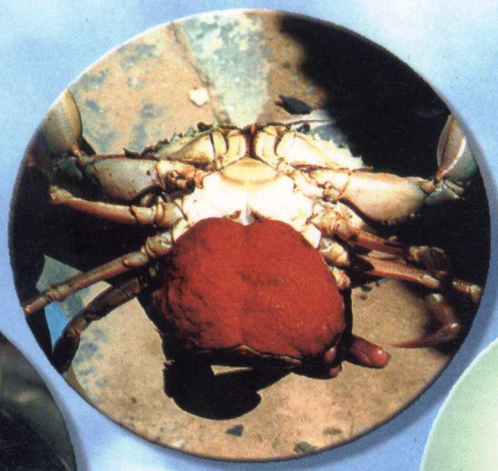
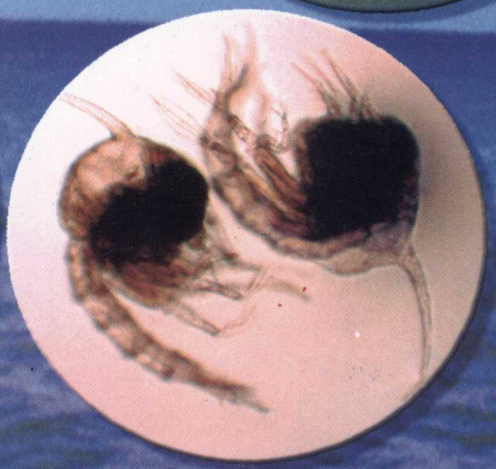
वार्षिक प्रतिवेदन
ANNUAL REPORT
2000 - 2001





केन्द्रीय खारापानी जलजन्तु पालन संस्थान

(भारतीय कृषि अनुसंधान परिषद)

७५, सांथोम हाई रोड, राजा अण्णामलैपुरम्, चेन्नै-६०० ०२८

CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
75, SANTHOME HIGH ROAD
RAJA ANNAMALAIPURAM, CHENNAI - 600 028

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CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE

(Indian Council of Agricultural Research)

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Front Cover

Clockwise : Berried Mud Crab *(Scylla tranquebarica);* Developing eggs; Third zoea; Megalopa; Fourth Crab Instar.

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1. PREFACE

The Central Institute of Brackishwater Aquaculture has made significant progress in its research and development programmes during the year 2000-2001. Sixteen Institute-based and eight externally-funded projects were operational during the period. Noteworthy success was achieved in mud crab (*Scylla* spp.) larval rearing, field trials on the improved extensive culture of tiger shrimp *Penaeus monodon* and polyculture of brackishwater finfishes and shrimp.

The seabass *Lates calcarifer* has gained importance as the next important candidate species for diversification due to the efforts of CIBA. The seabass seed production technology developed by the Institute is in the process of transfer to farmers / entrepreneurs / state dept. officials and other agencies through training and consultancy. Institute-hatchery produced fry are being regularly sold to farmers / entrepreneurs in different agro-climatic regions of the country for nursery and grow-out culture. Experimental trials on seabass culture in brackish / saline subterranean water in the semi-arid regions of Rajasthan and Haryana are also underway as part of the World-Bank aided NATP project entitled "Fish production using brackishwater in arid ecosystem".

The focus is now on transfer of technology through Institution-Village Linkage Programmes (IVLP). Reaching out to the farmers by means of a participatory approach has given encouraging results under the new NATP project entitled "Institution Village Linkage Programme for technology assessment and refinement in coastal agro-ecosystem of Tiruvallur district of Tamil Nadu".

Infrastructure development received priority attention. With the completion of the construction of Laboratory-cum-Administrative building of CIBA at Santhome, the Institute reached a milestone. The building was inaugurated on 31 May 2001. Human resource development and welfare of scientists and staff were given due importance.

The Annual Report 2000-2001 presents herewith the progress of research and development work of CIBA as an information source for the benefit of planners, researchers, farmers, entrepreneurs, etc., in the field of brackishwater aquaculture. I would like to express my gratitude to the Director General, ICAR and Secretary, DARE, Govt. of India; the Deputy Director General (Fy), ICAR and the Assistant Director General (M.Fy), ICAR for their encouragement and support.

2. EXECUTIVE SUMMARY

The Central Institute of Brackishwater Aquaculture, one of the eight Institutes under the Fisheries Division of the Indian Council of Agricultural Research, was established in April 1987. The Headquarters of the Institute is located in Chennai with an Experimental Field Station at Muttukadu, about 30 km south of Chennai. Presently, the Institute has two research centers located at Kakdwip (West Bengal) and Puri (Orissa). The Narakkal Research Centre was handed over to the Krishi Vigyan Kendra of CMFRI at Narakkal during July 2000. The Institute has a Director, 48 Scientists, 29 Technical, 21 Administrative and 71 Supporting staff as on 31.12.2000.

The mandate of the Institute is to conduct research towards supporting sustainable and responsible development of aquaculture in brackishwater systems in different agro-ecological regions, to develop eco-friendly and economically viable culture technologies towards greater productivity and production of fish, shellfish and other aquatic organisms in brackishwater areas through a multi-disciplinary matrix approach to production and management, to provide policy support for environmental and natural resource management and socio-economic development related to brackishwater aquaculture activity, to develop a strong database and information management system, to undertake human resource development and transfer of technology programmes, and to provide consultancy service.

The Institute is guided in its research programmes by a Research Advisory Committee (RAC) comprising eminent scientists outside the ICAR system. Its activities are supervised by the Institute Management Committee (IMC). The Staff Research Council (SRC) helps in research project formulation and planning and reviews regularly (biannual basis) the work programmes of the Institute.

The Divisional framework of the Institute was re-organised during the year 1999-2000 as per IX Plan EFC document. The research programmes are now carried out under six divisions *viz.*, Crustacean Culture Division, Fish Culture Division, Nutrition, Physiology and Pathology Division, Genetics and Biotechnology Division, Aquaculture Engineering and Environment Division and Extension, Economics and Information Division.

On-going projects include 16 Institute-based research projects and eight externally-funded research projects. Among the latter, three projects *viz.*, (a) Economic evaluation of brackishwater aquacultural systems in India (b) Shrimp health and water and soil quality monitoring for development of sustainable shrimp farming and (c) Development and evaluation of shrimp immunostimulants using whole cell preparations of *Vibrio* are funded by the AP Cess Fund of ICAR, four projects *viz.*, (d) Shrimp and fish broodstock development and breeding under captive conditions (e) Shrimp and fish health management (f)Fish production using brackishwater in arid ecosystem (g) Institution Village Linkage Programme for Technology Assessment and Refinement in Coastal Agro ecosystem of Tiruvallur district of Tamil Nadu are funded by the World Bank - aided National Agricultural Technology Project (NATP) of the ICAR and one project *viz.*, (h) Seabass Pilot Unit hatchery and culture is an Indo-French collaborative project between ICAR/DARE and COFREPECHE / IFREMER, France.

The significant research achievements made by the Institute during the year are as follows :

- Trials on improved extensive culture (60,000 PL 20/ha) of *P. monodon* were successfully carried out in two tide-fed ponds (area 0.16 and 0.18 ha) at Kakdwip, using formulated grow-out feeds developed by CIBA. A production rate of 1.2 ton/ha/100 days was obtained and shrimp attained an average size of 27 g. at harvest.

- CIBA succeeded for the first time in rearing all the zoeal stages of the mud crab *S. tranquebarica* (wild berried crab, 194 mm carapace width and 1.7 kg weight) from the egg to the megalopa stage and subsequently upto post-larval instar stage (baby crab) at the Institute's crab hatchery at Muttukadu. .

- Polyculture of finfishes (*Mugil cephalus, Liza parsia* and *Etroplus suratensis*) and shrimp (*P. monodon* and *P. indicus*) was successfully undertaken in a tide-fed pond (0.05 ha) at Narakkal. At a stocking density per ha of 19,800 for fishes and 24,000 for shrimps, the combined production rate for fish and shrimp was 1564.3 kg/ha/8 months.

- Captive broodstock of finfishes *viz.*, mullet *M. cephalus*, grouper *Epinephelus tauvina* and seabass *L. calcarifer* were maintained in 100 ton capacity RCC holding tanks at the Muttukadu Experimental Station of CIBA. The water quality and health of fishes were regularly monitored.

- The captive broodstock of seabass *L. calcarifer* was induced bred and a total of eleven induced breeding trials were carried out during the period June to November 2000. A total of 40.6 lakh hatchlings were produced during the year. Hatchery produced fry were sold to farmers / entrepreneurs and govt. organizations for nursery and grow-out culture.

- The milt of grouper *E. tauvina* was cryopreserved using a suitable cryodiluent made up of Fish Ringer, 5% glucose solution and cryoprotectant dimethylsulphoxide. Pre-freeze motility in cryodiluent ranged from 80-90% and post-thaw motility after 13 months of storage ranged from 20-30%.

- Cage culture of grouper *E. tauvina* (juvenile fishes size range 123-158 mm/ 23 to 62 g) was carried out in a net cage of area 54 sq.m., fixed in a pond at Muttukadu. The fishes were fed on a diet of *Tilapia* @ 5% of body weight. After seven months of culture, an average growth of 365 mm / 618 g (range 330-390 mm / 360-800 g) was attained.

- A feeding trial to determine the dietary protein requirements of seabass *L. calcarifer* fingerlings, using formulated diets with different levels of protein ranging from 27 to 43%, indicated that the diet with 43% protein level produced significantly higher growth (162%) and FCR (2.01).

- A formulated freeze-dried diet (100 micron size), having a protein content of 55.2% and tested for seabass *L. calcarifer* larvae (20 days old), gave a survival of 70%, with uniform size of larvae.

- Evaluation of various feed attractants for incorporation in seabass grow-out feeds was done through feeding trials using practical formulated diets. Results indicated that trimethylamine followed by glutamic acid could be used as feed attractants.

- Testing of formulated practical diets (prepared using indigenous feed ingredients such as shrimp meal, fish meal,squid meal,soybean meal, corn gluten and other additives) having different protein levels ranging from 31 to 47%, on the mud crabs *S. serrata* and *S. tranquebarica,* showed that the diet with 39% protein gave the highest growth and optimum feed conversion efficiency in both the species of mud crabs.

- Genetic characterization studies were carried out with respect to the mud crabs *S. serrata* and *S. tranquebarica.* Chromosomes were obtained from the testes of adult male crabs and the protocol for karyological work was standardized. The haploid chromosome number in *S. serrata* and *S. tranquebarica* was observed to be 53 and 51 respectively (modal values).

- Database on water and soil quality of traditional and extensive shrimp culture systems was developed through regular monitoring of commercial shrimp farms located in Tamil Nadu (Pooncheri, Nanamedu and Agaram), Andhra Pradesh (Pantapalem and Lakshmipathipuram), Kerala (Pizhala, Poyya and Appangad) and West Bengal (Belpukur, Battala, Maharajganj and Henry's Island).

- The environmental and socio-economic impacts of shrimp farming in the East Godavari district of Andhra Pradesh were assessed by means of a detailed survey of shrimp farms in 8 mandals *viz.*, Thalaveru, U. Kothapalli, I. Polavarum, Katterikona, Uppalakuptam, Allavaram, Mamidikudum and Rajolu. The survey revealed that shrimp farming had no adverse impacts on the water quality of farms / ponds /source creek water / irrigation canals or soil quality of adjacent agricultural fields. A questionnaire - based socio-economic survey revealed that shrimp farming activities had raised the standard of living of people in the coastal villages.

- Collection and updation of data relating to brackishwater fishery resources of Tamil Nadu, Andhra Pradesh and Kerala were carried out in respect of the Institute's computerized database information system. The Local Area Network (LAN) was commissioned and utilized for network analysis. The Institute website was also modified and updated.

Externally funded projects

The Institute took up four new externally funded projects during the year *viz.*, (a) Development and evaluation of shrimp immunostimulants using whole cell preparations of *Vibrio* (AP Cess Fund Project) (b) Fish production using brackishwater in arid ecosystem (NATP Project) (c) Institution Village Linkage Programme for Technology Assessment and Refinement in coastal agro-ecosystem of Tiruvallur district of Tamil Nadu (NATP project) (d) Seabass pilot unit hatchery and culture (Indo-French collaborative project between ICAR and IFREMER / COFREPECHE).

Transfer of technology programmes

The Institute regularly conducted training programmes on a calendar basis. Six training programmes were conducted during the period *viz.*, mud crab (*Scylla* spp.) broodstock development, breeding and culture; seabass breeding and seed production; shrimp disease and health management; shrimp breeding and hatchery technology; application of genetics and biotechnology in aquaculture; and environmental impact assessment of brackishwater shrimp farming.

The Institute participated in two exhibitions during the period *viz.*, a) the First Indian Fisheries Science Congress Exhibition, at Chandigarh, during 21-23 September 2000 and (b) Exhibition in connection with the National Seminar on Sustainable Fisheries and Aquaculture for Nutritional Security, at Chennai, during 29 November to 2 December 2000.

Consultancy

The on-going Institutional consultancy assignments during the year were (a) Environmental Monitoring Programme under World Bank - assisted Shrimp and Fish Culture Project of Ministry of Agriculture, Govt. of India, and (b) consultancy for seabass breeding and seed production to Rajiv Gandhi Centre for Aquaculture (MPEDA), Myiladuthurai.

Publications

The Institute publications brought out during the year 2000-2001 included Training Calendar for 2000-2001; Annual Report for 1999-2000; CIBA Bulletin No.12, Captive broodstock development, induced breeding and larval stages of mud crabs (*Scylla* spp); CIBA Bulletin No.13, Shrimp feed processing and production technology; CIBA Extension Series No.18, No.19 and No.20; and CIBA News Vol.5, Nos.1 to 4.

3. INTRODUCTION

1. Mandate

- To conduct research towards supporting sustainable and responsible development of aquaculture in brackishwater systems in different agro-ecological regions.
- To develop eco-friendly and economically viable culture technologies towards greater productivity and production of fish, shellfish and other aquatic organisms in brackishwater areas through a multi-disciplinary matrix approach to production and management.
- To provide policy support for environmental and natural resource management and socio-economic development related to brackishwater activity.
- To develop a strong database and information management system.
- To undertake human resource development and transfer of technology programmes and to provide consultancy service.

2. Summary of past achievements

Since its inception in 1987, CIBA has made significant contributions in the field of shrimp hatchery technology, captive fish broodstock development and breeding, shrimp nutrition and feed technology, shrimp/fish diseases and health management, environmental impact assessment of shrimp farming and development of a computerized database information system on brackishwater fishery resources of the country.

The major achievements of CIBA under the Crustacean Culture Division include development of simplified cost-effective backyard hatchery technology package for the seed production of *P. indicus*, technology packages for the captive broodstock maturation of tiger shrimp *P. monodon*, biomass and cyst production of brine shrimp *Artemia*, development of hatchery lay-out and designs for small-scale (2, 5 and 10 million capacity) and backyard shrimp hatchery, mud crab broodstock development and breeding and demonstration of improved traditional culture of tiger shrimp *P. monodon* in Pokkali fields.

Under the finfish breeding programme, CIBA achieved a major breakthrough in the development of captive broodstock, breeding and seed production of the seabass, *Lates calcarifer*. The seed produced by the Institute was successfully reared in a farmer's ponds under Institute's technical guidance and monitoring.

Significant advances in shrimp nutrition and feed technology made by CIBA include development of a technology package for the production of micro-particulate feed for post-larvae of *P. indicus* and development of a technology package for the production and processing of shrimp feed on commercial scale for semi-intensive farming of *P. monodon* and *P. indicus*.

Under shrimp disease investigations, a comprehensive database was built up on bacterial and viral diseases of shrimp. The white spot disease virus infection in shrimp was extensively studied and a simple diagnostic technique (DNA-based) was developed for its diagnosis which was standardized using 298 bp CIBA primer.

Extensive investigations were also conducted on the socio-economic and environmental impact assessment of shrimp farming.

A computerized database information system on brackishwater fishery resources of the country was developed. An Agricultural

Research Information System (ARIS) laboratory was established and the web site of the Institute was launched.

Under Transfer of Technology programmes, CIBA conducted several training programmes on different aspects of brackishwater aquaculture such as shrimp hatchery technology, shrimp disease diagnosis and health management, water and soil quality management in shrimp farms, seabass breeding and seed production and mud crab breeding and culture etc. for the benefit of State Government Officials/BFDAs / farmers / entrepreneurs etc. Extension literature *viz.* brochures / pamphlets on brackishwater aquaculture was published regularly. Farmer's meets, demonstrations and exhibitions were conducted from time to time.

3. Financial statement

The details of expenditure incurred (Rs. in lakhs) during 1999-2000 and 2000-2001 (till 31 March 2001) are as follows:

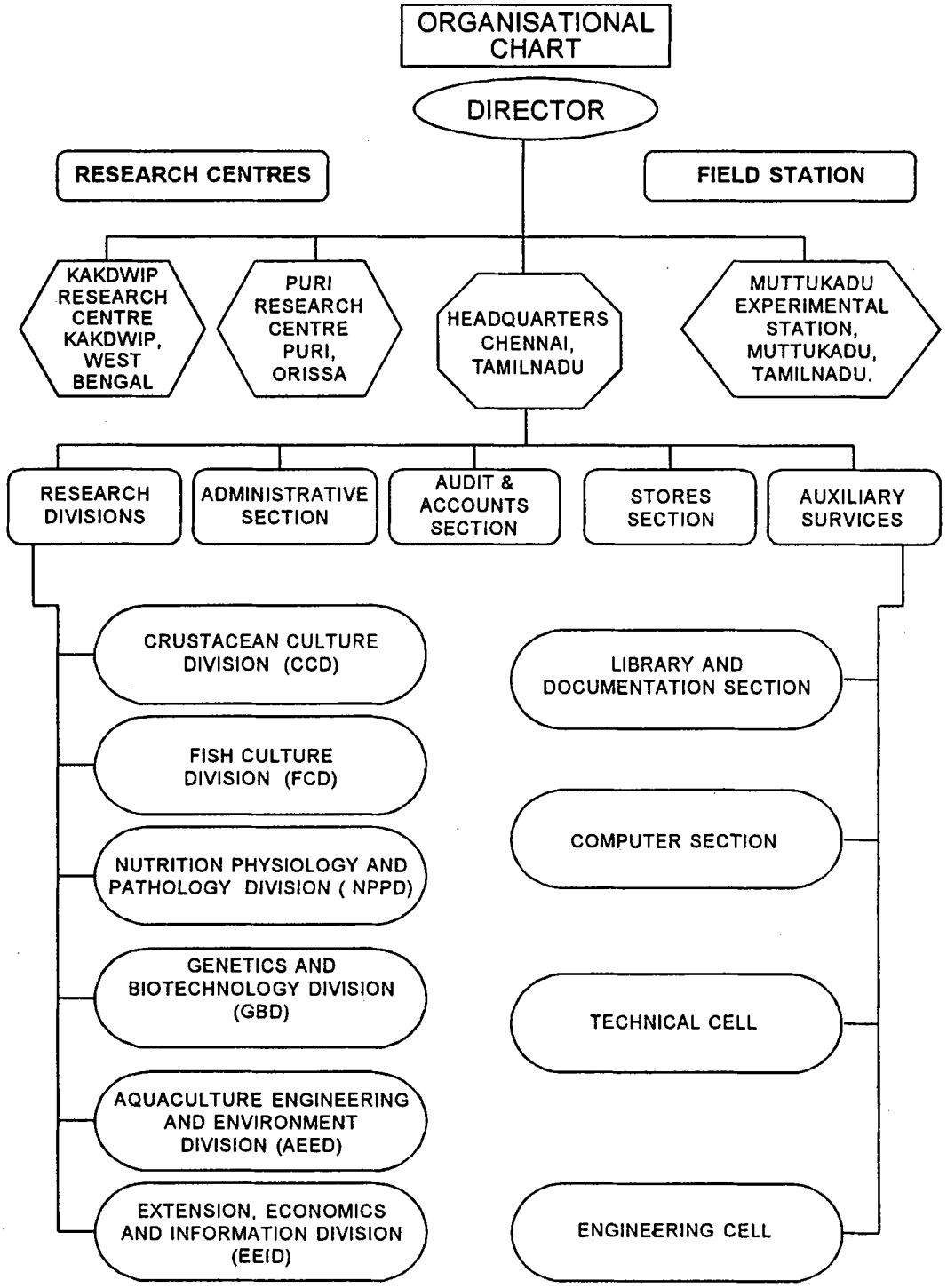
Head of account	Approved RE 1999-2000	Actuals 1999-2000	Approved RE 2000-2001	Actuals 2000-2001
Plan	300.00	268.56	175.00	118.48
Non-Plan	273.00	272.13	300.00	285.27

4. Staff position

The details of the number of positions sanctioned, filled and remaining vacant at CIBA as on 31.12.2000 are as follows:

Position	Sanctioned	Filled	Vacant
Director (R.M.P.)	1	1	-
Head of Division	2	2	-
Principal Scientist	2	1	1
Senior Scientist	14	-	14
Scientist	47	45	2
Administrative Officer	1	1	-
Asst. Finance & Accounts Officer	1	1	-
Superintendent	1	1	-
Stenographer Gr.II	2	2	-
Stenographer Gr.III	3	2	1
Assistant	3	3	-
Senior Clerk	5	4	1
Junior Clerk	9	7	2
Technical Officer	—	0	-
Technical Assistant	35	29	6
Supporting Staff	83	76	7
Total	209	175	34

CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE



4. RESEARCH ACHIEVEMENTS

CRUSTACEAN CULTURE DIVISION

Research Projects

1. **Title of project** : Improvement of penaeid shrimp hatchery technology for the production of quality seed (CCD/SP/1)
   Project Leader : Dr.P.Ravichandran
   Location of project : Chennai
   Associates : Dr.L.H.Rao, Shri K.Devarajan, Dr.S.Kulasekarapandian, Dr.C.Gopal, Dr.M.Muralidhar, Dr.Azad Ismail Saheb, Shri A.Panigrahi and Dr.P.S.Sudeesh

2. **Title of project** : Improvement of production and productivity of shrimp in traditional culture system by suitable management practices (CCD/MT/1)
   Project Leader : Shri R.K.Chakraborti
   Location of Project : Kakdwip
   Associates : Shri J.K.Sundaray and Dr.T.K.Ghoshal

3. **Title of project** : Monitoring of traditional shrimp farms (CCD/MT/2)
   Project Leader : Dr.S.M.Pillai (upto 3 July 2000)
   Location of project : Narakkal and Puri
   Associates : Dr.C.P.Balasubramaniam and Dr.(Mrs.) Imelda Joseph (upto 3 July 2000)

4. **Title of project** : Culture of tiger shrimp *Penaeus monodon* in low saline environment (CCD/SC/1)
   Project Leader : Dr.C.P.Balasubramaniam
   Location of project : Puri
   Associates : Nil

5. **Title of project** : Culture of mud crabs (*Scylla* spp.) (CCD/CF/1)
   Project Leader : Shri M.Kathirvel
   Location of project : Chennai and Kakdwip
   Associates : Shri S.Srinivasagam, Dr.S.Kulasekarapandian and Dr.P.K.Ghosh (upto 21 October 2000)

Progress of Work

1. Improvement of penaeid shrimp hatchery technology for the production of quality seed (CCD/SP/1)

Chennai

Larval rearing experiments

Larval rearing experiments were conducted in *Penaeus monodon* and *P. indicus*. Seven *P. monodon* and fourteen *P. indicus* spawners collected from the wild and maintained under hatchery conditions, yielded 28 lakh and 7.1 lakh nauplii respectively. The larvae were reared initially on a diet of *Chaetoceros* (30,000 nos/litre) and subsequently *Artemia* nauplii from mysis stage onwards. Larvae reached upto PL5 stage in *P. monodon* and PL1 stage in *P. indicus* (survival of 9% obtained in both stages).

Evaluation of larval feeds

Feeding trials were conducted with *P. monodon* (mysis stage) to evaluate the efficacy of different larval feeds, *viz.*, *Artemia*

nauplii, egg custard, polychaete custard and formulated pelleted feeds, tested in different combinations. *Artemia* nauplii were invariably combined with all the test feeds. The mysis larvae stocked in FRP tanks (500 l) @ 57 nos./ litre, were fed three times daily. Larval rearing was done upto PL 15 stage. Results indicated that though the larvae fed only with *Artemia* nauplii were larger in size and robust than those fed with other test feeds, higher survival rates were observed in larvae fed with a combination of *Artemia* nauplii and other feeds (Table 1a).

Efficiency of different larval feeds was also tested for *P. indicus* from PL 1 to PL 10 stage. Three test feeds *viz.*, egg custard, clam custard and polychaete custard were fed. The survival rates recorded were 60, 67 and 76% respectively (Table 1b).

Table 1

a. Results of rearing of *P. monodon* larvae fed with test feeds (Mysis III to PL 15)

Test Feed	Stocking rate	Final nos. recovered	% Survival
Artemia nauplii	3400	445	13.09
Clam custard + *Artemia* nauplii	3400	950	27.94
Polychaete custard + *Artemia* nauplii	3400	747	21.97
Pellet (CIBA) + *Artemia* nauplii	3400	697	20.50

b. Results of rearing of *P. indicus* post-larvae fed with test feeds (PL1 to PL 10)

Items	Egg custard	Clam custard	Polychaete custard
Tank capacity (1)	500	500	500
Nos. stocked	6500	5400	4500
Final nos. recovered	3890	3608	3114
% Survival	60	67	76

Algal Culture

Pure cultures of 4 algal species, *Tetraselmis gracilis, Isochrysis galbana, Donellia sp.* and *Chaetoceros calcitrans* were procured and maintained under controlled conditions. Mass culture of the same was also carried out.

Narakkal

Broodstock development of *Penaeus indicus*

Captive *P. indicus* broodstock was developed in a 0.02 ha tide-fed pond with ambient salinity of 17 ppt. In 234 days, the shrimps from the initial size of 45-58 mm, attained the size range of 142 - 175 mm/10 - 38 g, with an average size of 152.7 mm/28.4 g. Shrimp with I, II and III stages of ovary were harvested from this pond and ablated under hatchery conditions for further maturation and spawning. Natural maturation of *P. indicus,* was observed in low saline (17 - 20 ppt) pond conditions without supplementary feeding.

Seed production of *Penaeus monodon*

One wild spawner (240 mm/120 g) collected from trawl catches at Munambam, released 7 lakh eggs and yielded 1.4 lakh nauplii. Larval rearing was conducted following backyard hatchery technology. A total of 25,000 PL 20 were produced and sold to a farmer @ Rs.400/- per 1000 nos. The survival rate from N1 to PL1 was 42.9% and from PL1 to PL 20 was 41.7%. Overall survival recorded from N1 to PL 20 was 17.9%.

Seed production of *Penaeus indicus*

Two trials were carried out with nauplii obtained from natural spawners of *P. indicus* following backyard hatchery technology. In

the first trial 2.9 lakh nauplii were reared and 87,000 PL 21 were produced with 29.4% survival rate. In the second trial from 1.18 lakh nauplii, 15,000 PL 28 were obtained with 12.7% survival rate.

2. Improvement of production and productivity of shrimp in traditional culture system by suitable management practices (CCD/MT/1)

Trials on improved extensive culture (60,000 PL20/ha) of *P. monodon* were taken up at Kakdwip Research Centre in two ponds (area 0.162 and 0.184 ha) during March 2000. Prior to stocking, the ponds were sun dried and the bottom was manually levelled. The ponds were filled with tidal water through three layers of bolting silk net (of mesh size 20, 40 and 80). Chlorination @ 15 ppm chlorine was carried out and the ponds were fertilized with urea and superphosphate, with intermittent liming.

Feeding was done with CIBA formulated feed in one pond and a commercial feed in the second pond. The shrimps were harvested after 100 days of culture. The average size of shrimp at harvest and production rate obtained were 29 g and 1212 kg/ha and 27 g and 1181 kg/ha in the ponds supplied with commercial feed and CIBA feed respectively.

3. Monitoring of traditional shrimp farms (CCD/MT/2) (upto March 2000)

Improved traditional culture of *P. monodon* was demonstrated in the Pokkali fields of five adopted farmers of Trichur and Ernakulam districts, Kerala. The area of the fields (Fields I, II, III, IV and V) ranged from 0.36 to 2.4 ha. Of the five fields, three had acid sulphate soils with pH ranging from 2.2 to 5.5. With application of lime and other management measures, the pH was raised to 8.0 and maintained at that level throughout the culture period. Stocking was done in January/February 2000 with PL 20 of *P. monodon* @ 22,222 to 55,555/ha.

Except field III, all the fields were affected with white spot disease. In field I and II, total mortality occurred after 37 to 45 days of stocking. In field IV, the crop was harvested immediately and 214 kg *P. monodon* (average size 127.5 mm/20.3 g) was obtained. In field V, 99 kg of shrimp was harvested (average size 121.8 mm/24.4 g). In Field III, 81.0 kg was harvested after 90 days (average size 158.6 mm/37.4 g).

4. Culture of tiger shrimp *Penaeus monodon* in low saline environment (CCD/SC/1)

In order to develop a sustainable technology for culture of *P. monodon* in low-saline / freshwater ecosystem, culture trials were taken up at the Kausalyaganga freshwater farm of CIFA, Bhubaneswar. Two ponds, each 800 m^2 were prepared. Wild *P. monodon* PL of 16 mm total length were acclimatized gradually to freshwater conditions before stocking. However, total mortality of PL was observed in freshwater (0 ppt).

5. Culture of mud crabs (*Scylla* spp.) (CCD/CF/1)

Broodstock development, induced maturation and breeding of mud crabs *Scylla tranquebarica* and *S. serrata*

Thirty one induced maturation and breeding experiments were conducted with adult mud crabs *S. serrata* and *S. tranquebarica* collected from Pulicat Lake and from a culture pond at Muttukadu during January to December 2000 (12 experiments in the case of *S. tranquebarica* and 19 in *S.serrata*). All the experiments were conducted in 0.5 to 1.5 ton FRP tanks except one which was conducted in a 60 m^2 fenced earthen pond (salinity range 24 - 32 ppt). The crabs were fed twice daily@ 10% of stocked biomass with bivalve meat and squid meat. Induced maturation of females were effected with unilateral eyestalk ablation.

Observations were made on growth, moulting, mating, berry formation, hatching, etc.

Out of 22 *S. tranquebarica* females, only three became berried after 59 to 128 days of eye-stalk ablation. Out of these berried females, viable hatching was observed only in one after an incubation period of 9 days. In the case of *S. serrata*, out of the 22 ablated females, 7 became berried after 3 to 17 days. The incubation period ranged from 9 to 14 days.

In *S. serrata*, out of 27 unablated females, only 4 females became berried and viable hatching was observed only in one with an incubation period of 9 days.

The details of number of zoea larvae obtained from each hatching and the number sea - ranched are given in table 2.

Table 2
Details of mud crab larvae obtained from each hatching and their utilization

Expt. No.	Size of female, carapace width (mm)	Total no. of larvae hatched (in lakhs)	No. of larvae used for larval rearing (in lakhs)	No. of larvae used for sea ranching (in lakhs)	Remarks
S. tranquebarica					
2	134	7.20	0.60	6.60	Total mortality in Zoea I
S. serrata					
2	109	7.00	1.00	6.00	Reared up to Zoea I
6	120	28.70	-	28.70	-
8	126	34.31	3.00	31.31	Reared up to Zoea II
8	119	30.80	2.00	28.80	Reared up to Zoea I
10	111	1.64	0.64	1.00	Reared up to Zoea I
17	120	13.99	2.70	11.29	Reared up to Zoea III
18	109	20.17	1.50	18.67	Reared up to Zoea III
18	98	13.48	1.50	11.98	Reared up to Zoea III

First successful larval rearing trial in *S. tranquebarica*

The Institute succeeded for the first time in rearing all the zoeal stages of the mud crab *S. tranquebarica* (wild berried crab, 194 mm carapace width and 1.7 kg weight) from the egg to the megalopa stage and subsequently upto post larval instar stage (baby crab) at the Institute's hatchery at Muttukadu. A total of 5.27 million zoea I larvae were hatched out from the berried crab, of which 1000 larvae were taken for the rearing trial, at a stocking density of 4 nos./litre.

Live feeds *viz.*, rotifer and freshly hatched nauplii of *Artemia* were used for rearing the crab larvae upto megalopa stage. The megalopa stage was reached in 16 days and it lasted for 6 days. The survival rate ranged from 35 to75% from the zoea II to zoea III. The survival rate from zoea I to megalopa stage was 0.1%. From 23rd day onwards, i.e. first crab instar stage (carapace width 4 mm), these baby crabs were reared in aquarium tanks with sandy bottom, on a diet of live adult *Artemia* and boiled clam meat. In 185 days of rearing, the first crab instar underwent 10 moults and reached ninth crab instar stage (carapace width 80 mm).

Mud crab broodstock maintenance in an earthen pond

30 adult crabs (15 males and 15 females) of *S. tranquebarica* were stocked in a fenced

earthen pond (60 m^2) at Muttukadu. The female crabs were subjected to unilateral eyestalk ablation. However, there was no ovarian development even after 56 days of rearing.

Grow-out culture of *S. tranquebarica*

60 juvenile crabs (30 males and 30 females) with an average size of 90 mm / 120 g, were stocked in a fenced earthen pond (60 m^2) and reared on a diet of clam / squid meat @ 10% of stocked biomass. The crabs attained an average size of 117 mm/273 g after 60 days of rearing. Survival was only 9%.

FISH CULTURE DIVISION

Research Projects

1. Title of project : Broodstock development, breeding and seed production of *Mugil cephalus* and polyculture of finfishes and shrimps (FCD/B&C/1)
Project Leader : Dr.M.Natarajan
Location of project : Chennai, Kakdwip and Narakkal
Associates : Dr.G.R.M.Rao, Dr.Mathew Abraham, Dr.C.P. Rangaswamy, Dr.(Mrs.) Munawar Sultana, Dr.M.Kailasam, Dr.(Ms.) Shiranee Periera (upto June 2000), Dr.I.S.Azad, Shri S.R.Das, Shri R.K.Chakraborti, Dr.P.K.Ghosh (upto October 2000), Shri Jitendra Kumar Sundaray (upto October 2000), Dr.T.K.Ghoshal, Dr. S.M. Pillai (upto 3 July 2000) and Dr. (Mrs.) Imelda Joseph (upto 3 July 2000)

2. Title of project : Controlled breeding, seed production and culture of grouper *Epinephelus tauvina* (FCD/B&C/2)
Project Leader : Dr.M.Kailasam
Location of project : Chennai
Associates : Dr. G.R.M. Rao, Dr. Mathew Abraham, Dr.A.R.Thirunavukkarasu, Dr.M.Natarajan, Dr.(Mrs.) Munawar Sultana, Dr.I.S.Azad

3. Title of project : Breeding, seed production and culture of seabass *Lates calcarifer* (FCD/B&C/3)
Project Leader : Dr.A.R.Thirunavukkarasu
Location of project : Chennai, Kakdwip and Puri
Associates : Dr.G.R.M.Rao, Dr.Mathew Abraham, Dr.M.Natarajan, Dr.T.C.Santiago, Dr.N.Kalaimani, Dr.M.Kailasam, Dr.I.S.Azad, Dr.K.K.Vijayan, Shri S.R.Das, Shri Jitendra Kumar Sundaray (upto October 2000), Dr.T.K.Ghoshal and Dr.C.P.Balasubramaniam

Progress of Work

1. Broodstock development, breeding and seed production of *Mugil cephalus* and polyculture of finfishes and shrimps (FCD/B&C/1)

Procurement and maintenance of captive broodstock of grey mullet *Mugil cephalus* at Muttukadu, Chennai

A captive broodstock of forty-four adult grey mullet *Mugil cephalus* fishes in the size range of 0.5 to 2.0 kg was maintained in two RCC holding tanks (each 100 t capacity) at Muttukadu. The fishes were fed with formulated maturation feeds @ 5% of total biomass. 80% water exchange was effected daily. Water quality parameters *viz.*, salinity,

pH and temperature and health of fishes were regularly monitored. The range of water quality parameters during the period of report were: temperature 23-34°C, salinity 22-35 ppt, pH 6.3-8.6, D.O. 5 ppm and above, total ammonia 0-0.114 ppm.

Ectoparasitic infection with *Caligus* sp. was controlled by treatment with 100 ppm formalin for 60 to 90 minutes, at fortnightly / monthly intervals. During March and September 2000, the broodstock was infected with *Vibrio parahaemolyticus*. The infection was controlled on both occasions by treatment with 0.25% tetracyclin administered through feed. Other parasites like *Lernanthropus* were controlled by treatment with 2,2 dichlorovinyl dimethyl phosphate (DDVP) bath (0.5 ppm, for 30 to 40 minutes). Fungus was controlled by using a mixture of formalin plus malachite green.

From September onwards, the captive stock was examined for their maturity status. In October, two males were observed with oozing milt, but none of the females matured. With the onset of rains in November, the water salinity dropped to 22 - 23 ppt, affecting further maturation. This captive stock could not be used for induced breeding experiments. Hence, induced breeding was attempted with mature fishes collected from the wild.

Induced breeding

In December 2000, four mature females procured from the catches at Kovalam / Muttukadu (weight range 0.4 to 0.6 kg), having ova diameter of 563 - 635 µm, were subjected to hormone treatment. They were administered with a priming dose of 10,000 IU HCG and 5 mg metaclopromide. However, all the fishes died, 22 to 23 hrs after priming dose.

Cryopreservation of *M. cephalus* milt

During the period November - December 2000, oozing males of *M. cephalus* (weight range 200 - 350 g) were collected from the sea catch at Kovalam and the milt was cryopreserved in the extender Fish Ringer with 5% DMSO (Dimethyl sulphoxide) as cryoprotectant (dilution of milt : extender = 1:3), as per protocol standardized earlier. A total volume of 1.8 ml of milt was cryopreserved for fertilization experiments.

Maintenance of captive *M. cephalus* broodstock at Narakkal

At Narakkal, a captive stock of *M. cephalus* (25 adult fishes of weight range 250 - 500g) were maintained in a 0.02 ha pond, on a diet of formulated pelleted feed @ 4% of body weight per day. The water quality parameters and health of fishes were regularly monitored. As the pond water salinity remained low (8-20 ppt), six fishes were transferred to a 10 t FRP tank, holding sea water of salinity 32 to 34 ppt and pH 7.8 to 8.2. However, there was no progress in gonadal development.

Polyculture of finfishes and shrimp at Kakdwip

A polyculture trial of finfishes *viz., Liza parsia* (6,666 nos/ha), *L. tade* (6, 666 nos/ha) and *Etroplus suratensis* 333 nos/ha and shrimp *viz., P. monodon* 10,000 nos/ha, was initiated in April 2000 in a 0.275 ha tide-fed pond at Kakdwip. The fishes were reared on a diet of formulated feed @ 3% of stocked biomass daily. The survival of fishes and shrimps was affected due to poor water quality. The pond was restocked in September 2000 with *P. monodon* (3,000 nos) *L. parsia* (1,000 nos) and *L. tade* (1,000 nos).

Polyculture of finfishes and shrimp at Narakkal

A polyculture experiment of finfishes and shrimp was successfully undertaken at Narakkal in a 0.05 ha tide-fed pond from July 1999 to March 2000. *M. cephalus*, *Liza parsia* and *Etroplus suratensis* were stocked along with shrimp *P. monodon* and *P. indicus*. Details are given in Table 3.

Table 3

Details of Polyculture experiment at Narakkal

Culture details	Species				
	M. cephalus	*L. parsia*	*E. suratensis*	*P. monodon*	*P. indicus*
Mean size at stocking (mm/g)	25/0.16	25/0.16	58/8	23.3/0.3	0.3
Stocking density (No./ha)	12,000	4,000	3,800	12,000	12,000
Mean size at harvest (mm/g)	250/154.5	161.6/35.6	178/134	152/28.8	100.7/5
Culture duration (days)	250	250	215	130/190	84
Yield (kg/ha)	1115	40	318.8	82	8.5
Recovery rate (%)	69	27	70	32	14

2. Controlled breeding and seed production of grouper *Epinephelus tauvina* (FCD/B&C/2)

A captive broodstock of grouper *E. tauvina* (43 fishes, 1.5 to 7.0 kg) was maintained in a 100 ton RCC tank at the Muttukadu Experimental Station. The fishes were fed on a diet of frozen trash fish (*viz.*, *Tilapia*) @ 5% of body weight daily. Water quality and health of fishes were regularly monitored.

The fishes were regularly examined for their maturity status at the time of collection and thereafter at regular intervals. All fishes were observed to be immature females. During November 2000, one female fish (310 mm/3.0 kg) was observed to have an average ova diameter of 328 µm.

In order to overcome the problem of lack of males, sex conversion of fishes was attempted from August 2000 onwards, using the hormone Methyltestosterone (MT). The hormone was administered in the form of a pellet, prepared using cholestrol as matrix and gum acacia as binder, through feed, every alternate day @ 2 mg/kg body weight. No oozing males were observed in the treated stock.

Cage culture of grouper

Juvenile *E. tauvina* fishes (size range 123 to 158 mm/23 to 62 g) were stocked in a rectangular net cage of area 54 sq.m (9 x 6 x 1), fixed in a pond, having an average water depth of 1 meter, at Muttukadu, during March 2000. The fishes were fed with Tilapia @ 5% of body weight daily. After seven months of culture, an average growth of 365 mm/618 g (range 330 - 390 mm/360 - 800 g) was attained.

Cryopreservation of *E. tauvina* milt

Cryopreservation of milt of *E. tauvina* was successfully carried out using a suitable cryodiluent consisting of a combination of extenders *viz.*, Fish Ringer and 5% glucose solution along with the cryoprotectant dimethylsulphoxide. Percentage of pre-freeze motility in this cryodiluent ranged from 80 - 90%. The post-

thaw motility after 13 months of storage in liquid nitrogen ranged between 20 - 30%.

3. Breeding, seed production and culture of seabass *Lates calcarifer* (FCD/B&C/3)

Technology for breeding and seed production of seabass

The technology for breeding and seed production of captive seabass, developed by CIBA was further refined aiming at better survival and growth of fry. A viable captive broodstock (48 fishes in the weight range 1.5 to 10.0 kg) was maintained in two RCC holding tanks (100 ton capacity) @ 1 kg/m^3. The fishes were fed on a diet of frozen trash fish *viz., Tilapia* @ 5% of body weight daily. The tanks were cleaned on alternate days. 70 to 80% of water exchange was effected daily with fresh saline water drawn from an inter-tidal borewell. The water quality and health of fishes were regularly monitored.

Ectoparasitic infection (Copepods *viz., Caligus* sp., *Lernanthropus* sp. and monogenic trematodes *Diplectanum latesi*) was controlled by bath treatment with an organophosphorus pesticide Dichlorovos @ 1ppm/formalin @ 100 ppm, for one hour.

The fishes matured in the holding tank under captive conditions without any hormonal/ environmental manipulation. Mature fishes were observed during the months of June to November 2000. A total of 11 induced breeding trials were carried out (Table 4). Females with ova diameter above 0.450 mm and oozing males were injected intramuscularly with Luteinizing Hormone Releasing Hormone analogue (LHRHa) @ 70 µg/kg and 35 µg/kg body weight for females and males, respectively. Spontaneous spawning was observed in 10 trials and among these second spawning was also observed in 8 cases. The fertilization rate ranged from 56-80% in the first spawning and 40-62% in the second spawning.

The hatching rate varied from 61 to 90% in the first spawning and 58 to 92% in the second spawning. A total of 40.6 lakh hatchlings were produced during the year.

Table 4
Details of breeding experiments of seabass, *Lates calcarifer*

Sl. No.	Date	Wt. of fish (female) (kg)	No. of eggs spawned (in million)		Fertilization %		Hatching %		No. of hatchlings (in million)		Remarks
			1st spawning	2nd spawning	1st spawning	2nd spawning	1st spawning	2nd spawning	1st spawning	2nd spawning	
1.	26.05.00	6	Not spawned								
2.	12.06.00	7	1.18	0.96	63	60	76	70	0.56	0.40	Total hatchlings produced: 5.52 million Out of this 4.06 millions were further reared.
3.	24.06.00	4	0.98	1.21	51	53	43	54	0.21	0.35	
4.	10.07.00	8	1.30	0.70	59	49	58	61	0.44	0.21	
5.	23.07.00	5	0.80	0.96	80	61	90	48	0.58	0.28	
6.	07.08.00	7	0.93	1.04	56	48	46	40	0.24	0.20	
7.	22.08.00	6	1.00	0.48	68	62	58	62	0.39	0.18	
8.	06.09.00	6.5	0.96	-	64	-	60	-	0.37	-	
9.	20.09.00	6	1.02	0.86	60	40	56	58	0.35	0.20	
10.	05.10.00	7	0.93	-	54	-	61	-	0.31	-	
11.	20.10.00	6	0.56	0.50	48	51	45	50	0.12	0.13	

The hatchlings were reared upto fry stage in the hatchery following standard protocol developed earlier. Average survival rate of fry was 8% upto 21 days. A total of 4.3 lakh fry were produced. Prophylactic bath treatment with 10 ppm furozolidone or 50 ppm formalin was given to the fry to control bacterial infection (*Vibrio anquillarum).*

Hatchery produced fry were sold to farmers/entrepreneurs and Govt. organizations *viz.*, Poyya Farm, Kerala (Agency for Development of Aquaculture Kerala), RGCA farm, Myiladuthurai (MPEDA), Andaman Farm, Andaman & Nicobar Islands (CARI), Kausalyaganga Farm, Bhubaneshwar (CIFA), for nursery and grow-out culture. Feedback information on growth and survival were collected.

Culture of seabass

Culture of seabass was taken up in a 0.15 ha pond at Muttukadu. Seabass seed (average size 4.4 cm / 3.86 g) were stocked @ 2400 nos./ha. The fishes were fed on a diet of minced fish meat @ 20% of body weight, initially for a period of two months. Subsequently, the fishes fed only on forage fish *viz., Tilapia* growing in the same pond.

Technical guidance was provided for the culture of seabass in a farm at Kerala (ADAK) using the seed produced by the CIBA fish hatchery at Muttukadu.

Studies on genetic improvement of seabass

A preliminary study on genetic improvement of seabass was taken up through ploidy manipulation. Fertilized eggs of seabass were subjected to temperature shock. (ambient temperature - 27°C and experimental temperatures: 32, 37, 40 and 45°C). Improved hatching rates were observed at 40°C and the larvae were reared upto 45 days.

Pathological studies in hatchery produced seabass larvae/juveniles

Incidence of disease was observed in *Lates calcarifer* juveniles (120 days post hatch) reared in the Institute's hatchery. Clinically, the moribund fishes showed haemorrhages at the base of dorsal, pectoral and anal fins. Histopathological studies of infected tissues revealed marked internal haemorrhages in the kidney, fatty degeneration of pancreatic tissue and necrotic sloughing of the intestinal microvilli. *Vibrio anquillarum* - like (VAL) bacteria were isolated from the aseptic kidney of the moribund fish.

L. calcarifer juveniles were exposed to graded levels of VAL bacteria via bath treatment. A cell density of @ $10^{6.3}$ CFU per ml of bath solution could kill half of the exposed population. Experimentally injected fish showed muscular degeneration, extensive epithelial hyperplasty of body and gill surfaces and gill chamber similar to that observed in naturally infected fishes.

Consistently similar clinical and histopathological manifestations of *Vibrio* infection in seabass larvae (2 to 3 months old), during the period 1997-2000, under hatchery conditions, indicated that an Early Development Stage Syndrome (EDSS) occurred in the Institute's hatchery-reared seabass. Probable involvement of viral etiology in EDSS occurrence in seabass will be further investigated through electron microscopy and tissue culture studies.

NUTRITION PHYSIOLOGY & PATHOLOGY DIVISION

Research Projects

1.	**Title of project**	: Development of feeds for aquaculture of brackishwater shellfish and finfishes (NPPD/NT/1)
	Project Leader	: Dr.S.A.Ali
	Location of project	: Chennai and Kakdwip
	Associates	: Dr.M.Natarajan, Dr.C.Gopal, Dr.K.Ambasankar, Dr.J.Syamadayal, Dr.Tapaskumar Ghoshal
2.	**Title of project**	: Development of probiotics for disease tolerance / resistance in shrimp (NPPD/DIS/2)
	Project Leader	: Shri.S.V.Alavandi
	Location of project	: Chennai
	Associates	: Dr.K.K.Vijayan, Dr.K.P.Jitendran, Dr.M.Poornima
3.	**Title of project**	: Development and evaluation of immunodiagnostics and prophylactics for important brackishwater fish and shellfish (NPPD/PATH/1)
	Project Leader	: Dr.I.S.Azad
	Location of project	: Chennai
	Associates	: Dr.M.Poornima

Progress of Work

1. Development of feeds for aquaculture of brackishwater shrimp and finfishes (NPPD/ NT/1)

Determination of dietary protein requirement for seabass *Lates calcarifer* fingerlings

The dietary protein requirements for seabass *L. calcarifer* fingerlings were determined based on a feeding trial (30 days duration) using five different formulated diets, with protein levels at 27, 31, 35, 39 and 43%, prepared using indigenous feed ingredients *viz.*, fish meal, squid meal, shrimp meal, soybean meal, corn gluten, fish oil and other additives. Results indicated that the diet with 43% protein produced significantly higher growth (162%) and better FCR (2.01).

Development and testing of freeze-dried diet for seabass larvae

Seabass *L. calcarifer* larvae (20 days old) were successfully reared with a freeze-dried formulated diet (100 micron size), having a protein content of 55.2%, prepared using squid meal, shrimp meal, fish meal, soybean meal and other additives. The feeding trial was carried out with a batch of 300 larvae reared for a period of 15 days in a 500 litre FRP tank. A control diet consisting of *Artemia* nauplii was supplied to another group of larvae. At the end of the trial, it was shown that survival of larvae fed with test diet was 70%, with uniform size of larvae, whereas in the control group, the survival was 60%, with differential growth of larvae.

Identification of feed attractants for seabass grow-out feeds

With a view to improve the acceptability and efficiency of formulated grow- out diets developed for seabass *L. calcarifer*, various feed attractants *viz.*, betain, glutamic acid, methionine and trimethylamine were tested. These substances were individually incorporated at two different levels *viz.*, 0.1 and 0.2% in a practical diet formulated using indigenous feed ingredients such as fish meal, squid meal, shrimp meal, soybean meal, corn gluten and other additives. The experimental

diets were fed to the fingerlings of seabass (average weight 10g). The percentage of feed consumption over a fixed period of time was observed and the results were confirmed by repeated trials. A control diet was also simultaneously tested. Results indicated that trimethylamine followed by glutamic acid have gustatory stimulant properties and could be used as feed attractants.

Determination of dietary protein requirements for the mud crabs *Scylla serrata* and *S. tranquebarica*

Preliminary experiments conducted earlier had indicated that formulated feeds were readily accepted by the mud crabs *S. serrata* and *S. tranquebarica*. Further experiments were conducted to determine the dietary protein requirements for these mud crabs. Five practical diets prepared with indigenous feed ingredients such as shrimp meal, squid meal, fish meal, soybean meal, corn gluten and other additives, having different protein levels ranging from 31 to 47%, were tested on juvenile crabs of *S. serrata* in a feeding trial of 45 days duration. The diet with 39% protein gave the highest growth and optimum feed conversion efficiency. Similar results were obtained with the mud crab *S. tranquebarica*.

Effect of the enzyme phytase on the dietary phosphorus requirement in shrimp *P. indicus*

With the objective of improving the bio-availability of phosphorus through phosphorus supplementation in feed, the enzyme phytase was added to a shrimp feed and the effect of phytase on phosphorus availability was studied in *P. indicus*. Phytase was added at 0.5% level to a practical diet having natural phosphorus at 1.0 % level and tested on a batch of juvenile shrimp. The same practical diet without phytase but supplemented with additional phosphorus at 0.5% level was also tested with another batch of juvenile shrimp. A control diet without phytase or the additional phosphorus was also tested. At the end of the feeding trial (duration 45 days) it was observed that the shrimp fed with the diet without phytase but with phosphorus supplementation, exhibited better growth and FCR compared to the control batch or the batch with phytase treatment. This indicated that the enzyme phytase did not play a role in improving the availability of the natural phosphorus present in the feed.

Preparation and processing of shrimp feed for farmers

Shrimp feed was prepared and processed by the Institute and supplied to farmers (ingredients were provided by the farmers), against individual orders, with levy of processing charges. Two shrimp farmers, one at Ponneri and the other at Mahabalipuram, applied this feed technology for taking up extensive culture of tiger shrimp *P. monodon* and the feedback information on grow-out culture was collected. Using the feed (proximate composition: protein 39.16, fat 7.53, carbohydrate 24.5, fibre 5.12) one farmer at Mahabalipuram, obtained a production of 1820 kg shrimp / ha / crop (4 months). A total revenue of Rs.23,462/- was generated by CIBA during January to December 2000, by undertaking shrimp feed processing for farmers.

2. Development of probiotics for disease tolerance/resistance in shrimp (NPPD/DIS/2)

This project was initiated in April 2000 and aimed at identification and isolation of gut bacterial flora from wild and captive shrimp, *P. monodon* and *P. indicus*; characterization of bacteria using biochemical and molecular typing methods; development of a stock of well characterized bacterial strains and testing of selected strains for their ability to induce disease tolerance/resistance in shrimp.

During the period under report, captive shrimp *P. monodon* (12 nos) and *P. indicus* (6 nos) and wild fishes *L. calcarifer* (6 nos), *Tilapia mossambica* (6 nos) and *Therapon jarbua* (5 nos), were screened for intestinal bacterial flora. The bacterial load in shrimp was found to be 10^7 per gram while that of fish was 10^{7-8} per gram of gut contents. A

total of 134 bacterial cultures were isolated and subjected to detailed morphological, physiological and biochemical tests. Antibiotic resistance markers of the bacterial isolates were determined for 71/134 isolates towards the following antibiotics *viz.*, kanamycin, gentamycin, chloramphenicol, tetracycline, oxytetracycline, neomycin, streptomycin, erythromycin, furozolidone, ciprofloxacin and polymycin B.

3. Development and evaluation of immunodiagnostics and prophylactics for important brackishwater fish and shellfish (NPPD/PATH/1)

This project was initiated in April 2000, with the objective of developing suitable immunological diagnostic techniques and prophylactic measures for prevention of bacterial diseases in brackishwater fish and shellfish. The technical programmes under the project include (i) production, purification and characterization of *Tilapia* immunoglobulins (IgM), (ii) production and quantification of anti IgM antibodies in rabbit, (iii) development and evaluation of *Vibrio* vaccine for brackishwater fish.

During the period under report, two experiments on the immune response of *Tilapia* (*Oreochromis mossambicus*) were carried out. In the first experiment, rabbit immunoglobulin (IgM) was used as a standard antigen for eliciting immune response in Tilapia. A total of 150 fishes (average weight 15 $\pm$ 0.34 g), 50 nos each, in control, primed and boosted groups, were taken. The primed and boosted fishes were injected, intraperitoneally with 0.4 mg Rabbit IgG/per fish. The control group was injected with phosphate buffer saline. Blood samples were drawn from all three groups at 7, 14, 21, 28 and 35 days post-injection (dpi). Antibody titres from the samples were estimated using standard ELISA protocols, and the readings were taken on ELISA plate reader and expressed as OD values. Preliminary results indicated the ability of *Tilapia* to elicit significant primary response and memory factor to rabbit IgG.

In the second experiment, *Tilapia* (30 fishes, average weight 20 $\pm$ 2.5 g) were injected with rabbit IgG mixed with Freund's complete adjuvant (FCA) @ 0.4 mg/fish and another batch of 30 fishes were boosted keeping the dosage same, with IgG in Freund's incomplete adjuvant. The control group (30 fishes) was injected with sterile phosphate buffer saline. Results indicated that there was a significant enhancement in the levels of anti-IgG antibodies in *Tilapia* injected with adjuvated antigens.

Immune response of *Liza macrolepis* to heat - killed and formalin - killed *Vibrio anguillarum*

This work was taken up with the aim of evaluating the mode of presentation of the bacterial pathogen *Vibrio angillarum*, isolated from diseased seabass *Lates calcarifer*, to the immune system of *Liza macrolepis* in eliciting protection and humoral response. Humoral response is measured as agglutination titres. Results indicated that formalin - killed bacterial preparations elicited better response than heat - killed cells.

GENETICS & BIOTECHNOLOGY DIVISION

Research Projects

1. Title of project	:	Application of molecular genetics and biotechnology in genetic characterization, stock improvement and health care of finfish and shellfish (GBD/MG/1)
Project Leader	:	Dr.T.C.Santiago
Location of project	:	Chennai and Puri
Associates	:	Dr.N.Kalaimani, Dr.G.Gopikrishna, Dr.K.K.Vijayan and Dr.C.P.Balasubramaniam

Progress of Work

1. Application of molecular genetics and biotechnology in genetic characterization, stock improvement and health care of finfish and shellfish (GBD/MG/1)

Genetic characterization of finfish and shellfish of economic importance

Genetic characterization studies were carried out with respect to two species of mud crab *Scylla serrata* and *S. tranquebarica*. The chromosomes were obtained from testes of adult male crabs. The protocol for karyological work was standardized. The haploid chromosome number in *S. serrata* and *S. tranquebarica* was observed to be 53 and 51 respectively (modal values).

Studies on stability of white spot disease virus

Laboratory experiments were conducted to determine the stability of shrimp white spot disease virus and its ability to cause infection through horizontal transmission. Sub-adult *P. monodon* were challenged with virulent white spot virus inoculum (incubated for varying periods) and subsequently fed with pelleted feeds. Results obtained using Polymerase Chain Reaction technique indicated that the inoculum over different periods induced infection and caused mortality, indicating the stability of the virus and its ability to infect through horizontal transmission

Routine health monitoring of shrimp/fish broodstock at the Institute's broodstock holding facility

Routine health monitoring of seabass *Lates calcarifer* and grouper *Epinephelus tauvina* broodstock maintained in the holding tanks at the Muttukadu Experimental Station was regularly carried out. Observations on dissolved oxygen, salinity, pH, ammonia, nitrite and bacterial profile from water sources and broodstock tanks were made at fortnightly intervals.

AQUACULTURE ENGINEERING AND ENVIRONMENT DIVISION

Research Projects

1. Title of project	:	Environmental management of aquaculture systems (AEED/EM/1)
Project Leader	:	Dr.B.P.Gupta
Location of project	:	Chennai and Kakdwip
Associates	:	Dr.K.O.Joseph, Dr.K.K.Krishnani, Dr.M.Muralidhar and Shri R.K.Chakraborti
2. Title of project	:	Development of techniques for preventing/controlling seepage in brackishwater ponds (AEED/AE/2)
Project Leader	:	Dr.K.O.Joseph
Location of project	:	Chennai
Associates	:	Smt. P.Nila Rekha and Dr.M.Muralidhar
3. Title of project	:	Comprehensive study on impacts of shrimp farming (AEED/CI/1)
Project Leader	:	Dr.P.Ravichandran
Location of project	:	Chennai
Associates	:	Dr.B.P.Gupta, Dr.K.O.Joseph, Dr.M.Muralidhar, Dr.K.K. Krishnani, Dr.K.K.Vijayan, Dr.M.Krishnan, Shri A.Panigrahi and Dr.M.Kumaran

Progress of Work

1. Environmental management of aquaculture systems (AEED/EM/1)

Data base on soil / water quality and biological production of extensive and traditional shrimp culture systems

In order to have a database on water and soil quality of extensive and traditional shrimp culture systems, commercial shrimp farms located at Pooncheri (near Mahabalipuram), Nanamedu and Agaram (near Chidambaram) in Tamil Nadu; Pantapalem (near Nellore) and Lakshmipathipuram (near Kakinada) in Andhra Pradesh; Pizhala, Poyya and Appangad in Kerala; Belpukur, Battala, Maharajganj and Henry's island in West Bengal, were monitored regularly and the culture details were also collected.

Tamil Nadu

The water source for the farm at Pooncheri is the Buckingham Canal. The first crop (*P. monodon*) for the year, was initiated in April 2000 at a stocking density of 75,000 nos./ha. This crop was harvested in August 2000 (production 2,000 kg/ha/135 days). Water salinity ranged from 42-60 ppt. Total ammonia N and nitrite N of pond water ranged from 0.02 - 0.480 ppm and 0.012 - 0.024 ppm, respectively. Organic carbon content in soil ranged from 0.080 to 0.224%.

At Nanamedu farm, the water source is Vellar estuary. Two crops were harvested during the period under report. The first crop stocked in November 1999 (stocking density of *P. monodon* 50,000/ha) was harvested in April 2000 (production 1,080 kg/ha/140 days). Water salinity ranged from 19-31 ppt. Redox potential of pond soil ranged from -58 to -185 mV. Pond soil was alkaline (pH 8.1 - 8.7) in reaction. Organic carbon content in soil ranged from 0.118 to 0.324%. The second crop (stocking density of *P. monodon* 80,000/ha) was stocked in May 2000 and harvested in August 2000. The yield was 2,100 kg/ha in 118 days.

At Agaram, the source of water for the farm is Pennaiyar creek. *P. monodon* stocked in February 2000 @ 50,000/ha was affected with white spot viral infection with no production.

Andhra Pradesh

The farm at Lakshmipathipuram gets source water from Vadalanalli creek. The shrimp crop stocked in May 2000 was affected with white spot disease and production was nil.

At Pantapalem, the source water for the farm is Nakkala Kaluva. The shrimp *P. monodon* was stocked in April 2000 at a stocking density of 8/m^2. Pond salinity ranged from 5 to 12 ppt and pH 7.3 to 7.4. Redox potential of pond soil ranged from -110 to -185 mV. Crop was harvested in July 2000 due to outbreak of white spot viral disease (production 300 kg/ha). In the same farm, culture of *Macrobrachium rosenbergii* was started in August 2000.

Kerala

Improved traditional culture of *P. monodon* was practised in the shrimp farms located at Poyya, Pizhala and Appangad. In all the three farms, white spot disease affected the first crop stocked in December 1999 and there was no production. The next crop was stocked in December 2000. Stocking density of shrimp (*P. monodon)* was 20,000 nos./ha at Poyya, 30,000 nos./ha at Appangad and 75,000 nos./ha at Pizhala. During the culture period, the water quality parameters were: at Poyya, the pond water salinity ranged from 4 - 5 ppt, water was slightly acidic (pH: 6.3 - 6.4) and redox potential -160 to -190 mV; at Pizhala, the water salinity ranged from 1 to 4 ppt, water was slightly acidic (pH: 6.23 - 6.81) and at Appangad, the water salinity ranged from 5 to 9 ppt and water was slightly acidic (pH: 6.73 - 6.98).

West Bengal

Four farms were monitored in West Bengal, one each at Belpukur, Battala, Maharajganj and Henry's Island. All the farms recorded very poor production of *P. monodon* ranging from 218 - 316 kg/ha/crop. The farm at Belpukur and Battala used tidal water for flushing and entry of tide-borne seed. The other

two farms used seed collected from the wild. The stocking density was maintained at 2 nos./ m^2 in all the farms. No input or fertilizer was provided.

Environmental impact assessment of extensive shrimp culture systems and coastal hatcheries

Extensive shrimp culture farms selected for environmental impact assessment studies were located at Kandakkadu, Nanamedu and Parangipettai in Tamil Nadu. In order to observe soil salinisation near shrimp farms, the soil samples were collected at a distance of 0, 50, 100, 250 and 500 m away from the shrimp farm towards the village and drinking water samples were collected from bore wells situated in the adjoining villages.

Kandakkadu

At Kandakkadu (where onion crop is grown), there was no soil salinisation even at 0 m distance from the farm, as indicated by low electrical conductivity values (0.01 - 0.95 dS/m. The soil pH ranged from 5.46 to 8.69. The pH of borewell water ranged from 7.3 - 8.1. The chloride and total dissolved solids concentration in borewell water ranged from 112 - 602 ppm and 275 - 474 ppm, respectively.

Nanamedu

In Nanamedu (where onion and brinjal crops are grown), no soil salinisation was observed at a distance of 50 m away from the farm, as indicated from the range of electrical conductivity values (0.20 to 2.56 dS/m). Soil pH ranged from 6.08 to 9.4. The pH of borewell water ranged from 7.3 to 8.4. The total dissolved solids (TDS) concentration of borewell water ranged from 1435 - 2624 ppm and chloride values from 625 - 1470 ppm. These concentrations were above normal range.

Parangipettai

In Parangipettai (where paddy crop is grown), there was no salinisation as indicated by the range of electrical conductivity values (0.12 to 2.65 dS/m). Soil pH ranged from 5.23 - 9.24. The pH of borewell water ranged from 7.2 to 7.6. The concentration of chlorides and TDS ranged from 412 - 1134 ppm and 1098 - 2406 ppm, respectively.

2. Comprehensive study on the impacts of shrimp farming (AEED/CI/1)

A survey to assess the environmental and socio-economic impacts of shrimp farming was carried out in the East Godavari district of Andhra Pradesh, during March 2000. A detailed survey of shrimp culture practices and water quality/feed/health management measures adopted by farmers was undertaken in 8 mandals of the district *viz.*, Tallarevu, U.Kothapalli, I. Polavarum, Katterikona, Uppalakuptam, Allavaram, Mamidikudum and Rajolu. A questionnaire-based socio-economic survey was carried out in 30 villages. A brief summary of the impact study is presented below:

Shrimp farming practices

Hatchery produced shrimp seed was generally used for stocking @ 4 to 7 nos./sq.m. Pelletised imported feeds were fed to shrimps. Feed attractants like Biotrix or Biomax and probiotics, etc., were incorporated in the feeds. The farmers regularly monitored the soil and water quality (water exchanged once in 7 to 10 days). Aerators were used @ 2 nos./ha. Production ranged from 0.8 to 2 tons/ha/crop (120-150 days) of *P. monodon* of average weight 30 g for summer crop and 0.5 - 1.0 ton/ha for winter crop. Price of shrimp per kg varied from Rs.275 to 400.

Environmental impacts

A study of the water quality of farms/ ponds and source/creek water/irrigation canals indicated that ammonia-N and chemical oxygen demand (COD) values were within permissible levels. Soil quality of agricultural fields adjacent to shrimp farms was also checked. Electrical conductivity of soil ranged between 1.0 to 1.89 dS/m, which indicated that shrimp farming had no adverse effect on salinisation of soil.

Socio-economic impacts

A majority of the farmers had farm holdings less than 5 ha and about one third (33.33%) had holdings more than 5 ha. Most of the farmers (73.33%) were also engaged in other occupations like agriculture, especially paddy and coconut plantation and business in addition to shrimp farming. The major source of

information on seed quality, disease management, feed management etc., was provided by feed technicians, fellow farmers and State Fisheries Dept. personnel. Most of the farmers availed input on credit basis from local traders and sold their produce through a buy-back arrangement system between farmer and trader.

Labourers employed on the farm for pond construction, pond preparation, harvest and post harvest activities comprised of both men and women. Wages ranged from Rs.50 - 60/day for men to Rs.30-40/day for women.

Womenfolk actively participated in shrimp farming activities such as pond construction, seed segregation, seed collection, de-weeding of pond, harvesting by hand picking, grading, counting and weighing of harvested crop and de-heading and icing of shrimp. Women were able to get a regular employment for 4 to 5 months in a year in addition to their agricultural employment. Approximately, a woman labourer could earn Rs.1200 per month.

Increased income has raised the standard of living of people in coastal villages. Local infrastructure facilities like roads, communication and transport facilities had developed significantly in these areas due to shrimp farming activities. Growth of ancillary industries like hatcheries, feed companies, lime/ earth movers, etc., had provided considerable employment to local people.

Some of the constraints faced by shrimp farmers included problems of shrimp disease particularly white spot virus disease, poor seed quality, inadequate technical guidance, lack of credit and insurance, etc.

3. Development of techniques for preventing/controlling seepage in brackishwater ponds (AEED/AE/2)

The physico-chemical characteristics and seepage rate of soil samples collected from different coastal areas *viz.*, Nellore, Kokilamedu, Thiruporur and Muttukadu were estimated using standard methods. The seepage rate was higher in Muttukadu soil (0.000423 cm/sec) as the sand content was higher, while that of Thiruporur soil was lower (0.00000117 cm/sec) as clay content of the same was higher.

A field study on estimation of seepage rate was conducted in three shrimp culture ponds situated at Kokilamedu. The physio-chemical characteristics were analysed and found to range from: bulk density 1.14 to 1.25 g/cm^3, porosity 31.25 to 35.29%, clay content 30.5 to 36.5% and sand content 52.5 to 55.55%. The seepage rate ranged from 2 to 2.5 cm/day.

A laboratory scale model was fabricated to test different low-cost fibrous/porous materials for controlling seepage in brackishwater ponds.

EXTENSION, ECONOMICS AND INFORMATION DIVISION

Research Projects

1.	**Title of project**	: Development of database system for brackishwater fishery resources (EEID/Extn/02)
	Project Leader	: Dr.M.Krishnan
	Location of project	: Chennai
	Associates	: Dr.K.Gopinathan (upto September 2000), Dr.N.Kalaimani, Dr.T.Ravisankar, Shri V.Chellapandian, Shri K.Ponnusamy, Dr.M.Kumaran, Dr.(Smt.) Ch. Sarada and Smt.P.Mahalakshmi
2.	**Title of project**	: Extension approaches for sustainable shrimp and fish farming
	Project Leader	: Dr.K.Gopinathan (upto September 2000) Dr. N.Kalaimani (from October 2000)
	Location of project	: Chennai
	Associates	: Dr.M.Krishnan, Dr.T.Ravisankar, Shri V.Chellapandian, Shri K.Ponnusamy, Dr.M.Kumaran, Dr.(Smt.) Ch. Sarada and Smt.P.Mahalakshmi

1. Development of database system for brackishwater fishery resources (EEID/ Extn/02)

During the period under report secondary statewise data collection pertaining to Andhra Pradesh and Kerala *viz.*, area under brackishwater aquaculture; shrimp/fish culture production and productivity; number of shrimp hatcheries, feed mills and processing plants; area of agricultural land converted for aquaculture; number of farms situated within CRZ, etc., was carried out with the help of State Fisheries and Agriculture Depts. of Andhra Pradesh, regional offices of MPEDA and State Fisheries Dept. and Agency for Development of Aquaculture Kerala. Secondary data were also collected from published sources like Fishing Chimes, Seafood Export Journal, MPEDA Newsletter, etc.The data collected from Nagapattinam district of Tamil Nadu, Karaikal district of Pondichery and East Godavari district of Andhra Pradesh was analysed and incorporated into the Institute database. Updation of data relating to brackishwater fishery resources of Tamil Nadu was done with the help of State Fisheries Department of Tamil Nadu.

The local Area Network (LAN) was commissioned and utilized for network analysis. The Institute website was modified and updated.

2. Extension approaches for sustainable shrimp and fish farming (EEID/ Extn/03)

A comprehensive proforma was designed for collection of data pertaining to adoption of shrimp farming practices, training needs of farmers, women's role, impact of shrimp farming, etc. Three surveys were undertaken during the period under report. During February 2000, 15 farms in Nagapattinam district of Tamil Nadu and 9 farms in Karaikal district of Pondichery were surveyed covering a water spread area of 44 and 25 ha, respectively. The farm area varied from 0.8 to 10 ha. Most of the farmers followed modified extensive culture of *P. monodon* (stocking density 5-6 nos./m^2). Production varied from 750 - 1,300 kg/ha/crop. Occurrence of white spot virus infection was reported in some of the farms. Assessment of farmers' needs showed that farmers required training on shrimp disease prevention, diagnosis and health management.

During March 2000, 16 farms in the East Godavari district of Andhra Pradesh, covering a water spread area of 110 ha were surveyed. The farmers in this area practised agriculture in addition to shrimp farming. Extensive culture of *P. monodon* was practised both as summer and winter crop using hatchery produced seed. Commercial shrimp feeds were used. Production varied from 500 - 2,000 kg shrimp / ha/ crop. Though general information on shrimp culture practices was extended to farmers by the State Dept. of Fisheries, many of the farmers required training on shrimp disease prevention, diagnosis and health management, water quality management, seed selection, etc.

During March 2000, 20 shrimp farms in Krishna district of Andhra Pradesh covering a total water spread area of 60 ha were surveyed. The survey indicated that 50% of the farms had taken up extensive culture of tiger shrimp *P. monodon* under low saline conditions. Commercially prepared feeds were used and the yields ranged from 200 to 700 kg/ha/crop. Assessment of farmers' needs indicated that the farmers of this area required training for *P. monodon* culture under low saline conditions.

Women's role in shrimp farming includes involvement in pond preparation, seed segregation, seed stocking, feed management, harvest of shrimp and, grading, processing and packing of shrimp.

5. TECHNOLOGY ASSESSED AND TRANSFERRED

The following technologies/knowledge-base developed by the Institute were extended during the year to progressive fish farmers/ private entrepreneurs/officials of State Fisheries Dept. /BFDA officials/Scientists from ICAR Fisheries Research Institutes/ officials from MPEDA and other Govt. agencies, etc., through short-term training programmes.

1. Mud crab (*Scylla spp.*) broodstock development, breeding and culture (19-24 June 2000)

The technology on mud crab (*Scylla* spp.) captive broodstock development, induced maturation, breeding and production of berried females and guidance on mud crab culture practices including fattening were extended to one scientific and two technical personnel from CMFRI and four officers from the State Fisheries Department of West Bengal.

2. Seabass (*Lates calcarifer*) breeding and seed production (11-20 July 2000)

The technology for seabass *L.calcarifer* captive broodstock development, breeding and seed production was extended to two officials from MPEDA and one associate professor from College of Fisheries, Panangad, Kerala.

3. Shrimp disease and health management (2-11 August 2000)

Information on shrimp disease diagnosis and health management was extended to an official from the State Fisheries Dept. of West Bengal.

4. Shrimp breeding and hatchery technology (11-25 September 2000)

The technology for shrimp (*P.monodon* and *P.indicus*) breeding and hatchery technology was extended to two officials from the State Fisheries Dept. of Kerala and one farmer from Machilipatnam, Andhra Pradesh.

5. Application of genetics and biotechnology in aquaculture (16-21 October 2000)

Information on application of genetics and biotechnology in aquaculture were extended to four officials from the State Fisheries Dept. of Andhra Pradesh and three technical personnel from the private shrimp culture sector.

6. Environmental impact assessment of brackishwater shrimp farming (21-30 November 2000)

Information on Environmental impact assessment in relation to brackishwater shrimp farming and soil and water quality management for shrimp farms was extended to two officials from the State Fisheries Dept. of West Bengal.

6. TRAINING AND EDUCATION

The Institute conducted short-term training programmes on several aspects of brackishwater aquaculture regularly on a calendar-basis (The training programmes conducted by CIBA during January to December 2000 are mentioned in Chapter 5).

Lectures and demonstrations on brackishwater aquaculture were arranged for the following at the headquarters and Muttukadu Experimental Station :

- 16 students (B.F.Sc.) from College of Fisheries, Ratnagiri, Maharashtra, 10 January 2000.
- 20 trainees (MFVL) from CIFNET, Chennai, 10 January 2000.
- 42 students from CIFE, Calcutta, 29 January 2000
- 40 Probationary Officers/Agricultural Extension Officers from State Bank of India, 3 February 2000.
- 31 students (M.Sc., Zoology) from Ethiraj College for Women, Chennai, 11 February 2000.
- 19 trainees from Fisheries Staff Training Institute, Govt. of Tamil Nadu, Chennai, 19 February 2000.
- 10 students (B.F.Sc.) from College of Fisheries Sciences, G.B.Pant University of Agriculture and Technology, Pant Nagar, Uttar Pradesh, 4 April 2000.
- 9 trainees from Fisheries Staff Training Institute, Govt. of Tamil Nadu, 27 May 2000.
- 18 students (B.F.Sc.) from Faculty of Fisheries Sciences, West Bengal University of Animal Sciences, Nadia, West Bengal, 15 June 2000.
- 9 trainees from Fisheries Staff Training Institute, Govt. of Tamil Nadu, 13 July 2000
- 8 trainees from Fisheries Staff Training Institute, Govt. of Tamil Nadu, 13 August 2000.
- 5 students (B.Sc., Geography) from University of Madras, 18 August 2000
- 39 students (B.F.Sc.) from College of Fisheries, Mangalore, 19 August 2000
- 6 trainees from Fisheries Staff Training Institute, Govt. of Tamil Nadu, 30 August 2000.
- 21 students (B.Sc., Zoology) from PRNSS College, Mattannur, Kannur district, Kerala, 5 October 2000.
- 16 trainees from Fisheries Staff Training Institute, Govt. of Tamil Nadu, 12 October 2000.
- A group of students (M.Sc., Microbiology and Marine Biotechnology) from the Institute of Coastal Area Studies, Manonmaniam Sundaranar University, Nagercoil, 8 November 2000.
- 34 students (M.Sc., Zoology) from Ethiraj College for Women, Chennai, 14 December 2000.
- 26 students (B.Sc., Zoology) from NSS College, Ottapalam, Kerala, 14 December 2000
- 44 students (B.Sc., Zoology) from Presidency College, Chennai, 21 December 2000.
- 24 students (B.Sc., Zoology) from Nimapara College, Nimapara, Orissa, 29 December 2000.

Special lectures given by CIBA Scientists

- The Institute's Scientists delivered the following special lectures:
- Dr.I.S.Azad, Senior Scientist, gave a talk based on his experience at the Training Workshop on Molecular Diagnostics of Shrimp Viruses in the Asian Region, conducted at Bangkok, Thailand, during 21-25 March 2000, at Muttukadu Experimental Station, on 20 April 2000.
- Dr.M.Kailasam, Scientist (Senior Scale), gave a talk on his training experience

under the Third Country Training Programme, on Responsible Fisheries Development, conducted at SEAFDEC, the Philippines, during September - November 2000, at Muttukadu Experimental Station, on 14 December 2000.

Human Resource Development

Scientific

- Shri.J.K.Sundaray and Dr.(Smt.) Imelda Joseph, Scientists, participated in a short-term training course on Coastal Zone Management, at Fisheries College, Mangalore, 10-19 January 2000.
- Dr.I.S.Azad, Senior Scientist, attended the Second Module of the Training Workshop on Molecular Diagnostics of Shrimp Viruses in the Asian Region, at Bangkok, Thailand, 21-25 March 2000.
- Dr.Mathew Abraham, Principal Scientist and Head, Fish Culture Division, attended the 3rd Management Development Programme in Agricultural Research, at NAARM, Hyderabad, 24-29 April 2000.
- Dr.M.Kailasam, Scientist (Senior Scale), was deputed to undergo a Third Country Training Programme on Responsible Aquaculture Development, at SEAFDEC, Tigbaun, Iloilo, the Philippines, for a period of two months from 5 September to 3 November 2000.
- Dr.M.Natarajan, Principal Scientist, attended a training programme on Aquaculture Development, at CIFA, Bhubaneswar, 12-22 September 2000.
- Dr.K.K.Vijayan, Senior Scientist, attended a training programme-cum-workshop on Chromosome and Gene Manipulation Techniques, at School of Biological Sciences, Madurai Kamaraj University, Madurai, 2-23 October 2000.
- Dr.Mathew Abraham, Principal Scientist and Head, Fish Culture Division, visited the Islamic Republic of Iran, to conduct a feasibility study on Finfish Breeding in Iran, especially with reference to *Mugil cephalus*, during 10-17 November 2000
- Dr.M.Muralidharan, Scientist (Senior Scale), attended a training programme on "Computer applications in fisheries", at CIFE, Mumbai, 16 November - 6 December 2000.
- Shri.K.Ponnusamy, Scientist, attended a personal contact programme under correspondence course for Hindi Prabodh, at Chennai, 14-15 December 2000.

Technical / Administrative

- Shri.S.Rajukumar, Technical Assistant, T-II-3 and Smt.K.Hemalatha, Junior Stenographer, participated in the training programme on Intensive Training in Hindi and Workshop, at NAARM, Hyderabad, 18-22, January 2000.
- Shri.P.K.Manimandram, Administrative Officer, attended the First Interactive Workshop on O&M Reforms for Administrative and Finance Officers of ICAR and Brainstorming session on the Betterment of Institutional Management through Sensitisation and Orientation, at NAARM, Hyderabad, 13 - 17 February 2000.
- Shri.S.Sivagnanam, T-5, Shri.V.K.Charles, T-II-3, Shri.Joseph Sahayarajan, T-II-3, Shri.V.R.Senthil Kumar, T4, Shri.A.Manoharan and Smt.Mary Desouza, Junior Clerks, attended a training programme on MS Office, at NIIT, Chennai, under the contractual arrangement between ICAR and SIEMENS - HXDORF (NATP - ARIS 2000), 28-30 September 2000.
- Shri.A.Sekar and Smt.R.Vetrichelvi, Junior Clerks, attended a personal contact programme under correspondence course for Hindi Prabodh, at Chennai, 14-15 December 2000.
- Smt.K.Nandini, Senior Clerk, underwent training on ARFIS, Accounting Package, at CIFE, Mumbai, 26-30 December 2000.

7. AWARDS AND RECOGNITIONS

Dr.G.R.M.Rao, Director, Central Institute of Brackishwater Aquaculture, Chennai, was awarded the Honorary Fellowship of Association of Aquaculturists for the year 2000, in recognition of his contribution to Aquaculture and Fisheries Science. The award was received by the Director from Dr.R.S.Paroda, Secretary, DARE and Director General, ICAR, New Delhi, on 17 January 2000, at a function held at Central Institute of Freshwater Aquaculture, Bhubaneshwar.

- Shri.V.R.Senthil Kumar, T-4, was awarded the B.E. (Civil Engineering) degree from Anna University, Chennai, in March 2000.

Award for the Institute

- The Institute participated in the Exhibition conducted at the National Seminar on Sustainable Fisheries and Aquaculture for Nutritional Security, at Chennai, during 29 November - 2 December 2000. The Institute's stall was adjudged the Best Brackishwater Aquaculture Stall and a certificate and a medal were awarded.

8. LINKAGES AND COLLABORATION INCLUDING EXTERNALLY FUNDED PROJECTS

Linkages and collaboration

During the year the Institute had linkages with the following :

National

1. Dept. of Animal Husbandry and Dairying, Ministry of Agriculture, Govt. of India, New Delhi

The Institutional Consultancy for the Environmental Monitoring Programme, under the World Bank assisted Shrimp and Fish Culture Project of the Dept. of Animal Husbandry and Dairying (Ministry of Agriculture, Govt. of India) is an on-going programme at CIBA, in the third year of its operation.

2. Rajiv Gandhi Centre for Aquaculture (RGCA), Myiladuthurai

The Institute took up an Institutional consultancy for seabass *Lates calcarifer* breeding and seed production technology, for the Rajiv Gandhi Centre for Aquaculture (MPEDA), Myiladuthurai.

3. ICAR Institutes

NCAP

An Inter-institutional research project entitled "Economic evaluation of brackishwater aquacultural systems in India" was taken up in collaboration with National Centre for Agricultural Economics and Policy Research (NCAP), ICAR, New Delhi.

CMFRI

The Mandapam Research Centre of the Central Marine Fisheries Research Institute (CMFRI) is one of the co-operating centres in the Inter-Institutional NATP Project entitled "Shrimp and fish broodstock development and breeding under captive conditions", with CIBA as Lead Centre for the same project.

4. Other Institutes / SAUs / State Agriculture Depts. / Co-operating centres under the NATP Projects

- College of Fisheries, Konkan Krishi Vidyapeeth, Ratnagiri
- Fisheries Station, Kerala Agricultural University, Puduvype
- Orissa University of Agriculture & Technology, Rangailunda, Berhampur
- College of Fisheries, University of Agricultural Sciences, Mangalore
- College of Fisheries, ANG Ranga Agricultural University, Muthukur
- Fisheries College and Research Institute, Tamil Nadu University of Veterinary and Animal Sciences, Tuticorin.
- West Bengal University of Animal and Fisheries Sciences, Kolkata
- Central Institute of Fisheries Education, Mumbai.
- Haryana Agricultural University, Hisar
- Gujarat Agricultural University, Okha
- Rice Research Station, Tamil Nadu Agricultural University (TNAU), Tirur
- State Dept. of Agriculture (Govt. of Tamil Nadu), Ponneri and Minjur.
- Livestock Research Station, Tamil Nadu University of Veterinary and Animal Sciences (TANUVAS), Kattupakkam.
- Poultry Research Station, Tamil Nadu University of Veterinary and Animal Sciences (TANUVAS), Nandanam.
- Dept. of Horticulture, Govt. of Tamil Nadu, Chennai.

- Dept. of Animal Husbandry, Govt. of Tamil Nadu, Chennai.
- Tamil Nadu Rice Research Institute, TNAU, Aduthurai, Tanjore District.

5. State Fisheries Departments/BFDAs

The Institute has well established linkages with State Fisheries Depts./BFDAs mainly with regard to transfer of technology programmes.

International

1. M/s.COFREPECHE/Govt. of France

The Institute took up an Indo-French Collaborative Project entitled 'Seabass Pilot Unit' with M/s.COFREPECHE/Govt. of France, for a period of three years from November 1999.

2. World Bank

The Institute received World Bank aid under the following programmes :

(i) The World Bank-aided Institutional Consultancy programme on Environmental Monitoring of Shrimp Culture, under the Shrimp and Fish Culture Project of the Ministry of Agriculture, Govt. of India.

(ii) The World Bank-aided National Agricultural Technology Projects (NATP) of the ICAR, *viz.*,

a) Shrimp and fish broodstock development and breeding under captive conditions.

b) Shrimp and fish health management

c) Fish production using brackishwater in arid ecosystem

d) Institutional Village Linkage Programme for technology assessment and refinement in coastal agro-ecosystem of Tiruvallur district of Tamil Nadu.

Externally funded projects

I. Projects funded by AP Cess Fund of ICAR

1. Economic evaluation of brackishwater aquacultural systems in India : (Sanction order No.F6-20/96-ESM dated 13 August 1997).

Project Investigator : Dr.M.Krishnan

Project Associates : Shri.K.Ponnusamy and Dr.M.Kumaran

Project location : Chennai

This inter-institutional project funded by AP Cess Fund of ICAR was taken up in collaboration with National Centre for Agricultural Economics and Policy Research (NCAP), ICAR. It has a total outlay of Rs.7,12,000/- (CIBA - Rs.3,72,000/- and NCAP Rs.3,40,000) and a duration of 3 years from February 1998 to January 2001.

Work done :

The study was taken up in the districts of Nellore in Andhra Pradesh and Cuddalore in Tamil Nadu. The project work was completed as per schedule and a profile of fisheries and aquaculture development in Andhra Pradesh and Tamil Nadu was drawn up. In addition, an overview of the growth of the aquaculture sector in the world with special reference to India and an analysis of the input-output relationships existing in brackishwater aquaculture sector alongwith economic evaluation of the brackishwater aquacultural systems in selected districts were worked out.

2. Shrimp health and water and soil quality monitoring for development of sustainable shrimp farming (Sanction Order F.No.4(3)/96-ASR-I dated 25 June 1998).

Project Investigator : Dr.B.P.Gupta

Project Associates : Dr.K.O.Joseph
Dr.M.Muralidhar
Shri.R.K.Chakraborti
Dr.I.S.Azad
Shri.S.V.Alavandi
Dr.C.P.Balasubramaniam

Project location : Chennai,
Kakdwip and Puri

This project funded by the AP Cess Fund of ICAR has a total outlay of Rs.13,58,816/- and a duration of 3 years from July 1999.

Work done :

The commercial shrimp farms in Tamil Nadu, Andhra Pradesh, West Bengal and Orissa, were monitored periodically, during the culture period, for the soil and water quality and health status of shrimp. Culture details were also collected from time to time. The shrimp farms monitored in Tamil Nadu were located at Kokilamedu (near Mahabalipuram), Parangipettai and Kandakadu (near Cuddalore). Extensive culture of *P.monodon* was practised in all the farms. Generally 2 crops were harvested from the farms (yield ranged from 1280 - 2900 kg/ha/4 months.) but in some of the farms the problem of white spot viral infection affected the crop.

At Andhra Pradesh, two shrimp farms were selected at Korangi near Kakinada and Epuru Venkannapalem near Nellore. At Korangi farm, due to the failure of *P.monodon* crop by white spot disease infection, culture of the freshwater prawn *Macrobachium rosenbergii* was taken up. At Epuru Venkannapalem, improved management measures saved the crop of *P.monodon* and a production of 1000 kg/ha/4 months was harvested.

At Orissa, a total of 3 shrimp farms located at Nanpur, Astaranga and Tikna Chandrabhaga in Puri district were monitored. The culture period of shrimp was 4-6 months with yields ranging from 525 - 1143 kg/ha. White spot disease problem was also faced by these farms.

At West Bengal, a total of 4 farms were selected at Belpukur, Battala, Maharajganj and Henry's Island. At Belpukur, paddy-cum-shrimp culture practice was followed, but survival of shrimp was poor due to highly reduced soil conditions and disease problems like ciliate fouling, shell disease and vibriosis. Similar problems were encountered in Battala, Maharajganj and Henry's Island where extensive culture of shrimp was undertaken.

3. Development and evaluation of shrimp immunostimulants using whole cell preparations of *Vibrio*. (Sanction order F.No.4(37)/99-ASR-II dated 27th June 2000).

Project Investigator : Dr.I.S.Azad

Project Associates : Dr. C.Gopal
Dr. K.K.Vijayan
Shri. S.V.Alavandi

Project location : Chennai

This project funded by the AP Cess Fund of ICAR has a total outlay of Rs.11,09,390/- and a duration of 3 years with effect from 23 May 2000.

Work done :

The project work was initiated in December 2000 after the recruitment of two research scholars. Work on isolation and purification of *Vibrio* from the seabass *Lates calcarifer* and grey mullet *Mugil cephalus* was initiated.

II. Projects funded by ICAR/National Agricultural Technology Project (NATP) - (World Bank funded projects)

A. Coastal Agro-ecosystem :

1. Shrimp and fish broodstock development and breeding under captive conditions (Sanction order No.F.AED (FLP)/ 99/P-1 dated July 1999)

Project Investigator : Dr.L.Hanumantha Rao,
Project Associates : Dr.P.Ravichandran
Dr.S.M.Pillai
Dr.A.R.Thirunavukkarasu
Dr.M.Natarajan
Dr.C.Gopal
Dr.K.K.Vijayan
Dr.K.O.Joseph
Dr.M.Kailasam
Project location : Chennai

CIBA is the lead centre for this project and the cooperating centres are Central Marine Fisheries Research Institute, Mandapam; College of Fisheries, Konkan Krishi Vidyapeeth, Ratnagiri; Kerala Agricultural University, Puduvype, Ernakulam and Orissa University of Agriculture and Technology, Berhampur. The total outlay for the project is Rs.136.34 lakhs, the amount allotted to CIBA being Rs.67.9 lakhs . The project duration is four years from July 1999.

Work done :

During the period under report, the civil works in connection with pond renovation, were initiated. A captive broodstock of shrimp *P.monodon* and *P.indicus* was developed in the ponds at Muttukadu. Fish (Grouper *Ephinephelus tauvina* and seabass *Lates calcarifer*) broodstock was maintained in RCC holding tanks (100 ton capacity) at Muttukadu.

2. Shrimp and fish health management (Sanction Order No.F.AED/FLP/PSR/P-2/8 dated 27 July 1999)

Project Investigator : Dr.T.C.Santiago
Project Associates : Dr.K.K.Vijayan
Shri S.V.Alavandi
Project location : Chennai

CIBA is the lead centre for this project and the cooperating centres are College of Fisheries, University of Agricultural Sciences, Mangalore ; ANG Ranga Agricultural University, Muthukur; Fisheries College and Research Institute (Tamil Nadu University of Veterinary and Animal Sciences), Tuticorin; and West Bengal University of Animal and Fisheries Sciences, Kolkata. The total outlay for the project is Rs.142.27 lakhs. CIBA has been allotted an amount of Rs.49.04 lakhs. The project has a duration of 4 years from July 1999.

Work done :

During the period under report various shrimp farms in Andhra Pradesh and Tamil Nadu were visited. Preventive measures against shrimp diseases were advocated for the benefit of farmers. Quantification of white spot viral load in shrimp was done using the primers designed from the Indian strain of white spot virus for competitive polymerase chain reaction. Trials on use of herbal products like neem as a therapeutic agent against white spot viral disease infection in shrimp, were carried out. Results indicated that neem inhibits moulting.

3. Institution Village Linkage Programme for Technology Assessment and Refinement in coastal Agro-ecosystem of Tiruvallur district of Tamil Nadu (Sanction order No.F.AED (A&H)/2000/TAR dated 31st July 2000.

Project Investigator : Shri.K.Ponnusamy

Project Associates : Dr.M.Kumaran
Dr.T.Ravisankar
Dr.I.S.Azad
Dr.K.Ambasankar

Project location : Chennai

CIBA is the lead centre for this new project. The project work is to be carried out in close linkage with Rice Research Station, Tamil Nadu Agricultural University, Tirur; Poultry Research Station, Tamil Nadu Veterinary and Animal Sciences University, Chennai and the departments of Agriculture/ Horticulture/Animal Husbandry/Fisheries of the Tamil Nadu State Government. The total outlay for the project is Rs.28.27 lakhs and the duration of the project is 3 years from April 2000.

Objectives :

1. To identify and prioritize the problems in aquaculture, agriculture and livestock production.
2. To assess and refine technologies aiming at stability and sustainability along with productivity of the small farm production systems.
3. Assessment and refinement of labour-saving and drudgery alleviating technologies matching with the prevailing farming situations of the aquaculture, agriculture and live stock production systems.
4. To assess and refine each technological intervention in the light of farmers', technical, economic and mental perception and evaluation.
5. To identify extrapolation domains for new technology modules based on environmental characterisation at micro and mega levels.

Work done :

Two research scholars were recruited under the project. The core implementation team of the project visited the Kattur village in Ponneri Taluk (50 kms. from CIBA Headquarters, Chennai) during September 2000 and Wealth ranking analysis for categorisation of farm families was carried out. A total of 17 interventions were proposed for the year 2000-2001. Four interventions as mentioned below have been completed :

1. Assessment of the effect of Azospirillum with inorganic fertilizers in rice.
2. Assessment of the effect of neem oil (Azadirachitin 0.03%) in controlling the pests of rice.
3. Assessment of green gram KM-2 as a bund crop in rice fields.
4. Assessment of proper scheduling of feed for crab fattening.

B. Arid Agro-ecosystem :

4. Fish production using brackishwater in the arid ecosystem (Sanction order F.No.NATP/ AED (ARID) PAL-026/99 dated 22 May 2000)

Project Investigator : Dr.A.R.Thirunavukkarasu

Project Associate : Dr.M.Kailasam

Project location : Chennai

CIBA is the lead centre for this new project and the cooperating centres are Central Institute of Fisheries Education, Mumbai; Fisheries Station, Gujarat Agricultural University, Okha and Haryana Agricultural University, Hissar. The total outlay for the project is Rs.119.62 lakhs with budget allotment for CIBA being Rs.44.61 lakhs. The duration of the project is three years from May 2000 to December 2003.

Objectives :

1. To develop technology for the monoculture of Asian seabass *Lates calcarifer* and shrimp *viz., Penaeus indicus* and *P.monodon* in brackishwater areas of arid ecosystem.

2. To study environmental parameters in the brackishwater areas selected before culture, during culture and after crop harvest to understand the impact of aquaculture in arid zone.
3. To standardise water budgeting for sustainable culture and develop aquaculture calendar for arid zone areas.
4. To transfer technology to farmers and entrepreneurs for adoption and commercial scale production through training/demonstration and workshops.

Work done :

Recruitment of two Senior Research Fellows was completed. A survey of potential saline water resources available in the semi-arid and arid regions of Rajasthan for brackishwater aquaculture in these areas was carried out. Preliminary experiments on nursery rearing of seabass and grey mullet were conducted and trials on transportation of grey mullet seed were carried out. An Interactive workshop was held at CIBA, Chennai, during 30-31 October 2000.

III. Indo-French Collaborative Project

5. Seabass pilot unit hatchery and culture (MOU signed between DARE/ICAR and COFREPECHE (Govt. of France) dated 8 March 1999)

Project Investigator: Dr.A.R.Thirunavukkarasu

Project Associate : Dr.M.Kailasam

Project location : Chennai

This Indo-French collaborative project between IFREMER/COFREPECHE and CIBA has a total outlay of Rs.4,73,00,000 (French loan component : Rs.2,73,00,000 (3.9 million FF) and ICAR component : Rs.2,00,00,000). The project duration is three years. This is a transfer of technology project aimed at acquiring the technology from France for setting up a pilot-scale hatchery and grow-out facilities for the Asian seabass *Lates calcarifer* at Muttukadu and for demonstrating the technology on seabass breeding/culture and to train CIBA scientists/technicians enabling them to train extension workers and farmers for adoption of this technology.

Work done:

Work under the project commenced during January 2000. Site selection, site validation including preliminary studies of topographical survey, soil mechanical survey, water sample survey, hydrogeological survey and water quality assessment were completed by February 2000. Detailed engineering design preparation by the French Consultants (COFREPECHE) was completed by June-July 2000. The same was transmitted to CPWD, for preparation of the preliminary estimate for the buildings and ponds. A detailed project documentation/EFC Memo of the same was submitted to Council during August 2000 for evaluation and approval.

9. LIST OF PUBLICATIONS

CIBA Publications

- Annual Report for the year 1999-2000
- Training Programmes 2000-2001.
- CIBA Bulletin No.12, Captive broodstock development, induced breeding and larval stages of mud crabs (*Scylla* spp.), March 2000.
- CIBA Bulletin No.13, Shrimp feed processing and production technology, March 2000.
- CIBA Extension Series No.18, Cultured diatoms as feed for hatchery-raised penaeid shrimp larvae, November 2000.
- CIBA Extension Series No.19, Shrimp diseases : Symptoms, causes, diagnosis, prevention and control, November 2000.
- CIBA Extension Series No.20, Seabass *Lates calcarifer* seed production and culture, November 2000.
- CIBA News Vol.5, No.1, January - March 2000.
- CIBA News Vol.5, No.2, April-June 2000.
- CIBA News Vol.5, No.3, July-September 2000.
- CIBA News Vol.5, No.4, October-December 2000.
- CIBA Spl. Publ. No.11,A pictorial guide for mud crab culture, June 2000, pp. 1-37 (Mimeograph).

Publications by Scientists*

Ahamad Ali, S. 2000. Copper, manganese and zinc requirements in the diet of shrimp *Penaeus indicus*. *Asian Fisheries Science*, **13** : 201-207.

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* Also includes publications of scientists of the Institute based on their work in previous Institutes.

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Papers presented / Abstracts published

Muralidhar, M., B.P.Gupta, K.O.Joseph and K.K.Krishnani. 2000. Effect of manures and fertilizers singly and in combination on shrimp production and environment. Symposium on Ecofriendly Mariculture Technology packages - An update, at CMFRI, Mandapam, 25-26 April 2000. Abstract No.1.21.

Muralidhar, M., B.P.Gupta, K.O.Joseph and K.K.Krishnani. 2000. Impact of brackishwater shrimp farming on surrounding coastal soil and water. National Seminar on Coastal Zone 2000, at Hyderabad, February 26-27, 2000. Abstract No.2.

Gupta, B.P., M.Muralidhar, K.O.Joseph and K.K.Krishnani. 2000. Effect of salinity level and manure dose on the release of nutrients into water from brackishwater soil. Symposium on Ecofriendly Mariculture Technology Packages - An update, at CMFRI, Mandapam, 25-26 April 2000. Abstract No.1.24.

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Joseph, K.O., B.P.Gupta, M.Muralidhar and K.K.Krishnani. 2000. Characterisation of intake, pond and outlet water of creek and sea-based semi-intensive shrimp farms in Nellore District of Andhra Pradesh. National Seminar on Sustainable Fisheries and Aquaculture for Nutritional Security, at Chennai, 29 November - 2 December 2000. Abstract, p.79

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Kailasam, M., P.Kishore Chandra, M.Muralidhar, A.R.Thirunavukkarasu and Mathew Abraham. 2000. Survival and growth of seabass *Lates calcarifer* (Bloch) fry reared at different stocking densities. Symposium on Eco-friendly Mariculture Technology Packages - An update, at CMFRI, Mandapam, 25-26 April 2000, Abstract No.111.7, p.32.

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10. LIST OF ON-GOING RESEARCH PROJECTS FOR THE YEAR APRIL 2000 - MARCH 2001

Sl.No.	Title of Project	Project Leader
CRUSTACEAN CULTURE DIVISION		
1.	Improvement of penaeid shrimp hatchery technology for the production of quality seed (CCD/SP/1)	Dr.P.Ravichandran Principal Scientist
2.	Improvement of production and productivity of shrimp in traditional culture system by suitable management practices (CCD/MT/1)	Shri R.K.Chakraborti Principal Scientist
3.	Culture of mud crabs *(Scylla* spp.) (CCD/CF/1)	Shri M.Kathirvel Principal Scientist
4.	Culture of tiger shrimp *Penaeus monodon* in low saline environment (CCD/SC/1)	Dr.C.P.Balasubramaniam Scientist (Sr. Scale)
FISH CULTURE DIVISION		
5.	Broodstock development, breeding and seed production of *Mugil cephalus* and polyculture of finfishes and shrimp (FCD/B&C/1)	Dr.M.Natarajan Principal Scientist
6.	Controlled breeding, seed production and culture of *Epinephelus tauvina* (FCD/B&C/2)	Dr.M.Kailasam Scientist (Sr. Scale)
7.	Breeding, seed production and culture of seabass (*Lates calcarifer*) (FCD/B&C/3)	Dr.A.R.Thirunavukkarasu Principal Scientist
GENETICS & BIOTECHNOLOGY DIVISION		
8.	Application of molecular genetics and biotechnology in genetic characterization, stock improvement and health care of shellfish and finfish (GBD/MG/1)	Dr.T.C.Santiago Principal Scientist
NUTRITION, PHYSIOLOGY & PATHOLOGY DIVISION		
9.	Development of feeds for aquaculture of brackishwater shrimp and finfishes (NPPD/NT/1)	Dr.S.A.Ali Principal Scientist
10.	Development of probiotics for disease-tolerance / resistance in shrimp (NPPD/DIS/2)	Shri S.V.Alavandi Scientist (Sr. Scale)
11.	Development and evaluation of immunodiagnostics and prophylactics for important brackishwater fish and shellfish (NPPD/PATH/1)	Dr.Azad, I.S. Senior Scientist
AQUACULTURE ENGINEERING & ENVIRONMENT DIVISION		
12.	Environmental management of aquaculture systems (AEED/EM/1)	Dr.B.P.Gupta Principal Scientist

Sl.No.	Title of Project	Project Leader
13.	Development of techniques for preventing / controlling seepage in brackishwater ponds (AEED/AE/2)	Dr.K.O.Joseph Senior Scientist
14.	Comprehensive study on impacts of shrimp farming (AEED/CI/1)	Dr.P.Ravichandran Principal Scientist
EXTENSION, ECONOMICS & INFORMATION DIVISION		
15.	Development of database system for brackishwater fishery resources (EEID/EXTN/2)	Dr.M.Krishnan Senior Scientist
16.	Extension approaches for sustainable shrimp and fish farming (EEID/EXTN/3)	Dr.K.Gopinathan Principal Scientist (upto September 2000) Dr.N.Kalaimani Principal Scientist (from October 2000)
FUNDED PROJECTS		
17.	An economic evaluation of brackishwater aquacultural systems in India (AP Cess Fund)	Dr.M.Krishnan Senior Scientist
18.	Shrimp health and water and soil quality monitoring for development of sustainable shrimp farming (AP Cess Fund)	Dr.B.P.Gupta Principal Scientist
19.	Development and evaluation of shrimp immunostimulants using whole cell preparations of *Vibrio* (AP Cess Fund)	Dr.I.S.Azad Senior Scientist
20.	Shrimp and fish broodstock development and breeding under captive conditions (NATP / World Bank funded project)	Dr.L.Hanumantha Rao Principal Scientist & H.O.D., CCD
21.	Shrimp and fish health management (NATP / World Bank funded project)	Dr.T.C.Santiago Principal Scientist
22.	Fish production using brackishwater in arid ecosystem (NATP / World Bank funded project)	Dr.A.R.Thirunavukkarasu Principal Scientist
23.	Institute Village Linkage Programme for technology assessment and refinement in coastal agro ecosystem of Tiruvallur district of Tamil Nadu (NATP / World Bank funded project)	Shri K.Ponnusamy Scientist
24.	Seabass Pilot Unit (Indo-French Collaborative project) - IFREMER / COPREPECHE	Dr.A.R.Thirunavukkarasu Principal Scientist

11. CONSULTANCY/COMMERCIALISATION OF TECHNOLOGY

Details of the on-going consultancy programmes during the period under report are given below:

Environmental Monitoring of shrimp farming :

A major on-going institutional consultancy programme at CIBA is the Environmental Monitoring of shrimp farming under the World Bank assisted shrimp and fish culture project of the Dept. of Animal Husbandry and Dairying, Ministry of Agriculture, Govt. of India. The shrimp culture project sites covered under this programme are located at Canning, Dadanpatra, Digha and Dighirpar in West Bengal and Jagatjore and Banapada in Orissa. The consultancy cost initially was Rs.68,40,334/-. An additional consultancy was taken up for the Bhairavapalem site in Andhra Pradesh at a cost of Rs.9.00 lakhs.

The objectives of the assignment are to monitor (i) the positive and negative impacts of shrimp culture on environment (ii) the environmental impacts on shrimp culture (iii) to develop site-specific environmental management plans based on the monitoring results. The study also includes long-range environmental impact study using remote sensing.

Collection of baseline data before the initiation of culture operations which formed Phase I of the study was completed. Thematic maps for the sites were also prepared using remote sensing. Phase II of the study which pertains to the monitoring of the environment during the culture operations is in progress.

The scientific personnel involved in the consultancy were : Dr.L.Hanumantha Rao, Principal Scientist and Head, Crustacean Culture Division; Dr.P.Ravichandran, Shri.M.Kathirvel, Dr.S.Kulasekarapandian, Shri.R.K.Chakraborti, Shri.S.Srinivasagam, Dr.B.P.Gupta, Principal Scientists, Dr.K.O.Joseph, Senior Scientist, Dr.K.K.Krishnani; Dr.M.Muralidhar; Dr.C.P.Balasubramaniam, Scientists (Sr. Scale); and Shri.A.Panigrahi, Scientist.

Transfer of technology on seabass seed production

An Institutional consultancy was taken up by CIBA for transfer of technology on seabass seed production to the Rajiv Gandhi Centre for Aquaculture (MPEDA), Myiladuthurai, at a total cost of Rs.6,02,766/-.

Based on CIBA's technical guidance, an existing shrimp hatchery was taken on lease basis by RGCA and suitably modified and utilized for seabass seed production work. The technology for seed production which includes captive broodstock maintenance, water quality, feed and health management, induced breeding and larval rearing techniques, was transferred to RGCA and successful induced breeding and seed production has already commenced. The scientific personnel involved in the consultancy were Dr.Mathew Abraham, Principal Scientist and Head, Fish Culture Division, Dr.A.R..Thirunavukkarasu, Principal Scientist and Dr.M.Kailasam, Scientist (Sr. Scale).

12. RAC, IMC, SRC AND IJSC MEETINGS

Research Advisory Committee (RAC)

The present Research Advisory Committee was constituted by ICAR for a period of 3 years with effect from 27 May 1998 (Council's order F.No.18-4/98-ASR-I dated 27 May 1998).

The composition of the Research Advisory Committee (RAC) of the Institute is as follows :

1. Dr.P.S.B.R.James — Chairman
   Ex-Director, CMFRI
2. Dr.A.Banerjee — Member
   Former Head,
   Bio-organic Division,
   BARC, Trombay, Mumbai &
   Emeritus Scientist,
   Organic & Biomolecular Chemistry Unit,
   CSIR Regional Laboratory,
   Trivandrum.
3. Dr.M.Sakthivel — Member
   Ex-Director, MPEDA &
   President,
   Aquaculture Foundation of India,
   Chennai.
4. Dr.S.C.Pathak — Member
   General Manager, NABARD
   Guwahati, Assam.
5. Dr.Samir Bhattacharya — Member
   Director, Indian Institute of
   Chemical Biology, Kolkata.
6. Dr.G.R.M.Rao — Member
   Director,
   CIBA, Chennai.
7. Dr.R.A.Selvakumar — Member
   Assistant Director General (M.Fy.),
   Fisheries Division, ICAR, New Dehi.
8. Shri.Arjun Prasad Shastri — Non-official
   District Madhubani, Bihar — Member
9. Shri.Shiv Shankar Thakur, — Non-official
   Social Activist, Ranchi, Bihar — Member
10. Dr.L.Hanumantha Rao — Member
    Principal Scientist and Head, — Secretary
    Crustacean Culture Division
    CIBA, Chennai.

The sixth meeting of the RAC was held on 24 October 2000, at CIBA Headquarters, Chennai. The major recommendations/ suggestions of the RAC are highlighted as follows :

1. The Institute lacks experimental farm facility. The Institute should immediately procure suitable land from Govt. of Andhra Pradesh for establishment of the farm facility.
2. CIBA should develop a domesticated shrimp broodstock.
3. CIBA may be identified as a nodal agency for certifying the quality of shrimp seed supplied/used by farmers/ entrepreneurs.
4. Technology for Polyculture of shrimp and mullet may be developed for different agro-climatic regions.
5. CIBA and CMFRI may collaborate with Indian Institute of Chemical Biology (IICB), Kolkata, in the area of marine and brackishwater finfish breeding.
6. CIBA may send scientists abroad for training in grouper breeding.
7. Seminar/workshop on marine and brackishwater finfish breeding may be held at an early date.
8. Studies on shrimp immunology may be carried out to understand the basic mechanism and develop control methods for shrimp diseases. The Institute may collaborate with IICB, Kolkata, in the area of shrimp immunology.
9. Studies on *Lectins* may be taken up in haemolymph of shrimp. CIBA primer

developed for diagnosis of white spot disease may be cross checked using P32 labelling. A probe may be developed for the primer.

10. Economics to be worked out for shrimp feed developed/produced and field tested by CIBA and the feed technology package to be extended to the farmers

11. Case studies on impacts of shrimp farming on environment should be taken up in different areas and the results should be published immediately.

12. A monitoring system may be set up by CIBA to detect pollution in shrimp farms and the farmers may be advised with regard to the health condition of shrimps/ environment.

13. A biopond system may be developed for treatment of shrimp pond effluents. A combination of seaweeds and molluscs may be effectively used for treatment.

14. Technologies developed by CIBA should be projected through Internet and the technologies should be transferred to farmers through demonstration.

15. CIBA may arrange interactions/meetings wherein Bankers/NABARD officials/ entrepreneurs/farmers will be appraised about the latest technologies/ programmes developed by the Institute with economics.

Staff Research Council (SRC)

The Staff Research Council (SRC) of CIBA with Director, CIBA, as Chairman and all Heads of Divisions/Scientists In-charge of Divisions and Project leaders of on-going projects as Members and Asst. Director General (M.Fy.), ICAR, New Delhi, as ICAR representative, held three meetings during the year at CIBA Headquarters, Chennai, *viz.*, the tenth meeting on 31 January and 1 February 2000; the eleventh meeting on 29-30 June 2000, and the twelfth meeting on 20 December 2000. The progress of work in the on-going projects was reviewed at the above meetings. The major recommendations made at these meetings are briefly mentioned below.

Tenth meeting of SRC

- Need for training of Institute's scientists abroad in grouper breeding
- A detailed write-up on seabass breeding to be brought out in the form of a bulletin/manual.
- Parasitic infestation problem in broodstock fishes to be thoroughly investigated and effective prophylactic and control measures to be drawn up.
- Practical control measures to be drawn up for effective seepage control in ponds with sandy bottom.
- The Institute's project on comprehensive impact assessment of shrimp farming to be continued.
- Standardisation of mud crab hatchery technology.

Eleventh meeting of SRC.

- SRC gave approval for the new project proposal entitled "Culture of *P.monodon* in low saline environment.
- Two new project proposals under the Nutrition Physiology and Pathology Division entitled 'Development of pro-biotics for disease tolerance/resistance in shrimp' and 'Development and evaluation of immuno-diagnostics and prophylactics for important brackishwater fish and shellfish, were approved by SRC.
- Feed back information from farmers on culture of seabass with CIBA hatchery produced seed should be regularly monitored.
- A Bulletin may be brought out based on the findings of the extension project entitled "Investigations on the brackishwater aquaculture practices

adopted by different categories of farmers - an integrated approach".

12th Meeting of SRC

- Development of hatchery technology for *P.merguensis/P.pencillatus* may be included as a technical programme under the project entitled 'Improvement of penaeid shrimp hatchery technology for the production of quality seed'.
- Larval rearing of the two species of mud crabs *Scylla serrata* and *S.tranquebarica* may be standardised.
- Technology package for seabass breeding may be popularized through effective TOT programmes.
- Research programmes under Genetics and Biotechnology Division may be re-oriented and expanded.
- Studies on immunodiagnostics may be directed towards developing viable technologies for diagnosis and control of diseases in candidate species of fishes *viz.*, *L.calcarifer* and *M.cephalus*.
- The database project *viz.*, "Development of database information system for brackishwater fishery resources" may be extended upto March 2002.
- Information on land-lease policies of various maritime states may be taken up as a new technical programme under the database project.

Institute Management Committee (IMC)

The present Institute Management Committee was reconstituted by ICAR (term of 3 years) with effect from 18.10.1997 (Council's office order F.No.6-9/96-IA-VI dated 18.12.1997 and F.No.6-9/96-IA(VI) dated 14 October 1999).

The composition of the IMC is as follows :

1.	Director, CIBA	Chairman
2.	Director of Fisheries Govt. of Tamil Nadu	Member
3.	Director of Fisheries Govt. of Karnataka	Member
4.	Director of Research & Extension (Fy.), Tamil Nadu Veterinary and Animal Sciences University, Tuticorin	Member
5.	Shri.Shiv Shankar Thakur Social Activist, Alkapuri, Ratu Road, Ranchi (Bihar).	Non-official Member
6.	Shri.Arjun Prasad Shastri (Gram and Post : Sarabe), via Khajauli Dist., Madhubani, Bihar	Non-official Member
7.	The Finance & Accounts Officer, National Academy of Agricultural Research Management, Rajendranagar, Hyderabad.	Member
8.	Dr.R.A.Selvakumar Asst. Director General (M.Fy.) ICAR, New Delhi	Member
9.	Dr.L.H.Rao Principal Scientist and Head, Crustacean Culture Division CIBA, Chennai	Member
10.	Dr.S.A.Ali Principal Scientist, CIBA, Chennai	Member
11.	Dr.P.Ravichandran Principal Scientist CIBA, Chennai	Member
12.	Shri.S.R.Das Principal Scientist Kakdwip Research Centre of CIBA, Kakdwip	Member
13.	Administrative Officer CIBA, Chennai	Member Secretary

The 18th, 19th and 20th meetings of the IMC were held on 4 December 1999, 28 June 2000 and 19 December 2000, respectively, at CIBA Headquarters, Chennai. The major recommendations of the above meetings are indicated below :

The major recommendations of IMC made at the 18th meeting included approval for depositing money with CPWD for Institute's major works and taking up of minor works as proposed by the Institute.

The major recommendations of IMC at its 19th meeting included taking back of the deposits made with CPWD for reconstruction of larval rearing shed at NRC of CIBA in view of the decision taken by the ICAR for transferring NRC of CIBA, to KVK of CMFRI at Narakkal, along with staff and other assets; allotment of more funds under Non-plan minor works and approval for ratification for variation (cost-wise/quantity-wise) that occurred in procurement of equipments during 1999-2000; upgradation of computers in Technical cell, Computer laboratories, Aris Cell, Stores, Administration etc., procurement of equipment/furniture during 2000-2001 as approved in IX Plan; procurement of computer with printer, photocopier and fax for research centres and continuation of part-time AMA at KRC of CIBA from 1.11.2000 to 31.10.2003 under prevailing terms and conditions.

The major recommendations of the 20th IMC meeting included approval of payment of deposits to CPWD for major and minor works as per rules; purchase of one multi-projector as a substitute for video projector and overhead projector; and purchase of Bomb Calorimeter.

Institute Joint Staff Council (IJSC)

(Reconstituted by CIBA for a period of 3 years with effect from 12 August 1999, vide office order F.No.13-1/99-Admn. dated 12 August 1999).

The composition of the Institute Joint Staff Council (IJSC) is as follows :

Official side

1. Director, CIBA	Chairman
2. Dr.L.Hanumantha Rao, Principal Scientist and Head, Crustacean Culture Division	Member
3. Dr.S.A.Ali, Principal Scientist	Member
4. Dr.P.Ravichandran, Principal Scientist	Member
5. Shri.S.Srinivasagam, Principal Scientist	Member
6. Shri.K.Krishnaswamy, Asst. Finance & Accounts Officer	Member
7. Shri.P.K.Manimandram, Administrative Officer (upto 31st Aug.2000)	Secretary

Staff side

8. Shri.S.Krishnan, Technical Officer (T-5)	Secretary
9. Shri.S.Sivagnanam, T-4	Member
10. *Shri.R.Kandamani, Assistant	Member
11. Shri.K.Mani, Senior Clerk (upto 16 October 2000)	Member
12. Shri.N.Harinathan, SS.Gr.II	Member
13. Shri.N.Mani, SS.Gr.III	Member

* Shri.R.Kandamani, is also a Member of Central Joint Staff Council, New Delhi.

The IJSC held two meetings during the year at CIBA Headquarters, Chennai, on 21 January and 19 November 2000.

13. PARTICIPATION IN CONFERENCES/ MEETINGS/WORKSHOPS/SYMPOSIA

Dr.G.R.M.Rao, Director, attended the following workshops/seminars/ symposia/ meetings :

- 29th Meeting of the Academic Council of Tamil Nadu Veterinary and Animal Sciences University, at Chennai, 6 January 2000.
- 10th Meeting of the Project Management Committee (PMC) of the NATP, at NCIPM, New Delhi, 12 January 2000.
- 15th Meeting of the Aquaculture Authority, at New Delhi, 14 January 2000.
- Fifth Indian Fisheries Forum, at CIFA, Bhubaneswar, 17-18 January 2000.
- Expert Committee Meeting to examine research programmes, mandate etc. of different Fisheries Institutes, at New Delhi, 4 February 2000.
- 16th Meeting of the Aquaculture Authority, at Directorate of Fisheries, Govt. of Tamil Nadu, Chennai, 16 February 2000.
- National Workshop on Conservation of Aquatic Resources with special reference to Mahseer and National Presentation on Development of Fisheries in Irrigation Reservoirs and Employment for Oustees, at Bhopal, 26-27 February 2000.
- Meeting at Fisheries Development Commissioner's office, Goa, regarding the working of modalities for collaborative programmes in brackishwater aquaculture between ICAR and Department of Fisheries, Govt. of Goa, 3 March 2000.
- 30th Meeting of the Academic Council of Tamil Nadu University of Veterinary and Animal Sciences (TANUVAS), at Chennai, 15 April, 2000.
- Meeting on the Introduction of Tilapia in Indian Waters, at MPEDA, Vijayawada, 4-5 July 2000.
- 17th Meeting of Aquaculture Authority, at Directorate of Fisheries, Govt. of Tamil Nadu, Chennai, 10 July 2000.
- Meeting at Kakdwip Research Centre of CIBA, in connection with visit of Quinquennial Review Team to the Centre, 17 August 2000.
- Workshop on Green Belting and Bio-development in Koondankulam, at Manonmaniam Sundaranar Univeristy, Tirunelveli, 28 August 2000.
- Second Leg of NACA Task Force Meeting on Network Strengthening and Improvement of NACA's Management and Financial Capability, at CIBA Headquarters, Chennai, 31 August 2000.
- Sixth Scientific Advisory Panel Meeting of NATP, at National Research Centre of Oil Palm, Regional Centre, Thiruvananthapuram, 14-15 September 2000.
- Fourth Meeting of the National Committee to Oversee and Regulate the Introduction of Exotic Aquatic Species in India, at ICAR, New Delhi, 19 September 2000.
- First Indian Fisheries Science Congress, at Chandigarh, 21 - 23 September 2000.
- National Workshop on 'Code of Conduct for Responsible Fisheries' organised by BOBP, at Chennai, 29-30 September 2000.
- ICAR Directors' Conference, NBPGR, New Delhi, 12 October 2000.
- Brainstorming session on Manpower

Requirements and HRD in Fisheries Sector, at CIFE, Mumbai, 20-21 October 2000.

- Meeting at Puri Research Centre of CIBA, in connection with the visit of Quinquennial Review Team to the Centre, 14 November 2000.
- National Seminar on Sustainable Fisheries and Aquaculture for Nutritional Security, at Chennai, 29 November to 2 December 2000.
- Conference on Management of Alien Invasive Species, at MSSRF, Chennai, 2-5 December 2000.
- 18th Meeting of Aquaculture Authority, at New Delhi, 6 December 2000.

The Scientists attended the following Meetings/Seminars/Workshops :

- Dr.M.Krishnan, Senior Scientist and Shri.K.Ponnusamy, Scientist, attended the National Conference on Fisheries Economics, Extension and Management, at CIFE, Mumbai, 5-6 January 2000 and presented papers.
- Shri.M.Kathirvel, Principal Scientist, visited Kakdwip Research Centre to inspect the pond renovation work, as member of Infrastructure Development Committee of Kakdwip Research Centre, 12-21 January 2000.
- Dr.S.A.Ali, Principal Scientist and Dr.C.Gopal, Dr.S.S.Mishra and Dr.K.K.Krishnani, Scientists (Senior Scale) and Dr.I.S.Azad, Senior Scientist, participated in the Fifth Indian Fisheries Forum, at CIFA, Bhubaneshwar, 17-20 January 2000 and presented papers.
- Dr.L.H.Rao, Principal Scientist and Head, Crustacean Culture Division, visited the Orissa University of Agriculture and Technology (OUAT), Rangailunda, Berhampur, in connection with the NATP meeting, 19-20 January 2000.
- Dr.L.H.Rao, Principal Scientist and Head, Crustacean Culture Division and Dr.T.C.Santiago, Principal Scientist, attended the Fourth Meeting of the Scientific Advisory Panel of NATP, at CMFRI, Cochin, 28-30 January 2000.
- Dr.P.Ravichandran, Principal Scientist, attended the Third meeting of the National Committee on Introduction of Exotic Aquatic Species in Indian Waters, at New Delhi, 27 January 2000, and the meeting in connection with the NATP Programme on Digitisation of Database in Fisheries, at NBFGR, Lucknow, 28-29 January 2000.
- Dr.M.Kumaran, Scientist, attended the Shrimp Farmers Meet at Nagapattinam, Tamil Nadu, 25 February 2000.
- Dr.M.Muralidhar, Scientist (Senior Scale) and Dr.(Kum.) Shiranee Periera, Scientist, participated in the National Seminar on Coastal Zone 2000, at Hyderabad, 26-27 February 2000 and presented papers.
- Dr.K.K.Vijayan, Senior Scientist, participated in the First National Conference on Fisheries Biotechnology, at CIFE, Mumbai, 4-5 March 2000 and presented a paper.
- Dr.K.K.Krishnani, Scientist (Senior Scale), attended the National Seminar on Utilisation of Saline Soil for Aquaculture, at Rohtak, Haryana, 23-24 March 2000 and presented a paper in Hindi.
- Dr.A.R.Thirunavukkarasu, Principal Scientist, and Dr.M.Kailasam, Scientist (Senior Scale), attended the Symposia on Ecofriendly Mariculture Technology Packages - an Update, at CMFRI, Mandapam Camp, 25-26 April 2000 and presented papers.
- Dr.B.P.Gupta, Principal Scientist, attended the National Seminar on Fish

and Environment, at Lucknow, 10-11 August 2000 and presented a paper in Hindi.

- Dr.Mathew Abraham, Principal Scientist and Head, Fish Culture Division and Dr.P.Ravichandran, Principal Scientist and Secretary, QRT, visited Kakdwip Research Centre of CIBA in connection with Quinquennial Review Team's visit to Kakdwip Research Centre, 17 August 2000.

- Dr.S.A.Ali, and Dr.B.P.Gupta, Principal Scientists and Shri.K.Ponnusamy, Scientist, participated in the First Indian Fisheries Science Congress, at Chandigarh, 21-23 September 2000 and presented papers.

- Dr.T.C.Santiago, Principal Scientist, attended the NATP meeting (for procurement of equipments) at ICAR, New Delhi, 21-24 September 2000.

- Shri.K.Ponnusamy, Scientist, attended ICAR Annual Zonal Review Meet, at UPASI, KVK, Coonoor, Nilgiris, Tamil Nadu, 9-11 October 2000.

- Dr.P.Ravichandran, Principal Scientist and Secretary, QRT, attended the meeting in connection with QRT's visit to Puri Research Centre of CIBA, at PRC, 14 November 2000.

- Dr.L.H.Rao, Principal Scientist and Head, Crustacean Culture Division, Dr.Mathew Abraham, Principal Scientist and Head, Fish Culture Division, Dr.S.A.Ali, Shri.K.Devarajan, Dr.P.Ravichandran, Shri.M.Kathirvel, Dr.T.C.Santiago, Dr.B.P.Gupta and Dr.N.Kalaimani, Principal Scientists, Dr. I.S.Azad, Senior Scientist and Shri K.Ponnusamy, Scientist, attended the National Seminar and Exhibition on Sustainable Fisheries and Aquaculture for Nutritional Security, at Chennai, 29 November - 2 December, 2000.

14. SERVICES IN COMMITTEES

Director, CIBA, served in the following committees:

1. Member, Executive Committee and Governing Body, Rajiv Gandhi Centre for Aquaculture (MPEDA), Mayiladuthurai.
2. Member, National Committee to Oversee and Regulate Introduction of Exotic Aquatic Species, Ministry of Agriculture, Govt. of India.
3. Member, Committee for Orientation Courses in Aquaculture, Indira Gandhi National Open University, New Delhi.
4. Member, Aquaculture Authority, Ministry of Agriculture, Govt. of India.
5. Member, Tamil Nadu State Marine & Inland Fisheries Advisory Council.
6. Member, Planning Board, Tamil Nadu University of Veterinary and Animal Sciences, Chennai.
7. Member, ICAR Regional Committee
8. Co-AED/Facilitator, Coastal Agro-ecosystem (Fisheries), NATP
9. Member, Scientific Advisory Panel (SAP), Coastal Agro-ecosystem, NATP.
10. Member, Academic Council of TANUVAS
11. Member, OST for Islands - Constitution of a Project Monitoring & Coordination Committee.
12. Member, Fish and Fisheries Products Sectional Committee of Bureau of Indian Standards, New Delhi.

15. WORKSHOPS/SEMINARS/MEETINGS ETC. ORGANISED BY THE INSTITUTE

TAR-IVLP Interaction Workshop

An Interaction Workshop was arranged in connection with the Institution Village Linkage Programme (IVLP) for Technology Assessment and Refinement (TAR) in coastal agro-ecosystem of Tiruvallur district of Tamil Nadu (under NATP), at CIBA Headquarters, Chennai, during 17-18 March 2000. Dr.P.Das, Deputy Director General (Agri. Extension), ICAR, New Delhi ; Dr.P.Rethinam, Director, NRC for Oil Palm & AED (Coastal Agro-Ecosystem); Dr.G.R.M.Rao, Director, CIBA & Co-AED/Facilitator (Coastal Agro-Ecosystem); Dr.Shukla, Assistant Director General, KVK, ICAR; Dr.S.P.S.Ahlawat, Director, CARI, Andamans; Dr.C.Sriram, Dr.S.S.Ghosh, Dr.R.K.Samantha, Zonal Co-ordinators and Principal Investigators of different NATP Projects participated in the meeting.

Quinquennial Review Team (QRT) :

First Meeting of QRT

The first meeting of the Quinquennial Review Team (1995-1999) was held at CIBA Headquarters, Chennai, on 25 July 2000, under the Chairmanship of Dr.M.Devaraj, Former Director, CMFRI, Cochin. The following members of the QRT : Dr.G.R.M.Rao, Director, CIBA, Dr.A.Banerjee, Former Head, BARC, Mumbai, Dr.P.Vedavyasa Rao, Former Principal Scientist, CMFRI, Kochi, Shri.V.Venkatesan, Director, MPEDA, Kochi and Dr.P.Ravichandran, Principal Scientist, CIBA, (Secretary, QRT) attended.

The QRT reviewed the research work programmes carried out during 1995-1999 and held discussions with Heads of Divisions and Scientists-in-charge of Divisions. The QRT also visited Muttukadu Experimental Station on 26 July 2000 and interacted with the Scientists.

Second Meeting of QRT

The second meeting of QRT was held at CIBA Headquarters, Chennai, on 16 August 2000, under the chairmanship of Dr.M.Devaraj, Former Director, CMFRI, Kochi. The following members of the QRT : Dr.G.R.M.Rao, Director, CIBA ; Dr.A.Banerjee, Former Head, BARC, Mumbai, Dr.N.R.Menon, Head, Dept. of Marine Sciences, Cochin University of Science and Technology Kochi, and Dr.P.Ravichandran, Principal Scientist Secretary, QRT, attended.

The QRT Chairman visited the Kakdwip Research Centre of CIBA on 17 August 2000 and the Puri Research Centre of CIBA on 14 November 2000 to review the progress of work done at the above centres.

NACA Task Force Meeting

The second leg of NACA Task Force Meeting on Network Strengthening and Improvement of NACA's Management and Financial Capability, was held at CIBA Headquarters, Chennai, on 31 August 2000 under the chairmanship of Dr.K.Gopakumar, Deputy Director General (Fy.), ICAR, New Delhi. The following participated : NACA Task Force Members *viz.*, Dr.S.S.De Silva, Dr.Dilip Kumar and Dr.M.N.Kutty; Dr.G.R.M.Rao, Director, CIBA; Dr.B.N.Singh, Asst. Director General (I.Fy.), ICAR, New Delhi; Dr.M.Sakthivel, President, Aquaculture Foundation of India, Chennai; Dr.N. Sukumar, Professor & Head, School of Environmental Sciences, Manonmaniam Sundaranar University, Tirunelveli; Dr.Y.S.Yadava, Co-ordinator, BOBP, Chennai, Dr.(Smt.) Indirani Karunasagar, Professor, Dept. of Fishery Microbiology, College of Fisheries, Mangalore; Dr.Toms C.Joseph, Scientist, CIFT, Kochi and Shri.A.Gopalakrishnan, Scientist,

M.S.Swaminathan Research Foundation, Chennai.

Participation in First Indian Fisheries Science Congress Exhibition

The Institute participated in the exhibition organised in connection with the First Indian Fisheries Science Congress Exhibition, at Chandigarh, during 21-23 September 2000.

World Food Day

The Institute celebrated the World Food Day on 16 October 2000, at CIBA Headquarters, Chennai. The focal theme was "A Millennium free from Hunger". The chief guest Smt.V.Ilamathy, Lecturer (SG) in Zoology, Meenakshi College for Women, Chennai, delivered a lecture on genetically modified food and its role. Dr.P.Ravichandran and Dr.A.R.Thirunavukkarasu, Principal Scientists and Dr.M.Krishnan, Senior Scientist, spoke on the Role of Aquaculture for Food Security and Aquaculture issues of Nutritional Equity. Miss.Sowmya, a final year student (B.Sc. Zoology) from Meenakshi College for Women, gave a talk on 'Fight against Malnutrition'.

Interaction workshop under NATP Project

An Interaction Workshop was organised under the NATP Project entitled "Fish Production in Brackishwater in Arid Ecosystem" at CIBA Headquarters, Chennai, during 30-31 October 2000. The participants were from CIFE Unit of Rohtak, Haryana Agricultural University, Hissar, and Gujarat Agricultural University, Okha.

Participation in Exhibition under National Seminar on Sustainable Fisheries and Aquaculture for Nutritional Security

The Institute participated in the Exhibition conducted in connection with the National Seminar on Sustainable Fisheries and Aquaculture for Nutritional Security, held at Chennai, during 29 November - 2 December 2000. The CIBA stall at the Exhibition was adjudged the Best Brackishwater Aquaculture Stall and the Institute was awarded a certificate and medal.

16. VISITORS

The following visited CIBA Headquarters/Muttukadu Experimental Station.

• Dr.P.V.Joshi, Professor and Shri.R.A.Pawar, Assistant Professor, College of Fisheries, Ratnagiri, Maharashtra	10 January 2000
• Dr.Smt.L.Sukhavani, Reader and Miss.Ajantha, Lecturer, Dept. of Zoology, Ethiraj College for Women, Chennai	11 February 2000
• Director of Fisheries, Pondichery	17 Feb.2000
• Dr.P.Das, Deputy Director General (Agri.Extn.), ICAR, New Delhi	17-18 Mar.2000
• Dr.A.N.Shukla, ADG (KVK), ICAR, New Delhi	17-18 Mar.2000
• Dr.P.Rethinam, Director, NRC for Oil Palm, Eluru, A.P.	17-18 Mar.2000
• Dr.S.P.S.Ahlawat, Director, CARI, Port Blair	17-18 Mar 2000
• Dr.C.Sriram, TOT Project , ICAR Zone V, CRIDA, Hyderabad, Dr.S.S.Ghosh, TOT Project, ICAR Zone II, NBSS & LUP, Kolkata, Dr.R.K.Samantha TOT Project, ICAR Zone VIII, NDRI Campus, Adugodi, Bangalore, Zonal Co-ordinators, NATP	17-18 March 2000
• Shri.S.Amarasekara, Secretary, Ministry of Fisheries & Aquaculture Research Dept. and Shri.A.M.Jayasekara, Director General, National Agricultural Dept. Authority, Govt. of Srilanka	1 April 2000
• Dr.V.S.Chandrasekaran and Miss.Amita Saxena, Asst. Professors, College of Fisheries Sciences, G.B. Pant University of Agriculture and Technology, Pant Nagar, Uttar Pradesh.	4 April 2000
• Mr.Bruno Chaverial, COFREPECHE, France	26 May and 30 Oct. 2000
• Dr.V.R.Chitranshi, Principal Scientist (I.Fy.), ICAR, New Delhi	9 June 2000
• The Parliamentary Standing Committee on Agriculture visited Chennai/Tirupathi	21-24 June 2000
• Dr. R.A.Selvakumar, Asst. Director General (M.Fy.), ICAR, New Delhi	28-30 June 2000
• Director of Fisheries, Govt. of Maharashtra	3 July 2000
• Mr. Alexis Fostier, Scientist, National Institute of Agronomical Research, France	12 July 2000
• Shri.M.Mathivanan, Principal, Fisheries Staff Training Institute, Dept. of Fisheries, Govt. of Tamil Nadu	13 July 2000
• Shri.Nitish Kumar, Hon'ble Union Minister for Agriculture	24 July 2000
• Shri. M.D.Asthana, Principal Adviser (AGRI / DP), Planning Commission, Govt. of India, New Delhi	25 July 2000
• Dr.M.Devaraj, Former Director, CMFRI, Kochi	25-26 July 2000

(Chairman, QRT)	& 16 Aug. 2000
• Dr. A.Banerjee (Former Head, Bio-organic Division, BARC, Mumbai) and Emeritus Scientist, Organic & Biomolecular Chemistry Unit, CSIR Regional Laboratory, Trivandrum (Member, QRT)	25-26 July 2000 / 16 Aug. 2000 & 24 Oct.2000
• Dr.P.Vedavyasa Rao, Former Principal Scientist, CMFRI (Member, QRT)	25-26 July 2000
• Shri.V.Venkatesan, Director, MPEDA, Cochin (Member, QRT)	25-26 July 2000
• Dr.N.R.Menon, Head, Dept. of Marine Sciences, Cochin University of Science and Technology, Kochi (Member, QRT)	16 August 2000
• Shri.N.Chaturvedi, IAS, Principal Secretary, Fisheries Dept., Govt. of West Bengal	27 July 2000
• Dr.K.A.Dangre, Deputy Director of Fisheries, Directorate of Fisheries, Govt. of Maharashtra	3 August 2000
• Dr.Debendra Pradhan, Hon'ble Member of State for Agriculture, Govt. of India	4-6 August 2000
• Dr.K.Gopakumar, Deputy Director General (Fy.), ICAR, New Delhi.	31 August 2000
• Dr.S.S.De Silva, Dr.Dilip Kumar and Dr.M.N.Kutty (NACA Task Force Members)	31 August 2000
• Dr.B.N.Singh, Asst. Director General (I.Fy.), ICAR, New Delhi	31 August 2000
• Dr.M.Sakthivel, President, Aquaculture Foundation of India, Chennai	31 August 2000
• Dr. N.Sukumar, Professor and Head, School of Environmental Sciences, Manonmaniam Sundaranar University, Tirunelveli.	31 August 2000
• Dr.Y.S.Yadava, Coordinator, BOBP, Chennai	31 August 2000
• Dr. (Smt.) Indrani Karunasagar, Professor, Dept. of Fishery Microbiology, College of Fisheries, Mangalore	31 August 2000
• Dr.Toms C. Joseph, Scientist, CIFT, Cochin	31 August 2000
• Shri.A.Gopalakrishnan, Scientist, M.S. Swaminathan Research Foundation, Chennai.	31 August 2000
• Shri.N.K.Sinha, Secretary, ICAR and Shri.M.R.K.Nair, Commissioner of Fisheries, Ministry of Agriculture, Govt. of India	30 September 2000
• Parliamentary Standing Committee on Agriculture	14 October 2000

• Smt.V.Ilamathi, Lecturer(SG) in Zoology, Meenakshi College for Women, Chennai.	16 October 2000
• Dr.P.S.B.R.James, Former Director, CMFRI (Chairman, RAC)	24 October 2000
• Dr.S.C.Pathak, General Manager, NABARD, Guwahati (Member, RAC)	24 October 2000
• Dr.Samir Bhattacharya, Director, Indian Institute of Chemical Biology, Kolkata (Member, RAC)	24 October 2000
• Dr.A.D.Diwan, Asst. Director General (M.Fy.), ICAR, New Delhi (Member, RAC)	24 October 2000
• Dr.V.D.Singh, Former Commissioner of Fisheries, New Delhi	8 December 2000
• Dr.S.S.Tomar, Asst. Director General (ARIS), ICAR, New Delhi	17 December 2000

17. PERSONNEL

(Not a Gradation List)

DIRECTOR

G.R.M.Rao

SCIENTISTS

Head of Division

Dr.L.Hanumantha Rao, Crustacean Culture Division
& Principal Scientist (w.e.f. 27.7.98)

Dr.Mathew Abraham, Fish Culture Division
& Principal Scientist (w.e.f. 27.7.98)

Principal Scientist

Shri K.Devarajan (w.e.f.27.7.98)

Shri S.R.Das (w.e.f.27.7.98)

Dr.P.Ravichandran (w.e.f.27.7.98)

Shri M.Kathirvel (w.e.f.27.7.98)

Dr.S.Kulasekarapandian (w.e.f.27.7.98)

Dr.S.M.Pillai (w.e.f.27.7.98)
(Transferred to KVK of CMFRI, Narakkal on 4.7.2000)

Dr.T.C.Santiago (w.e.f.27.7.98)

Dr.A.R.Thirunavukkarasu (w.e.f.27.7.98)

Dr.Syed Ahamad Ali (w.e.f. 27.7.98)

Dr.K.Gopinathan (w.e.f.27.7.98)
(superannuation on 31.10.2000)

Shri R.K.Chakraborti (w.e.f.27.7.98)

Shri S.Srinivasagam (w.e.f.27.7.98)

Dr.C.P.Rangaswamy (w.e.f.27.7.98)

Dr.B.P.Gupta (w.e.f.27.7.98)

Shri N.Kalaimani (w.e.f.27.7.98)

Dr.M.Natarajan (w.e.f.27.7.98)

Dr.P.K. Ghosh (w.e.f.27.7.98)
(Transferred to CIFE on 21.10.2000)

Dr.(Mrs.) Munawar Sultana (w.e.f.27.7.98)

Senior Scientist

Dr.M.Krishnan
Dr.K.O.Joseph
Dr.G.Gopikrishna
Dr.K.K.Vijayan (w.e.f.5.10.99)
Dr.Azad Ismail Saheb (w.e.f.25.3.99)

Scientist (Senior Scale)

Dr.C.Gopal

Shri S.V.Alavandi

Dr.C.P.Balasubramaniam

Dr.M.Kailasam

Dr.S.S.Mishra (Transferred to CICFRI, Barrackpore, on 16.3.2000)

Dr.K.K.Krishnani

Dr.M.Muralidhar

Dr.K.P.Jitendran

Scientist

Shri T.Ravisankar

Mrs.D.Deboral Vimala

Dr.(Ms.) Shiranee Periera (on deputation to CPCSEA, Chennai, from 12.6.2000)

Shri V.Chellapandian

Dr.P.S.Sudheesh

Dr.(Mrs.) Imelda Joseph (Transferred to KVK of CMFRI on 4.7.2000)

Mrs. M.Jayanthi

Shri M.Shashi Shekhar

Shri K.Ponnusamy

Shri Akshaya Panigrahi

Shri J.K.Sundaray

Dr.K.Ambasankar

Mrs. P.Nila Rekha

Dr.J.Syama Dayal

Dr.M.Kumaran

Dr.T.K.Ghoshal

Dr. (Mrs.) Saradha Chundari

Mrs.P.Mahalakshmi

Dr. (Mrs.) M.Poornima (Joined on 7.6.2000 on Inter Institutional Transfer from Central Sheep and Wool Research Institute, Avika Nagar, Rajasthan).

TECHNICAL

Shri N.Venugopal, T-5 (Transferred to KVK Narakkal of CMFRI on 4.7.2000)

Shri R.Elangovan, T-5

Shri S.Krishnan, T-5

Shri M.Shenbagakumar, T-5

Shri S.Sivagnanam, T-5 (w.e.f.14.2.2000)

Shri D.Rajababu, T-5 (w.e.f.13.3.2000)

Shri R.Puthiavan, T-4

Shri V.R.Senthil Kumar, T-4

Shri M.G.Sivadasan, T-4 (w.e.f.1.1.2000) (Transferred to KVK, Narakkal of CMFRI on 4.7.2000)

Shri Vasanthakumar Charles, T-II-3

Shri S.Rajukumar, T-II-3

Shri Joseph Sahayarajan, T-II-3

Shri Marella Ravi, T-II-3

Shri S.Stanline, T-II-3

Shri A.Nagavel, T-II-3

Shri Ashok Kumar, T-II-3

Shri M.G.Subramani, T-II-3 (Driver)

Shri M.Gopinathan Nair, T-II-3 (Driver) (Transferred to KVK Narakkal of CMFRI on 4.7.2000)

Shri B.B.Roy, T-II-3 (Driver)

Shri N.Ramesh, T-2

Shri S.Saminathan T-2

Shri K.K.Surendran, T-I-3 (Transferred to KVK Narakkal of CMFRI on 4.7.2000)

Shri C.S.Sasidharan, T-I-3, (Transferred to KVK Narakkal of CMFRI on 4.7.2000)

Shri C.Ananthanarayanan, T-1

Shri P.C.Mohanty, T-1 (Driver)

Shri K.Paranthaman, T-1 (Driver)

Shri R.Balakumaran, T-1 (Driver)

Shri P.Manickyam, T-1

Shri P.S.Samantha, T-1

Ms.Chanda Mazumdar, T-1

Shri N.Jagan Mohanraj, T-1

Shri D.M.Ramesh Babu, T-1

Shri G.Thiagarajan, T-1

Shri K.Karayan, T-1

ADMINISTRATIVE

Shri P.K.Manimandram, Admn. Officer (Superannuation on 31.8.2000)

Shri S.Krishnaswamy, Asst. Fin. & Accts. Officer

Mrs.S.Bhagirathi, Superintendent

Shri A.B.Mondal, Assistant

Shri R.G.Ramesh, Assistant

Shri R.Kandamani, Assistant

Shri S.K.Halder, Stenographer

Ms.S.Nalini, Stenographer Gr.II

Mrs.K.Hemalatha, Stenographer Gr.III

Mrs.K.Subhashini, Stenographer Gr.III

Mrs.V.Usharani, Senior Clerk (under suspension)

Shri P.K.Roy, Senior Clerk

Shri K.Mani, Senior Clerk (V.R.S. on 16.10.2000)

Shri S.K.Bindu, Senior Clerk

Mrs.K.Nandini, Senior Clerk

Shri S.Pari, Junior Clerk

Mrs.E.Amudhavalli, Junior Clerk

Shri A.Manoharan, Junior Clerk

Shri A.Sekar, Junior Clerk

Mrs.E.Mary Desouza, Junior Clerk

Shri P.Srikanth, Junior Clerk

Mrs.R.Vetrichelvi, Junior Clerk

AUXILIARY

Shri N.Mani, Gestetner Operator

SUPPORTING STAFF

S.S.Gr.IV

Shri D.N.Sahoo

Shri N.C.Jana

Shri S.C.Mondal

Shri Gunadar Das

Shri L.C.Manna

Shri Prakash Chandra Saha

Shri Badlu Dhanuk

Shri K.K.Raman (Transferred to KVK, Narakkal of CMFRI on 4.7.2000)

S.S.Gr.III

Shri Dhaneswar Das

Shri R.K.Behera

Shri Shyam Bhoi

Shri Sita Ram Bahadur

Shri A.E.Raju

Shri M.N.Biswas

Shri A.K.Biswas

Shri Biswanath Mondal

Shri K.M.Das (V.R.S. on 30.9.2000)

Shri B.K.Jena

Shri N.N.Mondal

Shri Amulya Bijali

Shri N.C.Samanta

Shri N.K.Shanmugham

Shri P.Arumugam

Shri Baman Jally

S.S.Gr.II

Shri Sasidar Betal

Shri R.B.Das

Shri Gaur Hari Jena

Shri Kalipada Mondal

Shri M.C.Behera

Shri K.C.Samal

Shri Pani Gharami

Shri Sudarshan Naik

Shri Bijay Bhoi

Shri Balram Das

Shri K.U.Gopi (Transferred to KVK, Narakkal of CMFRI on 4.7.2000)

Shri Nitai Chandran Som

Shri Patit Paban Halder

Shri Abhimanyu Naskar

Shri R.K.Roy

Shri T.V.Shaji (Transferred to KVK of CMFRI, Narakkal)

Shri K.Kunjuraman (Transferred to KVK of CMFRI, Narakkal)

Shri K.Thankappan (Transferred to KVK of CMFRI, Narakkal)

Shri N.C.Mondal

Shri M.D.Suresh (Transferred to KVK of CMFRI, Narakkal)

Shri P.C.Saha

Shri M.Santhosam

Shri Maharaga Majhi

Shri N.Harinathan

Shri Narendra Nath Jana

Shri V.Jeevanandam (ACP on 4.9.99)

Shri Amar Gharami (ACP on 31.10.99)

Shri K.Mariappan (ACP on 4.12.99)

Shri Krishna Pada Naskar (ACP on 31.10.99)

Mrs.S.Santhi (ACP on 16.12.99)

Shri Premananda Bisoi (ACP on 11.3.2000)

Shri V.M.Dhanapal (ACP on 11.3.2000)

Shri K.Nityanandam (ACP on 11.3.2000)

S.S.Gr.I

Shri N.K.Jena
Shri B.C.Paik
Shri M.Subramani
Smt Lashmi Rani Bhuiya
Shri M.P.Devadasan (Transferred to KVK, Narakkal of CMFRI on 4.7.2000)
Shri V.Kumar
Shri E.Manoharan
Shri K.V.Delli Rao
Shri C.Saravanan
Shri S.Kuppan
Shri Uttam Kumar Santra
Shri M.Pichandi
Shri R.Kumaresan
Shri S.Selvababu
Shri D.Senthilkumaran
Shri C.Raghu
Shri P.G.Samuvel
Shri M.Sakthivel
Shri R.Mathivanan
Shri A.Paul Peter
Shri R.Indrakumar
Shri G.Dayalan
Shri Kanaka Prasad
Kum.M.Annamary
Mrs.S.Premavathy
Shri Bholalal Dhanuk
Shri Purna Chandra Das

18. INFRASTRUCTURE DEVELOPMENT

Headquarters / Muttukadu Experimental Station

The construction of Laboratory cum Administrative building of the Institute Headquarters at Santhome, Chennai, was completed and works in connection with electrical and water supply system are in progress.

The construction of a semi-permanent shed over Fish Larval Rearing Tanks at Mutukadu was completed. The construction of first floor over Nutrition Shed, compound wall to hatchery complex and fixing of boundary stones around the Muttukadu farm are in progress.

The work of farm lighting and seawater supply system to Muttukadu farm was initiated.

Regional Research Centre

At Kakdwip Research Centre renovation of few ponds in the A-Sector was initiated.

19. LIBRARY, INFORMATION AND DOCUMENTATION

Library holdings

The Institute's library holdings in December 2000 included 1200 books, 450 reprints and photocopies, 350 reports and 750 miscellaneous publications. 15 foreign journals and 20 Indian journals were subscribed during the year.

Exchange services

The library maintained exchange relationship with national and international organizations of mutual interest. The library maintained the free mailing of Institute's Annual Report and other publications to various research organizations, universities and other agencies.

Information services

The Library Section extended information services to the scientific personnel of research organizations, universities, research scholars, students and individuals through reference of books and journals in the library.

20. सारांश

केन्द्रीय खारापानी जलजन्तु पालन संस्थान की स्थापना अप्रैल, 1987 में भारतीय कृषि अनुसंधान परिषद के मात्स्यिकी विभाग के अन्तर्गत हुई । संस्थान का मुख्यालय चेन्नई में है तथा इसका प्रायोगिक केन्द्र चेन्नई से 30 कि.मी. दूर मुत्तुकाडु में स्थित है। इस समय संस्थान के दो शोध केन्द्र क्रमशः काकद्वीप (पश्चिम बंगाल) तथा पुरी (उड़ीसा) में स्थित हैं। नारक्कल शोध केन्द्र को जुलाई, 2000 में के.स.मा. अनु सं. के के.वी.के. केन्द्र को सौंप दिया गया। दिनांक 31-12-2000 तक संस्थान के निदेशक के साथ 48 वैज्ञानिक, 30 तकनीकी, 21 प्रशासनिक तथा 71 सहायक कर्मचारी कार्यरत हैं।

संस्थान का अधिदेश विभिन्न कृषि-पारिस्थितिकीय क्षेत्रों में खारेपानी में टिकाऊ तथा प्रभावशाली जलकृषि के विकास के लिए शोध का आयोजन करना है। अधिक उत्पादकता के लिए पारिस्थितिनुकूल तथा किफायती संवर्धन प्रौद्योगिकियों का विकास तथा विभिन्न विषयों को उत्पादन व प्रबंधन में लागू करते हुए खारेपानी क्षेत्रों में मछली, कवच मछली (शेलफिश) तथा अन्य जल-जन्तुओं का उत्पादन, पर्यावरण तथा प्राकृतिक सम्पदाओं के प्रबंधन हेतु नीतियों का निर्धारण, खारेपानी जलकृषि के कार्यों से संबंधित समाजार्थिकी का विकास, प्रभावशाली डेटाबेस व सूचना प्रबंधन प्रणाली का विकास, मानव संशाधन विकास, प्रौद्योगिकीय कार्यक्रमों का अंतरण एवं परामर्श सेवाएँ उपलब्ध कराना भी संस्थान के अधिदेश हैं।

संस्थान के शोध कार्यक्रम भारतीय कृषि अनुसंधान परिषद से बाहर के श्रेष्ठ वैज्ञानिकों से सम्मिलित शोध सलाहकार समिति के दिशानिर्देशों में चलाए जाते हैं। इनकी गतिविधियों का संस्थान प्रबंधन समिति द्वारा निरीक्षण होता है। कर्मचारी शोध परिषद संस्थान की अनुसंधान योजना के सूत्रीकरण तथा आयोजन में मदद करती है तथा वर्ष में दो बार नियमित रूप से संस्थान के कार्यक्रमों का पुनरीक्षण करती है।

वर्ष 1999-2000 में संस्थान के विभागीय ढाँचे की 9वीं ई.एफ.सी. योजना के अनुसार पुनःरचना की गई। इस समय छः (6) विभागों के अन्तर्गत शोध कार्य हो रहे हैं जैसे-क्रस्टेशियन संवर्धन विभाग, मत्स्य संवर्धन विभाग, पोषण, शरीर विज्ञान एवं रोग विज्ञान विभाग, आनुवांशिकी तथा जैव-प्रौद्योगिकी विभाग, जलकृषि अभियांत्रिकी तथा पर्यावरण विभाग एवं विस्तार, आर्थिकी तथा सूचना विभाग।

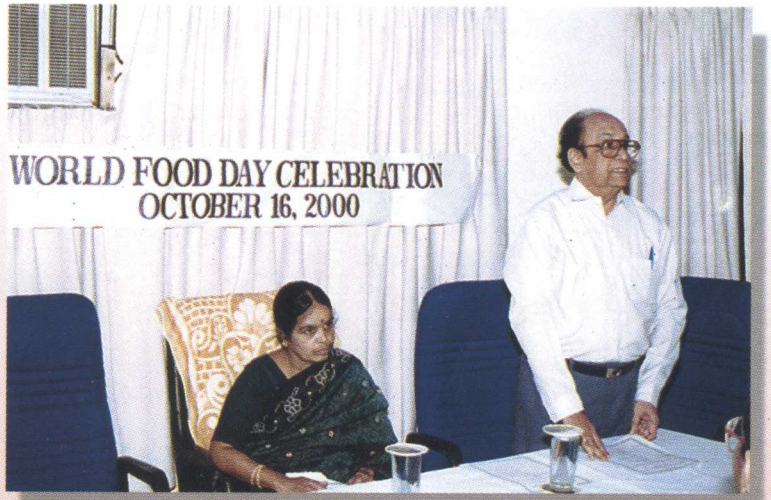
संस्थान में 16 शोध परियोजनाएँ तथा बाहर से वित्तीय सहायता प्राप्त 8 शोध परियोजनाएँ कार्य कर रही हैं। इनमें से निम्न तीन परियोजनाओं को भारतीय कृषि अनुसंधान परिषद के ए.पी. सेस फंड द्वारा वित्तीय सहायता प्रदान की गई है : (क) भारत में खारापानी जलकृषि प्रणालियों का आर्थिक मूल्यांकन, (ख) टिकाऊ झींगा पालन के विकासार्थ झींगा स्वास्थ्य, जल तथा मृदा की गुणवत्ता का रख-रखाव एवं (ग) विब्रियों की सम्पूर्ण कोशिका का उपयोग करके झींगा के रोग प्रतिरोधकों का विकास तथा मूल्यांकन। निम्न चार परियोजनाओं को भारतीय कृषि अनुसंधान परिषद की (विश्व बैंक से सहायता प्राप्त) राष्ट्रीय कृषि प्रौद्योगिकी परियोजना द्वारा वित्तीय सहायता प्रदान की गई है : (घ) झींगा तथा मछली शावक

Dr.G.R.M.Rao, Director, CIBA (extreme left), explaining the R & D programmes on seabass captive broodstock development and seed production to Shri Nitish Kumar, Hon'ble Minister for Agriculture, Govt. of India (second from right).

At First Indian Fisheries Science Congress, Chandigarh: Dr.G.R.M.Rao, Director, CIBA (left), Dr.K.Gopakumar, Deputy Director General (Fy.), ICAR (middle) and Dr.A.D.Diwan, Assistant Director General (M.Fy.) (right).

The visit of Quinquennial Review Team (QRT) to Muttukadu Experimental Station On 26th July 2000

The visit of Quinquennial Review Team (QRT) to Kakdwip Research Centre of CIBA On 17th August 2000



Dr.G.R.M.Rao, Director, CIBA (right), delivering the inaugural address during the World Food Day celebrations, on 16 October 2000 at CIBA Headquarters, Chennai.Smt. V. Ilamathy Lecturer, Meenakshi College for Women, Chennai (left), was the Chief Guest.

Dr.Mathew Abraham, Principal Scientist & Head, Fish Culture Division,CIBA (center) with the Gomishan Fish Farm officials, namely, Dr.Kourosh Amini (left) and Mr.Shahid Rajai (right).

Dr.G.R.M.Rao, Director, CIBA, delivering the vote of thanks at the inaugural function of the National Seminar and Exhibition on Sustainable Fisheries and Aquaculture for Nutritional Security, at Chennai, 29 November 2000.

Dr.G.R.M.Rao, Director, CIBA (extreme left), delivering the key note address at India International Seafood Show at Visakhapatnam.

संजाती का विकास तथा बंधित परिस्थितियों में प्रजनन, (ङ) झींगा तथा मछली स्वास्थ्य प्रबंधन, (च) खारेपानी की अनुर्वर परिस्थितियों में मछली उत्पादन तथा (छ) तमिलनाडु के तिरुवल्लूर जिले में प्रौद्योगिकी निर्धारण एवं तटवर्ती कृषि पारिस्थितिकी प्रणाली के शोधनार्थ संस्थान व गांव का संयुक्त कार्यक्रम। अन्तिम (ज) सीबास पायलट इकाई मत्स्यशाला तथा संवर्धन परियोजना ICAR/DARE भारत एवं COFREPECHE/IFREMER फ्रांस की एक इंडोफ्रेंच संयुक्त परियोजना है।

इस वर्ष संस्थान की महत्वपूर्ण शोध उपलब्धियाँ निम्न प्रकार रही है :

● काकद्वीप में ज्वारभाटा के पानी से भरे गए दो तालाबों (क्षेत्र 0.16 तथा 0.18 हे.) में पी. मोनोडान के संशोधित व्यापक संवर्धन (60,000 PL/20 ha) पर, संस्थान द्वारा तैयार सूत्रिकृत विकसित आहार देते हुए सफलतापूर्वक परीक्षण किए गए। उनकी उत्पादन दर 100 दिन में 1.2 टन/हे. तथा फसल की औसतन मात्रा 27 ग्रा. पाई गई।

● मुत्तुकाडु की केकड़ा मत्स्यशाला में मड केकड़े एस. ट्रंक्यूबेरिका (वाइल्ड बेरिड केकड़ा, पृष्ठवर्म की चौडाई 194 मि.मी. तथा वजन 1.7 कि.ग्रा.) के सभी जोयल स्तरों को अर्थात [अंडे से लेकर मेगालोपा स्तर से होते हुए पोस्ट लार्वल इंस्टार स्तर (बेबी केकड़े) तक] पालने में संस्थान को पहली बार सफलता प्राप्त हुई।

● नारक्कल केन्द्र में फिनमछलियों (मूगिल सेफालस, लिजा परसिया तथा इट्रोप्लस सरटेनसिस) तथा झींगों (पी. मोनोडान तथा पी. इंडीकस) को मिश्रित पालन के लिए ज्वारभाटा के पानी से भरे गए तालाब (0.05 हे.) में सफलतापूर्वक रखा गया। मछलियों तथा झींगों की संग्रहण सघनता क्रमशः 19,800 तथा 24,000 थी तथा मछली एवं झींगा की आठ महिनों में संयुक्त उत्पादन दर 1564.3 कि.ग्रा./हे. रही।

● संस्थान के प्रायोगिक केन्द्र मुत्तुकाडु में फिनमछलियों की बन्धक शावक संजाती जैसे मुलेट-एम. सेफालस, ग्रुपर-इपाइनेफेलस, सीबास-एल. क़ेलकरीफेर को 100 टन क्षमता वाले आर.सी.सी. टैंक में रखा गया। जहाँ नियमित रूप से इनके स्वास्थ्य व पानी की गुणवत्ता का ध्यान रखा गया।

● सीबास-एल. केलकरिफेर की बन्धक शावक संजाती का प्रेरित प्रजनन हुआ तथा जून-नवम्बर, 2000 के दौरान कुल ग्यारह (11) प्रेरित प्रजनन परीक्षण किए गए। इस वर्ष कुल 40.6 लाख स्फुटनिकाएँ उत्पादित की गई। मत्स्यशाला में उत्पादित पोना (यंग फिश) संवर्धन व वृद्धि के लिए किसानों/ठेकेदारों तथा सरकारी संगठनों को बेचे गए।

● ग्रुपर-ई. तौविना को फिश रिंगर, 5% ग्लूकोज विलयन व क्रायोप्रोटेक्टेंट डाइमिथायलसल्फाक्साइड से तैयार उपयुक्त क्रायोडायल्यूंट का उपयोग करते हुए शीतलीकृत किया गया। क्रायोडायल्यूंट में शीतलीकृत करने से पूर्व शुक्राणुओं की क्रियाशीलता 80-90% तथा शीतलीकरण के 13 महिनों के बाद शुक्राणुओं को पुनः द्रव रूप में लाने पर उनकी क्रियाशीलता 20-30% पायी गयी।

● मुत्तुकाडु में तालाबों में जालीदार पिंजरों द्वारा घिरे 54 वर्गमीटर क्षेत्र में ग्रुपर-ई. तौविना (ज्यूनिवेल मछलियों का आकार 123-158 मि.मी./वजन 23-62 ग्रा.) का पालन किया गया। उन्हें, शारीरिक भार के 5% की दर से टिलापिया मछली को आहार के रूप में दिया गया। सात महिनों के बाद

उनकी औसतन वृद्धि 365 मि.मी./618 ग्रा. (330-390 मि.मी./360-800 ग्रा. तक) पायी गयी।

● सीबास-एल. केलकरीफेर अंगुलिका के आहार में प्रोटीन-स्तर की आवश्यक्ता जानने के लिए परीक्षण किए गए। उन्हें 27-43% अलग-अलग प्रोटीन स्तर का सूत्रिकृत आहार दिया गया जो यह दर्शाता है कि 43% प्रोटीन स्तर का आहार देने से उत्पादन में अत्यधिक वृद्धि (162%) तथा एफ.सी.आर. (2.01) हुई।

● बीस (20) दिन के सीबास-एल. केलकरीफेर लार्वा को 55.2% प्रोटीनयुक्त सूत्रिकृत एवं शीतलीकृत व सूखा आहार (100 माइक्रान साईज) देते हुए परीक्षण किया गया, जिससे उनके जीवित रहने की क्षमता 70% पायी गयी तथा एक ही आकार के लार्वा प्राप्त हुए।

● प्रायोगिक सूत्रिकृत आहार का उपयोग करते हुए आहार परीक्षण के द्वारा सीबास के वृद्धिवर्धक आहार में आहार आकर्षकों के समावेश का मूल्यांकन किया गया। परिणाम यह दर्शाते हैं कि ट्राइमिथाइलामीन एवं ग्लूटेमिक अम्ल का आहार आकर्षक के रूप में उपयोग किया जा सकता है।

● एस. सेराटा तथा एस. ट्रंक्यूबेरिका को 31-47% तक अलग-अलग प्रोटीन स्तर का सूत्रिकृत प्रायोगिक आहार (स्वदेशी आहार तत्वों से तैयार किए गए, जैसे-झींगा आहार, मछली आहार, स्किवड आहार, सोयाबिन आहार, मक्कई ग्लूटेन आहार तथा अन्य संघटक) देकर परीक्षण किए गए, जो यह दर्शाते हैं कि यह मड केकड़े की दोनों प्रजातियों में 39% प्रोटीन स्तर का आहार, उनके आहार पचाने की क्षमता के अनुकूल है तथा उच्च वृद्धि भी प्रदान करता है।

● मड केकड़े एस. सेराटा तथा एस. ट्रंक्यूबेरिका के आनुवांशिकी लक्षणों का अध्ययन किया गया। प्रौढ़ नर केकड़े की टेस्टेस से गुणसूत्र लिए गए तथा केरियोलॉजीकल कार्य के लिए संलेख (Protocol) का मानकीकरण किया गया। एस. सेराटा तथा एस. ट्रंक्यूबेरिका में क्रमशः 53 तथा 51 अगुणित गुणसूत्र पाए गए।

● तमिलनाडु (पूचेरी, नानमेडु तथा अगरम) आंध्र प्रदेश (पंटापालेम तथा लक्ष्मीपतिपुरम), केरल (पिज़ाला, पोय्या तथा अप्पंगाड) तथा पश्चिम बंगाल (बेल्पुकुर, बेटलाल, महाराजगंज तथा हेनरीज आयलैंड) में स्थित व्यवसायिक झींगा खेती की निरन्तर निगरानी रखकर पारंपरिक तथा विस्तृत झींगा पालन के लिए पानी तथा मृदा की गुणवत्ता पर डेटाबेस विकसित किया गया।

● थालवेरू, यू. कोथापल्ली, आई. पोलावरम, कट्टेरिकोना, उप्पलाकुप्टम, अल्लावरम, ममिडिकुडम तथा राजोलु मंडलों के झींगा पालन व्यवसाय के विस्तृत सर्वेक्षण के द्वारा आंध्र प्रदेश के पूर्वी गोदावरी क्षेत्रों में पर्यावरण तथा समाजार्थिकी पर झींगा पालन के प्रभाव को देखा गया। जिससे पता चला कि झींगा पालन, खेतों के लिए प्रयुक्त पानी के तालाबों, पानी के छोटे नालों, सिंचाई के लिए प्रयुक्त नहरों तथा मृदा की गुणवत्ता पर कोई प्रतिकूल प्रभाव नहीं डालता है। समाजार्थिकी प्रश्नावली सर्वेक्षण के आधार पर यह पता चला कि झींगा पालन के कार्यक्रमों से तटवर्ती गावों के लोगों का जीवन-स्तर ऊपर उठा है।

● संस्थान की कम्प्यूटरिकृत डेटाबेस (आँकडों पर आधारित) सूचना प्रणाली के लिए तमिलनाडु, आंध्र प्रदेश तथा केरल की खारेपानी की मात्स्यिकी संपदा से संबंधित सभी आधुनिक डेटा (आंकडों) का संग्रह

किया गया। स्थानीय नेटवर्क (एल.ए.एन.) का प्रारंभ करके, नेटवर्क विश्लेषण के लिए उसका उपयोग किया गया। संस्थान का वेबसाइट भी संशोधित तथा आधुनिकीकृत किया गया है।

बाहर से वित्तीय सहायता प्राप्त परियोजनाएँ :

इस वर्ष संस्थान ने बाहर से वित्तीय सहायता प्राप्त चार नई परियोजनाओं को अपने हाथ में लिया है, जैसे-(क) विब्रियो की सम्पूर्ण कोशिका का उपयोग करके झींगा के रोग प्रतिरोधकों का विकास तथा मूल्यांकन (ए.पी. सेस फंड परियोजना) (ख) खारेपानी की अनुर्वर परिस्थितियों में मछली उत्पादन (रा.कृ.प्रौ.प. परियोजना) (ग) तमिलनाडु के तिरुवल्लूर जिले में प्रौद्योगिकी निर्धारण एवं तटवर्ती कृषि पारिस्थितिकी प्रणाली के शोधनार्थ संस्थान व गांव का संयुक्त कार्यक्रम (रा.कृ. प्रौ. प. परियोजना) (घ) सीबास पायलट इकाई मत्स्यशाला तथा संवर्धन परियोजना (ICAR व IFREMER/COFREPECHE के बीच इंडोफ्रेंच संयुक्त परियोजना)।

प्रौद्योगिकी कार्यक्रमों का अंतरण

संस्थान समय-समय पर नियमित रूप से प्रशिक्षण कार्यक्रमों का आयोजन करता रहा है। इस अवधि में छः (6) प्रशिक्षण कार्यक्रम आयोजित किए जा चुके हैं : जैसे (i) मड केकड़ा (सैला स्प.) शावक संजाति का विकास, प्रजनन तथा संवर्धन (ii) सीबास में प्रजनन व बीजों का उत्पादन (iii) झींगा रोग व स्वास्थ्य प्रबंधन (iv) झींगा प्रजनन व मत्स्यशाला प्रौद्योगिकी (v) जलकृषि में आनुवांशिकी व जैव-प्रौद्योगिकी का उपयोग एवं (vi) खारेपानी में झींगा कृषि का पर्यावरण पर प्रभाव।

इस वर्ष संस्थान ने दो प्रदर्शनियों में भाग लिया, जैसे-(क) 21-23 सितम्बर, 2000 में प्रथम भारतीय मात्स्यिकी विज्ञान सम्मेलन प्रदर्शनी, चंडीगढ़ तथा (ख) 29 नवम्बर-2 दिसम्बर, 2000 में चेन्नई में ''पोषण सुरक्षा के लिए टिकाऊ मात्स्यिकी तथा जलकृषि'' के संबंध में आयोजित संगोष्ठी के साथ प्रदर्शन।

परामर्श

इस वर्ष निम्न संस्थानिक परामर्श सेवाएं कार्यरत थीं : (क) कृषि मंत्रालय, भारत सरकार की विश्व बैंक से सहायता प्राप्त झींगा तथा मछली संवर्धन परियोजना के अधीन पर्यावरण निगरानी कार्यक्रम तथा (ख) राजीव गाँधी जलकृषि केन्द्र (एम.पी.ई.डी.ए.) मैलाडुदुरै को सीबास प्रजनन तथा बीज उत्पादन।

प्रकाशन

वर्ष 2000-2001 में संस्थान के द्वारा 2000-2001 का प्रशिक्षण कैलेंडर; 1999-2000 का वार्षिक प्रतिवेदन; केखाजपासं (सिबा) पत्रिका सं. 12-बंधक शावक संजाति का विकास, प्रेरित प्रजनन तथा मड केकड़े (सैला स्प.) के लार्वा स्तर, केखाजपासं (सिबा) पत्रिका सं. 13-झींगा आहार विधि तथा उत्पादन प्रौद्योगिकी, केखाजपासं (सिबा) विस्तार श्रेणी सं. 18 व 19 तथा 20 एवं समाचार अंक 5, सं. 1, सं. 2, सं. 3, तथा सं. 4 प्रकाशित किए गए।

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