ANNUAL REPORT

1979

Central Institute of Fisheries Technology

Cochin-682 029, India

(Indian Council of Agricultural Research)

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ISSUED BY:
THE DIRECTOR, C.I.F.T., COCHIN - 682 029, INDIA-
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CONTENTS

1. DIRECTOR'S INTRODUCTION

The activities of the Institute during the year were oriented towards implementing the Lab to Land Programmes launched by the Indian Council of Agricultural Research as a part of the Golden Jubilee Celebrations. The Programmes envisaged transfer of the various technologies developed at the Institute over the years to the ultimate users in a very persuasive way to achieve the expected benefits out of the developments. These benefits, it was anticipated, would create more potential for gainful employment of the people especially in the rural areas and thus would better the standard of living of the rural masses, at least to a certain extent. With many a result at hand for transfer in the rural areas, the Institute could continue the Lab to Land Programmes incessantly and in a way suitable for arousing overall interest in the programmes wherever carried out. Large scale field demonstrations of the methods of preserving the hitherto uneconomically utilized clam meat by canning and pickling paved the way for setting up for the first time in the country two units for production of pickled clam meat. Preservation and protection of traditional types of wooden fishing crafts with the compositions and treatment worked out at the Institute, use of specific types of synthetic twine nets from the country crafts for increasing daily fish catches and hence the daily income of fishermen, use of less expensive but efficient engines for powering the country boats especially of Kerala type to cover more areas of operation and more fish production and production of good quality dry fish products of better market value by improved methods are a few other technologies transferred under the Lab to Land Programme.

Studies on the freezing and frozen storage characteristics of whole milk fish as well as fillets of perch, threadfin bream and jew fish were completed. Oyster meat yielded good canned products when canned in its nectar and also in smoked form.

Lobster fishing experiments have shown the efficiency of lobster gill nets and large traps. Of the three designs of nets experimented with at Goa, viz. bulged belly, long wing and six seam trawl, the bulged belly was found to be most efficient. Two new designs of large mesh trawls have been found effective for exploitation of off bottom and column fishes.

As a result of the recommendations made by the Institute, now nearly 800 mechanised boat hulls in Kerala have been sheathed with the Aluminium - alloy in lieu of the hitherto used copper.

1.1. ORGANISATIONAL SET-UP

The Institute is headed by a Director in whom are vested all the administrative/financial powers regarding research and management of the Institute. He is assisted by a Senior Administrative Officer, Administrative Officer and Asst. Administrative Officer to deal with matters related to general administration, an Accounts Officer for looking into the accounts matters and internal audit and a Junior Technical Officer to attend to technical reports and matters connected with research projects handled by the different divisions of the Institute including the six Research Centres. During the year under report, the Seniormost Scientist S-3 at the Headquarters was assigned the charge of the vacant post of Jt. Director to assist the Director in his responsibilities. The Senior Administrative Officer was designated as the Vigilance Officer of the Institute.

The Headquarters of the Institute is located at Cochin with Research Centres functioning at Veraval (Gujarat), Kakinada (Andhra Pradesh), Burla (Orissa), Calicut (Kerala), Panaji (Goa) and Bombay (Maharashtra).

The activities of the Institute are chanelled through eight divisions as given below. Work under these divisions is extended to the Research Centres as well to tackle the problems facing the fishery industry specific to the area. Each Centre is under the control of a Scientist-in-Charge who carries out co-ordination, supervision and periodical assessment of the progress of the different projects.

1. Biochemistry and Nutrition.
2. Microbiology.
3. Processing and Packaging.
4. Craft.
5. Gear.
6. Engineering.
7. Electronics and Instrumentation.
8. Extension, Information and Statistics.

1.2. MANAGEMENT COMMITTEE

The Management Committee of the Institute was constituted consequent on the termination of the term of the previous Committee. The following is the constitution of the new Committee.

1.	Shri. G. K. Kuriyan Director, CIFT	.. Chairman
2.	Director of Fisheries, Kerala.	.. Member
3.	Dr. R. Raghu Prasad, Asst. Director General, ICAR	.. Member
4.	Director of Fisheries, Karnataka.	.. Member
5.	Director of Research, Kerala Agricultural University, Mannuthy, Trichur.	.. Member
6.	Shri. C. Cherian, President, Seafood Exporters' Association of India.	.. Member
7.	President, All India Fisheries Co-operative Federation Ltd., Bombay.	.. Member
8.	Dr. C. C. Panduranga Rao, Scientist. S-3.	.. Member
9.	Shri. T. K. Govindan, Scientist. S-2.	.. Member
10.	Shri. K. Mahadeva Iyer, Scientist. S-2.	.. Member
11.	Shri. M. Arul James, Scientist. S-1.	.. Member
12.	Accounts Officer, CPCRI, Kasaragode.	.. Member
13.	Sr. Administrative Officer, C.I.F.T.	Member Secretary

The new Committee met twice during the year. Many important recommendations were made by the Committee prominent among which are replacement of the fishing fleet of the Institute by new ones on condemnation of the old vessels and inclusion of Mechanical Engineering as

one of the disciplines under ARS. The Budget Estimate of the Institute and the Research Project Profile were also considered and approved.

1.3. ADMINISTRATION

The Administrative section deals with recruitment, service policy, discipline, staff welfare, lands and buildings, budget expenditure, stores procurement etc.

Construction of the quarters for Chowkidars and the Caretaker was completed and allotment made. The eligible percentage of temporary administrative S. S. grade posts was converted into permanent posts and action is under way to confirm eligible staff in these posts. The E.F.C. Memo of the Sixth Five Year Plan for the revised allocation of Rs. 235 lakhs as amended has been sent to the ICAR.

The Research Centres continued to function in rented buildings. Addresses of the Research Centres are given in Appendix I. List of staff under Scientific, Technical, Administrative and Supporting categories as on 31-12-1979 is also given in Appendix II.

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

1.4. STAFF JOINT COUNCIL

The proposed reconstitution of the new Institute's Staff Joint Council, on expiry of the term of the outgoing one, is yet to take final shape.

1.5. GRIEVANCE CELL

Due to the non-finalisation of the Staff Joint Council, the Grievance Cell also did not function.

As reported last year, a new Cell was constituted to look after the grievance of the A.R.S. Scientists and other employees not covered by the already existing scheme. The members included:-

1.	Shri. G. K. Kuriyan, Director.	Chairman
2.	Dr. P. N. Kaul, Scientist. S-3.	Members nominated by the Management Committee
3.	Shri. S. Ayyappan Pillai, Scientist. S-2.	
4.	Shri. K. M. Mathai, Sr. Admin. Officer	Member Secretary

The Cell met once during the year under report and considered the grievances of the concerned Scientists.

1.6. PROJECT ADVISORY COMMITTEE

The Project Advisory Committee met eight times during the year under report. The Committee gave a final shape to the Research Project Programmes of the Institute for the year 1979 taking into account the suggestions made by the Staff Research Council and the recommendations of the Scientific Panel for Fisheries of the ICAR. The review of the progress made under each project during the year was assessed periodically by the Committee and the suggestions forwarded to the Project leaders for follow-up action. The Project Advisory Committee finalised the Memorandum for the Expenditure Finance Committee pertaining to the Sixth Five Year Plan of the Institute. The Committee, in consultation with the Scientists-in-charge of the Research Centres, has also drawn up the draft Research Project Programmes for the year 1980.

1.7. TECHNICAL SECTION

As in previous years, the Section continued assisting the Director in collecting research materials from the different Divisions and Research Centres for preparation of technical notes and reports to be forwarded to the Council, Scientific Panel, etc.

Nineteen technical papers presented were approved for publication.

In order to ensure better co-ordination, the Section as per the recommendations of the Project Advisory Committee monitored the various foreign aid proposals, deputation for training of Scientists|Technicians and other similar items of work.

1.8. STAFF RESEARCH COUNCIL

The Council met twice during the year to review the various research proposals.

1.9. AGRICULTURAL RESEARCH SERVICE

Two candidates who got selected to ARS on the basis of competitive examination joined the Institute, one under the discipline of Fish Processing Technology and the other under Agricultural Extension.

The five yearly assessment papers of 22 eligible Scientists in the grades S, S1 and S2 were forwarded to the ASRB, New Delhi. Assessment, however is yet to be completed.

1.10. REGIONAL COMMITTEE

As the Director continued to function as Member-Secretary for the ICAR Regional Committee Region No. 8, the various recommendations made at 3rd meeting of the ICAR Regional Committee held on 7-10-1978 at TNAU, Coimbatore were forwarded to the concerned organisations, Universities and Institutes for implementation.

1.11. SYMPOSIA / SEMINARS/WORKSHOPS / MEETINGS Etc. ATTENDED

Shri. M. R. Nair, Scientist S-3 attended the All India Workshop on Rural Training Programme for Agricultural Research Scientists and ICAR Golden Jubilee of Transfer of Technology Programmes held at Hyderabad, 3-5 Jan. 1979.

Shri. A. V. V. Satyanarayana, Jr. Fishery Scientist, attended the Seminar on Mechanical Drying organised by Matsyasagar Consultancy Services (P) Ltd., at Visakhapatnam, 24 Jan. 1979.

Shri. T. K. Sivadas, Scientist S-2 attended the Symposium on Analytical Instruments and Instrumentation organised by Bhabha Atomic Research Centre, Bombay, 22-25 Jan. 1979.

Shri. K. G. Ramachandran Nair, Scientist S-1 attended the Symposium on Inland Aquaculture organised by the Central Inland Fisheries Research Institute, Barrackpore, 12-15 Feb. 1979.

Dr. C. C. Panduranga Rao, Scientist S-3 attended the Workshop on Institutional Financing for Fisheries Development with Special Reference to Aquaculture organised at Kakinada by the Central Institute of Fisheries Education, Bombay, 25 Feb. 1979.

S|Shri. T. S. G. Iyer, Scientist S-2 and A. P. Valsan, Jr. Scientist attended the International Seafood Trade Fair and its connected meetings held at Bombay, Feb. 1979.

Shri. P. Ravindranathan, Sr. Library Asst. attended the All India Seminar on Agricultural Library and Information Services organised by Andhra Pradesh Agricultural University, Hyderabad, 9-12 March 1979.

Shri. R. Balasubramanyan, Scientist S-3 attended the Workshop on Adhesives Technology organised by National Aeronautical Laboratory, Bangalore, in collaboration with Indian Space Research Organisation, April 1979.

S|Shri. T. S. G. Iyer, Scientist S-2 and A. P. Valsan, Junior Scientist, attended the Workshop on Ocean Management organised by Central Institute of Fisheries Education at Bombay, 5th and 6th April 1979.

Dr. P. N. Kaul, Scientist S-3 and Smt. T. L. Hemalatha, Jr. Clerk, attended the Bharatiya Rajabhasa Seminar organised by Dakshin Bharat Hindi Prachar Sabha, Ernakulam on the occasion of their Diamond Jubilee celebration and Rajabhasa year of the Govt. of India, 18-20 May, 1979.

Shri. S. Ayyappan Pillai, Scientist S-2, attended the Seminar on Condition Monitoring and Vibration Analysis, conducted by Indian Institute of Plant Engineers, Kerala Chapter, Cochin, July 8, 1979.

Dr. K. Ravindran, Scientist S-2, attended the All India Seminar on Hull Preservation Practices organised by the Institution of Engineers (India) Calcutta, 29 July 1979. A technical paper was presented by him at the Seminar.

Shri. T. K. Thankappan, Scientist S-1, attended the Summer Institute on Utilization of Under-utilized Fishes and Fish Wastes at College of Fisheries, Mangalore, 2-31 July 1979.

Shri. Anwar Ahmed Khan, Scientist S-1, attended the Summer Institute on Capture and Culture Fisheries of the Man-made Lakes of India organised at Central Inland Fisheries Research Institute, Barrackpore under the auspices of ICAR, New Delhi, 7th July 1979 to 6th August 1979.

Shri. A. P. Valsan, Junior Scientist, attended the ISI meeting held at Bangalore as Convener of AFDC 27: 3, Aug. 1979.

Shri. M. R. Nair, Scientist S-3, Dr. P. N. Kaul, Scientist S-3 and Shri. P. V. Prabhu, Scientist S-2 participated in the ICAR Golden Jubilee Symposium and IFARD (International Federation of Agricultural Research Systems for Development) and Glogal Convention on Agricultural Research and Education Systems for Development, New Delhi, 3-7 Sept. 1979.

Shri. P. T. Laxmanan, Scientist S-1, attended the Seminar on Adoption of New Agricultural Technology organised by Tamil Nadu Board of Rural Development at Kancheepuram, 10-11 November 1979.

Dr. C. C. Panduranga Rao, Scientist S-3, attended a Management Training and Case Writing Workshop in Agricultural Research organised by National Academy for Agricultural Research Management, Hyderabad in collaboration with South East Asian Regional Centre for Graduate Studies and Research in Agriculture (SEARCA), Philippines, 26 Nov. 1979.

S|Shri. A. P. Valsan and T. S. G. Iyer, Scientists S-2, attended the Short Term Training Course on Utilisation of Low Priced Fish at Central Institute of Fisheries Education Bombay, 10-15 Dec. 1979. Two technical papers were presented by them at the programme.

Shri. K. K. Kunjipalu, Scientist S-1, attended the Sub-Committee meeting on Exploratory Survey of Marine Fisheries held at Exploratory Fisheries Project Base, Veraval, 19 Dec. 1979.

1.12. HIGHER STUDIES

Shri. M. K. Mukundan, Scientist S-1 was deputed to Japan for training under the Colombo Plan in Enzyme Technology for a period of 7 months from 1-3-1979 to 30-9-1979. On arrival back at Cochin, he gave a talk on the experience gained by him during his training for the benefit of the other Scientists of the Institute. A similar talk was also delivered by Shri. Ibrahim, Head Draughtsman on his return from Bangkok where he had been deputed for training in Fishing Vessel Design the previous year.

Shri. M. D. Varghese, Scientist S-1, was awarded Ph.D. by the University of Kerala for his thesis entitled 'Biology of Mysids.' He carried out his studies under the guidance of Dr. N. Krishna Pillai, Professor, Dept. of Aquatic Biology, Trivandrum.

1.13. LIBRARY

During the year, 444 books and 33 bound volumes of journals were added to the collection of the Institute's library, bringing the total to 4106 books and 1919 bound volumes.

One hundred and twenty three Indian and foreign journals were subscribed to during the year and 60 journals received on exchange on gratis basis.

Indexing of current literature, compilation of bibliography on Fishery Technology, photo-copying service, ready reference service etc. were continued. In addition to the staff of the Institute, visitors including students and research scholars from Universities, educational and research Institutes, technical personnel from fishing and fish processing industry etc. made use of the library. Inter-library loan facilities were maintained in collaboration with other Institutes. The 'Bibliography on Fishery Technology' was given a new look in the Golden Jubilee year of the ICAR.

During the year, Dr. P. N. Kaul, Scientist S-3 took over charge as Officer-in-charge, Library. Earlier Shri. K. G. Ramachandran Nair, Scientist S-1 was in charge.

1.14. FAO CONSULTANCY SERVICE

Shri. R. Balasubramanyan, Scientist S-3 was on a short-term consultancy service with the FAO|SIDA organisation for the Development of Small Scale Fisheries in the Bay of Bengal with headquarters at Madras. Extensive studies were made for the development of kuttamaram, the traditional fishing craft of the East coast of India. In this connection Shri. Balasubramanyan visited Port Blair (Andamans), various forest departments, research institutions, wood treatment plants and fishing centres in the Bay of Bengal region. Recommendations were made on the use of various alternative timber species for kuttamaram logs, besides suggesting both chemical and physical methods of protection for their enhanced service life.

A special report on the mission undertaken by Shri. Balasubramanyan has been brought out by the FAO|SIDA under their Bay of Bengal Development Programme.

1.15. COMMITTEES REPRESENTED BY THE INSTITUTE

The Director served on the following Scientific and allied bodies.

1. *Member* .. Scientific Panel for Fisheries Research ICAR.
2. *Member* .. Central Advisory Committee on Exploratory Survey of Marine Fisheries.
3. *Ex-Officio Member* .. Panel of Experts for the purpose of hearing appeals - Export Inspection Agency, Karnataka and Kerala.
4. *Member* .. State Fishery Advisory Board, Kerala.
5. *Member* .. Fishery Advisory Committee, Kerala, Agricultural University, Mannuthy.
6. *Member* .. Management Committee, Krishi Vigyan Kendra (CMFRI) Narakkal.
7. *Member* .. Management Committee, Operational Research Project of CMFRI, Kovalam (Tamil Nadu)

8.	*Member*	..	Steering Committee on Fisheries Development, State Planning Board, Kerala.
9.	*Member*	..	Task Force on Fish Processing and Marketing, State Planning Board, Kerala.
10.	*Member*	..	Task Force on Fisheries Research and Education, State Planning Board, Kerala.
11.	*Member*	..	Scientific Research Committee, Fisheries Technological Research Station, Kozhikode, Kerala.
12.	*Member*	..	Board of Studies in Marine Sciences, University of Cochin.
13.	*Member*	..	State Fisheries Research Council, Govt. of Tamil Nadu.
14.	*Member*	..	State Level Committee for Co-ordination of Work on Marine Fisheries in the State and Central Sections in Tamil Nadu.
15.	*Chairman*	..	TDC-42 - Textile materials for fishing purposes - Sectional Committee, Indian Standards Institution
16.	*Chairman*	..	MCPD-21-Fishing Vessels Sectional Committee, Indian Standards Institution.
17.	*Member*	..	Board of Examiners, Central Institute of Fisheries Education, Bombay.
18.	*Member*	..	ICAR Visiting Team for Establishment of a Fisheries College under Kerala Agricultural University
19.	*Member*	..	Scientific Panel on Post Harvest Technology, ICAR
20.	*Member*	..	Visiting Team to look into various representations against construction of fishing harbours and fish based industries adjoining site for Fishing Harbour at Sassoon Dock, South Bombay-Ministry of Agriculture and Irrigation.
21.	*Member*	..	Panel of Experts to look into present *Salmonella* problem in marine products - Ministry of Agriculture and Irrigation.
22.	*Member*	..	Inter-Disciplinary Task Force for Kuttanad (Kerala) Development.

The following are the other Committees in which the Institute was represented.

1. *Shri. M. R. Nair,* Scientist S-3, as:-
   a) Alternate Member: ISI, AFDC-27 Fish and Fisheries Products Sectional Committee.
   b) Member: ISI, AFDC-27:2, Frozen Fish Products Sub-Committee.
   c) Technical Representative: ISI, AFDC-36:9, Metallic Contaminants Sub-Committee.

2. *Dr. C. C. Panduranga Rao,* Scientist S-3, as:—
   a) Principal Member: ISI, AFDC-27, Fish and Fisheries Products Sectional Committee.

3. *Shri. T. S. Gopalakrishna Iyer,* Scientist S-2, as:—
   a) Member: State Level Committee for the Co-ordination of work on Marine Fisheries, Maharashtra.
   b) Member: Central Advisory Committee of the Exploratory Fisheries Project, Bombay.
   c) Member: Regional Committee of the ICAR for western Zone, 7, Comprising of Maharashtra, Western and Central Madhya Pradesh.

4. *Shri. R. Balasubramanyan,* Scientist S-3, as:—
   a) Member: Marine Corrosion Sub-Committee of the CSIR.
   b) Alternate Member: ISI, MCPD-2, Indian Harbour Craft and Fishing Vessels Sectional Committee.
   c) Member: Consultative Committee for (FRP) Technology of the National Council of Science and Technology.

5. *Dr. K. Ravindran,* Scientist S-2, as:—
   a) Member: Committee of Experts to draw up a scheme for the Govt. of Kerala for the utilisation of Baliapatam Fishery Complex.
   b) Member: Committee of Experts to consider the feasibility of setting up an Aluminium fish can manufacturing Unit.
   c) Subject Expert: Doctoral Committee of the University of Cochin.

6. *Shri. K. K. Balachandran,* Scientist S-2, as:—
   a) Alternate Member: ISI, AFDC-27:1, Canned Fish Products Sub-Committee.
   b) Member: Group of Experts on Aluminium can fabrication Unit.

7. *Shri. K. K. Solanki,* Scientist S-2, as:—
   a) Member: ISI, AFDC-27, Fish and Fisheries Products Sub-Committee.
8. *Shri. S. Ayyappan Pillai,* Scientist S-2, as:—
   a) CIFT Nominee: National Committee for International Institute of Refrigeration.
   b) Executive Committee Member: Indian Cryogenic Council, South Zone.
   c) Alternate Member: ISI, MCPD-1, Ship-building Sectional Committee.
9. *Shri. T. S. Unnikrishnan Nair,* Scientist S-1, as:—
   a) Alternate Member: ISI, AFDC-27:3, Dried Fish Products Sub-Committee.
10. *Shri. A. P. Valsan,* Junior Scientist, as:—
   a) Principal Member and Convener: ISI, AFDC-27:3, Dried Fish Products Sub-Committee.
   b) Member: Sub-group for developing paper on requirements of research, development and training in Fisheries under the Regional Committee of the ICAR for western Zone comprising Maharashtra, Western and Central Madhya Pradesh.
   c) Associate: Institute of Chemists (India).

1.16. VISITORS

Many foreign dignitaries, State and Central Fisheries officials, students from educational departments, trainees etc. visited the Institute during the period. These include:-

1. *M. Sujan Singh,* M. P. and Member, Governing Body, ICAR.
2. *Mr. T. A. Gulland,* FAO, Rome.
3. *Mr. N. Gopinathan Nair,* Special Correspondent, UNI, New Delhi.
4. *Dr. M. A. Oommen,* Professor of Economics, Calicut University.
5. *Mr. Osman Ali Khan,* (former M.P.) and *Mr. V. A. Ramachandran,* Orient Marine Products (P) Ltd.,
6. *Mr. K. W. Chow,* FAO Expert.
7. World Bank Team.
8. Members of the Tamil Nadu Legistlative Assembly Committee on Estimates.

9. *Mr. M. V. Krishnappa,* Hon. Minister of State for Agriculture and Irrigation, Govt. of India.
10. *Mr. P. S. Appu,* Additional Secretary, Ministry of Agriculture, New Delhi.
11. *Mr. R. C. Choudhury,* Chairman, MPEDA.
12. *Vice Admiral S. Bahi,* Indonesian Ambassador to India.
13. Member of FAO/NORAD Introductory Course in Fishing Technology.
14. *Mr. J. C. Bakshi,* Director of Extension and Education, Punjab Agricultural University, Ludhiana.
15. *Mr. N. K. Anant Rao,* Retd. D.D.G, ICAR.
16. *Mr. S. C. Alexander* and *Mr. Edge Semmens* of British Council Madras.
17. *Dr. Ghatnekar,* Schroff Institute, Bombay.

1.17 GENERAL

Dr. P. N. Kaul, Scientist S-3, has been recognised as a guide for the Doctoral research Programmes of both Kerala University and Cochin University.

A Visiting Scientists' Home was opened at the residential colony of the Institute at Thevara, Ernakulam.

The Second Sub-Committee of the Committee of Parliament on Official Language Implementation, visited the Veraval Research Centre on 8-2-1979. The Research Centres of CIFT and CMFRI were among the offices visited by the Committee at Veraval to asses the progress of implementation of Official Language Act.

Technical guidance was rendered by the Institute in the Kuttanad Area Development Project sponsored by the Kerala Agricultural University.

With the help of 'Friends of the Trees' the staff of the Institute launched a scheme to plant trees and set up a flower garden in the premises of the Institute's staff quarters at Thevara. This scheme was evolved in connection with the Golden Jubilee Celebrations of the ICAR and International Year of the child. Mr. G. K. Kuriyan, Director, inaugurated the function. State Vice-President of 'Friends of the Trees', Dr. C. T. Samuel and Secretary, Mr. Joseph Alexander, spoke on the occasion. Mr. James Abraham, Administrative Officer, gave the welcome speech.

During the year under report, the Institute was selected by the ICAR as the Headquarters of the South Zone for holding the inter-Institutional tournaments as part of its Golden Jubilee Celebrations. Mr. G. K. Kuriyan was appointed Chairman of the 1st ICAR Inter-Institutional Tournaments (South-Zone) and Dr. K. Ravindran as Convener. Tournaments of various sports and athletic events were held. The Institute's team won first and second places in the following events making them eligible to compete in the Central Tournament Meet to be held in Hyderabad next year.

Team Events. (all first)

Foot Ball.
Badminton (Singles)
Badminton (Doubles)

Athletic Events.

100 m. race (first)
200 m. race (first)
400 m. race (first)
800 m. race (first)
1500 m. race (first)
Relay race (4 x 100 m.) (first)
Long Jump (Second)
High Jump (Second)
Javelin throw (Second)
Hop-Step and Jump (Second)

2. LAB TO LAND PROGRAMMES

The Indian Council of Agricultural Research celebrated its Golden Jubilee during the year 1979. As a part of its celebrations, programmes were chalked out to transfer different technologies developed and perfected at the various research Institutes under it to the rural poor engaged in their respective fields of work under a national project of extension education termed ICAR Golden Jubilee Experimental Transfer of Technology (Lab-to-Land) Programme. Under this programme, each Technology Transfer Center was assigned a set number of families who were to directly benefit from the research perfected. Two hundred families were allotted to CIFT. Different media of transfer of technology in this programme are training - cum - demonstration pragrammes, organising exhibitions, radio talks, film shows, distribution of extension literature etc. The main aim of these programmes with respect to this Institute is the improvement in the economic

well-being of fishermen families in 5 backward villages with at least 50 families as traditional fishermen selected from five different maritime states of India, viz. Andhra Pradesh, Kerala, Goa, Gujarat and Orissa where only traditional fishing exists and where there is scope for improvement in the socio-economic conditions by introduction of proven technology worked out by the Institute. The villages selected were:-

Andhra Pradesh	—	Nemam in Kakinada.
Kerala	—	Chellanam in Ernakulam Dist.
Gujarat	—	Chorwad.
Orissa	—	Baljuri-Kurumkhel.

Details of the training-cum-demonstration programmes conducted are given separately.

A radio - talk was given by Shri. K. K. Balachandran, Scientist S-2 on Home Canning of Clams as a Cottage Industry.

Scripts for radio-talks were prepared on "Activities of CIFT and its Benefits to Common Man" (in malayalam) by Mr. G. K. Kuriyan, Director and "Role of Engineers in Fishing and Fish Processing Technology" by Shri. S. Ayyappan Pillai, Scientist S-2.

The following publications were also brought out for distribution among participants in the various training-cum-field demonstration programmes held.

1. Canning preservation of clam meat (English and Malayalam).
2. Improved fish curing practice (English and Malayalam).
3. Improved method on fish curing (English and Hindi).

As part of the Lab-to-Land programmes, a survey was made of about 25 fishing boats in different length ranges and of different construction materials registered with the Cochin Fishing Harbour vide a proforma specially drawn up for the purpose. The survey made has thrown light on:-

1. Level of awareness of modified technologies at present available
2. Input of transfer of technology for research Institutes.
3. Faulty practices followed, neglect and wrong substitution for short-term gain.
4. Scope for reduction of maintenance costs and increase of efficiency.

The survey is in progress. Another survey was also made of 17 'Thanguvallams' - an indigenous craft - to ascertain the extent of bio-deterioration in these boats as well as to get information regarding the indigenous methods of preservation of the crafts currently adopted by the fishermen. The boats were mainly of 48 ft. OAL and constructed out of Anjili wood. Demonstrations were conducted of the chemical preservative treatment recommended by the Institute.

Five of the boats were treated with ASCU preservative. Performance of these boats is being studied. Steps have already been taken to treat the other boats also with the chemical preservative. These demonstrations have been helpful in making the fishermen aware of the efficacy of the chemical preservative to ward off fungal attacks. One of the crafts was also motorized and fishing demonstrations are in progress.

Benchmark surveys were undertaken on the economic position of the fishermen folk of the villages. At Chellanam, such a survey was initiated with a view to suggest possible improvement in their indigenous gear, 'thangu-vala' which is a single boat seine operated by 14-15 crew members from a dug-out canoe. At present, knotted nylon webbings are used for the fabrication of this gear. Since studies have revealed that knotless webbings can be advantageously used in gears requiring small mesh size and thin twine size, fabrication has been started of a 'thangu-vala' of knotless webbings. The material selected for the main body of the gear is knotless webbings of nylon 210 den. for swing threads and a combination of 420 den. nylon yarn and 100 den. polyethylene monofilament yarn for the laid - in threads having 18 and 20 mm. mesh size for the sides and central portion of the net proper. For the peripheral band of meshes and selvedge, 0.5 mm and 1.0 mm polyethylene twisted monofilament has been selected. Cutting and joining of one part of the net comprising of 56 pieces of 50 x 1430 to 2600 meshes have been completed. Work on the fabrication of the webbings with polyethylene monofilament twines is in progress.

Benchmark surveys have also been completed in Vellayil and Puthiappa at Calicut and Chorwad, a village in Gujarat.

In Calicut, two demonstrations were held on the hygienic and scientific method of preparing dry salted mackerel which is at present the most important item of dry fish produced and marketed here. The superiority of the quality of the product prepared as per the improved method has been well accepted. There is every possibility that the method will be adopted on a large scale by the processors of that area. Demonstrations were also held on the method of preparation of ready-to-serve pickle from mussel meat. Samples of the pickle have been sent to prospective

Application of a chemical preservative on an indigenous craft.

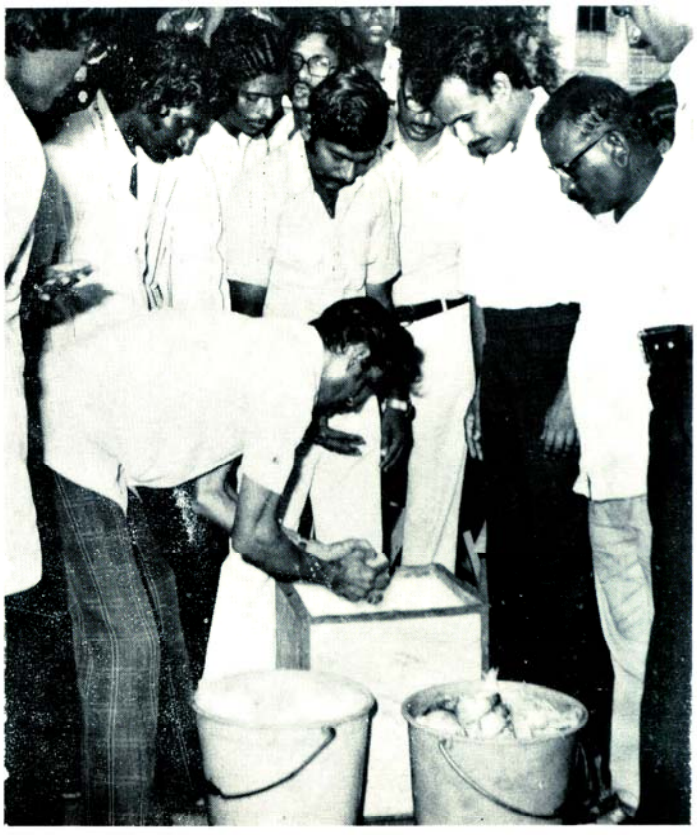
Use of improved gear for inland fishing at Burla Research Centre.

Training on improved method of fish curing.

Training in pickling clam meat.

Training in fish curing at Kakinada Research Centre.

Demonstrating improved packaging method for transporting fish.



Home canning of clam meat.

The finished product.

markets in and out of India for marketing trials. These training-cum-demonstration programmes are being continued under the scheme "fish curing on modern lines" in which selected local fishermen and fish curers are being trained in the improved methods of salting, drying and packaging of fish and shellfish.

The different programmes held have greatly helped in kindling an interest in the people to adopt some of the technologies developed by the Institute. In this context, special mention may be made of the manufacture of pickled clam meat undertaken by M|s. Protofoods, Kumbalam, Kerala. The product is manufactured as per the process developed at the Institute and the technology was transferred as part of the 'Lab-to-Land' programmes. Steps have also been initiated to set up another unit at Vaikom, Kerala, for manufacture of the product. This would give a fillip to the economy of one of the poorest sections of fishermen-the clam fishermen, besides giving a much better product with greater shelf-life, to the consumer.

In Veraval, the following programmes have been taken up for the benefit of the fishermen of Chorwad Village in Junagadh District.

1. Demonstration of modern methods of fish curing and preparation of a variety of products and by-products from available local catch.
2. Demonstration of modern methods of transportation of fresh fish.

Place	Date	Technology transferred/ Training-cum-demonstration held	Particulars of participation.	Remarks
Bombay	23 & 24 April 1979.	Filleting of fish	5 (10 attended demonstration)	
	25-28 April 1979.	Production of speciality products.	5 (8 attended demonstration)	
	30 April-5 May 1979.	Fish plant sanitation	5 (8 attended demonstration)	
Kumarakom (Kottayam)	14 & 15 May 1979	Canning preservation of clam meat	80 persons representing 39 fishermen families and Co-operative societies.	
Vellayil (Calicut)	22 May 1979	Improved method of curing packing and marketing of fishery products.	15 curers and fishermen engaged in fish curing.	
Chellanam (Ernakulam Dist)	22nd June 1979	Demonstration of chemical preservative treatment for 'thanguvallams' an indigenous fishing craft.		continuing
Kumbalam (Kundara, Quilon)	21 & 22 July 1979	Processing clam meat	82 participants.	
Vaikom	21 & 22 August 1979	Processing clam meat	74 participants.	
Madras	20 September — 4 October 1979	Handling and transportation of fish	24 fishermen 21 trainees from Fisheries Training Institute, Madras.	Jointly organised by CIFT and Dept. of Fisheries, Tamil Nadu.

		Fish plant sanitation, quality control and in plant inspection	21 trainees from Fisheries Training Institute, Madras. 8 from fish processing Industry	
		Production of diversified products from low cost fish.	24 fishermen 21 trainees from Fisheries Training Institute, Madras. 7 from fish processing Industry	
Kakinada Neman Village	21 Nov. 1979 27 Nov. and 4 Dec. '79	Demonstration on:— 1. Packing of fresh fish in improved containers for long distance transportation 2. Improved method of preservation of nets. 3. Improved method of curing and drying of fish using low - cost technology. 4. Improved designs of gill nets and improved method of hanging gill nets. 5. Extraction of rays from shark fins.		
Veraval (Chorwad Village)	22 Nov. 1979	Improved method of fishing for shark and utilization of the catch		In collaboration with Dept. of Fisheries, Govt. of Gujarat.
Burla (Orissa)	27 Dec. 1979	Fishing techniques with improved designs of entangling nets and long lines for better returns from Hirakud Reservoir.		

3. I. Y. C. PROGRAMMES

The year 1979 was observed as the International Year of the Child all over the world. The Institute in small measure played its part in this field sufficiently well. A committee was constituted with the following members to carry out the various programmes envisaged.

Shri. K. Mahadeva Iyer	..	Leader.
Dr. K. Ravindran		
Dr. K. Gopakumar		
Shri. H. Krishna Iyer		
Smt. A. Lekshmy Nair		Members
Shri. James Abraham		
Shri. P. A. Uthup		
Shri T. K. Syed Ali		

The major thrust of the programmes was directed towards the health, educational and recreational aspects of the children of the staff with special emphasis on families of low-paid employees. A brief account of the different programmes carried out is given below.

Cloth for school uniforms and note books and stationery were distributed to the children of the supporting staff. A Health Inspection Programme for the children of the Staff was held in whch Dr. Joy P. Chungath, Paediatrician and Dr. (Mrs) Kairali Mohan Raj, Dentist, extended their valuable services. A total of 45 children below twelve benefited from this scheme.

A competition was held in sports and fine arts in which also 45 children took part. Mrs. G. K. Kuriyan distributed the prizes.

As a finale, a pleasure trip was organised to Peechi Dam via Trichur. About 63 children accompanied by their parents took part in this sightseeing tour which was enjoyed by one and all. On the way up, a brief visit was also made at CPCRI Sub-Station at Kannara, Peechi.

The Bombay and Burla Research Centres of the Institute also celebrated the year by distributing note books, stationery and sweets to the children of their staff.

The expenses for the conduct of the entire programmes were solely met from the generous contributions made by the staff and members of the public, especially the Processors to whom all thanks are due.

4. PROGRESS OF RESEARCH

4.1. DEHYDRATION AND SMOKING

CHIEF FINDINGS

Good quality cured products were prepared from razor edge by the application of various antioxidants. Best results were obtained after treatment with BHA and BHT along with ascorbic acid. An improved method of preparing ready-to-serve pickle from mussel meat was perfected and a recipe formulated.

RESEARCH IN HAND

Special attention was paid during the year to develop methods for preparing better quality cured products from less utilized and cheap varieties of fish. An attractive salt cured product was prepared from razor edge (*Opisthopterus tardoore*) incorporating antioxidants like BHT and BHA along with ascorbic acid. Experiments were also carried out on smoke curing silver bar (*Chirocentrus dorab*).

Studies were continued on developing various products from mussel meat. Of them, the most important has been drying of the meat, method for which has already been standardised. The product remained in good condition for about four months without any preservative. Cost of production worked out to approximately Rs. 8,500|- per tonne. Preparation of ready-to-serve chutney powder from dried mussel meat was also tried. Results obtained have been very encouraging. The product has good flavour, taste and is comparable to prawn powder.

A process was also perfected for preparing ready-to-serve pickle from mussel meat. The taste and flavour of the pickle is found to be very good. The product has good storage life also. Cost of production is estimated at Rs. 15|- per kg.

Studies were carried out on the suitability of cement floor, palmyrah mat, aluminium tray and stretched net for sun drying fish. Palmyrah mat which is very cheap and also easily available to the fisherman, has been found to be as good as the others as far as rate of drying is concerned. Moreover, ribbon fish (*Trichiurus sp*) dried on palmyrah mats were found to possess better texture as compared to those dried on cement floor.

Samples of cured and dried fish collected from various sources and dried under different conditions were subjected to bacteriological and chemical analysis. It has been observed that the sun dried fish possess more moisture and sand than that dried in mechanical dryers. There was however, not much difference in the bacterial counts of the two types.

Studies carried out to improve the textural quality of cured ribbon fish have shown the effectiveness of a chemical available at a cheap rate in improving the quality. Further studies are in progress.

Samples of smoked prawns collected from different centres were subjected to periodical analysis to study their storage characteristics and shelf life at room temperature. It has been observed that the smoked prawns packed in polythene bags (200 gauge) remained in good condition even after 5 months of storage at room temperature.

Attempts were also made to prepare cooked and dried, cooked and smoked products from mackerel. The dressed fish was kept for 2 mts. in saturated brine at a temp. of 80-90°C. The fish was then taken out carefully and dried|smoked. The final moisture content was adjusted to about 35%. The product was found to be good with respect to flavour, taste and texture. But the shelf life was observed to be short and insufficient. Studies are under way to find ways of prolonging the shelf life.

RESEARCH CONTEMPLATED

1. Studies on improving smoke curing and salt curing of commercially available cheap varieties of fish and popularisation of these products.
2. Construction of Jithaka smoking Kiln for processing smoked prawns.

SCIENTISTS ASSOCIATED

CALICUT: T. S. Unnikrishnan Nair, V. Muraleedharan, N. Kalaimani, K. George Joseph.

VERAVAL: K. K. Solanki

KAKINADA: D. Imam Khasim Saheb, Sibsankar Gupta, Subrata Basu.

4.2. FREEZING

CHIEF FINDINGS

Studies on the frozen storage characteristics of whole milk fish (Chanos chanos) *and pearl spot* (Etroplus suratensis) *were completed. Fresh and one day iced frozen whole milk fish remained in acceptable condition for* 28-30 *weeks at* -18°C, 4 *days iced and frozen samples for* 20 *weeks and* 7 *days iced and frozen samples for* 11-12 *weeks. Fresh whole pearl spot, frozen and wrapped in polythene remained in edible condition for* 10 *months at* -18°C. *After one year there was considerable deterioration in the textural quality as well as slight change in the colour of the meat.*

Skinless fillets of perch, threadfin bream and jew fish when frozen as glazed blocks, packed in polythene lined waxed cartons and stored at -18°C remained in acceptable condition for 8-10 months.

Frozen smoked silver bar, both fillets and chunks, remained in good condition for 38 weeks at -18°C. The smoked samples had better flavour and texture compared to the control.

Further studies on suitability of freezing ribbon fish have shown that fillets individually wrapped in polythene has better storage life compared to block frozen fillets and frozen minced meat blocks.

Studies on the frozen storage characteristics of two important fishes of Bombay coast, viz. Pellona *and* Chirocentrus *have conclusively shown that the fish can be kept in ice for 10-12 days with organoleptically acceptable qualities and when frozen in the good quality raw material condition will have a shelf life of six months in the usual cold storages with a temperature of -20°C.*

RESEARCH IN HAND

Studies have shown that barracuda (*Sphyraenae sp*) can be stored in ice in edible condition upto 8 days as judged by chemical, organoleptic and bacteriological tests. After 8 days storage, there was development of rancidity, considerable increase of TBA and the total plate count was of the order of 10^7. Similar studies were also carried out on long billed half beak (*Hemiramphus* Georgii). It was seen that the fish stored well for 7-8 days in ice without serious impairment to its quality. Further studies are in progress.

Studies on the freezing and cold storage characteristics of fillets of perch, threadfin bream and jew fish were completed. These fillets contained low amount of fat and the flesh was white with minimum amount of red meat on the lateral line. The frozen fillets (glazed blocks) could be stored at -18°C for 8-10 months in edible condition. Individually frozen and packed fillets remained in acceptable condition for 7-8 months.

Work on filleting and freezing of shark fillets is in progress.

Comparative studies on the changes in quality during frozen storage of crab, both in raw and pre-cooked condition have shown that after 3 months storage both were in good organoleptic condition. The raw frozen material was more soft and flavorous compared to the cooked samples.

But the cooked samples were less sweet and had firm texture. There was no comparison in the chemical indices studied due to loss during cooking and protein denaturation.

Fillets and chunks of silver bar were dipped in 12% brine for 30 mts. drained and smoked for three hours at about 45°C. These, along with control samples, were quick frozen and stored at -18°C and storage characteristics studied. Organoleptically, both the control and smoked samples were in good condition after 38 weeks of cold storage. The smoked samples showed better flavour and texture compared to the control. There was no appreciable difference between the two in their bio-chemical and microbiological characteristics. The phenol content in smoked samples was also found to be negligible.

Continued studies have shown that ribbon fish is suitable for freezing and being a non fatty fish, its frozen storage life is fairly good. The fillets, individually wrapped in polythene, have better storage life than block frozen fillets and frozen minced meat blocks. The frozen products retained their natural flavour and texture for about 16 weeks.

Experiments were carried out to standardize methods for freezing smoked products prepared from mackerel and mussel. Dressed mackerel was dipped in saturated brine for 20 mts., drained and then subject to smoking for one hour. The smoked fish was later quick-frozen with and without the addition of glaze water. It was observed that addition of glaze water is essential to get frozen block of uniform shape and for quicker freezing, resulting in a better quality product as a whole. Freshly shucked mussel meat was also smoked after blanching in boiling brine. The blanched meat was drained and smoked for 30 minutes. The smoked meat was then quick frozen in blocks of 1 kg each. In this case also it was seen that addition of glaze water is essential for proper freezing and getting better quality product. Shelf life studies have shown that both the products were of good quality even after 3 months in cold storage.

Research contemplated

1. Further studies on freezing and frozen storage characteristics of fillets of shark.
2. Production and freezing of minced meat from fish.
3. Freezing cuttle fish.
4. Further studies on freezing and storage of fresh whole crabs, cooked crabs, raw meat and cooked meat, raw claw and cooked claw meat.
5. Studies on frozen storage characteristics of lightly smoked products of eel and cat fish.

6. Studies on the ice storage characteristics of important fishes of Gujarat, (*Wallago attu, Catla catla*), Kakinada, (Mullet (*Mugil sp*) and Hirakud reservoir (*Labeo calbasu, L. rohita and Cirrhina mrigala*).
7. Freezing and storage of oysters, barracuda and sole fish.
8. Filleting and freezing of ghol and rawas.

SCIENTISTS ASSOCIATED

COCHIN: T. K. Govindan, P. A. Perigreen, Chinnamma George, Jose Joseph.

VERAVAL: K. K. Solanki, A. C. Joseph, Rajendra Badonia, Anil Agarwal.

CALICUT: V. Muraleedharan

BOMBAY: D. K. Garg

4.3 CANNING

CHIEF FINDINGS

Use of frozen stored mackerel tuna (Euthynnus affinis) *for canning showed the incidence of green discolouration in the canned meat, its intensity increasing with length of storage. Steaming fresh mackerel* (Rastrelliger Kanagurta) *followed by cooling to room temperature renders removal of skin easy and yields unbroken fillets for canning. Oyster meat yielded good canned products when canned in brine. Smoked fillets of silver bar yielded acceptable canned products. Fresh whole mussel and freshly shucked meat transported in ice and also stored in ice upto two days yielded good canned products whereas storage beyond this period affected the quality.*

RESEARCH IN HAND

Studies on frozen and cold stored mackerel tuna have shown the incidence of green colouration in the canned meat, its intensity increasing with length of storage. Progressive reduction in the content of TMAO and increase in TMA was observed during the period of storage. Whereas fresh tuna, canned in oil, remained without any change in colour, taste and flavour, canned product prepared out of frozen tuna cold stored for a period of one week developed greening as also a detectable bitter taste. The factors responsible for this phenomenon are under study.

Detailed studies were undertaken on preparation of skinless fillets from mackerel for canning. The lye peeling method tried was not found suitable for the following reasons - i) washing the fillets to free them from

the alkali is difficult, ii) there occurs breakage to the extent of 8-15% in most cases. Steaming the fresh fish in saturated steam for 2 minutes followed by cooling to room temperature was found to facilitate easy skinning. Breakage of the fillets was also found negligible. The fillets thus obtained, when canned in natural style,yielded very good product. In the case of frozen and thawed mackerel, one minute's dip in hot water at 80-90°C facilitated easy removal of the skin. Unbroken, uniform fillets of acceptable appearance yielding good quality canned product could be obtained.

In order to overcome the problem of discolouration observed on the exposed surface of milk fish (*Chanos chanos*) when canned in fillet form, canning the fish in chunks was attempted. The processing parameters like blanching time, cooling time, etc. as applicable to canning in chunk form have been worked out. The fish so packed required longer period of cooking and heat processing to render the bone soft.

A detailed programme of study was undertaken to work out a system of transportation of mussel as is commercially conducive. Live transport in water was found to be the best, but involves transport of a bulk of shell and water which adds to the cost. Transport of whole mussel, freshly shucked meat, boiled and shucked meat and freshly shucked and boiled meat, separately stored in ice were attempted. The studies were undertaken to evolve an easy mode of transportation of mussel. If meat can be shucked at the place of production after purification, the storage and transportation of the meat will be made easy by reducing the bulk. Also the labour in the processing factories will be minimised. On further processing into canned product, it was observed that the best products were obtained from whole mussel as well as freshly shucked meat transported in ice. The same material was then subject to progressive ice storage when it was seen that material stored for 2 days in ice yielded organoleptically good products. The changes taking place in the chemical indices during storage have been followed.

Suitability of canning oyster meat in its own nectar, brine and in oil was studied in detail. A good product was obtained when the meat was canned in brine. Smoked oyster meat also rendered itself well for canning in oil. Studies were also undertaken on canning ghol and horse mackerel, both in brine and oil. In the case of ghol, canning in oil was found to yield a better product with better colour, texture and flavour.

Fillets of silver bar fish, soaked for 2 hours prior to canning, yielded a product firm in texture and better in flavour and appearance when compared to the control samples. A method was developed for canning fish paste prepared from ribbon fish. The product however lacked colour and texture.

Canning of smoked ribbon fish was also attempted. Work is in progress.

Preliminary studies were undertaken on feasibility of canning squid rings in syrup.

A study was also undertaken on the suitability of lacquer developed by (a) Metal Box Co. of India Ltd., and (b) Poysha Industrial Company Limited for application on cans for packing sardines. It was observed that the lacquer was sound and the product could be stored without blackening for a longer period. However, the lacquer coating was not of uniform thickness and especially at the edges of cans, the metal was found exposed.

The Institute collaborated with the MPEDA in their market development programme by preparing and supplying products developed by it.

RESEARCH CONTEMPLATED

1. Canning of fish roe.
2. Further trials on canning horse mackerel and ghol.
3. Canning squid rings in different syrup media.

SCIENTISTS ASSOCIATED

COCHIN: K. K. Balachandran, P. K. Vijayan
VERAVAL: Rajendra Badonia, A. C. Joseph, M. R. Raghunath.

4.4 ENZYMES, PROTEINS AND LIPIDS

CHIEF FINDINGS

The oxidative rancidity development in commercially important fishes during ice|frozen storage is contributed mainly by the lipids of the skin when they are held in round condition. Susceptibility of these lipids to autoxidation was found to change with seasonal variation of the fat content of the fish, though at the same time development of oxidative rancidity was independent of differences in the fatty acid composition from season to season. The proteolytic enzymes were present in relatively larger quantities in scombroid fishes which generally record lower shelf life during ice storage and frozen storage as judged from accepted organoleptic standards. The electrophoretic behaviour of myosin of sardine and mackerel brought out their decisive role in bringing out textural changes in frozen fish muscle. The mercury content of commercially important species of fishes examined was found to be far below the prescribed tolerance level.

Research in hand

Experiments initiated earlier on purification of pituitary hormone extracted from fish were completed during the period. A homogenous preparation with higher analytical purity was obtained as confirmed by chromatography on Sephadex G-100 using NIH ovine growth hormone as standard.

Detailed studies were undertaken on the biochemical composition of commercially important fishes and shell fishes. Almost all the fishes examined showed fairly good content of essential amino acids. Only clams and mussels recorded lower levels of these amino acids.

The distribution of toxic elements, particularly mercury and cadmium present in the different anatomical areas of the fish were screened. Their contents have been found to be far below the level required to produce toxicity. In mackerel undergoing spoilage, toxic amines, histamine and putrescine were detected.

The major myofibrillar proteins from sardine and mackerel were isolated and their properties studied. Although the myosin from these fish showed identical properties, an additional weak, fast moving band was detected in the electrophorogram of sardine myosin. As regards the action fraction, the isolate from sardine showed a single band during electrophoresis, whereas mackerel actin manifested several bands under the same condition even after repeated purification.

At the Veraval Research Centre, steps were initiated to undertake studies on these aspects as per the programme. A laboratory was set up and necessary equipments for the studies contemplated, purchased. Representative samples of fish from different sources were procured and analysed bacteriologically for their lipolytic activity. It was observed that the dried fish samples were a better source of lipolytic bacteria.

Research contemplated

1. Biochemical composition and nutritive value of edible fishes and shell fishes.
2. Biochemical changes in the major muscle constituents during processing and preservation of fish and their impact on flavour and texture of processed fish products.

Scientists associated

COCHIN: M. R. Nair, K. Devadasan, P. D. Antony, A. G. Radhakrishnan, P. G. Viswanathan Nair, M. K. Mukundan, Jose Stephen, K. Ammu, N. Unnikrishnan Nair.

VERAVAL: H. K. Beri.

4.5 FOOD POISONING MICRO-ORGANISMS AND THEIR CONTROL

CHIEF FINDINGS

The microbiological changes in the bacterial flora of milk fish and pearl spot during ice storage were studied in detail. The free amino acid content in jew fish in fresh and spoiled conditions was determined.

A method for improving the yield of prawns canned in brine by 5% was standardised and applied successfully in the industry. The method consists in treating the raw prawn meat with a mixture of phosphates in solution followed by blanching. The treatment also results in better size grade of the product. Incubation temperature of 30°C *was found to yield consistently higher total plate count of commercial frozen products compared to* 5-10°C *and* 37°C. *The total plate count of fish continuously stored n ice is highest at* 5-10°C, *but that at* 30°C *is more practicable due to the shorter incubation period.*

Intelectron Fish Tester VI was found to be useful in assessing the quality of raw tilapia, pearl spot, mackerel, mullet and sardine. Shelf life of these fishes at ambient temperature and in ice was worked out.

Studies on the behaviour of Vibrio parahaemolyticus *and* V. alginolyticus *in different fish homogenates during freezing and subsequent cold storage showed that* 80-99.9% *of the organisms are destroyed during freezing and subsequent cold storage showed complete elimination of residual organisms within* 30 *days.*

RESEARCH IN HAND

A detailed study was undertaken on the micro-flora of milk fish (*Chanos chanos*) and pearl spot (*Etroplus suratensis*). The microbiological changes in the flora during ice storage of the fishes were also studied. The groups of bacteria encountered were *Pseudomonas, Alcaligenes, Acinetobacter, Flavobacterium, Vibrio, Moraxella, Micrococci, Planococcus, Staphylococcus, Streptococcus, Bacillus* and *Escherichia*. The percentage of the gram positives in these fishes were a little on the higher side than that found in marine fishes. A collection of 108 cultures is being maintained under the National Collection of Aquatic and Fish Bacteria.

Studies were carried out on the selection of optimum temperature for incubating plates poured out from frozen fish samples. Samples studied

included fillets of jew fish, cat fish, mixed fish kheema and ribbon fish. A total of 287 cultures were isolated and their characteristics studied, especially with respect to their growth temperature ranges. It was observed that the total count on frozen fish products was highest with an incubation temperature of 30°C followed by 37°C and 8°C incubation.

Handling, storage and marketing of dried/cured products in domestic markets were studied. The general observation was that the fish is dried insufficiently and overall wastage is 10%. 'Pink' and 'dun' characteristics were not observed in all the 150 samples examined. However, in fatty fishes, yellowing due to oxidation of oils was found to be a common occurrence. The price of a unit weight of dry fish was lower than that of fresh fish. All the samples were examined for size, extraneous material, moisture, salt and acid insoluble ash. Salmonella was not detected in any of the samples examined. Changes in quality of tilapia, pearl spot, mullet and sardine during storage at ambient temperature and in ice were studied following readings on Intelectron Fish Tester VI, sensory evaluation technique, biochemical characteristics and bacteriological data. The maximum shelf life of these fishes was as follows:—

Fish species	Maximum shelf life at Ambient temp.	0°C
Mackerel	8½ hrs	5 days
Tilapia	9½ hrs	11 days
Pearl spot	12 hrs	12 days
Mullet	10 hrs	6 days
Sardine	8 hrs	4 days

In the case of fish stored continuously in ice, TPC at 5-10°C was highest, followed by that at 30°C and the lowest at 37°C. Counts at 30°C and 5-10°C correlated with the overall quality. However, the TPC at 30°C was preferred for routine estimation due to the shorter incubation period involved.

Behaviour of *Vibrio parahaemolyticus* and *V. alginolyticus* in sterile fish homogenates of seer, horse mackerel, hilsa, pomfret and razor edge during freezing and subsequent cold storage were studied in detail. During freezing, 80 to 99.9% of the inoculated organisms were destroyed. Subsequent cold storage showed elimination of residual organisms in the homogenates within 30 days. Behaviour of both the above strains of *Vibrio* was seen to be almost identical in all the fish homogenates during freezing and cold storage.

Studies were undertaken on the pathogenecity of the new sero-type of *Salmonella* viz. *S. roan,* which has been isolated for the first time in India, by injection into mice, in collaboration with the Haffkine Institute, Bombay. It was found to be a virulent pathogen producing symptoms similar to that produced by any enteropathogenic organism. Autopsy studies indicated generalised congestion of all the organs. Microphage infiltration of the spleen, liver and mesenteric lymph nodes were noted in all the cases. All the eleven mice experimented upon and killed on the 1st, 3rd, 6th and 14th days yielded non-lactose fermenting gram negative organisms showing biochemical characteristics exactly identical to those of the strains injected.

About forty six samples of fish and fish products commercially processed in Bombay were analysed for presence of *Salmonella* and other pathogens, *Salmonella* was detected in 6 samples of froglegs, 2 of lobster tails and 4 samples of frozen seer fish. More than 45 strains isolated from these sources are being serotyped. Among those already serotyped, *S. enteritidis* predominated. *Salmonella* was also detected in a sample of dried, non-penaeid shrimp which constitutes 25% of the total fish landings of Maharashtra coast.

Studies were also carried out on the incidence of *Clostridium perfringens* in some of the fishes landed in Sassoon Dock, Bombay. A total of 66 samples, comprising ten each of barracuda (*Sphyraena spp*), Bombay duck (*Harpodon nehereus*), sword fish and kilimeen, five of chorbombla (*Synodontidae spp*), Seer fish (*Scomberomorous spp*), Sole (*Cynoglossus spp*) and prawn (*Metapenaeus spp*) four of jawala prawns (*Acetes sp*) and two of half-beak (*Hemiramphus spp*) were thus examined. The meat and gut were examined in all the cases, except prawns. *Clostridium perfringens* could be isolated only from five prawn gut samples. The morphological and biochemical characteristics of the isolated strains are being studied.

At Kakinada Centre, eighty seven samples of dried fish, brine and ready-to-serve fish products were examined for enteric pathogens. Fourteen of the samples revealed presence of coagulase positive staphylococci Other pathogens were absent in all the samples. Further characterisation of the isolates is in progress.

RESEARCH CONTEMPLATED

1. Comparison of Torry meter and Intelectron Fish Tester for measuring freshness.
2. Quality of fish landed at Cochin fish harbour.

3. Further studies on quality of dried | cured products in domestic markets.
4. Comparison of objective indices with subjective assessment for important fish species.
5. Containers for storage of material of high unit value on board fishing vessels.
6. Studies on the incidence and isolation of *Salmonella* and *Vibrio parahaemolyticus* in fish and fishery products from Saurashtra region.
7. Enterotoxin typing of staphylococcal isolates from fishery products and handlers.
8. Examination of different types of fishery products for hazardous chemicals such as mercury, pesticide residues etc.

SCIENTISTS ASSOCIATED

COCHIN: K. Mahadeva Iyer, Cyriac Mathen, M. Arul James, P. R. Girija Varma, P. K. Surendran, Nirmala Thampuran, Francis Thomas, P. T. Laxmanan.

VERAVAL: A. C. Joseph

KAKINADA: C. C. Panduranga Rao, D. Imam Khasim Saheb, Sibsankar Gupta, Subrata Basu.

BOMBAY: T. S. Gopalakrishna Iyer, V. Narayanan Nambiar.

4.6 PACKAGING OF FISH & FISHERY PRODUCTS

RESEARCH IN HAND

1. Master cartons for frozen shrimp.

Samples of master cartons used for export of frozen shrimp were collected from Quilon, Cochin, Calicut, Bombay, Veraval and Kakinada and analysed for different parameters specified in ISI Standards (IS: 6715-1972). It was observed that of the specimens collected from Quilon, Cochin and Calicut, excepting one or two received from Quilon, most were not waxed and were below ISI specifications with respect to the combined weight of liners, basis weight of corrugating medium, bursting strength and water absorption value. The samples obtained from Bombay were waxed on both sides and conformed to IS Specifications with respect to water absorption value, combined weight of liners and basis weight of corrugating medium but were below standard with respect to bursting strength. The wax content in cartons received from Bombay and Kakinada varied widely from 1.17% to 6.54% and saponifiable matter from 1.17% to 2.85%. It was observed that higher the content of saponifiable matter, lower the

water absorption value. The cartons collected from Veraval were all below IS specifications with respect to water absorption value, but conformed with them in puncture resistance, bursting strength, combined weight of liners and basis weight of corrugating medium.

2. Duplex cartons for frozen shrimp.

Waxed duplex cartons collected from different centres were also analysed for various parameters like dimensions, thickness of board, moisture content, puncture resistance, tensile strength, tearing strength, wax content, saponifiable matter content and water absorption value. Wide variations were observed in the above properties.

3. Packagings for frozen fish.

Studies were initiated on the effect of different packaging materials on the quality and shelf life of frozen fish fillets during storage. Frozen cat fish fillets were packed in LDPE and HDPE films of 125 gauge thickness and stored at 18°C along with control samples, without packaging. It was observed that the control samples became inedible after six weeks of storage, discolouration, desiccation and rancidity being the main causes of spoilage. The packaged samples remained in good condition even after four months of storage. Polypropylene film was not found suitable for this purpose since it became brittle and cracked at frozen temperature.

4. Packaging of dried fish products.

A direct on-the-spot study was made of the cured fish industry at Tuticorin with special reference to packaging problems connected with the commodity and with a view to working out improved containers for them.

RESEARCH CONTEMPLATED

1. Survey of the properties of packaging materials used in the frozen shrimp industry to be continued with a view to working out quality standards. Study of changes taking place in their properties during frozen storage.
2. Studies on packaging materials for frozen fishery products for internal consumption.
3. Storage behaviour of cured fishery products in various packaging materials.

SCIENTISTS ASSOCIATED

COCHIN: T. K. Govindan, P. A. Perigreen, T. K. Srinivasa Gopal, K. P. Antony.

4.7 DIVERSIFIED PRODUCTS FROM FISH & UTILIZATION OF PROCESSING WASTES

CHIEF FINDINGS

Fish fingers prepared from the meat of cheap varieties of fish retained their good quality, as judged by organoleptic characteristics, even after nine months of storage at -15°C. Bacteriological peptone prepared from trash fish was found highly acceptable for bacteriological studies by many laboratories in India. Chitosan from prawn shell or squilla shell forms an addition compound with formalin thereby increasing the chain length and viscosity in solution. However, on keeping, the solubility of the product decreases, thereby becoming unsuitable for flocculation. Squilla proteins were shown to have no deleterious effect on rats, and in combination with casein, it gave better growth results. Technical grade fish albumin could be prepared from by-catch.

RESEARCH IN HAND

Fish fingers were prepared from the meat of cheap varieties of fish with 1% sodium chloride and kept at -15°C along with control sample prepared without sodium chloride for periodical assessment of their quality. The fingers thus stored were taken out after different periods of storage, dipped in a batter prepared from wheat flour, milk powder and water, deep fried in vegetable fat and their organoleptic qualities assessed. It was seen that all the fingers remained in good condition even after 9 months of storage at -15°C. Another batch of fish fingers was kept in storage at -15°C after breading, dipping in batter and frying. These, however, remained in good condition only upto 3 months.

Fish hydrolysates were prepared from different varieties of cheap fish by enzymatic hydrolysis using papain. The yield from some species is given below.

Lizard fish (*Saurida tumbil*)	..	13.3%
Orathal (*Platicephalus*)	..	11.0%
Ribbon fish (*Trichiurus sp*)	..	9.9%
Barracuda (*Sphyraena*)	..	11.9%
Jew fish (*Johnius sp*)	..	9.9%
Crescent perch (*Therapon sp*)	..	9.1%
Threadfin bream (*Nemipterus sp*)	..	12.2%
Cat fish (*Tachysurus sp*)	..	10.9%

Anchovies (*Thrissocles sp*)	..	9.7%
Sole (*Cynoglossus sp*)	..	8.6%
Flat fish (*Psettodes sp*)	..	13.2%

Studies were continued on the application of chitosan for flocculation purposes. It was observed that chitosan in acetic acid forms an addition compound with formalin increasing the chain length and consequent viscosity of the product in solution. It was however found that on keeping, the addition compound becomes insoluble in water or organic acids and cannot be used for flocculation purposes. It was also observed that chitosan in formic acid gives a more viscous solution compared to that obtained when acetic acid is used. The high viscosities of both the solutions however decrease rapidly on keeping.

Proteins extracted from squilla were evaluated for its nutritional efficiency by feeding to rats. No deleterious effects could be observed on the growth of rats fed with the protein. On the other hand, it was observed that rats fed with a feed comprising of 50% casein and 50% squilla proteins showed better growth when compared to rats fed with just 100% caseins. The protein efficiency ratio (PER) of squilla protein was also determined. The soluble non-protein nitrogen fractions of squilla when dried under vacuum and used in bacteriological media in place of peptone gave very good growth of bacteria. An expeller was procured and installed for extraction of proteins and soluble non-protein fractions from whole squilla. Further work on utilization of squilla is in progress.

Technical grade fish albumin was prepared from low cost fish and analysis of the samples prepared undertaken. Attempts were also made to prepare good grade fish albumin.

Designing was undertaken of a simple, manually operated machine for preparing isinglass.

Samples of edible fish powder were prepared from different cheap varieties of fish. Different types of food preparation were also formulated using this powder, starch and spices. Attempts were made to prepare fish sauce from non penaeid prawns at the Bombay Research Centre. Due to the minute size of these prawns it has been found practically impossible to separate the pulp from the shell for using as a direct food material. It was in this context that studies were undertaken to prepare fish sauces of the type "nuoemon," "patis," or "nampla" of the South Eastern countries. Moreover, the process is simple and can be carried out in bulk scale even in rural areas without much mechanisation. Initial studies carried out have yielded encouraging results, giving a highly flavoured golden brown sauce. These studies have also shown that sauce fermentation is related to the

temperature of fermentation, initial consistency of the material, proportion of salt, incorporation of proteolytic enzymes etc. Work is in progress to standardise the technique. Attempts are also being made to explore the possibility of preparing fish wafers utilizing the non-penaeid shrimps. Efforts are also being made to isolate the meat from these prawns free from shell particles.

RESEARCH CONTEMPLATED

1. Pilot scale production and utilization of bacteriological peptone. Its acceptability studies.
2. Improvement in the quality of fish fingers and their shelf life. Selection of suitable batters and consumer preference studies.
3. Development of products using fish hydrolysate and their nutritional evaluation.
4. Preparation of products incorporating fish powder.
5. Trial runs with pilot plant for production of chitosan from prawn waste. Application of chitosan in waste water treatment and studies on the absorption capacity of chitosan for organic and inorganic materials.
6. Standardisation of process for production of squilla proteins and chitosan from squilla shell and nutritional evaluation of squilla proteins.
7. Production of food grade albumin and its feasibility studies.
8. Further studies on utilization of non-penaeid prawns

SCIENTISTS ASSOCIATED

COCHIN: P. V. Prabhu, K. Gopakumar, A. Vasanth Shenoy, R. Thankamma, K. G. Ramachandran Nair, P. T. Mathew, A. Lekshmy Nair, Ravindran Nair,

VERAVAL: M. R. Raghunath

KAKINADA: Subrata Basu, D. Imam Khasim Saheb.

BOMBAY: A. P. Valsan, V. Narayanan Nambiar, D. K. Garg.

4.8 CRAFT MATERIALS

CHIEF FINDINGS

A modified version of a 17 m OAL steel trawler as required by the Institute was taken up for construction at the Mazagon

Docks. Construction of a 9 m OAL wooden mechanised vessel as per CIFT requirement was completed. This vessel is for use in the inland reservoir at Hirakud. Another 7m OAL wooden mechanised vessel was also constructed as per the Institute's design specifications and under its complete supervision on behalf of the Marine Products Export Development Authority.

Nearly 800 mechanised wooden hulls of fishing boats in Kerala have been sheathed with aluminium magnesium alloy plates in lieu of imported copper as per CIFT recommendations.

The 4m OAL wooden row boat constructed the previous year out of seasoned and preservative treated mango wood was put to extensive field trials. The performance was found to be satisfactory under manual as well as mechanised operations.

Deterioration of craft materials through physical, chemical and biological agencies was evaluated, both qualitatively and quantitatively.

RESEARCH IN HAND

1. *Corrosion and biodeterioration of fishing craft materials*

The performance, behaviour and inter-action of low cost, high utility fastenings such as cadmised iron, galvanised iron, aluminium alloy, iron | steel for hardware applications on selected species of boat building timbers like *Adina cordifolia; Lagerstroemia lanceolata, Mangifera indica* and *Tectona grandis* were studied. The quantitative measurements related to the determination of pH on potential shift. The latter was suggestive of interaction leading to deterioration of the fastenings. A scanning of pH in the immediate vicinity of extracted fastenings showed gradation, indicating the existence of well defined anodic and cathodic areas. Further experiments proved the formation of galvanic couples formed through, especially, treated woods which provide conducting paths. The quantitative measurements of corrosion and acidity of wood were also made for predicting the behaviour of fastenings under service conditions.

Studies have revealed distinct possibilities of combining antiborer and antifouling activities, through the use of toxins and abrasives on a single surface. The most promising results were obtained when TBTO was incorporated in polymerised rubber resin. The surface warded off foulers and borers for eight weeks during the peak period of attack. The binding

property was also quite satisfactory. An insight into the packing characteristics of the abrasive (Silicon carbide) into the resin could be gained through a study of the particle size of the abrasive. This helped to arrive at satisfactory loading of solid matter. In some formulations, the toxin got locked up with little chances for it to travel through the medium and reach the matrix|sea water interface. Such compositions were modified upon by incorporating alkali sensitive components.

2. *Fortification of oil-borne preservatives*

Studies were conducted to determine the affinity of creosote to arsenic trioxide and copper acetoarsenite. Known quantities of arsenic trioxide and copper acetoarsenite were treated in creosote separately at 50°C for about 5 hours. The mixture was then allowed to settle for about 24 hours, after which the mixture was filtered through Watman No. 42 filter paper. The stock samples were kept for future use. Known quantities of this sample were digested with concentrated sulphuric acid and hydrogen peroxide till the digest cleared. Several samples were prepared for the estimation of arsenic and copper which was done using atomic absorption spectophotometer. It was found that 0.2% W|W arsenic trioxide and 0.17% W|W of copper combined with creosote.

3. *Marine corrosion and its prevention*

A double action anti-corrosion paint for fishing boats has been designed, formulated and sample batches produced. The matrix comprising of linseed oil, rosin and phenol modified CNSL having adequate mechanical strength, water resistance and brushability was developed after working on different combinations and under different processing conditions. The compatibility studies have shown that zinc dust possessed pigment-pigment continuity and pigment-matrix compatibility. The few experiments that were carried out using zinc oxide in combination with zinc dust have yielded satisfactory results. The compositions withstood an applied potential in the range of -600 mV to -1200 mV with respect to saturated calomel electrode on marine steel and aluminium in sea water. An assessment of the degree of protection afforded by the anticorrosive paint system was made by using salt spray cabinet and other simulated tests.

4. *Boat building materials*

a) Fibreglass reinforced plastic (FRP):

Smaller versions of FRP fishing crafts of 4-6 m length suitable for installing an out-board motor or the indigenous inboard engine with out-board drive have been developed in the private sector based on the guidelines provided by this Institute. Prototypes of such boats have been tested,

trials taken and found suitable for coastal fishing as well as for inland lakes and reservoirs. The FRP boats, being light in weight, are easy to handle, require lesser horse-power for propulsion and has better cost-benefit ratio in its long lasting service. Two firms are now producing the required glass fibre material and six firms the required thermosetting resins and components. Eight firms have begun fabricating FRP boats as per given specifications and working schedule.

b) Ferrocement:

In the light of Lloyds Register of Shipping and their specifications, the quality of cement, aggregates, water and the mild steel reinforcement structures required for ferrocement fishing boat construction has been worked out for the benefit of prospective builders in the country. Suitable design details for ferrocement boats are being screened through F.A.O./UN and the International Ferrocement Information Centre, Thailand.

The possibility of introducing ferrocement construction for structures required for the coastal mariculture is also being worked out.

c) Treated timbers for boat building:

Prototype studies, tests and trials undertaken with the row boat constructed out of treated mango wood have resulted in a saving of about 40-50% in cost when compared with the conventional untreated venteak, aini and teak. The boat has been found to withstand the vigorous weathering conditions.

Studies have also shown that utilization of preservative treated haldu and mango wood for construction of mechanised fishing vessels will bring down the overall cost without in any way adversely affecting their working condition and life.

d) Other new materials:

Marine plywood and marine quality aluminium are being tried as alternate materials for boat building.

RESEARCH CONTEMPLATED

1. Process development for protection of low cost alloys for marine propeller
2. Evaluation of radiation processed woods
3. Testing of boron based preservatives and treated balsa woods
4. Further studies on fortification of oil borne preservatives

5. Treatment of built-in-canoes with chemical wood preservative and evaluation of their performance
6. Further studies on FRP, ferrocement, marine plywood and aluminium as alternative construction materials for fishing boats
7. Development of small scale fisheries through improvements to traditional fishing crafts, gear and methods of operation to be initiated in selected coastal villages.

SCIENTISTS ASSOCIATED

COCHIN: R. Balasubramanyan, K. Sreedharan Namboodiri, Dr. K. Ravindran A.G.G.K. Pillai, N. Unnikrishnan Nair, B. Meenakumari, Varghese Paul, Rani Mary Jacob

4.9 GEAR: MARINE

4.9.1 (a) TRAWLS (A) EVOLUTION OF SUITABLE GEAR FOR INSHORE FISHING

CHIEF FINDINGS

Experiments carried out at Cochin with two new designs of large mesh trawls have conclusively shown their efficiency for exploitation of off-bottom and column fishes. The 32 m *four seam large mesh high opening fish trawl evolved to suit the fishing conditions of the south-west coast showed its comparative efficiency over a* 32m *bulged belly trawl. This gear on separate trial fishing operations showed a fishing efficiency of* 65.7% *for squid,* 73.2% *for pomfret,* 71.70% *for barracuda,* 67% *for cat fish and* 65% *for sharks. The gear has also indicated a lesser utilization of horse power by* 18% *(as calculated by the resistance offered) over the bulged belly trawl indicating greater scope for enhancing the optimum size of the gear for increased fish production. In the overall performance, the efficiency of the gear was* 95% *and* 27% *more respectively for column and demersal fishes when compared to the bulged belly trawl. In addition, the cost of the gear is* 35% *less than that of the conventional trawl. The other gear evolved for the north-west coast was a* 32m *large mesh two seam fish trawl, which was found efficient for catching high swimming and fast moving fishes like seer, eel, perches, ghol, silver bar etc. and bottom dwellers like lobster, prawns, sharks and flat fishes.*

At Veraval, comparative fishing experiments conducted with a 25m *bulged belly trawl and* 25m *six seam trawl have indi-*

cated the efficiency of the former over the latter for capture of 'shallow-water mix.' The fishing operations were conducted from a 15.25m *vessel with* 165 H.P. *engine. While there was no significant difference in the landings of quality fishes like Sciaenids, Cephalopods and Ribbon fishes in the two nets, catch of prawn and lobsters was more in the bulged belly trawl. It was however observed that the warp tension offered by the bulged belly trawl was more than that offered by the other. Moreover, the six seam trawl is cheaper. Thus it was shown that while the bulged belly trawl is recommended for exploitation of 'shallow-water mix' comprising of small miscellaneous fishes and crustaceans, a six seam trawl is equally effective for capture of all other fishes other than the 'shallow-water mix.'*

Comparative efficiency studies carried out at Goa Centre of two mid-water trawl designs, viz a 10.3 m *unequal panel net and a* 10.5m *equal panel net have conclusively proved the superiority of the former over the latter. The two main objectives of the study were introducing mid-water trawls in the Goan waters and evolving a suitable design for medium class vessels. This study has also helped in introducing the design of a* 120 x 60 cm *vertical curved board in the area.*

Comparative studies with the three designs of trawls, viz. bulged belly, long wing and six seam have shown the superiority of the bulged belly trawl over the others.

RESEARCH IN HAND

Studies initiated earlier at Cochin with the 12.5 m single boat mid-water trawl net were continued in combination with two and four otter boards. Studies were also continued with 17m parachute trawl. Trial operations carried out with the separator trawl did not yield any significant result and hence were discontinued. Fabrication of polyvalent otter boards is in progress.

In Kakinada, fishing experiments were continued with the 15.5 m vertical double trawl net. Though the net functioned satisfactorily, it was found necessary to effect some modifications in the joining and in the jib region. The catch obtained was also low. A new net of head rope length 13.6 m incorporating the necessary changes was fabricated and trial operations carried out in the inshore areas for 6 days. Results indicate that the 13.6 m trawl works more satisfactorily with more vertical spread.

Further studies were made on twin trawling with sled. Experiments conducted earlier had shown that the size of the gear could be increased

for better returns and to cover more area. Trial operations made earlier were with nets with 10.2 m head rope length. Bigger nets of 13.5 m head rope length were designed and fabricated and operated for four days in combination with two boards and a sled. The results obtained have been encouraging.

Fishing experiments were continued with the Mexican type otter boards of size 150 x 60 cm and weight 50 kg and compared with the normal flat rectangular boards of specification 130 x 70 cm x 50 kg. The boards were operated in combination with a 20 m bulged belly trawl. Catch data obtained have shown the better efficiency of the Mexican type otter board over the rectangular board.

Studies were initiated during the year with a 23 m high opening trawl for exploitation of off-bottom fishes. The net was operated along with a 20 m bulged belly net. The boards used were of 130 x 70 cm x 50 kg flat rectangular type. A total of 25 daily trips were made. Results show that the new trawl worked quite satisfactorily and gave slightly better catch over the bulged belly net.

In Veraval, studies on the 25 m high opening trawl and its evaluation as a multipurpose trawl were continued. As observed earlier, the gear works as a bottom trawl, but serves the purpose of a mid-water trawl too to a certain extent.

Comparative efficiency studies with the 15 m bulged belly trawl, 15.8 m six seam trawl and 29.26 m long wing trawl in combination with the flat rectangular and horizontal curved boards were continued during the year from Goa Centre. A total of six combinations were tried. The bulged belly trawl in combination with flat rectangular board was found to be most efficient for landing shrimps, the catch per hour being 7.6 kg compared to 4.9 kg and 4.5 kg with the long wing and six seam trawls respectively. In combination with horizontal curved boards too, the catch per hour of shrimps was 4.0 kg, 3.2 kg, and 2.9 kg respectively for the three nets. But with regard to landing fish, six seam trawl in combination with flat rectangular board was seen to be most efficient with the catch per hour being 26.9 kg followed by bulged belly trawl (22.2 kg). With horizontal curved boards also, the nets showed decreased efficiency, catch rate being 12.5 kg., 9.3 kg and 7.3 kg for the six seam, bulged belly and long wing trawl respectively.

RESEARCH CONTEMPLATED

1 Studies on mid-water trawls for small and medium class vessels from Cochin, Kakinada and Veraval

2. Studies on parachute trawls to be continued from Cochin
3. Further studies on high opening trawls at Kakinada and Veraval
4. Studies on separator trawl to be attempted at Kakinada. Also, further studies on twin trawling.
5. Studies on the effect of large meshes in the bosom area of trawls and tapering jibs in bottom trawls at Goa Centre.

SCIENTISTS ASSOCIATED

COCHIN: K. A. Sadanandan, P. A. Appukutta Panicker, K. Sreedharan Namboodiri, K. N. Kartha, N. Subramonia Pillai, P. George Mathai, T. M. Sivan, K. Gopalakrishnan

VERAVAL: K. K. Kunjipalu, M. R. Boopendranath, A. C. Kuttappan

KAKINADA: A. V. V. Satyanarayana, G. Narayanappa, S. V. S. Rama Rao, R. Mangayya Naidu, J. Sitarama Rao.

GOA: H. N. Mhalathkar, T. Joseph Mathai, V. Vijayan, M. Syed Abbas, T. P. George

4.9 (b) TRAWLS (B) DEVELOPMENT OF GEAR FOR OFFSHORE FISHING

CHIEF FINDINGS

A new large mesh demersal trawl of 32 m *head rope length was found more suitable and efficient for exploitation of demersal fishery resources off Veraval compared to a standard bottom trawl of same head rope length with conventional small meshes.*

RESEARCH IN HAND

The suitability and efficiency of the newly developed 32 m large mesh demersal trawl were assessed for exploitation of offshore waters. Studies have indicated that this new trawl is more efficient than the conventional trawl with small meshes for exploitation of the demersal fishery resources off Veraval. Increased catch with a proportionate increase of quality fishes was obtained, indicating the possibility of increasing the mesh size of the trawl nets in the fore part without affecting the total catch. This results in an increase of the mouth area which in turn enhances the fishing power by covering a larger area per tow. Further, the new net is simple to consruct and easy to repair as it involves lesser number of meshes.

Studies have also been undertaken on the operation of the large mesh trawl with Vee form otter boards of size 1500 mm x 890 mm of 125 kg each in different riggings. Preliminary trials carried out have indicated the suitability of the Vee form board for offshore fishing.

. Designs were also evolved of a 21 m four equal panel mid water trawl and a 'Zagger net' for mid-water trawling in the off-waters.

New trawl resources like Cephalopods (squid and cuttle fishes) and ribbon fishes have been indicated off Veraval for commercial exploitation.

RESEARCH CONTEMPLATED

1. Studies on mid-water trawling, 'Zagger nets' and pelagic trawls
2. Squid fishing
3. Kalava fishing
4. Rigging of otter boards for mid-water trawls

SCIENTISTS ASSOCIATED

VERAVAL: K. K. Kunjipalu, A. C. Kuttappan.

COCHIN: P. Appukutta Panicker, K. N. Kartha, P. George Mathai, T. P. George, K. V. Mohan Rajan, T. M. Sivan, N. A. George.

4.9.2 ROUND HAUL NETS

CHIEF FINDINGS

Introduction of purse seining for the pelagic shoaling fishes of the Kerala coast is gaining momentum. Required technical guidance is being made available to various interested parties.

RESEARCH IN HAND

Popularisation of the 260.5 m purse seine standardised and released for operation from small classes of vessels has been taken up along the Karnataka - Goa coast.

Work has been initiated on designing a light purse seine for operation from two non-mechanised country crafts (thanguvallams)

Survey has also been taken up of purse seining along the Karnataka coast to suggest modification in the design and operation.

RESEARCH CONTEMPLATED

1. Fabrication and field trials of the light weight purse seine for operation from two non-mechanised country crafts in Chellanam area, Cochin, with the assistance of traditional fishermen.
2. Continuation of field trials for popularisation of the 260.5 m purse seine.
3. Modification in the design and operation of the purse seine at present in operation along Karnataka coast.

SCIENTISTS ASSOCIATED

COCHIN: P. Appukutta Panicker, T. M. Sivan, N. A. George
GOA: V. Vijayan, M. Syed Abbas

4.9.3 GILL NETS

CHIEF FINDINGS

Studies on the suitability of different riggings for gill nets as simple gill net, vertical lines net and framed gill nets with reference to fishes like Hilsa, *pomfret, seer, silver bar and razor edge were completed during the year. It was conclusively shown that gill nets rigged up with lines provide more looseness of webbing thereby enhancing the entangling capacity of the gear and was therefore more efficient than simple gill nets.*

RESEARCH IN HAND

Studies were continued on the efficiency of different coloured gill nets. Thirty six shots of nylon nets were fabricated and dyed in different shades, viz. yellow, orange, blue, brown and green and were operated along with the original white nets. The nets were made of nylon 210 D|2|3 in 50 mm and 60 mm bar meshes and nylon 210 D|3|3 in 70 mm bar meshes meant for *Hilsa,* pomfret, seer, silver bar and razor edge. A total of thirty one observations were made during the period under report. The studies are being continued for confirmatory results. Factors like the visibility of the water which varied from 1.0 m - 10.5 m and the surface water temperature which ranged from 22.5°C to 27.5°C during the season were also observed. The relationship of these physical factors on the catch and composition are also being evaluated.

RESEARCH CONTEMPLATED

1. Studies on shark gill netting
2. Further studies on the effect of colour of the webbing in gill nets

SCIENTISTS ASSOCIATED

VERAVAL: K. K. Kunjipalu, A. C. Kuttappan, M. R. Boopendranath

4.9.4 IMPROVEMENTS ON INDIGENOUS FISHING GEAR:

RESEARCH IN HAND

a) *Lobster Traps*:

A number of new designs of lobster fishing traps of different sizes and shapes have been made. New construction materials were tried for their fabrication. Chemical preservatives and coatings were used for enhancing the service life of the traps. Keeping the indigenous trap of the south-west coast as the control, the new traps were put to field trials at selected lobster fishing grounds. Catching efficiency of each trap, with special reference to environmental conditions, choice of bait and time of operation has been recorded from places like Collachel, Muttom and areas around Kanyakumari.

Similar operations were conducted off Betul and Chapora in Goa using newly fabricated small and large traps of CIFT design. Places like Chapora, Betul and Canacona could be indentified as good lobster fishing grounds. In Kakinada, fishing experiments were attempted with three types of traps, viz. Colachel type palmyrah heart shaped trap, local cycle wheel type and collapsible iron box type. Colachel type trap did not yield any catch during the initial trials conducted. The iron box type, after some modification, was found to show better performance. The studies are to be continued.

b) *Boat Seine*:

An extensive survey was made of the existing designs of 'Kolluvala' (indigenous boat seine) and their operations with a view to effect improvements in their catching efficiency with reduced efforts. An integrated development on the craft, gear and method of operation is contemplated in this regard.

c) *Gill Nets*:

In Goa, ten shots of new design of bottom set lobster gill nets and 10 of old design of gill nets were operated for assessing their comparative efficiency. The new design of gill net was found to be more efficient than the other. The catch per 1000 sq.m. webbing of the new design worked out to be 2.8 off Betul and 3.5 off Chapora compared to 0.54 and 1.8 respectively for the old design.

Entangling type gill nets were introduced in Kakinada area along with fish traps and these have been found effective for exploiting crabs,

d) *'Dol' Net*:

A new 'dol' net was designed and developed for operation in the Veraval waters. The new design has sufficient provision for escapement of juvenile Bombay duck unlike the conventional net designs which are found to land large quantities of uneconomical size groups of the fish. Although the total catch was observed to be less in the experimental net because of less retention of juveniles and certain other fishes, the quality, size-wise and weight-wise, of the Bombay duck landed by the improved design was far better. In addition, the catch of quality fishes was also more in the experimental net.

RESEARCH CONTEMPLATED

1. Further trials with the new designs of traps evolved
2. Study on the economic feasibility of 'Dol' net for recommending to the fishing industry
3. Studies on bag nets
4. Introduction of Chinese dip net in Goan waters

SCIENTISTS ASSOCIATED

COCHIN:	K. A. Sadanandan, K. V. Mohan Rajan, Meena Kumari, K. Gopalakrishnan
VERAVAL:	K. K. Kunjipalu, M. R. Boopendranath
KAKINADA:	G. Narayanappa, S. V. S. Rama Rao, R. Mangayya Naidu, J. Sitarama Rao
GOA:	T. Joseph Mathai, M. Syed Abbas, V. Vijayan, T. P. George

4.9.5 GEAR MATERIALS

CHIEF FINDINGS

The use of higher denier for swing threads in the manufacture of knotless webbings only adds weight to the webbing without any commensurate increase in the strength. Knotless webbings can be advantageously used for gear where webbings with small mesh size and twine size find an application. HDPE as fibrillated tape can be used as a substitute material for nylon on equivalent diameter basis for marine gill nets which used to

employ hemp twines earlier. Braided twines of polyethylene monofilament can be used as an alternate material for twised polyethylene in the fabrication of trawls. In finer diameter samples, medium, tight braid without core is advantageous. Standardisation of specifications of polyethylene monofilament braided twines appears to be necessary since wide variations are observed with regard to construction and properties of the samples studied.

RESEARCH IN HAND

Samples of knotless webbings received from a firm in Bombay were analysed for their properties. The construction details of the samples were also studied to correlate the same with the specifications marked on the sample by the manufacturers. The tests tend to indicate that use of higher denier for swing threads increases the weight four times without any commensurate increase in strength. Use of disproportionately higher deniers for laid-in threads over swing threads makes the interlacing points of the webbing prominent. The desirable combinations are 100 with 210 denier, 210 with 210 and 420 denier for swing and laid-in threads respectively. Knotless webbings may be advantageous in gears where small mesh and thinner twine sizes find an application. Polyethylene monofilament yarn can be advantageously incorporated in laid-in threads in combination with nylon yarns for knotless nets.

As part of the Lab-to-Land programme of the Institute, a bench mark survey was initiated in the Chellanam village to suggest possible improvements for their indigenous gear - Thangu Vala. It is a massive single boat seine operated from a dug-out canoe, employing 14 to 15 crew members. At present, knotted nylon webbings are used in this gear. Since the study on knotless webbings have indicated that knotless webbings can be advantageously used in gears where small mesh size and thin twine size find an application, a field trial of Thangu vala with knotless webbings was initiated in this village. The fabrication of the main body of the net with knotless webbings and the other parts of the net with Polyethylene monofilament twines was started. The material selected for the main body of the net is knotless webbings of specification of 2518 and 2520 i.e. webbings fabricated with nylon 210 denier for swing threads and a combination of 420 denier nylon yarn and 100 denier polyethylene monofilament yarn for laid-in threads having 18 and 20 mm mesh size for the side and central portion of the net proper. For the peripheral band of mesh and selvedge 0.5 mm. and 1.0 mm polyethylene twisted monofilament have been selected. Cutting and joining of one part of the net comprising of 56 pieces of 50 x 1430 to 2600 meshes were completed. Work on the fabrication of webbings with polyethylene monofilament twines is in progress.

RESEARCH CONTEMPLATED

1. Analysis and testing of newer fishing gear materials and accessories that are introduced by the industry from time to time
2. Field trials of newer materials wherever applicable

SCIENTISTS ASSOCIATED

COCHIN: S. Gopalan Nayar, K. Radhalekshmy, T. T. Annamma, Varghese Paul

4.10 GEAR: INLAND:

CHIEF FINDINGS

Further trials carried out have proved the efficiency of 90 mm *bar frame nets for exploitation of the commercial size groups of* C. catla *of Hirakud reservoir. Similarly, the efficiency of* 25 mm *bar simple gill nets for removal of forage and weed fishes that compete with survival of major carps was confirmed.*

Trial operations with trawl net showed that bottom trawling can be done successfully except at certain limited areas where there are submerged obstacles in the Hirakud reservoir.

RESEARCH IN HAND

Further studies carried out with simple gill nets of 25, 30, 35, 40 and 45 mm bar have shown conclusively that 25 mm bar nets are most suited for capture of uneconomical fishes of the Hirakud reservoir, like *G. chapra, R. cotio* and *E. vacha.* The yield from 25 mm bar nets was 2.716, 7.965, 16.520 and 27.534 times more by weight than that of the other four nets.

Collection of data on fish landings from the reservoir applying the stratified random sampling technique was continued.

Bottom trawling was done successfully in the Hirakud reservoir. This is the first time that trawling operations were attempted in an Indian reservoir. A 13 m trawl with flat rectangular board was used for the experiment. The catch included mainly cat fishes like *Mystus aor, M. seenghala, W. attu* and uneconomical fishes like *R. cotio, R. chrysea, N. chitala* and *A. coila.* The catch per hour worked out to 14.55 kg.

Line fishing was initiated with five different hooks of specification 16-20. Tadpoles and earthworms were used as bait. Kirby bent hook No. 20 has been found to show preference for catching cat fish.

Necessary modifications were effected in the prototype of the shore seine designed earlier and the modified gear operated in the upper and middle reaches of the reservoir. The catch constituted of 34.79% ,31.64% and 33.57% cat fish, major carps and uneconomical fishes respectively.

Observations on the effect of shore seining on the fishery resources of the region have shown that in small meshed nets, young ones of major carps are caught during the months of September and October along with other fishes like *M. seenghala, M. aor, S. sillondia, R. cotio, G. chapra, W. attu* and *E. vacha.*

RESEARCH CONTEMPLATED

1. Trials with experimental gill nets in reservoirs other than Hirakud reservoir.
2. Comparative fishing experiments with bottom and off-bottom trawls
3. Comparative set long line fishing experiments with round and kirby bent hooks of different numbers and different baits
4. Light fishing

SCIENTISTS ASSOCIATED

BURLA: V. C. George, M. D. Varghese, A. A. Khan, R. S. Manoharadoss, Percy Dawson

COCHIN: A. K. Kesavan Nair, K. Sreedharan Namboodiri

4.11 MARINE ENGINEERING

RESEARCH IN HAND

The compressor of the fish pump developed earlier was run for sufficient time to see whether it developed the required pressure for operation of the pump. Field trials could not be carried out because of the non-availability of a suitable vessel with enough deck space.

RESEARCH CONTEMPLATED

1. Field trials with the fish pump on board the 57 ft trawler under construction after effecting suitable modification to the compressor unit
2. Mechanisation of small country crafts with the inboard|outboard drive developed

SCIENTISTS ASSOCIATED

COCHIN: S. Ayyappan Pillai, K. Sreedharan Namboodiri

Testing of Marine Engines:

During the year, two indigenously manufactured diesel engines were offered for type testing. Tests were carried out and their suitability for installation in fishing vessels studied. Details of the engines tested are given below:

M|s Kirloskar Cummins Ltd.,	N.H. 220 M
	NHC 4 M
M|s Ruston & Hornsby Ltd., Poona	YD - water cooled
	2YDM - Mark II
	3YDM - Mark II
	4YDM - Mark II
	6YDM - Mark II

Type 692 - DI engine of M|s Tata Engineering and Locomotive Co. Ltd., Poona, installed on a 9.82 m (32 ft) vessel was offered for field tests. Fishing-cum-endurance test was conducted as per ISI specifications and test report issued.

Inspired by the development of the inboard|outboard drive, one enterpreneur, viz. M|s Gear Transmissions (P) Ltd., Madras, developed a stern drive system of Z type for small crafts and offered the same for trials. Trial runs of the drive were carried out and the test report issued.

SCIENTISTS ASSOCIATED

COCHIN: S. Ayyappan Pillai, K. Sreedharan Namboodiri

4.12 PROCESSING ENGINEERING

CHIEF FINDINGS

A 5 tonne capacity commercial solar drying yard was designed and a project report based on the design prepared. A combination of artificial dehydration plant and solar drying yard was found to be ideal considering technical and economic advantages of these two processes.

Design of a 1000 kg shark liver oil plant was also developed and a project report on the same prepared. Design was also developed of a deep freezer to maintain a constant temperature of -30°C. Fabrication is in progress.

Fabrication of the electrical smoke kiln for smoking fish was completed.

RESEARCH IN HAND

Comparative experiments were carried out using the prototype solar drying yard developed earlier, the artificial tunnel dryer and solar dryer under identical raw material condition. It was observed that the time taken for drying on the solar drying platform was the same as that in tunnel drying. Based on this, a commercial solar drying yard of 5 tonne raw material capacity|day was designed. This design consists of Rcc slabs and beams, poles etc. for constructing the raised drying platforms arranged in long rows on the sea-shore with passages in-between and a separate building for housing the processing hall and storing salt and the dried fish. The solar collector box is to be constructed using wooden frame and polythene sheet. A complete technical report was also prepared incorporating feasibility and application aspects, cost of units using various types of building materials and cost of production and it has worked out to be much cheaper than a dehydration plant mainly because of lower overhead cost. Combining the two was found to be ideal considering the technical and economic advantages of these two processes combined.

Design was developed of a 1000 kg capacity shark liver oil extraction plant and lay-out and flow sheet diagram prepared. The plant comprises of a boiler, meat mincer, digester, settling tank, basket centrifuge, hydraulic press, three phase centrifuge, crude oil storage tank, filter press, steam jacketed refining tank, sharple super contrifuge and storage tank for refined oil. A complete technical report has also been prepared giving detailed specification of the different equipments and method of production.

Fabrication of the electrical smoke kiln designed earlier for smoking of fish was completed. The body of the kiln is made out of asbestos sheet fitted on a steel frame of angle iron type.

Fabrication is in progress of a deep freezer designed to maintain a constant temperature of -30°C.

RESEARCH CONTEMPLATED

1. Installation of the solar drying yard at Veraval Research Centre
2. Experiments on smoking of fish using the electrical smoke kiln developed.
3. Experiments on non-mechanical solar drying
4. Design of a pre-fabricated type commercial tunnel dryer
5. Fabrication of commercial solar drying yards and tunnel dryers with the assistance of State Governments
6. Design, development and fabrication of a descaling and fish cutting machine.

SCIENTISTS ASSOCIATED

COCHIN: S. Ayyappan Pillai, P. K. Chakraborty, P. N. Joshi, S. M. S. Abuthahir Ali, Korah Eapen.

4.13 ELECTRONICS AND INSTRUMENTATION

CHIEF FINDINGS

Design and development of a freezer temperature alarm was completed successfully. The instrument measures the temperature of the freezer and displays the same at a remote and convenient place. A few instruments were made with alarm for indicating the change in temperature from its pre-set value and a few others, without. Some have even been installed in local firms and found to work quite satisfactorily. The main features of the instrument are:

Range: +30°C *to* -40°C *with* ± 1°C *accuracy*
(*other ranges also possible*)
Remote display facility for over a distance upto 2 KM
Power supply: 220 V AC or 9 V DC
Current consumption: *Less than* 40 mA at 9V
Approx. cost: *with alarm* — *Rs.* 3000|-
without alarm — *Rs.* 3500|-

A modified version of the intrument with six channels has been fabricated and installed at the Indian Institute of Sugarcane Research, Lucknow. The instrument is reported to be working quite satisfactorily. Another unit with 12 *channels has also been designed at the request of the same Institute.*

Design was also developed of an auto-brineometer for continuous measurement of concenration of brine used in blanching tanks. This design is an improvement over the earlier one in that the sensor is fixed permanently outside the blanching tank with greater accuracy. Principal features are:—

Range : 4 - 12% (*other ranges possible*)
Accuracy : ± 0.5%
Power supply : 220V AC (*can be operated at* 9V DC *also*)
Power consumption : 30 mA at 9V
Meter size : 20 x 12 x 15 cm
Approx. cost : *Rs.* 4,000|-

Arrangements are underway for installation of these units in processing factories.

RESEARCH IN HAND

Electronic boat log:—

This instrument was developed for continuous measurement of speed of small and large fishing vessels during operations. This is an improvement over the earlier model with digital pick-up and provision for display of the distance travelled. Design of the sensor and electronics have been completed and the transducer has also been developed successfully.

The 'boat log' developed earlier is being installed in two numbers of CIFT vessels.

Water current meter:—

This has been developed for on-the-spot measurement of water currents and their direction in sea and estuarine waters. The transducer is being developed for digital pick-up as per design and electronic part tested successfully. A pressure proof chamber for enclosing the sensing elements has been designed and fabrication is in progress.

Buoy telemetery system:—

This instrument has been designed for automatic acquisition of marine environmental data using moored buoys. Temperature and salinity sensors have been developed. Development of the sensors for air pressure and wind veocityl are in progress. All the sensors have been so designed as to offer an impedance in the range 100 - 200 ohms for uniform output and easy standardisation. Design was also completed of the functional part of the system. The signal conditioner has been fabricated and its testing carried out. The transmitter has also been developed.

Ocean tele lab:—

Design of an ocean tele lab, a remote sensing instrumentation system, for on-the-spot measurement of current, current direction, temperature, salinity and depth using a single sensing probe was completed. Development of the sensors is in progress as also suitable pressure proof chambers for enclosing the sensors.

RESEARCH CONTEMPLATED

1. Development of safety alarms for engine cylinders and bearing
2. Development of crane load monitor and alarm for port and labour applications

SCIENTISTS ASSOCIATED

COCHIN: T. K. Sivadas, K. Ramakrishnan, K. Vijayabharathi

5. EXTENSION AND INFORMATION

Replies to technical queries:

As in previous years, queries continued to be received from various State Fishery Departments, private entrepreneurs etc. on different aspects related to fishing and fish processing. Details furnished on fish processing include different methods of curing fish, spoilage factors affecting storage life of the cured products, comments on brown discolouration of salted fish and how it can be avoided to get better quality product, on different methods of packing cured fish in the country, on the utility of non-penaeid prawns for production of dried product, prawn powder etc. information on admissible percentage of water in drainable oil in canned products, methods for canning mussel and crab meat in brine, mackerel in oil, details of oils used for canning oil sardine, commens on use of chemicals for preservation of fresh fish at room temperature, comments on different types of freezing Bombay duck, note on freezing fish and shell fish in general, comments on prevention of black spot formation in shrimp, on changes, both physical and biological, occurring in shrimp/prawn meat frozen and kept in cold storage, methods for preparing fish/prawn pickle, ready-to-serve pickle from mussel meat, fish protein concentrate, liquid fertiliser, clam pickle, process for extraction of shark liver oil, feasibility report for a shark liver oil plant proposed to be set up in Andamans, project report on edible fish powder, comments on the use of antioxidants to stabilise fish oils and the oil used for frying in preparation of fish pickle, comments on suitability or otherwise of fish meal for human consumption, list of equipments and chemicals required for a laboratory for testing fish meal, comments on producing fish meal without electricity, details of solvent process for complete removal of oil from waste liver, on the varieties of sharks generally used for extraction of fin rays, yield, types of vessels used for the extraction etc, comments on the method generally followed for dyeing textiles, information on chemicals used, water and steam required and electricity consumed in production of chitosan and marketability and demand for the product. Assistance was also rendered in setting up a shark liver oil extraction plant at Port Blair. The information furnished with respect to craft and gear include comments on the future of polypropylene and polyethylene as fishing gear materials, extent to which traditional gear materials are being replaced by man-made fibres, comments on necessity for converting original nylon yarn into strands and then into the finished product suitable for fabrication of nets, and on its still being referred to as netting yarn, comparative data on polyamide, polyethylene and poly-

propylene, on floats used for inland and marine fishing, comments on converting fishing trawlers for tuna fishing, on the suitability of fibreglass and ferrocement boats, information on propeller shaft assembly for marine drive application, different types of traditional fishing crafts of India and their distribution, scheme for setting up a fishing boat building yard, layout for a machine shop and list of machineries required, comments on sloping cradle and boat cradle with regard to their position when the boat is hauled etc, on treatment necessary for 'maruthu' and 'thampakam' woods before they can be used as engine bearers, details of the inboard engine with outboard drive, comments on a project proposed by the FAO on fixed propeller nozzles for trawlers, etc.

Testing of materials and products:

Products and raw materials, processed|manufactured indigenously were tested on request and results of analysis intimated to the concerned parties with suggestions for improvement wherever necessary. A total of 351 such samples were tested during the year under report which include 4 samples of braided polyethylene twine, 4 of HDPE flat tape twisted twine, 11 of HDPE fibrillated tape twisted twine, 13 of HDPE monofilament twisted twine, 3 samples of nylon twine, 2 of nylon yarn, 1 each of cotton and polyethylene monofilament rope, 4 of nylon rope, 11 samples of monofilament twine square mesh nets, 3 samples of knotted nylon webbings and 3 of knotless nylon webbings, 8 samples of copper sheet, 10 numbers marine diesel engines, 6 samples of canned crab meat, 1 of canned pork achar, 142 samples of broken, peeled and undeveined shrimp, 1 each of shrimp and prawn shell powder, 2 samples of disinfectant, 3 of dehydrated green pepper, 28 samples of fish meal, two of fish manure, 8 samples of sardine oil, 2 of prawn flake, 51 samples of water, 24 of ice and 2 corrugated master cartons.

Publications:

Vol. I Nos 7 to 11 issues of the 'Fish Technology Newsletter,' publication of which was resumed last year, were brought out during the year under report. Hindi versions of the following pamphlets were also brought out.

1. Production of frozen frog legs
2. Aquatic weed harvester

Two other pamphlets, one on 'preparation of pickle from mussel meat,' and another on 'improved method of curing' were also published during the year in addition to a printed booklet on 'Quality Control in Fish Processing' priced at Rs. 4|- per copy. A few printed pamphlets on

canning calm meat and the improved method of fish curing were also brought out in English, Hindi and Malayalam in connection with the Lab-to-Land programmes mentioned elsewhere.

Supply of designs, publications:

In all, 79 designs were supplied to interested parties on request. These include 16 designs of the tunnel dryer for dehydration of fish, 12 of the rotary drum dryer for production of fish meal, 1 each of a lay-out for a fish dehydration plant, a smoke kiln and a 5 ton solar drying yard, 15 designs of the bulged belly type trawl, one of a shrimp trawl, 4 designs of otter boards, one of a purse seine net of 360.5 m length, 3 sets of designs each of trawl winches suitable for 30'|32', 36'|40', 45'|50' and 55'|60' boats respectively, one of a 15' row boat, one lay-out for a machine shop and 2, 3, 2 and 6 sets of designs each of 30', 32' 36' and 50' boats respectively. Twenty six copies of the Special Bulletin I - 'An Account of the Inland Fishing Gear and Methods of India' were supplied on request as also 33 copies of the publication 'Quality Control in Fish Processing.'

Film Shows and Exhibitions:

About fifteen film shows were conducted at the request of certain private organisations, educational institutions and State Govt. Departments. The films shown were on topics related to induced fish breeding, fish spoilage and control, fishermen co-operative societies etc.

The Institute took part in four exhibitions during the period. One was the 'AGINEX '79' organised by the Rotary Club of Cochin from 1st February, '79 to 30th April, '79, one held in connection with the International Cashew Symposium organised by the Indian Council of Agricultural Research (CPCRI), The International Society for Horticultural Sciences, the Hague and the Indian Society for Plantation Crops at Cochin during 12-15 March, '79, another organised by the Kerala State Small Industries Association during 6-14 December, '79 in connection with the All Kerala Seminar on Industry and one held in Delhi in connection with the ICAR Golden Jubilee Symposium from 3-7 September, '79.

Extension Training:

Refresher courses were held for the benefit of fish processors for producing better quality products. The courses conducted include two held at Cochin in collaboration with MPEDA on Fish Plant Sanitation, Quality Control and Inplant Inspection from 15-1-'79 to 20-1-'79 and 12-2-'79 to 17-2-'79 and one on the same topic held at Mangalore from 5-9 March, 1979. Twenty six trainees sponsored by different fish processing factories took part in these programmes.

GENERAL:

A function was organised at the Institute on 26th Nov., '79 by the CIFT, CMFRI and other fisheries Institutes in and around Cochin to release a postal stamp on fish culture in the sixth definitive series in 5 p. denomination brought out by the P & T Department in connection with the Golden Jubilee Celebrations of ICAR. Another on poultry of 25 p denomination was also released on the occasion. Shri T. S. Swaminathan, Collector of Customs and Central Excise, Cochin, received the stamps.

COCHIN: Dr. P.N. Kaul, M.K. Kandoran, P.N.R. Kaimal, S. Balasubramanyam, Mary Thomas, K. C. Purushothaman

Ad-hoc Training:

Short term training was given to a few parties, as detailed below, on different disciplines of fisheries technology.

	Name of party	*Period*	*Subject*
1.	Shri. P. S. Nandakumar, Cochin-11.	17-29 March 79	Preparation of Shark fin rays
2.	Shri. K. A. Suresh Babu, Prawns International Corporation, Cochin-5.	10 Sept '79 (One month)	Chemical and bacteriological methods of analysis for water and seafoods
3.	Shri K. R. Vimal Kumar Paragon Sea Foods Cochin-5	10 Oct '79 (Two months)	Quality control and bacteriological analysis of water and seafoods.
4.	Shri. V. K. Raja Spices Enterprises & Lab, Kuthiathode.	25 Oct '79	Preparation of antiseptic ointment.
5.	Shri. T. S. Sukrutha Babu Vaikom	18-25 Oct '79	Processing clam meat and preparation of prawn pickle.
6.	Shri. K. R. Somanathan Nair Fish India Export International, Shertallai.	I November — 15 December-1979	Bacteriological determination of water
7.	Shri. P. A. Roby Maradu.	21 & 22 November 1979.	Preparation of ointment and deodorant.

In addition to the above, lectures were arranged at the Institute for the Departmental Officers of the State Fisheries Department, Ernakulam. These lectures, on different aspects of fishing and fish processing, were delivered by the Scientists of the Institute.

6. STATISTICS:

CHIEF FINDINGS

The economics of operation of fishing boats operated along Kerala coast showed that smaller size fishing boats were more economical than bigger fishing vessels. On the basis of annual expenditure, the profits of 36 ft, 32 ft *and* 25 ft *fishing boats operated along Kerala coast worked out to* 35.2%, 37.5% *and* 28.5% *respectively.*

RESEARCH IN HAND

The economics of operation of fishing vessels (trawlers) operated along Kerala and other regions were continued during the year under report. Data under different heads of expenditure and earnings for all the fishing trips made during the year by the selected 140 boats operated along Kerala coast, 240 boats along South Kanara coast, 5 boats along Madras coast and 3 boats along Pondicherry coast were collected. The size of the fishing boats from which data were collected ranged between 25 ft to 43½ ft. Based on the data collected from Kerala coast, a preliminary estimate of the economics of different sizes of fishing boats was worked out. The percentage profit on capital investment of 36 ft, 32 ft and 25 ft fishing boats worked out to 13.9%, 13.6% and 8.3% respectively. On the basis of annual expenditure, the profits worked out to 35.2%, 37.5% and 28.5% for 36 ft, 32 ft and 25 ft boats respectively. Collection of data from other maritime States and their compilation is in progress.

As regards study on the idle capacity of fish processing plants in India, the list of freezing factories located in different States, and the data on their installed capacity were collected. The processing plants were stratified according to their installed capacity and allowing a marginal error of 20% in the mean capacity on all India level, 111 factories were sampled from different strata by pps method. The number of factories selected from different States include 19 from Kerala, 14 from Karnataka, 15 from Tamil Nadu, 9 from Andhra Pradesh, 6 from Orissa, 16 from West Bengal, 16 from Goa and 6 from Gujarat. A questionnaire for data collection was prepared and data collected randomly from selected fish processing factories located in South Kanara. Data collection from other States is in progress.

In addition to these, the Statistics Section has rendered help in the design, analysis and interpretation of research projects undertaken by the Institute.

RESEARCH CONTEMPLATED

1. Economics of operation of fishing trawlers operated in other maritime States of India and extension of the study to country crafts.
2. Collection of data on idle capacity of fish processing plants in India
3. A survey on the pattern of utilization of fish in India

SCIENTISTS ASSOCIATED

COCHIN: H. Krishna Iyer, A. K. Kesavan Nair, P. Srinivasa Rao, G. R. Unnithan

7. ALL INDIA CO-ORDINATED RESEARCH PROJECT ON TRANSPORTATION OF FRESH FISH AND UTILIZATION OF TRASH FISH

CHIEF FINDINGS

The Co-ordinated Research Project on Transportation of Fresh Fish and Utilization of Trash Fish with which the Institute was associated was terminated with effect from 31st *March,* 1979 *as per the recommendation of the Sub-Working Group on Animal Sciences of the I.C.A.R. During the three month period the use of insulated containers developed for transportation of fresh fish was demonstrated to a number of fish merchants and entrepreneurs at Veraval and Bombay centres. The Bombay centre has shown that fresh fish after transport could be kept in ice for a further period of* 10 *days in an acceptable condition. At Cochin centre, a high quality fish fiinger from minced fish meat was developed.*

At the Project Co-ordinator's Cell, Cochin, the quality changes occurring during transportation of fresh fish and details of cost of transportation and other economic aspects were studied statistically.

Review of work done at the Institute's Centres.

VERAVAL:

Some more experimental consignments of iced fish were despatched to project sub-centre at Bombay. Large scale demonstrations of the technology of handling, packaging and transportation of fresh and frozen fish

in containers developed at the project centre have been conducted at Veraval and a number of industrialists who are engaged in transportation of fresh fish have since adopted these procedures commercially.

BOMBAY:

The experimental fish consignments received from Veraval were subjected to further studies on their amenability to preservaton by icing. The quality of the transported fish was found to be good even after 10 days of further storage in ice.

KAKINADA:

Few consignments of fish were despatched to Calcutta. Demonstrations of the improved containers and methods of packing were conducted. Interested merchants have been supplied with insulated containers on loan basis to undertake field experiments. All of them were convinced of the superiority of the containers over the conventional containers in use. Samples of fresh fish arriving at the fish markets were taken and subjected to detailed examination for the detection of human pathogens.

COCHIN:

Fish fingers were prepared from minced fish meat and their quality determined by organoleptical assessment. They were kept in frozen storage and shelf life under frozen storage determined. About 11 species of trash fish were subjected to detailed study to estimate the yield of protein hydrolysates when they are enzymatically hydrolysed. The yield was determined and study completed. Bacteriological peptone samples were prepared and supplied to other laboratories for their use.

SCIENTISTS ASSOCIATED

COCHIN: M. Rajendranathan Nair (Project Co-ordinator), T. K. Govindan, K. Mahadeva Iyer, Dr. K. Gopakumar, A. V. Shenoy, G. R. Unnithan, R. Thankamma.

VERAVAL: H. K. Beri.

KAKINADA: Dr. C. C. Panduranga Rao, S. S. Gupta, D. Imam Khasim Saheb.

BOMBAY: A. P. Valsan.

8. PUBLICATIONS

1. **Balachandran, K. K.**

   Seafood canning in India-Souvenir, Industrial Fisheries Association, Cochin.

2. **Balasubramanyan, R.**

   Investment reduction and increase in service life of Kattumaram logs, Tamil Nadu, India-FAO|SIDA - (BDBP|WP|1) GCP|RAS|040| SWE). Development of Small Scale Fisheries in the Bay of Bengal, Madras, India: 1-120, Nov. 1979.

3. **Devadasan, K & Venkataraman, R.**

   On fish meal and our fish meal industry -*Seaf. Exp. Jour.* XI (1):9, 1979.

4. **George, V.C., Khan, A. A. & Varghese, M. D.**

   Rational exploitation of *Catla catla* (Ham) from Hirakud reservoir - A preliminary account - *Fish. Technol,* 16(2): 87, 1979.

5. **Govindan, T. K.**

   A re-usable disjoinable container for long distance transportation of fresh fish - *Science Today,* 13(8): 31, 1979.

6. **Govindan, T. K.**

   Rigor mortis in fish - the phenomenon and its significance - *Seaf. Exp. Jour.* 11(1): 37, 1979

7. **Iyer, T.S. Gopalakrishna**

   Importance of hygiene and sanitation in the utilisation of low priced fish - Paper presented at Short Term Training Course on Utilisation of Low Priced Fish, Central Institute of Fisheries Education, Bombay, Dec. 10-15, 1979.

8. **Kunjipalu, K. K., George Mathai, P. & Kuttappan, A. C.**

   Development of trawls for medium sized trawlers for Veraval, North west coast of India - *Fish. Technol.* 16(2): 55, 1979.

9. **Kunjipalu, K. K., Kuttappan, A. C. & George Mathai, P.**

A new large mesh trawl for demersal fishery - *Fish. Technol.* 16(1): 19, 1979.

10. **Mathai, T. Joseph & Kesavan Nair, A. K.**

On certain allometric relations of the spiny lobster *Panulirus polyphagus* (Herbst) - *Fish. Technol.* 16(2): 83, 1979.

11. **Mathen Cyriac, Annamma Mathew, Girija Varma, P. R. and Francis Thomas.**

A method for the preparation of cooked - peeled frozen prawns - *Fish. Technol.* 16(1): 33, 1979.

12. **Mathen Cyriac, Francis Thomas and Varma, P. R. G.**

A quality control laboratory for seafood processing plant - *Annual* 1979, Industrial Fisheries Association : 13.

13. **Mukundan, M. K., Arul James, M., Radhakrishnan, A.G. & Antony, P. D.**

Red and white meat of tuna (*Euthynnus affinis*): Their biochemical role and nutritional quality - *Fish. Technol.* 16(2): 77, 1979.

14. **Muraleedharan, V., Unnikrishnan Nair, T. S. & George Joseph, K.**

Smoke curing of mussels - *Fish. Technol.* 16 (1): 29, 1979.

15. **Nair, A.K. Kesavan, Srinivasa Rao, P, Unnithan, G. R. & Kaimal, P. N. R.**

Observations on the wastage of raw material and recovery of meat in the prawn processing industry - *Fish. Technol.* 16(1): 1, 1979.

16. **Nair, N. Unnikrishnan, Ravindran. K. & Gopalakrishna Pillai, A. G.**

Studies on the influence of moisture and specific gravity on the strength properties of mango wood (*Mangifera indica*) - *Fish. Technol.* 16 (1): 7, 1979.

17. **Nair, P. G. Viswanathan, Antony, P. D. & Gopakumar, K.**

Oxidative rancidity in the skin and muscle lipids of oil sardine - *J. Fd. Sci. Technol.* 16(4): 151, 1979.

18. **Perigreen, P. A., Lekshmy Nair, A. & Prabhu, P. V.**

Filleting of fish and utilisation of filleting wastes - *Fish. Technol.* 16(1): 43, 1979.

19. **Pillai, S. Ayyappan.**

Development in the chilling and freezing on board fishing vessels in India - Proc. XV. International Congress of Refrigeration, Venice (Italy) 23-29, September 1979.

20. **Pillai, N. Subramonia, George, N. A. & Kesavan Nair, A. K.**

Evolution of suitable net for medium sized vessels - II - Introduction of large meshed high opening fish trawl - *Fish. Technol.* 16(2): 65, 1979.

21. **Rao, C. C. Panduranga, Govindan, T.K., Sibsankar Gupta & Chattopadhyay, P.**

Investigations on long distance transportation of fish - V - Transportation of filleted and round seer fish (*Scomberomorus sp*) from Kakinada to Calcutta by rail - *Fish. Technol.* 16(1): 11, 1979.

22. **Ravindran, K. & Balasubramanyan R.**

Protection against marine corrosion and fouling of steel fishing trawlers - Paper presented at All India Seminar on Hull Preservation Practices organised by the Institution of Engineers (India), Calcutta, July 29, 1979.

23. **Thampuran Nirmala & Mahadeva Iyer, K.**

Studies on the growth temperature ranges of bacteria isolated from fresh sardine at different primary incubation temperatures - *Fish. Technol.* 16(1): 15, 1979.

24. **Thankamma, R., Gopakumar, K., Lekshmy Nair. A, Vasanth Shenoy, A. & Arul James, M.**

Protein hydrolysate from miscellaneous fish - *Fish. Technol.* 16(2): 71, 1979.

25. **Thomas Francis & Cyriac Mathen**

Water in seafood processing *Seaf. Exp. Jour.* XI (4): 15, 1979.

26. **Thomas Francis & Cyriac Mathen**

Mercury in fish - *Seaf. Exp. Jour.* (1): 31, 1979.

28. **Valsan A.P.**

Low priced fish - A probe into its economic utilisation under existing conditions of India - Paper presented at short term training course on Utilisation of Low Priced Fish, Central Institute of Fisheries Education, Bombay - Dec. 10-15, 1979.

9. APPENDICES

APPENDIX - I

HEADQUARTERS: CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY, Willingdon Island,
Matsyapuri P.O. Cochin - P.C. 682029. Kerala
TLX No. 0085 - 440.
Telephone No. 6845 (10 lines)
Telegram: MATSYAOUDYOGIKI or FISHTECH, COCHIN

Director's Telephone: Per.: 6880, Res. 35263.

DIRECTOR	..	G. K. KURIYAN
Scientists-in-Charge		
Biochemistry & Nutrition Division	..	Shri. M. Rajendranathan Nair
Processing & Packaging Division	..	Shri. P. Vasudeva Prabhu
Microbiology Division	..	Shri. K. Mahadeva Iyer
Craft & Gear Division	..	Shri. R. Balasubramanyan
Engineering Division	..	Shri. S. Ayyappan Pillai
Electronics & Instrumenation Division	..	Shri. T. K. Sivadas
Extension, Information & Statistics Division	..	Dr. P. N. Kaul

RESEARCH CENTRES

Sl. No.	*Place*	*Address*	*Telephone No.*	*Telegram*	*Scientist-in-Charge*
(1)	(2)	(3)	(4)	(5)	(6)
1.	VERAVAL	Research Centre of CIFT Bunder Road, Veraval-362265, Gujarat.	297	MATSYAOUDYOGIKI	Shri. K. K. Solanki
2.	KAKINADA	Research Centre of CIFT D. No. 1-14-7, Sree Ramanagar, Kakinada - 533003. Andhra Pradesh.	4436	MATSYAOUDYOGIKI	Dr. C. C. Panduranga Rao
3.	BURLA	Research Centre of CIFT Burla P.O. 768017 Sambalpur Dist. Orissa.	19	MATSYAOUDYOGIKI	Shri. V. C. George
4.	BOMBAY	Research Centre of CIFT 162 Sassoon Dock, Colaba, Bombay-400005, Maharashtra.	213892	FISHPROCESS(FT)	Shri. T. S. Gopalakrishna Iyer
5.	CALICUT	Research Centre of CIFT Beach Road, West Hill, Calicut - 673005, Kerala.	76607	CARE "KADALMIN"	Shri. T. S. Unnikrishnan Nair
6.	GOA	Research Centre of CIFT 2nd Floor, 'Shanta,' 18th June Road, St. Inez, Panaji - 403301, Goa.	2049	MATSYAOUDYOGIKI	Shri H. N. Mhalathkar

APPENDIX - II

List of Personnel in C.I.F.T. as on 31-12-1979.

SCIENTIFIC PERSONNEL

DIRECTOR

Shri. G. K. Kuriyan

Scientist S-3

1. Shri. M. Rajendranathan Nair
2. Dr. C. C. Panduranga Rao
3. Shri R. Balasubramanyan
4. Dr. P. N. Kaul.

Scientist S-2

1. Shri K. Mahadeva Iyer
2. Shri T. K. Govindan
3. Shri S. Ayyappan Pillai
4. Dr. K. Gopakumar
5. Shri P. Vasudeva Prabhu
6. Shri V. C. George
7. Shri K. A. Sadanandan
8. Shri K. Devadasan
9. Shri Cyriac Mathen
10. Shri T. S. Gopalakrishna Iyer
11. Shri K. Sreedharan Namboodiri
12. Shri K. K. Balachandran
13. Shri P. Madhavan
14. Shri P. Appukutta Panicker
15. Shri H. N. Mhalathkar
16. Shri M. K. Kandoran
17. Shri P. K. Chakraborty
18. Shri K. K. Solanki
19. Shri T. K. Sivadas
20. Dr. K. Ravindran
21. Shri H. Krishna Iyer
22. Shri K. Krishna Rao.

Scientist S-1

1. Shri P. D. Antony
2. Shri P. A. Perigreen
3. Shri M. Arul James
4. Shri A. K. Kesavan Nair
5. Shri A. G. Radhakrishnan
6. Shri P. K. Surendran
7. Smt. Chinnamma George
8. Smt. Mary Thomas
9. Shri P. R. Girija Varma
10. Shri K. K. Kunjipalu
11. Shri V. Narayanan Nambiar
12. Shri K. G. Ramachandran Nair
13. Shri A. Vasantha Shenoy
14. Shri T. S. Unnikrishnan Nair
15. Shri P. N. Joshi
16. Shri Sibsankar Gupta
17. Shri Korah Eapen
18. Shri G. Narayanappa
19. Shri N. Unnikrishnan Nair
20. Shri T. Joseph Mathai

21. Shri K. N. Kartha
22. Shri N. Subramonia Pillai
23. Shri S. V. S. Rama Rao
24. Shri A. C. Joseph
25. Shri A. A. Khan
26. Shri R. S. Manoharadoss
27. Shri A. G. Gopalakrishna Pillai
28. Shri V. Muraleedharan
29. Shri T. P. George
30. Shri P. George Mathai
31. Shri P. Vijayan
32. Smt. K. Vijayabharathi
33. Shri M. K. Mukundan
34. Shri P. G. Viswanathan Nair
35. Smt. Nirmala Thampuran
36. Shri T. K. Thankappan
37. Shri P. T. Mathew
38. Shri Jose Joseph
39. Shri D. I. Khasim Saheb
40. Shri Rajendra Badonia
41. Shri Harinder Krishan Beri
42. Shri S. M. S. Abuthahir Ali
43. Shri Subrata Basu
44. Shri T. K. Srinivasa Gopal
45. Kum. B. Meenakumari.
46. Shri K. V. Mohan Rajan
46. Shri M. R. Boopendranath
48. Shri P. K. Vijayan
49. Smt. K. Ammu
50. Shri K. Ramakrishnan
51. Shri P. T. Lakshmanan
52. Shri Rupsankar Chakraborty
53. Shri Anil Agarwal
54. Shri S. P. Damle
55. Shri J. K. Bandyopadhyay
56. Shri S. K. Bhattacharyya
57. Kum. K. V. Lalitha
58. Shri P. Ravindranathan Nair
59. Shri K. Gopalakrishnan
60. Shri S. Sanjeev
61. Shri S. Balasubramaniam
62. Shri M. R. Raghunath
63. Shri A. K. Chattopadhyay
64. Shri N. Kalaimani
65. Shri P. N. Ravindranatha Kaimal
66. Smt. A. Lekshmy Nair
67. Dr. Jose Stephen
68. Shri K. P. Antony
69. Shri Gopal Rao Desai

Junior Fishery Scientist

1. Shri A. V. V. Satyanarayana
2. Shri S. Gopalan Nayar

Junior Scientist

Shri. A. P. Valsan

Assistant Fishery Scientist

1. Shri T. M. Sivan
2. Shri N. A. George
3. Smt. K. Radhalekshmy
4. Shri R. Mangayya Naidu

Scientist 'S'

1. Shri Francis Thomas
2. Shri J. Sitarama Rao
3. Shri M. Syed Abbas
4. Shri P. Srinivasa Rao
5. Shri Percy Dawson
6. Shri G. Rajagopalan Unnithan
7. Shri D. K. Garg
8. Shri A. C. Kuttappan
9. Shri K. George Joseph
10. Dr. M. D. Varghese
11. Smt. R. Thankamma

Sr. Research Assistant

Smt. T. T. Annamma

TECHNICAL PERSONNEL

Technician T-7

1.	Shri M. S. Fernando	.. Skipper
2.	Shri A. P. Jayaprakash	.. Skipper
3.	Shri K. S. Ganesan	.. Workshop Engineer.

Technician T-6

1.	Smt. P. J. Cecily	.. Jr. Technical Officer
2.	Shri K. C. Purushothaman	.. Editor-cum-Information Officer

Technician T-4

1.	Smt. Annamma Mathew	.. Sr. Analyst
2.	Shri K. Vasudevan Nair	.. Sr. Analyst
3.	Shri N. Subramanian	.. Technical Assistant
4.	Shri V. K. Ibrahim	.. Head Draughtsman
5.	Shri C. Chandrasekharan	.. Superintendent (E & M)
6.	Shri N. Vareethiah	.. Glass Blower
7.	Shri K. Bhaskaran	.. Photographer-cum-Artist
8.	Shri Varghese Paul	.. Technical Assistant
9.	Shri M. John	.. Instrument Technician

Technician T II-3

1.	Smt. T. L. Hemalatha	.. Hindi Translator
2.	Shri P. Ravindranathan	.. Sr. Library Assistant
3.	Shri M. L. Anslem	.. Sr. Draughtsman
4.	Shri A. Kassimkutju	.. Analyst
5.	Shri P. Sadanandan	.. Analyst
6.	Shri G. Mohanan	.. Artist
7.	Shri K. K. Poulose	.. Instrument Technician
8.	Shri R. Gopalakrishnan Nair	.. Computer
9.	Shri M. Abdul Sathar	.. Media Supervisor
10.	Shri B. Anandan	.. Foundry Assistant
11.	Shri M. V. Vijayan	.. Sr. Mechanic
12.	Shri T. K. David	.. Fitter

Technician T I-3

1.	Shri T. K. Syed Ali	.. Analyst
2.	Shri K. J. Augustine	.. Sr. Turner
3.	Shri O. Subramonian	.. Sr. Welder
4.	Shri M. R. Nair	.. Bosun
5.	Shri N. Bahuleyan	.. Bosun
6.	Shri A. K. Jaisingh	.. Bosun
7.	Shri M. S. Rajan	.. Bosun
8.	Shri K. K. Subramanian	.. Engine Driver
9.	Shri K. V. Baladasan	.. Engine Driver
10.	Shri V. V. Johni	.. Senior Field Assistant
11.	Shri M. K. Sasidharan	.. Senior Field Assistant
12.	Shri Thomas J. Mammoottil	.. Sr. Laboratory Assistant
13.	Shri V. K. Ramachandran	.. Sr. Laboratory Assistant
14.	Shri T. John	.. Sr. Laboratory Assistant

Technician T-2

1.	Shri E. K. Balakrishnan	.. Draughtsman
2.	Smt. K. Sarasamma	.. Draughtsman
3.	Shri Shaju A. Averah	.. Draughtsman
4.	Shri S. R. Jethwa	.. Sr. Mechanic

5.	Shri T. S. Bhaskara Menon	..	Sr. Mechanic
6.	Shri K. E. Mani	..	Sr. Mechanic
7.	Shri C. C. Sivan	..	Welder-cum-Blacksmith
8.	Shri G. Ratnakaran Nair	..	Refrigeration Mechanic
9.	Shri Anil Kumar	..	Refrigeration Mechanic
10.	Shri Shanmughavel	..	Refrigeration Mechanic
11.	Shri C. Rajendran	..	Refrigeration Mechanic
12.	Shri Jose Kalathil	..	Refrigeration Mechanic
13.	Shri K. V. Madhavan	..	Electrician
14.	Shri P. M. Joseph	..	Machinist
15.	Shri V. S. Augustine	..	Sr. Carpenter
16.	Shri Philip Durom	..	Sr. Carpenter
17.	Shri A. R. Dharaneedharan	..	Media Assistant
18.	Shri Mohammed Jaffar	..	Engine Driver
19.	Shri Vasudev G. Kubal	..	Engine Driver (Ad-hoc)
20.	Shri A. Gopalakrishnan Nair	..	Staff Car Driver
21.	Shri P. P. Poulose	..	Staff Car Driver
22.	Shri P. Natarajan	..	Driver
23.	Shri M. G. Narayanan Nair	..	Driver
24.	Shri N. J. Tandel	..	Driver (Launch)
25.	Shri K. K. Pappukutty	..	Driver (Launch)
26.	Shri A. Haranath	..	Sr. Field Assistant
27.	Shri Nallababu Rao	..	Sr. Field Assistant
28.	Shri C. G. Tank	..	Sr. Field Assistant
29.	Shri M. M. Vara	..	Sr. Field Assistant
30.	Shri P. K. Damodaran	..	Sr. Laboratory Assistant
31.	Shri V. Venkata Rama Krishna	..	Sr. Laboratory Assistant
32.	Shri A. Veeranjaneyulu	..	Sr. Laboratory Assistant
33.	Shri V. Gopalakrishna Pillai	..	Sr. Laboratory Assistant
34.	Shri P. V. Channey	..	Sr. Laboratory Assistant
35.	Shri G. P. Vaghela	..	Sr. Laboratory Assistant
36.	Shri P. M. Pattanayak	..	Sr. Laboratory Assistant
37.	Shri M. M. Devasaya	..	Jr. Library Assistant
38.	Shri T. Neelakandan	..	Projector Operator
39.	Shri V. Gaspar	..	Field Assistant
40.	Shri Tony B. Fonseka	..	Boilerman
41.	Shri Gurudas Ram	..	Tindal

42.	Shri V. Veer Raju	..	Tindal
43.	Shri S. Laxmanadu	..	Deckhand
44.	Shri G. B. Tandel	..	Deckhand
45.	Shri K. K. Lekshmanan	..	Deckhand
46.	Shri T. Balan	..	Deckhand
47.	Shri H. M. Kotiya	..	Deckhand
48.	Shri P. K. Pushpangadan	..	Deckhand
49.	Shri K. Sarangadharadu	..	Deckhand
50.	Shri G. R. Bhogte	..	Deckhand
51.	Shri K. V. Rajan	..	Jr. Laboratory Assistant
52.	Shri P. T. Sebastian	..	Jr. Laboratory Assistant
53.	Shri G. Subba Rao	..	Cook
54.	Shri E. R. Krishnan	..	Cook

Technician T-1

1.	Shri P. S. Alias	..	Jr. Laboratory Assistant
2.	Shri B. Ramaiah	..	Jr. Laboratory Assistant
3.	Shri N. M. Vasu	..	Jr. Laboratory Assistant
4.	Shri T. K. Bhaskaran	..	Jr. Laboratory Assistant
5.	Shri K. B. Tilakan	..	Jr. Laboratory Assistant
6.	Shri T. K. Vasudevan	..	Jr. Laboratory Assistant
7.	Shri T. K. Aravindakshan	..	Jr. Laboratory Assistant
8.	Smt. K. K. Sumathy	..	Jr. Laboratory Assistant
9.	Kum. Florence Joseph	..	Jr. Laboratory Assistant
10.	Shri Kadermiyan Umermiyan	..	Jr. Laboratory Assistant
11.	Shri D. R. Aparnath	..	Jr. Laboratory Assistant
12.	Shri C. C. Gandhi	..	Plant Attendant
13.	Shri N. C. Bhaskaran	..	Plant Attendant
14.	Shri K. R. Kesavan	..	Plant Attendant
15.	Shri T. Gopalakrishnan	..	Metal Worker
16.	Shri T. N. Manibhadran	..	Tindal
17.	Shri P. A. John	..	Tindal
18.	Shri A. B. Varghese	..	Driver (Launch)
19.	Shri Radhupandey	..	Driver (Launch) ad-hoc)
20.	Shri V. P. Raphel	..	Driver
21.	Shri Vasanthrai Kanji Solanki	..	Driver

22.	Shri Narasingh Panda	.. Driver
23.	Shri M. Venkateswara Rao	.. Driver
24.	Shri P. I. Abraham	.. Driver
25.	Shri P. Bahulayen	.. Telephone Operator -cum-Receptionist
26.	Shri T. K. Dasan	.. Deckhand
27.	Shri Malam Bachu Sidi	.. Deckhand
28.	Shri K. Gangaraju	.. Deckhand
29.	Shri T. A. Francis	.. Cook

ADMINISTRATIVE PERSONNEL

Sr. Administrative Officer

Shri K. M. Mathai

Administrative Officer

Shri James Abraham

Asstt. Administrative Officer

Shri A. Chakrapany, Shri Varghese Paul

Accounts Officer

Shri T. Velayudhan Asari

Superintendent

1. Shri V. Joseph
2. Shri P. J. Joseph
3. Shri M. P. Chandrasekharan
4. Shri S. Sadanandan

P. A. to Director

Shri K. J. Thomas

Assistant

1. Smt. T. N. Ambujakshy Amma
2. Shri P. A. Uthup
3. Shri M. George Joseph
4. Shri S. Naveen Chandra Prabhu
5. Smt. K. A. Devaky
6. Smt. Alice M. Joseph

Stenographer

1. Smt. Mariamma Sadanandan
2. Shri K. Ravindran

Jr. Stenographer

1. Shri A. A. Sankarankutty
2. Smt. N. K. Saraswathy
3. Smt. R. Vasantha

Senior Clerk

1. Shri P. Vasudevan
2. Smt. Nafeesa Ali
3. Shri T. M. Padmanabhan
4. Smt. N. K. Sulochana
5. Smt. T. K. Sarala
6. Shri R. S. Shanmugham
7. Shri A. L. John
8. Shri M. Gopalakrishnan
9. Shri M. T. Joseph
10. Shri A. K. Venugopal
11. Shri P. Vijayan
12. Shri M. J. Sebastian
13. Shri V. N. Rajasekharan Nair
14. Shri M. Ravindran
15. Smt. Annamma Varghese
16. Smt. C. G. Marykutty
17. Smt. M. S. Susanna
18. Smt. N. Prabhavathy Amma
19. Shri C. Ravindran Nair
20. Smt. K. R. Gita Rani
21. Shri N. Venugopalan
22. Shri T. M. Ramraj
23. Shri Veer Singh
24. Shri Y. W. Mhadgut

Junior Clerk

1. Shri M. Balan Nambiar
2. Shri G. Somappan
3. Shri V. R. Kesavan
4. Smt. Smita K. Shrishkar
5. Smt. M. Jully
6. Shri K. Bhaskaran
7. Smt. M. A. Prasanna
8. Smt. K. A. Nazeem
9. Shri A. Chakrapani
10. Shri Y. Phillipose
11. Shri A. B. Rodrigues
12. Shri Ch. Satyanarayana
13. Shri T. Veerabhadra Rao
14. Shri C. K. Muraleedharan
15. Shri P. K. Sreedharan
16. Smt. K. Gracy
17. Shri M. K. Kuttykrishnan Nair
18. Smt. B. Hemalatha
19. Shri P. V. Venugopalan
20. Shri A. George Joseph
21. Shri K. P. Velayudhan
22. Smt. T. K. Susannamma
23. Shri C. A. Punnoose
24. Smt. P. C. Kamalakshy

25. Shri R. Viswanathan
26. Shri P. K. Sankarakutty
27. Shri K. Rajappan Pillai
28. Smt. N. I. Mary
29. Shri P. K. Janardanan
30. Shri Gopal Chandra Adhikari
31. Shri Satish Chandra B. Purohit

SUPPORTING STAFF

Supporting Staff Grade IV

1. Shri S. S. Salvi
2. Shri T. K. Bava
3. Shri B. Suryaprakash Rao
4. Shri E. Gangadharan Nair
5. Shri Koppada Gandhi
6. Shri Gajendra Karali
7. Shri M. K. Prabhakaran
8. Shri K. K. Radhakrishnan

Supporting Staff Grade III

1. Shri N. K. Kunjan
2. Shri O. C. Lonan
3. Shri E. S. Balachandra Pai
4. Shri E. S. Sreedharan
5. Shri Krishna Chandra Meher
6. Shri V. V. John
7. Shri S. M. S. Yadav
8. Shri P. A. Thomas
9. Shri C. S. Govindan
10. Shri K. Balakrishnan Pillai
11. Shri C. M. Gopalan
12. Shri P. J. George
13. Shri P. C. Sukumaran
14. Shri A. G. Vasu
15. Shri C. A. Subran
16. Shri B. Tirupathi Rao
17. Shri D. Gopalakrishna Rao
18. Shri A. T. Waghmare
19. Shri N. Gnanaranjan Rao
20. Shri P. A. Abdul Rahman
21. Shri Digamber D. Naik
22. Shri K. K. Appachan
23. Shri K. X. Joseph
24. Shri T. T. Das
25. Shri Laba Nag
26. Shri. Satrugan Kumara
27. Shri O. M. Thankappan
28. Shri O. A. Krishnan
29. Shri M. K. Thevan
30. Shri P. M. Pakeer Mohammed
31. Shri Santhosh Banchor

Supporting Staff Grade II

1. Shri K. Raghavan
2. Shri Ramachandra D. Padnakar
3. Shri Gokulchandra Mehar
4. Shri Rattan Chand
5. Shri Menino Souza
6. Shri Satrughan Seth
7. Shri Naran Lakham Chorwodi
8. Shri K. K. Madhavan

9. Shri P. S. Morajkar
10. Shri S. Rajan
11. Shri C. Kama Raju
12. Shri Voleti Kamaraju
13. Shri T. V. Manoharan
14. Shri Sadhucharan Mehar
15. Shri Chandru B. Shirodkar
16. Shri K. Kameswara Rao
17. Shri Malladi Perraju
18. Shri K. C. Fofandi
19. Shri E. K. Chinnappan
20. Shri B. S. Thambe
21. Shri Gordhan Mulji Vaghela
22. Shri P. Padmanabhan
23. Shri C. A. Krishnan
24. Shri Krishna Chandra Nayak
25. Shri P. A. Shanmukhan
26. Shri K. N. Mukundan
27. Shri P. Gopalakrishnan
28. Shri Govind Laxmen Tandel
29. Shri Karsan Arjan Masani
30. Shri K. A. Gopinath

Supporting Staff Grade I

1. Shri P. D. George
2. Shri K. B. Bhaskaran
3. Shri K. K. Karthikeyan
4. Shri N. N. Goswami
5. Shri T. T. Velayudhan
6. Shri K. A. Kunjan
7. Shri A. P. Gopalan
8. Shri T. T. Thankappan
9. Shri P. R. Unnikrishna Panicker
10. Shri R. Chellappan
11. Shri V. S. Ambasudhan
12. Shri K. Kochukuttan Nair
13. Shri Kirtan Kisan
14. Shri G. Chinna Rao
15. Shri Vasipalli Yellaiah
16. Shri M. K. Asokan
17. Shri A. R. John
18. Shri A. A. Kunjappan
19. Shri C. N. Raghavan
20. Shri Orilika Heman
21. Shri K. Appa Rao
22. Shri A. Ravindran Nair
23. Shri B. Sivanandan
24. Shri Harbhajan
25. Shri Bandu M. Ghare
26. Shri P. N. Sukumaran Nair
27. Smt. P. L. Roseilly
28. Shri Vinayak P. Halarnekar
29. Shri Udekar Pandey
30. Shri Thomas Topno
31. Shri Gopi Xenkar Chodankar
32. Shri Lokanath Kumura
33. Shri T. K. Rajappan
34. Shri O. K. Xavier
35. Shri Chandrakant Kolvalkar
36. Shri S. Chakram
37. Shri S. Appa Rao
38. Shri Duda Pitha Parmar
39. Shri Bashir Mohammed Allarkha Khokhar
40. Shri Namdev S. Hiwale
41. Shri C. Sreedharan
42. Shri K. N. Velayudhankutty
43. Shri Gopal Guru
44. Shri Nepal Mahanandia
45. Shri Badrinarayan Guru
46. Shri K. K. Lakshmanan
47. Shri N. Padmanabha Pillai
48. Shri Jayasingh Oram

ON DEPUTATION

Sl. No.	*Name*	*Deputation with*	*Designation*
1.	Shri M. Velu Jr. Fishery Scientist.	Cochin Port Trust Cochin-3.	Dy. Chief Mechanical Engineer.
2.	Shri. C. V. N. Rao, Scientist S-2.	Office of the Development Commissioner (Small Scale Industries) Nirman Bhavan, New Delhi - 110011.	Dy. Director
3.	Shri. P. Sulochanan, Scientist S-1	Exploratory Fisheries Project, Kandla Base, Block No. 80|262, Kutch	Dy. Director
4.	Shri. Y. Sreekrishna, Scientist S-1	Central Institute of Fisheries Education P.B. 7392, Kakori Camp, J. P. Road, Bombay-61.	Professor, (Fisheries Technology).
5.	Shri. M. Mukundan, Scientist S-1	Integrated Fisheries Project Cochin-16.	Dy. Director
6.	Shri. R. Rajendran, Scientist S-1	Central Institute of Fisheries, Nautical and Engineering Training	Instructor (Craft and Gear).
7.	Dr. M. Shahul Hameed, Scientist S-1	Cochin University, Cochin.	Reader.
8.	Shri. C. Hridayanathan, Scientist S	Cochin University Cochin.	Lecturer
9.	Dr. G. Jagatheesan Scientist S-1	Tamil Nadu Agricultural University, Coimbatore.	Associate Professor (Fish Technology)

APPENDIX III

FINANCE

Details of budget Provision and actual expenditure during the financial year 1979-1980.

Plan	Budget Provision Rs.	Actual Expenditure Rs.
House Salary of officers.	1,05,000.00	
Salary of Establishment	1,87,000.00	
Dearness Allowance	1,00,000.00	
Overtime Allowance	7,000.00	Nil
House Rent Allowance	56,000.00	
City Compensatory Allowance	4,000.00	
Other Allowances & Honoraria	26,000.00	
Travelling Expenses.	1,01,000.00	97,810.48
Other Charges	47,14,000.00	41,91,058.45
Total	53,00,000.00	42,88,868.93
A. P. Cess Fund		68,801.68
Lab-to-Land Programmes + Summer Institute.		24,923.08
GRAND TOTAL	53,00,000.00	43,82,593.69

NON-PLAN

Non Plan	Budget Provision Rs.	Actual Expenditure Rs.
Salary of Officers.	14,00,000.00	13,28,721.17
Salary of Establishment	17,50,000.00	12,81,468.42
Dearness Allowance	17,60,000.00	12,24,891.29
Overtime Allowance	23,500.00	21,223.90
House Rent Allowance	3,80,000.00	2,34,616.01
City Compensatory Allowance	45,000.00	28,272.00
Other Allowances + Honoraria	1,56,500.00	1,14,282.89
Travelling Expenses	70,000.00	78,085.80
Leave Salary Contribution	5,000.00	805.26
Pension Contribution.		746.76
P. F. Contribution		192.00
Other Charges	7,00,000.00	6,54,192.00
Fellowships, Scholarships, Awards	10,00.00	—
Total	63,00,000.00	49,67,498.28

10. ABBREVIATIONS

AGINEX	..	All India Agricultural & Industrial Exhibition.
ARS	..	Agricultural Research Service.
ASRB	..	Agricultural Scientists' Recruitment Board.
BHA	..	Butylated hydroxy anisole.
BHT	..	Butylated hydroxy toluene.
EFC	..	Expenditure Finance Committee.
FMNT	..	Food and Mouth Nutrition Programme.
HDPE	..	High density poly-ethylene.
LDPE	..	Low density poly-ethylene.
MPEDA	..	Marine Products Export Development Authority
NIH	..	National Institute of Health.
PPS	..	Probability proportional to size.
STDP	..	South Trading Diesel Petrol.
TBA	..	Thio barbituric acid.
TBTO	..	Tributyl tin oxide.
TMA	..	Tri-methyl amine.
TMAO	..	Tri-methyl amine oxide.
TNAU	..	Tamil Nadu Agricultural University.
TPC	..	Total plate count.