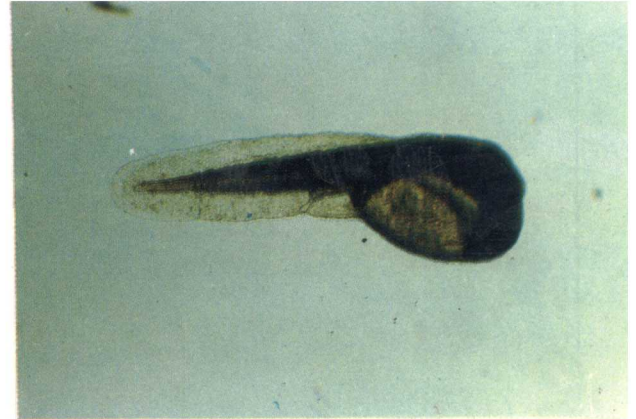
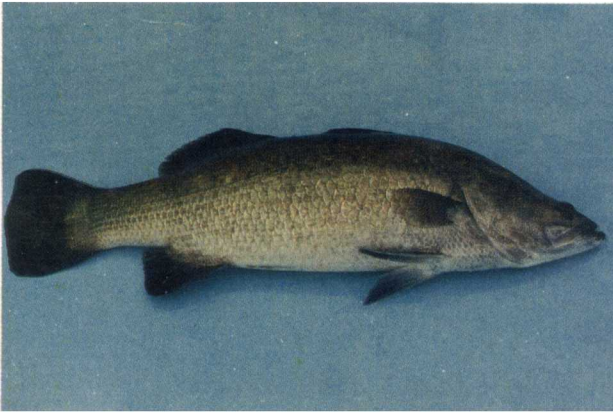




वार्षिक प्रतिवेदन
ANNUAL REPORT
1997-98



केन्द्रीय खारापानी जलजन्तु पालन संस्थान
(भारतीय कृषि अनुसंधान परिषद)
न. १४१, मार्शल्स रोड, एगमोर, चेन्नै - ६०० ००८.

CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE
(Indian Council of Agricultural Research)
141, Marshalls Road, Egmore, Chennai - 600 008.



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141, MARSHALLS ROAD, CHENNAI - 600 008.

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Cover Photos

Top Left : Mature fish seabass *Lates calcarifer*

Top Right : Embryonic development of seabass *L. calcarifer*

Bottom Left : 40 day old hatchery reared seed of seabass *L. calcarifer*

Bottom Right : 1 day old larva of seabass *L. calcarifer*

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1. PREFACE

The year 1997-98 has become an outstanding one for the Central Institute of Brackishwater Aquaculture. During this period, the Institute made a major breakthrough in the field of aquaculture - the captive broodstock development, breeding and seed production of the Asian seabass *Lates calcarifer*, an outcome of dedicated effort by a team of scientists. This breakthrough came at a time when the Institute completed a decade of service to the nation, coinciding with the commemoration of the Golden Jubilee of the country's Independence.

The Institute made significant progress in all its activities. Fifteen Institute based research projects and one externally funded project were operated during the period. Important training programmes were conducted *viz.*, training on seabass breeding and seed production and fish / shrimp disease diagnosis and health management. The extension needs of farmers / entrepreneurs were met through farmers meets, exhibitions, publications, advisory and monitoring services. The Institute received several consultancy proposals from farmers / entrepreneurs, Govt. agencies and feed industry. The major consultancy offer clinched by the Institute was the Environmental Monitoring Programme (EMP) under the World Bank - assisted Shrimp and Fish Culture Project of the Dept. of Agriculture and Cooperation, Ministry of Agriculture.

The Institute strengthened its linkages with several government organisations *viz.*, Dept. of Biotechnology (Ministry of Science and Technology), Dept. of Agriculture and Cooperation (Ministry of Agriculture), Marine Products Export Development Authority (Ministry of Commerce), Indira Gandhi National Open University, State Fisheries

Depts. / BFDAs, ICAR organisations, NGOs, aqua-farmers / entrepreneurs, etc.

Good progress was made in development of infrastructure facilities. New facilities like the finfish hatchery and feed mill were completed during the year. Development of facilities for staff included construction of additional staff quarters at Muttukadu (Chennai). The Agricultural Research Information System (ARIS) laboratory is being set up at Muttukadu to cater to the needs of our scientists.

Human resource development and staff welfare has also received priority attention.

The Institute is continuously striving forward to achieve the targets set for the research and development of brackishwater aquaculture. The future goals and strategies to be adopted are reflected in the Perspective Plan document published during the period - Vision 2020 - CIBA Perspective Plan.

I would like to express my gratitude to Dr.R.S.Paroda, Secretary, DARE, Govt. of India and Director General, ICAR; Dr.P.V.Dehadrai (former Deputy Director General (Fy), ICAR; Dr.K.Gopakumar, Deputy Director General (Fy), ICAR and Dr. R. A.Selvakumar, Assistant Director General (Fy), ICAR, for their constant guidance and encouragement. I wish to express my deep and sincere appreciation to all my colleagues who have contributed to the success of the research programmes thereby projecting the image of this Institute to the whole country . The Annual Report 1997-98 presents the progress of research and development activities at CIBA as an information source for the benefit of planners, researchers and farmers / entrepreneurs involved in the field of brackishwater aquaculture.

G. R. M. RAO
Director

2. EXECUTIVE SUMMARY

The Central Institute of Brackishwater Aquaculture is one of the eight Institutes under the Fisheries Division of the Indian Council of Agricultural Research. It was established in April 1987 to conduct research and provide technology support to the country's growing brackishwater aquaculture sector. The Headquarters of the Institute is located in Chennai with an Experimental Field Station at Muttukadu, about 30 km south of Chennai. There are three Research Centres, located at Kakdwip (West Bengal), Puri (Orissa) and Narakkal (Kerala). The Institute has a Director, 49 Scientists, 37 Technical, 23 Administrative and 87 Supporting staff as on 31.12.97. A total budget of Rs 387 lakhs was allocated for the year 1997-98.

The mandate of the Institute is to conduct research for development of technoeconomically viable and sustainable culture systems for finfish and shellfish in brackishwater, to act as a repository of information on brackishwater fishery resources with a systematic data-base, to undertake transfer of technology through training, education and extension education 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). A number of internal committees such as Staff Research Council (SRC), Institute Joint Staff Council (IJSC), Purchase Committee, Works Committee etc., have been constituted to manage the Institute's activities.

In the past ten years, since its inception, the Institute has made significant contributions in the development of production / hatchery technology for shrimp, captive fish broodstock development, fish breeding and seed production, nutrition and feed technology, diagnosis of fish and shellfish diseases and health management, shrimp farm environmental survey and impact assessment and transfer of technology programmes.

The research programmes are carried out under five research divisions / units viz., Crustacean Culture Division, Fish Culture Division, Technology Improvement Division, Aquaculture Engineering and Environment Unit and Extension, Economics and Information Unit. The major research achievements of the Institute during the year are highlighted below:

For the first time in the country, the Institute made a major breakthrough in the successful development of captive broodstock and controlled breeding of the Asian seabass *Lates calcarifer* during June-July 1997. The fishes (3-10 kg), held in captivity for over a year in two 100 ton capacity RCC tanks at the Muttukadu Experimental Station, were subjected to induced maturation and breeding. Implantation of LHRHa (Luteinizing Hormone Releasing Hormone analogue) pellets @ 100 mg/kg in the body, induced final maturation of fishes. Such fishes injected with LHRHa @ 60-80 mg/kg in females and 30-40 mg/kg in males, spawned and 90% fertilisation was achieved. Fertilised eggs, incubated in sand-filtered water having a salinity range of 30 to 32 ppt, hatched, yielding 1.4 million hatchlings. The hatchlings were successfully reared on a diet of live rotifers (*Brachionus plicatilis*) and *Artemia* nauplii. Subsequently a few more sets spawned and about 2 lakh fry (25 to 30 days old) were sold to progressive fish farmers.

The Institute also achieved captive broodstock development and induced breeding of the grey mullet *Mugil cephalus* for the first time in the country. 20% of the broodstock (0.4 to 1.5 kg), held under captive conditions, attained final maturity without any hormonal manipulation. Induced breeding was carried out in February 1997 with Human Chorionic Gonadotropin (HCG) @ 10,000 IU/kg as priming dose and Ovaprim @ 5 ml/kg as resolving dose after 24 h interval. The fish ovulated and 90% fertilisation of stripped eggs was achieved with milt from oozing males. 5.2 lakh hatchlings were obtained. The larvae were reared for a period of 8 days.

The Institute carried out detailed investigations on the White Spot Syndrome Virus (WSSV) infection in shrimp. A simple and rapid DNA-based diagnostic technique was developed for the diagnosis of this disease using the eyestalk of shrimp as indicator organ. Another diagnostic method was developed based on the sequential histopathology of sub-cuticular ectodermal layer of eyestalk. These techniques can have wide application in screening broodstock shrimp in hatcheries for WSSV infection.

The WSSV infection has also been induced under laboratory conditions in several species of shrimp, crabs, freshwater prawns and lobsters, to study the susceptibility / reservoir or carrier potential of the different aquatic crustaceans to this infection. The study has shown that among the different groups of decapod crustaceans studied, mud crabs and lobsters can act as asymptomatic carrier / reservoir hosts of this virus.

The Institute conducted a significant study on the impact assessment of shrimp farming, to assess the ground realities of the impacts on the environment and socio-economic conditions of the people in the coastal districts of Tamil Nadu viz., South Arcot, Nagai-Quaide-Milleth, Thanjavur, Pudukottai, Ramanathapuram and V.O.Chidambaranar. The study showed that the levels of various water quality parameters viz., ammonia, nitrite, Hydrogen sulphide, COD and BOD at the outfall areas of farms were within permissible limits. Though salinisation of soil and water were observed in farms and villages, this could not be attributed to shrimp farming alone. Among the socio-economic impacts, the most significant included the increased employment opportunities for the local people.

Further advances have been made by the Institute in shrimp / fish nutrition and feed technology. Indigenous technology was developed for processing and production of shrimp feeds. A semi-commercial feed mill

installed at Muttukadu was used for the production of different grades of shrimp feed. Alternate protein sources including plant protein sources viz., oil cakes, *Spirulina* etc. were evaluated for incorporation in shrimp feeds. Studies on the use of probiotics for shrimp feeds indicated that growth and feed efficiency of juvenile shrimp could be improved with probiotics at 3% inclusion level. Experiments with fish silage prepared by formic acid fermentation indicated that it could be used as feed attractant. A maturation feed was developed for broodstock of grey mullet *Mugil cephalus*.

An effective data-base information system for brackishwater fishery resources has been developed on an in-house software in a text-based media, with data entry on a regular basis. An ARIS laboratory is also being set up. A number of extension brochures / pamphlets / bulletins have been brought out for the benefit of farmers / entrepreneurs on small-scale shrimp hatchery technology, finfish farming, site selection and farm design, shrimp nutrition and feed technology, disease diagnosis and health management in shrimp farms, brine shrimp *Artemia* biomass and cyst production and mud crab culture. Monitoring and advisory services are being rendered from time to time. The Institute has also agreed to take up the consultancy on Environmental Monitoring Programme (EMP) for the World-Bank assisted Shrimp and Fish Culture Project under the Dept. of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India.

Vision 2020 - CIBA Perspective Plan was published during the year. Other publications of the year include Research Highlights 1987-1997, Annual Report of the Institute for the year 1996-97, CIBA Bulletin No.10 on mud crab culture, CIBA Extension Series No. 8, 9, 10, 11, 12 & 13 and CIBA News Vol.1, No. 2, 3 & 4 and Vol.2, No.1, 2 & 3.

3. INTRODUCTION

Brief Historical Background

Brackishwater aquaculture has been identified as one of the high potential areas for increasing fish and shellfish production and for deriving maximum economic and social benefits such as better utilisation of unproductive and marginally productive coastal lands, swamps and brackishwater bodies, augmenting production for export and foreign exchange earnings, support to food security system, establishment of ancillary industries, generation of employment and improving the socio-economic conditions of rural poor. As all these activities require adequate and continuous R & D support, the Indian Council of Agricultural Research sanctioned the establishment of the Central Institute of Brackishwater Aquaculture during the 7th Plan period with effect from 1.4.1985, by reorganisation of the then existing Fisheries Research Institutes of the Council. The Institute started functioning independently since April 1987. The Headquarters of the Institute is located in Chennai City with field and farm facilities at Muttukadu, about 30 km south of Chennai. The Institute has three Research Centres, located at Kakdwip (West Bengal), Puri (Orissa) and Narakkal (Kerala).

Mandate

The Institute has the following mandate:

- To conduct research for development of techno-economically viable and sustainable culture systems for finfish and shellfish in brackishwater
- To act as a repository of information on brackishwater fishery resources with a systematic data-base
- To undertake transfer of technology through training, education and extension education programmes
- To provide consultancy service

Achievements made during the past decade (1987-97)

In the past ten years, since its inception, the Institute has made significant contributions

to the development of production / hatchery technology for shrimp, captive fish broodstock development, fish breeding and seed production, shrimp / fish nutrition and feed technology, diagnosis of fish and shellfish diseases and health management, shrimp farm environmental survey and impact assessment, database on brackishwater fishery resources and transfer of technology programmes as outlined below :

Production / hatchery technology for shrimp

- Higher production rate (1.2 t / ha / crop) of tiger shrimp *Penaeus monodon* was obtained in tidal-fed extensive culture using feeds developed by the Institute.
- Production levels of 4.5 t / ha / crop were achieved in semi-intensive culture of tiger shrimp in demonstration / collaboration project with MPEDA.
- A simplified cost-effective backyard hatchery technology package was developed for the seed production of white shrimp *P. indicus*.
- A technology package was developed for captive broodstock maturation of tiger shrimp *P. monodon*.
- A technology package was developed for the biomass and cyst production of the brine shrimp *Artemia*.
- Hatchery lay-out and designs were developed for small-scale (2, 5 and 10 million capacity) and backyard shrimp hatchery.

Captive fish broodstock development, fish breeding and seed production

- A technology package was developed for the pond-breeding of the pearlspot *Etroplus suratensis*.
- A technology package was developed for the captive broodstock development, induced maturation, breeding and seed production of seabass *Lates calcarifer*.
- Technology was developed for captive broodstock development, induced

maturation and breeding of grey mullet *Mugil cephalus*.

- Technology was developed for low-input integrated shrimp/fish cum poultry farming.

Shrimp / fish nutrition and feed development

- Nutritional requirements of candidate species of shrimp *P. monodon* and *P. indicus* were drawn up and shrimp feeds were formulated using indigenous feed ingredients.
- A technology package was developed for small-scale shrimp feed processing and production.
- A technology package was developed for production of micro-particulate feed for post-larvae of shrimp *P. indicus*.
- The availability of marine protein resources was assessed in different maritime states for use in aquaculture feeds.
- Digestive and gut microbial enzymes were identified in shrimp *P. monodon* and grey mullet *M. cephalus* and their activity levels studied.

Shrimp / fish diseases and health management

- Extensive investigations were conducted on the bacterial and viral diseases of shrimp and a comprehensive database on shrimp diseases was built up.

A simple and rapid DNA - based diagnostic test using Polymerase Chain Reaction (PCR) technique was developed for the diagnosis of White Spot Syndrome Virus (WSSV) infection in tiger shrimp *P. monodon*.

- Another diagnostic method, based on sequential histopathology of sub-cuticular ectodermal layer of shrimp eyestalk, was

developed for the diagnosis of WSSV infection in shrimp.

- Studies were conducted on the bacterial and parasitic diseases of fish broodstock.

Environmental survey and impact assessment of shrimp farming

- Extensive investigations were conducted on shrimp farm environment and comprehensive impact assessment of shrimp farming.
- Technical assistance was rendered to the Govt. of India and State Governments of Andhra Pradesh and Tamil Nadu for the development of guidelines for brackishwater aquaculture.

Database on brackishwater fishery resources

- An extensive computerised database information system was developed on brackishwater fishery resources of the country.

Transfer of technology

- Several training programmes were conducted on brackishwater aquaculture of shrimp / fish, hatchery technology for shrimp, soil and water quality management in shrimp ponds, disease diagnosis and health management of shrimp / fish and seabass breeding and seed production.
- Extension literature was published for farmers / entrepreneurs on several aspects of brackishwater aquaculture; farmers meets / demonstrations/ exhibitions were conducted from time to time
- Advisory services were rendered to farmers on brackishwater aquaculture of shrimp / fish, pond environment management, shrimp health management, mud crab culture and the brine shrimp (*Artemia*) cyst and biomass production.

Financial statement

The details of expenditure incurred (Rs. in lakhs) during 1996-97 and 1997-98 (till 31 March 1998) are as follows :

Head of account	Approved RE 1996-97	Actuals 1996-97	Approved RE 1997-98	Actuals 1997-98
Plan	175.00	174.17	250.00	240.00
Non-Plan	114.80	111.44	137.00	126.96

Staff Position

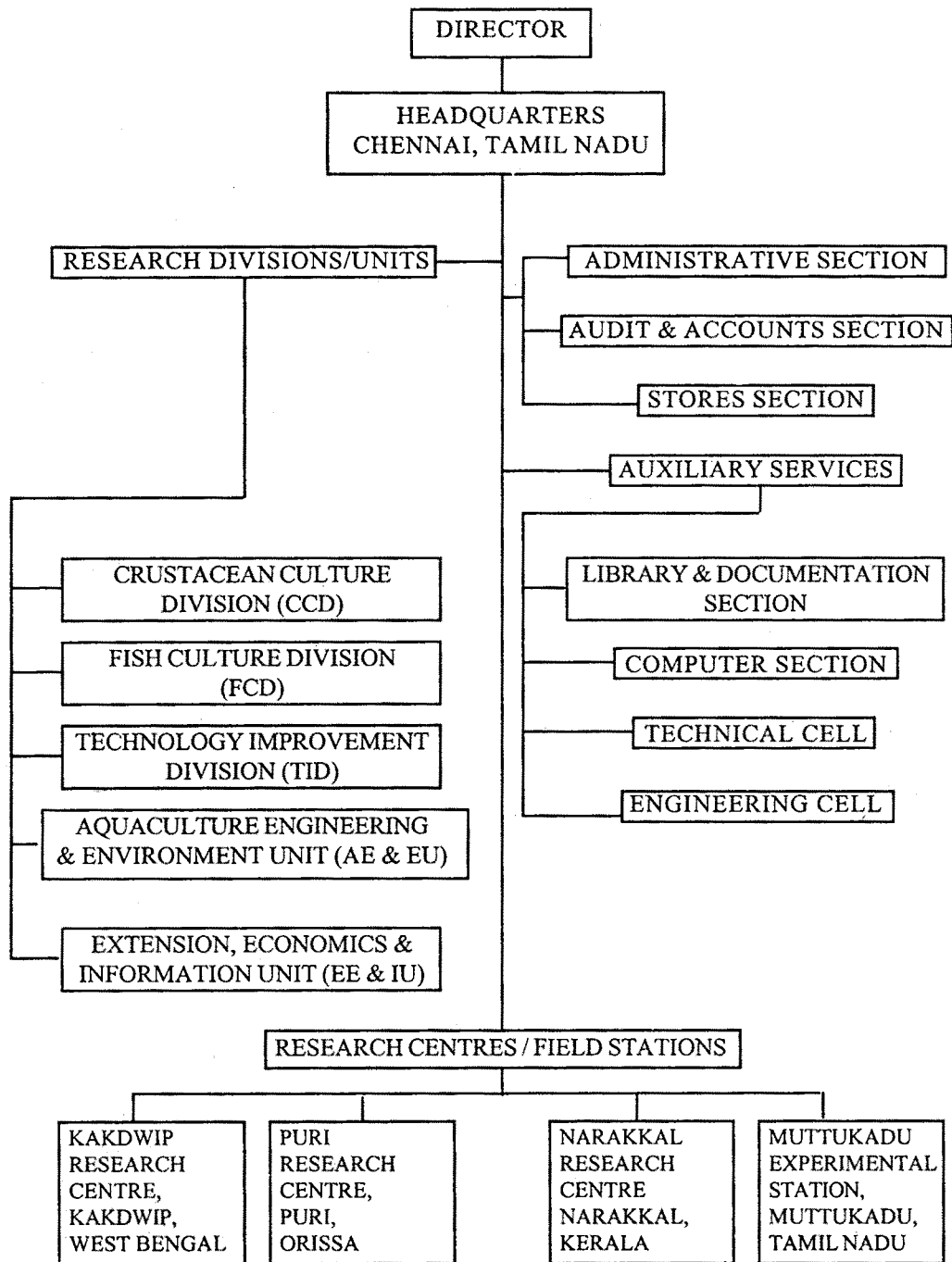
The details of the number of positions sanctioned, filled and remaining vacant at CIBA as on 31.12.97 are as follows:

Position	Sanctioned	Filled	Vacant
Director (R.M.P.)	1	1	-
Head of Division	2	-	2
Principal Scientist	2	-	2
Senior Scientist	61	49	12
Administrative Officer	1	1	-
Asst. Finance & Accounts Officer	1	1	-
Superintendent	1	1	-
Senior Stenographer	1	1	-
Stenographer	1	1	-
Junior Stenographer	3	3	-
Assistant 3	2	1	
Senior Clerk	5	4	1
Junior Clerk	10	9	1
Technical Officer	-	1*	-
Technical Assistant	40	36	4
Supporting Staff	91	87	4
Total	223	197	27

* Transferred along with the incumbent from IARI, New Delhi.

CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE

Organisational Chart



4. RESEARCH ACHIEVEMENTS

CRUSTACEAN CULTURE DIVISION

Development of broodstock for penaeid shrimp (CCD/BS/1)

Chennai : L.H.Rao (PL), P.Ravichandran, S.Kulasekarapandian, Azad Ismail Saheb, A.Panigrahi (from August 1997), M.Muralidhar and M.Natarajan.

Muttukadu (Chennai)

Work under this project, initiated in April 1997, mainly included shrimp broodstock maintenance and induced maturation.

Broodstock maintenance

Adult *Penaeus monodon* of both sexes were procured from the commercial landing centres and maintained in maturation tanks (capacity 5 t) on a diet of clam meat @ 5% of biomass supplemented with polychaete worms @ 5% of biomass. 200% water exchange was effected in the tanks everyday.

Induced maturation

During the period April - August 1997, induced maturation experiments with *P. monodon* broodstock were affected due to outbreak of White Spot Syndrome Virus (WSSV) disease. Though the infection was subsequently controlled with bath treatment in furosolidon, formalin and chloramphenicol, the broodstock failed to mature after eyestalk ablation.

28 female *P. indicus*, collected from the wild and subjected to eyestalk ablation, showed continuous maturation and rematuration during a period of 30 days and released 24 lakh viable eggs in 20 viable spawnings. 18 lakh nauplii were obtained.

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

Chennai : P.Ravichandran (PL), L.H.Rao, K.Devarajan, S.Kulasekarapandian, C. Gopal, Imelda Joseph, Azad Ismail Saheb, A.Panigrahi (from August 1997) and M.Muralidhar.

Narakkal : S. M. Pillai

This project was initiated in April 1997 for undertaking studies on penaeid shrimp seed production.

Muttukadu (Chennai)

Experiments were conducted on the seed production of *P. monodon*, *P. indicus* and *P. semisulcatus* using *Spirulina* and flake diets as replacement for algal feeds. Results with flake diets were encouraging. The survival rate from nauplii to post-larvae (PL 2-6) ranged from nil to 24% for *P. indicus* in a total of 12 larval rearing cycles and nil to 15% for *P. monodon* in 10 cycles. Survival was 75% in one cycle with *P. semisulcatus*. Survival rates during nursery rearing from PL2 to PL20 ranged from 27 to 79% and 65 to 80% for *P. monodon* and *P. indicus* respectively, while it was 75% for *P. semisulcatus*.

Narakkal

At Narakkal Research Centre, three sets of larval rearing experiments were conducted during January to February 1997 using backyard hatchery technology, with nauplii obtained both from induced bred and wild spawners of *P. indicus*. 1,42,000 PL20 were produced from a total of 36.5 lakh nauplii. The survival from nauplii to PL20 stage was very poor due to reduction in water temperatures upto 25°C and poor quality of sea water. One wild spawner of *P. monodon* yielded 5 lakh nauplii which were reared upto PL2 stage, with a survival of 30%. The PL2 were reared upto PL20 stage using mantis shrimp powder and shrimp meat suspension (survival 13%). The PL20 were further reared upto PL39 and sold to a farmer.

During December 1997, five wild spawners of *P. indicus* in the size range 155 to 174 mm spawned yielding 11.3 lakh nauplii. A total of 2,51,600 PL17 were produced, with a survival of 22.3% from nauplii to PL17. About 2000 PL17 seed were stocked in an experimental pond (0.05 ha) and the remaining were sold to a farmer @ Rs 75/- per 1000.

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

Kakdwip : S.R.Das (PL) and R.K.Chakraborti

Studies under this project on the improvement in production and productivity of shrimp in tide-fed traditional culture system through suitable management practices, were initiated at Kakdwip in April 1997 and included monoculture of *Penaeus monodon* and monoculture of *Metapenaeus monoceros*.

Monoculture of *Penaeus monodon*

Penaeus monodon postlarvae (16 to 18 mm length) were stocked @ 40,000 / ha in 2 ponds (0.16 and 0.19 ha) during June 1997. Productions obtained within a period of 6 months, through phased harvesting of shrimp were low, being 261 and 273 kg / ha from ponds of 0.16 and 0.19 ha respectively. Average size of shrimp harvested were 134 mm / 20 g and 140 mm / 21 g from the former and latter pond respectively.

Culture of *Metapenaeus monoceros*

Metapenaeus monoceros of size range 60 to 63 mm were stocked @ 1,00,000 / ha in a 0.275 ha pond during June 1997. The shrimp attained an average size of 86 mm / 4.9 g in two months.

Monitoring of traditional shrimp farms (CCD/MT / 2)

Narakkal: S.M.Pillai (PL)

Puri : C.P. Balasubramanian

Studies on the monitoring of traditional shrimp farms were initiated from April 1997, at Narakkal and Puri Centres.

Narakkal

Monitoring of traditional shrimp culture fields (both perennial and Pokkali type) was undertaken in the Ernakulam, Alappuzha and Thrissur districts of Kerala.

In Pokkali fields, shrimp filtration is carried out from mid-November to mid-April

after the harvest of paddy. In perennial fields, filtration is followed throughout the year. For monitoring purpose, two Pokkali fields of 14.0 and 2.2 ha area were selected in Elamkunnappuzha and Edavanakad respectively and three Pokkali fields were selected in Kottuvally, Varappuzha and Kodungallur with area 3.2, 4.6 and 1.0 ha respectively. Similarly, two perennial fields were selected at Edavanakad having an area of 13.2 and 19.2 ha.

The Pokkali fields were stocked with seed of *P. indicus* in addition to auto-stocking. They were monitored during the filtration period. Periodic sampling of species, size and catch composition was conducted at fortnightly intervals. Soil and water parameters, plankton and bottom biota were studied on a monthly basis.

The species composition in the Pokkali fields consisted of *Penaeus indicus*, *Metapenaeus dobsoni* and *M. monoceros*. A few *P. monodon* were also caught. The production ranged from 107.6 kg to 179 kg / ha / 5 months.

The Pokkali fields at Kottuvally, Varappuzha and Kodungallur were stocked with seed of *P. monodon* @ 1.2 lakh / ha, 1 lakh/ha and 0.5 lakh /ha respectively. Modified traditional / extensive farming was practised here. The experiment is under progress.

The species composition of perennial fields comprised *P. indicus*, *M.dobsoni* and *M. monoceros*. The production ranged from 129.3 to 257 kg / ha / year.

Puri

Monitoring of confined ponds and traditional gheris was taken up during the year. Gheris are defunct and silted fishing grounds in the fringe areas of Lake Chilka. They range in size from 2 to 5 ha. They are constructed in the dry season and get filled up in the rainy season. About 87% of the total shrimp farms in Puri district are under gheri culture. For the present study, two confined ponds (0.3 and 0.8 ha) and two gheris (16 and 19 ha) were taken up in the Krishnaprasad Block.

Monitoring studies were initiated from stocking onwards. Observations were made on temperature, salinity, dissolved oxygen, total alkalinity, pH, transparency, organic carbon of soil and primary productivity. Sampling of plankton and benthos were undertaken at fortnightly intervals.

Culture of mud crabs (CCD/CF/1)

Chennai : M.Kathirvel (PL), S.Srinivasagam, S.Kulasekarapandian and Imelda Joseph

Puri: C.P.Balasubramaniam

Kakdwip : P.K.Ghosh

Chennai

Broodstock development and breeding of mud crab *Scylla tranquebarica*

Fifteen adult males (size range : 110 to 165 mm in carapace width and weighing 200 to 685 g) and 21 females (102 to 175 mm cw/150 to 690 g) of *Scylla tranquebarica* obtained from Lake Pulicat were maintained in 5 to 10 t RCC tanks. The stocking ratio was 1:1 for male and female for 6 trials, while only one large sized

impregnated female was stocked in the 7th trial. The stock was fed with bivalve meat (90%), squid meat (8%) and polychaete worms (2%) @ 10% of the body weight distributed twice in a day. Induced maturation was carried out through unilateral eyestalk ablation of females. Moulting and mating of crabs were observed under captive conditions.

The results of 6 experiments on induction of maturity are given in Table-1.

The time taken between eyestalk ablation and formation of berry ranged from 46 to 56 days. Repeated formation of berry was noticed. The incubation period ranged from 10 to 15 days in the first time formed berry, while it was 11 days in the second time formed berry.

Out of 17 cases of berry formation, larvae hatched out in 6 instances, while in the rest unviable eggs were found attached. A total of 14.8 million larvae were obtained. The zoea were reared on a diet of brine shrimp *Artemia*, Artemia flakes, rotifers, boiled bivalve meat and unicellular algae (*Chaetoceros* spp. and *Chlorella* sp.).

Table 1 : Details of captive broodstock, induction of maturity, formation of berry and larval production in *Scylla tranquebarica*

Expt. No.	Duration (days)	No. of crabs stocked		Time (days) taken between			Incubation period (days)			Production of zoeal larvae (in million)		
		Male CW (mm) /TW(g)	Female CW(mm) /TW(g)	Eye-stalk ablation and formation of 1st berry	1st berry and 2nd berry	2nd berry and 3rd berry	1st	2nd	3rd	1st	2nd	3rd
1.	72	165 / 685	163 / 675	59	—	—	10	—	—	0.2	—	—
2	86	144 / 550	125 / 330	—	—	—	—	—	—	—	—	—
		139 / 530	125 / 330	—	—	—	—	—	—	—	—	—
		129 / 400	123 / 300	—	—	—	—	—	—	—	—	—
		112 / 210	122 / 300	—	—	—	—	—	—	—	—	—
3.	212	138 / 490	144 / 500	35	46	42	12	11	*	3.5	2.9	—
		126 / 310	160 / 570	56	54	—	10	*	—	4.9	—	—
		124 / 330	129 / 330	35	—	—	13	—	—	1.4	—	—
4.	162	139 / 600	145 / 480	76	—	—	*	—	—	—	—	—
		126 / 450	165 / 670	57	—	—	*	—	—	—	—	—
		144 / 620	140 / 440	117	—	—	*	—	—	—	—	—
		144 / 450	155 / 550	26	56	39	10	*	*	1.9	—	—
		—	175 / 690	51	—	—	*	—	—	—	—	—
5.	82	127 / 360	130 / 340	—	—	—	—	—	—	—	—	—
		124 / 330	134 / 350	—	—	—	—	—	—	—	—	—
		134 / 400	127 / 300	—	—	—	—	—	—	—	—	—
6.	—	—	168 / 640	46	—	—	*	—	—	—	—	—
		—	146 / 460	—	—	—	—	—	—	—	—	—
		—	148 / 460	39	34	—	*	*	—	—	—	—
		—	150 / 450	—	—	—	—	—	—	—	—	—
		—	158 / 540	—	—	—	—	—	—	—	—	—

* No hatching took place, since eggs were loosely attached to the pleopods and discarded in 4-7 days.

Puri

Survey of mud crab resources of Orissa coast

A survey of mud crab (*Scylla tranquebarica* and *S. serrata*) resources of Lake Chilka was initiated at two centres viz., Balugan and Arkhakuda. Both the species were found to occur in Lake Chilka where they were caught with baited lift net. The size ranges in the catches for males and females of both species are given in Table 2:

Kakdwip

At Kakdwip, the smaller species of mud crabs, *S. serrata* were cultured in cylindrical bamboo baskets (34 cm dia x 28 cm height) on a

1997 at Muttukadu is as follows:

Quality control tests for penaeid post-larvae

The Institute developed quality control tests for shrimp post-larvae produced in the commercial hatcheries. The parameters identified in evaluating the quality of post-larvae are: physical appearance viz., behaviour, colour and activity; microscopic tests viz., muscle gut ratio, condition of gut, shell clarity, muscle deformity, number of rostral spines, bacterial / fungal / MBV infection, protozoan infestation etc. and stress tests viz., exposure to 100 ppm and 200 ppm concentration of formalin and lowering of

Table 2: Size details of *S. tranquebarica* and *S. serrata* in the catches from Lake Chilka

Size details			<i>S. tranquebarica</i>		<i>S. serrata</i>	
			Male	Female*	Male	Female*
Size range:	CW	in mm	98-178	98-160	85-120	85-120
	TW	in g	100-135	150-650	250-450	150-350
Mean size:	CW	in mm	135	115	98	112
	TW	in g	621	292	220	235

* Occurrence of ovigerous females is rare. CW - Carapace width, TW - Total weight

diet of mussel meat, at a stocking density of 1 crab per basket. The stocked crabs grew from an initial size of 45.3 mm / 17.3 g to 76.8 mm / 85.0 g within a period of 65 days. The monthly growth rate was 13.9 mm / 29.9 g.

Development of hatchery technology for penaeid shrimp (CCD/HT/1)

Chennai : L.H.Rao (PL), K.Devarajan, P.Ravichandran, S.Kulasekarapandian, C.P. Rangaswamy, K.O. Joseph, S.S. Mishra, Imelda Joseph, R. Rangeswaran (upto March 1997), N.Kalaimani (upto January 1997), M. Natarajan, C. Gopal, M. Muralidhar and M.Krishnan

Puri : C. P. Balasubramanian

Narakkal : S.M. Pillai

The project was completed in March 1997. The work done during January to March

salinity from 130 to 15 ppt (50%) for a period of 2 hours.

Studies on long distance transportation of shrimp broodstock

Shrimp broodstock *P. monodon* (average size 200 g) were transported successfully at low-temperature (20 to 22°C) for a period of 24 to 36 hours. The effect of super-oxygen (calcium peroxide) (ranging in concentration from 5 to 50 ppm) was tested at the above temperature range.

Survey of broodstock / spawners of penaeid shrimp availability along Orissa coast

The survey on the availability of broodstock/spawners of penaeid shrimp viz., *P. monodon*, *P. indicus* and *P. merguensis* along the Orissa coast was completed. The data was

collected from 6 major fish landing centres viz., Paradeep, Astarang, Pentakota, Baluguon, Gopalpur and Chandrabhaga.

Culture of penaeid shrimp in different ecosystems (CCD/CP/1)

Chennai : P. Ravichandran (PL), B.P.Gupta, S.A.Ali, K.V. Rajendran and R. Rangeswaran (up to March 1997)

Narakkal : S.M. Pillai

Puri : C. P. Balasubramanian

Kakdwip : Hardial Singh (upto March 1997) and R.K.Chakraborti

The project was completed in March 1997. During the period under report, the culture programmes at Kakdwip and Narakkal suffered due to outbreak of disease and poor water quality conditions respectively. At Muttukadu, the culture ponds were under renovation and at Puri, efforts were made to acquire ponds from State Fisheries Dept.

FISH CULTURE DIVISION

Broodstock development, breeding and seed production of brackishwater finfishes (FCD / BS / 1)

Chennai : Mathew Abraham (PL from July 1997), G.R.M.Rao (from April 1997), R.D.Prasadam (upto June 1997), A.R.Thirunavukkarasu, Munawar Sultana, Shiranee Pereira, P. Kishore Chandra, M.Kailasara, M. Natarajan, K.V. Rajendran, Jitendra Kumar Sundaray (from August 1997)

Narakkal : L.Krishnan

Muttukadu (Chennai)

Seabass *Lates calcarifer*

For the first time in the country, a major breakthrough was achieved in the captive broodstock development, breeding and seed production of the Asian seabass *Lates calcarifer*. A total number of 42 adult fishes (size range 2 to 10 kg) were held in captivity for over a year in two RCC (Re-inforced cement concrete) broodstock holding tanks (100 t capacity each) and maintained under hygienic conditions on a diet of frozen trash fishes like *Tilapia* and sardines @ 5% of biomass daily.

During June 1997, a few females with ova diameter ranging from 400 to 432 μm were subjected to induced maturation by implantation with LHRHa (Luteinizing Hormone Releasing Hormone analogue) pellets @ 100 μg / kg body weight. The ova diameter improved from 430 to 460 μm .

During July to October 1997, six females with ova diameter 450 μm and above were administered with LHRHa @ 65 to 70 μg / kg body weight, while males were administered with the same @ 35 to 40 μg / kg body weight. Successful spawning and fertilisation were observed in 5 sets. Fertilisation ranged from 70 to 80%. The fertilised eggs were incubated in sand-filtered seawater of salinity 30 to 32 ppt.

The larvae hatched out 17 to 18 h after spawning. They were successfully reared on a diet of live rotifers *Brachionus plicatilis* upto 10th day. From day 11 to 21, rotifers and *Artemia* nauplii were given as feed and from day 21 onwards minced clam meat was given. A total of 1.86 lakh larvae were produced and sold to progressive fish farmers.

Grey mullet *Mugil cephalus*

A significant achievement was also made for the first time in the country, in captive broodstock development and induced breeding of the grey mullet *Mugil cephalus*. Sixty six adult *M. cephalus* (size range of 0.4 to 1.5 kg) were maintained in captivity in two RCC tanks (100 t capacity each) on a diet of formulated maturation feed (developed by the Institute) @ 3-5% of body weight daily. The water quality in the tanks and the health of fishes were regularly monitored. Prophylactic treatment of stock with 100 ppm formalin for 1 hour was done at monthly intervals to control ecto-parasitic infection.

Periodical observations on the maturity condition of the fish revealed that 10% of the

stock was in mature condition during January to February 1997. Five females in the size range of 380 to 470 mm / 0.68 to 1.0 kg (with ova diameter 525 to 550 μm) were subjected to hormone treatment. One female administered with HCG @ 10,000 IU / kg as priming dose and Ovaprim @ 5 ml / kg as resolving dose after 24 h interval, responded and underwent complete ovulation, yielding 14 lakh eggs. Fertilisation of stripped eggs was effected with milt collected from 2 oozing males. The rate of fertilisation was 90%. Hatching of eggs started 30 h after fertilisation and was completed in 2 h. Water temperature during incubation ranged from 26.0 to 28.0°C. The number of hatchlings was estimated at 5.2 lakh which worked out to 41.6% of the fertilised eggs. The hatchlings were reared in five 2 t FRP tanks provided with flow-through facility. However, they did not survive beyond 8 days.

In the following breeding season, during November to December 1997, the major problem encountered was non-synchronisation of maturity in males and females. 60-70% of males and 65-70% of females attained maturity during November and December respectively. Four females in the size range of 1.3 to 1.7 kg with ova dimensions in the range 536 to 614 μm were subjected to induced breeding. HCG @ 10,000 IU / kg was given as priming dose. LHRHa @ 300 to 400 μg / kg was given as resolving dose in 3 experiments while Ovaprim @ 5 ml / kg was given in one experiment. Males were administered with 1 ml / kg Ovaprim along with resolving dose for females. Natural spawning was observed in 2 sets. 50% fertilisation was noticed in one set followed by poor hatching rate. The hatched-out larvae were weak and survived only for one day.

To circumvent non-synchronisation of maturity, preliminary experiments were conducted on the cryo-preservation of milt. Fish Ringer solution with the cryoprotectant 10% Dimethyl sulphoxide (DMSO) was used as cryodiluent. The post-thaw motility observed in this cryodiluent ranged from 5-30%.

Grouper *Epinephelus tauvina*

With a view towards diversification of candidate species for brackishwater aquaculture, the grouper *Epinephelus tauvina* was taken up during this year for broodstock development, breeding and seed production. Twenty fishes in the size range 210 to 580 mm / 0.25 to 4.0 kg were maintained in a 100 t capacity RCC tank on a diet of frozen trash fishes @ 5% of body weight daily.

Culture of brackishwater finfishes (FCD/FC/1)

Chennai: R.D.Prasadam, (PL till June 1997), A.R.Thirunavukkarasu (PL from July 1997), Munawar Sultana, M.Kailasam, Jitendra Kumar Sundaray (from August 1997)

Kakdwip: S.R.Das, P.K.Ghosh, B.K.Banerjee and R.K.Chakraborti

Narakkal: L.Krishnan

Culture of seabass *Lates calcarifer*

Chennai

Seabass seed (21 to 25 days old) produced in the Institute's fish hatchery at Muttukadu were sold to private farmers. The feed-back information collected from the farmers on growth and survival of fish during nursery and grow-out rearing is given below:

Nursery rearing

Seabass (average size 0.9 cm) seed were stocked in cement tanks @ 1000 no./m³ and fed with brine shrimp *Artemia nauplii* and minced fish / prawn meat *ad libitum* for the first 10 days, followed by minced fish / prawn meat @ 20% of body weight for the next 20 to 25 days. At the end of 35 days of rearing, the fry attained an average size of 3.0 cm / 1.25 g with a survival rate of 82%.

Similarly seabass seed of average size 1.0 cm stocked in hapas (2m x 1m x 2m) @ 500 no./m³ and fed with *Artemia nauplii* and minced prawn / fish meat as mentioned above, attained

an average size of 3.0 cm / 1.25 g at the end of 30 days with a survival rate of 86%.

Grow-out culture:

The nursery reared seabass seed as mentioned above were subsequently stocked in a 0.4 ha farmer's pond at Nagapattinam @ 5000 no./ha. They were fed daily with minced trash fish @ 10% of body weight. After 100 days of rearing the average size attained by the fishes was 200 g.

Another batch of nursery-reared seed of the same initial size were also stocked in a 0.1 ha farmer's pond @ 5000 no./ha. Minced trash fish @ 10% of body weight was given as feed daily. The average weight of fish recorded after 59 days of culture was 85 g.

Kakdwip

At Kakdwip, wild seabass seed of average size 118 mm / 19 g were stocked in a 0.2 ha grow-out pond @ 1500 no./ha. The fish were fed with supplementary feeds. Trash fish / miscellaneous crustaceans trapped in the pond during spring tide also served as additional feed. At the end of two months of rearing the average size of fish recorded was 200 mm / 105 g.

Culture of milkfish *Chanos chanos*

Chennai

Milkfish *Chanos chanos* seed of average size 40 mm / 1g were nursery reared in cement concrete tanks (12 m x 6 m x 2 m) @ 10 no./m³. Before stocking the tank with fishes, lab-lab was produced by fertilising the tank with ammonium sulphate @ 50 ppm, superphosphate @ 5 ppm and urea @ 5 ppm, at a water depth of 20 cm. Lab-lab production was observed within a period of 10 days and it was

sustained by adding fertilisers @ half of initial dose at fortnightly intervals. No supplementary feeding was done. Over a period of 4 months, the fishes attained an average size of 130 mm / 40 g with a survival of 56%.

Integrated fish cum poultry farming

Narakkal

An experiment on integrated fish cum poultry farming was conducted at the Narakkal Research Centre. Two 0.02 ha ponds, were each stocked with 260 pearlspot *Etroplus suratensis* (average size 83 mm / 13 g), 10 grey mullet *Mugil cephalus* (average size 293 mm / 296 g) and 50 milkfish *Chanos chanos* (average size 35 mm / 1 g) at a combined stocking density of 16,000 no. / ha, in March 1996. In each pond, 4 wooden cages were erected, holding 10 layer birds (Astro-white variety) obtained from the Kerala Agricultural University at Mannuthy. The birds were fed daily with a commercial feed mash. The fish in both ponds were fed with a supplementary diet of groundnut oil cake, rice bran and wheat bran, only once a week @ 10% of body weight. At the end of about one year period, the fish were harvested from both the ponds, giving a production of 32.6 kg (estimated 1,630 kg / ha) and 23.5 kg (estimated 1,175 kg/ha) from the first and second ponds respectively. Average size attained by the fishes and survival (%) in the first and second ponds were: *E. suratensis* 177 mm / 112 g, 51.1% and 167 mm / 93 g, 29% respectively; *C. chanos* 397 mm / 367 g, 80% and 396 mm / 375 g, 78% respectively; *M. cephalus* 433 mm / 818 g, 100% and 392 mm / 584 g, 90% respectively. The production of eggs from the first and second ponds were 882 and 883 respectively.

TECHNOLOGY IMPROVEMENT DIVISION

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

Chennai: S.A. Ali (PL), C.P. Rangaswamy, D. Narayanaswamy, M. Natarajan, C. Gopal, K.K. Krishnani, M. Shashi Shekhar (upto March 1997)

Testing of probiotics in shrimp feeds

Bacterial preparations from the gut of shrimp *Penaeus monodon* were tested as probiotics in shrimp feeds. Non-pathogenic strains of *Bacillus*, *Lucibacterium* and *Pseudomonas* were produced using a bench-top fermentor and incorporated in a formula feed at different levels. Feeding trials on juveniles of *P. indicus* have indicated that growth of shrimp can be enhanced at 3% inclusion level of the probiotic. Inclusion of probiotics at higher levels from 4.5 to 6% reduced the growth in shrimp.

Testing of materials as feed attractants

Fish silage prepared by fermentation with different organic acids and incorporated in a formula feed was tested on the juveniles of *P. indicus*. Results indicated that fish silage acted as an attractant and improved feed ingestion.

Feeding trials with juveniles of *P. monodon* using free amino acids viz., l-glycine, l-glutamic acid, dl-serine, l-proline, l-isoleucine and taurine as feed attractants, indicated that only glycine and glutamic acid were effective in enhancing the rate of feed consumption.

Formulation of maturation feed for broodstock of *Mugil cephalus*

A maturation feed was formulated for the broodstock of grey mullet *Mugil cephalus*. The feed was tested at various lipid levels ranging from 4.59% (low lipid) to 8.21% (high lipid) while keeping the protein level constant at 33%. A total quantity of 201 kg of feed was produced and supplied for testing. The feed has been effective in advancement of maturity condition of the fish.

Formulation and testing of micro-particulate feeds for seabass *Lates calcarifer* larvae

Several microparticulate feeds (approximately 500 microns) were formulated for the larvae of seabass using indigenously available feed materials. Feeding trials with larvae (9-11 days old) indicated that the survival of larvae fed on micro-particulate diet was comparable to that fed on live feed *Artemia* nauplii which served as control, while growth was better with live feed. Particulate diets tested on 22 day old larvae also showed survival and growth of fish larvae comparable to that of control.

Formulation of feeds for grow-out culture of seabass *Lates calcarifer*

Using indigenously available raw materials such as soybean meal, low value fish, cereal flour, fish oil, vitamins and minerals, a grow-out feed was formulated for the culture of seabass *Lates calcarifer* having 36% protein, 7.8% lipid and 27.9% carbohydrate. It is being tested under field conditions.

Development of standards for quality control of shrimp feeds

To develop standards for quality control of shrimp feeds, a comprehensive database was built up on the quality of commercial shrimp feeds, both local and imported. Twenty-five commercial feed samples of different grades, belonging to several brands, were collected from 13 shrimp farms in Nellore district. The feeds were analysed for their proximate composition (Table 3). The protein content in indigenous feeds ranged from 40 to 45%. Both imported and indigenous feeds showed aflatoxin levels ranging from 10 to 130 ppb. However, the feed samples were negative for mould growth suggesting that the aflatoxin may be of raw material origin. This database will be used in consultation with the Bureau of Indian Standards for evolving broader quality standards for commercial shrimp feeds in the country.

Table : 3 Proximate composition (%) of commercial shrimp feeds (number of samples analysed is given in parenthesis)

Parameter	Indigenous feeds (range) (9)	Imported feeds (range) (12)
Moisture	6.03 - 6.91	6.44 - 6.91
Crude protein	40.46 - 44.67	45.49 - 47.14
Lipid	9.13 - 10.78	9.66 - 10.12
Carbohydrate	22.50 - 24.75	22.50 - 22.84
Crude fibre	1.53 - 2.30	1.07 - 1.40
Ash	9.21 - 12.68	10.72 - 12.22
Total volatile nitrogen (mg%)	60.40 - 126.78	44.57 - 86.50
Aflatoxin (ppb)	10.00 - 130.00	Nil - 130.00

Diagnosis, prophylaxis and control of diseases of commercially important brackishwater shrimp / fish (TID/DIS/1)

Chennai : T.C.Santiago (PL), K.K.Vijayan, S.S.Mishra, K.V.Rajendran, M.Shashi Shekhar, K.O.Joseph

Development of diagnostic techniques for White Spot Syndrome Virus (WSSV) infection in shrimp

A simple and rapid DNA-based diagnostic technique was developed for White Spot Syndrome Virus (WSSV) infection affecting shrimp (*Penaeus monodon*). The eyestalk of shrimp was used as an indicator organ for developing this technique as it contains the sub-cuticular ectoderm, one of the target tissues of the virus. The template DNA is extracted from the eyestalk for Polymerase Chain Reaction (PCR). By applying this technique it is possible to diagnose WSSV disease at an early stage within 6 h post-infection.

Another diagnostic method for WSSV infection based on the examination of sequential histopathology of sub-cuticular ectodermal layer of eyestalk, has also been developed. By this method, WSSV infection can be diagnosed as

early as 18 h post-infection. The diagnosis was also confirmed through PCR. These diagnostic techniques may serve as a tool in screening broodstock shrimp in hatcheries for WSSV infection.

Polymerase Chain Reaction (PCR) technique has also been used to screen shrimp samples for presence of Monodon Baculovirus (MBV) infection.

Experimental host range and histopathology of White Spot Syndrome Virus (WSSV) infection in shrimp, crabs, prawns (freshwater) and lobsters

White Spot Syndrome Virus (WSSV) infection has been induced under laboratory conditions in several species of shrimp, crabs, freshwater prawns and lobsters to study the susceptibility / reservoir or carrier potential of the different aquatic crustaceans to WSSV infection. Experimental results indicated that five species of shrimp viz., *Penaeus monodon*, *P. indicus*, *P. semisulcatus*, *Metapenaeus monoceros* and *M. dobsoni*, 4 species of crabs viz., *Scylla serrata*, *S. tranquebarica*, *Metapograpsus messor*, *Varuna litterata*, 3 species of lobsters viz., *Panulirus ornatus*, *P. homarus* and *P. polyphagus* and 2 species of freshwater prawns viz.,

Macrobrachium rosenbergii and *M. idella* are susceptible to WSSV infection.

Experimentally infected mud crabs were reared upto 30 days post-infection while prawns and lobsters upto 70 days post-infection. Though exuvia (carapace particularly) of infected freshwater prawns showed tiny white spots (pattern of spots being different from that observed in shrimp), clinical signs of viral infection were not observed. Mud crab and lobsters neither showed clinical signs of infection nor white spots on the carapace. However, histopathological studies of various tissues of ectodermal and mesodermal origin of mud crab, lobster and freshwater prawn showed prominent characteristic eosinophilic to basophilic intranuclear occlusions and severe necrotic changes.

In the case of all five species of shrimp used in the experiments, mortality occurred during 48 - 72 h of post-infection with full-blown clinical symptoms.

This study on the experimental induction of WSSV infection in various groups of decapod crustaceans has shown that mud crabs and lobsters can act as asymptomatic carrier / reservoir hosts of this virus. Besides, the study also indicated the susceptibility of freshwater prawns to this virus. The results obtained are significant in the epidemiology of this virus.

Detection of *Vibrio parahaemolyticus* in shrimp by Polymerase Chain Reaction (PCR)

Vibrio parahaemolyticus is known to cause bacterial disease in cultured shrimp. Rapid diagnosis of the disease is essential for effective control. With this view in mind, a Polymerase Chain Reaction (PCR) based diagnostic technique was developed for the rapid detection of *V. parahaemolyticus* infection in shrimp. For developing this technique, approximately 623 base pair (bp) DNA fragment of *tdh* gene from *V. parahaemolyticus* was amplified using PCR. This technique has been effective in detection of minute quantities of bacteria in culture broth and isolated colonies.

Study of anti-microbial activity of various chemicals / drugs

Various commercially available indigenous chemicals / drugs viz., Wolmid, Mizophur, Blesson, Germicin and Pizomix gel obtained from Wockhardt Aquavet, Wockhardt Ltd., Mumbai, were tested for their activity in inhibiting microbial growth. Initial laboratory trials showed that all these chemicals could inhibit bacterial growth in test tubes. Indigenous natural materials viz., garlic extract, neem extract, turmeric and *Calotrophis latex* did not show any significant anti-microbial activity.

Genetic characterisation, stock improvement and health care of shellfish and finfish (TID/RP/1).

Chennai: T.C. Santiago (PL), K.K.Vijayan, P.Kishore Chandra, K.V. Rajendran and M.Shashi Shekhar

Selective breeding of *Penaeus monodon*

A selective breeding experiment was taken up in *P. monodon* for selection of a desirable trait such as faster growth. As a preliminary step, different morphometric traits were taken into consideration which could be used as selection criteria. The degree of relationship between the various morphometric traits and tail weight was studied.

Genetic characterisation of *Penaeus monodon*

The mitochondrial DNA (mt DNA) ribosomal genes isolated from wild populations of *Penaeus monodon*, were amplified by Polymerase Chain Reaction (PCR) and the amplified DNA products were found to be of size 415 base pairs (bp) and 520 bp for 12 S ribosomal DNA and 16S r DNA genes respectively.

Restriction endonuclease analysis of the amplified mt DNA ribosomal genes was used to assess the genetic variation among the two wild populations of shrimp. Alu I, Cla I and Hae III showed monomorphism for the 12 S r DNA and 16 S r DNA genes respectively, whereas the MboI restriction pattern of 16 S r DNA displayed polymorphism.

AQUACULTURE ENGINEERING & ENVIRONMENT UNIT

Soil and water quality and productivity management for sustainable shrimp farming (AEED/PM/1)

Chennai: B.P.Gupta (PL), K.O.Joseph, C.P.Rangaswamy (from April 1997), K.K.Krishnani and M.Muralidhar

Kakdwip: R.K.Chakraborti

Evaluation of effects of bioaugmentors used in shrimp ponds

Laboratory experiments were conducted on the use of bioaugmentors viz., Bioklean MX-1 (bacterial product), Super oxygen (calcium peroxide), calcite (CaCO_3), dolomite ($\text{CaCO}_3 \cdot \text{MgCO}_3$) and potassium permanganate (KMnO_4) for removal of toxic ammonia from culture systems. Results indicated that Bioklean @ 12 ppm was effective in reducing the concentration of ammonia in 2 litres of seawater (salinity 20 ± 2 ppt) held in flasks to which ammonia salt solution was added to attain a concentration of 0.5 ppm. Analysis of water samples after one hour and three hours of treatment and subsequently at daily intervals indicated that the concentration of ammonia ($\text{NH}_3\text{-N}$) gradually decreased being 0.402 ppm at 1 h, 0.320 ppm at

48 h and 0.289 ppm at 144 h. There was not much change in dissolved oxygen and pH levels during the experimental period. Further work is in progress.

Effect of bacterial cultures on the removal of nitrite ($\text{NO}_2\text{-N}$) from culture systems

To understand the efficacy of bacterial cultures on the removal of nitrite ($\text{NO}_2\text{-N}$) from culture systems, pure cultures of *Pseudomonas* (gram negative and reducing type of bacteria) were isolated and applied @ 1 ml and 5 ml / l to 2 litres of seawater (salinity 20 ± 2 ppt) held in flasks to which standard nitrite solution was added to attain a concentration of 0.85 ppm. This culture contains 1×10^6 number of colonies of *Pseudomonas* per ml of culture. Analysis of water samples 2 hours after treatment and then at daily intervals indicated that 5 ml / l of *Pseudomonas* was effective in decreasing nitrite concentration from 0.85 ppm to 0.03 ppm after 24 h and 0.015 ppm after 96 h.

Effect of plant by-products and extracts on the removal of ammonia ($\text{NH}_3\text{-N}$)

Neem and custard apple by-products viz., neem powder, neem seed oil, neem leaf extract,

Table 4 : Effect of plant extracts on the removal of ammonia from culture systems

Treatment	Ammonia value in ppm ($\text{NH}_3\text{-N}$)			
	Initial	24 h	48 h	72 h
Neem powder @ 100 ppm	0.5	0.572	0.872	1.030
Neem seed oil @ 100 ppm	0.5	0.293	0.139	0.086
Neem leaf extract @ 90 ppm	0.5	0.249	0.039	0.053
Custard apple seed powder @ 100 ppm	0.5	0.667	0.866	1.100
Custard apple seed oil @ 90 ppm	0.5	0.246	0.049	0.041
Control	0.5	0.442	0.464	0.418

custard apple seed powder and custard apple seed oil were used under laboratory conditions to assess their effect on the removal of ammonia from culture systems. One experiment was conducted with different treatments. Each treatment was carried out in triplicate.

Results indicated that neem seed oil @ 90 to 100 ppm was effective in decreasing ammonia (in 2 litres of seawater of salinity 20 ± 2 ppt held in flasks) levels from 0.5 ppm to 0.086 ppm in 72 h (Table 4). Neem leaf extract @ 90 ppm also showed reduction of ammonia from 0.5 ppm to 0.039 ppm in 48 h but subsequently, ammonia level was found to increase gradually till the end of the experiment. On the other hand, neem seed powder used @ 100 ppm enhanced the ammonia level from 0.5 ppm to 1.03 ppm in 72 h.

Custard apple seed oil @ 90 ppm decreased ammonia levels from 0.5 ppm to 0.041 ppm in 72 h whereas custard apple seed powder @ 100 ppm enhanced the ammonia level from 0.5 ppm to 1.10 ppm in 72 h (Table 4).

Though there was a decrease in dissolved oxygen with all treatments, the reduction was drastic with neem seed powder and custard apple seed powder, the levels decreasing from an initial 6.8 ± 1 ppm to 3.38 ± 0.5 ppm. Further experiments are being conducted to find out the mechanism of ammonia removal through extraction and fractionation of neem seed oil and custard apple seed oil.

Treatment of shrimp farm waste water

Shrimp farm waste / effluent water generally contains high levels of metabolites and suspended solids. To improve the quality of waste water released from shrimp farms, one experiment was conducted in the laboratory using different type of materials (different treatments) and each treatment was carried out in triplicate. The materials used were the following: activated charcoal, potassium dichromate, potassium permanganate, potassium-aluminium sulphate (alum), mizuphor (alkyl aryl polyoxyethylene complex),

Clinzox-DX (a type of zeolite with high cation exchange capacity and composed of oxides of Si, Al, Fe, Ca, Mg and Na), Environ-AC (consists of two major components : (1) consortia of large number of non-pathogenic, beneficial and native micro-organisms in biofixed form and (2) cocolith (a natural calcareous matrix rich in oligo-nutrients which support the growth of micro-organisms), coconut shell powder, neem oil and neem leaf extract.

The above mentioned materials were applied separately to 2 litres of shrimp farm waste water held in flasks and their effect on removal of ammonia and hydrogen sulphide was recorded after 4 h of treatment and then at daily intervals. Activated charcoal @ 5 ppm was effective in decreasing ammonia level from 0.093 to 0.013 ppm. Neem oil @ 3.6 ppm also decreased ammonia level from 0.093 to 0.025 ppm. Other materials such as coconut shell powder, mizuphor, Clinzox-DX and Environ-AC were also found to be effective in decreasing ammonia levels. The experiment will be repeated to confirm results.

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

Chennai: P.Ravichandran (PL), B.P.Gupta, K.O.Joseph, M.Muralidhar, K.K.Krishnani, M.Krishnan, D.Deboral Vimala and Imelda Joseph

An impact assessment study of shrimp farming was undertaken in the coastal districts of Tamil Nadu to assess the ground realities of the impacts on the environment and socio-economic conditions of the people. About 20 villages were covered in the districts of South Arcot, Nagai-Quaid-e-Milleth, Thanjavur, Pudukottai, Ramanathapuram and V.O.Chidambaranar. Out of a total of 1119 shrimp farms present in these districts, only 7-14% are in the category of above 5 ha, while 40-75% are in the small farm category of less than 2 ha. These farms are constructed on saline lands unsuitable for agriculture and are pump-fed using either creek or sea as source of water.

Observations on water quality parameters of 26 farms (including creek / canal based and sea-based farms) revealed that the levels of various parameters viz., ammonia, nitrite, hydrogen sulphide, COD and BOD of the natural creek at the outfall areas are within permissible limits. Salinisation of soil adjoining creek and farm was observed upto 100 to 250 m as seen from the electrical conductivity values given in Table 5. However, this salinisation is not due to shrimp culture alone. Though salinisation of drinking water in coastal villages is known to occur, this may have been prevalent even before the initiation of shrimp farming as earlier data has not been documented. In some farms, good drinking water is available within the farm itself.

The problem of access to fishing areas and other areas of social activity was not observed in most of the districts visited, as the farm holdings were small.

Detailed enquiry was carried out among

the local villages situated in the vicinity of the shrimp farms. The problems reported by the villagers were drinking water salinisation and salinisation of agricultural land, but there is no scientific evidence to substantiate that this may be due to shrimp farming.

The most significant and positive socio-economic impact was the increased generation of employment opportunities for the local people. Permanent employment to the tune of 2-4 labourers / ha (routine daily management including watch and ward) and casual seasonal employment of 10 to 12 labourers / ha (pond preparation, harvesting, pond construction / renovation) were generally observed. With regard to health of villagers, no health problems attributed to shrimp farming were reported.

Design and development of structures for brackishwater aquaculture (AEED/AE/1)

Chennai: P. Lakshmanadoss (PL), M. Jayanthi and Nila Rekha (from December 1997)

Table 5: Electrical conductivity of soils adjacent to shrimp farms in the coastal districts of Nagai Quaidi-Millet, Thanjavur and South Arcot

District	Site No.	Electrical conductivity (mmhos/cm)*			
		Distance from farm			
		50 m	100 m	250 m	500 m
Nagai Quaidi-e-Milleth	1	8.96	9.46	5.76	2.66
	2	7.70	6.13	4.76	2.00
	3	8.00	7.10	4.80	2.67
	4	6.60	3.90	4.03	2.60
	5	5.63	3.50	3.50	2.13
	6	6.33	4.16	3.66	2.83
Thanjavur	1	7.66	4.83	2.66	2.00
	2	6.26	3.93	2.30	1.66
	3	6.90	4.16	1.93	2.30
South Arcot	1	8.66	3.63	2.76	1.76
	2	7.90	3.70	1.73	1.76
	3	5.26	2.86	1.93	1.73

(* Average of three values)

Testing of different materials for control of seepage in brackishwater ponds

Preliminary studies were conducted to test different materials viz., polythene sheets (600 gauge) and chicken litter (mixture of chicken dropping, feathers and rice bran having the following composition: total solids 91.2%, nitrogen 2.49%, ash 23.4% and fibre 8.59%), to arrest or prevent seepage in ponds at Muttukadu. A pond (8m x 4m x 1.3m) with sandy bottom having water depth of 1m and seepage rate of 0.0324 m³/m²/h was lined with polythene sheets. No seepage was noticed during the first five days. However, beyond this period there was a reduction in water depth (about 1-2 cms /

day) due to puncturing of sheets. The experiment will be repeated.

Chicken litter applied @ 4 to 8 kg / pond / week in 2 ponds of the same area (8m x 4m x 1.3m) also arrested water movement in sandy soil. Further work is in progress.

Development of eco-friendly farm designs

Several shrimp farms were surveyed in Nellore (Andhra Pradesh) and Chengalpet (Tamil Nadu) districts to study the topography of site, farm design and construction, water supply, drainage etc. in order to develop eco-friendly farm designs for aqua-farms. The study is in progress.

EXTENSION, ECONOMICS AND INFORMATION UNIT

Investigations on the brackishwater aquaculture practices adopted by different categories of farmers - an integrated approach (EEID/EXTN/1)

Chennai: K. Gopinathan (PL), M. Krishnan, D.D. Vimala, V. Chellapandian, K. Ponnusamy (from February 1997)

Survey of shrimp farms in the coastal districts of Kerala was continued during the period 1997-98. The States of Karnataka and Orissa were also covered during the period. A total of 66 farms with a water spread area of 388 ha were surveyed in Kerala (Kollam, Allapugha, Ernakulam, Thrissur, Kozhikode and Kannur districts). Traditional, extensive and improved extensive shrimp culture practices were followed with productions ranging from 280-300 kg / ha, 300-500 kg / ha and 600-1000 kg / ha respectively. No disease and social problems were encountered.

Twelve farms with a water spread area of 49.83 ha were surveyed in Karnataka. The farmers adopted improved extensive culture of *P. monodon* in these farms.

Twenty - three farms with a water spread area of 36.06 ha were surveyed in the coastal districts of Orissa under the Krishnaprasad, Bramagiri and Astarang blocks. Of these, twenty farms were rain-fed, two were extensive and one was a gheri. Rain-fed ponds on the fringes of Lake Chilka were stocked with tiger shrimp *P. monodon* @ 4,000-12,000 no. / ha.

Development of database for brackishwater fishery resources (EEID/EXTN/2)

Chennai: M.Krishnan (PL), K.Gopinathan, D.D.Vimala, V. Chellapandian, K.Ponnusamy (from February 1997)

Collection of data on the brackishwater fishery resources of the country was continued. Data entry was done on a regular basis and updated. Development and testing of in-house software for data management-posting and retrieval is in progress. Web page of the Institute is being developed. ARIS Laboratory is being established at Muttukadu Experimental Station.

5. TECHNOLOGY ASSESSED AND TRANSFERRED

The Central Institute of Brackishwater Aquaculture developed the technology for the breeding and seed production of the Asian seabass *Lates calcarifer* during the year 1997. This was a major breakthrough achieved by the Institute for the first time in the country. *L. calcarifer* is a fast-growing, euryhaline marine fish which can be cultured in the interior coastal areas. It is most sought after on the gourmet table, both in India and abroad. For further details on the technology developed refer section on Fish Culture Division (Page no. 12).

The technology for seabass breeding and seed production is being extended to farmers / entrepreneurs / Fisheries officials from State Depts. / ICAR Institute's viz., CMFRI, through training programmes / demonstrations. The seed produced at the Institute's hatchery has been sold to farmers / entrepreneurs for nursery and grow-out culture in ponds. Monitoring of farmers ponds has also been taken up for feed-back information on growth and survival of fish.

6. TRAINING AND EDUCATION

Training

The Institute conducted two training programmes during the period as follows :

- A training programme on "Diagnosis, prevention and control of shrimp diseases", sponsored by the Dept. of Agriculture and Co-operation (Ministry of Agriculture, Govt. of India) under the Central Sector Scheme, was conducted by the Institute at the Muttukadu Experimental Station from 26 August to 8 September 1997. Shri P. S. Ganesan and Shri R. Ravichandran, BFDA officials from Tamil Nadu and Shri B. Stanley, a private shrimp farmer, participated in the training programme.
- A training programme on controlled breeding and seed production of seabass *Lates calcarifer* was conducted at the Muttukadu Experimental Station from 10 to 16 September 1997. Eight Scientists from Central Marine Fisheries Research Institute, Kochi, participated in the programme.

Education

Lectures and demonstrations on brackishwater aquaculture were arranged for the following at the headquarters and research centres of the Institute :

Chennai

- Fourteen B.F.Sc. students from College of Fisheries, Orissa University of Agriculture and Technology, Berhampur, Orissa, on 3 January 1997.
- Two batches of twenty - seven and sixteen students of Coastal Aquaculture and Marine Biotechnology from College of Science and Technology, Andhra University, on 4 January and 10 to 13 January 1997 respectively.
- Thirty five participants of the National Aquaculture Week, conducted by Aquaculture Foundation of India, on 2 February 1997.

- A batch of B.Sc. Industrial Fish and Fisheries students from Madras Christian College, Tambaram, on 6 February 1997.
- Nine staff trainees from Staff Training Institute, Tamil Nadu Fisheries Dept., Chennai, on 15 February 1997.
- Fifteen students from G.B.Pant University of Agriculture and Technology, Pant Nagar (UP), on 7 May 1997.
- Fifteen staff trainees from Staff Training Institute, Tamil Nadu Fisheries Dept., Chennai, on 19 May 1997.
- Ten officier trainees from Indian Bank Management Academy for Growth and Excellence, Chennai, on 28 May 1997.
- Thirty B.Sc. students from Madras Christian College, Tambaram, Chennai, on 30 May 1997.
- Thirty two trainees from CIFE Research Centre, Lucknow, on 17 June 1997.
- Nine fisheries officials from Dept. of Fisheries, Govt. of Tamil Nadu, on 23 July 1997.
- Twenty one staff trainees from Staff Training Institute, Tamil Nadu Fisheries Dept., Chennai, on seabass *Lates calcarifer* breeding, on 18 September 1997.
- Eight M.Sc. (Aquaculture) students from Nandanam Arts College, Chennai, on shrimp hatchery operations, on 18 October 1997.
- Fourteen Junior Subordinate Officers / trainees from Staff Training Institute, Tamil Nadu Fisheries Dept., Chennai, on 15 December 1997.

Kakdwip

- A batch of trainees of Rural Entrepreneurship Development Programme, organised by Sundarban Kalpataru, Ramakrishna Mission, Kakdwip, on Aquaculture as an Industry, on 21 February 1997.

- Twenty B.Sc. 2nd year students from West Bengal University of Animal and Fishery Science, Faculty of Fishery Science, Kulia, Kalyani Dist., Nadia, West Bengal, on 29 April 1997.

Narakkal

- A batch of M.Sc. (Marine Biology) students from Cochin University of Science and Technology, Cochin.
- A batch of B.F.Sc. students from College of Fisheries, Mangalore.

Puri

- Twenty nine M.Sc. students from Nagarjuna University, Andhra Pradesh, on 10 January 1997.

Special Lectures given by Scientists

The Institute's Scientists delivered the following special lectures:

- An overview of economics of brackishwater aquaculture, in connection with the Ad-hoc A.P. Cess Fund Project proposed by the Institute on Economics of Brackishwater Aquacultural Systems in India, in collaboration with the National Centre for Agricultural Economics and Policy Research (NCAP), at NCAP, New Delhi, 20 January 1997.

Dr. M. Krishnan

- Shrimp diseases and their diagnosis, prevention and control, to the participants of Farmers Awareness Meet, Machilipatnam, Andhra Pradesh, 5 February 1997.

Dr. S. S. Mishra

- Brackishwater finfish breeding, seed production and culture, to the participants of the programme organised by the School of Biological Sciences, Bharathidasan University, Thiruchirapalli, 7 February 1997

Dr. A. R. Thirunavukkarasu

- Developments in penaeid shrimp seed production to the participants of the

training programme on Recent Advances in Aquaculture, organised by the Dept. of Aquaculture, College of Fisheries, Mangalore, 11 February 1997.

Dr. S.M. Pillai

- Nutrition and feeding of penaeid shrimp for their sustainable aquaculture, to the participants of UGC programme on Blue Revolution in Sustainable Development, Bharathidasan University, Thiruchirapalli, 12 February 1997.

Dr. S.A. Ali

- Environmental education and aquaculture and aquaculture potentialities and constraints to the participants of Orientation Course in Environmental Education, at Academic Staff College, University of Pondichery, 3 March 1997.

Dr. S. A. Ali

- Brackishwater fish culture and fish breeding at Centre of Advanced Studies in Marine Biology, Annamalai University, Parangipettai, 17 October 1997.

Dr. A. R. Thirunavukkarasu

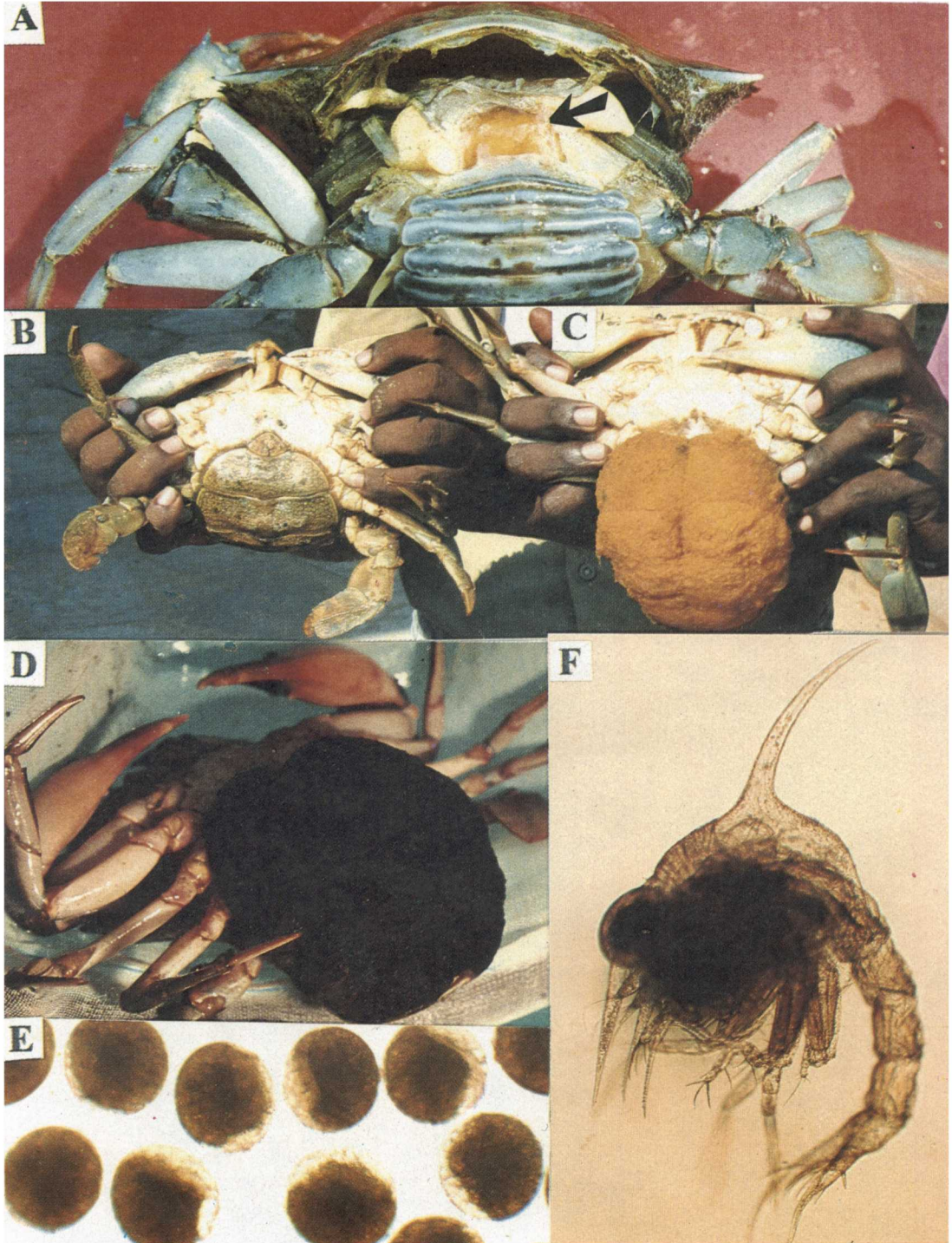
Human Resource Development

- Dr.K.K.Vijayan, Scientist (SS), was deputed for one year Advanced Training in Biotechnological Methods, sponsored by the Dept. of Biotechnology, Govt. of India, at Gulf Coast Research Laboratory, U.S.A., from 27 December 1996 to 28 December 1997.

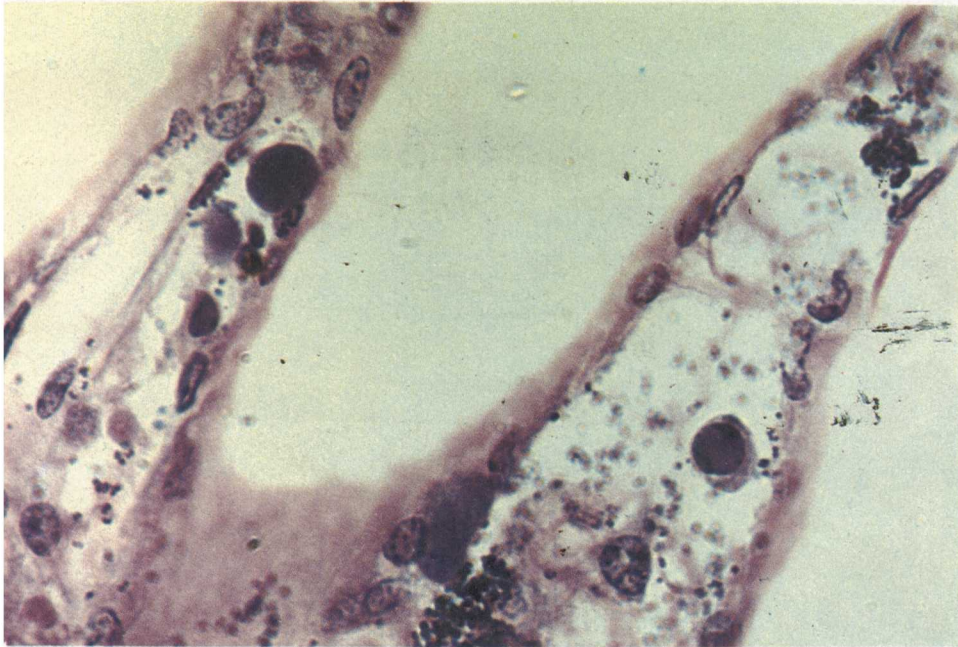
- Smt. M.Jayanthi, Scientist, attended a training course on Agricultural Electronics at C.I.F.T., Kochi, from 12 to 20 February 1997.

- Dr. P. Kishore Chandra, Scientist, attended the National Training Programme on D.N.A. Finger- printing in Farm Animals, conducted by DCB Division of National Dairy Research Institute, Karnal, during 25 February to 14 March 1997.

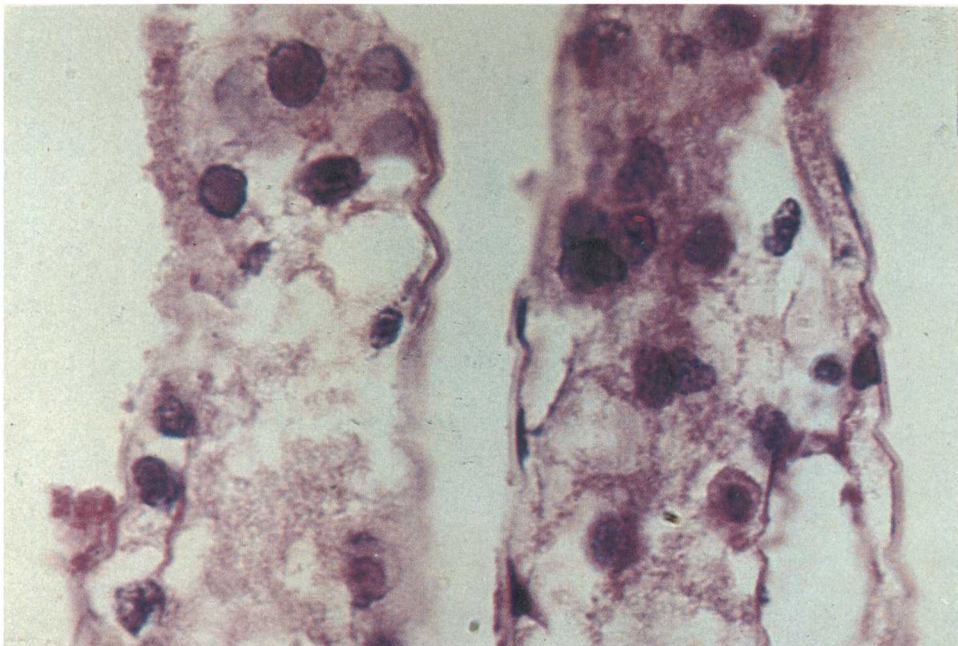
- Shri M. Shashi Shekhar, Scientist, attended a training course on Application of



Induced maturation and breeding in mud crab, *Scylla tranquebarica*. A. Developed ovary (indicated by arrow); B. Before the extrusion of eggs; C. After the extrusion of eggs; D. "Berry" before hatching; E. Developing eggs; F. Hatched out first zoeal larva.



Histological section of the gill of crab *Scylla serrata*, experimentally infected with white spot disease virus, showing necrotic changes and hypertrophied nuclei with basophilic viral inclusions.



Histological section of the gill of lobster *Panulirus homarus*, experimentally infected with white spot disease virus, showing necrotic changes and hypertrophied nuclei with viral inclusions.



Dr. G.R.M. Rao, Director, delivering the inaugural address on the occasion of the celebrations of ICAR and CIBA Foundation Day on 16th July 1997 at Muttukadu Experimental Station (Left to right) Dr. K. Gopinathan, Senior Scientist, Shri K. N. Krishnamurthy, Principal Scientist (Rtd.), Dr. K. Dorairaj, Principal Scientist & Officer-in-charge, CMFRI, Chennai, Dr. M. Sakthivel, President, Aquaculture Foundation of India, Chennai and Dr. S. Ramamurthy, Principal Scientist, CMFRI (Rtd.).



Dr. G.R.M. Rao, Director, handing over the first-batch of hatchery-reared seed of seabass (*Lates calcarifer*) to a private fish farmer.



Dr. Mathew Abraham and Dr. A. R. Thirunavukkarasu, Senior Scientists, explaining the activities of the captive fish broodstock development programme to Shri Shaw M. Farid (AGR) & Secretary, Planning Commission, Govt. of Bangladesh (2nd from right).



A visiting Australian Scientist from SARDI Aquatic Sciences Centre, Australia, explaining the Australian fisheries research activities to Dr. L.H. Rao, Dr. B.P. Gupta and Dr. K. Gopinathan, Senior Scientists of the Institute.

Biotechnology in Animal Health Management, at Centre of Advanced Studies in Animal Biotechnology, Indian Veterinary Research Institute, Izatnagar, from 20 February to 12 March 1997.

- Shri M. Kathirvel, Senior Scientist, participated in an advanced course on Management of Agricultural Research Institutes / Stations, conducted by the National Academy of Agricultural Research Management (NAARM), at Hyderabad, from 18 to 23 August 1997.
- Dr. P. Kishore Chandra, Scientist, attended the training programme on Computerised Project Management, organised by the National Agricultural Technology Project (NATP) Monitoring Unit at IASRI, New Delhi, 20 to 25 October 1997.

The following Scientists and Staff attended computer training programmes:

- Shri S. Rajukumar, T-II-3, in Introductory course on Windows & MS-Office, at National Academy of Agricultural Research Management (NAARM), Hyderabad, 11 to 21 June, 1997.
- Shri M. Shashi Shekhar, Scientist, in Word Proc. & Data Entry, at National

Informatics Centre, Chennai, 9 to 12 September 1997.

- Shri S. Rajukumar, T-II-3, in Computer training for ARIS Cell Personnel, at University of Agricultural Sciences, BSH College, GKVK, Bangalore, 15 to 23 September 1997.
- Shri N. Raghavan, Senior Stenographer, in Computer training for ARIS Cell Personnel, at University of Agricultural Sciences, BSH College, GKVK, Bangalore, 15 to 23 September 1997.
- Smt. Usha Rani, Senior Clerk, in FoxBase/d Base, at National Informatics Centre, Chennai, 22 to 26 September 1997.
- Dr. K. Gopinathan, Senior Scientist, in Introduction to Computers, at National Informatics Centre, Chennai, 20 to 24 October 1997.
- Dr. K. O. Joseph, Senior Scientist, in Introduction to Computers, at National Informatics Centre, Chennai, 20 to 24 October 1997.
- Dr. M. Krishnan, Senior Scientist, in Introduction to Computer Networks and e-mail, at National Informatics Centre, Chennai, 19 to 21 December 1997.

7. AWARDS AND RECOGNITIONS

Dr. Imelda Joseph, Scientist, was awarded the Doctoral degree in Marine Sciences, in June 1997, by the Cochin University of Science and Technology, Cochin, for her thesis entitled "Biodegradation of phenolic compounds in different ecosystems in Cochin".

Dr.M. Kailasam, Scientist, was awarded the Doctoral degree in Marine Sciences, in July 1997, by the Cochin University of Science and Technology, Cochin, for his thesis entitled "Effect of thermal effluent on water quality in relation to benthic community".

8. LINKAGES AND COLLABORATION INCLUDING EXTERNALLY FUNDED PROJECTS

During the year the Institute had linkages with the following:

Dept. of Biotechnology, Govt. of India

A research project entitled "Development of feed technology for semi-intensive / intensive prawn farming" with a total outlay of Rs 19,31,972 /- was funded by the Dept. of Biotechnology, Govt. of India (Sanction Order BT/AA/03/037/91, dated 13.10.1992) from 01.10.1992 to 31.03.1998

During the period under report, several shrimp feeds were formulated using indigenous ingredients *viz.*, soybean meal, fish meal, prawn head meal, mantis shrimp meal, squid meal, wheat flour, fish oil, lecithin, vitamins, minerals, feed additives and binders. The feeds were produced in three grades *viz.*, starter, grower and finisher having the nutrient composition as shown in Table 6.

A technology package was developed for processing and production of the formulated feeds, involving grinding of dry feed ingredients in a micropulverizer, passing through a 300 micron sieve, mixing and homogenising in a ribbon (horizontal) mixer and pelletizing in a ring-die pellet mill.

Pellet production was standardized using three different binders *viz.*, guar gum, wheat gluten and polymethylo-carbamide. All three binders were found to be effective.

Several field testing experiments were carried out to evaluate the performance of the feeds developed under the project. During the period under report one of the feeds was tested in a grow-out shrimp pond (0.64 ha area) taken on lease from M/s Balaji Biotech Ltd., Thuppilipalem, near Gudur in Andhra Pradesh. Tiger shrimp *P. monodon* were stocked @ 15 per square meter and fed with starter feed. However, this experiment was vitiated after 39 days due to outbreak of White Spot Syndrome Virus (WSSV) infection. Average weight of shrimp attained in one month was 5 g.

Dept. of Agriculture and Cooperation (DAC), Ministry of Agriculture, Govt. of India

The Institute was offered Institutional Consultancy for Environmental Monitoring Programme in West Bengal and Orissa under the World Bank - assisted Shrimp and Fish Culture Project, by the Dept. of Agriculture and Cooperation (DAC), Ministry of Agriculture, Government of India, at a total cost of Rs. 68,40,334 /-.

A training programme sponsored by the DAC under Central Sector Scheme, on "Diagnosis, prevention and control of shrimp diseases," was conducted by the Institute during 26 August to 8 September 1997 (Refer section on Training and Education, page no. 23).

Table 6 : Proximate composition of shrimp feed developed (%)

Nutrient	Starter	Grower	Finisher
Crude protein	40.8	36.2	34.5
Fat	8.6	8.4	7.6
Carbohydrate	24.0	29.8	35.8
Crude fiber	3.1	2.5	2.5
Ash	15.4	15.5	13.3
Moisture	8.1	7.6	6.3

Marine Products Export Development Authority (MPEDA), Ministry of Commerce, Govt. of India

A programme on field testing of shrimp feeds was taken up by the Institute at a farm in the Andaman and Nicobar Islands, under the Andaman and Nicobar Shrimp Farming Development and Research Agency (AN-SFDA) programme implemented jointly by MPEDA and Dept. of Ocean Development (DOD).

National Centre for Agricultural Economics and Policy Research (NCAP), ICAR

An Ad-hoc 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. The project with a total outlay of Rs 7,12,000 (CIBA - Rs 3,72,000 and NCAP - Rs 3,40,000) will be funded by the A.P. Cess Fund of ICAR under ICAR Ad-hoc Scheme (Sanction Order No.F.6-20/96-ESM, dated 13 August 1997). The duration of project is for a period of 3 years from 2.1.1998.

Rajiv Gandhi Centre for Aquaculture (RGCA), MPEDA

A consultancy proposal on transfer of technology for breeding and culture of seabass *Lates calcarifer* to Rajiv Gandhi Centre of Aquaculture (RGCA) was submitted by the Institute.

Indira Gandhi National Open University (IGNOU)

The Institute collaborated with Indira Gandhi National Open University (IGNOU) for formulating syllabi for a course on Brackishwater Aquaculture at graduate level.

State Fisheries Depts. / BFDA's

The Institute has well established linkages with State Fisheries Depts. / BFDA's mainly with regard to transfer of technology.

World Bank - funded National Agricultural Technology Project (NATP)

The Institute has submitted the following research project proposals under the World Bank-funded National Agricultural Technology Project (NATP):-

a) Coastal Aquaculture Programme:

- Shrimp and fish broodstock development and breeding under captive conditions
Lead Centre - CIBA and Cooperating Institutions viz., CMFRI, KKV & KAU.
- Shrimp and fish health management
Lead Centre - CIBA and Cooperating Institutions viz., UAS, TANUVAS, APAU and WBUAFS.

b) Fish production system:

- Natural resources management (NRM) / fish production using brackishwater
Lead Centre - CIBA and Cooperating Institutions viz., HAU, CAZRI, CIFE and CSSRI.

9. LIST OF PUBLICATIONS

CIBA Publications

- Annual Report for the year 1996-97.
 - Research Highlights 1987-1997.
 - Vision 2020 - CIBA Perspective Plan.
 - CIBA Extension Series No.8. Site Selection and Farm Design, January 1997.
 - CIBA Extension Series No.9. Finfish farming, January 1997.
 - CIBA Extension Series No.10. Small Scale Shrimp Hatchery Technology, January 1997.
 - CIBA Extension Series No.11. Disease Diagnosis and Health Management, January 1997.
 - CIBA Extension Series No.12. Shrimp Nutrition and Feed Technology, January 1997.
 - CIBA Extension Series No.13. Brine Shrimp *Artemia* Biomass and Cyst Production, March 1997.
 - CIBA Bulletin No.10. Mud crab culture, March 1997.
 - CIBA Special Publication No.4. Diagnosis, prevention and control of shrimp diseases, September 1997, (Mimeograph).
 - CIBA News, Vol. 1, No.2, April to June 1996.
 - CIBA News, Vol. 1, No.3, July to September 1996.
 - CIBA News, Vol. 1, No.4, October to December 1996.
 - CIBA News, Vol. 2, No.1, January to March 1997.
 - CIBA News, Vol.2, No.2, April to June 1997.
 - CIBA News, Vol. 2, No.3, July to September 1997.
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Ahamad Ali, S., C. Gopal and J.V. Ramana 1997. Development of indigenous feed technology for shrimp farming. National

- Joseph, K.O., B.P. Gupta, M. Muralidhar, K.K. Krishnani, S.V. Alavandi, S.S. Mishra and S.G. Sivakumar. 1997. Shrimp culture systems and their impact on the environment. National Workshop on Fish and Prawn Feeds, CIFA, Bhubaneswar, 2-3 September 1997, Abstract, p.48.
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10. LIST OF ON-GOING RESEARCH PROJECTS FOR THE YEAR 1997-98

Sl. No.	Title of the project	Project Leader
CRUSTACEAN CULTURE DIVISION		
1	Development of broodstock for penaeid shrimp (CCD/BS/1)	Dr. L. H. Rao Senior Scientist
2.	Improvement of penaeid shrimp hatchery technology for the production of quality seed (CCD/SP/1)	Dr. P. Ravichandran Senior Scientist
3.	Improvement of production and productivity of shrimp in traditional culture system by suitable management practices (CCD/MT/1)	Shri S. R. Das Senior Scientist
4.	Monitoring of traditional shrimp farms (CCD/MT/2)	Dr. S. M. Pillai Senior Scientist
5.	Culture of mud crabs (<i>Scylla</i> spp.) (CCD/CF/1)	Shri M. Kathirvel Senior Scientist
FISH CULTURE DIVISION		
6.	Broodstock development, breeding and seed production of brackishwater finfishes (FCD/BS/1)	Dr. Mathew Abraham Senior Scientist
7.	Culture of brackishwater finfishes (FCD/FC/1)	Dr. A. R. Thirunavukkarasu Senior Scientist
TECHNOLOGY IMPROVEMENT DIVISION		
8.	Genetic characterization, stock improvement and health care of shellfish and finfish (TID/RP/1)	Dr. T. C. Santiago Senior Scientist
9.	Diagnosis, prophylaxis and control of diseases of commercially important brackishwater shrimp and fish (TID/DIS/1)	Dr. T. C. Santiago Senior Scientist
10.	Development of feeds for aquaculture of brackishwater shrimp and finfishes (TID/NT/1)	Dr. S. A. Ali Senior Scientist

AQUACULTURE ENGINEERING AND ENVIRONMENT UNIT

- | | | |
|-----|---|--|
| 11. | Soil and water quality and productivity management for sustainable shrimp farming (AEED/PM/1) | Dr. B. P. Gupta
Senior Scientist |
| 12. | Design and development of structures for brackishwater aquaculture (AEED/AE/1) | Shri P. Lakshmanadoss
Technical Officer (T-7) |
| 13. | Comprehensive study on impacts of shrimp farming (AEED/CI/1) | Dr. P. Ravichandran
Senior Scientist |

EXTENSION ECONOMICS AND INFORMATION UNIT

- | | | |
|-----|--|---------------------------------------|
| 14. | Investigations on the brackishwater aquacultural practices adopted by different categories of farmers-An integrated approach (EEID/EXTN/1) | Dr. K. Gopinathan
Senior Scientist |
| 15. | Development of database system for brackishwater fishery resources (EEID/EXTN/2) | Dr. M. Krishnan
Senior Scientist |

EXTERNALLY FUNDED PROJECT

- | | | |
|-----|--|-----------------------------------|
| 16. | Development of feed technology for semi-intensive/intensive prawn farming (DBT II) | Dr. S. A. Ali
Senior Scientist |
|-----|--|-----------------------------------|
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11. CONSULTANCY, PATENTS, COMMERCIALISATION OF TECHNOLOGY

The Central Institute of Brackishwater Aquaculture has emerged as a pioneer research organisation in brackishwater aquaculture especially in the areas of production / hatchery technology for shrimp, fish breeding and seed production, shrimp nutrition and feed development, diagnosis of fish / shellfish diseases and health management and shrimp farm environmental survey and impact assessment. It has linkages with farmers, State Fisheries departments / BFDA's and other organisations / agencies for developing effective transfer of technology mechanisms. It has taken up consultancy services as one of its priority mandates. The consultancy activities have been drawn up and formalised as per Council's guidelines. The following consultancies are proposed to be taken by the Institute:

i) Consultancy for Environmental Monitoring Programme (World Bank funding)

Institutional Consultancy for Environmental Monitoring Programme is proposed to be taken up in the states of West

Bengal and Orissa under the World Bank - assisted Shrimp and Fish Culture Project, of the Dept. of Agriculture and Cooperation, Ministry of Agriculture. The total cost of consultancy is Rs 68,40,334 /-.

ii) Consultancy for seabass *Lates calcarifer* breeding and seed production to private farmers

A consultancy proposal for seabass *Lates calcarifer*, breeding and seed production, at a cost of Rs 7,41,366 /- has been prepared and sent to two private farmers.

iii) Consultancy for seabass *Lates calcarifer* breeding and culture to Rajiv Gandhi Centre of Aquaculture (RGCA), MPEDA

A consultancy proposal on transfer of technology for breeding and culture of seabass *Lates calcarifer* to Rajiv Gandhi Centre of Aquaculture (RGCA), MPEDA, has been submitted by the Institute, with consultancy fees estimated at Rs 6,02,766/- for the former and Rs 4,28,576/- for the latter.

12. RAC, IMC, SRC AND IJSC MEETINGS

Research Advisory Committee (RAC)

(Constituted by ICAR for a period of 3 years with effect from 8th February, 1995, vide Office Order No.18(2)/94-ASR-I, dated 8.2.95)

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

- | | | |
|-----|--|----------------------|
| 1. | Dr. T. V. R. Pillay,
Former Programme
Director, Aquaculture
Development & Coordination
Programme, FAO | Chairman |
| 2. | Prof. R. Natarajan,
M.S.Swaminathan
Research Foundation, Chennai | Member |
| 3. | Dr. M. Sakthivel,
Aquaculture Foundation
of India, Chennai | Member |
| 4. | Dr. H. P. C. Shetty,
Retd. Director of Instructions
(Fisheries), University
of Agricultural Sciences,
Mangalore | Member |
| 5. | Dr. K. Venkataramanujam,
Dean, College of Fisheries,
Tamil Nadu Veterinary and
Animal Sciences University,
Tuticorin | Member |
| 6. | Director, CIBA, Chennai | Member |
| 7. | Asst. Director General (M.Fy.)
ICAR, Krishi Bhawan, New Delhi | Member |
| 8. | Shri Subba Somu,
Thiruchirapalli (Representing
Agriculture & Rural Interest) | Member |
| 9. | Shri A. Rajeswara Rao,
Khammam (A.P.) (Representing
Agriculture & Rural Interest) | Member |
| 10. | Dr. L. H. Rao,
Senior Scientist, CIBA,
Chennai | Member-
Secretary |

The third meeting of RAC was held on 11-12 March 1997. The major recommendations / suggestions of the RAC are summarised as follows:

- The Institute should take immediate steps to ensure early land allotment at Polekurru (Andhra Pradesh) and simultaneously look

into the possibility of taking on lease, the required farm area for production-oriented research, on a short term basis.

- The Institute should improve its visibility among the farmers, industry and public through appropriate measures including suitable articles in print and electronic media.
- Total technology packages including feed trials may be undertaken in farmers' ponds after enlisting the cooperation and assistance of the farmers.
- Impact assessment studies on shrimp farming should receive high priority. Information collected should be published and public should be informed of the findings.
- Thrust area of research of the Institute shall be on development of sustainable technology for brackishwater aquaculture with suitable modifications / adaptations to suit local conditions.
- The Institute should take up cage culture of high-value carnivorous fishes such as seabass and grouper.
- The RAC supports the implementation of the Institute's proposed programmes on establishment of shrimp health and water quality monitoring centre under World Bank - assisted Shrimp and Fish Culture Project of DAC, Ministry of Agriculture and the ICAR Cess Fund Project on establishment of shrimp health monitoring centres at CIBA headquarters and research centres and training programmes on shrimp health management sanctioned by Ministry of Agriculture. Routine monitoring and advisory services to farmers is essential and should be broad-based.
- Adequate T.A. funds, vehicle and mobile laboratory facilities should be provided on a high priority basis for carrying out work programmes in farmers' ponds.
- Data collection through Institute's Data centre and NICNET facilities to be strengthened by enlisting the cooperation

of all data-producers at National / State / District levels and relevant information should be disseminated without much time-log.

CIBA should have effective collaborative working arrangements for collecting and analysing latest information on coastal aquaculture.

At national level, such collaborative arrangements should be firmed up with concerned Institutes / agencies. CIBA may establish collaborative linkages with RGCA of MPEDA for programmes on commercial production technologies.

Institute Management Committee (IMC)

(Constituted by ICAR for a period of 3 years, vide Office Order No.6-35/89-IA-VI dated 3.8.93, 23.5.94, 21.7.94 and 6(9)/96-I.A.-VI dated 18.7.96)

The composition of the Institute Management Committee (IMC) is as follows:

- | | | |
|----|---|----------|
| 1. | Director, CIBA,
Chennai | Chairman |
| 2. | Commissioner of
Fisheries, Govt.
of Tamil Nadu | Member |
| 3. | Director of Fisheries,
Govt. of Orissa | Member |
| 4. | Director of Research
& Extension (Fy.),
Tamil Nadu Veterinary
& Animal Sciences
University, Chennai | Member |
| 5. | Non - Official | Member |
| 6. | Non - Official | Member |
| 7. | The Finance &
Accounts Officer,
Sugarcane Breeding
Research Institute,
Coimbatore | Member |
| 8. | Dr.R.A.Selvakumar,
Asst. Director General (M.Fy.),
ICAR, New Delhi | Member |
| 9. | Dr. Mathew Abraham,
Senior Scientist,
CIBA, Chennai | Member |

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|-----|---|----------------------|
| 10. | Dr. S. M. Pillai,
Senior Scientist,
CIBA, Narakkal | Member |
| 11. | Shri R. K. Chakraborti,
Senior Scientist,
CIBA, Kakdwip | Member |
| 12. | Dr. C. P. Rangaswamy,
Senior Scientist,
CIBA, Chennai | Member |
| 13. | Administrative Officer,
CIBA, Chennai | Member-
Secretary |

The fourteenth meeting of the IMC was held on 2 July 1997. The major recommendations of the Committee are indicated below:

The IMC approved the new works proposed by the Institute during the financial year 1997-98. It accorded approval for the settlement of outstanding advances made by the Institute in the case of completion of works by CPWD. It also approved the Institute's action to engage work-based contract to complete the project works funded by the Dept. of Biotechnology. The IMC agreed to the Institute's action to surrender 3 acres of land to Tamil Nadu Government as per the Proceedings of the Collector, Chennai, on account of fresh allotment of 4.19 ha of land at Santhome. It also noted the allotment of land at Chennai on 15 year lease basis at a nominal lease rent of Rs 1,000 /- per annum.

Staff Research Council (SRC)

(Constituted by ICAR for a period of 3 years with effect from 8th February 1995, vide Council's Office Order No.18(2)/94-ASR-I, dated 8.2.95 and modified by Institute vide Institute's Office Orders No.TC/1.1/SRC/95, dated 14.2.1995, TC/1.1(3)/SRC/96, dated 16.3.96 and TC/1.1(3)/SRC/96, dated 13.11.96.). The composition of the Staff Research Council (SRC) is as follows:

- | | | |
|----|--|----------|
| 1. | Director, CIBA | Chairman |
| 2. | Asst. Director
General (M.Fy),
ICAR, New Delhi | Member |

3.	Dr.L.H.Rao, Senior Scientist	Member
4.	Dr.Mathew Abraham, Senior Scientist	Member
5.	Dr. T. C. Santiago, Senior Scientist	Member
6.	Dr.B.P.Gupta, Senior Scientist	Member
7.	Dr. K. Gopinathan, Senior Scientist	Member
8.	Dr. P. Ravichandran, Senior Scientist	Member
9.	Shri M. Kathirvel, Senior Scientist	Member
10.	Dr.S.A. Ali, Senior Scientist	Member
11.	Dr. A. R. Thirunavukkarasu, Senior Scientist	Member
12.	Dr. S. M. Pillai, Senior Scientist	Member
13.	Shri S. R. Das, Senior Scientist	Member
14.	Dr. M. Krishnan, Senior Scientist	Member
15.	Shri P. Lakshmanadoss, Technical Officer (T-7)	Member
16.	Dr. (Smt.) Munawar Sultana, Senior Scientist & Officer-in-charge, Technical Cell	Member- Secretary

The fifth meeting of the SRC was held on 23-24 April 1997. The progress of on-going research programmes was reviewed at this meeting. The Institute's new projects for the year 1997-98 were formulated *viz.*, development of broodstock for penaeid shrimp (CCD/BS/1); improvement of penaeid shrimp hatchery technology for the production of quality seed (CCD/SP/1); improvement of production and productivity of shrimp in traditional culture system by suitable management practices (CCD/MT/1) and monitoring of traditional shrimp farms (CCD/MT/2). Projects completed during the year included development of hatchery technology for penaeid shrimp (CCD/HT/1) and culture of penaeid shrimp in different ecosystems (CCD/CP/1).

Institute Joint Staff Council (IJSC)

(Constituted by CIBA for a period of 3 years with effect from 1.11.95, vide Office Order F.No.13-1/90-Admn., dated 2.11.95)

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

Official side

1.	Director, CIBA	Chairman
2.	Dr. L. H. Rao, Senior Scientist	Member
3.	Dr. Mathew Abraham, Senior Scientist	Member
4.	Shri M. Kathirvel, Senior Scientist	Member
5.	Dr. (Smt.) Munawar Sultana Senior Scientist	Member
6.	Shri S. Krishnaswamy, Asst. Finance & Accounts Officer	Member
7.	Shri P. K. Manimandram, Administrative Officer	Secretary

Staff side

8.	Shri S. Krishnan, T-4	Secretary
9.	Shri R. Kandamani, Senior Clerk	Member
10.	Shri K. Mani, Senior Clerk	Member
11.	Shri C. S. Sasidharan, T-I-3	Member
12.	Shri N. Mani, S.S. Grade III	Member
13.	Shri P. Arumugam, S.S. Grade II	Member

The Sixth meeting of the IJSC was held on 4 October 1997. Matters relating to the welfare of Institute staff were discussed *viz.*, payment of bills on time, recognition of public / private hospitals for treatment of staff, opening of canteen / tea room at headquarters and other centres, recruitment of staff against vacant posts and increase of staff strength in Administrative / Technical / Supporting cadres as per ICAR norms, etc.

13. PARTICIPATION IN CONFERENCES / MEETINGS / WORKSHOPS / SYMPOSIA

Dr. G. R. M. Rao, Director, attended / participated in the following Workshops / Seminar / Symposia / Meetings:

- ICAR Directors' Conference, New Delhi, 5-6 May 1997.
- Meeting of Committee of Officers on Fisheries, Central Board of Fisheries, Ministry of Agriculture, Govt. of India, New Delhi, 13-14 May 1997.
- Symposium on Coastal Aquaculture organised by Maharashtra Chamber of Commerce, Mumbai, 20 June 1997.
- World Bank Review Mission Meeting organised by Dept. of Agriculture and Co-operation, Ministry of Agriculture, New Delhi, 22-25 June 1997.
- The ACIAR - ICAR Interface Meeting, New Delhi, 9 - 11 July 1997.
- 2nd Meeting of Aquaculture Authority, Chennai, 21-22 July 1997.
- 7th Meeting of Executive Committee and 3rd Meeting of General Body of Rajiv Gandhi Centre for Aquaculture (RGCA), MPEDA, Kochi, 1 August 1997.
- Bay of Bengal Programme (BOBP) Consultative Meeting on Coastal Fisheries and Aquaculture Management Project in India, Chennai, 19 August 1997.
- 3rd Meeting of the Aquaculture Authority, Hyderabad, 10-11 September 1997.
- Divisional Meeting of ICAR Fisheries Institutes at CICFRI, Barrackpore, 17-18 September 1997.
- Workshop on Environment Impact Assessment of Aquaculture Enterprises, organised by Rajiv Gandhi Centre for Aquaculture (RGCA), Chennai, 10 December 1997.
- Colloquium on Key Issues relating to the Fisheries Sector, organised by MPEDA, Kochi, 14-15 October 1997.
- Orientation Workshop under National Agricultural Technology Project (NATP),

Tamil Nadu Veterinary and Animal Sciences University, Chennai, 27 October 1997.

- NATP Meeting chaired by Director General, ICAR, New Delhi, 22 December 1997.

Dr. K. Alagarwami, Former Director, attended / participated in the following meetings:

- Technical Consultancy Meeting on World Bank Shrimp and Fish Culture Project, Dept. of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, New Delhi, 12 February 1997.
- 2nd Meeting of Social Audit Committee, CICFRI Research Centre, Guwahati, 12-14 February 1997.
- 6th Meeting of the Executive Committee of the Rajiv Gandhi Centre for Aquaculture (RGCA), MPEDA, Kochi, 20 March 1997.

The Scientists attended / participated in the following Workshops / Seminar / Symposia / Meetings:

- Seminar on Village Development jointly organised by Akshayanagar Pallisri Sangha and Bharath Chamber of Commerce, Akshayanagar, South 24 Parganas (West Bengal), 19 January 1997.

Shri Hardial Singh, Shri S.R.Das, Dr. P. K. Ghosh, Shri R.K.Chakraborti and Shri B.K.Banerjee

- Workshop on Coastal Regulation Zone Research Management Interaction Meeting organised by the Dept. of Town and Country Planning, Govt. of Tamil Nadu, Chennai, 29 January 1997.

Dr.A.R.Thirunavukkarasu

- National Aquaculture Week, organised by Aquaculture Foundation of India, Chennai and co-sponsored by Fisheries Division, ICAR; Dept. of Agriculture and Co-operation (Ministry of Agriculture), Dept. of Ocean Development and Dept. of Biotechnology, Govt. of India,

- Vijayawada, 24-26 February 1997 and Chennai, 31 January and 1 February 1997.
- Dr. R.D. Prasadam, Dr. L.H. Rao,
Dr.P.Ravichandran, Dr.K.Gopinathan,
Shri M.Kathirvel, Dr.S.Kulasekarapandian,
Shri D.Narayanaswamy, Dr.S.A.Ali,
Dr.A.R.Thirunavukkarasu, Dr.C.Gopal,
Dr.S.S.Mishra and Dr.K.V.Rajendran
- 5th Steering Committee Meeting on Technology Project in Mission Mode on Semi-Intensive Prawn Culture, Dept. of Biotechnology, Govt. of India, New Delhi, 3 February 1997.
Dr.S.A.Ali
 - Meeting convened by the Secretary, Animal Husbandry and Fisheries, Govt. of Tamil Nadu, to discuss about the pros and cons of the Supreme Court Judgement on Brackishwater Aquaculture in Tamil Nadu, Chennai, 4 February 1997.
Dr.A.R.Thirunavukkarasu
 - Expert Committee Meeting of the Indira Gandhi National Open University (IGNOU), New Delhi, 4-5 February 1997.
Dr.R.D.Prasadam
 - Farmers' Awareness Programme conducted by BFDA, Machilipatnam, 5 February 1997.
Dr. C. Gopal and Dr. S. S. Mishra
 - ICAR - ODA Meeting at NBPGR, ICAR, New Delhi, 5-6 February 1997.
Dr.R.D.Prasadam and Dr. L. H. Rao
 - National Seminar on Recent Trends in Aquaculture, at Nagarjuna University, Nagarjuna Nagar, A.P., 6-8 February 1997.
Dr. S. S. Mishra
 - 12th Meeting of the Governing Body of Agency for Development of Aquaculture in Kerala (ADAK), Thiruvananthapuram, Kerala, 23 February 1997.
Dr. S. M. Pillai
 - Meeting of the Sub-group on Coastal Aquaculture for drafting IX Five Year Plan of Tamil Nadu, Chennai, 24 February 1997.
Dr.R.D.Prasadam
 - "Aqua Fair" organised by Inland Capture Fisheries Society, India, CICFRI, Barrackpore, 16-17 March 1997.
Shri Hardial Singh, Shri S.R.Das,
Shri R.K.Chakraborti, Dr.P.K.Ghosh
and Shri B.K.Banerjee
 - 8th Meeting of the Research Sub-Committee, at Sundarban Biosphere Reserve, Calcutta, 21 March 1997.
Shri Hardial Singh
 - Fishermen - Farmers - Industry - Institution Meet - XX - Seafarming technologies, organised by CMFRI, Krishi Vighyan Kendra (KVK), Narakkal, 5 April 1997.
Dr.S.M.Pillai
 - Symposium and Panel discussion on Leptospirosis organised by Tamil Nadu Veterinary and Animal Sciences University and MGR Medical College, Chennai, 26 April 1997.
Dr. S. S. Mishra
 - 2nd meeting on Course Writers for B.Sc. Aquaculture, CIFA, Kausalyaganga, Bhubaneswar, 27-28 April 1997.
Dr.K.Gopinathan and
Dr.C.P.Rangaswamy
 - Fourth meeting of Social Audit Committee, CICFRI, Barrackpore, 9 May 1997.
Dr.S.A.Ali
 - National Agricultural Technology Project (NATP) Workshop on Coastal Aquaculture, CIFT, Kochi, 22-28 May 1997.
Dr. L. H. Rao, Dr. Mathew Abraham
and Dr. T. C. Santiago
 - Meeting convened by the Collectorate of Chengalpet - MGR district, Thiruvallur, 8 July 1997.
Shri S. Srinivasagam and
Dr. B. P. Gupta
 - Bay of Bengal Programme (BOBP) Consultative Meeting on Coastal Fisheries and Aquaculture Management Project in India, Chennai, 19 August 1997.
Dr. L. H.Rao

- National Workshop on Fish and Prawn Feeds, CIFA, Bhubaneswar, 2-3 September 1997.
Dr. S. A. Ali, Dr. M. Natarajan,
Dr. C. Gopal and Dr. K. K. Krishnani
- National Conference on Agricultural Marketing under the auspices of the Indian Society of Agricultural Marketing and Tamil Nadu State Agricultural Marketing Board, Chennai, 17-19 September 1997.
Dr. M. Krishnan
- National Agricultural Technology Project (NATP) Orientation Workshop, NAARM, Hyderabad, 25-26 September 1997.
Dr. Mathew Abraham
- National Agricultural Technology Project (NATP) Workshop on Planning and Preparation of Project Proposal, Tamil Nadu Veterinary and Animal Sciences University, Chennai, 27 October 1997.
Dr. L.H. Rao, Dr. Mathew Abraham,
Dr. P. Ravichandran, Dr. I.C. Santiago, Shri
S. Srinivasagum, Dr. S.S. Mishra,
Dr. K.V. Rajendran
- National Agricultural Technology Project (NATP) Workshop on Livestock and Fish Production Systems in Arid-Ecosystem, CAZRI, Jodhpur, 5-8 June 1997 and 27-29 October 1997.
Dr. A.R. Thirunavukkarasu
- National Workshop on Fish and Shellfish Health Management, CIFA, Bhubaneswar, 18-19 November 1997.
Dr. S.S. Mishra and Shri M.S. Shekhar
- National Seminar on the Technological Empowerment of Women in Agriculture, Chennai, 3-4 December 1997.
Dr. (Smt.) Munawar Sultana
- Workshop on Identification and Assessment of Acid Sulphate Soils and their Impacts on Shrimp Production in India, Dept. of Aquaculture, College of Fisheries, Mangalore, 10-12 December, 1997.
Dr. M. Muralidhar

Policy Interaction

Dr. G.R.M. Rao, Director, served as member in the following Committees involved in the formulation and execution of policy decisions in aquaculture:

- Member, Executive Committee and Governing Body, Rajiv Gandhi Centre for Aquaculture (RGCA), MPEDA.
- Member, National Committee to Oversee and Regulate Introduction of Exotic Aquatic Species, Ministry of Agriculture, Govt. of India.
- Member, Committee for Orientation Courses in Aquaculture, Indira Gandhi National Open University (IGNOU), New Delhi.
- Member, Aquaculture Authority, Ministry of Agriculture, Govt. of India.

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

The following workshops / meetings were organised by the Institute during the year:

- The third meeting of the Social Audit Committee was held at Muttukadu Experimental Station on 26-27 March 1997. Dr. Prabin Chandra Sarma, MP (LS), Assam and Chairman, Social Audit Committee, presided over the meeting.
- The ICAR Foundation Day and CIBA Foundation Day was celebrated at Muttukadu Experimental Station on 16 July 1997. A number of fish farmers / entrepreneurs and State Fisheries personnel participated in the celebrations.
- The ARS/NET/SRF Examination 1997, was conducted by CIBA at Chennai during 7-9 October 1997.
- The National Agricultural Technology Project (NATP) Workshop on Planning and Preparation of Project Proposals under the Coastal Aquaculture Programme was organised at Chennai on 27 October 1997 by Dr. P. Rethinam, Director (NRC on Oil Palm) and AED (Agri-Horti & Coastal Ecosystem) in collaboration with CIBA. The workshop was presided over by Dr. K. L. Kaul, Officer on Special duty (OSD), ICAR. Various Principal Investigators and Co-investigators from different State Agricultural Universities (SAUs) and ICAR Institutes participated in the discussions.

15. VISITORS

- Shri Jaswant Singh, Hon'ble Minister for Revenue, Fisheries and Aviation, Govt. of Haryana
- Dr. P. V. Dehadrai, Deputy Director General (Fy), ICAR, New Delhi
- Dr. R. A. Selvakumar, Asst. Director General (M.Fy), ICAR, New Delhi
- Dr. M. Yusuf Kamal, Asst. Director General (Fy.I), ICAR, New Delhi
- Dr. S. M. Ilyas, Asst. Director General (TC), ICAR, New Delhi
- Dr. T. V. R. Pillay, Former Programme Director, Aquaculture Development and Coordination Programme, FAO (Chairman, RAC)
- Prof. R. Natarajan, No.7, Astalakshmi Flats, I Floor, 67, Teachers Colony, Indhra Nagar, Chennai (Member, RAC)
- Dr. K. Venkataramanujam, Dean, College of Fisheries, Tamil Nadu University of Veterinary and Animal Sciences, Tuticorin (Member, RAC)
- Shri A. Rajeswara Rao, Satyasudha, Bhadrachalam, Khammam, Andhra Pradesh (Member, RAC)
- Shri Subba Somu, 22/1, Hebbur Main Road, Beema Nagar, Thiruchirapalli (Member, RAC)
- Dr. Prabin Chandra Sarma, MP (LS), Assam (Chairman, Social Audit Committee)
- Dr. V. Rajagopalan, Ex-Vice Chancellor, Tamil Nadu Agricultural University, Coimbatore (Member, Social Audit Committee)
- Dr. M. Sinha, Director, CICFRI, Barrackpore
- Dr. S. R. Srivastava, Senior Scientist, CIFA, Dhauli, Bhubaneswar
- Smt. Prabhavathi, Deputy Director, Tamil Nadu State Fisheries, Chennai
- Dr. G. R. C. V. Prasada Rao, IAS, Director of Fisheries, Govt. of Andhra Pradesh, Hyderabad
- Dr. A. G. Ponniah, Director, NBFGR, Lucknow
- Dr. Ms. Natalie Daalder, Country Manager, South-Asia, ACIAR
- Dr. K. V. Devaraj, former Vice Chancellor, University of Agricultural Sciences, Bangalore
- Shri R. K. Tripathy, IAS, Secretary, Dept. of Fisheries, Govt. of West Bengal
- Shri Abhay Rath, IAS, Principal Secretary, Fisheries and Animal Resources Dept., Govt. of Orissa
- Shri Rob Lewis, Chief Executive, South Australian Research & Development Institute (SARDI), Australia
- Dr. John Keesing, Chief Scientist (Aquatic Sciences), SARDI, Australia.
- Dr. Martin Kumar, Senior Scientist (Aquatic Sciences), SARDI, Australia
- Shri Shah M. Farid, Member (AGR) & Secretary, Planning Commission, Govt. of Bangladesh
- Shri A. Purna Chandra Rao, Manager (Rural Development), Agriculture Section, State Bank of India, Vijayawada
- Shri K. B. Pillai, Chairman, MPEDA / President RGCA, Cochin
- Shri V. Venkatesan, Director, MPEDA, Cochin
- Dr. R. Ganapathy, Project Director, RGCA, Mayilathurai
- Dr. G. Santhanakrishnan, Joint Director, MPEDA, Cochin
- Dr. P. Rethinam, Director (NRC on Oil Palm) and AED (Agri-horti & Coastal Ecosystem under National Agricultural Technology Project)
- Shri M. P. Parmar, Joint Commissioner, Dept. of Fisheries, Govt. of Gujarat
- Shri K. R. Narayanan, Asst. Director, Dept. of Fisheries, Govt. of Gujarat
- Dr. H. Dave, Asst. Director, Dept. of Fisheries, Govt. of Gujarat
- Dr. Horny Emara, Director, National Institute of Oceanography & Fisheries (NIOF), Alexandria, Egypt
- Dr. Meseda Etahanbary, Head of Fish Production Dept., National Institute of Oceanography & Fisheries (NIOF), Alexandria, Egypt
- Dr. Fatima Aly Abdel Razex, Scientist, National Institute of Oceanography & Fisheries (NIOF), Alexandria, Egypt
- Dr. Saliman Hamed, Scientist, National Institute of Oceanography & Fisheries (NIOF), Alexandria, Egypt

16. PERSONNEL

(Not a Gradation List)

DIRECTOR

Dr.K.Alagarswami

(Voluntary retirement on 1.4.1997)

Dr.G.R.M.Rao

(From 1.4.1997)

SCIENTISTS

Principal Scientist

Dr. R.D. Prasadam
(Superannuation on 30.6.97)

Senior Scientist

Dr. L. Hanumantha Rao
Dr. Mathew Abraham
Shri K. Devarajan
Shri Hardial Singh (Transferred to CIFA,
Bubhaneshwar w.e.f. 2.4.1997)
Shri S.R. Das
Dr. P. Ravichandran
Shri M. Kathirvel
Dr. T. C. Santiago
Dr. S. Kulasekarapandian
Dr. S.M. Pillai
Dr. L. Krishnan
Dr. A. R. Thirunavukkarasu
Dr. Syed Ahamad Ali
Dr. K. Gopinathan
Shri R. K. Chakraborti
Shri S. Srinivasagam
Dr. C. P. Rangaswamy
Dr. B.P. Gupta
Shri D. Narayanaswamy
Shri N. Kalaimani
Dr. M. Natarajan
Dr. P. K. Ghosh
Dr. (Smt.) Munawar Sultana
Shri B. K. Banerjee
Dr. M. Krishnan
Dr. K. O. Joseph

Scientist (Senior Scale)

Dr. C. Gopal
Shri S. V. Alavandi
Dr. K. K. Vijayan

Scientist

Shri T. Ravisankar
Smt. D. Deboral Vimala
Dr. (Kum) Shiranee Periera
Dr. S. S. Mishra
Dr. J. V. Ramana
(Transferred to NIANP,
Bangalore, w.e.f. 31.3.1997)
Dr. P. S. P. Gupta
(Transferred to NIANP,
Bangalore, w.e.f. 5.1.1997)
Dr. P. Kishore Chandra
Shri V. Chellapandian
Shri P.S. Sudheesh
Dr. K.V. Rajendran
Dr. (Smt.) Imelda Joseph
Dr. K.K. Krishnani
Dr. M. Muralidhar
Smt. M. Jayanthi
Shri M. Shashi Shekhar
Shri R. Rangeswaran
(Transferred to PDBC,
Bangalore, w.e.f. 5.3.1997)
Dr. M. Kailasam
Dr. C. P. Balasubramanian
Shri K. Ponnusamy
(Joined on 26.2.1997)

Shri Azad Ismail Saheb
(Joined on 18.3.1997)
Shri Akshaya Panigrahi
(joined on 7.8.1997)
Shri J. K. Sundar Ray
(joined on 27.8.1997)
Shri K. Amba Sankar
(joined on 4.12.1997)
Kum. P. Nila Rekha
(joined on 3.12.1997)

Technical

Shri P. Lakshmanadoss, T-7(Engineer)
Shri P. M. A. Kadir, T-5
Shri N. Venugopal, T-5
Shri R. Elangovan, T-4
Shri S. Krishnan, T-4
Shri S. Sivagnanam, T-II-3
Shri R. Puthiavan, T-II-3
Shri V. R. Senthil Kumar, T-II-3
Shri D. Rajababu, T-II-3
Shri K.K. Surendran, T-I-3
Shri C.S. Sasidharan, T-I-3
Shri M.G. Sivadasan, T-II-3
(w.e.f. 1.1.1995)
Shri M.G. Subramani, T-II 3(Driver),
(w.e.f. 1.1.1995)
Shri M. Gopinathan Nair, T-II-3(Driver),
(w.e.f. 1.1.1995)
Shri B.B. Roy, T-II-3(Driver),
(w.e.f. 1.1.1995)
Shri P.C. Mohanty, T-1 (Driver)
(w.e.f. 2.6.1986)
Shri K. Paranthaman, T-1 (Driver)
(w.e.f. 27.9.1989)
Shri R. Balakumaran, T-1 (Driver)
(w.e.f. 28.5.1996)
Shri N. Ramesh, T-1
Shri S. Saminathan, T-1
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
(Joined on 17.2.1997)
Shri Ananthanarayanan, T-1
Shri P. Manickyam, T-1
Shri S.S. Maity, T-1
Shri P.S. Samantha, T-1
Kum. Chanda Mazumdar, T-1
Shri N. Jagan Mohan, T-1
Shri A. Nagavel, T-1
(joined on 21.8.1997)
Shri D. M. Ramesh Babu, T-1
(joined on 24.7.1997)
Shri G. Thiagarajan, T-1
(joined on 4.8.1997)
Shri R. Subhuraj, T-1
(joined on 27.8.1997)
Shri Ashok Kumar, T-1
(joined on 1.9.1997)
Shri K. Kariyan, T-1
(joined on 10.9.1997)

ADMINISTRATIVE PERSONNEL

Shri P.K. Manimandram,
Administrative Officer
Shri S. Krishnaswamy,
Asst. Fin. & Accts. Officer
Shri N. Raghavan, Senior Stenographer
Smt. S. Bhagirathi, Superintendent
(w.e.f. 27.2.1997)
Shri A.B. Mondal, Assistant
Shri R. Kandamani, Senior Clerk
Shri R.G. Ramesh, Assistant
Smt. V. Usharani, Senior Clerk
Shri P.N. Rajasekharan Nair, Senior Clerk
Shri P. K. Roy, Senior Clerk
Shri K. Mani, Senior Clerk
Shri S.K. Haldar, Stenographer
Kum. S. Nalini, Junior Stenographer
Smt. K. Hemalatha, Junior Stenographer
Smt. K. Subhashini, Junior Stenographer
Shri S.K. Bindu, Junior Clerk
Smt K. Nandini, Junior Clerk
Shri S. Pari, Junior Clerk
Smt. E. Amuthavalli, Junior Clerk

Shri A. Manoharan, Junior Clerk
Shri R. Suresh, Junior Clerk
(Resigned on 27.2.1997)
Shri A. Sekar, Junior Clerk
Smt. E. Mary Desouza, Junior Clerk
Shri P. Srikanth, Junior Clerk
Smt. R.Vetrichelvi, Junior Clerk
(joined on 13.8.1997)

AUXILIARY PERSONNEL

Shri N. Mani, Gestetner Operator

SUPPORTING STAFF

S.S.Gr. IV

Shri A.K. Mondal
(reverted to SSG-III w.e.f. 1.5.1996)
Shri D.N. Sahoo
Shri N.C. Jena
Shri Sita Ram Das
(reverted to SSG-III w.e.f. 17.5.1997)
Shri S.C. Mondal
Shri Gunadar Das
Shri L.C. Manna
(promoted to SSG-IV w.e.f. 10.4.1997)
Shri Prakash Chandra Saha
(promoted to SSG-IV w.e.f. 10.4.1997.)
Shri Badlu Dhanuk
(promoted to SSG-IV w.e.f. 10.4.1997)

S.S.Gr. III

Shri K. K. Raman
Shri Dhaneswar Das
Shri R. K. Behera
Shri Shyam Bhoi
Shri Sita Ram Bahadur
Shri A. E. Raju
Shri M. N. Biswas
Shri Shyamlal Dhanuk
Shri A. K. Biswas
Shri Biswanath Mondal
(w.e.f. 10.4.1997)
Shri K. M. Das (w.e.f. 10.4.1997)
Shri B. K. Jena (w.e.f. 10.4.1997)
Shri N. N. Mondal (w.e.f. 10.4.1997)

Shri Amulya Bijali (w.e.f. 10.4.1997)
Shri N. C. Samanta (w.e.f. 10.4.1997)

S.S. Gr. II

Shri N. K. Shanmugham
Shri P. Arumugam
Shri Baman Jally
Shri R. Subramani
Shri Sasadar 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
Shri Nitai Chandra Som
Shri Patit Paban Halder
(w.e.f. 10.4.1997)
Shri Abhimanyu Naskar
(w.e.f. 10.4.1997)
Shri R. K. Roy (w.e.f. 10.4.97)
Shri T. V. Shaji (w.e.f. 10.4.97)
Shri K. Kunjuraman (w.e.f. 10.4.1997)
Shri K. Thankappan (w.e.f. 10.4.1997)
Shri N. C. Mondal (w.e.f. 10.4.1997)
Shri M. D. Suresh (w.e.f. 10.4.1997)

S.S. Gr. I

Shri N. K. Jena
Shri M. Santhosham
Shri B. C. Paik
Shri Pranesh Chandra Saha
Shri N. Harinathan
Shri V. Jeevanandam
Shri Amar Gharami
Shri K. Mariappan
Shri Maharaja Majhi
Shri Narendra Nath Jena

Shri Krishna Pada Naskar
Smt. S. Santhi
Shri Premanda Bisoi
Shri V.M. Dhanapal
Shri K. Nityanandam
Shri M. Subramani
Smt. Lakshmi Rani Bhuiya
Shri M.P. Devadasan
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 (joined on 23.7.1997)
Shri D.Senthilkumaran (joined on 24.7.1997)
Shri C.Raghu (joined on 25.7.1997)
Shri P.G.Samuel (joined on 29.7.1997)
Shri M.Sakthivel (joined on 30.7.1997)
Shri R.Mathivanan (joined on 1.8.1997)
Shri A.Paul Peter (joined on 4.8.1997)
Shri R.Indrakumar (joined on 5.8.1997)
Shri G.Dayalan (joined on 7.8.1997)
Shri Kanaka Prasad (joined on 14.8.1997)
Kum. M.Annamary (joined on 27.8.1997)

17. INFRASTRUCTURE DEVELOPMENT

The construction of Fish Hatchery and Feed Mill at Muttukadu was completed this year. The construction of Nutrition Laboratory, additional Essential Staff Quarters (Type II, 2 no.), culverts, storm water drain, approach road and 'A' series ponds is nearing completion at Muttukadu.

Construction of the Larval Rearing Shed

at Narakkal Research Centre, Staff Quarters Type IV (1 no.) at Kakdwip Research Centre and Laboratory cum Administrative building for Headquarters of CIBA at Santhome, Chennai, have been entrusted to CPWD for execution.

The Agricultural Research Information System (ARIS) laboratory is being established at Muttukadu.

18. LIBRARY, INFORMATION AND DOCUMENTATION

Library holdings

The Institute's library holdings in March 1998 included 1000 books, 470 reprints and photocopies, 300 reports and 600 miscellaneous publications. It subscribes 12 foreign and 17 Indian journals.

Exchange services

The library maintained exchange relationship with national and international organisations of mutual interest. The library

maintained the free mailing of Intitute's Annual Report and other publications to various research organisations, universities and other agencies.

Information services

The library section extended information service to the scientific personnel of research organisations, universities, research scholars, students and individuals through reference of books and journals in the library.

सारांश

केन्द्रीय खारापानी जलजन्तु पालन संस्थान भारतीय कृषि अनुसंधान परिषद के अंतर्गत आनेवाली 8-मत्स्यकीय संस्थानों में से एक है। इस संस्थान की स्थापना बढ़ते हुए खारापानी की जलकृषि के शकल (सेक्टर) को सक्षम करने और शोध कार्य एवं प्रौद्योगिकी प्रावधान हेतु अप्रैल 1987 में हुई थी। इस संस्थान का मुख्यालय चेन्नई एवं प्रयोगशाला केन्द्र चेन्नई से 30 कि.मी. दक्षिण में स्थित हैं। इस संस्थान के तीन शोध केन्द्र काव्दीप (पश्चिम बंगाल), पुरी (उड़ीसा) और नारक्कल (केरल) में स्थित हैं। इस संस्थान में निदेशक के साथ 50 वैज्ञानिक, 37-तकनीकी, 23 प्रशासनिक और 87 आधारी (स्पोर्टिंग) कर्मचारी (31 दिसंबर 1997 तक) कार्यरत हैं। सन 1997-98 के लिए 387 लाख रूपयों का बजट प्रावधान किया गया है।

खारापानी मछली एवं झींगा पालन पद्धति बनाए रखने हेतु तकनीकी-आर्थिक सक्षमता वाले शोध कार्य और खारेपानी में मछली एवं झींगा की टिकाऊ कृषि इस संस्थान के मुख्य अधिदेश हैं। इसके इलावा खारापानी मत्स्यकीय संसाधनों के क्रमबद्ध डेटा-बेस को विकसित करना, प्रौद्योगिकी हस्तांतरण हेतु प्रशिक्षण, शिक्षा एवं प्रसार कार्यक्रमों, परामर्शी सेवाओं को उपलब्ध कराना आदि भी शामिल हैं।

भारतीय कृषि अनुसंधान परिषद के बाहर से लिए गये विशिष्ट वैज्ञानिकों से गठित शोध सलाह समिति के दिशानिर्देशों में और संस्थान की प्रबंधक समिति के निगरानी में संस्थान के कार्यक्रम चलाये जाते हैं। संस्थान के गतिविधियों के चालन के लिए कर्मचारी शोध परिषद, संस्थान संयुक्त कर्मचारी समिति, खरीदारी समिति, कामगारी समिति, आदि आंतरिक समितियों का गठन भी किया गया है।

पिछले दस वर्षों में झींगा उत्पादन एवं हैचरी प्रौद्योगिकी विकास, रणगृहित (कैप्टिव) मछली प्रजनकों का विकास, मछली प्रजनन एवं बीजोत्पादन, पोषण एवं खाद्य प्रौद्योगिकी, मछली/झींगा मछली रोग निदान एवं स्वास्थ्य प्रबंधन, झींगा पक्षेत्र (फामी) परिसर सर्वेक्षण, प्रभाव आँकन (इम्पैक्ट असेसमेंट) और प्रौद्योगिकी हस्तांतरण के क्षेत्र में संस्थान ने गणनीय योगदान दिया है।

संस्थान के कार्यक्रमों को पाँच विभागों द्वारा चलाया जाता है। यह विभाग हैं:- क्रस्टेशियन पालन विभाग, मछली पालन विभाग, प्रौद्योगिकी संशोधन विभाग, जलकृषि अभियांत्रिकी एवं पर्यावरण विभाग और प्रसार, अर्थिकी एवं सूचना विभाग। संस्थान के प्रमुख उपलब्धियों का ब्योरा यहाँ दर्शाया गया है।

आसियायी समुद्री बास (लेटस कैलकारिफर) के रणगृहित प्रजनकों का विकास एवं इनका नियंत्रित प्रजनन जून-जुलाई 1997 में देश में पहिली बार सफलता पूर्वक संभव कर दिखाया गया है। यह संस्थान की महत्वपूर्ण उपलब्धि है। मुत्तुकाडु में स्थित संस्थान के प्रायोगिक केन्द्र में दो 100 टन क्षमतावाली सिमेंट कान्क्रीट टंकियों में 3-10 किलो मछलियों को करीब एक वर्ष रखने के पश्चात उनका लैंगिक परिपक्वता एवं प्रजनन के प्रयत्न किए गये। त्वचा के झिल्लियों में एल. एच. आर. एच. न्यार्स (हार्मोन) गोलियों को 100 माइक्रोग्राम प्रति किलो के दर से स्थापित करके अंतिम लैंगिक परिपक्वता का प्रारोचन किया गया। इन मछलियों में 60-80 माइक्रोग्राम प्रति किलो के दर से मादा मछलियों को और 30-40 माइक्रोग्राम प्रति किलो के दर से नर मछलियों को एल. एच. आर. एच. का इंजेक्शन देने के उपरान्त अंड स्वलन (स्पानिंग) और 90 प्रतिशत निषेचन (फर्टिलिजेशन) संभव हुआ। निषेचित अंडों को 30-32 पी पी टी स्वच्छय समुद्री जल में सेका गया। इस से 1.4 मिलियन शिशु मछलियों को आहार के रूप में जिवित रोटीफर और अर्टिमिया देकर पाला गया। इसके उपरान्त अंड स्वलन के कुछ और प्रयत्नों से दो लाख शिशु मछलियाँ जो 20-25 दिन की थीं मत्स्य पालकों में बेचा गया।

रणगृहित प्रजनक संकुल (ब्रूड स्टॉक) विकास एवं प्रारोचित प्रजनन द्वारा मलट (मुगिल सेफालस) मछली पर सफल शोध भी संस्थान की उपलब्धियों में एक है। रणगृहित परिस्थितियों में पाले गये मलट मछली में 20% प्रजनक संकुल (0.4 से 1.5 किलोग्राम) किसी न्यासर्गों के प्रयोग के बिना लैंगिक परिपक्वता संभव कर दिखाया है। मानव कोरियानिक गोनाडोट्रोपिन (एच. सी.जी.) 10,000 आइ. यु प्रति किलो के दर से

प्राथमिक खुराख और 5 मिली लीटर प्रति किलो के दर से औवाप्रिम का प्रभावी खुराख, 24 घंटों के अंतराल में इंजेक्शन के रूप में दिया गया। इन मछलियों में अंड स्खलन और 90% निषेचन संभव हुआ। निषेचित अंडों से 5.2 लाख शिशु मछलियों का उत्पादन करने के पश्चात उनको 8 दिनों तक सफलता पूर्वक पाला गया।

झींगों में होनेवाली सफेद छींटों (व्हाइट स्पॉट) की बीमारी के क्षेत्र में विस्तृत शोध किया गया है। इस बीमारी के वाइरस की उपस्थिति का डी.एन.ए. आधारित सरल एवं शीघ्र विधानों से पता लगाया जा सकता है। आँख की गिल्ली (स्टाक) के सूक्ष्म दर्शी अध्ययन से इस रोग के निदान को विकसित किया गया है। झींगों के प्रजनन में इस विधान के द्वारा सफेद छींटा कारक वाइरस की जाँच हो सकती है।

सफेद छींटा कारक रोग का अन्य दशपदि (डेकापोड) जीवियों में प्ररोचित करने की संभावनाओं का भी संस्थान की प्रयोगशाला में अध्ययन किया गया है। लाबस्टर, केकडा, मीठे पानी का झींगा आदि में इस रोग को प्ररोचित किया गया है। लाबस्टर एवं रेती केकडों (मड क्रेब) में इन रोग कारकों की मात्रा अधिक पायी गयी और लाबस्टर एवं केकडों में वाइरस की भंडार होने की संभावनाओं का भी अध्ययन किया गया है।

दक्षिण आरकाट, नागै-क्वैडे-मिल्लत, तंजावूर, पुदुकोट्टै, रामनाथपुरम, वि. ओ. चिदंबरनार आदि तमिलनाडु के तटवर्ती जिलों में झींगा पालन से हुए पर्यावरण एवं सामाजिकी आर्थिकी प्रभावों की वस्तु स्थिति मूल्यांकन हेतु महत्वपूर्ण अध्ययन संस्थान द्वारा किए गये हैं। इन अध्ययनों से अमोनियाँ, नाइट्रेट, हाइड्रोजन सल्फाइड, सी. ओ. डी., बी. ओ. डी. आदि पानी के गुण विशेषों की मात्रा अनुमोदित परिमितियों के भीतर पायी गयीं। मिट्टी और पानी के खारे होने की प्रक्रिया देखी गयी, किंतु झींगा पालन ही इसका एकमात्र कारण है, यह प्रतिपादन करनेवाले कोई साक्ष्याधार नहीं हैं। सामाजिकी - आर्थिकी प्रभावों में महत्वपूर्ण, स्थानीय रोजगारी के नये संभावनाओं में वृद्धि होना था।

झींगा और मछली आहार एवं पोषण प्रौद्योगिकी का सुधार किया गया है। झींगा आहार संस्करण एवं उत्पादन के स्थानीय प्रौद्योगिकी को विकसित

किया गया है। विविध श्रेणियों का झींगा आहारोत्पादन हेतु एक अर्ध व्यापारिक खाद्य मिल को मुत्तुकाडु के प्रायोगिक केन्द्र में स्थापित किया गया, है। तेल की खली, स्पैरुलिना जैसे विकल्प प्रोटीन स्रोतों का मूल्यांकन झींगा आहार में सम्मिलित करने हेतु किया गया। झींगों की बाल्यावस्था में दिजाने वाले आहार में 3% की मात्रा में उपयोगी जीवाणुओं के स्मिग्न से आहार परिवर्तन (फूड कन्वर्शन) दर को बढ़ाया जा सकता है। फारमिक अम्ल के फरमेंट किया गया मछली सार (सैलेज) आहार को आकर्षक बना सकता है।

खारापानी मत्स्यकीय संसाधनों की सांख्यिकी आधारित एक प्रभावी सूचना प्रणाली को भी संस्थान द्वारा स्थापित किया गया है। कृषि सूचना प्रणाली (एरिस) प्रयोगालय की स्थापना के प्रयास भी लगभग पूर्ण कर लिए गये हैं। मछली झींगा पालन में कृषिकों के सहायता के लिए अनेक प्रसारण हस्त प्रतियाँ, प्रशिक्षण पुस्तिकाएँ, आदि का प्रकाशन भी किया गया है। इन प्रकाशनों द्वारा सरल भाषा में- लघु स्थरीय झींगा हैचरी प्रौद्योगिकी, मछलीपालन, क्षेत्र चयन एवं रचना क्रम, झींगा पोषण एवं खाद्य प्रौद्योगिकी, रोग निदान एवं स्वास्थ्य प्रबंधन, ब्रेन झींगा (ब्रेन श्रिंप) एवं उसका बीजोत्पादन, रेती केकडा पालन, आदी विषयों की जानकारी झींगा/मछली कृषिकों तक पहुँचाया जा रहा है। निरीक्षण एवं सलाह सेवाएँ समय समय पर दिए जा रहे हैं। भारत सरकार की कृषि एवं सहकारिता मंत्रालय के विश्व बैंक की सहायता से चलाए जा रहे झींगा एवं मछलीपालन परियोजनाओं के अंतर्गत परामर्श सेवाओं को प्रदान करने की सहमति संस्थान की ओर से दी गयी है।

“2020-एक दृष्टिकोण” के अंतर्गत इस संस्थान के आनेवाली योजनाओं का ब्योरा प्रकाशित किया गया है। अन्य प्रकाशनों में 1987-97 दशक के प्रमुख शोध उपलब्धियों का प्रतिवेदन और 1996-97 की वार्षिक प्रतिवेदन (रेती केकडों की कृषि प-सी. आई. बी. ए. का बुलेटिन सं 10, सी. आई. बी. ए. प्रसार क्रमांश सं 8, 9, 10, 11, 12 एवं 13 और सी. आई. बी. ए. समाचार पत्र अंक 1, सं 2, 3, एवं 4 और अंक 2, सं 1, 2 एवं 3) प्रमुख है।

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