1980

ANNUAL REPORT

CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
COCHIN - 682 029, INDIA

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CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY

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OUR LATE DIRECTOR, SHRI G. K. KURIYAN

CONTENTS

1. INTRODUCTION:

During the year under report, emphasis was given on development of small scale fisheries for the benefit of the coastal fishermen of India and towards this goal, activities were strengthened at a few centres for improving the traditional craft and gear used by the local fishermen.

The various activities of the Institute, especially those related to fishing craft and gear are mainly carried out from the Institute's vessels stationed at the different centres. The Institute has added one more vessel to this fishing fleet. The new addition is a 17.5 m. steel trawler 'Matsyakumari', built at Mazagon Docks, Bombay. A list of the vessels now with the Institute is given in Appendix III.

More numbers of 12 m. mechanised purse seine boats that were commissioned for fishing by the industry came up for performance tests and cost evaluation.

A new paint matrix embracing both antifouling and antiboring properties was developed and its effectiveness established experimentally.

Prototype of a shore seine developed for use in reservoirs was subject to field trials and its performance found satisfactory.

Studies were intensified towards converting non-penaeid prawns landed in large quantities along Bombay coast into useful products and by-products.

A new serotype of salmonella, *S. larochelle* was isolated for the first time in India at the Institute's Research Centre at Bombay from frozen frogleg samples.

A hand operated machine for production of isinglass was developed.

The year also witnessed the continuation of the lab-to-land programmes initiated during the previous year. These programmes have helped some entrepreneurs to set up establishments of their own and thus earn a living for themselves. The technologies transferred during the year were mainly on fabrication and operation of improved and newly developed fishing gear, conversion of the hitherto underutilised mussel into a number of useful products, demonstration of utilisation of different parts of sharks and skates and preparation of soup powder, improved methods of fish curing and fish transportation. The training in fabrication of fishing gear was given to about 100 fisherwomen of Badagara area (Calicut District, Kerala) and it can be rightly claimed that it has made an impact on the fishermen community in their onward march to self-reliance.

The Institute suffered a great loss due to the sad and sudden demise of its Director, Shri G. K. Kuriyan during the early hours of 5th August, 1980.

1.1 ORGANISATIONAL SET-UP:

The Institute is headed by the Director with whom is vested all Administrative/financial powers regarding research and management of the Institute. He is assisted by a Senior Administrative Officer and an Asst. Administrative Officer to deal with matters related to general administration and an Accounts Officer and one Asst. Accounts Officer for looking into matters relating to accounts and internal audit of the Institute. A Junior Technical Officer attends to the technical matters including those connected with research projects handled by the Headquarters and the various Research Centres.

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

The activities of the Institute are channelled through the following Research Divisions.

1. Craft Division
2. Gear Division
3. Engineering Division

4. Processing Division
5. Biochemistry & Nutrition Division
6. Microbiology Division
7. Electronics & Instrumentation Division
8. Extension, Information & Statistics Division

Work under these Divisions is extended to the Research Centres also to tackle the various problems specific to the fishery industry of that region. Each Centre is under the charge of a Scientist who is designated as the Scientist-in-charge of that Centre. He carries out the co-ordination, supervision and periodical assessment of the progress of the different projects/personnel attached to that Centre.

1.2 ADMINISTRATION :

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

The Research Centres continued to be accommodated in rented buildings, addresses of which are given in Appendix-I. List of staff under Scientific, Technical, Administrative and Supporting categories is given as Appendix-II. Details of budget provision and actual expenditure are given as Appendix-IV.

1.3 MANAGEMENT COMMITTEE :

The Committee met once during the year.

1.4 MONITORING CELL :

The Monitoring Cell, which was constituted in August 1978 for reviewing the physical and financial achievements in the implementation of the Plan scheme met four times during the year under report and reviewed the progress of Plan expenditure in connection with procurement of stores, recruitment of staff, construction works, etc.

1.5 JOINT STAFF COUNCIL :

The Institute Joint Council was reconstituted on 4-10-1980 with the following members

	Director	Chairman
1.	Shri M. R. Nair, Scientist S3	Official Side Member
2.	Shri R. Balasubramanyan, Scientist S3	,,

3.	Shri P. V. Prabhu, Scientist S2	Official Side Member
4.	Dr. P. N. Kaul, Scientist S3	,,
5.	Senior Administrative Officer	,,
6.	Accounts Officer	,,
7.	Shri T. M. Sivan, A. F. S.	Staff Side Member
8.	Shri Varghese Paul, T4	,,
9.	Shri T. K. Syed Ali, T-II-3	,,
10.	Shri M. T. Joseph, Sr. Clerk	,,
11.	Shri V. N. Rajasekharan Nair, Sr. Clerk	,,
12.	Shri P. A. Shanmukhan, S. S. Gr. II	,,
13.	Shri Rattan Chand, S. S. Gr. II	,,

Shri P. V. Prabhu functioned as Official side Secretary and Shri T. K. Syed Ali as Staff side Secretary.

The Council met once during the year and discussed various staff problems.

1.6 GRIEVANCE CELL (General)

With the constitution of the Institute Joint Council, the Grievance Cell was also reconstituted on 23-12-'80 with the following as members.

1.	Shri R. Balasubramanyan, S3	Nominated by Director
2.	Shri K. T. Abubacker, Accounts Officer	,,
3.	Shri K. M. Mathai, Sr. Admn. Officer	,,
4.	Shri T. M. Sivan, A. F. S.	Nominated by Joint Council
5.	Shri T. K. Syed Ali, T-II-3	,,
6.	Shri M. T. Joseph, Sr. Clerk	,,
7.	Shri P. A. Shanmughan, S. S. Gr. II	,,

GRIEVANCE CELL FOR ARS SCIENTISTS AND OTHERS NOT COVERED BY THE GENERAL GRIEVANCE CELL

The Cell was reconstituted during the year as follows:

1. Director .. Chairman

2.	Dr. P. N. Kaul, Scientist S3	}	Members nominated by Management Committee
3.	Shri S. Ayyappan Pillai, Scientist S2		
4.	Sri P. K. Surendran, Scientist S–1	}	Elected representatives of Scientists S1 & S2
5.	Shri Jose Joseph, Scientist S–1		
6.	Shri K. M. Mathai, Sr. Admn. Officer ...		Member Secretary

The Cell met once and considered and disposed of the grievances referred to it.

1.7 Work Study of ICAR

The work study team of the ICAR conducted the work study of the Administrative staff at Headquarters, Calicut and Bombay and submitted its report during Jan. – Feb. 1980

1.8 PROJECT ADVISORY COMMITTEE:

The Committee met seven times during the year under report. It reviewed periodically the progress of work being carried out in various research projects and necessary recommendations were made to improve the working of the projects. The initial screening of the project proposals for the year 1981–82 was also done and an outline prepared for finalisation by the Staff Research Council. Necessary changes as recommended and required by the ICAR and Planning Commission were made in the E. F. C. Memo pertaining to the 6th Five Year Plan projects of the Institute.

1.9 TECHNICAL SECTION:

The Section continued to assist the Director in collection of research materials from the different divisions at Headquarters and Research Centres for preparation of technical notes and reports for forwarding to the Council, Scientific panel and other concerned agencies.

Forty three technical papers were approved for publication.

1.10 STAFF RESEARCH COUNCIL:

In order to review the various research proposals envisaged, the Staff Research Council met once on 18th February, 1980.

1.11 AGRICULTURAL RESEARCH SERVICE:

The five yearly assessment papers in respect of 22 eligible scientists of the Institute in the Grade S, S-1 and S-2 were forwarded to the Council/ASRB, New Delhi.

1.12 REGIONAL COMMITTEE, No. 8:

Director, being the Member Secretary for the ICAR Regional Committee No. 8, work relating to preparation of the agenda, arrangements etc. for holding its fourth meeting on 21st August, 1980 at Kerala Agricultural University, Vellanikkara was carried out. The proceedings of the meeting were also prepared, incorporating all the recommendations and forwarded to the Director General for approval.

1.13 OFFICIAL LANGUAGE IMPLEMENTATION:

The Institute took the following steps for implementing Hindi as the official language.

Hindi/English name boards were provided to all entitled officers/ sections and other points at Headquarters and Research Centres, giving precedence to the Hindi version.

Bilingual letterheads and rubber stamps with precedence to Hindi version were prepared for use at the Institute and its Research Centres.

Hindi newspapers were subscribed to and Hindi-English dictionaries and "Karayalaya Sahayak" supplied to both headquarters and research centres.

There is one Hindi typist attached to the Headquarters. One Hindi translator attends to the translation of the Newsletter, a journal of the Institute and other publications.

Seven Devanagari typewriters have been procured, one at the Headquarters and one at each Research Centre.

Meetings of the Official Language Implementation Committee were held periodically.

Hindi Prabodh classes were held regularly with permissible incentives to those who attended the classes. Eight staff members came out succcesful in the examination held in June, 1980.

1.4 LIBRARY:

During the year, 267 books and 100 bound volumes of journals

were added to the collection at the Institute's library, bringing the total to 4374 and 1993 respectively. In addition, there was a good collection of reports, reprints, pamphlets etc.

Ninety seven Indian and foreign journals were subscribed to during the year and 50 journals received in exchange or 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 Institute staff, visitors, including students and research scholars from Universities, educational and research Institutes, technical personnel from the fishing and fish processing industry etc. made use of the library. Inter-library loan facilities were maintained in collaboration with other Institutes.

1.15 COMMITTEES REPRESENTED BY THE INSTITUTE

The Director served on the following Scientific and allied bodies.

1.	Member	:	Scientific Panel for Fisheries Research, I. C. A. R.
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	:	Management Committee, Krishi Vigyan Kendra (CMFRI), Narakkal
6.	Member	:	Fishery Advisory Committee, Kerala Agricultural University, Mannuthy
7.	Member	:	Management Committee, Operational Research Project of CMFRI, Kovalam (Tamilnadu)
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 Tamilnadu
14.	Member	:	State Level Committee for Co-ordination of work on Marine Fisheries in the State and Central sections in Tamilnadu
15.	Member	:	Board of Examiners, Central Institute of Fisheries Education, Bombay
16.	Member	:	ICAR Visiting Team for Establishment of a Fisheries College under Kerala Agrl. University
17.	Member	:	Scientific Panel on Post Harvest Technology. ICAR
18.	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 Agrl. & Irrigation
19.	Member	:	Technical Screening Committee, Tamil nadu
20.	Member	:	Inter – Disciplinary Task Force for Kuttanad (Kerala) Development
21.	Member	:	Panel of Experts to look into present *Salmonella* problem in marine products, Ministry of Agriculture & Irrigation
22.	Chairman		TDC – 42 – Textile materials for fishing purposes, Sectional Committee, Indian Standards Institution
23	Chairman		MCPD – 21 – Fishing Vessels Sectional Committee, Indian Standards Institution

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

1. Dr. C. C. Panduranga Rao, Scientist S3, as:

   a) Principal Member : ISI, AFDC - 27, Fish and Fisheries Products Sub–Committee.

2. Shri M. R. Nair, Scientist S3, as:

   a) Alternate Member : ISI, AFDC - 27, Fish and Fisheries Products Sub- Committee

   b) Member : ISI, AFDC–27 : 2, Frozen Fish Products Sub–Committee

   c) Technical Representative : ISI, AFDC–36.9 Metallic Contaminants Sub- Committee

   d) Member : Panel of Experts for hearing appeals against rejection of canned prawns – Export Inspection Agency, Cochin

3. 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

4. Shri T. S. Gopalakrishna Iyer, Scientist S2, 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

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 P. V. Prabhu, Scientist S-2 as:–

a) Principal Member : ISI, AFDC-27:5 Fish Meal Sub–Committee

b) Alternate Member : ISI, AFDC-27:2, Frozen Fish Products Sub–Committee

7. Shri K. K. Balachandran, Scientist S-2 as:

a) Principal Member : ISI, AFDC-27:1, Canned Fish Products Sub–Committee

b) Member : Group of Experts on Aluminium fish can fabrication unit

8. Shri. V.C. George, Scientist S-2 as:-

a) Member Secretary to Working Group to devise ways and means of exploiting fishery resources of inland waters.

9. Shri. K. K. Solanki, Scientist S-2 as:-

a) Member : ISI, AFDC-27, Fish & Fisheries Products Sub-Committee

10. 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

11. Dr. K. Gopakumar, Scientist S-2 as

a) Alternate Member : ISI, AFDC-27:5, Fish Meal Sub-Committee

12. Shri T. S. Unnikrishnan Nair, Scientist S-1, as:

a) Alternate Member : ISI AFDC-27:3, Dried Fish Products Sub-Committee

13. Shri A. P. Valsan, Junior Scientist as:–

a) Principal Member and Convener: ISI, AFDC 27:3, Dried Fish Products Sub–Committee

14. Smt. K. Radhalekshmi, Asstt. Fishery Scientist as:

a) Alternate Member : ISI, TDC-42 Textile Materials for fishing purposes, sectional committee, Indian Standards Institution

1.16 SYMPOSIA/SEMINARS/WORKSHOPS/MEETINGS ETC. ATTENDED

Shri R. Balasubramanyan, Scientist S-3, attended the Seminar on Teaching Fisheries, organised by Tamil Nadu Agricultural University, Fisheries College, Tuticorin, 22 Feb. 1980. A technical paper was presented by him at the Seminar.

Shri S. Gopalan Nayar, Jr Fishery Scientist and Smt K. Radhalekshmi, Asstt. Fishery Scientist attended the 13th Meeting of the ISI, TDC 42 Textile Materials for Fishing Purposes, March 1980.

S/Shri M. R. Nair, Scientist S3, K. K. Balachandran and Cyriac Mathen, Scientists S2 attended the Workshop on Modernisation of Seafood Industry, sponsored by Small Industries Service Institute, Govt. of India, Trichur at Cochin, 26th March, 1980. A paper was presented.

S/Shri. Balasubramanyan, Scientist S3, V.C. George, Scientist S2, A. P.Valsan Junior Scientist, S. Gopalan Nayar, Junior Fishery Scientist and A. A. Khan, Scientist S1 attended the Workshop on Reservoir Fisheries for Rural Development, CIFE, Bombay, 8-9 April, 1980. About six papers were presented at the Workshop.

S/Shri T.K. Sivadas and K. Sreedharan Namboodiri, Scientists S2 attended the First Annual Workshop on Agricultural Engineering and Technology in Kerala, organised by Kerala Agricultural University, Mannuthy, 28 & 29 May, 1980.

Shri K. G. Ramachandran Nair and Smt A. Lekshmy Nair, Scientists S1 attended the Symposium on By-products from Food Industries-Utilisation and Disposal, jointly organised by Association of Food Scientists and Technologists (India) and CFTRI, Mysore, 29 & 30 May 1980. Three papers were presented.

Dr. K. Ravindran, Scientist S2, attended the Seminar on the Management of the Seafood Industry, organised by Department of Industrial Fisheries, University of Cochin & Seafood Exporters' Association of India, 22–24, Sept. 1980

S/Shri M. R. Nair, Scientist S3 and K. K. Balachandran, Scientist S2 attended the Workshop on Mussel Farming organised by CMFRI/ Centre of Advanced Studies in Mariculture, Madras, 25-27 Sept. 1980. A paper was presented at the Workshop.

S/Shri K.K. Solanki, Scientist S2 and K.K. Kunjipalu, Scientist S1 attended the Seminar on Account Trends in Teaching and Research in Aquatic Biology organised by Central Salt & Marine Chemicals Research Institute, Bhavanagar, Gujarat, 26-28 Sept. 1980. Five papers were presented at the Seminar.

Shri T. K Sivadas, Scientist S–2, attended the Annual Convention and Exhibition 1980. organised by the Institute of Electrical and Electronic Engineers Inc., Indian Council at Trivandrum, 2-5 Nov. 1980. A paper was presented by him.

Dr. K Gopakumar, Scientist S–2, participated in the FAO/DANIDA Workshop on Handling of Small Fish in the Arabian Sea, Mangalore, 3-14 Nov. 1980. He also presented a paper at the Workshop.

Shri V. C. George, Scientist S–2 attended the Meeting of the Co-operative Co–ordinate Committee of the Hirakud Fishermen Society, Sambalpur, 15th Nov. 1980.

Shri T. P. George, Scientist S–1 attended the Fourth Meeting of ICAR Regional Committee No. 7 at Panaji (Goa) 22 & 23 Nov. 1980.

Shri V. C. George Scientist S -1 attended the sixth Workshop on All India Co-ordinated Research Project on Ecology and Fisheries of Fresh Water Rescrvoirs organised by CIFRI, Barrackpore at Simla, 25 & 26 Nov. 1980 and delivered a lecture on 'Investigations on Reservoir Fishing Technology'.

Shri K. K. Balachandran, Scientist S–2 attended the Workshop on Integrated Area Development Programme organised by Govt. of Kerala, UNICEF at Cochin, 20 & 21 Dec. 1980.

A number of Scientists also attended the following events held at Cochin

i) Seminar on Problems and Prospects of Mechanised Fishing in Kerala, organised by All Kerala Federation of Mechanised Fishing Boat Owners' Association, 29 Feb., 1980. Six papers were presented at the Seminar.

ii) Symposium on Coastal Aquaculture organised by Marine Biological Association of India, 12–18 January 1980. Five papers were presented at the Symposium.

iii) National Seminar on Fisheries Extension organised by CMFRI, CIFT and CIFE, 8–10 Dec. 1980.

1.17 STUDY TOUR:

S/Shri P. V. Prabhu and K.K. Balachandran, Scientists S–2 visited U. K., Canada and Singapore on a study tour for a period of five weeks from 29-5-1980 to 7-7-1980 as a part of the collaborative programme

between IDRC, Canada and this Institute They were able to gain first hand knowledge in fish handling and processing techniques in vogue in the different places visited.

1.18 TRAINING:

Shri P. T. Sebastian, Junior Laboratory Assistant, attended a three month course in 'Seasoning and Preservation of Timber' from 15-1-1980, conducted by Forest Research Institute, Dehra Dun.

Dr. K. Ravindran, Scientist S-3 attended a course on 'Design of FRP Products for Marine and Transport Applications' conducted by Indian Institute of Technology, Madras from 15-19 January 1980.

Shri P. Ravindranathan, Senior Library Assistant, attended a course on Information, Storage and Retrieval Systems conducted by Small Industry Extension Training Institute, Hyderabad from 7-1-1980 to 2-2-1980.

Shri M. K. Asokan, S. S. Grade I, was sent for Chart Works and Navigational Practicals at CIFNET, Cochin from 18-2-1980 to 22-3-1980.

Shri Gokul Chandra Mehar, SS Grade II, attended the training course of Engine Drivers under the control of Joint Director, Central Inland Water Transport, Cuttack.

S/Shri S. Ayyappan Pillai, K. S. Namboodiri, Scientists S-2 and K. S. Ganesan, Workshop Engineer attended a training course for Marine Engineers organised by Tata Engineering and Locomotive Co. Ltd., at Cochin on 5, 6 and 7 March 1980.

Dr P. N. Kaul, Scientist S-3 was sent for training in Agricultural Research Management at NAARM, Hyderabad from 12-22 March 1980.

Shri P. A. Appukutta Panicker, Scientist S-3 was deputed for training in Fisheries Management at the Grimsby College of Technology, UK under the Colombo Plan for a period of one year from Sept. 1980.

1.19 FAO CONSULTATION SERVICE:

Shri R. Balasubramanyan, Scientist S-3 was on short term consultancy service with the FAO/SIDA organisation for Development of Small Scale Fisheries in the Bay of Bengal at Madras, in Sept.-Oct. 1980.

Shri P. K. Chakraborty, Scientist S-2 was sent to Madras for assistance in the FAO/SIDA Project on Small Scale Fisheries in Bay of Bengal during February - March 1980. He reviewed the fish drying practices in the Project area and suggested improvements.

1.20 FELLOWSHIPS/SCHOLARSHIPS/AWARDS:

Shri K. Devadasan, Scientist S-2 was awarded a Fellowship by the Norwegian Agency for International Development (NORAD). As a Norad Fellow at the Norwegian Herring Oil and Meal Industry's Institute, Fyllingsdallen Norway, he worked on the effect of thermal denaturation on nutritive value of fish proteins.

1.21 VISITORS:

The visitors to the Institute during the period included:

Dr & Mrs John Bene of IDRC, Canada.

Shri Sujan Singh, MP and Member, Governing Body, ICAR.

Dr H. K. F. Hoffman (FAO) and Prof. Cobley (UNESCO)

Mr E. Williams, Editor & Publisher, Quick Frozen Foods International, New York.

His Excellency, Mr France Albert Rene, President, Republic of Seychelles.

Dr. O. P. Gautam, Director General, ICAR.

Team of 15 Members of Parliament.

Dr: H. R. Arakeri, Chairman, ASRB & Dr. A. N. Bose, Professor & Head, Dept. of Food. Tech. and Biochem. Engg., Jadavpur University, Calcutta.

Mr. W. Lodder, KOFAMSTERDAM, Holland.

Mr. E. J. de Boer, Institute for Fisheries Investigations, Netherlands.

Dr. Erne Wieback and Dr. Walter Stovhasi, Restock, GDR.

Dr. R. E. Wright, Regional Education Adviser, British Council Division, British High Commission, Madras.

Fishery Law Committee, Govt. of West Bengal.

Shri B. N. Saigal, Scientist – in – Charge, Documentation and Information Division, CIFRI, Barrackpore.

Mr E. H. Nichols, Consultant, Bay of Bengal Project.

Dr John Disney, Tropical Products Institute, London.

Mr O. Gulbrandsen, FAO Naval Architect & Consultant.

Dr David James, Sr. Fishery Industry Officer, FAO, Rome.

Dr Zak A. Obanu, Sr. Lecturer, Food Science & Technology, University of Nigeria.

Mr A. T. Jackson, Lecturer, Food Engg., University of Leeds, U. K.

Mr Andjelao Blazevic, Yugoslavian Ambassador to India.

Mr Akin Olaniawo, Federal Fisheries School, Lagos, Nigeria.

Mr G. M. Gerhardsen, FAO Expert.

Mr A. Bringsvor, FAO, Rome.

Mr Inger Bjorklund, Nutritionist, Fish Utilisation and Marketing Services, Fisheries Dept., FAO, Rome.

Mr K. S. Aaige, Minister of Agriculture, Republic of Seychelles.

Mr J. Fyson, Fishery Industry Division, FAO, Rome.

1.22 OBITUARY:

Shri Chandu Lal Govindji Tank, Senior Field Assistant of the Veraval Research Centre passed away on January 13, 1980. following a brief illness. He was 42.

2 LAB – TO – LAND PROGRAMMES:

The Lab - to - Land programmes initiated in 1979 were continued during the year under report.

In Elathur, Calicut, a training programme on processing of mussel meat was held during 19 - 22 April 1980 for the benefit of

those engaged in mussel fishing. A total of 33 trainees, including six members of the Badagara Taluk Matsya Pravarthaka Mahila Sangham, attended this programme. Methods of preparing dried, smoked and dried, pickled meat, chutney powder and canned mussel were demonstrated. It is worth recording that four trainees have already started production of mussel meat pickle on a large scale at Elathur. A training - cum - demonstration of fabrication of improved fishing gear, especially trawls, was held at Badagara, Calicut District, which was attended by 101 fisherwomen belonging to the local Mahila Sangham. The training was for one month from 12 July 1980 and proved very useful to the fisherwomen in finding gainful employment. A publication on the method of fabrication of trawls was also brought out

Demonstrations were also held at Chellanam, a village near Cochin, in the method of preparing poultry feed from prawn shell wastes. Samples of the feed and fish soup powder were distributed to 35 families of the village adopted under the lab - to - land programme. Short talks on method of preparation of the products, their nutritional value etc. were also given.

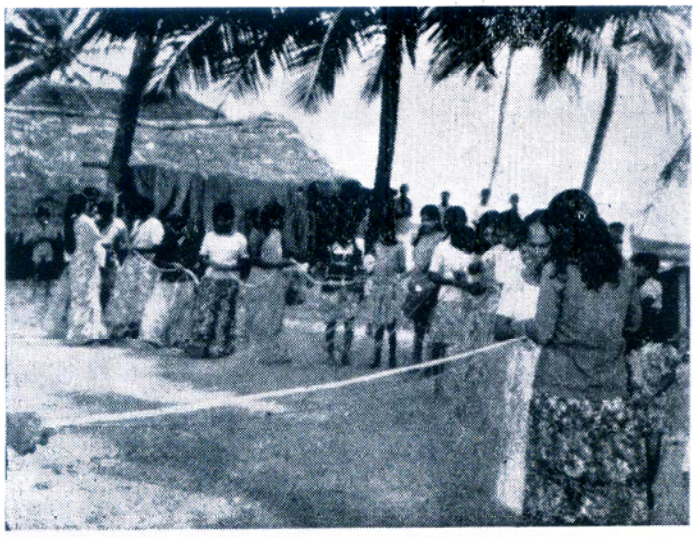
As a follow - up action of the programmes held at Vaikom the previous year on processing of clam meat, the design of an improved type of oven for cooking raw clams was supplied to the beneficiaries of the training programme. A salient feature of this equipment is its reduced fuel consumption.

In Veraval, Lab-to-Land programmes were started in the Chorwad village in Junagadh district in collaboration with State Fisheries officials. Various products and by-products developed at the Institute were displayed for information of the fishermen. Utilisation of different parts of sharks and skates and preparation of certain products and by-products developed at the Institute's Centre at Veraval, as also the modern methods of fish curing and transportation of fresh fish were demonstrated. Thermocole insulated plywood tea chests were given to a few selected fishermen families. Great appreciation of the performance of these boxes was recorded.

3 ICAR SPORTS:

As a culmination of the organised sports activities which began in the Golden Jubilee Year of the ICAR, the finals of the 1st ICAR Inter - Institutional Sports were held from 18 - 24 February 1980 at NAARM, Hyderabad in which, winners at the Zonal

Training in processing mussel meat, at Elathur, Calicut.



Training in fabrication of improved fishing gear at Badagara, Calicut.

tournaments held in the previous year participated. The Institute's Football, Badminton Shuttles (Singles and Doubles) and Athletic men teams participated in the six day tournaments in which about four hundred athletes from 27 ICAR Institutes took part. The Badminton Doubles team led by S/Shri Shenoy and V. Vijayan won the ICAR Trophy. Shri Jose Kalathil secured first place in Triple and High Jumps. The Institute bagged the individual Institute championship. The South Zone, comprising 9 Institutes won the overall championship by securing 57 points in games and athletics taken together. Dr. K. Ravindran was the Zonal Convener and Member of the Central Management Committee for the ICAR Sports Meet.

Following the 1st Sports Meet, the Institute took part in the 2nd ICAR Zonal (Zone IV) Sports Meet at SBI, Coimbatore held in November 1980. The Institute's Men team bagged the championship in Football and Badminton (both Singles and Doubles). The Ladies teams were the runners up in Shuttle (Singles and Doubles) and Table Tennis (Doubles). First places in High Jump, Triple Jump and Javelin Throw were won by the Athletic team. In all, the Institute secured 76 points. The Zonal Winners will take part in the Inter-Zonal Meet at Cochin for athletics and at Karnal for team events.

Dr. K. Ravindran and Shri A. V. Shenoy served as Members in the Zone IV Management Committee.

4. PROGRESS OF RESEARCH

4.1 DEHYDRATION AND SMOKING:

RESEARCH IN HAND

In order to arrive at the optimum salt:fish ratio for curing ribbon fish, trials were carried out with three different sizes of the fish, viz. small, medium and big. Penetration of salt, removal of moisture from the fish and spoilage as determined by TVN, at different periods of curing were studied. It was observed that for small and medium size ribbon fish, curing for 18 hrs, with 1:5 and 1:4 salt to fish ratio respectively would be sufficient.

The practice at present adopted in Kakinada region for brine curing fish is to use the same brine respeatedly, during which it gets spoilt, in spite of which, the fishermen continue using the same brine for further curing. Preliminary trials were made to prevent spoilage of brine during curing by chlorinating it (20%) to 50ppm, 100 ppm and 200 ppm chlorine levels using bleaching liquor. The

brine samples were then analysed for total bacterial count (TBC) halophilic count (HC) and total volatile nitrogen content (TVN) for three days continuously after curing the fish just once. It was observed that even though there was off odour and increase in both TBC and TVN counts in the case of brine chlorinated to 200 ppm level the HC remained the same. Further studies are in progress.

Experiments for standardising methods of preparing hot-dipped dried and smoked products were carried out. The temperature of the saturated dipping brine has been fixed at 80°C, dipping time 2 minutes and final moisture content of the product below 35%. The finished product is to be smeared with a preservative mixture of 3% sodium propionate in refined salt to prevent fungus attack. The shelf life of such a product would be about 4 months.

Studies were also carried out in utilising cheap varieties of fishes for conversion into smoked products. Sardines were smoked, filleted and the fillets used to prepare chutney powder and ready-to-serve pickle.

A simple thermal treatment consisting in heating smoked mussel meat to 125°C for five minutes and then cooling to room temperature immediately before packing, has been found to check insect attack for a long time.

The non-penaeid prawns landed along Bombay coast are converted into dried products in the traditional way. This method has a number of defects, like undesirable contamination with sand and other impurities, heavy bacterial load and limited shelf life. These defects have been traced to the poor quality of the initial raw material and improper handling and processing. The following remedial measures have been suggested.

a) Adequate icing of fish as soon as it is caught.
b) Reduction of time lag between landing and processing.
c) Giving an initial cleaning in fresh clean water before drying.
d) Drying on raised platforms.
e) Keeping the finished product properly packed in clean dry warehouse.

A survey was conducted of insect infected samples of dried fish collectd from various markets along the West and East coasts, the samples subject to chemical analysis and the insects identified, Work is in progress.

Survey of the curing yards along the West coast was conducted by the Calicut Centre and the conditions under which processing and marketing are carried out, studied. Representative samples were subject to bacteriological and chemical analysis. About 40% of the samples were found infected with red halophiles.

RESEARCH CONTEMPLATED

1. Further studies on prevention of spoilage of brine used in curing of fish.
2. Improvement in the textural quality of sundried fish.
3. Construction of smoking kiln.

SCIENTISTS ASSOCIATED

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

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

KAKINADA : D. Imam Khasim Saheb, Subrata Basu, Sib Sankar Gupta.

4.2 FREEZING :

CHIEF FINDINGS

Studies on the freezing and frozen storage characteristics of lightly smoked eel fillets showed that the product had better flavour and texture compared to non-smoked fillets. Studies on the ice storage characteristics of mullet *(Mugil kela artii)*, Barracuda *(Sphyraena Sp.)* and *Labeo rohita* have shown that mullets remained in acceptable condition for 10 to 15 days when stored in direct and indirect contact with ice respectively, barracuda for 8 to 10 days and *Labeo* for 12 days when stored in crushed ice. Barracuda frozen as blocks remained in good condition for 6 months' storage at $-18^{0}C$ and frozen smoked fillets of eel for 31 weeks of frozen storage. Shark fillets frozen as glazed blocks did not show any appreciable change in physical, biochemical and organoleptic qualities even after 8 months storage at $-18^{0}C$.

The colour and appearance of minced meat from cat fish could be improved by washing with a solution of polyphosphate or salt.

RESEARCH IN HAND

Studies were carried out on preparing minced meat from cat fish, threadfin bream and shark. The yield from shark was low

owing to the presence of large amounts of connective tissues. Washing the minced meat reduced the urea content, but leaching losses were considerable and the washed meat on freezing and thawing lost its texture and became spongy. The colour and appearance of the minced meat from cat fish could be improved by washing with a solution of polyphosphate or salt. Washing also reduced the fat content of the minced meat by 1.4 to 1.7% (on DWD). Minced meat from thread fin bream could be stored at -18°C for more than 4 months in acceptable condition.

Periodic examination of fresh cuttle fish, cleaned, frozen and stored at -18°C showed that the product could be preserved in good condition upto 6 months without discolouration.

Crabs were frozen in raw and cooked conditions as shell-on (inner shell only), claw with shell and meat and their storage characteristics studied at -23°C. Yield of meat was 26.4% from raw crab, 19.72% from cooked crab, 51 6% from raw claw and 44.5% from cooked claw. The thawed yield varied from 94% in raw frozen with shell-on to 80% in frozen cooked meat. In claw, the yields were 93 2% and 94.6% respectively for raw and pre-cooked samples. Loss of nitrogen in drip was maximum in frozen cooked meat and minimum in pre-cooked claw. The raw frozen samples retained much of the flavour bearing compounds during frozen storage, Cooked meat showed browning after 4 months storage at -23°C. In raw claw meat, the characteristic colour of the pigment changed to slight black after 8 weeks storage. All the other samples were found to be in acceptable condition even after 6 months storage.

The iced and frozen storage characteristics of barracuda were studied in detail. The shelf-life of ice stored material was observed to be 8 days in the case of samples stored in direct contact with ice and 10 days in the case of those stored without contact with ice. Fresh barracuda frozen as blocks remained in good condition for six months at -18°C after which oxidative rancidity and total volatile nitrogen values showed a slight increase. Both iced and frozen materials were found to be more spongy compared to the fresh sample. Total bacterial count was low in all the samples.

Studies on the ice storage characteristics of mullet *(Mugil Kela artii)* were conducted in detail. The fish packed in polythene bags and stored in crushed ice without contact were acceptable upto 15 days, but those stored in direct contact with ice were acceptable only upto 10 days. Fishes dipped in chlorinated water (15 ppm) at 90°C for 5 seconds and then in chilled water (8-10°C.) were acceptable

upto 14 days when stored in ice with improved texture but poor external appearance. It was also observed that there was no increase in the ice storage life of the fish when dipped in 25 ppm chlorinated water at room temperature for 30 minutes prior to storage.

Fillets of eel were smoked for three hours, frozen, stored at –18°C. and storage characteristics studied along with control (non-smoked) samples. Both the samples were in acceptable condition even after 31 weeks of storage, but the smoked samples had better flavour and texture. A remarkable decrease in total bacterial count was observed in the smoked samples during storage.

Studies were also carried out on the ice-storage life of cockle meat. Half the meat was preserved in direct contact with ice and the remaining half packed in polythene bags and then stored in ice. Sufficient ice was added to maintain the temperature at 0–1°C. and extra ice added every day to keep the temperature constant within this range. It was observed that the meat remained in acceptable condition for 4 days and 7 days though accompanied by change in colour and texture after 2 and 4 days storage respectively. The changes were more rapid in the former case. From these it can be concluded that cockle meat can be stored in very good condition for 7 days if packed in polythene bags and stored out of contact with ice.

Ice-storage characteristics of ***Labeo rohita*** were studied in detail. Fish samples collected from reservoirs, were kept in contact with ice for 12 days and changes in physical, biochemical, bacteriological and organoleptic characteristics studied. The fish remained in ice in good condition for 5 days, while on the 12th day it was just acceptable. The moisture content on storage increased from 76.5% to 79%, total nitrogen decreased from 3.681% to 3.055% and bacteriological count rose from 288/g to 3734/g. The samples were free from faecal and pathogenic organisms.

RESEARCH CONTEMPLATED

1. Studies on freezing and storage characteristics of Elasmobranchs.
2. Freezing and storage of fishes like Hilsa, sole fish, cuttle fish, squid.
3. Further studies on the amenability of cockle meat to canning, freezing and pickling.
4. Storage of fatty fishes at low temperature, use of chemical preservatives to extend shelf-life of fatty fishes during frozen storage etc.
5. Technological aspects of production and freezing of minced meat from low priced fish.

SCIENTISTS ASSOCIATED

COCHIN : P. A. Perigreen, Chinnamma George, Jose Joseph

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

KAKINADA : R. Chakraborti, Sib Sankar Gupta, Subrata Basu

BOMBAY : D. K. Garg

4.3 CANNING :

CHIEF FINDINGS :

The phenomenon of greening observed in canned mackerel tuna prepared out of frozen stored material is more or less dependent on the initial quality. Flavour of canned product prepared out of iced raw material could be improved by suitable additives provided the storage period did not exceed four days. A modified method was worked out for skinning mackerel to process canned boneless, skinless fillets. Methods were standardised for canning ghol and horse mackerel in brine and oil. A method has been suggested for canning hilsa roes. Attempts have been made to process canned squid rings in a new medium, viz. sugar syrup, with good results.

RESEARCH IN HAND :

Studies on the use of frozen and cold stored mackerel tuna ***(Euthynnus affinis)*** for canning were continued particularly with reference to the phenomenon of greening of the meat observed earlier. Highly erratic results were obtained probably because of the non-uniformity in the quality of the initial material used. However, it became clear that the phenomenon is more or less related to the quality of the initial material. Studies conducted with ice-stored mackerel tuna showed that the flavour of the canned product prepared out of them could be improved by modifying the packing medium, viz, oil, with the extracts of red chilly, provided the ice storage period does not exceed 4 days.

A modified method has been worked out to skin mackerel to process skinless, boneless fillets. In this method, the fish is first blanched in 15% brine containing 0.1% acetic acid, followed by cooking in steam at 5 psig., cooling to room temperature and scraping off the skin using a blunt knife or split bamboo chip. Keeping the fish in chill store overnight renders the meat firm when it can be split open to remove the bone. The fillets can be canned then in

the usual style. Storage studies conducted upto a period of 10 months showed that the product remains intact.

Methods of skinning other fishes like Kilimeen *(Nemipterus japonicus)*, jew fish *(Sciaenids spp.)* etc. with a view to canning in the above style have been taken up. Lye peeling could be effectively done, but it affected the wholesomeness of the meat.

Lactic acid in low concentrations has been found effective in loosening the attachment of the skin to the muscle thereby rendering its removal easy. This method is being standardised with respect to the species of fish under study.

Methods were standardised for canning ghol and horse mackerel. The different canning media used were oil and brine. For canning ghol, oil was found to be a better medium

Studies were undertaken on canning of fish roes, particularly those of cat fish and hilsa. The whole egg mass of hilsa was steamed and canned in brine, oil and tomato ketchup. Those canned in ketchup and brine turned out to be good acceptable products. On the other hand, normal methods of canning did not yield an acceptable product with respect to cat fish roe, the product lacking in juiciness and showing a dry taste. Modification in the blanching process undertaken with a view to rendering the product soft and succulent by incorporating baking soda or mild alkali in the brine did not yield a satisfactory product.

Canning squid rings in a new medium, viz., sugar syrup was studied. Squid rings, after blaching in brine of different concentrations for varying periods, were packed in sugar syrup of different concentrations. Modified syrup incorporated with oleoresins of spices like pepper, ginger, chilly etc. was also used as filling medium. Caramelisation of syrup and absorption of caramel colour by the squid rings were observed with higher concentrations of syrup, besides resulting in hardnes of texture.

RESEARCH CONTEMPLATED

1. Thermal distribution studies in different types of cans and different types of products.
2. Further studies on canning skinless and boneless fillets of fish.
3. Canning fish in curry.
4. Evaluation of bacterial safety in canned products.
5. Feasibility of canning squid and its organoleptic evaluation.

SCIENTISTS ASSOCIATED

COCHIN : K. K. Balachandran, P. K. Vijayan

VERAVAL : M. R. Raghunath, Anil Agarwal

4.4 PROTEINS, ENZYMES AND LIPIDS:

CHIEF FINDINGS:

C20: 1 and C22: 1 acids were found in very low amounts in lipids of tropical fishes. Monoenoic acids accounted for 25–30% of the total fatty acids, whereas in temperate water fishes about 50-60% of the total fatty acids are monoenoic. Brackish water species from tropical waters showed greater similarity in their fatty acid composition to fresh water species than marine species. Phosphatidylcholine and phosphatidylethanolamine were the main phospholipids found in fishes and shell fishes from tropical waters. Muscle lipids of oil sardines showed a high content of polyunsaturated fatty acids in July. Seasonal variations were not very much marked in the case of skin lipids of sardines.

A purified preparation of lipase enzyme from hepatopancreas of oil sardine showed optimum activity at 37°C and pH8. Carbonyl compounds, metallic ions like Fe++, Cu++, Ba++ and halogens were found to inhibit the activity of the enzyme, while Ca++ activated it.

Muscle protein homogenates in phosphate buffer (u = 0.1, pH 7.8) were found to be hydrolysed fast by trypsin at 39°C when 3 mg/ml was used. The rate of hydrolysis was found to increase upto 2 hours. Heat treatment of fish muscle was found to be beneficial for fast tryptic digestion.

Red meat of scombroid fishes was found to be richer in fat, carbohydrates and minerals compared to white meat, which, however, was richer in lysine and calcium.

5% salt soluble proteins were found to coagulate when heated at 40°C and 50°C upto 2 hours, after which there was very little change in the protein remaining in solution. For soluble fish proteins the pH of maximum coagulation was found to be 4.

RESEARCH IN HAND :

A systematic study on the effect of heat treatment on the structure and nutritive value of fish proteins was initiated. The effect, if any,

of protein fat interactions on the thermal denaturation of fish proteins was also studied.

Further characterisation of the major myofibrillar protein fractions of fish muscle is in progress.

Studies on the fatty acid composition of fish lipids showed that phospholipids had a significantly higher content of polyunsaturated acids when compared to neutral lipids. Seasonal variations in the composition of lipids were more pronounced in muscle lipids when compared to skin lipids. Phosphatidylcholine (50–60%) and phosphatidylethanolamine (20–30%) were the major phospho-lipids found in tropical fishes. Compared to temperate water fishes, tropical fishes had higher content of saturated acids in their lipids. These studies are continued.

The effect of cooking and frying on the digestibility of fish proteins is being studied in detail.

Enzyme lipase was isolated and purified from hepatopancreas of oil sardine and its properties studied. Valuable informations on the inhibitors and activation of the enzyme and conditions for its optimum activity have been obtained.

Experimental methods for the isolation and identification of volatile carbonyls from processed fishery products were standardised with a view to initiating a systematic investigation on the flavour bearing compounds in processed fishery products. Commercially important fishes of Cochin coast were screened for their content of major vitamins. Studies are also in progress on the toxic amines found in important food fishes of this coast.

RESEARCH CONTEMPLATED

1. Biochemical composition of common food fishes and shell fishes-distribution of vitamins, seasonal changes in the fatty acid composition of lipids of sardine and mackerel, characteristics of red and white meat of Scombroid fishes.

2. Characterisation of major myofibrillar proteins from sardine and mackerel–including studies on thermal denaturation and its effect on nutritive value, digestibility of protein as effected by freezing, canning, frying etc. and self digestion and textural changes.

3. Isolation and characterisation of lipases from sardine and mackerel and microbial sources.

4. Volatile flavorous principles from processed fishery products and studies on toxic amines.

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.

4.5 FOOD POISONING MICRO - ORGANISMS AND THEIR CONTROL:

CHIEF FINDINGS :

Comparison of freshness meters to evaluate the quality of wet fish during storage at ambient temperature and at 0°C has shown the Intelectron Fish Tester VI to give more accurate readings. ***Salmonella larochelle,*** a new serotype of ***Salmonella,*** was isolated for the first time in India from frozen froglegs.

RESEARCH IN HAND :

Taxonomical studies on the bacterial cultures isolated from pearl spot ***(Etroplus suratensis)*** and milk fish ***(Chanos chanos)*** were continued. The predominant flora of fresh pearl spot consisted of ***Pseudomonas, Alcaligenes, Micrococcus*** and ***Moraxella.*** The guts of pearl spot contained 'coliform' group of bacteria. During the storage of pearl spot, a gradual build up of ***Moraxella*** and ***Pseudomonas*** was observed.

Preliminary studies on the bacteriology of clams and mussels were initiated during the year.

Studies were undertaken for selecting suitable diluent for use during bacteriological sampling. Of the six diluents tried with twelve samples each of raw uniced fish, iced fish and frozen samples, Ringer's solution was found to give the best results with uniced fish, sea-water with iced fish and normal saline with frozen fish samples. Some preliminary studies were also done on the hold-up time for these diluents. For frozen fish samples, a hold-up time of more than 30 minutes tended to give higher bacterial count using normal saline as diluent.

Studies on the catalase activity and total count of bacteria associated with iced sardines were continued.

At Bombay, studies were undertaken to investigate the nature of microflora on fresh fish landed at Sassoon Docks. It was found that in the case of half beak ***(Hemiramphus spp.)*** and pomfret ***(Pampus argenteus)*** gram negative rods predominated, while in

Chorbomble (*Synodontidae spp.*) and Barracuda (*Sphyraena spp.*) the predominant group was gram positive cocci. In cat fish (*Tachysurus sp.*) a few gram positive spore formers were also observed.

In Veraval, samples of fish Kheema commercially prepared from 'dai' and 'kati' and samples of different species of fresh fish procured from the local market were screened for the incidence of *Salmonella* and *Vibrio parahaemolyticus* along with enumeration of total count, *E. coli,* faecal *Streptococci* and coagulase positive *Staphylococci.* Though a few samples showed presence of faecal *Streptococci* and *E. coli, Salmonella, Vibrio parahaemolyticus* and coagulase positive *Staphylococci* were absent in all the samples. Similar studies were also carried out at Bombay Research Centre, where samples tested included swabs from fish landing Centres, fresh and frozen fish and shell fish. Frozen cuttle fish had lower bacterial count compared to frozen shrimp, lobster tails and froglegs while frozen lobster tails had the maximum bacterial count. Among fresh fish analysed. sole fish showed maximum count. Of the bacterial flora, occurrence of faecal *Streptococci* was most closely followed by *E. coli,* while only few samples showed the peresence of coagulase positive *Staphylococci.* Samples of fresh and frozen fish were also analysed for the occurrence of *Clostridium spp.* This organism was isolated from one sample of cat fish and 13 samples of frozen shrimp. At Kakinada Centre also, analysis of iced prawn, fresh fish, smoked prawn, frozen prawn, cockle and fish products showed that none of the samples cantained *Salmonella* or *Vibrio parahaemolyticus.*

The Intelectron Fish Tester VI and Gr. Torry Meter were compared to evaluate the quality of pearl spot and mullet during spoilage at ambient temperature and at 0°C in ice. The former gave more accurate readings than the latter, especially for fish at ambient temperature.

Investigations were undertaken to study the presence of *Salmonella* alone in various fishery products. Ninety-four samples of fresh and frozen fish were analysed. While *Salmonella* was absent in all fresh fish samples, it was present in samples of frozen shrimp, frozen froglegs and frozen lobster tails. The different serotypes of *Salmonella* isolated included *S. orion: S. weltavreden: S. larochelle, S. roan, S. wittingfoss, S. senftenberg, S. nehanga, S. typimurium* and *Ariznoa*. The isolation of *S. larochelle* from froglegs deserve special mention as it is the first time that this has been done in India. Similarly *S. senftenberg,* though reported to have been isolated previously, was on this occasion isolated for the first time from lobster tails. *S. orion,* also a very rare serotype, has been isolated only three times of which

two were by this Institute's Research Centre at Bombay, once from frozen red snapper and the second time from frozen shrimps.

Samples of commercially important fishes and ice continued to be collected from the fishing harbour at Cochin at regular intervals and analysed for quality characteristics. Twelve bacterial cultures including three obligatory halophilic cultures, after identification, were added to the culture collection. They were classified as *Halobacterium spp.*

With the introduction of the modified in-process quality control by the Export Inspection Council, which empowers the processor to test the quality of his products in his own laboratory, the Institute started undertaking bacteriological examination of the samples from processors who had delay in setting up laboratories of their own. Under this scheme, a number of samples of frozen prawns, squid and cuttle fish were analysed and results furnished to the concerned parties.

RESEARCH CONTEMPLATED:

1. Examination of different types of fishery products for potential human pathogens by employing suitable media.
2. Epideological and serological characteristics of isolation of pathogens in order to assess their role as potential food poisoning organisms.
3. Determination of heavy metals and pesticide residues in fishery products.
4. Further studies on the bacterial quality of fish and fishery products with special emphasis on the incidence of *Salmonelle* and *Vibrio parahaemolyticus.*

SCIENTISTS ASSOCIATED:

COCHIN	:	Cyriac Mathen, K. Mahadeva Iyer, P. R. Girija Varma, M. Arul James, P. K. Surendran, Nirmala Thampuran, P. T. Laxmanan, Francis Thomas.
VERAVAL	:	A. C. Joseph.
BOMBAY	:	S. P. Damle, T. .S Gopalakrishna Iyer
KAKINADA	:	Dr. C. C. Panduranga Rao, Sib Sankar Gupta, Imam Khasim Saheb.

4.6 PACKING OF FISH AND FISHERY PRODUCTS:

CHIEF FINDINGS:

Survey on the physical properties of corrugated fibre-board master cartons used in frozen fish industry was completed. A large number of cartons collected from processing factories all over the country were evaluated for bursting strength, puncture resistance, water-proofness, combined weight of liners, basis weight of corrugating medium, weights and demensions of cartons and the wax and saponifiable matter contents. It was observed that only 9 4% of the samples conformed to ISI standard with respect to bursting strength and Cobb 30' values, while 18.5% met the minimum requirement for the combined weight of liners. Percentage of samples that conformed to ISI standards with respect to the other physical properties were - puncture resistance, 50% and basis weight of corrugating medium, 34.4%. Survey of physical properties of waxed duplex cartons was also completed. The properties analysed were bursting strength, puncture resistance, water-proofness, tearing strength, tensile strength, elongation, moisture content, thickness, weights and dimensions as well as wax and saponifiable matter contents. Moisture content value ranged from 8 to 10%. One half of the cartons had bursting strength above 6Kg/Sq.cm and 67.4% showed puncture resistance above 26 beach units, while 80% of the samples had Cobb 30' values below 46. Majority of the cartons had tensile strength between 6.08 and 9.08Kg per 1.5 cm width and 18 cm length, while one third showed elongation values below 0. 85 cm/18 cm length. The wax and saponifiable matter contents varied widely. 58.3% of the samples had tearing strengths below 229 g. in cross direction, while 44% showed values below 178g. in machine direction. 75% of the cartons weighed between 62 and 77 g. while 72% showed thickness below 0.465 mm.

Studies were also completed on the deteriorative changes in physical properties of corrugated fibre-board cartons and waxed duplex cartons during frozen storage. A sudden spurt in the moisture content was observed after the first month, followed at a slower rate thereafter. This was accompanied by deteriorative changes in physical properties. Similar changes due to prongled exposure of the boards to moisture in the laboratory and the effect of repeated wax-coatings on the water resisting capacity of the boards were also investigated. The deteriorative changes could be controlled to a great extent by coating the boards twice with wax.

RESEARCH IN HAND:

Studies on the keeping quality of satted and dried lizard fish in ten different packaging materials, viz. 100, 200, 300, 400 and 700

gauge LDPE, 100 gauge polypropylene, 200 gauge HDPE, 400 gauge PVC and paper aluminium polythene and paper polythene laminates at atmospheric temperature and humidity conditions were initiated. Samples were drawn every month and quality evaluated. The samples packed in polythene films showed acceptable organoleptic qualities even after 6 months storage.

Studies on the effect of packaging materials on the shelf life of frozen cat fish fillets at $-18^{0}C$ were continued. It was seen that samples packed in 200 gauge HDPE film exhibited maximum storage life of 7 months, compared to 5–6 weeks in control. Simllar studies on frozen otolithes fillets are also in progress.

RESEARCH CONTEMPLATED

1. Survey of properties of packaging materials used in the fish processing industry, eg. polythene films, synthetic strapping material and shipping containers for canned fish.

2. Studies on methods for improving the functional properties of corrugated fibre-board master cartons by different treatments.

3. Studies on the effect of packaging materials on the shelf life and quality of frozen, cured and dried fishery products.

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 :

A method was developed for separating meat alone from Jawala prawns, free from shell particles.

Trial runs of the pilot plant for production of chitosan were undertaken and necessary modifications in the machinery effected.

Poultry feed formulated by using fish/prawn waste, tapioca waste and other agricultural wastes was subject to feeding trials and found satisfactory.

Fish fingers incorporated with monosodium glutamate were found to have enhanced shelf life in frozen storage. Fingers prepared from fatty fish were more prone to rancidity than those prepared from lean fish.

An excellent formula for preparing chutney powder from dried mussel meat was evolved. Dried mussel meat and black gram dhal are fried, powdered and mixed in equal proportion. This when mixed with coconut oil was found to be very tasty.

A hand operated machine for production of isinglass was developed.

A high quality fish sauce was prepared by fermentation of non-penaeid prawns.

RESEARCH IN HAND :

A few trial runs of the pilot plant set up for production of chitosan from wet and/or dry prawn shell waste were undertaken. A number of defects were noted in the functioning of the plant and necessary modifications made. About 200–300 kg of raw material can now be employed at a time for production of chitosan. The quality of the product has been found to be quite good. With some improvement in the design and in the selection of machinery, it is possible to evolve a commercial plant.

Studies were continued on the properties of chitosan and its industrial applications. The properties of chitosan prepared under identical conditions using various raw materials such as shell waste of different species of prawn, crab waste and squid pen were studied and the yields of chitin/chitosan from these raw materials determined.

Chitosan, on prolonged storage, lost its solubility in dilute acetic acid. Such insoluble samples when treated with 40% alkali, became readily soluble giving viscous solutions having good flocculation properties.

Paper treated with chitosan had improved breaking strength and moisture proofness. Preliminary studies carried out on the effect of coating master cartons made of corrugated kraft paper with chitosan showed the treated cartons to have better strength and longer life than the untreated cartons.

A mixture of chitosan and citric acid and/or maleic acid gave a viscous solution which can be used for wine clarification or other flocculation purposes. Such mixtures are known to be used for wine clarification in countries such as U. K.

Studies were also continued on the utilization of squilla, which after thorough washing was fed into a mini expeller where it got crushed and pressed, with the result that the meat portion oozed

out through the slits and the shell portions came out as a hard cake. The protein extract thus got can be dried under vacuum or subjected to spray drying. The method is simple and can be employed to get high quality protein with characteristic flavour.

Nutritional evaluation of squilla proteins, lantern fish, fish hydrolysate, shark fin rays and soluble non-protein fractions of squilla extract was undertaken by feeding the products to albino rats. Precipitated squilla proteins had PER values comparable to that of casein. No deleterious effect on the health of the animals was noted when fed with squilla protein. PER values of lantern fish were higher than that of casein, while that of shark fin rays, fish hydrolysates, whole squilla extract were lower than that of caseins. The amino acid compositions of the products were also determined. Fish hydrolysates, whole squilla extract, squilla protein etc. were deficient in some essential amino acids. Work on these aspects is to be continued further.

Based on the data collected earlier, poultry feed was prepared on large scale using prawn waste, fish meal, groundnut cake, tapioca waste and rice/wheat bran and feeding trials undertaken at the Kerala Agricultural University, Mannuthy. Though the feed was good, there is much scope for improvement. It was also tested in a local poultry farm with good results and some parties have shown interest in its production on a commercial scale.

Prawn shell powder, after treatment with acetic acid was also used in the formulation of fish/prawn feed indicating good acceptability and ensuring better growth.

Studies were carried out on the storage behaviour of fish fingers prepared from Kilimin *(Nemipterus japonicus)*. Samples prepared with batter, without batter and those containing 0.01% mono-sodium glutamate were stored upto six months, with chemical analysis being carried out at monthly intervals. The parameters examined were moisture, protein, fat, peroxide value, free fatty acids (FFA) and TBA values. Moisture, fat and protein showed variation in values with length of storage. Peroxide values though initially high, decreased in all the samples on storage, though FFA value showed wide fluctuations during frozen storage. The experimental sample showed higher FFA values compared to the other two. The sample with batter showed comparatively low FFA value.

Several batches of edible fish powder were prepared at Veraval Centre and recipe trials conducted on a local popular snack. Preliminary studies showed that the basic recipe can be modified by

incorporating the fish meat without any notifiable changes in the taste of the final product.

Attempts were also made to find out a suitable method for preparation of the fish powder from homogenised muscle of cheaper varieties of fish available at Kakinada. A soft, odourless powder was prepared using solvent ethyl alcohol for fat removal. Its characteristics are being studied.

Bacteriological peptone was prepared from fish muscle using papain. The bitter fraction was separated using solvent containing ethyl alcohol and water. Less bitter fractions of peptone are being studied.

Good quality pickle was prepared from cockle meat. The product remained in good condition even after storage for four months at room temperature, as judged by organoleptic and bacteriological studies.

A method was developed to isolate the meat from jawala prawns. The process consists of controlled masceration along with required quantity of water followed by press filtering. The filtrate was heated to precipitate all protein and again press filtered. The product so obtained could either be stored in block frozen condition, or dried and powdered. It can be incorporated in any food product.

Attempts to prepare fish sauce from non-penaeid prawns by fermentation technique gave encouraging results. Various trials carried out to accelerate the process of fermentation showed it to be quickest at 45° C and addition of 0.2% papain to the ground prawn substantially improved the process. Ground jawala gave a sauce yield of 77.25% on fresh weight compared to 76.11% obtained from whole sample. The shell waste after extraction of meat yielded 1.33% of finished chitosan.

Some preliminary experiments were carried out in preparation of breaded mussel meat by shucking fresh mussel and blanching the meat in 5% boiling brine for 5 minutes and breading. Different mixes like bread crumbs, rice flour and maida with condiments were tried. The products were good with respect to taste and other organoleptic qualities.

A hand operated simple machine was designed and fabricated for the preparation of isinglass from the fish bladders. The machine after necessary modifications was found useful in producing good quality isinglass.

RESEARCH CONTEMPLATED :

1. Further studies on utilisation of prawn/fish waste in the preparation of low cost edible products, fish feed and poultry feed.

2. Industrial application of chitosan and utilization of squilla by converting into protein rich products.

3. Further trials with the machine fabricated for preparation of isinglass.

4. Preparation of food grade fish albumin from technical grade albumin already available.

5. Evaluation of nutritional quality of food preparations developed in the laboratory.

6. Nutritional evaluation of fish fingers.

7. Further studies on economic utilisation of non-penaeid prawns.

SCIENTISTS ASSOCIATED :

COCHIN : Dr. K. Gopakumar, A. Vasanth Shenoy, P. V. Prabhu, P. Madhavan, K. G. Ramachandran Nair, A. Lekshmi Nair, P. T. Mathew, T. K. Thankappan, S. M. S. Abuthahir Ali. R. Thankamma, P. Ravindranathan Nair.

KAKINADA : Sib Sankar Gupta, Subrata Basu, D. Imam Khasim Saheb, R. Chakraborti.

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

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

.8 CRAFT MATERIALS :

CHIEF FINDINGS :

The Institute's new 17.5 m steel trawler 'Matsyakumari' whose construction was completed at the Mazagon Docks, Bombay was taken out for basin trials, sea trials, speed trials, fishing trials, and final fit-out before delivery.

Minor modifications were completed on the 9 m. OAL mechanised fishing vessel operating in the Hirakud Reservoir under the Burla Research Centre of the Institute.

A number of fibreglass reinforced plastic (FRP) gill netters,

beach boats and canoes developed in the private sector were tested for trials and demonstrations for development of small scale fisheries. More number of 12 m. mechanised purse seiners, commissioned for fishing by the industry were also subjected to performance trials and cost evaluation.

Anodic metal coatings of zinc, aluminium and cadmium on mild steel boat fastenings provided compatability and increased their service life with the common boat building timbers now in use.

A dual combination of antifouling and antiboring properties in a single paint matrix was developed and its effectiveness established experimentally.

The technology of wood polymer composite (WPC) was extended to the development of toxin incorporated wood polymer composites (TWPC).

RESEARCH IN HA D :

i) CORROSION AND COMPATABILITY OF METAL FASTENINGS WITH BOAT BUILDING TIMBERS :

The quantitative and qualitative analysis of performance of fastenings such as cadmised iron, galvanised iron, aluminium alloy etc, in contact with timber species like *Adina cordifolia, Artocarpus hirsuta, Lagerstroemia lanceolata, Mangifera indica* and *Tectona grandis* were continued. Interaction of the fastenings with moist wood shavings incubated for varying periods for liberating the free acids and monitoring the resultant variation of the pH were also completed. The non-compatability of iron fastenings in contact with ASCU treated wood was evident throughout the study. The holding capacity of the nail/bolt was found to deteriorate progressively in the case of ASCU treated wood, irrespective of the metallising of the nail/bolt. Brass and copper fastenings were found compatible with Ascued wood.

ii) DEVELOPMENT OF ANTI-FOULING-ANTIBORING SUBSTRATA :

The preparation of a substrata which would ward off both foulers and borers simultaneously, which was conceived on theoretical grounds has been practically achieved. Tough coatings based on melamine treated cashewnut shell liquid (CNSL), polymerised rubber with carbon, alkali sensitive pigments and finely divided silicon carbide were developed. This substratum is so designed as to function as a tough film which the borers cannot drill through, but at the

same time allowing the toxin to reach the matrix/seawater interface. The coatings, applied on mango test blocks and subject to free attack of marine borers and foulers remained completely free of any biogrowth and boring for over six months.

iii) **WOOD POLYMER COMPOSITES :**

The Bhabha Atomic Research Centre, Bombay has been producing wood polymer composites (WPC). At the request of this Institute, incorporation of toxic compounds of TBTO, creosote or ASCU prior to irradiation was attempted in order to produce toxin incorporated wood polymer composites. Application tests are under way.

iv) **FORTIFICATION OF OIL BORNE PRESERVATIVES :**

Panels of mango and haldu were got treated (pressure impregnation) by boron salts and then assessed for their antiborer properties. Results are given below :

Panel	Treated with	Period of immersion (in months)	Foulers	Borers	Remarks
Mango	Boron 340 Kg/m³	4	Fouled by barnacles & oysters	NIL	An initial resistance to foulers was observed. But subsequently fouling occurred,
Haldu	Boron salts 310/ Kg/m³	4	-do-	NIL	
Mango	Boron (duplicate)	4	-do-	NIL	
Haldu	Boron (duplicate)	4	-do-	NIL	

Mango and haldu panels were also treated with creosote fortified with 5% of Malathion and Sumithion. Results are as below :

Panel	Type of treatment	Period of immersion (in months)	Fouler	Borer	Remarks
Mango	Plain creosote	5	Heavily fouled by balanids	NIL	No resistance to fouling.
Haldu	Creosote + 5% Sumithion	5	Heavily fouled by balanids	NIL	As borers were present both
Mango	Creosote + 5% Sumithion	5	Heavily fouled by barnacles	NIL	in treated and control panels,
Control			Heavily fouled by balanids	NIL	no conclusion could be drawn

Balsa wood was procured and pressure treated with ASCU to determine its holding power. The holding power of ASCU in balsa wood was found to be very poor and the panels after an initial resistance were subsequently fouled by barnacles.

v) **BOAT BUILDING MATERIALS :**

a) Fibreglass Reinforced Plastic (FRP)

Fibreglass reinforced plastic as a boat building material was put to use by a number of private enterpreneurs for the fabrication of canoes, beach boats and gill netters ranging in length from 6–9 m. OAL. During tests and trials, such boats were found suitable for manual as well as mechanical operations. The prototypes developed by private sector as a result of demonstrations were found acceptable by the traditional fishermen, except for the high initial cost of the new material. Marine plywood, in combination with FRP lamination is likely to bring down the cost if adopted to standard and well proven specifications. Lloyd's specifications provide the basic guidelines.

b) Treated Timbers For Boat Building.

Besides mango and haldu, other secondary species of timbers like chaplash *(Artocarpus chaplasha)* and Chini *(Tetrameles nudiflora)* were taken up for treatment with preservatives like ASCU *(copper chrome arsenic compound)* and creosote. The timber samples when treated with the preservatives under pressure yielded the desired effect and were found to be free from bio-degradation. Such treated timbers can be used for deck planks, beams, bulk-heads and wheel-house construction at relatively reduced cost. Pressure treatment plants have been located for large scale trials.

c) Aluminium

Marine quality aluminium, possessing the required quantity of magnesium in its composition, has been found suitable for boat construction, both as sheets and as extrusions. Between rivetting and argon gas welding processes the latter appears to be ideal and more efficient for joinery works. Scantlings and size standards for construction work are being studied. The utility of indigenous aluminium for large scale manufacture of canoes to begin with is being explored.

RESEARCH CONTEMPLATED :

1. Field trials and further studies of prototype boats built of newer materials.

2. Studies on wood plastic composites.

3. Chemical preservative treatments to traditional fishing crafts so as to enhance their service life.

4. Studies on marine plywood/FRP lamination

SCIENTISTS ASSOCIATED :

COCHIN : R. Balasubramanyan, Dr. K. Ravindran, N. Unnikrishhan Nair, A. C. Gopalakrishna Pillai, B. Meena Kumari, K. Sreedharan Namboodiri.

4.9 GEAR : MARINE

4.9.1 (a) TRAWLS (A) Evolution of Suitable Gear for Inshore Fishing :

CHIEF FINDINGS :

Bridle efficiency studies of 10.3 m unequal panel midwater trawl and 15 m bulged belly trawl were completed during the period under report. 50 m bridles were found more suiitable as compared to 40 and 30m bridles for the 10.3m unequal panel mid-water trawl and 20m bridles for the 15m bulged belly trawl.

RESEARCH IN HAND :

Fabrication of 12.5m and 17.5m midwater unequal panel trawls was taken up and and completed at Cochin. Based on trial fishing operations from small and medium class vessels, suitable combinations of gear and accessories were evolved for two-board and four-board operations. Trial fishing was also done with the 17.5 m midwater trawl for evolving a suitable rigging and method for exploitation of column and pelagic fishes. A 17m parachute trawl, belly portion of which is made up of 12 equal sized triangular panels was compared with a 17m conventional four-seam trawl and a 17m bulged belly trawl. Catches obtained were 32.5 Kg, 25 Kg and 21 Kg respectively. Experiments are in progress. For effecting economy in the use of materials in construction of trawls, the belly of the original 17m parachute trawl was modified with eight equal sized panels. Studies are in progress to ascertain the comparative efficiency between the 8 and 12 panel parachute trawls.

At Kakinada, a survey was undertaken at the different mechanised fishing centres to gather information on the mechanised boats operated, gear used, pattern of fishing and particulars of catch obtained.

A 13.6m vertical double trawl was operated and its catches

compared with those of a 20m bulged belly net. The net worked quite satisfactorily.

A few trials carried out with the twin trawls operated with sled have shown that the prawn catch landed by the twin trawls is more or less similar to that by a single large trawl, while the catch of fish was more in the case of the bigger net. The experiments are to be continued.

A 11m unequal, four panel, newly developed midwater trawl was operated in combination with a vertical curved otter board and trial operations carried out with the same. The catch obtained was quite good, with ribbon fish dominating the midwater trawl catches.

Studies were continued with the 23m high opening trawl which was operated along with a 20m bulged belly net. Its peformance, as observed earlier, continued to be good, especially with reference to off-bottom fishes.

With the increase in the number of small and medium size fishing crafts, shrimp catch alone will eventually be unable to sustain the economic operation of these vessels. Diversification of the existing fishing methods is the only alternative for the successful exploitation of the different fish resources. With this in view, studies were taken up at Goa Research Centre to modify existing designs and introduce new ones for exploitation of marine resources other than prawns. Tapering jibs, giving an obtuse angle of about 135°, were designed for a 15m bulged belly trawl and the net fabricated. Field operations with the net are in progress.

Studies were initiated on the effect of larger meshes in the bosom area of a 10.3, unequal panel midwater trawl, with no other changes in its design parameters. Field trials are in progress.

At Veraval, investigations were conducted on a newly developed 32m large mesh trawl in combination with two types of otter boards, viz. rectangular flat (wood and iron) of size 1524 mm x 762 mm, 100 Kg each and 'V' form (steel) boards of size 1500 mm x 890 mm, 125 Kg each. Results indicate that the 'V' form boards are more suited for demersal trawling and offered less warp tension, though heavy in air.

Studies on the comparative efficiency of three designs of trawls, viz. 25m bulged belly, 25m six seam and 25m, high opening trawl confirmed the suitability of the last one for capture of bottom and off-bottom fishes. It had the qualities of both a high rising trawl and a midwater trawl, without necessitating any enhancement of engine RPM or fuel

consumption, two essential pre-requisites for sophisticated midwater trawling.

Trials were conducted with a 10.5m four equal panel mid water trawl in combination with hydrofoil and vertical curved otter boards (Super Crub) of size 1200mm x 600mm weighing 55 Kg each. Operations were also conducted with 25m high opening trawl in combination with Super Crub boards.

Fabrication of 21m large mesh midwater trawl and 21m 'Zagger' nets was also undertaken during the year.

RESEARCH CONTEMPLATED :

1. Studies on the merits and de-merits of two-board and four board rigging in single-boat midwater trawling.
2. Studies on two boat midwater trawling.
3. Further studies on comparative efficiency of eight panel and twelve panel parachute trawls.
4. Field trials with Mexican type otter boards and its relative efficiency compared to flat rectangular type.
5. Further studies on vertical double trawl with sail kite for more horizontal spread as also on twin trawling with sled.
6. Design and fabrication of separator and rope trawls.
7. Studies on large mesh midwater trawls, Zagger nets, high-opening trawls, Super Crub otter boards etc.

SCIENTISTS ASSOCIATED :

COCHIN : K. N. Kartha, P. George Mathai, A.C. Kuttappan.

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

VERAVAL : K. K. Kunjipalu, N. Subramonia Pillai, K. Gopalakrishnan, M. R. Boopendranath.

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

4.9.1 (b) TRAWLS (B) Development of Gear for Offshore Fishing

RESEARCH IN HAND :

Design of a squid jigging equipment for operation from the Institute's new 17.5m steel trawler was prepared. Arrangements were made for fabricating locally 100 Nos. Japanese type squid jigs from the prototype designed earlier.

Ten numbers of kalava traps were fabricated. Fishing efficiency studies will be carried out.

A detailed survey was conducted to gather information on the design and constructional details of kalava lines.

A 11 x 11m midwater trawl and 40m and 50m bulged belly trawl were got ready for operation from the newly acquired 17.5m vessel.

RESEARCH CONTEMPLATED :

1. Survey of fishing grounds and trial operations to evolve proper method of squid jigging.
2. Fishing efficiency studies with different designs of traps.
3. Fabrication of kalava lines and fishing operation to ascertain the efficiency of the gear.
4. Standardisation of gear and accessories for operation from 17.5 m steel vessel.

SCIENTISTS ASSOCIATED:

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

4.9.2 Improvements to the Traditional Fishing Craft, Gear and Methods:

During the year under report, an integrated project was implemented from different centres based at Cochin (Kerala), Kakinada (Andhra Pradesh), Veraval (Gujarat) and Goa (Union Territory) for the development of small scale fisheries of the coastal fishermen of India.

The traditional fishermen, living along our extensive coastline, with their indigenous craft, gear and methods of fishing account for nearly 70% of the total marine fish landings. However, a general survey has brought to light the fact that they suffer due to low productivity, inefficient technology and weak institutional support.

They can perhaps be made more useful to society and to themselves, if more opportunities to develop their skill and financial support, wherever possible, are given to them.

It is in this context that need arises for small scale fisheries sector to be given due importance and recognition as a potential industry. The existing traditional technology has to be blended with appropriate modern technology for the benefit of the fishermen community as a whole. With this end in view, the following programmes have been envisaged.

1. Improvements to traditional fishing craft, gear and methods of operation and maintenance for better returns and longer service life.

2. Reduction in the cost of inputs through the introduction of cheaper, but efficient materials for construction of craft and fabrication of gear.

3. Manual and mechanical operation of the traditional crafts wherever needed.

4. Introduction of modified fishing nets, lines and traps and demonstration of their efficient operations from both the existing crafts and improved crafts.

5. Generation of adequate skilled man-power from the fishermen community to ultimately handle the mechanised fishing operations of the future.

6. Training of fisherwomen for increasing scope for self-employment in required areas.

7. Location of source of financial help and required infrastructural facilities.

8. Creating an awarenes among the fisherfolk to understand and appreciate the technology of commercial fishing on modern lines.

PROGRESS OF WORK:

At Cochin, the traditional country crafts, 'Thanguvalloms' (dug-out canoes and built-up canoes of 15–18m. OAL) were treated with oil borne wood preservatives for enhancing their service life. The method of preparation of the preservatives and mode of application were

demonstrated in the field with the fishermen actively participating in the process. Twelve indigenous crafts were given preservative treatment.

Suitable modifications were suggested to the existing crafts for facilitating mechanisation with light engines. The existing hulls were shaped finely to reduce frictional resistance to suit motorization.

Demonstration and actual fishing operations were carried out by installing 1) inboard light diesel engine 2) inboard engine with outboard drive and 3) outboard kerosene engine.

Improved 'thanguvalai' a single boat–seine net, fabricated with knotted and knotless webbings, was introduced. This new innovation produced double the quantity of fish when compared to the traditional methods.

The efficient operation of a 270 m light purse seine net from traditional crafts, with and without engine, was demonstrated.

Training in gear fabrication on modern lines was given for the benefit of fisherwomen at Badagara (Calicut) and Chellanam (Cochin).

For the benefit of lobster fishermen of the Kanyakumari District of Tamil Nadu, five different types of lobster pots were designed and fabricated and introduced in the villages of Enayam, Kodiapatnam, Muttom and Colachel with increased landings. The existing traditional traps were kept as control. Wooden, metallic and plastic traps were put to extensive trials. Sixty days of experimental fishing with the traps resulted in the landing of 724 rock lobsters belonging to various size groups but mostly of a single species.

Design and development of efficient multi-meshed gill nets for operation from traditional crafts were also taken up.

At the Veraval Centre, design, fabrication and development of nylon gill nets, both coloured and white, for catch of fishes like pomfret, Hilsa and the like were taken up. Fishing operations revealed that nylon nets of 210 D/2/3 with 50 mm and 60 mm bar mesh and coloured yellow, landed more Hilsa fish, while white nylon nets of 210 D/2/3 with 70 mm, bar mesh landed more of pomfrets. Catch of other species was better with brown and orange coloured nets.

A survey of the working traditional 'Gunja' stake nets for prawns in the Kutch region necessitated a number of improvements to the existing gear for better efficiency.

Studies were undertaken at Goa Centre on the design, fabrication and development of an encircling gill net for operation from existing country crafts for catch of mackerel. Fishermen who cannot afford to buy large purse seine nets can now hope of having better landing of mackerel with this new gear.

RESEARCH CONTEMPLATED :

1. Efficiency studies of 'Thanguvala' with knotless webbing and popularisation of the gear.
2. Studies on the impact of mechanisation on the economics of the fishermen.
3. Studies on the comparative performance of different types of engines installed in country crafts.
4. Operation of bag nets and multi-mesh gill nets to be intensified at Kakinada.
5. Field demonstrations with nylon gill nets and 'Gunja' nets and motorisation of country crafts at Veraval, as also light fishing, fishing for lobster etc.
6. Operation of more encircling gill net units for catch of mackerel.

SCIENTISTS ASSOCIATED :

COCHIN : R. Balasubramanyan, Dr. K. Ravindran, N. Unnikrishnan Nair, A. G. Gopalakrishna Pillai, S. Ayyappan Pillai, K. Sreedharan Namboodiri, S. Gopalan Nayar, K. Radhalakshmi, P. George Mathai, T. P. George, A. C. Kuttappan, P. A. Panicker, N. A. George T. M. Sivan, K. V. Mohan Rajan, B. Meenakumari.

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

VERAVAL : K. K. Kunjipalu, N. Subramonia Pillai, K. Gopalakrishnan, M. R. Boopendranath.

GOA : T. Joseph Mathai, M. Syed Abbas, V. Vijayan.

4.9.3 Round Haul Nets :

RESEARCH IN HAND :

A purse seine of 265m. head rope length and 30m. depth

suitable for small class of vessels was operated in the sea off Goa from the 10.97m. departmental vessel after making necessary deck alterations. Additional floats were supplied to the head rope of the net to increase the buoyancy of the gear. Good quality of sardine and mackerel were obtained during the trial operations conducted. The success with the gear has created an interest among the local fishermen as it holds promise of conducting purse seine operations from small classes of vessels of size 9.75m. which constitute more than 2/3 of the fishing fleet of the area.

RESEARCH CONTEMPLATED :

1. Standardisation of purse seine for different classes of vessels.

2. Popularisation of purse seine from small class of vessels.

SCIENTISTS ASSOCIATED :

COCHIN : P. Appukutta Panicker, N. A. George, T. M. Sivan.

GOA : V. Vijayan, M. Syed Abbas.

4.9 4. 'Dol' Nets

CHIEF FINDINGS :

'Dol' nets with 30mm cod end mesh size were found suitable for proper management of Bombay duck fishery.

RESEARCH IN HAND :

Experiments were continued with the 'dol' net designed and developed earlier for use in Veraval waters. The study is aimed at devising a suitable 'dol' net which would provide escape opportunity for juveniles of Bombay duck of 100-120mm length. The experimental net continued to land less percentage of the juveniles than the traditional gear. Hence 'dol' nets with 30mm cod end mesh size can be employed for Bombay duck fishery, without adversely affecting the catch or the income of the fishermen engaged in this fishery and saving a certain percentage of the juveniles from fishing mortality.

RESEARCH CONTEMPLATED :

Studies on above aspects will be continued.

SCIENTISTS ASSOCIATED :

VERAVAL : K. K. Kunjipalu, M. R. Boopendranath.

4.9.5. Gear Materials :

Raschel type knotless nets can substitute economically knotted nets on equal wet mesh strength. Hexagonal meshes popular in some countries for seine net webbings covered a greater surface area than equal size rhombic meshes. But the lesser coverage of the latter is more than compensated by its lower weight.

RESEARCH IN HAND :

Knotless nets manufactured by different firms were collected and analysed. The webbings fell under the following specifications.

i) Swing threads of 210 d. nylon multifilament yarns and laid-in threads of same/heavier deniers.

ii) Laid-in threads of 210 d. yarns with finer swing threads.

iii) Webbings with PE monofilament yarns incorporated.

iv) Hexagonal meshes.

A theoretical estimation of the strength of knotless nettings was made and compared to the observed values. The calculations were based on the fact that nylon multifilament yarns possess a minimum tenacity of 6.5 g/d and as laid-in threads, its strength can be identical as linear breaking strength. There is reduction in strength by 20% due to wetting in the case of these yarns, while swing threads experience an additional reduction in strength of 25% by looping. A Raschel denier is equal to the sum of the denier size of laid-in threads and 4 times the denier of swing threads.

It is inferred that if knotless nettings were produced with the theoretically estimated values of strength, its replacement for knotted nets will be economical. This is quite possible since calculations were made with minimum values of tenacity and maximum value of reduction by wetting.

A procedure was worked out to fix Raschel denier for replacing a given specification of knotted netting.

Fabrication of 'thanguvala', an indigenous boat seine with knotless netting was completed and is undergoing field trials. The modifications effected to this gear from the conventional net are, use of knotless netting of quality numbers 2518 and 2520 for the sides and central portions of the main body of the webbing, 0.5 mm polyethylene

twine for the peripheral band and polypropylene for ropes. The conventional gear employs 210/1/3, 210/2/3 nylon twines and polyethylene ropes for these components. The knotless netting used is stronger than the 210/1/3 knotted webbing.

The other probable substitutes for the currently popular 210 d. nylon multifilament twines for gill nets are nylon monofilaments and finer denier nylon twines, the advantages being lower cost by saving of material. During the course of survey, samples of imported 110 d. nylon twines were also spotted whose performance in prawn gill nets is reported to be good. The possibility of making finer denier nylon twines was discussed with the manufacturers, who informed that these yarns are being produced in India with medium tenacity for textile purposes. As the excise duty on this item is high, it is felt that it will not be economical to the fishing industry.

Mackerel gill nets fabricated with nylon monofilament yarn are undergoing field trials along with multifilament units. A single unit has the following dimensions:

Length	:	800 meshes
Depth	:	150 meshes
Mesh size	:	5 cm
Head rope	:	30 m

Samples of polypropylene yarn (flat monofilament type), twisted twines and webbings were tested to find out their suitability for different types of nets.

Studies on weathering of synthetic yarn were carried out. UV light tests showed that strength loss varied widely with samples of gear materials currently in production in India. Tests were also carried out to determine loss in strength of synthetic gear materials as a result of leaching of weather resistant ingredients incorporated in the yarns, in sea water.

RESEARCH CONTEMPLATED :

Studies and analysis of newer fishing gear materials and accessories.

SCIENTISTS ASSOCIATED :

COCHIN : S. Gopalan Nayar, Dr. K. Ravindran, K. Radhalekshmy, B. Meenakumari.

4.10 Gear : Inland

CHIEF FINDINGS :

Studies on development of shore seine for use in reservoirs were completed. The prototype developed was put to trial operations and its performance found to be satisfactory. The catch constituted mostly of cat fishes and trash fish, forming about 97.7% of the total catch, the rest being carps.

RESEARCH IN HAND :

Experiments were carried out with frame nets of different twine sizes for exploitation of major carps. Fishing operations were carried out with nets made of 210/1/3, 210/2/2 and 210/2/3 twines having mesh size 90 and 105 mm bar. Catch was observed to be more in nets made of 210/2/3 twine. Further studies are in progress.

Comparative fishing operations were carried out with 13m bulged belly trawl and 12m high opening trawl in the middle of the Hirakud reservoir, at depth range of 7–35m. The nets were operated at a speed of 1.618–1.942 knots and depth warp ratio 1:2.5 to 3.0. The catch was more in the 12m high opening net, both in the morning and in the evening and was composed of cat fishes and uneconomical fishes, with *R. cotio* being most dominant throughout.

Studies were continued on the selectively of hook and baits in line fishing. Round and kirby bent hooks of size ranging from 11 to 20 were used along with baits such as prawn, green algae, earthworm and tadpole. As in the previous year, kirby and round bent hooks of size 20 landed more catch by number as well as by weight. The catch comprised mainly of cat fishes and miscellaneous fish. Of the different baits used, prawn and earthworms were found to be most effective.

Observations of catches landed by shore seines were continued. Juveniles of major carps formed nearly 50% of the total catch of major carps by both small and large meshed nets.

RESEARCH CONTEMPLATED :

1. Development of suitable fishing techniques for major carps, cat fishes and other undesirable fishes.

2. Biological and limnological studies as ancillary to fishing gear investigations.

3. Multilocational testing of prototype of shore seine in other reservoirs.

SCIENTISTS ASSOCIATED :

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

4.II Marine Engineering :

CHIEF FINDINGS :

Laboratory trials were carried out with the fish pumb after modification to its various accessories.

Design of the inboard/outboard drive was handed over to NRDC for commercial exploitation. Some manufacturers, with the help of the Engineers of this Institute, have modified the design and produced commercial models of the improved drive units. These have been installed on traditional fishing crafts and tests are underway.

RESEARCH IN HAND :

1. Development of pumb fishing technique from large fishing vessels.
2. Development of equipment and devices for effecting improved fishing operations.

RESEARCH CONTEMPLATED :

1. Field trials with the fish pumb for effecting improved catch and easy handling of fish on board fishing vessels.
2. Development of devices such as torque/speed meter for the measurement of torque and speed of the propeller shaft so that the actual power transmitted from the engine to the stern gear can be measured and the optimum size of stern gear for the most efficient operation determined.

SCIENTISTS ASSOCIATED :

COCHIN : S. Ayyppan Pillai, K. Sreedharan Namboodiri.

Testing of Marine Engines :

During the year under report, two indigenous marine engine manufacturers offered their engines for testing. Tests were carried out and their suitability for installation on fishing vessels studied. Details of engines tested are given below:

M/s Kirloskar Oil Engines Ltd. TA 1, TV 1, TV 2, R 11

M/s Ruston & Hornsby Ltd. 743/744, 763/764

A Greaves Lombardini engine with and outboard drive was also tested and test results furnished.

SCIENTISTS ASSOCIATED :

COCHIN : S. Ayyappan Pillai, K. Sreedharan Namboodiri.

4.12 Processing Engineering ;

CHIEF FINDINGS :

Design was developed of a non-mechanised solar tent drier. A new design was made of pre-fabricated type commercial tunnel drier.

The electro-thermal smoke klin designed and developed earlier was installed.

Designing of an automatic grading machine, fish cutting and descaling machine was completed.

A cooking chamber and electrically heated stainless steel kettle have also been designed and fabricated.

RESEARCH IN HAND :

Preliminary studies were carried out with the non-mechanised solar tent-drier designed. The drier consists of raised bamboo structure covered with polythene sheet. Studies were also initiated on a pre-fabricated type commercial tunnel dryer, electro-thermal smoke kiln and development of equipments and pilot plants required for fish processing.

RESEARCH CONTEMPLATED :

1. Modification of smoke kiln based on Experimental observations.
2. Development of commercial plant for the production of chitosan.
3. Development of glucosamine hydrochloride plant.
4. Completion of fabrication of deep freezer.
5. Fabrication of an automatic grading machine, fish cutting machine and descaling machine.

6. Development of an equipment for removal of extraneous materials like sand, filth etc. from prawn meat.

7 Development of a pilot plant for production of fish wafers.

8. Development of a 'through circulation' multi-stage conveyer drier.

SCIENTISTS ASSOCIATED :

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

4 13 Electronics and Instrumentation :

CHIEF FINDINGS :

Design, development and field trials of an electronic boat log have been completed successfully. This insrtrument is used for the measurement of speed and distance teavelled by small and large boats. It is a further improvement over the earlier model incorporating digital pick up and displaying distance travelled. Two numbers of the instrument were installed in the Institute's vessels and one unit each given to CMRI, Cochin, and National Traffic Planning and Automation Centre, Cochin for their temporary use. The National Traffic Planning and Automation Centre has utilised the instrument for survey of inland waterways between Cochin and Quilon and gathered much useful data.

Following are the general featrues of the instrument :

Range : 0 to 10 knots (other ranges can also be provided)

Accuracy : $\pm$ 0.1 knots

Power requirement : I60 mA at 12 V.

Approximate cost : Rs. 8500/-

This instrument has got two types of transducers, one for permanent installation at the hull of large boats and the other for temporary side mounting in smaller vessels.

Design and development of a safety alarm for engines and bearing has also been completed. It is used for maintaining the temperatures of marine engine cylinder, bearings, exhaust gas etc. and gives an alarm when they exceed pre-set limits. Hence, this instrument is suitable for general check of the above factors. It can also be used with suitable probes for measurement of liquid temperature, air temperature and surface temperature. Improper alignment between

engine and stern tube causes excess temperature on the shaft bearings which are monitored by the instrument. If timely attention is not given, the misalignment causes breakage of the shaft.

Following are the features of the instrument :

Range	:	0 to 100°C (Higher ranges can also be provided)
Power requirement	:	10 mA at 9V (normal) and 50 mA during alarm
Cost	:	Rs. 750/- (approximately)

RESEARCH IN HAND :

Water Current Meter :

This instrument is developed for ***insitu*** measurement of the amplitude and direction of water current in the sea and estuarine waters. Transducer for digital pick-up of signals has been developed. The electronic circuit has been modified incorporating automatic triggering and switching off operations. Circuits for digital display of current direction in LCD have been developed. Final assembly of the system is being carried out.

Buoy Telemetery System :

This is an instrument system being developed for automatic acquisition of marine environmental data using moored buoys. Sensors for wave height and water speed have been developed. Design of sensor for wave direction has been completed and its fabrication started. Electronic circuit for separating tide and wave has been designed, fabricated and tested in the laboratory and found to be working satisfactorily. Studies on frequency response of circuits and sensors are continued.

Ocean Tele lab :

Sensors have been developed and tested satisfactorily. Various electronic circuits required have been fabricated. Final assembly is being designed. Electronic circuit for remote multi-plexing operation inside the sensor head has been designed and fabrication is in progress.

Crane Load Monitor and Alarm :

The existing load meters developed earlier have been modified to suit the ranges and conditions of cranes. Designs are being prepared

for installing these cells in different types af cranes. Load characteristics of the cells are being studied.

RESEARCH CONTEMPLATED :

1. Development of simple and inexpensive type fisn finders to help the poor traditional fishermen. This instrument will also help to measure and restrict the mechanised fishing operations in the permitted ranges only.

SCIENTISTS ASSOCIATED :

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

5. Extension and Information

Replies to Technical Queries :

As in previous years, replies were continued to be given to queries received from different parts of the country and abroad on different aspects related to fishing and fish processing. Information provided on fish processing include methods for freezing and canning different varieties of fish and shell fish like prawns, mackerel, cat fish 'ghol' fillets, seer fish, crab meat, general guidelines for canning fish and shell waste, liquid fertiliser from shrimp and fish wastes, uses of fish oil and cuttle fish bone, details of setting up a quality control laboratory, information regarding equipments required for production of shark fin rays, fish soup powder, transportation of fresh and iced fish, fish hydrolysate, its method of preparation and role in human nutrition, preservation of fish in different forms and as consumable fish flour, fish in oil, fish in sauce etc , comments on the percentage of discolouration and dehydration in frozen scampi, utilisation of miscellaneous fish and conversion into useful products, the yield rates of different species of prawns when converted into PD, HL and CP forms, utility of dry ice as a refrigerant in fish preservation and reasons for its not being ideal for preservation of fish in spite of its many advantages, comments on the causes for excessive dehydration of frozen prawn blocks, extra amount of material to be added to compensate thaw drip loss in frozen prawns, methods for production of fish, clam and prawn pickle, fish wafers, chitosan and scope for its marketability, general composition of prawn shell powder and poultry feed, information on the composition of oyster shell grit, comments on the market potentiality of roller-dried fish, on the suitability of boil-in-bag laminated films of polyster-polyethylene for packaging fish, containers for packing

pickles, different methods of packaging fish in vogue in the country, etc. Information furnished with regard to fishing craft and gear include comments on the use of polypropylene twines as fishing gear materials and points to be considered while starting production of polypropylene multiple yarn and twine, suitability of HDPE twisted twines and nylon braided cords for fabrication of fishing nets, efficiency of nylon monofilament over its multifilament counterpart especially in use in fresh waters, advantages and disadvantages of monofilaments, possibility of two-boast midwater trawling, operation of seer gill nets from vessels ranging in size from 30ft. to 36ft., economics of trying long lines from these vessels, mesh regulations in gill nets, essential machinery and capital investment required for setting up a factory for manufacture of fish nets from nylon and HDPE monofilament twisted twines, motorisation of country crafts, information on 'Roya' type of boat and net and otterboard suitable for operation from the boat, use of explosives in reservoirs in exploiting the fishery resources, horse power requirement of different vessels, providing of sailing equipment on mechanised boats to reduce consumption of oil, suitability of a 38 ft. GRP vessel for operation in inshore and creek regions in Andaman & Nicobar Islands, utilisation of CNSL for preparation of marine paints and protective coatings, specification of marine diesel engines suitable for different sizes of vessels and maintenance of wooden fishing boats.

Testing of Materials and Products :

Indigenously processed/manufactured products and raw materials were analysed on request and the results intimated to the concerned parties with suggestions for improvement of their quality wherever necessary. A total of 659 such products/materials were analysed during the year under report. These include 2 samples of nylon yarn, 12 of nylon monofilament twine, 1 each of nylon rope and knotted nylon webbing, 3 samples of nylon knotless nets, 7 samples of knotless nylon webbings, 5 samples of polypropylene monofilament twine and one of polyethylene monofilament twisted twine, 1 of HPDE monofilament twine square mesh net, 2 samples of polyethylene rope and one purse seine net, 6 samples of marine paints, 2 of copper sheet, one Greaves Lombardini engine, one Zinga outboard drive, 4 Ruston and 4 Kirloskar engines, 344 samples of frozen prawns, 6 of frozen frog legs, 41 samples of frozen cuttle fish, 25 of frozen squid. 3 samples of canned prawn, 1 of tuna canned in oil, 3 samples of prawn pickle and 2 of clam meat pickle, 1 sample each of dried crab powder, prawn head powder, lobster powder and mixture of crab, prawn and lobster powder, 7 samples of shark liver oil, 17 samples of fish meal, 1 sample of an antibacterial product and 1 of a disinfectant, 2 of

chemicals, 2 samples of an instant prawn cutlet mix, 2 samples of plastic box strapping, one of a PVDC coated paper (for packing), 3 Nos. master cartons, 20 cans for testing experimental sulphur resistant lacquer and 6 lids, 70 samples of water and 44 of ice.

Publications :

Vol. 1, No. 12 and Vol. II Nos. 1 to 5 issues of the Fish Technology Newsletter were published during the year under report. Vol. I, Nos. 1 to 8 issues of the same in Hindi were also published during the period.

In connection with the Lab-to-land programme at Badagara (Calicut Dist.) on fabrication of fishing gear, a booklet on improved method of fabrication of trawl nets was brought out in Malayalam. Another publication brought out was a hand-out on processing mussel meat in connection with the lab-to-land programmes of the Institute.

Supply of Designs, Publications :

A total of 86 designs were supplied to interested parties on request. These include 22 designs of bulged belly trawls, one design each of long wing trawl and a midwater trawl, 10 designs of otter boards of various sizes, 4 designs of purse seine nets, 2 sets of trawl winch designs, 2, 3, 8, 4 and 7 sets of 25 ft, 30 ft, 32 ft, 36 ft, and 50 ft, fishing vessel designs respectively, 2 designs of a 15 ft. row boat, 8 designs of the rotary drum dryer for production of fish meal, 11 of the tunnel dryer for dehydration of fish and one design of lay-out for prawn freezing plant. Twenty eight copies of the Special Bulletin-I 'An Account of the Inland Fishing Gear and Methods of India' were supplied on request, as also 324 copies of the publication "Quality Control in Fish Processing".

Film Shows & Exhibitions :

About half a dozen film shows were conducted for the benefit of trainees of the lab-to-land programmes of the Institute, private organisations etc. The film shows were those related to induced breeding, fishermen co-operative societies, marvels of the sea, fishermen of Kerala etc.

The Institute participated in an exhibition held in connection with the Symposium on Coastal Aquaculture organised by the Marine Biological Association of India, in January, 1980. A pavilion was set up jointly with the Central Marine Fisheries Research Institute at the Cochin Fair 1980 conducted by Al-Ameen Educational Trust

which commenced towards the end of December, 1980. Photographs on the various activities of the Institute, especially those related to the Lab-to-land programmes, were displayed in the Institute's premises in connection with the National Seminar on Fisheries Extension held in December, 1980.

Extension Training :

A training course on 'Methods of Analysis in Quality Control of Sea Foods' was held in three series for the benefit of technical personnel in charge of production of processed fish. Of these, the first two were held during the year under report. The first in this series was held from July 7, 1980 to September 6, '80 and the second from 21 October '80 to 20 December '80. In all 17 trainees attended these courses. Another training course was also conducted at Cochin in collaboration with the MPEDA. The course, conducted in 3 batches imparted training in processing canned frog legs and extraction of shark fin rays.

PERSONS ASSOCIATED :

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

Information - seeking Behaviour in Fisheries Technology :

During the period December 1978-December 1979, 613 technical queries were received. The largest number (35.2%) were received during July to September 1979. The number of queries received more or less increased steadily from 3.6% in December 1978 to 8.6% in June 1979. The queries from India were 96% and from foreign countries, 4%. From the coastal states of India, 79.9% of the total queries were received, some of the top ones being Kerala (25.3%), Maharashtra (13.2%), Tamil Nadu (11.9%), Punjab (including Delhi (10%) and Andhra Pradesh (6.4%). The subject-matter-wise distribution is as under: Fishing crafts and craft materials (8.6%), fisheries engineering (7.0%), fishing gear and gear materials (6.4%), fish processing (4.5%) and training (2.4%). Complete replies were sent for 96.2% of the queries, partial replies for 3.6% and a technical silence was observed in the case of 0.2%. Normally two weeks were taken for replying a query, sometimes over one month. (All percentages reported are in terms of the total).

SCIENTISTS ASSOCIATED :

COCHIN : Dr. P. N. Kaul, Mary Thomas

Adoption of Innovations Developed at CIFT :

RESEARCH IN HAND :

This new project aims at evaluating the extent of adoption of innovations developed by CIFT to provide feed back and further problem oriented research in future. There are two components under this project. (1) Adoption of designs of craft and gear for which the addresses of gear manufacturers, boat building yards and parties who approached CIFT were collected, and (2) adoption of improved practices of fish curing for which two major fish curing centers of Calicut District were taken. There were 110 active fish curers in these two centres. Structured interview schedules were prepared and data were collected from the respondents. The data collected are under analysis.

RESEARCH CONTEMPLATED :

A study on the technological gap among traditional and mechanised fishing boat owners.

SCIENTISTS ASSOCIATED :

COCHIN : Dr. P N. Kaul, A. K Kesavan Nair, M K. Kandoran, S. Balasubramanian.

Ad-hoc Training :

Short-term training in the different aspects of fish processing technology as detailed below were given to the following parties.

	Name of party	Period	Subject in which trained
1.	Shri K. G. S. Nair, S. S. Food Packers, Angamaly	14-15 Jan. '80	Manufacture of deodorant and ointment
2.	Trainees of M/s Protofoods, Kumbalam	16-19 Jan. '80	Production of prawn and fish pickle, manufacture of deodorant and antiseptic ointment & production of fish wafers
3	Shri S. Joy, Kundara, Quilon	23 Jan. '80	Production of shark fin rays

4.	Smt Vimala Vijayan, Priya Food Industries, Edappally	26-27 Feb. '80	Production of prawn and fish pickle
5.	Smt Girija Ravindranathan	26-27 Feb. '80	Production of prawn and fish pickle
6.	Shri T. C. Paul, Karthika Marine Industries (P) Ltd., Cochin-5	21 April- '80 11 July '80	Quality control of seafoods
7.	Shri C. R. Prasad, Universal Sea Food Industries, Visakhapatanam	13-25 Oct. '80	Production of artificially dried fish
8.	Shri P. C. Sebastian, Metro Exports' Cochin	15-31 Oct. '80	Bacteriological analysis of fishery product
9.	Shri Chunduri Rama Chandra Prasad, Universal Sea Food Industries, Visakhapatanam	21-27 Oct. '80	Production offishery by-products
10.	Shri R. Mohanachandran, Universal Trades Corporation, Cochin	11-17 Nov. '80	Microbiological methods used in quality control of seafoods

Radio Talk :

The All India Radio, Calicut, broadcast on 17-10-1980, a talk in malayalam on "Mineral health of the Sea" by Shri K. George Joseph, Scientist S, Calicut Research Centre.

6. Statistics :

CHIEF FINDINGS :

A survey on the sources of supply of raw materials to the processing factories was initiated by estimating the total raw materials received by the processing plants at Cochin. It was estimated that

during the year under report, 19,000 tonnes of raw materials were received by the Cochin region.

A survey on the idle capacity of fish processing plants in India was conducted and the same estimated using a stratified simple random sampling design. The factors behind the low rate of production were also identified.

The economics of operation of fishing boats of sizes 36 ft, 32 ft., and 25 ft. built according to CIFT designs worked out to 19%, 31%, and 2% respectively on capital investment. The percentage profit for Mexican trawlers was estimated to be 16% on the basis of the data for the year 1978.

RESEARCH IN HAND :

Data collected from the sampled prawn processing plants on specified days, each month, have yielded an estimate of 19,058 tonnes as the total quantity of raw material received by the processing plants at Cochin. The material consisted of PD., PUD, HL prawns, froglegs etc. PD and PUD prawns accounted for 61% of the total quantity of material and froglegs 16%. The Centres near about Cochin and upto Alleppey supplied 65% of the above quantity, of which 89% of PD and 67% of PUD material came from the above zone and 77% of froglegs came from Tamil Nadu.

Data on the installed capacity, production figures, factors leading to underutilisation of the plants, number of personnel employed, sources of getting raw material and ice and cold storage facilities were collected from 107 factories selected at random from Kerala, Karnataka, Maharashtra, Goa, Gujarat, Tamil Nadu, Andhra, Orissa and West Bengal. Non-availability of raw materials was a major factor resulting in under-utilisation of most plants. Other factors are 1) high cost of production 2) labour problems, 3) delay in getting purchase order 4) cut throat competition, 5) high cost of diesel oil, 6) investment in holding the material upto shipment, and 7) unsteady foreign market.

Data under various heads of expenditure and income were collected from 60 fishing boats operating at Calicut region, 44 boats at Parappanangadi region, 2 Mexican trawlers of Andhra Pradesh Fisheries Corporation operating at Vizag and 110 boats operating along North Karwar and Goa. The percentage profit on capital investment for the three sizes of boats, 36 ft, 32 ft and 25 ft. were estimated to be 19%. 31% and 20% respectively. Profit on capital for

the Mexican trawlers was 16% on the basis of the data for 1978.

In addition to these, the Section also rendered assistance in designing equipments and analysis and interpretation of experimental data.

RESEARCH CONTEMPLATED :

All the above studies will be continued.

SCIENTISTS & OTHERS ASSOCIATED :

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

KAKINADA : R. Chakraborthi.

VERAVAL : Anil Agarwal.

BOMBAY : S. Damle.

7 Publications :

1	Badonia Rajendra & Devadasan, K.	Frozen storage characteristics of ribbon fish *Fish Technol.* 17(2):125, 1980
2.	Balachandran, K. K.	On utilisation of clam and mussel meat- *Industrial Fisheries Association Annual 1979* (issued in 1980):6
3.	Balachandran, K. K. & Prabhu, P. V.	Preliminary studies on preservation and transportation of Green mussel *(Perna viridis)* Paper presented at Symposium on Coastal Aquaculture, organised by Marine Biological Association of India, Cochin 12-18, Jan. '80.
4.	Balachandran, K. K. & Prabhu, P. V.	Technology of processing mussel meat-Paper presented at Workshop on Mussel Farming CMFRI/CAS, Madras, 25-27, Sept. '80.
5.	Balasubramanyan, R.	Fishing boat maintenance-some basic guide lines - *Fisherman*, 1(2):21, 1980
6.	Balasubramanyan, R.	Curriculum on fishing craft technology-teaching techniques and guidelines - Paper presented at Seminar on Teaching Fisheries organised by Tamil Nadu Agricultural Uni-

versity, Fisheries College, Tuticorin, 22 Feb. '80

7, Balasubramanyan, R. — Fishing crafts for inland reservoirs – Paper presented at Workshop on Reservoir Fisheries for Rural Development, CIFE, Bombay, 8–9 April '80

8. Balasubramanyan, R. — Changing trends in sea-fishing – a technology forecast – ***Industrial Fisheries Association Annual*** 1980:23

9. Devadasan, K. & Nair, M. R. — A note on the proteins of frog leg muscle ***Sci. & Cul.***, 46(2):51, 1980

10. George, V. C. — Efficient fishing gear in Hirakud reservoir - Paper presented at Workshop on Reservoir Fisheries for Rural Development at CIFE, Bombay, 8–9 April '80

11. George, V. C., Percy Dawson, Khan A. A. & Varghese M. D. — Scope of trawling in Indian reservoirs - Paper presented at Workshop on Reservoir Fisheries for Rural Development at CIFE, Bombay, 8–9 April '80.

12. Gopakumar, K. — A review of handling and processing of fish in India – Paper presented at FAO/DANIDA Workshop on Handling of Small Fish in the Arabian Sea, at Mangalore, 3-14 Nov. '80.

13. Gopakumar, K. & Nair, M. R. — Development of fish products from low priced fish–Paper presented at Symposium on Coastal Aquaculture, Cochin 12-18, Jan. '80.

14. (Joy P, Chungath), Gopakumar, K., Vasanth Shenoy, A. & Thankamma R. — Nutritional evaluation of an indigenous low cost protein food – ***Fish. Technol.*** 17 (2):95 1980.

15. Gopal, T. K. Srinivasa & Govindan, T. K. — Survey of the properties of waxed duplex cartons used in frozen shrimp industry–***Fish. Technol.***, 17(2):107, 1980.

16 Gopal, T. K. Srinivasa & Govindan, T. K. — Survey of the properties of master cartons (corrugated fibre board boxes) used in frozen shrimp industry–***Fish. Technol.*** 17(2):103, 1980

17. Gopal. T. K. Srinivasa, Antony, K. P., & Govindan, T. K. — Packaging materials used in fishery industry and scope for future diversification – ***Marketing & Management Monthly*** 12(6):19, 1980.

18. Govindan, T. K. — A new concept in fresh fish transport container design – ***Perfectpac***, 20(12):6, 1980.

19. Govindan, T. K. — Indian fish processing industry – performance and perspectives – ***Industrial Fisheries Association Annual,*** 1979 (issued in 1980):1.

20. (Narayanaswamy D., Narasimha Rao, C. V.) & Govindan T. K. — Penetration of sodium chloride during prolonged salting of fish-***Fish. Technol.*** 17(1):63, 1980.

21. Govindan, T. K — Importance of fisheries management in India's rural economy – ***Marketing Digest,*** 12(11):11, 1980

22. Gupta Sib Sankar, Subrata Basu, Imam Khasim Sahib, D. & Panduranga Rao, C. C. — Studies on the preservation of cultured ***Chanos*** by icing and freezing – Paper presented at Symposium on Coastal Aquaculture, Cochin 12–18 Jan. '80

23. (Chitnis D. S., Kamat R. S.) & Iyer, T. S. G. — Pathogenicity studies on ***Salmonella roan-Bull. Haff. Inst.*** 7(2):35, 1979 (issued in 1980)

24. (Gore P. S.), Iyer, T. S. G. (Ravindran O. & Unnithan R. V.) — Isolation and significance of ***Salmonella*** spp. from some beaches of Kerala – ***Mahasagar*** 13(2):147, 1980

25. Iyer, H. Krishna — Statistical methods in sensory evaluation of quality of fishery products – ***Industrial Fisheries Association Annual*** 1980:39

26. Iyer, T. S. Gopalakrishna & Joseph, A. C. — Isolation of ***Salmonella roan*** for the first time in India – ***Fish. Technol.*** 17(2): 123, 1980

27. Iyer, K. Mahadeva — Microbes and fresh fish – ***Industrial Fisheries Association Annual,*** 1979 (issued in 1980): 18, 1980

28. Joseph Jose, Perigreen, P. A., Chinnamma George & Govindan, T. K. — Iced and frozen storage characteristics of cultured ***Chanos chanos*** (FORSKAL) - ***Fish. Technol.*** 17(1):21, 1980

29.	Joseph, K. George & Muraleedharan, V.	Indian fish curing industry – present status and some suggestions for improvement–*Seaf. Exp. Jour.* XII(12):15, 1980
30.	Joseph, K. George & Muraleedharan, V.	Fish curing and poor quality - *Indian Express*, 7 Oct '80
31.	Kandoran, M. K.	Points to be noted in preservation of fish (Malayalam) – *Fisherman* I(1):27, 1980
32.	Kartha, K. N.	Prospects of introducing midwater and pelagic trawling along the Indian coast from 9.75m – 15.4m (32'-50') boats – *Fisherman* I(2):27, 1980
33.	Khan, A. A., George N. A. & Pandey O. P.	Column set gill net fishing in Gobindsagar reservoir – *Fish. Technol.* 17(1):65, 1980
34.	Khan, A. A., George, V. C. & Varghese M. D.	Eradication of uneconomical fishes with simple gill nets at Hirakud reservoir – *Fish. Technol.* 17(1):15, 1980
35.	Khan, A. A., George V. C. & Varghese M. D.	Gill net fishing in Indian reservoirs – Paper presented at Workshop on Reservoir Fisheries for Rural Development at CIFE, Bombay, 8–9 April 80
36.	Kunjipalu, K. K.	Ribbon fishes – a new trawl resource off Veraval – Paper presented at Seminar on Recent Trends in Teaching & Research in Aquatic Biology, Bhavnagar, 26-28 Sept. '80
37.	Kunjipalu, K. K., Boopendranath, M. R. & Gopalakrishnan, K.	A new multipurpose trawl for multifarious fisheries - Paper presented at Seminar on Recent Trends in Teaching & Research in Aquatic Biology, Bhavnagar, 26–28 Sept. '80
38.	Kuriyan, G. K.	Recent advances in reservoir fishing - Development of craft and gear - Paper presented at Workshop on Reservoir Fisheries for Rural Development, CIFE, Bombay, 8–9 April '80
39.	Mathen Cyriac	Hygiene and sanitation in handling of prawns

(Malayalam) - Paper presented at Discussion Forum organised by MPEDA at Quilon.

40. Mathen Cyriac, Francis Thomas & Varma, P. R. G. — A quality control laboratory for seafood processing plant–*Industrial Fisheries Association Annual*, 1979 (issued in 1980) : 13

41. Mathen Cyriac, Francis Thomas & Varma, P. R. G. — Improved yield in canning of prawns – *Seaf. Exp. Jour.*, XII(1):35, 1980

42. Mukundan, M. K. & Kuriyan, G. K. — Scope of fisheries in India – *Yojana*, Sept. '80

43. Mukundan, M. K. & Nair, M. R. — Rigor mortis – a Nature's gift to be taken advantage of – *Seaf. Exp. Jour.* XII(1):21, 1980

44. Mukundan, M. K., Radhakrishnan, A. G., Arul James M, & Nair, M. R. — Comparative study of the nutrient content of fish and shell fish–Paper presented at Seminar on Recent Trends in Teaching and Research in Aquatic Biology, Bhavnagar, 26–28 Sept. '80

45. Muraleedharan, V. — Processing mussels by drying (Malayalam)- 'Karshika Rangam', *Malayala Manorama*, 10 Feb. '80

46. Muraleedharan, V. — Smoke curing of fish (Malayalam) – 'Karshika Rangam', *Mathrubhumi*, 3 March '80

47. Muraleedharan, V. — Ready-to-serve products from oil sardine- *Seaf. Exp. Jour.* XII(2):29, 1980

48. Muraleedharan, V. — How to ice fish (Malayalam) - 'Karshika Rangam', *Mathrubhumi*, 1 Dec. '80

49. Muraleedharan, V., George Joseph, K. & Devadasan, K. — Pickled products from mussels - Paper presented at Symp. on Coastal Aquaculture, Cochin, 12-18 Jan. '80

50. Muraleedharan, V. & Valsan, A. P. — Preparation of masmin - An improved method *Fish. Technol.*, 17(2):101, I980

51. Nair, A. Lekshmy & Prabhu, P. V. — Water soluble nitrogenous components from *squilla* (*Orato squilla nepa*) - Paper presented at Symposium on By-products from Food

		Industries-Utilisation and Disposal, CFTRI, Mysore, 29–30 May '80
52.	Nair, A. Lekshmy & Prabhu, P. V.	Utilisation of prawn waste – ***Fish. Technol.*** 17(1):27, 1980
53.	Nair, K. G. Ramachandran & Prabhu, P. V.	On better utilisation of shark fins - Paper presented at Symposium on By-products from Food Industries - Utilisation and Disposal, CFTRI, Mysore, 29–30 May '80
54.	Nair, K. G. Ramachandran, Srinivasa Gopal, T. K. & Prabhu, P. V.	Chitosan in paper finishing - Paper presented at Symposium on By-products from Food Industries - Utilisation and Disposal, CFTRI, Mysore, 29–30 May '80
55.	Nair, M. R., Balachandran, K. K. & Cyriac Mathen	Scope for development of seafood industry in India - Paper presented at Workshop on Modernisation of Seafood Industry - sponsored by Small Industries Service Institute, Trichur, at Cochin, 26 March '80
56.	Nair, M. R. & Govindan, T. K.	Rejuvenation of India's seafood industry through product diversification - ***Industrial Fisheries Association Annual*** 1980:17
57.	Nambiar, V. Narayanan	Bacteriology of spoilage of canned prawns- ***Fish. Technol.*** 17(1):35, 1980
58.	Namboodiri, K. Sreedharan	Development of an aquatic weed harvester- Paper presented at First Annual Workshop on Agri. Engg. & Technology in Kerala, organised by Kerala Agri. University, Mannuthy, Trichur, 28–29 May '80
59.	Nayar, S. Gopalan & Radhalekshmy, K.	Netting materials for inland fishing gear- Paper presented at Workshop on Reservoir Fisheries for Rural Development at CIFE, Bombay, 8–9 April '80
60.	Panicker, P. A., George, N. A. & Sivan, T. M.	Prospects of exploitation of pelagic fishery resources by purse seining from small class of vessels - ***Fisherman*** 1(2),1980
61.	Perigreen, P. A.	Some aspects of freezing fish and fishery products - ***Industrial Fisheries Association Annual,*** 1979 (issued in 1980):10

62. Perigreen, P. A. & Jose Joseph — Freezing and cold storage of cat fish fillets- *Fish. Technol.*, 17(1):31, 1980

63. Pillai, A. G. Gopalakrishna, Ravindran, K. & Balasubramanyan, R. — Cathodic protection of aluminium sheathed wooden fishing boats with ternary aluminium anodes – *Fish. Technol*, 17(2):71, 1980

64. Pillai, N. Subramonia — Diversification of fishing methods - some aspects – *Fisherman*, 1(2):30, 1980

65. Pillai, S. Ayyappan — The maintenance of marine engines and accessories of mechanised wooden boats- *Fisherman*, I(2):35, 1980

66. Purushothaman, K. C. — A machine for removal of water weeds (Malayalam) - *Yojana* - Dec. 1-15: 14, 1980

67. Rao. C. C. P., Govindan T. K., Sib Sankar Gupta & Imam Khasim Saheb, D. — Studies on transportation of *Chanos chanos* – Paper presented at the Symposium on Coastal Aquaculture, Cochin, 12-18 Jan. '80

68. Rao, J. Sita Rama, Percy Dawson & Sreekrishna, Y — Effect of colour on the catch of gill nets- *Fish. Technol.*, 17(2): 75, 1980

69. Ravindran, K. — Dolphins' secret – A clue for the reduction of surface roughness of ships' hulls – *Industrial Fisheries Association Annual*, 1979 (issued in 1980):61

70. Ravindran, K. — Exclusive economic zone and India's fishing fleet–*Ind. Seaf.* XIV (1):1979 (issued in 1980):14

71. Ravindran, K,. Unnikrishnan Nair, N. & Pillai, A. G. G. K. — Cost reduction in the maintenance of fishing boats – *Fisherman* I(2):37, 1980

72. Sivadas, T. K. — Electronic testing and measuring instruments developed in CIFT for mechanised fishing vessels - *Fisherman*, I(2):33, 1980

73. Sivadas, T. K. — Indigenous electronic instruments for fishery technological investigations – Paper presented at Annual Workshop on Agricultural Engi-

		neering, 28 & 29 May 1980, College of Horticulture, Vellanikara, Trichur.
74.	Sivadas, T. K.	Marine electronic instruments developed in CIFT – Paper presented at Convention & Exhibition '80 by Institute of Electronics and Electronic Engineers Inc. Indian Council, Trivandrum, 2-5 Nov. '80
75.	Sivadas, T. K.	Indigenously developed marine electronic instruments – ***Industrial Fisheries Association Annual*** 1979 (issued in 1980):31
76.	Solanki, K. K.	Activities and achievements of Veraval Research Centre of Central Institute of Fisheries Technology, Veraval, Gujarat - Paper presented at Seminar on Recent Trends in Teaching and Research in Aquatic Biology, Bhavnagar, 26–28, Sep. '80
77.	Solanki, K. K. & Joseph, A. C.	Problems associated with processing and preservation of seafoods in Gujarat - Paper presented at Seminar on Recent Trends in Teaching and Research in Aquatic Biology, Bhavnagar, 26–28, Sept. '80
78.	Solanki, K. K. & Joseph, A. C.	Economic utilisation of Elasmobranchs-Paper presented at Seminar on Recent Trends in Teaching and Research in Aquatic Biology, Bhavnagar, 26–28 Sept. '80
79.	Surendran, P. K. & Iyer, K. M.	The bacterial flora of Pearl Spot ***(Etroplus suratensis)*** caught from Cochin backwaters–Paper presented at Symposium on Coastal Aquaculture, Cochin, 12–18 Jan. '80
80.	Thomas Francis	The importance of quality chemicals in the testing of water used in fish processing-Paper submitted at the Water Chemists Forum organised by Glaxo Laboratories (India) Ltd.
8I.	Varghese, M. D., Manoharadoss, R. S., Khan, A. A. & George, V. C.	Control of predatory fishes - A case study of Hirakud Reservoir - Paper presented at Workshop on Reservoir Fisheries for Rural Development, CIFE, Bombay, 8–9 April, '80

82. Varma, P. R. G. & Jose Joseph — Canning of squid – *Fish. Technol*, 17 (2):93, 1980

83. Varma, P. R. G., Valsan, A. P. & Prabhu, P. V. — Transportation of fish – III – Biochemical changes in fish during transportation in insulated containers – *Fish. Technol.*, 17 (1): 41, 1980

8. APPENDICES

APPENDIX – I

HEADQUARTERS: CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY, Willingdon Island, Matsyapuri P. O., Cochin – 682 029 (Kerala)
TLX No. 0085 – 440
Telephone No. 6845 (10 lines)
Telegram: MATSYAOUDYOGIKI or FISHTECH, COCHIN

Director's Telephone: Per: 6880

DIRECTOR : Shri G. K. KURIYAN (Upto 4-8-'80)
Dr. C. C. PANDURANGA RAO (from 1-12-'80)

Scientists-in-Charge

Biochemistry & Nutrition Division	:	Shri M. Rajendranathan Nair
Processing Division	:	Shri P. V. Prabhu
Microbiology Division	:	Shri K. Mahadeva Iyer
Craft & Gear Division	:	Shri R. Balasubramanyan
Engineering Division	:	Shri S. Ayyappan Pillai
Electronics & Instrumentation 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 – 362 265, Gujarat	297	MATSYAOUDYOGIKI	Shri K. K. Solanki
2.	KAKINADA	Research Centre of CIFT D. No. 1-14-7, Sree Ramnagar, Kakinada-533 003 (A. P.)	4436	MATSYAOUDYOGIKI	Dr. C. C Panduranga Rao (upto 30-11-1980) Shri A. V. V. Satyanarayana (from 1-12-1980)
3.	BURLA	Research Centre of CIFT Burla P. O. 768 017 Sambalpur Dist. Orissa	19	MATSYAOUDYOGIKI	Shri V. C. George
4.	BOMBAY	Research Centre of CIFT 162, Sassoon Dock, Colaba, Bombay-400 005, Maharashtra	213892	FISHPROCESS (FT)	Shri T. S. Gopalakrishna Iyer
5.	CALICUT	Research Centre of CIFT Beach Road, West Hill, Calicut-673 005, Kerala	76607	CARE "KADALAMIN"	Shri T. S. Unnikrishnan Nair
6.	GOA	Research Centre of CIFT 2nd Floor, 'Shanta', 10th June Road, St. Inez, Panaji-403 301, Goa.	2049	MATSYAOUDYOGIKI	Shri H. N. Mhalathkar

APPENDIX – II

List of Personnel in C. I. F. T. as on 31-12-1980
SCIENTIFIC PERSONNEL

DIRECTOR
Shri G. K. Kuriyan
(Upto 4-8-1980)
Dr. C. C. Panduranga Rao (Officiating)
(from 1-12-1980)

Scientist S-3

1. Shri M. Rajendranathan Nair
2. Shri R. Balasubramanyan
3. 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. Vasanth Shenoy
14. Shri T. S. Unnikrishnan Nair

15. Shri P. N. Joshi
16. Shri Sib Sankar 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 V. 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. Imam Khasim Saheb
40. Shri Harinder Krishan Beri
41. Shri S. M. S. Abuthahir Ali
42. Shri Subrata Basu
43. Shri T. K. Srinivasa Gopal
44. Kum B. Meenakumari
45. Shri K. V. Mohan Rajan
46. Shri M. R. Boopendranath
47. Shri P. K. Vijayan
48. Smt K. Ammu
49. Shri K. Ramakrishnan
50. Shri P. T. Lakshmanan
51. Shri Rupsankar Chakraborty
52. Shri Anil Agarwal
53. Shri S. P. Damle
54. Shri J. K. Bandyopadhyay
55. Shri S. K. Bhattacharyya
56. Smt K. V. Lalitha
57. Shri P. Ravindranathan Nair
58. Shri K. Gopalakrishnan
59. Shri S. Sanjeev
60. Shri S. Balasubramaniam
61. Shri M. R. Raghunath
62. Shri A. K. Chattopadhyay
63. Shri N. Kalaimani
64. Shri P. N. Ravindranatha Kaimal
65. Smt. A. Lekshmi Nair
66. Dr. Jose Stephen
67. Shri K. P. Antony
68. Shri Gopal Rao Desai
69. Shri R. M. Naidu
70. Shri P. Srinivasa Rao
71. Shri G. Rajagopalan Unnithan

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. Smt K. Radhalekshmy
3. Shri N. A. George

Scientist 'S'

1. Shri Francis Thomas
2. Shri J. Sitarama Rao
3. Shri M. Syed Abbas
4. Shri Percy Dawson
5. Shri D. K. Garg
6. Shri A. C. Kuttappan
7. Shri K. George Joseph
8. Dr. M. D. Varghese
9. 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
4. Shri K. J. Francis Xavier : Skipper

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. Technical Assistant
2. Shri K. Vasudevan Nair : Sr. Technical Assistant
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
10. Shri G. Mohanan : Artist
11. Shri O. Subramanyan : Senior Weider

Technician T-II-3

1.	Smt T. L. Hemalatha	: Hindi Translator
2.	Shri P. Ravindranathan	: Sr. Library Assistant
3.	Shri M. A. Anslem	: Sr. Draughtsman
4.	Shri A. Kassim Kunju	: Technical Assistant
5.	Shri P. Sadanandan	: Technical Assistant
8.	Shri K. K. Poulose	: Instrument Technician
7.	Shri R. Gopalakrishnan Nair	: Computer
8.	Shri M. Abdul Sathar	: Media Supervisor
9.	Shri B. Anandan	: Foundry Assistant
10.	Shri M. U. Vijayan	: Senior Mechanic
11.	Shri T. K David	: Fitter
12.	Shri Thomas J. Mammoottil	: Technical Assistant
13.	Shri M. K. Sasidharan	: Technical Assistant
14.	Shri V. Gopalakrishna Pillai	: Technical Assistant
15.	Shri T. John	: Technical Assistant
16.	Shri A. Veeranjaneyulu	: Technical Assistant
17.	Shri V. V. Ramakrishna	: Technical Assistant
18.	Shri G P. Vaghela	: Technical Assistant
19.	Shri P. T. Sebastian	: Technical Assistant
20.	Shri V. Gaspar	: Technical Assistant
21.	Shri P. S. Alias	: Superintendent (Instrumentation)
22.	Shri A. Haranath	: Technical Assistant
23.	Shri N. Babu Rao	: Tecnnical Assistant
24.	Shri N. M. Vasu	: Technical Assistant
25.	Shri T. K. Syed Ali	: Technical Assistant

Technician T-1-3

1.	Shri K. J. Augustine	: Sr. Turner
1.	Shri M. R. Nair	: Bosun
3.	Shri N. Bahuleyan	: Bosun
4.	Shri A. K. Jaisingh	: Bosun
5.	Shri M. S. Rajan	: Bosun
6.	Shri K. K. Subramanian	: Engine Driver

7.	Shri K. V. Baladasan	: Engine Driver
8.	Shri V. V. Johni	: Sr. Field Assistant
9.	Shri V. K. Ramachandran	: Sr. Laboratory Assistant
10.	Shri V. S. Augustine	: Sr. Carpenter
11.	Shri S. R. Jethwa	: Sr. Mechanic
12.	Shri A. R. Dharaneedharan	: Media Assistant
13.	Shri T. S. Bhaskara Menon	: Sr. Mechanic
14.	Shri K. E. Mani	: Sr. Mechanic
15.	Shri P. M. Joseph	: Mechanic

Technician T-2

1.	Shri E. K. Balakrishnan	: Draughtsman
2.	Smt K. Sarasamma	: Draughtsman
3.	Shri Shaju A. Averah	: Draughtsman
4.	Shri C. C. Sivan	: Welder-cum-Blacksmith
5.	Shri G. Ratnakaran Nair	: Refrigeration Mechanic
6.	Shri Anil Kumar	: Refrigeration Mechanic
7.	Shri Shanmughavel	: Refrigeration Mechanic
8.	Shri C. Rajendran	: Refrigeration Mechanic
9.	Shri Jose Kalathil	: Refrigeration Mechanic
10.	Shri K. V. Madhavan	; Electrician
11.	Shri Philip Durom	: Senior Carpenter
12.	Shri Mohammed Jaffer	: Engine Driver
13.	Shri Vasudev G. Kubal	; Engine Driver (Adhoc)
14.	Shri A. Gopalakrishnan Nair	: Staff Car Driver
15.	Shri P. P. Poulose	: Staff Car Driver
16.	Shri P. Natarajan	: Driver
17.	Shri M. G. Narayanan Nair	: Driver
18.	Shri N. J. Tandel	: Driver (Launch)
19.	Shri K. K. Pappukutty	: Driver (Launch)
20.	Shri M. M. Vara	: Sr. Field Assistant
21.	Shri P. K. Damodaran	: Sr. Lab. Assistant
22.	Shri P. M. Pattanayak	: Sr. Lab. Assistant
23.	Shri M. M. Devassya	: Jr. Library Assistant

24.	Shri T. Neelakantan	:	Projector Operator
25.	Shri Gurudas Ram	:	Tindal
26.	Shri T. Gangadharan	:	Sr. Lab. Assistant
27.	Shri M. K. Kuttykrishnan Nair	:	Sr. Field Assistant
28.	Shri P. A. John	:	Tindal
29.	Shri V. Veer Raju	:	Tindal
30	Shri S. Laxmanadu	:	Deckhand
31	Shri C. G. Tandel	:	Deckhand
32	Shri K. K. Lakshmanan	:	Deckhand
33	Shri T. Balan	:	Deckhand
34	Shri K. M. Kotiya	:	Deckhand
35	Shri P. K. Pushpangadhan	:	Deckhand
36.	Shri K. Sarangadharedu	:	Deckhand
37.	Shri G. R. Bhogte	:	Deckhand
38.	Shri T. K. Dasan	:	Deckhand
39.	Shri K. V. Rajan	:	Jr. Laboratory Assistant
40.	Shri G. Subba Rao	:	Cook
41.	Shri E. R. Krishnan	:	Cook
42.	Shri T. Gopalakrishnan	:	Metal Worker
43.	Shri Narasingh Pande	:	Driver

Technician T-1

1.	Shri B. Ramaiah	:	Jr. Lab Assistant
2.	Shri T. K. Bhaskaran	:	Jr. Lab Assistant
3.	Shri K. B. Thilakan	:	Jr. Lab Assistant
4.	Shri T. K. Vasudevan	:	Jr. Lab Assistant
5.	Shri T. K. Aravindakshan	:	Jr. Lab Assistant
6.	Smt K. K. Sumathy	:	Jr. Lab Assistant
7.	Kum Florence Joseph	:	Jr. Lab Assistant
8.	Shri Kaderniyam Umermiyan	:	Jr. Lab Assistant
9.	Shri D. R. Aparanath	:	Jr. Lab Assistant
10.	Shri C. C. Gandhi	:	Plant Attendant
11.	Shri N. C. Bhaskaran	:	Plant Attendant

12.	Shri K. R. Kesavan	:	Plant Attendant
13.	Shri T. N. Manibhadran	:	Tindal
14.	Shri A. B. Varghese	:	Driver (Launch)
15.	Shri Radhu Pandey	:	Driver (Launch)
16.	Shri V. P. Raphel	:	Driver
17.	Shri Vasantharai Kanji Solanki	:	Driver
18.	Shri K. Prakasa Rao	:	Driver (Launch)
19.	Shri M. Venkateswara Rao	:	Driver
20.	Shri O. K. Xavier	:	Driver
21.	Shri P. Bahuleyan	:	Telephone Operator-cum-Receptionist
22.	Shri Malam Bachu Sidi	:	Deckhand
23.	Shri K. Gangaraju	:	Deckhand
24.	Shri T. A. Francis	:	Cook
25.	Shri P. Joseph Paul	:	Carpenter
26.	Shri Satrugan Kumura	:	Tindal

ADMINISTRATIVE PERSONNEL

Sr. Administrative Officer

Shri K. M. Mathai

Administrative Officer

Shri P. James Abraham

Assistant Administrative Officer

Shri A. Chakrapany/Shri Varghese Paul

Accounts Officer

Shri K. T. Abubacker

Asstt. Accounts Officer

Shri T. Velayudhan Asari

Superintendent

Smt T. N. Ambujakshi Amma

P. A. to Director

Shri K. J. Thomas

Assistant

1. Shri P. A. Uthup
2. Shri M. George Joseph
3. Shri S. Naveen Chandra Prabhu
4. Smt K. A. Devaky
5. Smt Alice M. Joseph
6. Smt Nafeesa Ali

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

Junior Clerk

1. Shri M. Balan Nambiar
2. Shri G. Somappan
3. Shri V. R. Kesavan
4. Smt Smita K. Srishkar
5. Smt M. Jully
6. Shri K. Bhaskaran
7. Smt M. A. Prasanna
18. Shri P. V. Venugopalan
19. Shri A. George Joseph
20. Shri K. P. Velayudhan
21. Smt T. K. Susannamma
22. Shri C. A. Punnoose
23. Smt P. C. Kamalakshy
24. Shri R. Viswanathan

8. Smt K. A. Nazeem
9. Shri A. Chakrapani
10. Shri Y. Phillipose
11. Shri Ch. Satyanarayana
12. Shri A. B. Rodrigues
13. Shri T. Veerabhadra Rao
14. Shri C. K. Muraleedharan
15. Shri P. K. Sreedharan
16. Smt K. Gracy
17. Smt B. Hemalatha
25. Shri P. K. Sankarankutty
26. Shri K. Rajappan Pillai
27. Smt N. I. Mary
28. Shri P. K. Janardhanan
29. Shri Gopal Chandra Adhikari
30. Shri Satish Chandra B. Purohit
31. Kum K. Chandini
32. Shri N. S. Sangodkar
33. Shri M. M. Damodaran
34. Shri P. K. Thomas

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 O. C. Lonan
2. Shri E. S. Balachandra Pai
3. Shri E. S. Sreedharan
4. Shri K. C. Mohar
5. Shri V. V. John
6. Shri S. M. S. Yadav
7. Shri P. A. Thomas
8. Shri C. S. Govindan
9. Shri K. Balakrishna Pillai
10. Shri C. M. Gopalan
11. Shri P. J. George
12. Shri P. C. Sukumaran
13. Shri A. G. Vasu
14. Shri C. A. Subran
15. Shri B. Tirupathi Rao
16. Shri D. Gopalakrishna Rao
17. Shri A. T. Waghmare
18. Shri N. Gnanarajan Rao
19. Shri P. A. Abdul Rehman
20. Shri Digambar D. Naik
21. Shri K. K. Appachan
22. Shri K. X. Joseph
23. Shri T. T. Das
24. Shri Laba Nag
25. Shri O. M. Thankappan
26. Shri O. A. Krishnan
27. Shri M. K. Thevan
28. Shri P. M. Pakeer Mohammed
29. 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 Sathrugan 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 Parraju
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 Vasippalli 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 Loknath Kumara
33. Shri T. K. Rajappan
34. Shri Chandrakant Kolvalkar
35. Shri G. Chakoram
36. Shri Appa Rao
37. Shri Duda Pitha Parmar
38. Shri Bashir Mohammed Allarkha Khokhar
39. Shri Namdev S. Hiwale
40. Shri C. Sreedharan
41. Shri K. N. Velayudhan kutty
42. Shri Badrinarayan Guru
43. Shri K. K. Lakshmanan
44. Shri N. Padmanabha Pillai
45. Shri Dayasingh Oram
46. Shri P. K. Bhanga Raj
47. Shri Satyanarayan Mirdha
48. Shri T. G. John
49. Shri Kana Jina Chander

ON DEPUTATION

	Name	Deputation with	Designation
1.	Shri M. Velu, Jr. Fishery Scientist	Cochin Port Trust Cochin-3	Deputy 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	Deputy Director
3.	Shri P. Sulochanan Scientist S–1	Exploratory Fisheries Project, Kandla Base, Block No. 80/262, Kutch.	Deputy 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	Deputy Director
6.	Shri R. Rajendran Scientist S-1	Central Institute of Fisheries Nautical & Engineering Training, Cochin-16	Instructor (Craft & 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)
10.	Shri S. Sadanandan Superintendent	ICAR Research Complex for NEH Region, Shillong	Asstt. Admn. Officer
11.	Shri V. Joseph Superintendent	Sugarcane Breeding Institute, Coimbatore	Asstt. Admn. Officer
12.	Shri P. J. Joseph Superintendent	NBSS & LUP, Regional Centre, Bangalore	Asstt. Admn. Officer

APPENDIX III

C. I. F. T. FISHING FLEET

Name of vessel	LOA(m)	H. P.	Place of Operation	Year of Build
FISHTECH No. I (Wooden)	9.14	40	KAKINADA	1958
FISHTECH No. II (Wooden)	9.75	47.5	COCHIN	1959
FISHTECH No. IV (Wooden)	10.97	64	GOA	1963
FISHTECH No. V (Wooden)	9.14	30	BURLA	1963
FISHTECH No. VI (Wooden)	9.75	37.5	COCHIN	1965
FISHTECH No. VII (Wooden)	12.2	60	KAKINADA	1968
FISHTECH No. VIII (Wooden)	15.25	102	VERAVAL	1966
FISHTECH No. X (Wooden)	9.75	37	VERAVAL	1970
FISHTECH No. X (Wooden)	9.14	47.5	BURLA	1979
SINDHUKUMARI (Wooden)	15.25	120	COCHIN	1969
MATSYAKUMARI (Steel)	17.5	240	COCHIN	1980
FRP sheathed plywood row boats (2 Nos.)	4.3	15 (O/B engine)	BURLA	1968/1970

APPENDIX IV

FINANCE

Details of budget provision and actual expenditure during the financial year 1980–81

PLAN

Head of Account	Budget Provision Rs.	Actual Expenditure Rs.
Salary of Officers	1,45,000	—
Salary of Establishment	2,25,000	—
Dearness Allowance	1,75,000	—
Overtime Allowance	10,000	3,413.30
House Rent Allowance	30,000	—
City Compensatory Allowance	10.000	—
Other Allowances+Honoraria	55,000	—
Travelling Expenditure	1,00,000	1,24,732.56
Other Charges	47,50,000	37,70,503.94
Total	55,00,000	38,98,649.80

NON – PLAN

Head of Account	Budget Provision Rs.	Actual Expenditure Rs.
Salary of Officers	13,50,000	13,43,746.66
Salary of Establishment	16,00,000	13,39,620.67
Dearness Allowance	13.00.000	16,42,059.34
Overtime Allowance	20.000	19,532.95
House Rent Allowance	4,00,000	2,31,182.67
City Compensatory Allowance		29,682.27
Other Allowance & Honoraria		1,11,417.23
Travelling Expenditure	60,000	59,785.60
Leave Salary Contribution	5,000	366.06
Pension Contribution		334.00
P. F. Contribution		192.00
Other Charges	7,00,000	4,74,764.29
Fellowships, Scholarships & Awards	10,000	—
Total	54,45,000	52,52,683.68

9. ABBREVIATIONS

DWB	:	Dry Weight Basis
HDPE	:	High Density Polyethylene
MPEDA	:	Marine Products Export Development Authority
NAARM	:	National Academy of Agricultural Research Management
PER	:	Protein Efficiency Ratio
SBI	:	Sugarcane Breeding Institute
TBTO	:	Tri-butyl tin oxide
TVN	:	Total Volatile Nitrogen