shri P.N. Joshi and Shri M.Nasar
3. Name of Project	:	**Development of indigenous electronic instruments for harvest and post harvest technology of fish**
Project leader	:	Dr T.K. Sivadas
Location of project	:	Cochin
Associates	:	Shri K. Ramakrishnan and Ms K. Vijayabharathy
4. Name of Project	:	**Development and application of electronics for agricultural investigations**
Project leader	:	Dr T.K. Sivadas
Location of project	:	Cochin
Associates	:	Shri K. Ramakrishnan and Ms K. Vijayabharathy

★ Chief findings

- ★ Three basic hull forms were developed for the 18 m fuel efficient deep sea steel trawler and gill netter-cum-longliner.
- ★ The hull construction of the 15.5m fuel efficient steel fishing vessel was completed and the propulsion system installed.
- ★ The 10 kg capacity PVC solar drier was fabricated and installed.
- ★ Fabrication of the through flow cross circulation hot air dryer was undertaken.
- ★ A pressure injecting device for production of moulded prawn was designed and fabricated.
- ★ Detailed engineering drawings of a forming machine for value added fishery products was developed.
- ★ Net height meter was developed for measuring the vertical opening of trawl nets in the range 1 m to 10m with an accuracy of ± 5 cm.

Report of work done

Marine engineering

Five different hull forms keeping fuel efficiency in mind, were developed for the 18 M deep sea trawler and gill netter-cum-longliner using variations in key parameters such as bilge shape, angle of enhance, art shape, forward shape and hydrostatic parameters. These lines were then improved upon through alterations ensuring required performance criteria. Out of the five hull shapes three were optimised for fuel efficiency and performance criteria using computer aided design methods for tank testing.

Hull construction of the 15.5m fuel efficient steel fishing vessel developed at CIFT was completed. The improved propulsion system for the vessel was manufactured and installed. This vessel, intended for commercial operation and demonstration, is expected to be commissioned sometime in 1999.

The 15.5 m fuel efficient steel trawler

Processing engineering

The 10 kg capacity PVC solar drier was fabricated and installed on the rooftop of the Institute building and experiments performed using cooked 'thelly chemmeen' which could be dried in 9 hours to 9 per cent moisture level. The drier recorded 60°C to 65°C and 45 per cent average humidity. The material kept inside for drying was well protected from contaminating agents like sand, dust, flies, birds, animals and also from rain which is not possible in the case of normal sun drying.

The 10 kg capacity PVC solar drier

Fabrication of the through flow cross circulation drier was undertaken in the departmental workshop as per design prepared earlier.

A pressure injecting device was designed and fabricated for converting small prawn meat into the shape of jumbo size shrimp for value addition.

Detailed engineering design drawings of a forming machine were developed for the production of value added fishery products such as fish burgers of uniform weight, shape and size.

Instrumentation

A net height meter was developed in collaboration with NPOL to measure the

vertical opening of trawl nets in the range 1 m to 10m with an accuracy of ± 5 cm. Field trials of the instrument have yielded fruitful results.

Fabrication of the high speed log for measuring the speed of speed launches up to 25 knots was completed.

Field trials were initiated with the speed log with towed transducer for measuring towing speed of fishing vessels in the range 2 to 5 knots.

Circuit and software for the measurement of fuel consumption rate has been developed. System for measurement of total fuel consumption is in the process of development.

Design of a sensor and electronic circuit for measuring breaking strength and compressibility of food samples and gels was completed. Fabrication of the sensor is in progress. Performance evaluaton of the water activity meter was carried out as part of updating and recalibration.

One unit of the gel strength tester developed in CIFT was supplied to the Visakhapatnam Research Centre of CIFT.

The contract service work of water level measurements of 10 nos of bore wells in the premises of Cochin Shipyard Ltd. was carried out for 24 hours as a part of the Pollution Abatement Project of the Shipyard. The above work was carried out for an amount of Rs.34,000/-.

Research projects handled

1. Title of Project	:	**Harvest and post harvest technology transfer and evaluation in fisheries**
Project leader	:	Dr S. Balasubramaniam
Location of project	:	Cochin and Veraval
Associates at Cochin	:	Dr M.K. Kandoran, Dr Krishna Srinath, Ms. Mary Thomas, Shri V. Annamalai, Shri T. Joseph Mathai, Dr Nikita Gopal and Dr Sreevalsan J. Menon
2. Title of Project	:	**Estimation of seasonal production in the fish processing industry with special reference to the monsoon trawl ban**
Project leader	:	Shri G.R. Unnithan
Location of project	:	Cochin
Associates	:	Dr A.K. Kesavan Nair, Shri H. Krishna Iyer and Shri V. Annamalai

★ Chief findings

- ★ Demonstrations of nylon monofilament gill nets with 36mm mesh size and 0.16mm diameter twines in Cherai fishing centre, Cochin, revealed that the average fish catch per hour per unit area of net was 44.60 kg. The average price value of fish catch for the above fishermen operating 8.46m LOA motorised plankbuilt crafts was calculated as Rs.817.95 per day of fishing.
- ★ Demonstrations of 50mm nylon mono-filament gill nets in 8.46m LOA motorised plankbuilt crafts operated from the Cherai fishing centre revealed the average fish catch per hour per unit area of net to be 21.19 kg. The average value of fish catch was calculated as Rs.1026.82 per day of fishing.
- ★ In Gujarat, the mechanised fishing boat owners operating from Veraval fishing centre had higher scores (61.16 per cent) on the extent of adoption of improved practices such as use of recommended wood materials, adoption of paintings schedules and adoption of improved trawl designs followed by Mangrol (56.64 per cent) and Porbundar (49.92 per cent). The adoption scores in the Kerala fishing centres were in the high category (>85 percent) and did not vary significantly between the fishing centres.
- ★ The annual average fish catches among the mechanised boat owners operating 11.31 to 13.5m LOA boats in the fishing centres of Gujarat were found to be above 78 tonnes and in Kerala, it was higher in Cochin ($\bar{X}$ = 95.29) followed by Calicut ($\bar{X}$ = 39.47) and Quilon ($\bar{X}$ = 28.90).

- ★ Among the traditional fishermen operating plankbuilt crafts (11 to 20m LOA), the overall monthly average fish catch per fishing day was found to be 553.46kg in Punnapra, 526.81 kg in Chethi and 531.53 kg in Thaikkal.
- ★ The group attributes index scores of fishermen respondents from three fishing villages differed significantly. But, when they were categorised as shareholders and fishing labourers, the group attributes index scores did not vary significantly. The socio - personal and technological variables of respondents did not have significant influence over the group attributes perception in all the three fishing villages.
- ★ Fish processing factories in Kerala were found to utilize only 28 per cent of their installed capacity. Non-availability of raw material is found to be the main reason for under-utilization of the plant capacity.
- ★ Trawl ban is seen to adversely affect the fish processing industry in Kerala, whereas production during the post ban period was found to increase substantially. However, fish processors in Gujarat are of the opinion that fishing ban is essential for conservation of fishery resources.
- ★ Maximum percentage of fish production in Gujarat is contributed by different varieties of finfish which is a clear indication of the trend towards diversification of fishery products for export.

Report of work done

During the period, 18 training courses were organised and 261 candidates were trained in the different fields of fisheries technology The major subject areas of training include production of value added fish products, fish processing technology, quality control, HACCP concepts, modern techniques of testing water quality, seafood quality assurance, laboratory techniques for identification of bacteria in fish and fishery products, analytical microbiology, application of electronics for agricultural field inves-tigations, fishing craft technology and fabrication of improved gill nets. Under the Indo-UK collaborative project on fish processing, three batches of training courses on food hygiene and handling were also organised. In all, 44 participants deputed from CIFT, EIA, MPEDA and fish processing industry were trained.

In order to popularise the improved gill nets, the scheduled caste fishermen at Cherai fishing centre were trained on the fabrication and operation of two types of improved nylon monofilament gill nets with 36mm and 50mm mesh sizes. Ten kg of nylon monofilament net webbings (0.16mm diameter) were given to each of the six scheduled caste fishermen groups operating 8.46m LOA motorised plankbuilt (transom) crafts. The fish catch data collected from the respondents revealed that

Dr Ravindran, Director, handing over improved gill nets for fishing trials

on an average, 50mm gill nets yielded 21.19 kg per hour per unit area while 36mm gill nets yielded 44.60 kg per hour per unit area. The average sale values of fish catch for the above fishermen were found to be Rs.1026.82 and Rs.817.95 respectively per fishing day.

The research methodology for the new component 'improved trawls and productivity in mechanised fishing boats' was finalised and the variables were selected. Interview schedules were prepared after necessary pre-testing. Data were collected from 12 mechanised fishing boat owners in Quilon region and 27 respondents in Veraval Centre. The analysis of results revealed that on an average, the boat owners with 20-25 m shrimp trawl nets had obtained higher annual fish catch (60.42 tonnes) than the boat owners with 26-30 m shrimp trawls (34.3 tonnes) at Veraval. At Quilon, the boat owners operating 26-30 m shrimp trawls had an average annual fish catch of 46.57 tonnes. Further data collection is in progress.

On the new component 'productivity and associated factors among fishermen operating smaller crafts', interview schedules were prepared for data collection among the artisanal fishermen operating 7.5 to 9.5 m LOA fishing crafts. For the selection of fishermen respondents and fishing centres, data were collected from two major fishing centres such as Azhikode and Kaipamangalam in Trichur district. Data were also collected from two landing centres in Quilon district. From the data collected, the average fish catch from smaller fishing crafts and the value of fish catch was calculated as 185 kg and Rs.1501 per fishing day respectively. In Gujarat, data were collected from two landing centres namely Veraval and Chorwad.

In the study on 'marketing channels and margins in fresh fish trade', the price spread data collected revealed that for sardine, the price variation at the landing site ranged from Rs.2.5 to 8.5 per kg while the variation at market outlets ranged from Rs.20 to 40. For mackerel, the range of price variation at the landing site was between Rs.4 per kg and Rs.15 per kg while the variation at market outlets was between Rs.20 and Rs.40. It is seen that the highest price at the landing site was far below the lowest price at the market, keeping a gap of three-fold price difference throughout the year under review.

In the study on 'training needs and technological adoption in prawn peeling units', data were collected from the peeling units in Ezhupunna, Aroor, Edacochin, Murikkumpadam and Palliport areas. The tabulated data revealed that 85.71 per cent of the respondents had prawn peeling as their main occupation. The average quantity of raw materials peeled in a year by the respondents was found to be 115 tonnes. Number of days of work in the peeling sheds on an average was 168 days. The extent of adoption of quality control practices and constraints were recorded.

Under the component 'consumption pattern of fish and the associated socio-economic factors', questionnaires were prepared and data were collected from 100 households. The tabulation of data and preliminary analysis were carried out. The initial results showed that the relationship between household income and expenditure on food consumption was tenuous. Expenditure on food has a floor level and it will not move up with increase in income. Data on non-food expenditure are being collected to complete the analysis.

Statistical analysis on data collected from 48 fish processing factories in Kerala was carried out. Separate production estimates for three strata (based on installed capacities in tonnes) viz. 0-10, 10-15 and 15-30 and the combined estimate for the State as a whole were made within reasonable error estimates. The total production for the year 1996 was

estimated to be 87,956 tonnes. The utilized capacity was found to be only 28 per cent for the State taking 365 working days with three shifts per day. The seasonal utilisation of plants show that the trawl ban has adversely affected the processing industry in the months of June and July (10.5 per cent). At the same time, post ban period of August, September and October has shown substantial improvement in the capacity utilization (25 per cent). Non-availability of raw material is found to be the main reason for under-utilization of plant capacity.

The compilation and analysis of data on the annual installed capacity of all the 58 fish processing factories along the Gujarat coast revealed that there exists a total installed capacity of 2162 tonnes per day (789,000 tonnes per year) in the State, which is about 30% of the all India capacity. Fifteen per cent of the factories in the State had 35 per cent of the installed capacity. The factories were stratified according to their installed capacities and the distribution is furnished as below.

Stratum	Number of processing plants	Total installed capacity (Tonnes)
10-20	11	181.0
20-30	17	437.5
30-40	13	444.6
40-50	8	343.7
50 UP	9	754.9
Total	**58**	**2161.7**

Studies were carried out on the production of processing plants in Gujarat with reference to fishing ban. Data revealed that there exists a self imposed total fishing ban by the fishing industry for 3 months from June to August every year with the production being lowest during this season. Also, the post-trawl ban period registered a substantial improvement in production, the estimates being 18.1 per cent in October, 16.6 per cent in November and 17.4 per cent in December. The picture was almost the same in respect of shrimp, squid and fish varieties. During post-trawl ban period, shrimp production increased to an average of 16 per cent, squid to 33 per cent and fish varieties to 17 per cent. Thus it may be inferred that the capacity utilization mainly depended on the diversified fishery products rather than shrimp or cephalopods and that the production reached its peak in the post - trawl ban period of the year. The processing factories operated for about 200-250 working days a year with two shifts per day, during 1996 and 1997. Ninety per cent of the processors were of the opinion that fishing ban is essential for the conservation of fishery resources.

Seventy per cent of the factories belonged to medium and high capacity range above 25 tonnes/day. Fifty three per cent of the freezers were plate freezers, 40 percent tunnel and blast freezers, and only 7 per cent had IQF facility.

The maximum percentage of production was contributed by fish and other diversified products (70.9 per cent) followed by squid and cuttlefish (19.7 per cent) and shrimp (9.4 per cent). Proforma for collection of data was modified for estimation of utilised capacity as per EU standards.

Ban on monsoon trawling – study on the fishing and related activities during the ban period

With a view to examining the various socio-economic and technological issues in relation to monsoon trawl ban, a crash study was conducted by a team of scientists from the Extension, Information and Statistics Division as well as Fishing Technology Division.

During the trawl ban period from 12 June to 29 July during the year 1998, the team visited selected fish landing centres representing the central zone of Kerala including Chavakkad,

Puthenkadappuram, Blangad and Thiruvathara in Trichur Dist., Munambam, Cochin Fisheries Harbour and Fort Cochin in Ernakulam Dist., Ambalappuzha, Valanjavazhi and Kakkazham in Alleppey Dist., and Thankasseri, Vadi, Mudakkara, Pallithottam and Fort Kollam in Quilon Dist. Data were collected using RRA techniques on the types of craft and gear and accessories in use in the various centres, fleet size, fishing season, ownership pattern, capacity utilisation of processing plants and socio-economic aspects.

The study revealed that the fishermen engaged in motorised and artisanal sectors welcome trawl ban as they were able to operate freely during this period without interference from the mechanised vessels. The period June-August, which was previously considered months of scarcity, became a period of activity and earnings for these fishermen. Post ban fisheries also improved considerably for the traditional fishermen.

Ring seines operated from Munambam fishing harbour during the trawl ban period

Research projects handled

1. Title of Project	:	**Investigations on aquatic micro-organisms with reference to pollution, fish preservation, pathogenesis and bioactivity**
Project leader	:	Dr P.K. Surendran
Location of project	:	Cochin
Associates	:	Dr Nirmala Thampuran, Shri V. Narayanan Nambiar, Dr Sanjeev, S., Ms K.V. Lalitha, Dr Toms C. Joseph and Dr B. Madhusudana Rao
2. Title of Project	:	**Occurrence of *Vibrio vulnificus* in tropical marine fish and development of methods for their eradication**
Project leader	:	Dr P.K. Surendran
Location of project	:	Cochin
Associates	:	Dr Nirmala Thampuran, Ms K. Sudha, Shri V. Vinod, (upto 30-4-98) and Ms P. Seema Nair (from 1-9-98 onwards)

★ Chief findings

- ★ Enteropathogenic *E. coli* O 157 : H 7 was found absent in the fish samples collected from the retail fish markets around Cochin as also in the water samples collected from the canals adjoining the fish markets.
- ★ *E. coli* isolates from the market fish were found to be non - toxigenic when tested for the presence of heat labile diarrhoeal toxin by the Reversed Passive Latex Agglutination (RPLA) technique.
- ★ Actinomyces strains isolated from sea water showed poor bioactivity compared to such strains from fish intestine when tested against gram positive and gram negative bacteria. About 10 per cent of these strains showed a mild activity towards *Bacillus* spp..
- ★ *Campylobacter* spp. were not detected in any of the 16 samples of fish and shellfish procured from the local retail outlets in and around Cochin.
- ★ *Clostridium botulinum* was detected in three out of the 12 samples of farm mud and one out of 13 samples of farmed fish.
- ★ Toxigenic *Bacillus cereus* was detected in 18 per cent of the fresh fish samples collected from local retail markets, and 85 per cent of the *Bacillus cereus* strains were found to produce diarrhoeal enterotoxin by the RPLA technique.

- ★ Salmonella serotypes were detected in 17 per cent of the fresh fish samples collected from local retail markets.
- ★ Total viable counts of more than 10^6 /g were observed in 75 per cent of the fresh fish samples collected from six retail markets in the Cochin Corporation area and 63 per cent of the samples were found to have *E. coli* count more than 100/g (MPN).
- ★ *Yersinia enterocolitica* was not detected in any of the 110 samples of fresh fish collected from local retail markets.
- ★ The total aerobic counts (TPC) of water from fresh water farms of Kottayam District were in the range of $10^3 - 10^4$ cfu/ml. and that of mud samples ranged from $10^5 - 10^6$ cfu /g. The TPC of shell with muscle of *Macrobrachium rosenbergii* was in the range of $10^4 - 10^5$ cfu / g and that of intestine ranged from $10^7 - 10^8$ cfu / g.

Report of work done

Enreropathogenic *E. coli* O157 : H7 in fish and fishery products

E. coli O157 :H 7 was not detected in samples of fish and shellfish collected from market places in and around Cochin. Fourteen presumptive colonies were isolated for testing with latex. Certain biochemical reactions indicative of this pathogen such as lysine and ornithine decarboxylase test and lactate utilization were also performed. Biochemically as well as serologically, these isolates failed to give an indication of the presence of this pathogen. Water samples collected from canals adjoining the fish markets were also screened for *E.coli* O 157 : H7. Sixteen colonies were isolated based on presumptive reactions. None of the isolates were found to give a positive latex test. Fifteen strains of *E. coli* from fish samples from the market were also tested for the production of heat labile toxin by RPLA technique. None of the strains was found to be toxigenic.

Campylobacter spp. in fish and fishery products

A total of 16 samples of fish and shellfish procured from the local retail outlets in and around Cochin were analysed for the presence of *Campylobacter* spp. as per the FDA method. Six samples of clam, six samples of shrimp and four samples of fish were examined using the enrichment method. Sixty four presumptive Campylobacter colonies were isolated. Morphological and biochemical characteristics of the isolates were studied. *Campylobacter* spp. was not detected in any of the samples.

Anaerobic bacterial toxins in fish and fishery products

A total of 49 samples of fish and shellfish obtained from local retail markets and fish and shrimp farms as also water and mud samples were analysed for the presence and type of *Clostridium botulinum*. Of the 16 fish samples procured from the market and 13 farmed fish and shrimp samples, one each harboured *C. botulinum*. None of the two wild mussel samples and six water samples collected from fresh water and brackish water farms yielded *C. botulinum*. Three out of 12 mud samples tested were however found to be contaminated with *C. botulinum*. Forty presumptive *C. botulinum* colonies were isolated from the mud and farmed fish samples and their toxicity tested in mice. Further work on the identification and typing of *C. botulinum* is in progress.

Toxigenic *Bacillus cereus* in fish/fishery products

Studies were continued on the incidence and distribution of toxigenic *Bacillus cereus* in fish and fishery products collected from the local retail fish markets A total of 110 samples of fresh fish comprising 23 different species were analysed of which eighteen per cent were found to harbour *Bacillus cereus*. Out of the 20 cultures tested for the production of diarrhoeal enterotoxin by the RPLA technique, 17 cultures (85%) were found to be positive. The positive samples included *Epinephelus melanostigma, Sphyreana jello, Acanthopagrus berda, Lutjanus argentimaculatus, Rastrelliger kanagurta, Euthynnus affinis, Etroplus suratensis, Lepturacanthus savala, Mugil cephalus, Megalaspis cordyla* and *Scomberomorus commerson*.

Salmonella and related species in fish/shellfish/fishery environments

Investigations were carried out on the incidence of Salmonella serotypes in fish and fishery products. Samples of fresh fish collected from local retail markets were analysed for the presence of Salmonella serotypes using ELISA technique, Salmonella Rapid Test and conventional methods. One hundred and ten fresh fish samples belonging to 23 different species were examined during the period under report. Salmonella could be detected in 19 samples out of the 110 samples analysed by the ELISA method whereas by the SRT method Salmonella could be detected in only 15 samples and by the conventional method in 17 samples. These tests further proved that the ELISA method is the most sensitive one for the detection of Salmonella serotypes from fish and fishery products.

Yersinia enterocolitica in fish/shellfish

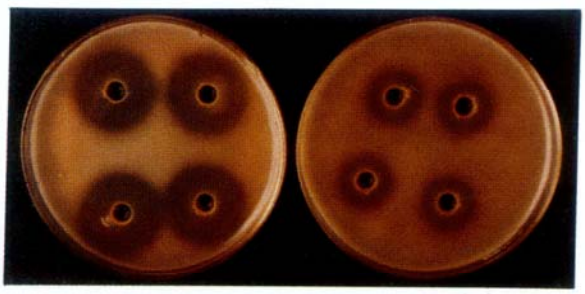
Sixtysix samples of fresh fish comprising 22 species collected from local retail markets were further examined for the presence of *Yersinia enterocolitica*, recognised as a causative agent for diarrhoeal disease in man. The samples were analysed by directly plating on Yersinia selective agar and also by the enrichment technique using phosphate buffered saline. The enrichment broth was incubated at 40°C for up to 6 weeks and periodically subcultured to detect the organism. One hundred and fifty suspected cultures isolated from the samples were subjected to detailed biochemical tests for the identification of *Yersinia enterocolitica*. Typical *Yersinia enterocolitica* strains could not be detected.

Staphylococcus enterotoxins and Shigella in fish/fishery products

Fifty two samples consisting of fresh finfish, shellfish and frozen fishery products collected from local landing centres and factories were examined for the incidence of enteric pathogen Shigella. All the samples were found to be free from Shigella. Seven samples of cooked, picked and frozen crab meat were examined for the presence of Staphylococcal enterotoxins A, B, C and D by the RPLA technique. All samples were found to be free from the above enterotoxins.

Microbial enzymes

Twenty two fresh fish samples, 4 dry fish samples and one sample each of mud and soil were analysed. Out of 105 cultures of pectinase producing bacteria isolated from these samples, one culture showed lyase and esterase activity,



Pectinase from bacterial strains

sixty amylase activity and 44 nitrate reductase activity.

Twenty two cultures showing amylase activity above 10 were tested for the quantitative assay of amylase activity by the agar diffusion technique.

Halophilic bacteria in cured fish

Twenty dry fish samples were analysed for halophilic bacteria. Out of the 135 cultures isolated, 36 cultures were found to be obligately halophilic, growing in presence of 20% NaCl and were identified as *Halobacterium halobium*. Twenty samples of dry fish were analysed for lipolytic bacteria and out of the 50 isolates, 24 were found to have lipolytic activity.

Bacteriology of cultured fishes

Cultured fresh water fish Rohu (*Labeo rohita*), water and mud collected from the fresh water farm at Thiruvankulam, near Cochin were analysed for bacteriological and physico-chemical parameters. The total plate counts of mud, water, gills and intestine were in the order of 10^5/g, whereas the skin surface had very low values, of the order of 10^2/cm^2. Parameters like pH, salinity, dissolved oxygen, etc. were within the limited range. The microflora of the fish are being studied.

Lactic acid bacteria in feeds and medicines

Forty two cultures of lactic acid bacteria were isolated from various sources such as curd, vegetables and animals and their biochemical characteristics are being studied.

Bacteriological quality of fish in retail trade in Cochin

Samples of fresh fish were collected from six different retail markets situated in the Cochin Corporation area and analysed to study their bacteriological quality, with special reference to total viable count, counts of coliforms and *E. coli* and presence of Salmonella and *Bacillus cereus*. Of the 110 samples collected from the markets and analysed, 82 samples (75%) were found to have a total viable count more than 10^6 /g. Sixty nine samples (63%) were found have *E.coli* count more than 100/g (MPN), 20 samples (18%) were found to harbour toxigenic *Bacillus cereus* and 19 samples (17%) were found to be contaminated with Salmonella serotypes. Significant differences were not observed in the quality of fish in the six different markets.

Bioactive and antibiotic producing bacteria in aquatic environments

Sea water samples collected from offshore areas were analysed for the presence of bioactive Actinomyces. The bioactivity of the isolates were tested by noting the inhibition of growth of selected gram positive and gram negative bacteria. The inhibitory activity was much less compared to similar strains from the fish intestine. A small number (10%) of the isolates showed an inhibitory action against gram positives.

Emergence of antibiotic resistant bacteria in culture system

Studies have been initiated for determining the antibiotic resistant population in culture farms and their surroundings. Fifty four samples of fresh and brackish water prawns were examined for the presence of eight different antibiotics. None of the prawn samples contained any antibiotic residues. Replica plating procedure has been worked out for this purpose.

Microbiology of fresh water prawn and environments

Fresh water prawn, *Macrobrachium rosenbergii* obtained from two farms at Vallakom near Vaikom were brought to the laboratory in live condition for analysis. Water and mud samples from the two farms and the feeder

canals were also collected and analysed. Water quality parameters like temperature, pH, turbidity, dissolved oxygen and salinity were measured.

Quantitative analysis for total aerobic plate count (TPC) at 37°C and 22°C, total coliforms, faecal coliforms, *Escherichia coli,* faecal Streptococci, *Staphylococcus aureus,* Vibrio and *C. perfringens* counts was carried out. The total aerobic plate count (TPC) of farm water samples was in the range of $10^3 - 10^4$ cfu/ml and that of farm mud samples $10^5 - 10^6$ cfu / g. The TPC of shell with muscle portions was in the range of $10^4 - 10^5$ cfu / g while that of intestine samples ranged from $10^7 - 10^8$ cfu/g. Coliforms, *E. coli,* faecal Streptococci, Vibrio and sulphite-reducing Clostridia were found to be present in water and mud samples and were also found to be associated with *M. rosenbergii.*

The aerobic bacterial flora on the shell with muscle portion of fresh water prawn showed predominance of gram negative rods followed by gram positive cocci and gram positive rod. Gram negative rod on the surface of fresh water prawn comprised of Aeromonas, Vibrio, Pseudomonas, Enterobacteriaceae and Chromobacterium. Gram positive cocci belonging to the genera Micrococcus, Staphylococcus and Streptococcus were also isolated from the surface of *M. rosenbergii.* The microflora of the intestine samples of *M. rosenbergii* were predominantly Enterobacteriaceae, Aeromonas, Vibrio, Acinetobacter, Pseudomonas, Bacillus, Micrococcus and Streptococcus.

The microflora of the water samples composed of Enterobacteriaceae, Vibrio, Cytophaga, Aeromonas, Nocardia, Bacillus and Staphylococcus. In the pond water and mud samples, gram positive bacteria predominated.

Microbiology of *Macrobrachium rosenbergii* during ice storage

Samples of *M. rosenbergii* obtained from a farm at Vaikom were brought to the laboratory in sterile polythene bags kept in ice. A portion of the sample was analysed immediately quantitatively and qualitatively. The other portion was kept in ice but without direct contact with ice and chilled stored for 10 days and analysed.

Quantitative analyses for total aerobic plate count (TPC) at 37°C, 30°C and 22°C, hydrogen sulphide producers at 22°C, total coliforms, faecal coliforms, *E. coli,* faecal Streptococci, *Staphylococcus aureus,* Vibrio and *C. perfringens* count was carried out. Total coliforms, *E. coli* counts and total number of hydrogen sulphide producers decreased during iced storage whereas the number of faecal Streptococci increased during iced storage in both shell with muscle portion and intestine samples. The population of Vibrio remained same during iced storage. *C. perfringens* numbers were reduced to nil after 10 days iced storage. Of the 85 isolates from fresh and iced prawn samples, 40 were identified up to generic level. Identification of the bacterial isolates from ice stored prawn is in progress.

Microbiology of brackish water prawn / environment

Water and sediment samples were collected from the pond, inlet source and outlet of the Golden Creek brackish water prawn farm located at Kannamali. The samples were drawn on four occasions viz., twice before stocking (June, July), once during growth phase (November) and once at harvest stage (December).

The water samples were tested for different physico-chemical parameters viz., temperature, pH, dissolved oxygen (DO), biological oxygen demand (BOD), salinity and secchi disc transparency. The pH of the sediment samples was also checked. Temperature of the water samples ranged from 26°C to 31°C. pH range of water was between 7 and 8 while that of sediment was between 6-8. DO of the pond water was always within normal range but the DO

of outlet touched low levels. Inlet water had relatively higher DO levels. BOD of the pond and outlet waters was higher than that of inlet waters. Salinity of the water samples was low till November. During December the salinity of inlet waters increased and reached up to 10 ppt. Secchi disc transparency increased gradually in pond and outlet waters.

Quantitative and qualitative bacteriological studies of the samples

There was no marked difference in the TPC values of the water samples. The counts were higher at 37°C than at 20°C. The counts in sedi ment samples were higher than that in the corresponding water samples. Inlet water had higher faecal Streptococcal counts. Pond sediment (harvest stage) had more faecal Streptococci. MPN values of sulphite-reducing Clostridia and coliforms were high in all water and sediment samples. Pond water showed a steady decline in faecal coliform and *E. coli* numbers.

Bacteria isolated from the water samples were mostly gram –ve and belonged to Vibrio, Pseudomonas, Aeromonas, Acinetobacter, Moraxella, Alcaligenes and Enterobacteriaceae. Pond water had relatively more Vibrios. Pseudomonas could not be detected in pond water samples but it was always present in the pond sediment. Inlet and outlet had Pseudomonas in both water and soil. The sediment samples were loaded with gram +ve bacteria, predominantly, Bacillus, Micrococcus, Streptococcus and Nocardia. Inlet sediment samples had relatively more gram –ve, oxidase +ve bacteria while outlet and pond sediments had more of gram +ve spore formers and filamentous type bacteria.

Occurrence of *Vibrio vulnificus* in tropical marine fish and development of methods for their eradication

Total heterotrophic count fluctuated within 7.00x 10^3 to 6.4x10^5/ml of water. Total Vibrio count estimated by MPN and direct plating methods were 60 to 1300 and 21 to 240, respectively. The population of Vibrio formed 1 to 3 % of the total population in the sea-water. A total of 60 bacterial isolates were recovered from the water samples and identified up to species level based on approved keys. *Vibrio alginolyticus* and *Vibrio parahaemolyticus* dominated in the sea-water. Other species such as *V. campbelli, V. orientalis* and *V. pelagius* were also isolated.

Quantitative and qualitative distribution of Vibrio species with respect to their habitat, i.e. pelagic and demersal, was studied. The study indicated that Vibrios showed no constant pattern in their distribution on the fish body. The total bacterial population as well as total Vibrios were maximum in number in the intestine followed by gills and the body surface. Pelagic fishes showed more species diversity among Vibrios than the demersal fishes. *Vibrio vulnificus* was isolated from the skin and muscle portion and intestine of one pelagic (*Sardinella longiceps)* and two demersal (*Cerres filamentosus* and *Lutjanus malabaricus)* fishes. Compared to fin fishes, the total bacterial count as well as the total Vibrio count was greater in the shellfishes. Two prawn species, viz. *P. monodon* and *P. stylifera* harboured *V. vulnificus* in the meat portion. Contrary to the observation in fish, this organism was absent in the intestine of the shrimp samples. Some of the Vibrio species like *V. damsela* and *V.harveyi* are not reported previously in marine fishes. *V. vulnificus* could not be isolated from cured/salted fish and frozen fish. However, in cured fish, other Vibrio species were found to be present.

The growth kinetics of *Vibrio* species were found to be affected by temperature, pH and salinity. In the case of *V. vulnificus,* growth was observed only in the temperature range of 15°C - 37°C. At 3.6°C in the refrigerator, the cells were gradually destroyed and complete

destruction was observed on the seventh day of storage. Similarly at 42°C, after six days of storage, no cell could be detected. Majority of the strains preferred a salt level of 1 to 2% for optimum growth. Also, majority of the strains failed to grow beyond a salt level of 6%. Distilled water, deionized water and tap water were found to affect the viability considerably.

Studies on the symbiotic growth of *V. vulnificus* with other bacterial genera and among other Vibrio species showed that the ability of *V. vulnificus* to grow competitively in the presence of members of the same genera or family was very poor, but presence of other enteric bacteria such as *E. coli* is not very inhibitory, especially in the early period of growth.

Vibrio species were capable of producing DNAases, protease, amylases, heamolysins and lipases at temperatures 30°C to 37°C only, indicating that the Vibrios are capable of spoiling fish muscle at these temperatures.

Based on the scrutiny of the various biochemical reactions that are observed for *V. vulnificus* isolated from Cochin area, the most salient reactions that aid in the identification of this species in the presence of other commonly occurring Vibrio species have been chalked out and a flow chart has been constructed for the easy and accurate detection of this pathogen.

VERAVAL RESEARCH CENTRE

Research projects handled

1. Title of Project	:	**Investigations on demersal trawls for continental shelf and slope**
Project leader	:	Shri K.K. Kunjipalu
Location of project	:	Cochin, Visakhapatnam and Veraval
Associates at Centre	:	Shri Pravin Puthra and Shri M.P. Ramesan
2. Title of Project	:	**Development of ecofriendly demersal trawls and resource specific trawls for demersal fishing**
Project leader	:	Shri K.K. Kunjipalu
Location of project	:	Cochin, Visakhapatnam and Veraval
Associates at Centre	:	Shri Pravin Puthra, Shri M.P. Ramesan, Dr Raghu Prakash and Shri Prem Kumar
3. Title of Project	:	**Development of resource specific trawl gear system and assessment of commercial trawling practices**
Project leader	:	Shri V. Vijayan
Location of project	:	Cochin, Veraval and Visakhapatnam
Associate at Centre	:	Shri Pravin Puthra
4. Title of Project	:	**Harvest and post harvest technology transfer and evaluation in fisheries**
Project leader	:	Dr S. Balasubramaniam
Location of project	:	Cochin and Veraval
Associates at Centre	:	Shri Pravin Puthra and Shri M.P. Ramesan
5. Title of Project	:	**Studies on the material conservation, environmental quality, ecosystem and the sustainable use of coastal zone of India**
Project leader	:	Dr A.G. Gopalakrishna Pillai
Location of project	:	Cochin and Veraval
Associates at Centre	:	Dr Raghu Prakash and Shri Prem Kumar
6. Title of Project	:	**Studies on handling practices and their impact on quality of fish and fish products**
Project leader	:	Shri K.K. Solanki
Location of project	:	Veraval
Associates	:	Shri A.A. Zynudheen and Dr Arnab Sen

★ Chief findings

- ★ Demonstration and popularisation of CIFT designs of demersal trawls and V – form steel otter boards were carried out.
- ★ Information was collected on various aspects of processing and storage of semi-dried commercially available fish.
- ★ Phenolphthalein phosphate agar was found to be satisfactory in characterising coagulase positive Staphylococci.

✍ Report of work done

Fishing technology

The chemical wood preservative, ASCU, was introduced and popularised in the area.

Fabrication of a 32m demersal trawl was completed for popularisation in Veraval.

Samples of soft wood immersed in Veraval waters for collection of wood borers are being monitored. An unusual attack on the hulls of wooden fishing vessels by wood boring organisms *Bankia carinata* and *B. companilata* was observed. Different wood panels were also immersed to study the rate of wood boring and fouling.

Hydrological study of Veraval waters is being carried out.

Data collection on the components 'productivity and associated factors among fishermen operating smaller crafts' and 'improved trawls and productivity in mechanised fishing boats' is in progress in Veraval/Chorwad and Veraval / Mangrol fishing centres respectively.

Fish processing

A study on the marketing channels of fish and its price fluctuations is in progress. A study is also in progress on the capacity utilisation of processing plants of Veraval.

An increased incidence of suspected *Vibrio cholera* and Salmonella were found in the landing centre creek water samples. A total of 64 samples were analysed of which 11 tested positive for Salmonella and 14 for *Vibrio cholera*. This is indicative of the extremely poor hygienic conditions and sanitation present at the landing centre and adjoining areas. Serological confirmation was done for *Vibrio cholera* using 01 polyvalent sera. Salmonella were identified on the basis of biochemical reactions, Oxoid rapid test kit and Oxoid latex tests.

Twenty samples of PUD prawns drawn from local processing plants were tested positive for faecal coliforms, faecal Streptococci and *Staphylococcus aureus*. Positive results were also recorded for sulphite reducing Clostridia by conducting preliminary tests, viz growth on TSC agar and litmus milk fermentation, in eight samples.

An attempt was made to evaluate the use of Stern's Glycerol Reaction for rapid identification of Salmonella. Identification relies on the ability of the organism to convert glycerol into an aldehyde that recolorises the fuchsin-sulphite complex. Initial results were promising, but a high level of secondary contamination was seen. Steps are under way to develop a suitable formulation for preventing growth of secondary contaminating bacteria.

On the basis of the ability of coagulase positive Staphylococci to produce urease, the use of phenolphthalein phosphate agar for identifying coagulase positive Staphylococci

was evaluated. This test can be carried out in combination with the plasma test for identifying coagulase positive Staphylococci.

A systematic analysis of the hazard points, before the fish reaches the processing plant, i.e. in and around the landing centres, handling areas, vehicles used for transport of fish, workers, peelers etc. is being carried out from a microbiological perspective. This is to assess the risk factors and hazard points outside the processing plants and their effect on the quality of the material to be processed. A very high incidence of bacterial contamination is seen in and around the landing centre. This could pose a major hazard to the quality of freshly landed fish which is being handled under poor sanitary conditions before being taken to the processing plants.

Preliminary trials have shown that crude extracts of shark tissue did not possess any antimicrobial activity. The two buffer formulations used for the study were Borax-NaOH/pH 9.4 and Glycine-HCL/pH 3.0. The use of chaotropic extraction buffers viz, sarkosyl, urea, guanidium chloride etc. also needs to be assessed.

Information on various processing and storage parameters of semi-dried commercially available fish is being collected and analysis of the same carried out for organoleptic, biochemical and microbiological quality.

Evaluation of methods to impart a prawn like flavour to low-priced fish meat using *Acetes* sp. is being done. Attempts are also being made to develop value added products using jawala and other ingredients.

Performance studies on the use of batters, binders and dusting flours are being carried out on ready-to-cook products using *Acetes* and low-priced fish meat.

VISAKHAPATNAM RESEARCH CENTRE

Research projects handled

1. Title of Project	:	**Studies on the effect of experimental installation of FADs for fishery resource enhancement in and around Visakhapatnam coast**
Project leader	:	Shri S.V.S. Ramarao
Location of project	:	Visakhapatnam
Associates	:	Dr G. Rajeswari and Dr U. Sreedhar
2. Title of Project	:	**Development of ecofriendly demersal trawls and resource specific trawls for demersal fishing**
Project leader	:	Shri K.K. Kunjipalu
Location of project	:	Cochin, Visakhapatnam and Veraval
Associates at Centre	:	Shri S.V.S. Ramarao, Dr G. Rajeswari and Dr U.S. Sreedhar
3. Title of Project	:	**Management measures in trawling with reference to conservation and fuel saving**
Project leader	:	Shri N. Subramonia Pillai
Location of project	:	Cochin and Visakhapatnam
Associates at Centre	:	Shri S.V.S. Ramarao and Dr G. Rajeswari
4. Title of Project	:	**Studies on processing and quality aspects of fish and fishery products in the east coast of India**
Project leader	:	Shri Sib Sankar Gupta
Location of project	:	Veraval and Visakhapatnam
Associates at Centre	:	Dr D.I. Khasim, Dr R. Chakraborthi and Shri M.M. Prasad

★ Chief findings

- ★ The modified 30 m large mesh ecofriendly trawl developed at the Institute showed greater degree of escapement of juveniles than the net operated by the commercial mechanised boats. The catch rate of this trawl with a CPUE of 22.10 kg was also very promising.
- ★ Sodium tripolyphosphate (STPP), besides controlling the growth of red halophilic bacteria in salted and dried fish was also seen to show anti-oxidant property controlling rancidity to some extent.
- ★ The edible muscle of mullet as well as some other fishes caught from the near shore waters of Vizag was found to contain high levels of naphthalene hydrocarbons.

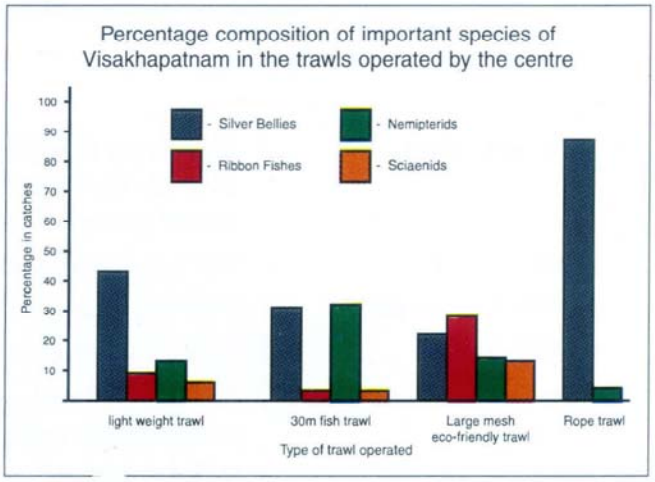
Report of work done

Fishing gear

Field trials were carried out with the 30m fish trawl developed at the Institute. The net was operated continuously for 61 hours at depths between 20 to 50m. The catch rate on an average was 15.67 kg/hour. The catches were mainly dominated by nemipterids which shared about 32.95 per cent of the total catch followed by silver bellies (30.85 %). A good catch of crabs (6.28 %) mainly supported by the single species *Portunus sanguinolentus* was also recorded by this net The net was sub-sequently modified into a 30m. large mesh eco-friendly trawl to facilitate the escapement of juveniles of commercially important species. This net was subjected to field trials at various depths off Visakhapatnam. During the 51 hours of operation a catch rate of 22.10 kg/hour was observed. The catches were dominated by ribbon fishes which shared about 28.84 per cent of the total catch. The percentage of juveniles of the species landed by this net was much less compared to that by nets operated by commercial mechanised boats wherein juveniles of this species form major portion of the so-called trash catch. The second dominant variety was silver bellies (22.98%) followed by nemipterids (13.13 %) and sciaenids (13.04 %).

Investigations were continued with a 30m. light weight trawl of CIFT design. During 91 hours of operation, the gear landed 2.6 tonnes of fish, indicating a catch rate of 28.30 kg/hour. Almost 50 per cent of the catch was constituted by silver bellies (42.60 %) followed by nemipterids (13.32 %), ribbon fishes (8.97 %) and sciaenids (5.86 %).

Investigations were also carried out with the 25m. rope trawl. This net landed on an average 15.17 kgs/hour, mainly dominated by silver bellies (87.91 %). The other species landed by this net were cat fishes (5.49 %), crabs (3.30 %) and nemipterids (3.30 %).



Comprehensive surveys were conducted in and around Visakhapatnam for the selection of site for the installation of the first FAD. The design of a simple bamboo raft type FAD was finalised and action for procurement of the material for construction and subsequent installation initiated.

Studies on the by-catch landed by mechanised fishing vessels were carried out. The trash catches were mainly dominated by juveniles of commercially important fishes such as ribbon fish, sciaenids, nemipterids and small crabs. Priacanthids of marketable sizes were also disposed as trash due to the lack of market.

Fish processing

Monitoring the presence of fungi on salted dried fish samples was continued. Sensitivity of fungus isolates from air, sea water and fish samples at Vizag coast to salt and preservatives was studied in detail.

Penicillium sp. was seen to be most sensitive to propionic acid and sodium benzoate among the dominant halotolerant isolates, namely, *Aspergillus flavus, A. niger* and *Penicillium* sp. *A. flavus* was the most

sensitive to potassium sorbate. New fungi isolates are under study for identification.

Fresh marine fishes such as *Priacanthus* sp., *Decapterus* sp., Carangidae, horse mackerel and seer collected from local markets were screened for histamine levels in the edible muscle which varied from 2.4 mg. to 8.4 mg/ 100g muscle. In the Carangidae, even after becoming unacceptable after keeping for 8 hours at ambient temperature, histamine level increased to the range of 6.8 – 7.6 mg/100g muscle. Further monitoring is being carried out.

A simple method was evolved to separate caroteno-proteins from prawn shell waste. Storage characteristics are under study. Loss of the carotenoid pigment was seen to occur on storage at ambient temperature.

About 40 samples of fresh fish and shellfish samples from local market and iced and frozen shell fish samples from local processing plants were screened for major pathogens, namely, Vibrios, Salmonella and coagulase +ve Staphylococci. Along with pathogens the samples were also screened for coliforms, *E. coli* and faecal Streptococci. Suspected Salmonella and Vibrio species were purified. Characterization and identification are in progress.

Water samples from processing plants were also tested for Salmonella and *Vibrio cholerae* along with TPC, coliforms (MPN) and *E. coli* (MPN). In one particular case, *Vibrio cholerae* was encountered and it was brought to the attention of the management of the processing plant.

About 25 samples of fresh water fish of different varieties were screened for *E. coli* using VRBGA + Mug media and were found absent.

Forty samples of solar salt were screened for red halophiles, slime producing halo-tolerant bacteria (SPHB) and Halomonas. Further studies are in progress.

Different varieties of fish and shellfish both from marine and fresh waters and cultured prawn samples from different locations namely, Nellore, Ongole, Kakinada, Bhimavaram, Kolleru lake and Visakhapatnam areas in Andhra Pradesh were collected and different tissues of the fishes digested for heavy metal analysis (Pb, Cd, Zn, Cu, Cr, Co and Mn) using AAS. It was interesting to note that accumulation of heavy metals such as Pb, Cd, Cu and Zn was more in the tissues of marine fishes of the species sciaenids, *N. japonicus*, *Priacanthus* sp. and *Decapterus* sp., caught from deeper marine waters than in the tissues of fresh water fishes such as catla, mrigal, tilapia, *Notopterus* sp. etc collected from Kolleru lake area. Internal organs such as liver, gonads and eggs accumulated comparatively higher concentrations than edible muscle and skin. Head and hepatopancreas of cultured prawns accumulated higher levels than the edible meat. Edible meat from *Wallago attu* from the local Meghadrigadda reservoir contained about 0.2 ppm of total mercury. However, edible muscle from all the fishes and prawns contained these toxic metals within tolerable limits. Red meat of tuna and horse mackerel accumulated more zinc and other metals compared to the white meat portions. Some commercial shrimp feed samples analysed showed high amounts of Cd, Pb, Zn and Cu.

The edible meat of mullet caught from inshore waters nearer to Vizag harbour, was found to contain 1.45 mg/g (on wet basis) of naphthalene hydrocarbon (a poly nuclear aromatic hydrocarbon) whereas tilapia caught from Kolleru lake area contained only 0.149 mg/g. The studies are being continued.

Some deep sea fish samples collected from FSI vessels including new varieties and other marine varieties were analysed for proximate composition and nutritional elements. These include *Protonebia diacanthus, Siganus*

rivulatus, Siganus javans, Ephippus orbis, Atule mate, Aloes melanoptera as well as some lobster varieties. The edible meat of these fishes was digested for amino acid analysis. Studies are in progress.

Small size silver bellies dipped for 10 minutes in water mixed with citronella oil, packed in polythene bags and kept in closed containers were found to be in acceptable condition even after six months of storage at room temperature. Some insects were seen in the control samples whereas the treated samples did not contain any insect.

Storage studies were carried out of ready-to-fry products prepared from silver bellies, upenoids and anchovies packed in polythene bags. Even after six months storage at room temperature the moisture content was 10 ± 2% and TVN values were in the range of 75.00 to 85.00 mg/100 g. TVN and PV values were higher in control samples than in STPP and spices treated samples.

Commercial cured and sundried ribbon fish and seer fish were procured from the local market and treated with STPP at different proportions. The samples were packed in polythene bags and stored at room temperature. The peroxide values of the STPP treated samples after 2 months were lower than that of the control samples showing antioxidant effect of STPP.

A few commercial shrimp feed samples from different markets in Andhra Pradesh were analysed for proximate composition, nutritional and toxic elements. Some of the feeds contained high levels of Cd, Pb and Zn.

The feed samples were tested for the presence of aflatoxin but the results were found to be negative.

Extracts were obtained from about 20 different varieties of fatty and lean fishes with chloroform + methanol mixture and the extracts are being analysed for fatty acid content.

BURLA RESEARCH CENTRE

Research projects handled

1. Title of Project	:	**Studies on improved harvesting techniques for reservoir**
Project leader	:	Shri A.A. Khan
Location of project	:	Burla
Associates	:	Nil
2. Title of Project	:	**Improvements on the existing methods of processing fish in Orissa**
Project leader	:	Shri J.K. Bandhopadhyay
Location of project	:	Burla
Associate	:	Shri A.K. Chattopadhyay

★ Chief findings

- ★ Gill nets of high tenacity monofilament of 30 mm mesh bar size showed better catch than other mesh sizes.
- ★ Five per cent of pseudo-hibernated *Channa* spp. were found to survive up to 18 hours in moist condition at 11-14°C.
- ★ No standard practice is seen to be followed in the commercial curing yards of Orissa.

✍ Report of work done

Fishing gear

Fabrication of forty units of high tenacity monofilament gill nets with mesh size ranging from 30-60 mm was completed and field trials initiated. From preliminary trials it was observed that 30 mm mesh bar gill nets landed better catch comprising mainly minor carps and cat fishes compared to the other mesh size gill nets.

Nine traps made of bamboo were operated with different baits at various depths and location. The catch comprised mainly of fresh water prawn *(M. malcomsonii)* and small cat fishes.

Studies were carried out on the effect of different sweep lengths on the performance of a 8.5 m trawl. The net was operated with 5 m and 10m sweep lengths. Work is in progress.

Fish processing

Studies were continued on the time-temperature tolerance for cold shock hibernation of small varieties of fresh water fishes. Experiments were carried out during the period with *Channa* spp. The water temperature was maintained between 29°C and 31°C with rate of reduction of the temperature at 1°C per minute. Different sizes of the fish (12 cm – 22cm) pseudo-hibernated at around 11°C. The hibernated fishes were kept in moist condition in a poly urethane foam (PUF) insulated box whose inside temperature was maintained between 11°C and 14°C. About 25 per cent of the fishes survived even after 18 hours of storage.

Survey was carried out of the commercial curing/drying yards along Orissa coast. Forty eight curers of Puri and Ganjam districts were covered by the survey. Studies revealed that all the respondents have adopted dry curing method and about 53 per cent were engaged solely in curing business.

Only small and medium sized fish were cured. Small cement or earthern vats were used for the purpose. Ratio of fish to salt was maintained at 2:1. The curing time was roughly adjusted between 10-12 hours. It was observed that the fishes were never restacked and the somewhat large fishes were never eviscerated.

After curing the fishes were dried on the beach on plastic sheets, bamboo mats, coconut leaf mats or on platforms made of old nets. Rope drying was also done in some cases. Drying time varied from 6 to 8 hours in the case of small fish and 10 to 12 hours for medium size fish. Yield and shelf life of the products varied widely. The taste of the end product was judged average by the local consumers. In general it was observed that no standard method was being followed for packing and storage of the cured and dried products.

The samples were subsequently analysed for physical, biochemical, microbiological and organoleptic qualities and the moisture, fat, TVN, alpha amino nitrogen, PV, TBC, TMC and organoleptic scores recorded.

HOSHANGABAD RESEARCH CENTRE

Scientist associated : Shri George Ninan

The main areas of work envisaged under this Centre are:

a) To cater to the research and development needs of the fishery of the reservoirs located in Madhya Pradesh with the main Centre at Hoshangabad.
b) To train the local fishermen in net fabrication and in reservoir fishing on scientific lines.
c) To suggest solutions to minimise the post-harvest losses in catches and to ensure the quality of the catch.
d) To assess the feasibility of value addition of the catch.
e) To work in collaboration with CICFRI, CIFE and Madhya Pradesh State Fisheries Deptt. for the development of reservoir fishery.

Report of work done

A benchmark survey of the major reservoirs in Madhya Pradesh with the aim of chalking out future course of research work is in progress. The main objective of the survey is to study the existing fishing methods and scope for post harvest technology with reference to reservoir fisheries.

MUMBAI RESEARCH CENTRE

Research project handled

1. Title of Project	:	**Quality improvement and value addition in fish and fishery products of Maharashtra region for domestic and export market**
Project leader	:	Shri D.K. Garg
Location of project	:	Mumbai
Associate	:	Shri S.P. Damle

★ Chief findings

- ★ Fresh water fishes such as rohu and catla sold in Navi Mumbai markets are found to be brought from reservoirs of Pune by lorry and from Gujarat by train.
- ★ Shelf life of iced stored chunks of 'Karkara' (*Pomadasys maculatus)* was found to be seven days while that of 'Chand' (*Drepane punctata)* was found to be nine days.

✍ Report of work done

Fresh water fishes such as rohu and catla retailed in Navi Mumbai markets located in Vashi, Belapur and Turbhe were sampled for their quality assessment. Fresh water fishes were sold in small quantities in all these markets. While marine fishes were sold in numbers or chunks, fresh water fishes were sold by weight. Both these varieties were brought from fresh water reservoirs of Pune by lorry and from Gujarat by train. Bacterial load on both the varieties was found to be more than 10^5. Organoleptically the quality varied between 'fair to poor' which may be due to the time lag between the time the fish was caught and ultimately retailed in market with poor icing and improper handling. The time lag, as reported by retailers, is usually 4-5 days which explains the organoleptic quality.

With a view to studying the iced storage shelf life of some of the common varieties of marine fishes sold in Vashi and Belapur markets, two commonly available varieties normally sold in these markets were sampled. These are 'Karkara' and 'Chand'. 'Karkara' (*Pomadasys maculatus)* weighing around 5 kg with an overall length of around 80 cm was cut into chunks of 500 g. each, packed in polythene and stored in flake ice collected from one of the processing plants. Ice was replenished every alternate day. The proximate composition of 'Karkara' is as follows:

Moisture	-	75.8%
Protein	-	17.9%
Fat	-	2.3%
Ash	-	1.9%

Initial bacterial load dropped from 2.16 x 10^6 to 4.79 x 10^4 after eviscerating, cleaning and cutting the whole fish into chunks. TPC dropped to 1.83 x 10^4 on the second day and then was more or less steady till the fifth day.

After 8 days, TPC was found to be 3.51×10^5. Pathogens were found to be absent throughout the period of study. TVN value increased from 14.78 mg% to26.31 mg% on the seventh day and was 29.86 mg% on the ninth day. Overall observations indicated the shelf life to be 7 days, beyond which deterioration was observed.

'Chand' (*Drepane punctata)* was ice stored as whole fish. Fresh material was sampled in the morning from the retail market in Belapur. Study samples of an overall length of 20-23 cms, weighing around 400 g to 500 g each were ice stored in flake ice which was replenished every alternate day. The proximate composition of the sample was :

Moisture	-	76.1%
Protein	-	18.3%
Fat	-	3.7%
Ash	-	1.5%

Initial bacterial load of 6.13×10^5 dropped to 1.93×10^3 on the second day. Slight variations were observed in the TPC values on the succeeding days. On the eighth day TPC was 3.17×10^4 and on the tenth day the value increased to 1.19×10^5. TVN value increased from initial level of 12.37 mg% to 27.73 mg% on the tenth day. The shelf life, based on overall observations, was found to be 8-9 days.

Both the varieties arriving in Navi Mumbai markets are brought by retailers from New Ferry Wharf landing harbour.

CALICUT RESEARCH CENTRE

Research projects handled

1. Title of Project	:	**Processing of marine and fresh water fishery resources into upgraded traditional products**
Project leader	:	Shri K. George Joseph
Location of project	:	Calicut
Associate	:	Ms J. Bindu
2. Title of Project	:	**Studies on the ecology and behaviour of blow-fly populations in fish processing and storage systems with respect to the development of a target system for pest control**
Project leader	:	Dr Richard Wall (University of Bristol, U.K.)
Location of project	:	Calicut
Associate	:	Ms J. Bindu
3. Title of Project	:	**Appropriate packaging for fish and fish products**
Project leader	:	Dr T.K. Srinivasa Gopal
Location of project	:	Cochin
Associate at the Centre	:	Ms J. Bindu

★ Chief findings

★ *Aspergillus* spp. continued to be the major constituent of microflora in commercial dried fish brought to Calicut from outside Kerala. However, the percentage of *Polypaecilum* sp. was higher than that observed the previous year. This was at the expense of *Aspergillus* spp.

★ Blow-fly population showed variation depending on climatic condition. The population was highest during August – November.

✍ Report of work done

Trials on commercial scale applicability of anti-red and anti-insect treatments

One more trial was carried out at the commercial dry fish godown of a private party on the storage of dry fish packed in containers subjected to anti-insect treatments. Two types of containers, namely gunny bags and palmyrah leaf baskets, were sprayed on the outside with hydnocarpus oil, gingelly oil and Pyrocon-E. Reprocessed commercial samples of silver belly were used for the experiments. Periodical observations showed that the samples remained in an insect free state for a period of four months after which the samples showed crumbling, mainly due to the high fat content and loss of wholesomeness of the

product. The storage trial was discontinued after four months.

Survey of major markets and retailers

A survey of the major markets in Wayanad District was conducted. A total of ten wholesalers stationed in five centres (Kalpetta-1, Meenangadi-4, Ambalavayal-1, Meppadi-1 and Sulthan Bathery-3) were interviewed during the survey and details of the trade collected. One interesting finding was that all the wholesalers interviewed got their supply of the merchandise from Calicut Central Market.

Studies on fungi in dry fish

This study is aimed at monitoring the mycological quality of dried fish of commerce brought to states of India other than Kerala. Thirty five samples of dried fish of diverse species were collected and analysed.

The water activity (a_w) of the samples was found to be within the range 0.73 – 0.79 and the values were highest (0.76 – 0.79) during the period June to September.

One hundred and sixty one fungal isolates comprising *Aspergillus* spp. (52.80 %), *Aspergillus niger* (12.42 %), *Polypaecilum* spp. (15.53 %), *Rhizopus / Mucor* (18.63 %) and *Penicillium* spp. (00.62 %) were obtained from these samples.

Studies on 'Red' halophiles

Twenty samples of dried fish collected from Calicut Central Market were analysed for their chemical characteristics and bacteriological qualities with emphasis on halophilic bacteria. The summary of results is as follows:-

Chemical characteristics

Moisture	-	22.95	-	46.33%
Chloride	-	07.31	-	19.89%
Ash	-	19.00	-	29.00%
Fat	-	05.00	-	19.00%
Protein (WWB)	-	22.75	-	45.50%

Bacteriological characteristics

	Range of bact. load (-x10^3 / g.)	
Standard plate count	0.625	43.344
Total halophiles	07.125	1863.354
'Red' halophiles	0.334	72.670

Water activity (a_w) of these samples was found to be within the range 0.73 – 0.78.

Studies on blow-fly population in fish processing and storage systems

Studies on the population of the commonly found blow-fly, *Chrysomya megacephala*, have been emphasised in this project. Adult and larval sampling from inside and outside eight curing sheds at Puthiyappa, Calicut were done on a bi-weekly basis. The data collected for the period October 1997 – September 1998 shows that *Chrysomya megacephala* forms the major fly population inhabiting the curing centres. Fluctuations in their population were also observed in relation to climatic conditions, fishing seasons etc. The population showed an increase during the months August to November, the major fishing season.

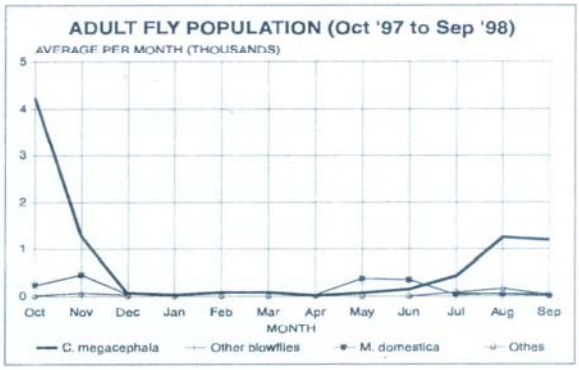
Diurnal patterns of fly movement were also investigated in order to find out the movement of the flies in relation to sunlight, temperature and wind. Three mark-release-recapture trials were also conducted during this period in which blow-flies, reared in the laboratory and marked with fluorescent dye, were released from a central point in the curing area and recaptured using sticky targets.

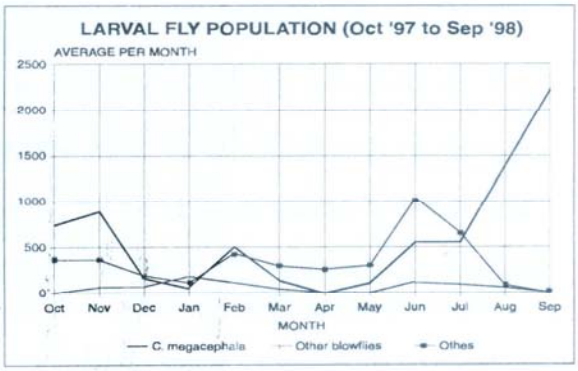
Studies on appropriate packagings for fish and fish products

Samples were prepared to study the shelf life of fried and dried mussel meat packed in different flexible packaging materials. Fresh mussels caught in the wild were bought from Calicut. The meat was removed from the shells and transported to the Headquarters laboratories at Cochin where it was fried in an

automatic electric fryer at a constant temperature. Condiments were then added to the fried mussel meat and the meat then packed in polyester film covers. Vacuum packed as well as air-packed samples were prepared. Periodic analysis of the samples is being carried out to monitor the changes in the chemical and bacteriological qualities.

Blow-flies entrapped on sticky paper target





FISHING CRUISE

Following are the cruises undertaken on board the research vessel FORV *Sagar Sampada* during the year under report.

Cruise No.	Period	Participant	Objectives
168	8-26 October 1998	Shri Sreekumar V. Thampi	• Stock assessment, biology and mapping of deep sea fishery resources
170	7-21 December 1998	Ms. Saly Paul	• Assessment of environmental parameters in the Indian EEZ and role of Myctophid fauna in the mecopelagic habitat • Studies on deep scattering layer • Harvest technology – operation and performance of bottom trawls and instrumentation connected with it

TECHNOLOGIES ASSESSED AND TRANSFERRED

- Designs of twelve wooden fishing vessels in the size range 7.62 m- 15.24m
- Designs of aluminium crafts for inshore waters and FRP pole and line fishing vessels for Lakshadweep waters
- Effective treatment for secondary species of timbers for boat construction and formulation of indigenous preservatives for traditional fishing craft
- Painting schedules for aluminium magnesium alloy and FRP sheathing for under water hulls of fishing vessels
- Antifouling and anticorrosive paints for protection of fishing vessels
- Mercury free anodes for cathodic protection of fishing craft
- Protective coating for cast iron propeller
- Specifications for cotton and different types of synthetic materials for fabrication of different types of fishing gear
- Designs of different types of fishing gear for exploitation of the fishery resources
- Combination wire rope for deep sea fishing
- Designs of dryers such as tunnel dryer, rotary fish meal dryer, electrical fish dryer for cottage scale operation
- Designs of a deep fat fryer, cutlet moulding machine, inboard and outboard drive, electro-thermal smoke kiln, mechanised processing table and mechanical fish cleaner for spratts
- Fuel efficient propeller for fishing boats
- Other fuel saving devices such as propeller nozzle
- Biogas plant from water hyacinth
- Electronic instruments for fisheries technology, commercial fishing, marine environmental obervations, fisheries hydrography, coastal engineering and agricultural investigations. The important ones are Trawl Depth Meter, Warp Load Meter, Fishing Log, Environmental Data Acquisition System, Speed and Distance Log and Ship Borne Data Acquisition System
- Fishing accessories such as trawl winch, power-take-off clutch and gurdy

- Improved methods for freezing, freeze drying, canning, drying and curing different types of fish and shellfish
- Hygienic drying of anchoviella on raised platform
- Cleaning schedules for fish processing establishments and boat decks
- Method for economic utilisation of low grade fish and conversion of fish wastes into useful by-products
- Methods for production of value added products such as fish wafers, fish pickle and battered and breaded products from fish/shellfish
- Chlorine level indicator paper for instant reading of chlorine level in water used in fish processing plants
- Specifications for various types of seafoods, process water and ice for food processing
- Procedure for implementation of HACCP
- Methods for extraction of chitin and chitosan from prawn shell waste and their application in textile and poultry industry and in the medical field; pilot plant for production of chitosan
- Method for extraction of shark fin rays and processing shark cartilage
- Bacteriological media for 1) Direct plate count of *Alteromonas putrefaciens* and 2) Enumeration of total bacteria in foods containing swarming *Bacillus* sp.
- An 18 hr depuration method to eradicate pathogenic bacteria and grittiness from bivalves, especially clams and mussels
- Collagen film from fish skin, bone and air bladder for application in treatment of burns
- Fine grade absorbable surgical sutures from fish gut
- Method for isolation of squalene from shark liver oil for use in cosmetics
- Method for preparation of n-3 polyunsa-turated concentrates from fish oils
- High gel strength agar from sea weeds
- Improved packaging materials for transportation and storage of fish
- Method for processing fish curry in flexible pouch. The product can remain without any change for over a year at room temperature
- Device for drawing uniform samples from frozen fish blocks for microbiological evaluation
- Deodorant for use in fish processing industry
- Antiseptic ointment for use by prawn handlers

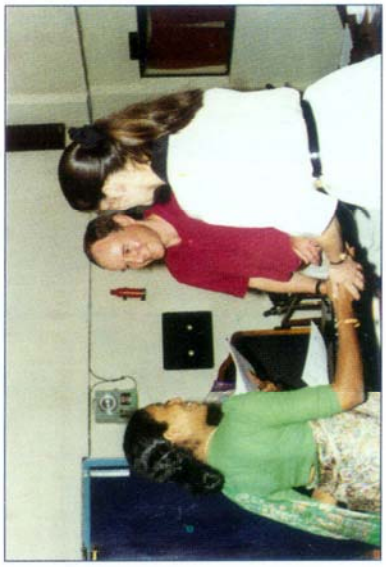
EXTENSION, EDUCATION AND TRAINING

TRAINING AND DEMONSTRATION

Subject	Beneficiary	Venue and Date
Production of value added fish products	Seven candidates from Lakshadweep	Cochin 2 - 3 Jan. 1998
Application of electronics in agricultural field investigations	Twenty six candidates	Cochin 19 – 24 Jan. 1998
Quality control of seafoods	Fifteen students of Madras Christian College, Chennai	Cochin 23 - 24 Jan. 1998
HACCP concepts	Eleven officials of Export Inspection Agency, Cochin	Cochin 2 – 7 Feb. 1998
Modern techniques of testing water quality	Six officials of Kerala Water Authority	Cochin 20 Feb. 1998
Demonstration on production of fish pickle and fish cutlet	Twelve unemployed young men and women sponsored by Common Facility Service Centre, Changanacherry	Cochin 23 Feb. 1998
Food hygiene and handling (in association with NRI, U.K)	Forty four scientific and technical personnel from MPEDA, EIA, industry and CIFT	Cochin (in 3 batches) 23 - 24 Feb. 1998 26 - 27 Feb. 1998 2 - 3 Mar. 1998
HACCP plan for the seafood industry	Twelve personnel from the industry	Cochin 23 - 28 Mar. 1998
Manufacture of dried and speciality products from fish	Fifty women sponsored by the Kerala State Women's Development Corporation Ltd., Trivandrum	Calicut (held in three batches) 9 - 20 Mar. 1998 20 - 30 Apr. 1998 25 May – 4 Jun. 1998
Demonstration on hygienic handling of fish/prawns on board fishing vessel and at landing centre	Fourteen trainees	Visakhapatnam 25 Mar. 1998
Fish handling, icing and filleting	Fifteen fisherwomen sponsored by Chellanam Panchayat SC/ST Service Co.op. Society	Kandakadavu, Cochin 3-4 Apr. 1998
Fish processing in general	Two youth members of the District Fishermen Youth Welfare Association, Gangavaram P.O.	Visakhapatnam 16 - 30 Apr. 1998
General fish processing technology	Twenty four B.Sc. (fisheries) students of Andhra Loyola College, Vijayawada	Visakhapatnam 16 - 30 Apr. 1998

Some of the training programmes conducted

Manufacture of dried and speciality products



Food hygiene and handling

Laboratory techniques for identification of bacteria in fish and fishery products

Seafood quality assurance

Production of fish ensilage

Hygienic handling of fish and prawns

Subject	Beneficiary	Venue and Date
Basic methods in microbiology	One senior grade lecturer from SNM College, Maliankara	Cochin 8 May-6 June 1998
General bacteriology and processing aspects	Four persons	Visakhapatnam 8 - 22 May 1998
Advances in electronic instrumentation for field data collection in agriculture and ocean sciences	Thirty five persons	Cochin 18 - 25 May 1998
Laboratory techniques for identification of bacteria in fish and fishery products	Six participants from processing establishments located at Cochin, Orissa, Maharashtra and Tamil Nadu	Cochin 18 - 30 May 1998
Preventive methods of wood boring	Few boat owners of Veraval	Veraval 10 July 1998
Quality control of seafoods	Twenty one technical staff from fish processing plants	Veraval
Manufacture of dried and speciality products from fish	Five persons One person	Calicut Five days Fifteen days
Laboratory techniques for identification of bacteria in fish and fishery products	Eight technologists from fish processing establishments	Cochin 20 Jul. – 1 Aug. 1998
Seafood quality assurance	Fifteen technicians sponsored by processing establishments in Kerala	Cochin 14 - 26 Sep. 1998
Laboratory techniques for identification of bacteria in fish and fishery products	Nine technicians from processing establishments in Kerala	Cochin 14 - 26 Sep. 1998
Fish processing in general	Eleven officials of MPEDA	Cochin 21 - 31 Oct. 1998
General bacteriology	Three technical personnel	Visakhapatnam 5 - 18 Nov. 1998
Processing mussel meat into various products	Ten students of a local college	Calicut 1 – 4 Dec. 1998
Utilisation of fish waste for production of fish ensilage	Fifteen women sponsored by CRATPAW	Cochin 2 Dec. 1998
Fish processing and quality control	Thirteen students of NSS Hindu College, Changanassery	Cochin 28 Dec. 1998 – 8 Jan. 1999

Analysis of products / materials

The Institute rendered technical assistance to the industry by way of testing materials and products manufactured / prepared indigenously, both at its Headquarters and Research Centres. Amino acid analysis of some of the samples was also carried out. In all 1956 such materials were analysed during the year. Samples tested at Headquarters include:

Product / material	No. of samples analysed
Frozen fishery products	310
Canned fishery products	3
Dried /dehydrated fishery products	67
IQF products	34
AFD products	11
Raw fish samples	9
Fish by-products	301
Oil	45
Water	290
Ice	80
Agar Agar	24
Calibration of thermometers	96
Craft materials	13
Sanitary survey	10
Chemicals	43
Packaging materials	248
Natural dyes	4
Bacteria testing kit	2
Other materials and products	22
Gear materials	25
Marine paints	21
Electrical fastenings and fittings	48
Marine engine	1

In addition to the above, seventy eight samples of water and ice were analysed as per European Economic Community norms (EEC).

The Calicut Centre analysed 75 samples of water, salt, frozen products and ice, Visakhapatnam Research Centre 44 samples of salt, water, frozen products, by-products, speciality products and chemicals and Veraval a total of 131 samples. The Bombay Centre analysed 24 samples of fresh and frozen fish and shellfish, 12 samples of water and ice, 3 of sodium hypochlorite, 3 of common salt and 20 samples of swabs from processing tables, utensils and workers hands.

Reply to queries

As in previous years, the Institute continued to reply to technical queries received on various topics related to fishing, fish processing and allied topics.

The queries received related to setting up plants for manufacture of various fish products and by - products, procedures for different types of products, composition of clam juice, details regarding chlorination of water, information on principle of shrinkage or loss in fish weight when transported from landing centre to consumer, budgetary cost details of dryers, details of fabrication and installation of the tunnel dryer etc.

Supply of designs and publications

One design each of the effluent treatment plant, and one tonne tunnel dryer developed at CIFT were supplied to two entrepreneurs.

The Institute also sold out thirty six copies of the publication *Biochemical composition of Indian food fish,* three of the Special Bulletin *Marine fishing gear and methods of India – Part I – Karnataka State,* one of *Abstracts of CIFT publications,* two of *Improved trawls developed at CIFT* and one of *Fishing in impounded waters – A case study of Hirakud reservoir.*

Exhibitions/Radio talks/T.V. broadcast

The Institute actively participated in the following exhibitions during the year:-

- All India Aquarium Show and Exhibition 1998 organised by Department of Fisheries and Matsyafed, (Government of Kerala) at Trivandrum, 6-11 January 1998.
- Mini exhibition at Valappu, Elamkunnapuzha in connection with World Environment Day (5 June 1998 and observed at CIFT on 29 June 1998)

Agricultural exhibition at Thriprayar

- Agricultural exhibition in connection with celebration of 32nd anniversary of Farm and Home programme of All India Radio at Thriprayar, 18-20 December 1998
- 'ADIMALI FEST' '98 at Adimaly, Idukki Dist. 26-31 December 1998.

Exhibits were also sent for display at the following two exhibitions:

- Indian Industrial Trade Fair '98 at Pragati Maidan, New Delhi, 14-27 November 1998
- Exhibition at Senegal, November 1998

The following radio talks were broadcast during the period

- Fuel efficiency in mechanised fishing vessels – *Shri M. Nasar*
- Technology transfer programmes of CIFT – *Dr Krishna Srinath*
- Production of indigenous fish feed as an income generating activity for women – *Dr Krishna Srinath*

Dr K. Ravindran, Director also took part in a feature 'Salary Plus' a programme by Hyphen Communications telecast over Asianet on 12 January 1998.

AWARD/DEGREE

Ms Leela Edwin, Scientist (Senior Scale) was awarded Ph.D. for her thesis entitled "Studies on the ringseine fishery of South Kerala Coast" by the Cochin University of Science and Technology. She carried out her work under the guidance of Dr C. Hridayanathan, Prof. School of Industrial Fisheries, CUSAT.

AD-HOC/SPONSORED/COLLABORATIVE PROGRAMMES

The following are the Ad-hoc / Sponsored / Collaborative projects / programmes undertaken at the Institute.

- **Design, construction, performance monitoring and popularisation of a new series of deep sea fishing vessels - *ICAR ad-hoc project***
- **Harvest technologies – Assessment of marine living resources research on board FORV *Sagar Sampada* - *DOD sponsored project***
- **Processing and test marketing of fish curry in retortable pouches - *MPEDA sponsored project***
- **Autolytic activity in mackerel and squid mantle muscle - *ICAR ad-hoc project***
- **Value added marine products - *MPEDA sponsored programme***
- **Value added products from low cost fish and their quality improvement - *Ministry of Food Processing Industries sponsored project***
- **Selectivity of trawl nets with respect to commercially important species of fin fish and shellfish caught off Cochin, South west coast of India - *ICAR ad-hoc project***
- **Occurrence of *Vibrio vulnificus* in tropical marine fish and development of methods for their eradication - *ICAR ad-hoc project***
- **Occurrence, effect of processing and survival of halophilic pathogenic Vibrios in fishery products of the export trade - *ICAR ad-hoc project***
- **Selective bio-accumulation of toxicants in cephaopods (viz. squid and cuttle fish) and changes in quality, its upgradation and safety of processed products - *ICAR ad-hoc project***
- **Studies on ecology and behaviour of blow-fly population in fish processing and storage system with respect to development of a target system for pest control - *CIFT-University of Bristol, U.K. collaborative project with ODA funding***
- **Development and application of electronics for agricultural field investigations - *ICAR ad-hoc project***

Details of these projects are given in the reports of the respective Divisions/Section

TECHNICAL GUIDANCE / CONSULTANCY

The Institute, as in previous years, continued to render all technical help to entrepreneurs as well as the state and central government departments in setting up establishments for fishing and fish processing and improving the working of existing ones. Some of the advisory services and consultancies in progress are listed below.

Name of party	Subject
M/s India Seafoods, Cochin	Processing of shark cartilage
Shri Koshy Thomas, Elamakara	Processing of shark cartilage
M/s Invicta Food Industries, Cochin	Technical report on production and distribution of prawn curry in flexible packaging

Dr. Ravindran, Director, hands over technical report on 'Production and distribution of prawn curry in flexible packaging' to Mr. N.T. Norbert, Proprietor, Invicta Food Industries, Cochin

M/s Amalgam Foods, Cochin	Standardisation of F_o value effective for pasteurisation of sea crab meat packed in multilayer film.
M/s Cochin Shipyard Limited, Cochin	Measurement of variation of water level of 10 number of borewells in the premises of Cochin Shipyard as part of pollution abatement work
M/s Aswin Seafoods, Veraval	Setting up of a quality control laboratory
M/s Mamta Cold Storage, Veraval	Implementation of HACCP in production of frozen whole round fish
M/s Blue Bay Exports (P) Limited, Cochin	Processing of shark cartilage
M/s ARK Marine Biopolymers Private Limited, Ponekkara, Ernakulam	Processing of shark cartilage
M/s Bhavani Seafoods, Veraval	Implementation of HACCP in production of frozen squid tubes

Ministry of Agriculture, New Delhi	Development of 18m steel stern trawler and gill netter-cum-long liner
M/s Hansawati Exports(P) Limited, Veraval	Improvement in building layout for installation of laboratory
M/s Rameshwar Cold Storage, Veraval	Modification of processing unit and implementation of HACCP system as per EC norms
M/s Karthik Cold Storage, Veraval	Modification of processing unit and implementation of HACCP system as per EC norms

In addition to the above, the Scientists and technical officers, were, one many occasions, called upon to take classes for students, deliver lectures at training programmes, refresher courses etc.

MANAGEMENT COMMITTEE

The Management Committee of the CIFT which was reconstituted w.e.f. 24.10.1997 for a term of 3 years functioned with the following members.

Chairman (Ex-officio)

The Director, CIFT, Cochin

Members

1. Director of Fisheries, Department of Fisheries, Government of Kerala, Trivandrum
2. Director of Fisheries, Department of Fisheries, Government of Karnataka, Bangalore
3. Dean, Faculty of Fisheries, Kerala Agricultural University, Kerala, Panangad
4. Shri Ponadmanda Ramachandra Rao, H.No.60-1-35, Jaganniakpur, Kakinada Post, East Godavari Dist.1, Andhra Pradesh
5. Shri Samir Kumar Mahaseth MLA, Qtr.No.4, New Family-Type, Road No.3, 'R' Block, Patna, Bihar-800 001
6. Dr R.A. Selvakumar, Asst. Director General (Mfy), ICAR, Krishi Bhavan, New Delhi
7. Senior Finance Accounts Officer, Central Marine Fisheries Research Institute, Cochin
8. Dr K. Devadasan, Head, Division of Biochemistry and Nutrition, CIFT, Cochin
9. Shri K.K. Balachandran, Principal Scientist, CIFT, Cochin
10. Shri D.K. Garg, Senior Scientist, Mumbai Research Centre of CIFT, Mumbai
11. Shri A.A. Khan, Senior Scientist, Burla Research Centre of CIFT, Burla

Member Secretary

Senior Administrative Officer, CIFT, Cochin

The committee met twice during the year

INSTITUTE JOINT STAFF COUNCIL

The Institute Joint Staff Council which was re-constituted with effect from 29-01-1996 for a period of three years fun-ctioned with the following members.

Chairman

The Director, CIFT

Member (Official side)

1. Dr T.S.Gopalakrishna Iyer, Head, Division of Fish Processing
2. Dr K. Devadasan, Head, Division of Biochemistry and Nutrition
3. Shri M. Nasar, Senior Scientist
4. Senior Administrative Officer/ Administrative Officer
5. Asst. Finance & Accounts Officer

Secretary (Official side)

Shri A.C. Joseph, Senior Scientist

Secretary (Staff side)

Shri M.K. Kuttykrishnan Nair, Technical Officer, (T-5)

Members (Staff side)

1. Shri K.U. Sheik, T-II-3
2. Shri T. Gopalakrishnan, T-II-3
3. Smt. T.K. Sarala, Superintendent
4. Shri Y. Kanakaraju, Junior Clerk
5. Shri P.A. Thomas, SSG.IV
6. Shri K.N. Velayudhankutty, SSG.II

The Council met thrice during the year.

STAFF RESEARCH COUNCIL

The Staff Research Council with the following members met twice during the year, on 3 February 1998 and 23 November, 1998.

Chairman

Dr K. Ravindran, Director

Members

All Project leaders

Member Secretary

Shri A.V. Shenoy, Senior Scientist

Dr R.A. Selvakumar, Assistant Director General (M.Fy), ICAR was also present at the meetings.

Progress of all ongoing project programmes for the half year period ending December 1998 and period ending September 1998 was reviewed at the meetings.

Significant observations/recommendations made/actions to be undertaken are briefly mentioned below.

- Updating of Proxim Database
- Publication of technical reports on technologies developed at the Institute
- CIFT – CMFRI collaborative works to be undertaken
- More attention to be paid to formulating projects relevant to the need of the co-mmon man
- More training programmes to be organised in preparation of battered and breaded products in view of the availability of the imported battering and breading machine installed at the Institute
- Need to restrict the number of chitin plants being set up in view of stiff competition for the raw material
- Need to confirm presence of *Vibrio cholerae* reported detected in fish before the matter is published
- Availability of cutlet making machine and fish fryer ready for transfer to the industry
- Stress to be laid on taking into account the number of workers, water storage capacity and ice production capacity while working on the idle capacity of the processing plants

RESEARCH ADVISORY COMMITTEE

The Research Advisory Committee with the following members met once on 27 March 1998.

Chairperson

Dr (Mrs.) Rugmini Sankaran,
89 B Gokulam, 2nd Stage,
V.V. Mohalla, Mysore –570 002

Members

1. Dr T.M. Rudrashetty,
   Karangalpadi, Mangalore – 575 003
2. Prof. R.L. Roychoudhury
   Velachery, Chennai – 600 042.
3. Dr P.U. Varghese,
   Kadavanthara, Cochin – 682 020
4. Shri K.P. Sashidharan Nair,
   Padmaragam, Kaitharam, Quilon-12
5. Dr C.T. Samuel, Unichira,
   Cochin – 682 021
6. Shri Sitaram Nishad,
   Advocate, 204 Civil Lines,
   Station Road, Faizabad,U P
7. Dr K. Ravindran, Director,
   CIFT, Cochin – 682 029
8. Dr Alfred Selvakumar,
   Asst. Director General (M.Fy.)
   (Representative of I.CA.R).

Member Secretary

Dr K. Devadasan, Head,
Biochemistry and Nutrition Divn.,
CIFT, Cochin – 682 029

Heads of Divisions of the Institute were also invited to attend the meeting.

Significant observations made and decisions taken include:-

- Recognition of competency of CIFT as evident from hiring of experts from CIFT by FAO for proposing ways and means of developing improved methods for utilization of fishery resources of Maldives
- Appreciation of recognition given by the European Union to CIFT's expertise and experience in field of quality assurance of fishery products by identifying the Institute as the Supervisory Audit Authority in recommending processing plants for export to European countries
- Need for popularisation of work on battered and breaded products and value added products from low value fish
- Stoppage of work on solar driers, as several designs are already available
- Improving budgeting of projects
- Importance stressed on proposed project on nutrients, toxicants, pollutants and growth promoters

The Research Advisory Committee meeting in progress

PROJECT ADVISORY COMMITTEE

The Project Advisory Committee with the following as members met four times during the year to finalise the new projects and te chnical programmes of on-going projects for the year 1998-99 as also to review the pro gress of all the research projects in the light of the milestones set for each scientist in the research project programmes of the Institute.

Chairman

Dr T.S.G. Iyer,
Head, Division of Fish Processing

Members

1. Dr K. Devadasan, Head, Division of Biochemistry and Nutrition
2. Dr (Mrs.) Krishna Srinath, Head, Division of Extension, Information and Statistics
3. Dr T.K. Sivadas, Head, Division of Engineering
4. Dr P.K. Surendran, Head, Section of Microbiology, Fermentation and Biotechnology
5. Shri K.K. Kunjipalu Senior Scientist

Member Secretary

Dr M.K. Mukundan
Head, Division of
Quality Assurance and Management

The Project Advisory Committee reviewed three new projects, twenty two on-going projects and seven ad-hoc projects.

Important observations, recommendations and decisions of the Committee are given below:

- Experiments on use of chitosan coated paper bags for improving shelf life of chilli to be continued
- A comprehensive report on the poly aromatic hydrocarbons (PAH) in Visakhapatnam harbour area and Kolleru lake to be submitted early as values of PAH in these areas are reported to be very high
- All pathogens usually present in fish to be monitored while screening for pathogens in order to make results more meaningful
- CIFT designed gear and expertise to be made available for promoting fisheries development in Lakshadweep

GRIEVANCE CELL

The Grievance Cell of CIFT was re-constituted with the following members for a term of two years with effect from 17.3.1998.

Chairman

The Director

Members

1. Dr (Mrs.) Krishna Srinath, Head, Division of Extension, Information and Statistics
2. Senior Administrative Officer
3. Asst. Finance and Accounts Officer
4. Dr Imam Khasim Saheb, Senior Scientist, Visakhapatnam Research Centre of CIFT, (Scientific)
5. Shri G. Ratnakaran Nair, T-4 (Technical)
6. Shri G. Somappan, Assistant (Administrative)
7. Shri T.A. Gopalakrishnan, Bearer (Auxiliary)
8. Shri P.A. Thomas, SSG.IV (Supporting)

Member Secretary

Shri N. Subramonia Pillai,
Senior Scientist

The Committee met once on 19 May 1998.

WOMEN'S CELL

In May 1998 the new committee of the Women's Cell was nominated with Dr Chinnamma George, Principal Scientist, as the Liaison Officer. Regular meetings were held with the supporting, administrative, technical and scientific staff for assessment of their welfare in general and problems faced, if any, during the working hours and for offering solutions for solving the problems.

The Women's Cell observed International Women's Day on 8 March, 1998. Dr K. Ravindran, Director, CIFT presided over the meeting. Dr Jacob Thomas, IPS was the Chief Guest. Dr P.J. Cecily, then Liaison Officer of the Cell gave a brief report on the activities of the Cell during the previous year.

Some of the members of the Cell performed 'Kaikottikali', a traditional folk dance, in connection with the Onam Day celebrations of the Institute.

Women's Cell annual day celebrations

PARTICIPATION IN SYMPOSIA/SEMINARS/WORKSHOPS

Particulars of Symposia/ Seminars/Workshops etc	Organised by/ Venue and Date	Participant(s)
Within the Country		
Seminar on Fisherwomen welfare development cooperatives and self employment schemes	Matsyafed, Trivandrum 9 Jan.1998	Dr Krishna Srinath Dr P.J. Cecily
Workshop on Monsoon losses in wet fish handling	Natural Resources Institute, U.K., Chennai 5-6 Feb. 1998	Dr D. Imam Khasim
XXVIII Fishermen meet on Mycotoxins in feed	CMFRI, Cochin 19 Feb. 1998	Shri V Narayanan Nambiar
Symposium on DNA technologies: Forensic and other applications	Jointly organised by Assn. for DNA Fingerprinting and other DNA Technologies (ADNAT) and Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad 23-24 Feb. 1998	Ms K.V. Lalitha
Seminar on Recent advances in chemistry	Cochin 4 Aug. 1998	Dr A.G.G.K. Pillai Shri P. Muhamed Ashraf
Workshop on Value addition and quality assurance for seafood exports	Jointly organised by Centre for Processed Foods and MPEDA, Cochin, 1 June 1998	Shri K.K. Balachandran
Workshop on Assessment of fish processing units for EU approval	EIA and MPEDA, Cochin 2-3 June 1998	Shri P.R.G. Varma Dr P.T. Lakshmanan
Workshop on Assessment of fish and fishery products establishments	EIA, Cochin 2-3 June 1998	Shri Sibsankar Gupta Dr D. Imam Khasim Shri K.K. Solanki
Workshop on Poverty and post harvest fisheries research	DFID, Chennai 4 June 1998	Dr D. Imam Khasim
Workshop on Career advancement of women	Institute of Management in Government, Cochin 14-16 July 1998	Dr Toms C. Joseph Dr Leela Edwin Ms Susheela Mathew
Symposium on Ocean space utilisation	Indian Institute of Technology, Chennai 17-18 July 1998	Shri M.V. Baiju
Workshop on Monitoring of EU approved fish processing establishments	Export Inspection Council of India, New Delhi, Cochin 17-18 July 1998	Dr P.T. Lakshmanan (As faculty)

Particulars of Symposia/ Seminars/Workshops etc	Organised by/ Venue and Date	Participant(s)
Seminar on Sustainable fishery resource management-strategies for Kerala	Fisheries Management Society, Kerala, Cochin 8 Aug. 1998	Dr K. Ravindran Shri K.K. Kunjipalu Shri N. Subramonia Pillai Shri T. Joseph Mathai Dr M.D. Varghese Dr B. Meenakumari
Annual Convention of Kerala State Janakeeyasutranam	State Planning Board, Trivandrum 16 Aug. 1998	Dr Krishna Srinath (Chaired session on Aquaculture)
Workshop of Working group on ecosystem monitoring and management	Commission for Conservation of Antarctic Marine Living Resources (CCAMLR), Cochin 10-20 Aug. 1998	Dr K. Ravindran Dr C.N. Ravishankar Shri T. V. Shankar Dr Jose Joseph Shri M.R.Boopendranath
National Seminar on History of Indian sciences	Cochin 26-28 Aug. 1998	Dr K. Ravindran
Eighth National Congress on Corrosion control	National Corrosion Council of India, Karaikudi, Cochin 9-11 Sep.1998	Dr K. Ravindran Dr A.G.G.K. Pillai
Experience sharing Workshop for Fisheries sector development in Gujarat State	Ahmedabad, 22-23 Sep. 1998	Shri K.K. Solanki
Workshop on Utilisation of by-catch	ODA and DFID, Visakhapatnam	Shri U. Sreedhar
Workshop on Germplasm inventorisation and gene banking of fresh water fishes under NATP	National Bureau of Fish Genetic Resources, Cochin 12-13 Oct. 1998	Dr K. Ravindran
Seminar on Raising HPLC performance with innovative technologies	Waters (India) Ltd., Cochin 30 Oct. 1998	Shri A.G. Radhakrishnan
Eighth Swadeshi Science Congress	Kerala Swadeshi Science Movement, Alleppey 5-7 Nov. 1998	Dr K. Ravindran Dr B. Meenakumari Shri K. Ramakrishnan
Fourth International Food Convention	Central Food Technological Research Institute, Mysore 23-27 Nov. 1998	Dr T.K. Srinivasa Gopal

Particulars of Symposia/ Seminars/Workshops etc	Organised by/ Venue and Date	Participant(s)
International Symposium on Large marine ecosystems: Exploration, exploitation and conservation of fish stocks	Fishery Survey of India, Cochin 25-27 Nov. 1998	Dr K. Ravindran Shri K.K. Kunjipalu Shri V. Vijayan Shri R.S. Manoharadoss Dr B. Meenakumari Shri T. Joseph Mathai Shri N. Subramonia Pillai Dr M.D. Varghese Shri A.A.Zynudheen
Sixth International Symposium on Advances in electrochemical sciences and technology	Chennai 26-28 Nov.1998	Dr A.G.G.K. Pillai
International Conference on Environmental sciences	C-MARS, RRL Trivandrum 2-4 Dec, 1998	Dr A.G.G.K. Pillai Shri P. Muhamed Ashraf
Symposium	Assn. of Microbiologists of India, Mangalore 5-7 Dec. 1998	Shri M.M. Prasad
Seminar on Women and technologies	Institute of Management in Government, Cochin 9 Dec. 1998	Dr Krishna Srinath
Workshop on Sustainable livelihood and environment management in the coastal ecosystems	Fisheries Resource Management Society, Kerala , Cochin 10-11 Dec.1998	Shri K.K. Kunjipalu
First Brainstorming Workshop on Aquaculture engineering	CIAE, Bhopal and MPCST 28-29 Dec. 1998	Shri George Ninan
Abroad		
FAO Consultancy on Utilisation of fish wastes	Maldives: Forty five days from 24 Mar. 1998	Shri P. Madhavan Shri K.K. Balachandran
APFIC Symposium on Fish utilisation in the Asia – Pacific region	FAO of the U.N., Rome Beijing, China 24-26 Sep. 1998	Ms K.V. Lalitha

PARTICIPATION IN TRAINING PROGRAMMES

Name of Course	Organisation /Venue & Date	Participant(s)
Within the Country		
62nd Foundation Course for Agricultural Research Scientists	NAARM , Hyderabad 7 Jan. – 5 May 1998	Dr Toms C. Joseph Shri Premkumar
DNA technologies: Forensic and other applications	Jointly organised by Centre for DNA Fingerprinting and Diognostics, Hyderabad and ADNAT, Hyderabad 25 Feb. – 10 Mar. 1998	Ms K. V. Lalitha
Field demonstration	Institute of Wood Science and Technology, Visakhapatnam	Dr G. Rajeswari Shri U. Sreedhar
Methods and techniques in marine biotechnology	Dept. of Biotechnology, University of Madras 23 Mar. – 12 Apr. 1998	Dr B. Meenakumari
Thermal processing of foods: Principles, practices and packaging aspects (short term course)	Central Food Technological Research Institute, Mysore 30 Mar. – 3 Apr. 1998	Shri G. Omanakuttan Nair
Faculty Training Programme for Fisheries Sector	Kerala Institute of Local Administration (KILA), Trichur 2-4 Apr. 1998	Dr Nikita Gopal (as faculty)
Assessment of seafood processing plants for export to EU	EIA, Cochin 2 – 3 June 1998	Shri P.R.G.Varma Dr P.T Lakshmanan
63rd Foundation Course for Agricultural Research Scientists	NAARM, Hyderabad 5 June – 30 Sep. 1998	Dr Nikita Gopal
Commercial production of agar	Trainers Training Centre of CMFRI, Mandapam 22-23 June 1998	Dr P.T. Mathew (as faculty)
Management development programme in agricultural research (Programme 1)	NAARM, Hyderabad 29 June - July 1998	Dr M.K. Mukundan
Application of SWOT Analysis in National Agricultural Research System	NAARM, Hyderabad 15-18 July 1998	Dr P.K. Surendran
64th Foundation Course for Agricultural Research Scientists	NAARM, Hyderabad 21 July – 13 Nov. 1998	Dr B. Madhusudana Rao Dr Sreevalsan J. Menon Shri Muhamed Ashraf
Methods of empowerment for development officials	Institute of Management in Government, Cochin 1 July 1998	Dr Krishna Srinath (as faculty)

Name of Course	Organisation /Venue & Date	Participant(s)
Improving the administrative efficiency in agricultural research and extension organisations	NAARM, Hyderabad 29 July – 5 Aug. 1998	Shri P.A. Uthup Shri G. Sasidharan
Advanced Course on Management of human resources in agriculture	NAARM, Hyderabad 7-18 Sep.1998	Shri Sibsankar Gupta
TQM and ISO 9000 quality system	Kerala State Productivity Council, Kalamassery 26 Sep. 1998	Dr Sanjeev, S.
Computer applications	CIFT, Cochin. Two and half weeks from 6 Oct. 1998	Twenty Admn. staff of CIFT
Agricultural research prioritization techniques	NAARM, Hyderabad 16-21 Nov. 1998	Shri G.R. Unnithan
Training of Trainers Course on Food quality and safety based on GMPs and HACCP principles	FAO and EIC, Cochin 30 Nov. – 11 Dec. 1998	Dr P.T. Lakshmanan
Abroad Pelagic fisheries	SEAFDEC, Thailand 23 Feb. – 24 Mar. 1998	Shri M.P. Ramesan
Advanced training on Practical implementation of HACCP systems in the working environment	Costa Rica 16-28 Mar. 1998	Dr C.N. Ravishankar Dr C. Ashok Kumar
Documentation and auditing of HACCP	Natural Resources Institute, Chatham, U.K. 30 Mar. – 3 Apr. 1998	Dr C.N. Ravishankar Dr C. Ashok Kumar
Group training course on Coastal fishing, training and extension	Kangawa International Fisheries Training Centre, Japan 7 Apr. – 6 Sep. 1998	Shri J.B. Paradwa
Short Term Regional Training Course on Refrigeration for fishing vessels	SEAFDEC, Thailand 3 Aug. – 3 Sep. 1998	Shri Moka Swamy Kumar

REPRESENTATION IN COMMITTEES

The following officials represented the Institute in different committees, boards, panels etc in various capacities.

1. **Dr K. Ravindran, Director**

As Vice-Chairman

- Organising Committee of the Eighth National Congress on Corosion Council of India.

As Member

- Academic Council of CIFE, Mumbai
- Board of Management, CIFE, Mumbai
- State Committee on Science and Technology
- Committee to examine various aspects of issue regarding registration and licensing of mechanised boats
- Board of Studies in Marine Biology
- Senate of Cochin University of Science and Technology
- National Advisory Committee of Symposium on Sustainable Development in Fisheries Towards 2020 AD – Opportunities and Challenges organised by CUSAT
- Editorial Advisory Board of scientific journal 'Aquacult' – of Nature Conservators (An international scientific and social organisation)

2. **Dr T.S.G. Iyer, Head,**
Fish Processing Division

As Principal Member 1 and Chief

- Supervisory Audit Team for monitoring performance of Inter Departmental Panel and approval of fish processing establishments for export to European Union

As Member

- Core-group for Value Added Products – Committee constituted by MPEDA
- Subsidy Committee for Captive Peeling Sheds (MPEDA)
- Interest Subsidy Committee (MPEDA)
- FAD 12 – Standards Committee for Fish and Fishery Products of Bureau of Indian Standards
- FAD 45 – Standards Committee on Food Hygiene – Bureau of Indian Standards
- Board of Studies (Industrial Fisheries) – Cochin University of Science and Technology
- Subject Matter Committee – PG Curricula, CIFE, Mumbai.

As National Consultant

- Food and Agriculture Organisation (FAO) of the UN

3. **Dr P.K. Surendran, Principal Scientist**

As Alternate Principal Member – I

- Supervisory Audit Team constituted by Govt. of India for monitoring performance of Inter Departmental Panel and approval of fish processing establishments for export to European Union

As Alternate Member

- Subsidy Claims Evaluation Committee constituted by MPEDA, Cochin

4. **Dr M.K. Mukundan,**
Head, Quality Assurance and Management Division

As Principal Member

- Supervisory Audit Team constituted by Govt. of India and European Union for approval of seafood processing plants

As Member

- Expert panel for validation of HACCP manual of seafood industries in India
- Committee for Finalising Exim Policy constituted by MPEDA and Department of Foreign Trade, New Delhi

5. **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

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

As Member

- Steering Committee on Geo Scientific, Agri – Electronic and Test and Measuring Instruments of Department of Science and Technology, Govt. of India

- NRC Working Group on Sonars and Under Water Electronics of Department of Electronics, Govt. of India
- Committee on Hydraulic Instruments constituted by Ministry of Water Resources, Govt. of India
- Sectional Committee on Marine Instruments and Safety Aids of Bureau of Indian Standards
- Indian National Committee on Hydrology (INCOH), Ministry of Water Resources, Govt. of India
- Transport Engineering Division Council of Bureau of Indian Standards
- Panel of experts of National Physical Laboratory, Delhi
- Technical Committee of INCOE – 97

7. **Dr. Krishna Srinath, Head, Extension, Information and Statistics Division**

As Member

- High level committee on Extension and Training constituted by MPEDA

8. **Shri P. Madhavan, Principal Scientist**

As Member

- Committee for Technical Scrutiny of Subsidy Application for Plate Freezer at MPEDA, Cochin
- Instrumentation Committee of CIFE, Mumbai

9. **Shri S. Ayyappan Pillai, Principal Scientist**

As Alternate Member

- BIS-TEDC Transport Engineering Division Council

10. **Shri P.K. Chakraborty, Principal Scientist**

As Member

- Subsidy Committee of MPEDA, Cochin

11. **Shri K.K. Solanki, Principal Scientist**

As Chairman

- Nagar Rajya Bhasha Karyavayan Samithi, Veraval
- Hindi teaching scheme at Veraval

As Member

- DPC, NRCG, Junagadh
- Management Committee, NRCG, Junagadh
- Inter Departmental Panel of experts for approval of seafood processing factories / fishing boat / landing centre for European Union

12. **Shri P.R.G. Varma, Senior Scientist**

As Member

- Inter Departmental Panel for southern region of India

13. **Dr Francis Thomas, Senior Scientist**

As Alternate Member

- Supervisory Audit Team constituted by Govt. of India and European Union for approval of seafood processing plants

14. **Dr P.T. Lakshmanan, Senior Scientist**

As Member

- Inter Departmental Panel (IDP) for assessing fish processing establishments and factory vessels for approval for export to European Union and US

15. **Dr T.K. Srinivasa Gopal, Senior Scientist**

As Member

- Advisory Committee constituted by MPEDA for the selection of fish boxes for fresh fish transportation
- Committee constituted by CIFT and MPEDA to identify value added fish products for export, select companies for production, transfer of technology, training of personnel etc.

16. **Dr Imam Khasim, Senior Scientist**

As Member

- Inter Departmental Panel for approval of fish processing plants for export

17. **Shri Sibsankar Gupta, Senior Scientist**

As Member

- Inter Departmental Panel for approval of fish processing plants for export

18. **Shri P.N. Joshi, Senior Scientist**

As Member

- Subsidy Committee for Acquisition of various processing machinery and equipment for production of value added marine products constituted by MPEDA
- Subsidy Committee of MPEDA for upgrading of cold storages
- Subsidy Committee constituted by MPEDA for

setting up new chilled fish storages

19. **Dr. S. Balasubramaniam, Senior Scientist**
As Member

- High level committee on Extension and Training constituted by MPEDA

20. **Shri S.P. Damle, Senior Scientist**
As Member

- Inter Departmental Panel for assessing processing plants for export of fishery products to EU.

21. **Shri D.K. Garg, Senior Scientist**
As Member

- Consultative Committee for Mumbai Base Offshore Fishery Survey of India
- Interview board constituted by Fishery Survey of India

22. **Dr K. Ashok Kumar, Scientist**
As Alternate Member

- Inter Departmental Panel (IDP) for approval of fish processing plants for export to EU in the States of Maharashtra, Goa, Daman and Diu.

ADMINISTRATION

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

The Research Centres at Burla, Hoshangabad and Calicut continued to function in rented buildings. Research Centres Mumbai, Veraval and Visakhapatnam functioned in their own buildings.

Five yearly assessment of technical staff for the period up to 31 December 1997 was completed and orders issued. The cases due for 31 December 1998 have also been taken up.

DPCs/Selection Committees met during the year for clearance of:-

a.	Probation	3 times
b.	Permanency	Once
c.	Promotion	5 times

Posts filled during 1.1.1998 to 31.12.1998

	Direct Recruitment	Promotion/ Departmental Test
Scientific	1	-
Technical	-	3
Administrative	1	32
Supporting	2	15

Staff position as on 31.12.1998

	Sanctioned	Filled
Scientific	101	94
Technical	184	164
Administrative	104	102
Supporting	125	101
Auxiliary	7	6
Total	**521**	**467**

TECHNICAL SECTION

Compilation of Research Project Programmes

The Research Project Programmes of the Institute for the year 1998-99, comprising three new projects, 22 ongoing projects and seven ad-hoc projects were compiled, taking into consideration the recommendations of the Project Advisory Committee, Research Advisory Committee, Staff Research Council, Institute Management Committee, ICAR Regional Committees, Directors' Conference etc., and brought out on the due date. The final reports of three projects completed during 1997-98 were sent to Council for record.

Preparation and submission of technical reports

Monthly report to DARE

Reports on the important activities of the Institute, significant research findings, training programmes, seminars, symposia and work shops conducted, particulars of new projects/ schemes undertaken, visit of officers abroad and visits by foreign delegates, exhibitions, film shows, radio talks etc. organised by the Institute, were collected from various Divisions at Headquarters and Research Centres, compiled and sent to Council regularly for inclusion in the monthly report to DARE for programme imple-mentation.

Ad-hoc/collaborative research projects

The Technical Section monitors correspondence and follow-up actions with regard to various ad-hoc/collaborative projects and NATP programmes undertaken at the Institute.

Regional committee meetings

Detailed reports on the research and extension activities carried out at CIFT Research Centres of Visakhapatanam and Burla (Region No.V) , Veraval (Region No.VI) and at the Headquarters and Calicut Research Centre (Region No.VIII) for the last two years were compiled and sent to Council at the appropriate time for presentation at the meetings of the Regional Committees of the respective regions. Action taken reports on the recommendations made in the previous meeting, pertaining to the above regions were also prepared and furnished.

Staff Research Council meeting

Meeting of the SRC was convened twice to review the progress of research projects handled at the Institute, for the respective periods.

Publication of scientific papers

The Technical Section acts as a clearing house for processing scientific papers, research notes and popular articles received from scientists, seeking Director's permission for publication and presentation. The papers are arranged to be presented before a Scrutiny Committee which meets periodically, to ensure the suitability of the papers for publication, before they are approved by the Director for publication/presentation.

During the period under report, 59 such papers were received from scientists and Director's approval for publication and presentation of 56 papers was communicated to the respective authors.

Maintenance and updating of project files

Consolidated quarterly reports, individual half yearly reports, annual reports and final reports of the ongoing projects were collected from the concerned Project Leaders and Associates for the relevant period and maintained up to date.

Data Bank

The updated biodata of all the scientists of the Institute were furnished to Council through the software package for updating the Biodata of ICAR Scientists at the ICAR Computer Centre.

Other technical works

The Technical Section also attends to various other technical matters relating to Awards, Fellowships and follow-up actions on the recommendations made at the Directors Conference and Regional Committee meetings, in-house training for ARS scientists and assessment of scientists. Besides, all the technical queries from various sources were answered on behalf of the Director.

OFFICIAL LANGUAGE IMPLEMENTATION

During the period under report CIFT carried out various programmes as per the annual programme for the year 1998-99 for implementation of the official language policy of the union issued by Government of India, Department of Official Language, Ministry of Home affairs.

Official Language Implementation Committee meetings

The quarterly OLIC meetings of the institute reviewed the implementation activities of CIFT. The committee consisted of the following members.

Chairman

Director

Members

1. HOD, Fishing Technology
2. HOD, Fish Processing
3. HOD, Bio-Chemistry and Nutrition
4. HOD, Engineering
5. HOD, Quality Assurance and Management
6. HOD, Extension, Information and Statistics
7. HOS, Microbiology, Fermentation and Biotechnology
8. Sr. Administrative Officer
9. Asst. Finance and Accounts Officer

Member Secretary

Asst. Director (O.L.)

Three quarterly meetings were held during the period.

Technical reports

The quarterly, half yearly and annual reports pertaining to Headquarters and Research Centres were forwarded to Council for inclusion in the report of the Secretariat.

Hindi Samaroh

As in the previous years CIFT celebrated Hindi day as 'Hindi Samaroh'. Competitions were held in terminology, translation, precis writing and letter writing.

The concluding day of the 'Hindi Samaroh' was conducted on 14 September 1998. Chief guest of the occasion was Dr K.T. Joseph, General Manager, Hindustan Organics Limited, Cochin who gave away the rolling trophies for the best division of the institute and individual competition winners. Keynote address on Official Language was delivered by Shri D. Mehrotra, Chief Surveyor of Mercantile Department, Government. of India.

Hindi Workshop

During the period under report two Hindi Workshops were conducted as given below.

First Hindi Workshop on Technical Aspects of Official Language was conducted for the technical category staff members of CIFT on 9 and 10 March, 1998 in which 16 staff members participated.

Smt Celin, Deputy Manager (OL) State Bank of Travancore, Cochin and Shri Vijayakumar, Research Officer of Regional Implementation Office, Cochin, were the resource persons for the Workshop.

Second Hindi Workshop on 'Computer aided implementation of official language' was conducted on 27 May 1998 for the senior scientists and scientists of this Institute. Dr Umashankar Upadhyay, Professor and Head of Hindi Department, University of Pune, delivered lectures on use of Hindi software in the field of Science and Dr Jagannathan, Professor, IGNOU, New Delhi delivered lectures on Modernisation process of official language.

Joint Hindi Week Celebrations – 1998

Cochin Town Official Language Implementation Committee Joint Hindi Week was celebrated from 16 to 25 November, 1998. CIFT participated in different competitions and won second position in designing poster, third in translation and consolation prizes in poetry recitation and Hindi typewriting.

Rajbhasha Rolling Trophy

The Institute won the Rajabhasha rolling trophy - IInd position for the best performance in official language implementation in the office, among the members of the Cochin TOLIC whose staff strength is more than 200.

Dr K. Ravindran, Director, receiving the Rajabhasha rolling trophy

LIBRARY

Structure

The library was shifted to the newly constructed wing on the second floor of the Institute. The new library has more space, adequate number of shelves for keeping books and comfortable seating arrangements.

Acquisition

A total of 93 books were purchased by the library during the year. Subscriptions were made to 50 foreign and 34 indian journals. Quarterly updates of Aquatic Sciences and Fisheries Abstracts (ASFA) database on CD-ROM have also been acquired. At present, the library holds 8276 books, 5038 bound volumes of journals and CD – ROMs of ASFA containing data from the year 1978 to 1998.

A new photocopier was purchased to strengthen the reprographic unit of the Library.

Services

During the year, 2633 bonafide readers visited the library and 1652 books were issued and retrieved. Reprographic unit of the Library supplied copies of 75000 pages of documents on requisition. Issues of current contents were brought out fortnightly. Lists of quarterly additions of books were circulated among various Divisions and Research Centres of the Institute. The Library , in association with NIO, Goa, continued to act as a national input centre of ASFA database.

EVENTS

National Symposium

A national symposium on Advances and Priorities in Fisheries Technology was organised by the Society of Fisheries Technologists (India) in association with CIFT as part of Golden Jubilee Celebrations of India's independence from 11-13 February 1998. About 250 delegates consisting of scientists, teachers, research scholars, industrialists and administrators participated in the symposium in which 106 papers were presented.

Rear Admiral R.K. Whig, AVSM, inaugurating the symposium

Summer Institute

A Summer Institute (Short course) on Advances in Electronic Instrumentation for field data collection in Agriculture and Ocean Sciences sponsored by ICAR was held at the Institute from 18-27 May 1998. Thirty five personnel including scientists, engineers, teachers and research scholars from agricultural universities, state and central government institutes participated in the Summer Institute. The programme included theory classes, practicals, field demonstrations and discussions.

Trainees of the Summer Institute participate in demonstration of method of data collection using sensors developed at CIFT

ICAR Fisheries Directors' meet

The meeting of the Directors of all the eight ICAR Fisheries Institutes was held at the Institute on 10 September 1998.

Release of publications

In connection with the 32nd anniversary of the Farm and Home programme of the All India Radio, Trichur, the English edition of a book entitled **Kadalekum Kanivukal** (Bounties of the sea), published jointly by CIFT and AIR, Trichur was released by Shri K.E. Ismail, Minister for Revenue, Kerala in the presence of Shri Krishnan Kaniyanparampil, Minister for Agriculture, Kerala State, at a function held at Thriprayar, Trichur Dist. on 19 December 1998.

A memento was presented by AIR to Dr Krishna Srinath who conceived the theme and coordinated the broadcast and publication of the Farm and Home series.

A publication entitled **Improved trawls developed at CIFT** was also released at the time of inauguration of The Golden Jubilee Block by Dr. R.S. Paroda, Director General, ICAR.

Release of the book 'Kadalekum Kanivukal' (Bounties of the sea) by Shri K.E. Ismail, Minister for Revenue, Kerala

Report of ICAR Zone III Inter-Institutional Sports Meet

A 60 member contingent of the CIFT participated in the ICAR Zone III Inter-Institutional Sports meet organised by NAARM at Hyderabad during 15-18 December, 1998.

The team won the following prizes:

Women

100m	1	Anitha K. John
	2	M.V. Valsala
200m	1	Anitha K. John
High Jump	1	K. Smitha
	2	V.K. Raji
Long Jump	1	Anitha K. John
	2	K. Smitha
Shotput	1	J. Bindu
Shuttle Badminton		
Singles:	1	J. Bindu
Doubles:	1	J. Bindu and K. Smitha
Table Tennis		
Singles :	1	J. Bindu

Men

Javelin	1	B. Madhusudhana Rao

Ms. J. Bindu was adjudged the best sportswoman of the meet. The CIFT Team was also adjudged the second best in the march past on the inaugural day.

World Environment Day

In connection with World Environment Day an awareness campaign was organised by the Institute on 29 June 1998 at the coastal village of Valappu, Elamkunnapuzha near Cochin in collaboration with Ajantha Marananthara Sahaya Fund Society, an organisation of about 170 poor scheduled caste families. The campaign used a three pronged approach to project the theme of protection of the fragile coastal ecosystem and the role of coastal communities in coastal zone management through lectures, exhibition and film show. The programme was chalked out in accordance with the United Nations Environment Programme (UNEP) current year's slogan ***for life on earth, save our seas*** emphasizing the importance of the seas and the coastal zone.

'Women in Agriculture' Day

In connection with Women in Agriculture Day, fifteen participants of a training course on fish processing and marketing organised by Centre for Research and Training in Poverty Alleviation and Women Welfare and sponsored by the Department of Science and Technology, Govt. of India, were given training at the Institute on utilisation of fish waste for production of fish ensilage. Methods of production of value added fish products were also explained to them. The valedictory function of the training programme of CRATPAW as well as Women in Agriculture

Day was held at the Institute on 4 December 1998. Shri K.K. Somasundara Panicker, Worshipful Mayor, Corporation of Cochin, was the chief guest.

At Veraval Centre, fifty girls from two local educational institutions visited the Institute. They were briefed on the importance of the Day and the role the women have to play in the betterment of the nation. The students were later taken around the various sections of the Centre. They were explained the method of plating bacteria, various types of fish products and by-products developed at the Centre, different types of gear developed and their operation. An exhibition on harvest and post harvest technology of fish was also organised.

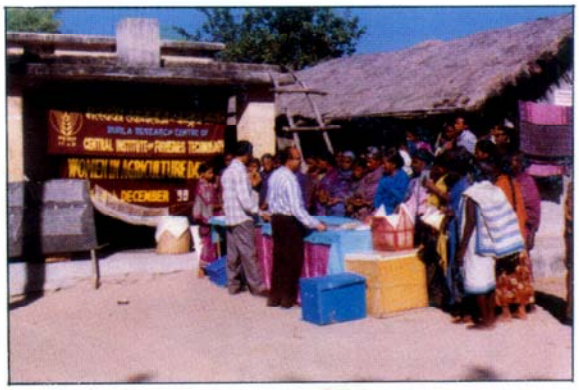
At the Burla Centre, an exhibition of the different types of gear and processed fish products was held for the benefit of forty members of a Mahila Samiti of Purana Burla Village.

Fisherwomen of Visakhapatnam fishing harbour engaged in handling and marketing were appraised of the hygienic method of handling fish at the Visakhapatnam Research Centre.

At Calicut, a training-cum-demonstration on processing mussel meat into a variety of products was given to ten girls from a local college as part of their academic project work. They were given opportunity to acquire hands-on experience in the development of the different products.

Girls being trained in processing mussel meat at Calicut Centre

Fisherwomen at Visakhapatnam Centre



Local women at an exhibition arranged at the Burla Centre

INAUGURATION OF GOLDEN JUBILEE BLOCK

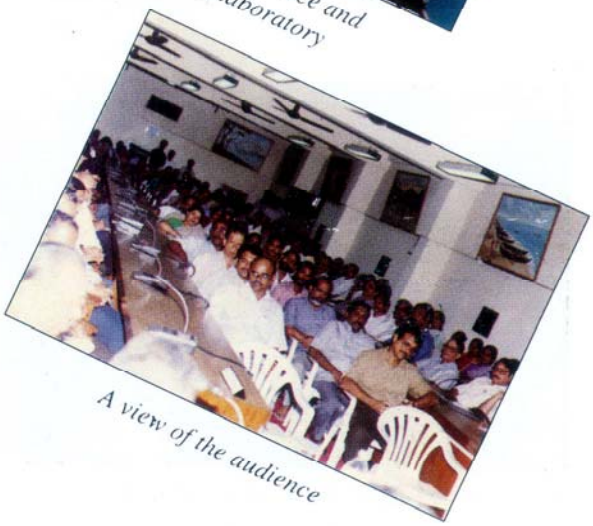
Dr R.S. Paroda, Secy. DARE and Director General, ICAR inaugurated the Golden Jubilee Block of CIFT on 8 December 1998. The new block houses the Quality Assurance and Management (QAM) Division, the Microbiology, Fermentation and Biotechnology (MFB) Section as well as the Institute's Library and ARIS Cell. Dr Paroda also formally inaugurated the state-of-the-art QAM and MFB laboratories built to ISO 9000 specifications.

Dr R.S. Paroda, Director General, ICAR inaugurating the Golden Jubilee Block of CIFT

In the Microbiology, Fermentation and Biotechnology laboratory

In the Quality Assurance and Management laboratory

Dr Paroda releasing the booklet Improved trawls developed at CIFT



A view of the audience

LIST OF MANAGERIAL STAFF AS ON 31 DECEMBER 1998

HEADQUARTERS, COCHIN

Director : Dr K.Ravindran

Heads of Division / Section

Fishing Technology Division	:	Dr K. Ravindran
Fish Processing Division	:	Dr T.S.G. Iyer
Quality Assurance and Management Division	:	Dr M.K.Mukundan
Biochemistry and Nutrition Division	:	Dr K. Devadasan
Extension, Information and Statistics Division	:	Dr Krishna Srinath
Engineering Division	:	Shri S. Ayyappan Pillai (Principal Scientist)
Microbiology, Fermentation and Biotechnology Section	:	Dr P.K.Surendran (Principal Scientist)

Principal Scientist

1. Shri P. Madhavan
2. Shri H. Krishna Iyer
3. Shri K.K.Balachandran
4. Shri P.K. Chakraborthy
5. Dr P.G. Viswanathan Nair
6. Shri Cyriac Mathan
7. Dr Chinamma George
8. Dr K. G. Ramachandran Nair
9. Dr A. K. Kesavan Nair
10. Shri T.S. Unnikrishnan Nair

Senior Scientist

1. Dr Jose Stephen
2. Dr P.T. Lakshmanan
3. Dr M.D.Varghese
4. Dr A. G. Goplakrishna Pillai
5. Dr Nirmala Thampuran
6. Dr M.R Raghunath
7. Dr P.T. Mathew
8. Dr B. Meenakumari
9. Dr S. Balasubramaniam
10. Dr Jose Joseph
11. Dr Sanjeev S.
12. Dr T.K. Thankappan
13. Dr Francis Thomas
14. Dr T.K.Srinivasa Gopal
15. Shri A.C. Joseph
16. Shri K.K.Kunjipalu
17. Shri A.G.Radhakrishnan
18. Shri P.R. Girija Varma
19. Shri P.K.Vijayan
20. Ms Mary Thomas
21. Shri P.N.Joshi
22. Shri V. Muraleedharan
23. Shri M.R.Boopendranath
24. Shri N. Subramonia Pillai
25. Shri V. Narayanan Nambiar
26. Shri T. Joseph Mathai
27. Shri P. Ravindranathan Nair
28. Shri G.R.Unnithan
29. Shri V.Vijayan
30. Ms K. Vijayabharathy
31. Shri K. Ramakrishnan
32. Shri P. George Mathai

33. Shri A Vasantha Shenoy
34. Shri Percy Dawson
35. Ms K. Ammu
36. Shri K.P Antony
37. Shri R.S.Manoharadoss
38. Shri M. Nasar
39. Shri V. Annamalai
40. Ms K.V. Lalitha

Scientist (Senior Scale)

1. Ms R. Thankamma
2. Shri T. Sankar
3. Shri A.C Kuttappan (CIFNET)
4. Ms Saly N. Thomas
5. Shri Braj Mohan
6. Dr Leela Edwin
7. Shri A Ramachandran (CUSAT)
8. Shri Pravin Puthra

Scientist

1. Dr C. N. Ravishanakar
2. Dr K. Ashok Kumar
3. Ms Susheela Mathew
4. Dr Tom C. Joseph
5. Shri Muhamed Ashraf
6. Dr B. Madhusudana Rao
7. Dr Nikita Gopal
8. Dr Sreevalsan J. Menon

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1. ShriT.S.Ganesan
2. Shri K.J.Francis Xavier

T-7

1. Shri Vasudevan Nair
2. Shri D.C.Besra

T-6

1. Shri M.S.Rajan
2. Shri N. Sriharshan
3. Ms T.T.Annamma
4. Shri C. Chandrashekharan
5. Shri G.Mohanan

T-5

1. Shri R. Gopalakrishnan Nair
2. Shri T.K.David
3. Shri C.R.Gokulan
4. Shri M.V.Baiju
5. Shri P.Ravindranathan
6. Shri M.M.Devasya
7. Shri P.S.Alias
8. Shri V.Gopalakrishna Pillai
9. Shri Thomas J. Mamoottil
10. Shri P.T.Sebastian
11. Shri N.M.Vasu
12. Shri M.K.Sasidharan
13. Shri M.K.Kuttykrishnan nair
14. Shri O.Subramonian

Senior Administartive Officer

Shri Nand Kishore

Administrative Officer

Shri G. Sasidharan

Asst. Adiministrative Officers

1. Shri M. George Joseph
2. Shri S. Naveenchandra Prabhu
3. Shri R. Anil Kumar

Asst. Finance and Accounts Officers

1. Shri P.A.Uthup
2. Shri H.Ganesha

VERAVAL RESEARCH CENTRE

Principal Scientist

Shri K.K.Solanki (Scientist-in-chrage)

Senior Scientist

Shri Rajendra Badonia

Scientist

1. Shri M.P.Ramesan
2. Dr Arnab sen
3. Dr A.A.Zynudheen
4. Shri C. Karthikeyan

5. Dr R. Raghu Prakash
6. Shri Prem Kumar

Technical Officer

1. Shri J.B.Paradwa
2. Shri K.U.Dholia
3. Shri G.P.Vaghela

Asst. Administrative Officer

Shri P.Vasudevan

VISAKHAPATNAM RESEARCH CENTRE

Senior Scientist

1. Shri Sibsankar Gupta (Scientis-in-charge)
2. Dr Imam Khasim Saheb
3. Shri S.V.S.Rama Rao
4. Dr Rupshankar Chakraborthy

Scientist (Senior Scale)

Shri M.M.Prasad

Scientist

1. Dr G.Rajeswari
2. Dr Sreedhar U

Technical Officer

1. Shri A. Veeranjaneyulu
2. Shri V.V.Ramakrishna

BURLA RESEARCH CENTRE

Senior Scientist

1. Shri Anwar Ahmed Khan (Scientist-in-charge)
2. Shri A.K.Chathopadyay
3. Shri J.K.Bandhopadhyay

Technical Officer

Shri Baikunta Pradhan

HOSHANGABAD RESEARCH CENTRE

Scientist

Shri George Ninan

Technical Officer

Shri Moka Swamy Kumar

MUMBAI RESEARCH CENTRE

Senior Scientist

1. Shri Dinesh Kumar Garg (Scientist-in-charge)
2. Shri S.P.Damle

CALICUT RESEARCH CENTRE

Senior Scientist

Shri K. George Joseph (Scientist-in-charge)

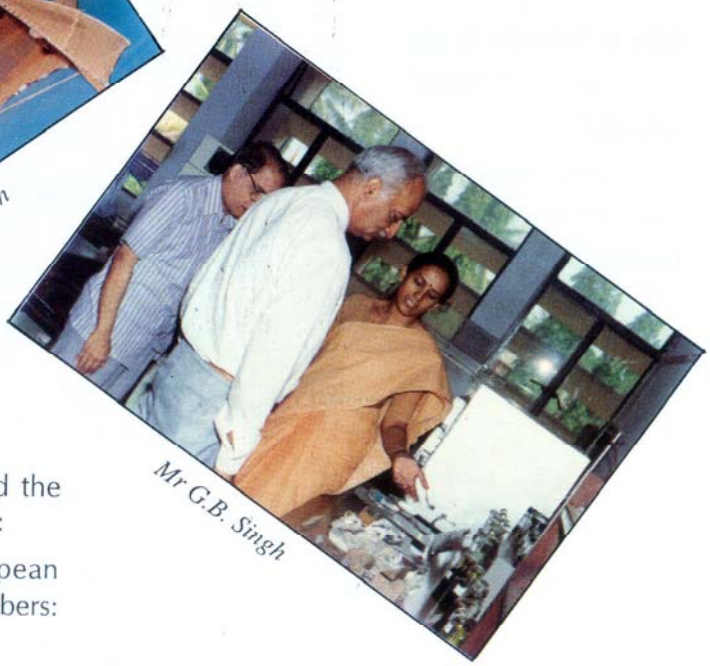
Scientist

Ms Bindu J

VISITORS TO THE INSTITUTE

Mr Bjorn Eirik Olsen and Mr Jan Trollvik

Mr A.N. Rath



Mr G.B. Singh

Some of the dignitaries who visited the Institute during the year are listed below:

- Team of journalists from the European Union consisting of the following members:
  - Mr Didier Morineau, Produits de la Mer Magazine, Rennes, France.
  - Mr Manrico Murzi, Island of Elba, Italy
  - Mr Nicui
- Mr G.B. Singh, Dy.Director General (IF), ICAR
- Ms Carmen Moraru, Lecturer, University of Galeti, Romania
- Mr Christopher Leftwich, Chief Inspector, Fishmongers Company, London, England
- Mr Jan Trollvick, Director of Information

Centre, Norwegian Seafood Export Council, Norway

- Mr Bjorn Eirik Olsen, Research Director, Norway, Norwegian Institute of Fisheries and Aquaculture Limited, Tromso, Norway
- Mr A.N. Rath, IAS, Principal Secretary, Fisheries and ARD, Govt. of Orissa
- Mr Altaf Hussain, Deputy Adviser, Planning Commission, Govt. of India.
- Mr K.R.K. Iyer, Director, CIRCOT (ICAR), Mumbai
- Shri D. Chhotrai, Joint Secretary and Dr. Rekha Pai, Director, Ministry of Food Processing Industries, New Delhi
- Dr R.S. Paroda, Director General, ICAR and Secretary DARE, New Delhi
- Dr P. Das, DDG (Extn) ICAR, New Delhi
- Dr S.L. Mehta, DDG(Edn.), ICAR
- Prof. V.N. Rajasekharan Pillai, Vice-Chancellor, M.G. University, Kottayam
- Prof. K.I. Vasu, Ex-Director, CECRI, Karaikudi
- Dr M. Raghavan, Director, CECRI, Karaikudi
- Mr Neil J. Mac Pherson, Sr. Fisheries and Aquatic Resources Adviser, DFID, London, U.K.
- Dr Lakshmi Menon, DFID, New Delhi
- Mr Vohra, IAS, Commissioner of Fisheries, Gujarat
- Dr D.D. Malavia, Assoc. Dean (Agriculture), GAU, Junagadh

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प्राक्कथन

मत्स्य एवं मत्स्य संसाधन व्यवसाय को उपयुक्त बनाकर, दीर्घीकृत एवं अंतर्राष्ट्रीय व्यापार आवश्यकताओं के अनुसार अनुकूल बनाना देश द्वारा सामना करने वाली चुनौती बन गयी है। केन्द्रीय मात्स्यकी प्रौद्योगिकी संस्थान ने इन चुनौतियों को स्वीकारा और तदनुसार संस्थान के (R & D) क्रियाकलापों को संस्थान ने उत्तरदायी मत्स्य तरीकाओं और मत्स्य पकडाव एवं उपयोग की कुल गुणता को सुनिश्चित करके सुझाव की ओर पुन: अनुस्थापित किया।

वाणीज्यिक मत्स्य के लिए अनुयोज्य एक 15.5 एम इंधन-क्षमता इस्पात मत्स्यन यान के अभिकल्प एवं संरचना और साधन महत्व एवं इंधन-क्षमता ट्रालों का विकास आदि मात्स्यकी प्रौघोगिकी अनुसंधान ने संस्थान द्वारा प्राप्त किए गए महत्वपूर्ण मील पत्थर होते हैं। जैव रसायन एवं पोषण अनुसंधान कार्य ने मत्स्य तेल के कोलोस्ट्राल को कम करने की गुणता पर अधिक प्रकाश डाला और तिर्यक बंधित एवं क्रोमीकृत कैलोजन कैटोसान झिल्लिकाएँ जिनको दंत एवं प्लास्टिक शल्य चिकित्सकों द्वारा सक्षम एवं बाजार में अत्यधिक आवश्यक उत्पन्न के रूप में विस्तृत अनुमोदन मिल गया है। संस्थान ने परोसने के लिए तैयार मत्स्य करी को भी भभका कोष्टों पर तैयारित करने की तरीका को भी मानकीकृत किया जो अब विपणी में परीक्षणाधीन है।

संस्थान के पहले ही प्रभावी, ठंग से संचालित अनुसंधान सुविधा कार्यक्रमों में दो नए विकसित, प्रयोगशालाओं को जोड दिया गया यानी गुणता आश्वासन एवं प्रबंध प्रयोगशाला एवं सूक्ष्म जीव एवं जैव प्रौद्योगिकी प्रयोगशाला। इनका औपचारिक उद्घाटन डॉ आर.एस. परोदा महा निदेशक भा. कृ. अनु. प द्वारा 8 दिसंबर 1998 को संपन्न हुए थे। इन कार्यक्रमों ने संस्थान को HACCP धारणा और अंतर संयंत्रीय सफाई, प्रौद्योगिकी स्थानांतरण विश्लेषात्मक सेवाएँ परामर्शिता एवं समुद्री खाद्य व्यवसाय उन्नयन आदि प्रशिक्षणों द्वारा गुणता नियंत्रण में अंतर्राष्ट्रीय मानकों के कार्यान्वयन को सुनिश्चित रखने के लिए व्यवसाय को सहायता देने में सहायक बना।

भारतीय स्वाधीनता के सुवर्णजयन्ती समारोह के सिलसिले 11-13 फरवरी 1998 के दौरान मात्यकी तकनोलजिस्टों की सोसाइटी (भारत) और के. मा. प्रौ. सं. ने संयुक्त रूप से मात्स्यकी प्रौद्योगिकी प्रगति एवं पूर्वता पर एक राष्ट्रीय परिचर्चा संचालित की।

इस अवधी में हुए (R & D) और विस्तार कार्यक्रमों एवं प्रशासनिक कार्यक्रमों संबधी रिपोर्टों से युक्त केन्द्रीय मात्स्यकी प्रौद्योगिकी संस्थान 1998-99 की वार्षिक रिपोर्ट को आपके समक्ष प्रस्तुत करने में मुझे अत्यधिक खुशी है।

ह/-
(डॉ के रवीन्द्रन)
निदेशक

अनुसंधान विशिष्टताएँ

मुख्यालय, कोचिन

मत्स्य प्रौद्योगिकी डिवीज़न

मुख्य उपलब्धियाँ

विविध संरक्षकों को प्रयुक्त करके रबड़ काष्ट (हीविया ब्रासिलिएन्सिस) पर संचालित अध्ययनों ने दिखाया कि जल बार्न कोपर क्रोमी आरसेनिक (सी.सी.ए.) और ऑयल बार्न क्रयोसेट संरक्षक का संयोग, वातावरणीय, धरती व समुद्रीय अवस्थाओं के अधीन जैव-बिगाड को उच्चतम रूप में रोकते हुए दिखाई पडा।

बन्दरगाह जालों में 180 दिनों की अवधि तक खुले रहने पर भी 5000 श्रेणी के एलुमिनियम एलॉय गर्तन एवं विदारिका संदूषण से मुक्त रहते हुए दिखाई पडा।

जलीय संवर्धन तालाबों एवं उनके निस्रावी रद्दियों के तिरस्कार, जल एवं मिट्टी पैरामीटरों का नियमित मॉनिटरिंग दिखाया गया कि कोचिन के वर्तमान झींगा एवं मत्स्य संवर्धन प्रथाएँ पर्यावरण को प्रदूषित नहीं करती है।

तलमज्जी ट्रॉलों के कोड एन्ड मेश आकार अद्ययन ने दिखाया कि 30 एम.एम. और 25 एम.एम. स्कवयर मेश कोड एन्ड से 80% किशोर मछलियाँ बच जाती है इसलिए उपतटीय मात्स्यकी स्रोतों के श्रेष्ट संरक्षण एवं प्रबंध के लिए 25 एम.एम. और इसके अधिक कोड एन्ड मेश आकार के तलमज्जी ट्रॉल का सुझाव दिया जाता है।

डायमन्ड मेश कोड एन्डों के जालों की अपेक्षा स्कवयर मेश कोड एन्ड के जालों में मत्स्य का प्रमुख आकार ग्रूपों को अधिक दिखाई पडता है, पी स्टैलिजेरा को छोडकर।

झींगा मत्स्यन के लिए विकसित अर्ध-बलून ट्रॉल झींगों को पकडने के लिए सक्षम एवं उचित दिखाई पडा।

बेड मेश तलमज्जी ट्रॉल (40 एम. और 32 एम.) और उन्नत खुलाव ट्रॉल गुणता फिन मत्स्यों एवं शीर्षपादों के शोषण के लिए प्रभावकारी निकला।

उप पकड के गुणता एवं संरचना मुल्यांकन ने दिखाया कि 30% किशोरों और छोटों को समाविष्ट करके उपपकड 70 से 90% माना गया है।

12 एम.एम. मेश कोड एन्ड के स्टेक जालों से पकड का पलायन प्रायोगिक तौर पर नहीं होता है। यह सूचित किया जाता है कि वाणीज्यिक तौर पर प्रयुक्त 10 एम.एम. मेश आकार और भी बढ़ा किया जाय।

मत्स्य संसाधन डिवीज़न

मुख्य उपलब्धियाँ

खेती किए गए पीनेस मोनोडॉन की हिमीकृत संग्रहण शेल्फ जीविका (-20^0 सी) बर्फ संग्रहण की बढ़ती करके कम कर दिया गया।

संवर्धित पीनेस मोनोडॉन से विभिन्न रूप आकृतियों के लेपित उत्पन्नों की तैयारी के लिए बैटर सम्मिश्रण एवं लेपन तरीका को मानकीकृत किया गया।

करी माध्यम में खेती किए गए झींगों के डिब्बाबन्दन संबंधी तरीका को विकसित किया गया।

डिब्बाबन्दित संवर्धित ताजे जल मत्स्यों के गठन सुधार के लिए तरीकाओं को विकसित किया गया।

ट्यूणा के काले मांस से माक्रो फाइब्रिलर प्रोटीन सांद्रण को पाउडर रूप में तैयार किया गया।

शुष्कित उत्पन्नों में फँफूदे आक्रमण को रोकने के लिए तरीकाओं को मानकीकृत किया गया।

बहुत निम्न विस्कासिता के और सौदंर्यवर्द्रक व्यवसाय में प्रयुक्त कैटोसान की प्राप्ति के लिए कैटीन को नियंत्रित अवस्थाओं में विऐलिकृत किया गया।

जल से विषैले घने लोहे, pb और cd के दूरीकरण और इसके अलावा (OC-BHC) के दूरीकरण से जो उन्नत शुद्ध जल का उत्पादन होता है, के लिए कैटोसान को विजयप्रद रूप में प्रयुक्त किया जाता है।

कैटोसान की सहायता से एक जलस्थायी विटामीन सी की तैयारी की गयी।

कर्कट सीपी से 10% प्रोटीन निचोड को समावेशित करके बहुत अच्छे कर्कट रुचि की करी तैयारी को रूपायित किया गया।

उपवेशी तापमान में दो महीनों तक संग्रहित करने पर भी रेड स्नापर से सुरुमी जोडकर तैयारित नूड्ल श्रेष्ट गुणता रखा जाता है। वाणिज्यिक मशहूर ब्रान्डों की अपेक्षा उसे 110% की शुष्कन गुणता है।

कैटोसान आवरित कागज़ थैलियों में संवेष्ठित करने पर हरी मिर्च की शेल्फ जीविका को श्रेष्ठ तौर पर बढायी जा सकती है।

क्रेस्टेशियन सीपियों से कैटीन तैयार करते वक्त रद्दियों की वसूली के लिए कार्यप्रणाली विकसित की गयी।

एनज़ाइमिक हाइड्रोलाइसिस द्वारा झींगी सीपी से प्रोटीन को निकाला जाता है जिसे प्रोटीन पूरक एक खाद्य गंध (सुवास) के रूप में प्रयुक्त किया जा सकता है।

सोयाप्लवर को मूख्य प्रोटीन स्रोत बनाकर 30% प्रोटीन से युक्त एक खाद्य को विकसित किया गया।

भभका कोष्ठों में संवेष्ठित, खाने के लिए तैयार वाँगडा करी की प्रक्रिया को मानकीकृत किया गया।

150 गेज CDPE के साथ पटलित वातरहित रूप में 12 U प्लेन पॉलीस्टर में संवेष्ठित शुष्कित बैराकुडा की 200 दिनों की संग्रहण अवधि थी जबकि वायु में संवेष्टित नियंत्रण नमूने केवल 35 दिनों तक अच्छी अवस्था में रहती हुई दिखाई पडी। उसी प्रकार ऐसे संवेष्ठनों में संवेष्ठित हिमीकृत D टाइगर झींगा को क्रमानुसार 330 दिन और 150 दिन और हिमीकृत सीर मत्स्य को क्रमानुसार 12 महीने एवं 10 महीने की शेल्फ जीविका थीं।

118 CD-HD सह बहिर्वेधित फिल्म से 12 U प्लेन पॉलीस्टर पटलित भभकाओं में संवेष्ठित वातहीन सूखे, सूगंध द्रव्यों से मिश्रित सीर मत्स्य को कोष्ठ तापमान में एक महीने की शेल्फ जीविका थी। वात युक्त संवेष्ठन नमूनों को एक हफ्ते के बाद तिरस्कृत किया जाता है।

जैवरसायन एवं पोषण डिवीज़न

मुख्य उपलब्धियाँ

पूर्वी तटों से प्राप्त मत्स्य की कुछ जातियों (ट्यूणा, मुल्लट आदि) के लिपिटों में अधिक मात्रा में पॉली असंतृप्त वसा अम्ल (PUFA) खासकर डोकोसा हेक्सानोइक अम्ल (डी एच ए) दिखाई पडा।

मुक्त PUFA के साथ अनुपूरण आहारों में विटामीन E का जोडन PUFA के साथ हाइपोलिपिडेमिक क्रिया के कारण कोई दर्शनीय फायदा प्रभावों को नही दिया गया।

आलबिनों मूषिकों पर निर्वसीकृत मत्स्य पाउडर खास हाइपो लिपिडेमिक गुणताओं को प्रदान किए गए दिखाई पडा। वह सीरम कुल कोलेस्ट्रॉल को निम्न करके और उन्नत सांद्रण के लिपो प्रोटीन अनुपात को बढ़ाते हुए दिखाई पडा।

धान्य, स्टार्च, आलू और टैपियोका आदि जलाटीनीकृत स्टार्चों सामग्रियों को मत्स्य मांस में 20% स्तर पर समावेशित करने पर, शुष्क उत्पन्नों के क्रियागत गुणों को सुधारते हुए दिखाई पडा।

जब वाँगडा को लवण या शुष्क नमक पर संसाधित करने पर संसाधन प्रारंभिक अवस्थाओं पर ऊतक की स्वलयन क्रियाशीलता शीघ्र बढती हुई दिखाई पडी लेकिन पेशी के लवणांश की बढती के कारण बाद में पूर्णत: रोकता है। जब स्किडों को उसी प्रकार संसाधित करने पर कोई प्रारंभिक उत्तेजन के बिना स्वलयन क्रियाशीलता रोकता था।

क्रूड पेशी होमोजनेटों को प्रयुक्त अध्ययनों ने दिखाया कि वाँगडा के स्वलयन प्रोटीनेसों ने पी.एच. अम्ल (पी.एच. 4) क्रियाशील और सल्फहाइड्रिल अभिकारक द्वारा सक्रियित था। क्षारीय पी.एच. (9&10) में सक्रिय प्रोटीनेस को, डाइथायोथ्रेइटोल (डी टी टी) और एथिलीन डायामीन टेट्रा अम्ल (EDTA Na2) द्वारा सशक्त रूप में रोका जाता है। स्किड में अम्ल पी एच प्रोटीनेस (पी.एच. 3,4) डी टी टी और इ डी टी ए द्वारा सशक्त रूप में सक्रियित है जब कि उदासीन एवं क्षारीय पी.एच. (पी.एच. 7, 8) प्रोटीनेस को सेरीन प्रोटीन रोधक जैसे कि फिनाइल मीथेल सल्फोनिल फ्लूराइड (पी एम एम एस) और ट्रिपासिन रोधक टोसल लाइसिल क्लोरोमेथिल केटोन (टी एल सी के) द्वारा रोकता है।

कोचिन के चारों ओर से संचित ताजे जल मत्स्यों में ओरगानोक्लेरिन पीडकनाशी एवं पॉली साइक्लिक अरोमाटिक हाइड्रोकारबनों (PAH3) को क्रमश: 1.5 पी पी बी से निम्न निहित दिखाई पडा। जाँच किए गए प्रमुख पी ए एच (PAH) नाफ्थलीन था।

साधारणत: ताजे जल मत्स्य एवं सीपी मत्स्यों के प्रोटीनों में अधिकमात्रा में ग्लाइसीन और निम्न मात्रा में ड्रिप्टोसन दिखाई पडता है।

मत्स्य वायु आशय से तैयारित कैलोजन-कैटोसन झिल्लिकाएँ, झींगी सीपी से तैयारित कैलोजन एवं कैलोजन घावों एवं जलन को ढकने के लिए उपयोगप्रद जैसे कि द्रवों व रक्तों के नष्ट को रोकने एवं संक्रमण को रोकने में उपयोगप्रद (सक्षम) निकला। तिर्यक् बन्धित एवं क्रोमिकृत झिल्लिकाएँ दंत चिकित्सा के अवहड्डीय एवं अधिहड्डीय परिदन्तिका खराबियों के लिए प्रयुक्त की जाती हैं।

गुणता आश्वासन एवं प्रबंधन डिवीज़न

मुख्य उपलब्धियाँ

केरल तट के विभिन्न स्थानों से जीवित सीपी मत्स्य एवं भारत के तटवर्ती राज्यों के समुद्री खाद्य व्यवसायों से संचित विलक, झींगे, कर्कट आदि को परखने से यह साबित किया जाता है कि हमारे सीपी मत्स्य पैरालिटिक सीपी मत्स्य विष (पी एच पी) से मुक्त है।

स्किवड एवं कतला मत्स्य के जिगर में मेटालोथिनिक प्रोटीन दिखाई पडा। इन प्रोटीनों की वियुक्ति एवं जाँच ने मेटालोथियोनिन पराकाष्ठा के अनुरूप भिन्नों के लिए 8 ug/ml काडमियम और 6 ug/ml ज़िक की उपस्थिति को स्थापित किया गया।

समुद्री खाद्य व्यवसाय से विश्लेषित करीब 30% हिमीकृत झींगों पर 'के' - मुल्य 25% दिखाई पडा। बाकी 70% ने करीब 40% के -

मुल्य को दिखाया जो निर्यात के समुद्री खाद्य की प्राथमिक गुणता को सूचित किया जाता है।

समुद्री ताजे वांगडे में भी हाइपोक्सान्थीन का बिगाड इन्डेक्स प्रतिग्राम में 0.6 मैक्रो मोल स्तर में दिखाई पडा।

निर्यात के लिए तैयारित अधिकतर 100 हिमीकृत नमूनों को जाँच करने पर जिनमें स्किवड, कतला मत्स्य ओक्टोपस, भिन्न मत्स्य जातियाँ, PUD, HL CP & FD झींगे शामिल है, ने विब्रियो कोलरे, सालमोनेल्ला और लिस्टीरिया मोने साइटोजन आदि रोगाणुएँ और जीवाणु सूचक ई कॉली की अनुपस्थिति साबित की गयी। फिर भी नमूनों में 10% ने कोआगुलेस पॉसिटीव स्टाफिलोकोकी और फेकल स्ट्रेप्टोकॉकी की उपस्थिति दिखायी पडी।

मत्स्य और सीपी मत्स्य के 84 नमूनों को परखने से रोगाण्विक हैलाफिलिक विब्रियो की उपस्थिति और उनका भार बी. मेथेनिकॉवी के संबंध में 1.9% और वी सिनसिनोटियिन्सिस के संबंध में 22.62% विभिन्न दिखाई पडा।

गुणता आश्वासन एवं प्रबंधन डिवीज़न

मुख्य उपलब्धियाँ

18 एम इंधन क्षमता अगाध समुद्री इस्पात ट्रॉल एवं क्लोम जाल व लंबी डोरों के लिए तीन बुनियादी पोत नमूनों को विकसित किया गया।

15.5 एम इंधन क्षमता इस्पात मत्स्यन यान की पूर्ति की गयी और उसकी नोदन व्यवस्था को स्थापित किया गया।

10 की ग्रा क्षमता का PVC सूर्य शुष्कक की संरचना की गयी और स्थापित किया गया।

सतत प्रवाह तिर्यक परिचालन गरम वात शुष्कक की संरचना प्रारंभ की गयी।

सांचित झींगा उत्पादन के लिए दबाब अत:क्षेपक उपकरण की अभिकल्पना की एवं निर्मित किया गया।

मूल्यवान मात्स्यकी उत्पन्नों के लिए एक रूपायन यंत्र का सविस्तृत अभियांत्रिकी आरेख विकसित किया गया।

±5 सी एम यथार्थता के 1 एम से 10 एम रेंज के ऊर्ध्व खुलाव ट्रॉल जालों को मापने के लिए एक जाल उन्नत मीटर को विकसित किया गया।

विस्तार, सूचना एवं सांख्यिकी डिवीज़न

मुख्य उपलब्धियाँ

36 एम.एम. मेश आकार और 0.16 एम.एम. डयामीटर के डोरों से युक्त नाईलॉन मॉनोफिलेमेन्ट क्लोम जालों का चेराई मत्स्यन केन्द्र पर किए गए विनिर्देशनों ने साबित किया कि प्रति यूनिट क्षेत्र पर प्रति घण्डें का औसतन मत्स्य पकड 44.660 की.ग्रा. होता है। 8.46 एम LOA मोटरीकृत तख्ता निर्मित यान को प्रचालित उपर्युक्त मछुवारों द्वारा पकडे गए मत्स्य पकड का औसतन मूल्य प्रतिदिन मत्स्य के लिए रु. 817.95 आकलित किया गया।

चेराई मत्स्य केन्द्र, कोचिन से 8.46 एम LOA मोटरीकृत तख्ता निर्मित यानों में 50 एम एम नाइलॉन मोनो फिलेमेन्ट क्लोम जालों का प्रचालन विनिर्देशन साबित किया गया है कि प्रति यूनिट क्षेत्र पर प्रतिघण्डे का औसतन मत्स्य पकड 21.19 की.ग्रा. होता है। मत्स्य पकड का औसतन मूल्य प्रतिदिन मत्स्यन के लिए रु. 1026.82 आकलित किया गया है।

गुजरात में, वेरावल मत्स्यन केन्द्र यंत्रीकृत मत्स्यन यानों को प्रचालित स्वामियों में सुधरी तरीकाओं के अभिग्रहण फैलाव में उन्नत प्राप्तांक (61.6%) दिखाई पडा और बाद में माँगरोल (56.64%) और पोरबन्दर 49.92% आए हुए दिखाई पड़ा। केरल मत्स्यन केन्द्रों पर अभिग्रहण प्राप्तांक उन्नत श्रेणी में (>85%) था और मत्स्यन केन्द्रों के बीच कुछ खास परिवर्तन नहीं था।

गुजरात केन्द्र के 11.31 से 13.5 एम LOA नावों को प्रचालित यंत्रीकृत नाव स्वामियों के बीच वार्षिक औसतन मत्स्यन पकड 78 टन से अधिक दिखाई पडा और केरल के कोचिन में यह उन्नत था (X=95.29) बाद में कोज़िक्कोड (X=39.47) और कोल्लम (X=28.90) आ गए।

तख्ता निर्मित यानों (11 से 20 LOA) को प्रचालित पारंपरिक मछुवारों के बीच समग्र मासिक औसतन मत्स्य पकड प्रति मत्स्यन दिन पुन्नप्रा में 553.46 की.ग्रा. चेथी में 526.81 की.ग्रा. और थैकल में 531.53 की.ग्रा. दिखाई पडा।

चेल्लानम, थैक्कल और कन्नमाली नामक तीन मत्स्यन गाँवों से आए गए मछुवारे प्रतिवादियों को समूह विशेषता घातांक प्राप्तांक खास तौर पर भिन्न दिखाई पडा है। लेकिन, जब उन्हें हिस्सेदार और मत्स्यन श्रमिकों के रूप में वर्गीकृत करने पर समूह विशेषता घातांक प्राप्तांक में कोई खास परिवर्तन न दिखाई पडता। प्रतिवादियों के सामाजिक,

वैयक्तिक एवं प्रौद्योगिकीय परिवर्तियाँ सभी तीन मत्स्यन गॉवों के समूह विशेषता अवगम पर कोई खास प्रभाव नहीं डाला गया।

केरल के मत्स्यन संसाधन कारखानें, प्रायोगिक अवस्थाओं पर उनकी स्थापित क्षमता का केवल 28% का उपयोग ही करते हुए दिखाई पडा। कच्ची सामग्री की अनुपलब्धता ही संयंत्र क्षमता के निम्न उपयोग का कारण निकला गया।

ट्रॉल रोकधाम केरल के मात्स्यकी व्यवसाय पर प्रतिकूल प्रभाव डाला गया, जब कि पूर्व ट्रॉल रोकधाम अवधि में उत्पादन भर पूर रूप से बढ़ते हुए दिखाई पडा। फिर भी गुजरात के मत्स्य संसाधकों का राय यह है कि मात्स्यकी स्त्रोतों का संरक्षण के लिए मत्स्यन रोकधाम आवश्यक है।

गुजरात में उत्पादन की अधिकतम प्रतिशतता विभिन्न मत्स्यों से है जिससे निर्यात के लिए मात्स्यकी उत्पन्नों का विविधीकरण के प्रति झुकाव की स्पष्ट सूचना मिलती है।

सूक्ष्मजीव विज्ञान, किण्वन एवं जैव प्रौद्योगिकी अनुभाग

मुख्य उपलब्धियाँ

कोचिन के चारों ओर के फुटकर बाज़ारों से संचयित मत्स्य नमूनों में आन्त रोगाण्विक (E Coli O 157:H7) नामौजूद रहा।

रिवेर्सड पॉसीव लाटेक्स अग्लूटिनेशन (RPLA) तकनीक द्वारा गरम अस्थिर डायरियल टोक्सीन की उपस्थिति की जाँच करने पर बाज़ार मत्स्यों से वियुक्त किए गए E Coli अविषैले निकला गया।

समुद्री जल से वियुक्त एक्टिनोइज़ीन वंशों ने मत्स्य आँतों में पाए गए ऐसे वंशों की तुलना में ग्राम धनात्मक एवं ग्राम ऋणात्मक जीवाणु के खिलाफ जांच करने पर निम्न जैव क्रियाशीलता को दिखाई। इन वंशों के करीब 10% वंश बैसिलस जाति के प्रति, मंद क्रियाशीलता दिखाई।

कोचिन और चारों ओर के स्थानीय फुटकर बाज़ारों से खरीदे गए मत्स्य और सीपी मत्स्य के 16 नमुनों में किसी में भी कॉम्पिलो बैक्टर जाति नहीं दिखाई पडी।

पंकीले खेत से संचित 12 नमूनों में और खेती किए गए मत्स्यों के 13 नमुनों में से एक में क्लोस्ट्रिडियम बोटुलिनम का जाँच किया गया।

स्थानीय फुटकर बाज़ारों से संचित ताजे मत्स्य नमूनों में 18% में विषैले बैसिलस सेरेस को ढूँढ निकला और आर.पी.एल.ए. तकनीक द्वारा बैसिलस सेरेस वंश के 85%, विषूचिका आंत्राविष उत्पन्न करते हुए दिखाई पडे।

स्थानीय फुटकर बाज़ारों से संचित ताजे मत्स्य नमूनों में 17% में सालमोनेल्ला सीरम प्ररूप को दिखाई पडा।

कोचिन कारपरेशन क्षेत्र के छः फुटकर बाज़ारों से संचित ताजे मत्स्य नमूनों के 75% में 10 / ग्राम कुल जीवनक्षम काउन्ड दिखाई पडा और 63% नमूनों में कॉली काऊंड 100 ग्रा (एम.पी.एन.) से अधिक दिखाई पडा।

स्थानीय फुटकर बाज़ारों से संचित ताजे मत्स्य के 110 नमूनों में किसी में भी येरसीनिया एन्डरो कोलिटिशिया को नहीं दिखाई पडा।

कोट्टयम जिले के ताजे जल खेतों के जल को कुल वायु जीवि काऊंड (टी पी सी) 10^3-10^4 cfu/ml रेंज पर था और पंक नमूने 10^5-10^6 cfu/g रेंज पर थे। माक्रोब्राचियम रोसेनबर्गे के सीपी व पेशी का टी.पी.सी 10^4-10^5 cfu/g रेंज पर थे और आँतों में 10^7-10^8 cfu/g रेंज पर थे।

वेरावल अनुसंधान केन्द्र

मुख्य उपलब्धियाँ

तलमज्जी ट्रॉलों और V-फार्म इस्पात ऊद नावों के, के.मा.प्रै.सं. अभिकल्पों के विनिर्देशन और प्रचार संचालित किया गया।

अर्ध शुष्कित, वाणीज्यिक तौर पर उपलब्ध मत्स्य के संसाधन एवं संग्रहण की विभिन्न पहलुओं पर सूचनाएँ संचयित की गयी।

कोअगुलेस पॉसीटीव स्टाफिलोकॉकी के विश्लेषण के लिए फिनोफ्तलीन फोसफेट अगर तृप्तिजनक निकला।

विशाखपटनम अनुसंधान केन्द्र

मुख्य उपलब्धियाँ

संस्थान में विकसित सुधरे 30 एम दीर्घ मेश इको फ्रेन्डली ट्रॉल वाणीज्यिक यंत्रीकृत नावों द्वारा संचालित जालों की अपेक्षा अधिक मात्रा में किशोरों की बचाव करके दिखाई पडा। ट्रॉल का पकडाव दर 22.10 की.ग्रा. सी पी यू ई भी बहुत आशाजनक था।

अधोजल से आगे की मछलियों को पकडने के लिए 30 एम हल्के वज़न के ट्रॉल प्रभावकारी दिखाई पडा।

नमकीकृत एवं शुष्कित मत्स्य से लाल हैलोफिलिक जीवाणु की बढ़ती को नियंत्रित करने के अलावा कुछ हद तक विकृतगंधिता को रोकने की प्रति ऑक्सिकारक गुणता को भी सोडियम ट्रिपॉलीफोसफेट में दिखाई पडा।

विसाग के तटवर्ती जलों से पकडे गए मुल्लट और कुछ अन्य मछलियों के खानेयोग्य पेशियों में उन्नत मात्रा में नाफ्तलीन हाइड्रोकार्बन निहित दिखाई पडा।

बुरला अनुसंधान केन्द्र

मुख्य उपलब्धियाँ

30 एम एम मेश बार आकार के उन्नत दृढ़ता के मोनो फिलेमेन्टों से युक्त क्लोम जाल अन्य मेश जालों की अपेक्षा श्रेष्ठ पकडाव देते हुए दिखाई पडा।

5% स्यूडोहाइबरनीकृत चन्ना जाति 11-14 सी की आर्द्रता अवस्था में 18 घण्डों तक जीवित दिखाई पडा।

उड़ीसा के वाणीज्यिक शुष्कन खेतों में कोई मानकीकृत प्रथाओं का अनुसरण नहीं करते हुए दिखाई पडा।

होशंगबाद अनुसंधान केन्द्र

मुख्य उपलब्धियाँ

जलाशय मात्स्यकी विकास पर अनुसंधान कार्य के भविष्य मार्गों की रूपरेखा तैयार करने के लक्ष्य से मध्यप्रदेश के मुख्य जलाशयों पर एक बेंच मार्क सर्वेक्षण किया गया।

कैलिकट अनुसंधान केन्द्र

मुख्य उपलब्धियाँ

केरल के बाहर से कैलिकट लाए गए वाणीज्य शुष्कित मत्स्य में पाए गए सूक्ष्म वनस्पती जातों के मुख्य घटक अस्पेर जिलेस जाति रही। फिर भी पॉलीपोसिलम जातियों की प्रतिशतता पिछले वर्षों की अपेक्षा उन्नत थी।

वातावरणीय अवस्थाओं के अनुसार ब्लो प्लाई आबादी में उतार-चढाव दिखाई पडा (अगस्त - नवंबर) के दौरान आबादी की बढ़ती हुई।

मुंबई अनुसंधान केन्द्र

मुख्य उपलब्धियाँ

नई मुंबई के बाज़ारों पर बेचे गए रोहू, कतला आदि ताज़े जल मत्स्य पूने जलाशयों से लॉरी में और गुजरात से रेलगाडी से लाए गए दिखाई पडा।

'करकरा' (पॉमडासिस माकुलेरस) के बर्फ शीतित टुकडों (खंडों) की शेलफ जीविका सात दिन होती है जब की चाँड (ड्रेपेन पन्कटाटा) जिसकि शेलफ जिविका 9 दिन होती है।