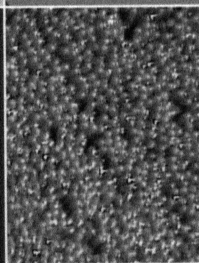
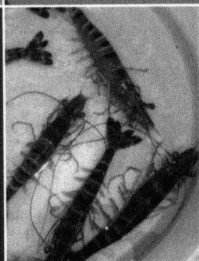


# वार्षिक प्रतिवेदन Annual Report 2004 - 2005



भारत  
ICAR

केन्द्रीय खारा जलजीव पालन अनुसंधान संस्थान  
(भारतीय कृषि अनुसंधान परिषद्)

75, सन्थोम हाई रोड, राजा अण्णामलेपुरम, चेन्नई - 600 028.

**CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE**  
(Indian Council of Agricultural Research)

75, Santhome High Road, R.A. Puram, Chennai - 600 028.





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2004 - 2005



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(Indian Council of Agricultural Research)

75, Santhome High Road, R.A. Puram, Chennai - 600 028.

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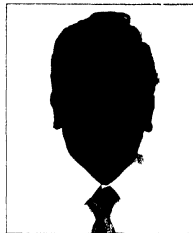
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## PREFACE

The year 2004-2005 was of mixed feelings for the Institute. While there were reasons to rejoice on the accomplished research achievements, at the same time there was tragic loss of a young researcher and the enormous damage and loss of infrastructure, equipments and research materials due to tsunami which devastated the research facilities at our Muttukadu Experimental Station on 26 December 2004. The Institute worked overtime to restore normalcy with the timely support, assistance and help from the Director General, Deputy Director General (Fy.), Secretary, Director (Finance) and Director (Works) of ICAR. The Institute conducted a survey of the damages caused by the tsunami to the brackishwater aquaculture sector in Andhra Pradesh, Tamil Nadu, Pondicherry and Kerala. The Institute also contributed to the Prime Minister's Relief Fund and relief materials were distributed to the affected fishermen community at Muttukadu. The scientists and staff of the Institute have risen to the occasion to convert the calamity into an opportunity to build up the Institute for a better future.



The Institute has made noteworthy contributions for further advancement of brackishwater aquaculture in the country. Development of several generations of kuruma shrimp in captivity, demonstration of kuruma shrimp culture in a farmer's pond, improved production up to 1.8 tonnes / ha of tiger shrimp from tide fed ponds following best management practices, preparation and evaluation of grow out feeds for seabass, *rt*PCR (nested) diagnostic kit for white muscle disease of scampi, DNA finger printing of luminescent bacteria, sequencing of white muscle disease virus, isolation of beneficial bacteria for the bioremediation of shrimp farm discharge water etc. were some of the significant research findings.

The Institute has given utmost importance to transfer of technology and organized training programmes, workshops and farmers' meets to enlighten the different stakeholders abreast with the recent innovations and findings in brackishwater aquaculture. Human Resource Development received utmost importance and a good number of scientific, technical and administrative personnel were trained under various programmes. Effective linkages were maintained with national and international institutions.

The Annual Report 2004-2005 contains the highlights of the research and other activities of the Institute. The progress achieved in different spheres of activity of the Institute was made possible by the sincere and dedicated works of all the scientists and staff and I take this opportunity to

thank one and all. I am extremely indebted to Dr.Mangala Rai, Secretary, DARE and Director General, ICAR and Dr.S.Ayyappan, Deputy Director General (Fy.) for their invaluable support and help to reconstruct the facilities destroyed by the tsunami at Muttukadu and also for their guidance and encouragements to steer the Institute to progress and prosper. My sincere thanks are also due to Dr.A.D.Diwan, Assistant Director General (M.Fy.), Dr.V.R.Chitranshi, Assistant Director General (I.Fy.) and Shri Anil Agarwal, Principal Scientist (M.Fy.) for their help.

Chennai-28  
29 August 2005

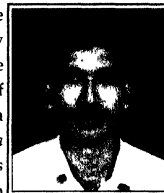


P.RAVICHANDRAN  
DIRECTOR



## EXECUTIVE SUMMARY

The year 2004 was a shocking one for the Institute with the losing of the precious life of a Senior Research Fellow Shri M.Vijaya Kumar to the deadly tsunami waves on 26 December 2004 which caused extensive damages to the infrastructure and hatchery facilities at the Muttukadu Experimental Station of CIBA. Valuable live domesticated broodstocks and generations of kuruma shrimp *Marsupenaeus japonicus*, and broodstock of mud crabs *Scylla tranquebarica* and *S. serrata*, grey mullet *Mugil cephalus* and seabass *Lates calcarifer* were lost in the tsunami. The damages to the shrimp, fish and crab hatcheries were so severe that except for the physical structures, every thing was lost. The Institute immediately sprang into action to restore normalcy and reconstruct the infrastructure facilities. The scientists, officers and staff of CIBA, contributed generously to the Prime Minister's Relief Fund Tsunami relief measures were organized to the affected fishermen families in Muttukadu Village. The Institute also undertook a quick survey of the tsunami affected districts in Tamil Nadu, Pondicherry, Andhra Pradesh and Kerala states to assess the damages caused to the aquafarms. In the wake of the tsunami destructions, Dr.Mangala Rai, Director General, Dr.S.Ayyappan, Deputy Director General (Fy.), Ms. Shashi Misra, Secretary, Shri Jangira, Director (Finance) and Shri. V.P. Kothiyal, Director (Works) from ICAR, New Delhi visited the Institute to assess the damages caused to the infrastructure facilities and provided all the necessary support and help to bring back the conditions to normalcy. The Director, scientists, officers and staff are extremely grateful for their timely help during this period of crisis.



Shri M. Vijaya Kumar

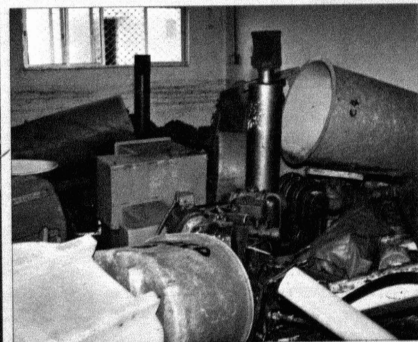
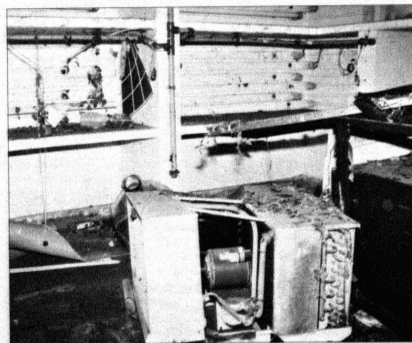
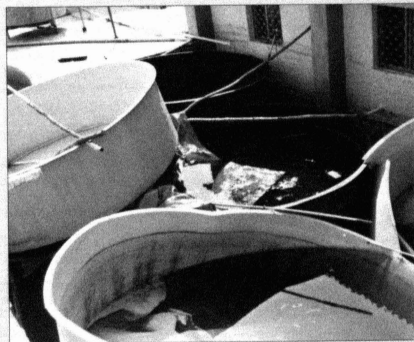
Although the period after the tsunami was mainly devoted for reconstruction of the damaged facilities at Muttukadu Experimental Station, the Institute has contributed significantly on the research front as well for the further development of brackishwater aquaculture of the country through its 10 in-house research projects and 8 externally funded projects. The research programmes of the Institute are guided by the Research Advisory Committee and the future thrust areas of research are planned in the Staff Research Council which also evaluates the progress made in the research programmes. The overall functions of the Institute are supervised by the Institute Management Committee. The salient research achievements during the year are as follows:

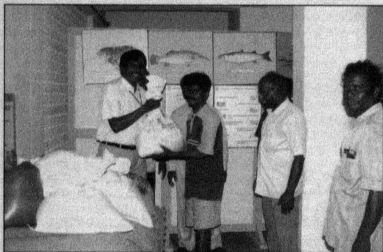
- ◆ F3 generation of kuruma shrimp, *M. japonicus* reared from PL20 stage have attained 19g in 7 months and matured and bred under hatchery conditions without eyestalk ablation. The rearing of F4 generation larvae was also successfully completed.
- ◆ Extensive culture trials of *Penaeus monodon* conducted in tide fed ponds at Kakdwip, West Bengal have resulted in a production of 1.8 t/ha/crop.
- ◆ The Institute has taken up mono culture of kuruma shrimp, *M. japonicus* in a 0.09 ha pond of a farmer at Sirkazhi, Nagapattinam dist., Tamil Nadu. In a culture duration of 113 days, the shrimp

stock had attained an average size of 12.5 g with a survival rate of 83%. The production obtained was 1018 kg/ha.

- ◆ Captive breeding and seed production of pearl spot *Etroplus suratensis* was achieved in plastic pools and concrete tanks provided with tiles, bricks and palm leaves as substrata for egg attachment.
- ◆ A total of 16 breeding trials were carried out on captive broodstock of seabass, *L. calcarifer* with 12 successful spawnings and 10 second spawnings. Nearly 4.8 million hatchlings and 0.6 million 21 day old seabass fry were produced in the hatchery.
- ◆ Grow-out culture of seabass, *L. calcarifer* was demonstrated in farmer's ponds in Tamil Nadu and Andhra Pradesh.
- ◆ Tamarind seed rich in starch was tested for its binding quality in shrimp feeds at 0.5 to 2% levels. At 1% inclusion level, it can be used as a good feed binder with a water stability of 80-85% for 3 hrs.
- ◆ The dietary requirement of vitamin C for juvenile mud crab *S. tranquebarica* was determined using test diets. The diet containing 0.6% vitamin C resulted in better growth, FCR and survival of the crab.
- ◆ The dietary effects of aflatoxin B1 on shrimp was studied by incorporating it at 0, 50, 100, 200, 500 and 1000 ppb levels in the feed. In 30 days, the growth and feed conversion ratio in shrimps fed with diets containing aflatoxin declined from 273% for control to 183% for the test group, although there was no mortality of the shrimps upto 1000 ppb of aflatoxin in the diet.
- ◆ The putative antiviral genes in the genome of *P. monodon* and *Macrobrachium rosenbergii* have been identified through PCR technique.
- ◆ rtPCR (Nested) Diagnostic Kit was developed for the early diagnosis of white muscle disease in the postlarvae of scampi, *M. rosenbergii*. The diagnostic kit was released in Chennai on 16 November 2004 by Dr.N.Balaraman, Vice Chancellor, TANUVAS, Chennai, in the presence of Dr.S.Ayyappan, Deputy Director General (Fy.), ICAR, New Delhi.
- ◆ DNA finger printing of *Vibrio harveyi* isolates were carried out. The shelf life of the probiont of *Pseudomonas* PS 102 was evaluated and its potential to inhibit pathogenic *V. harveyi* was tested. Non-radioactive labeled probe for detection of white spot virus has been developed and its sensitivity is being evaluated.
- ◆ Bacterial formulation containing live cells isolated from fermented filtrates of rice husk was found to be effective in the removal of ammonia from shrimp farm discharge water at 106 cells/ml. The total NH<sub>3</sub>-N concentration decreased from 0.602 ppm to 0.07 ppm and 0.068 ppm within 24 and 48 hrs respectively, whereas in the control it decreased to 0.48 ppm in 48 hours.
- ◆ The satellite image of IRS 1C of Krishna district was processed in ERDAS Imagine. Survey of the coastal mandals of Krishna district was undertaken to identify the land use pattern and to verify the ground truth information. The major land use classes identified were agriculture, aquaculture, mangroves, fallow land, salt pans, settlements and water bodies.

## TSUNAMI FURY ON CIBA



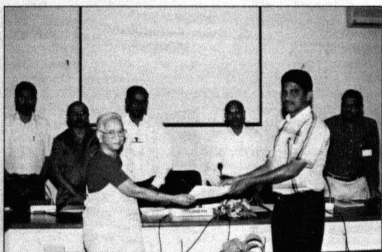


Supply of tsunami relief materials to fishermen

- ✦ For the first time in India, the total RNA extracted from viral pathogens isolated from *M. rosenbergii* affected by white tail disease has been sequenced. A 850 bp amplified product was obtained by RT-PCR. The analysed sequence showed 96% similarity with the reported sequence of *Macrobrachium rosenbergii* Nodavirus isolated from West Indies, whereas 94% similarity was observed on amino acid sequence comparison. The results revealed that the white tail disease of *M. rosenbergii* was caused by a Nodavirus.
- ✦ RAPD of *P. monodon* collected from Kakdwip, Chilka lake, Kakinada, Chennai, Cochin and Goa areas were analysed and the dendogram revealed that the samples from Kakinada, Chilka lake and Cochin group are genetically more similar than that from Goa, Kakinada and Chennai.
- ✦ Statistical analysis of pre and post disease scenarios of shrimp farming has revealed that the expansion of area and fluctuations in production are highly variant in the states of Andhra Pradesh, Tamil Nadu and Goa. However, Gujarat, Maharashtra and Tamil Nadu states exhibited high variation with respect to expansion of area and fluctuation in production in post disease period. Linear regression analysis resulted in a negative and significant coefficient for disease dummy variable indicating that there is a significant negative effect of disease on production.
- ✦ With the assistance of National Informatics Centre (NIC), Chennai, development of dynamic web pages for fisheries statistics, Institute research projects and aquaculture technologies have been completed and uploaded in the Institute website file [www.ciba.tn.nic.in](http://www.ciba.tn.nic.in) for online access.
- ✦ 15 training programmes were organized on different aspects of brackishwater aquaculture. The Institute conducted 4 workshops and a farmers' meet and participated in 4 exhibitions and a symposium.

In addition to the research papers of scientists published in national and international journals, the Institute published its annual report for 2003-04, CIBA news, special publications, training calendar and pamphlets during 2004-05.

For excellence in research, scientists of the Institute are conferred with awards. Human resource development was given top priority and scientists and staff of the Institute were trained on various aspects of HRD in different institutions in the country and abroad.



Young Scientist Award to Dr. K. Ambasankar

# INTRODUCTION

In India brackishwater aquaculture is synonymous to shrimp farming and from the level of a homestead / traditional type of activity, shrimp aquaculture has took off to attain the level of an industry practiced by small and marginal farmers. The 8129 km coastline of the country is rich in varied biodiversity with a wide spectrum of fauna and flora. The brackishwater resources of the country comprise 3.9 million ha of estuaries, 3.5 million ha brackishwater area and 8 million ha inland salt affected areas. Around 1.2 million ha brackishwater area suitable for development is available in the coastal regions in the country and till date around 1.52 lakh ha was brought under brackishwater aquaculture, centered on farming of tiger shrimp *Penaeus monodon*.

The Central Institute of Brackishwater Aquaculture was established in April 1987 to serve as a nodal agency for the development of brackishwater aquaculture in the country. The Headquarters of the Institute is located at Chennai with an Experimental Field Station at Muttukadu, about 30 km south of Chennai. The Institute has two Research Centres at Kakdwip (West Bengal) and Puri (Orissa). The Institute has a Director, 47 Scientists, 30 Technical and 20 Administrative and 66 Supporting staff as on 31.3.2005.

## MANDATE

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

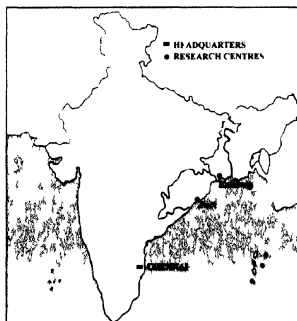
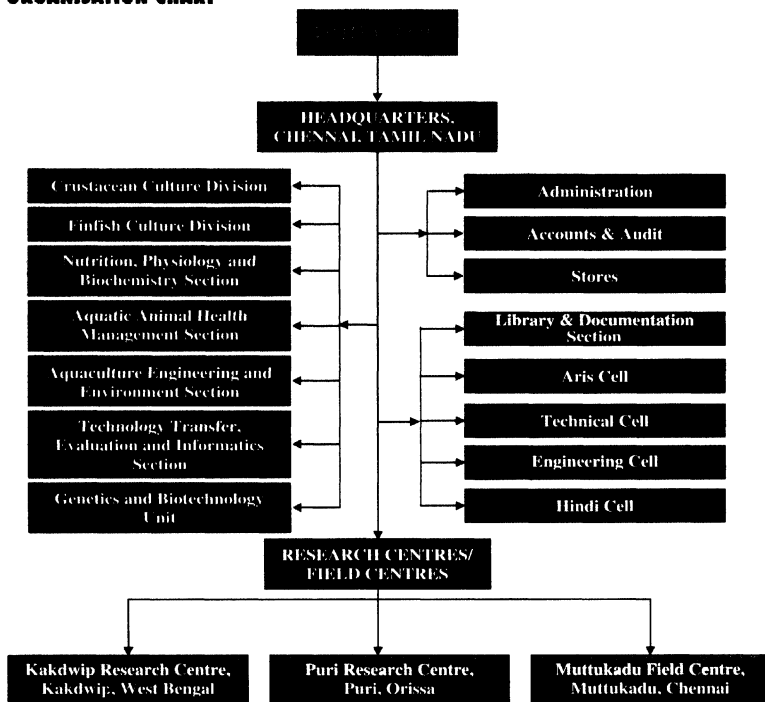
## ORGANIZATIONAL SET-UP

The research activities of the Institute are carried out under two Divisions, four Sections and an Unit.

- ♦ Crustacean Culture Division
- ♦ Fish Culture Division
- ♦ Aquatic Animal Health Management Section
- ♦ Nutrition, Physiology and Biochemistry Section
- ♦ Aquaculture Engineering and Environment Section
- ♦ Technology Transfer, Evaluation and Informatics Section
- ♦ Genetics and Biotechnology Unit

A number of research programmes funded by various externally funded schemes are also implemented. In addition, the Institute undertakes consultancy programmes.

## ORGANISATION CHART



## ORGANISATION CHART

### HEADQUARTERS

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Chennai 600 028

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Orissa

Telephone : 06752-223381

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Muttukadu Experimental Station of CIBA

Kovalam Post

Muttukadu 603 112

Tamil Nadu

Telephone : 04114-2472344, 954114-2472344, 954114-272061

## FINANCIAL STATEMENT

	2004-05	2005-06
Plan	253.58	253.57
Non-Plan	433.35	433.35

## LIBRARY AND DOCUMENTATION SECTION

During 2004-05, 39 books were added to the Library which now has a total of 1400 books. Subscriptions were also made for 25 each of foreign and Indian journals. Exchange of publications with Indian and international organizations was maintained. Reference and reprographic facilities were also provided to scientists, visitors and students. Retrospective conversion of library holdings in the library management software is also taken up during the year.

## THE OFFICIAL LANGUAGE IMPLEMENTATION PROGRAMME

Three meetings of the Official Language Implementation Committee were conducted and the progress report on Hindi was sent to Council on quarterly basis. The in-house publication, CIBA News was published in bilingual form. The Hindi day was celebrated on 15 September 2004. Elocution and song competitions were conducted. A staff of the Institute secured first position in post graduate Diploma in Translation conducted by Dakshin Bharath Hindi Prachar Sabha, Chennai. A Hindi workshop was also organized on 22 December 2004.



Meeting of the Official Language Implementation Committee

### STAFF POSITION

The details of the number of positions sanctioned, filled and remaining vacant as on 31.3.2005 are as follows:

Position	Sanctioned	Filled	Vacant
Director (R.M.P.)	1	-	1
Head of Division	2	-	2
Principal Scientist	2	2	-
Senior Scientists	14	1	13
Scientists	47	44	3
Technical Assistant	32	30	2
Administrative Officer	1	1	-
Assistant Finance & Accounts Officer	1	-	1
Junior Accounts Officer	1	1	-
Superintendent	1	1	-
Stenographer Gr.II	2	2	-
Stenographer Gr.III	2	2	-
Assistant	3	3	-
Senior Clerk	5	5	-
Junior Clerk	8	5	3
Supporting Staff	74	66	8
Total	196	163	33



# RESEARCH ACHIEVEMENTS

## CRUSTACEAN CULTURE DIVISION

### RESEARCH PROJECTS

◆ **Title of project** : Captive broodstock development, breeding, seed production and culture of *Penaeus monodon*, *Marsupenaeus japonicus* and *Fenneropenaeus indicus* (CCD/B&C/1)

**Principal Investigator** : Dr.P.Ravichandran

**Location of project** : Chennai, Kakkdwip and Puri

**Co-investigators** : Dr. S. Kulasekarapandian, Dr. S.M. Pillai, Dr. C. Gopal, Dr.C.P.Balasubramanian, Shri V.Chellapandian,

Shri S.R. Das, Dr. T.C. Santiago, Shri R.K. Chakraborti, Dr. G. Gopikrishna, Dr. Azad Ismail Saheb, Dr. M. Muralidhar, Dr. S.V. Alavandi, Dr. M. Shashi Shekhar, Dr. Debasis De, Dr. J.K. Sundaray

◆ **Title of project** : Culture of mud crabs (*Scylla* spp.)(CCD/CF/1)

**Principal Investigator** : Shri M. Kathirvel

**Location of project** : Chennai and Kakkdwip

**Co-investigators** : Dr.S.Kulasekarapandian, Dr.C.P.Balasubramanian

Shri R.K. Chakraborti, Dr. J. Syama Dayal, Dr. Debasis De, Dr.J.K.Sundaray

## **CAPTIVE BROODSTOCK DEVELOPMENT, BREEDING, SEED PRODUCTION AND CULTURE OF *PENAEUS MONODON*, *MARSUPENAEUS JAPONICUS* AND *FENNEROPENAEUS INDICUS* (CCD/B&C/1)**

### **Raising generation of *Marsupenaeus japonicus***

Maintenance of broodstock of F3 generation of *M. japonicus* was continued for the development of its next generation. The shrimps were regularly sampled to assess their growth and health. One of the F3 *M. japonicus* bred in captivity and the postlarvae were reared to raise F4 generation. About 660 nos. of postlarvae were maintained separately and by December 2004, they reached average weight of 62g with survival rate of 85%. Majority of these shrimps were lost in the tsunami waves which severely damaged the hatchery. Only 16 F4 generation shrimps are now surviving.

### **Captive breeding of *M. japonicus***

During the period under report, 18 breeding trials of F3 generations and 5 trials with wild stock of *M. japonicus* were carried out and produced PL20. F3, F2 and F1 generations shrimps were also maintained in healthy conditions in the hatchery.

### **Induced breeding and seed production**

#### ***M. japonicus***

Induced breeding experiments were conducted in 20 female kuruma shrimps by unilateral ablation. Successful maturation and breeding was achieved after 8-12 days. The hatching rate was between 80-89%.

#### ***P. monodon***

A total of 12 breeding trials were carried out with ablated and unablated spawners. Random PCR

test carried out in spawners and larvae revealed that they were negative to WSSV. 80% of the ablated shrimps attained maturity up to III stage and thereafter the ovaries reabsorbed. Successful spawning was noticed in four spawners and the larvae were reared upto PL20. The survival rate from spawning to PL20 ranged from 28 to 48%.

### **CHALLENGE TEST**

#### ***M. japonicus***

Challenge test was carried out to test the sensitivity of *M. japonicus* (average weight 7.8g) to WSSV. Different levels (0.25, 0.5 and 1.0 microlitres) of live WSSV were injected into PCR negative pre-tested shrimps. After 15 days PCR test showed that the shrimps were positive to WSSV. The shrimps survived beyond 45 days after injection indicating that they are resistant to WSSV, unlike *P. monodon*. The challenge tests were repeated twice and on both occasions the results confirmed the above findings.

#### ***P. monodon***

Two trials of challenge test were done in tiger shrimp (average weight 2.5g). Live WSSV was injected @ 0 (control), 0.25, 0.50, 1.0 µl/ml into the shrimps. In both the trials, the shrimps developed white spots on the body. Maximum mortality of the shrimps took place at 38 hrs even at the lowest concentrations.

### **Culture of *M. japonicus***

#### **Tamil Nadu**

#### **Marakkanam**

Hatchery reared *M. japonicus* seed stocked in the last week of February 2004 in a farmer's pond of 0.5 ha, grew to 5.5 g in 45 days. During the culture, the salinity of pond water increased from 34 ppt to 45 ppt by April. Since water exchange was not possible due to non-



Dr. S. Ayyappan, DDG (Fy.) releasing *Marsupenaeus japonicus* seed

availability of water in the creek and the prevailing higher ambient temperature of 38-40°C during daytime increased the salinity. By the end of April 2004 the water quality deteriorated with heavy algal bloom and the pond bottom soil became black in colour. However, the shrimps attained average body weight of 8.2g in 65 days.

Majority of shrimps were infected with *Zoothamnium*. Mortality was noticed which increased subsequently and by early May 2004 total mortality occurred.

#### Sirkazhi

About 83,000 PL18 were stocked in a 0.9 ha farmer's pond. The shrimps were fed with a commercial feed containing 40% protein during the culture period. Water exchange was done initially once in 15 days and later once in 10 days. Weekly sampling was done to assess the growth



Harvested *M. japonicus*

and health status of shrimps. Soil and water parameters were also recorded. During October 2004, following rains the pond salinity dropped from 29 ppt to 20 ppt. After the rains there was an outbreak of WSV in *P.monodon* ponds in the adjoining areas. However *M. japonicus* was not affected by this disease. The shrimps reached average final size of 12.5g in 113 days and registered 83% survival. The total quantity of shrimps harvested was 916.3 kg. The production achieved was 1018.1 kg / ha.

#### Andhra Pradesh

##### Suryalanka

A 0.5 ha pond of a farmer was stocked with 10,000 nos. of *M. japonicus* in the 1<sup>st</sup> week of March 2004 along with 30,000 nos. of *P.monodon*. The pond received sea water filtered through different meshes. The water and soil qualities and the growth of shrimps were recorded on weekly basis. Comparative growth of *M. japonicus* and *P.monodon* in the pond over a period of 139 days is given in Table 1. The survival rate of *M. japonicus* was 40%.

**Table 1. Growth performance of *M. japonicus* in a farmer's pond**

DOC	<i>M.japonicus</i> (g)	<i>P.monodon</i> (g)
42	5.5	3.1
49	6.3	3.2
54	7.9	3.2
67	8.44	5.4
76	9.44	6.38
91	9.09	12.0
111	11.3	14.1
132	12.4	15.1
139	13.6	26

Since there was an outbreak of white spot virus disease in *P.monodon*, the pond was harvested early and 4000 nos. of *M. japonicus* were retrieved. White spot disease was not observed in the Kuruma shrimp.

## CIFE Centre, Kakinada

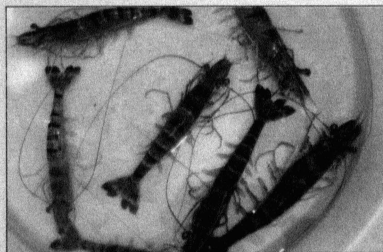
Pond culture of *M. japonicus* was undertaken in a 0.2 ha pond. The pond was stocked with 6,000 PL20 in December 2004. The salinity of the pond varied from 14-15 ppt. The pond was harvested after 102 days and the shrimps attained average weight of 18g.

### Rearing of *P.monodon* juveniles

Juveniles of *P. monodon* (100 nos.) brought from Andamans were raised to 8-9 g weight with a survival rate of 86% in the hatchery. The stock was affected by tsunami and only 12 nos. were retrieved.

### Development of *P. monodon* broodstock at Kakkwip

A total of 239 *P. monodon* with average weight of 27.2g collected from an earlier culture at Kakkwip farm were stocked in a 0.1 ha pond in August 2004. The shrimps were fed @ 3% body weight with a commercial feed. By March 2005, they attained 73g weight.



Pond reared *Penaeus monodon* broodstock

### Culture of *P.monodon* at Kakkwip

Culture of *P. monodon* was taken up in three ponds (B2, B3 and B8) in the B sector of the farm. The ponds were stocked with hatchery seed @ 10m<sup>2</sup>, 6m<sup>2</sup> and 10m<sup>2</sup>, respectively. The shrimps were fed with different grades of a commercial feed. After one month of culture, weekly samplings were done to assess the growth and health of the shrimps. For two months, water



Harvested *Penaeus monodon*

exchange was not followed, but the water depth was maintained by pumping. Water quality was maintained by the applications of lime @ 100 kg/ha and zeolite @ 90 kg/ha. The shrimps were harvested at the end of 118-131 days of culture and the production obtained varied from 1150 to 1965 kg/ha/crop (Table 2). A net profit of Rs.47,850/- was realized from this crop.

Table 2. Details of *P. monodon* culture

Pond No.	B2	B3	B8
Area (m <sup>2</sup> )	1620	3750	1840
Stocking rate (no.m <sup>2</sup> )	10	10	6
Days of culture	118	131	118
Final weight (g)	33.55	28.94	28.15
Survival (%)	51	70	67
Total production (kg)	290	737	212
Feed consumed (kg)	553	1005	246
FCR	1.90	1.36	1.16
Yield/ha/crop (kg)	1800	1965	1150

### Studies on genetic variation in *M. japonicus*

Adult *M. japonicus* collected from Chennai coast were kept in individual tanks in the hatchery at 30 ppt salinity to generate full-sib families. The average size of the males and the females were 15.5 cm/ 27.972g and 16.4 cm/37.414g, respectively. They were fed with live polychaete worms during day time and fresh clam meat in the night. After a week, eyestalk ablation was carried out on the females and two females matured and spawned. The larvae were reared following standard procedure. From PL 15 onwards, wet weight and total length of the

progeny were recorded. From PL 115, sex-wise data was collected. The results are presented in Table 3. The shrimp grew from 0.033 g at PL 15 to 9.80 g at PL 150. The coefficient of variation (CV) for wet weight at PL 15 is 24.37% whereas at PL 150, it is about 12.65%. The maximum CV value of 29.13% is observed at PL 60 and there after it started declining. A high coefficient of variation indicates that this trait would be amenable to selection and there would be considerable genetic gain in the next generation. The CV of total length was relatively small compared to

that of weight. In order to find out the correlation between weight and total length, weight was treated as a dependent variable and was regressed on total length. The regression values (Table 4) were highly significant and the correlation between the two traits ranged from 0.60 to 0.90, thereby indicating a strong relationship between the two variables. The strong positive correlation indicates that data need to be collected for one of these traits. Weight would be a better choice as the CV for this trait is quite high.

Table 3. Trend of wet weight and total length of *M. japonicus* in captivity.

PL 15	0.033±0.001 (48)	24.37	17.66±0.41 (48)	16.20
PL 30	0.123±0.005 (46)	27.45	28.19±0.44 (46)	10.77
PL 45	0.350±0.012 (47)	24.67	39.21±0.62 (47)	10.83
PL 60	0.580±0.025 (46)	29.13	45.37±0.67 (46)	10.01
PL 75	1.040±0.030 (41)	21.17	53.54±0.69 (41)	8.29
PL 90	1.940±0.060 (41)	18.40	69.66±0.72 (41)	6.61
PL 100	3.280±0.070 (39)	14.20	81.77±0.84 (39)	6.40
PL 115	M: 4.40±0.16 (11)	11.89	83.5±1.09 (11)	4.33
	F: 4.80±0.13 (22)	13.20	85.7±1.05 (22)	5.75
	P: 4.63±0.10 (33)	13.30	85.0±0.80 (33)	5.41
PL 135	M: 7.09±0.34 (11)	16.03	98.90±1.80 (11)	6.09
	F: 7.73±0.25 (15)	12.43	100.47±1.07 (15)	4.12
	P: 7.46±0.20 (26)	14.30	99.80±0.98 (26)	4.98
PL 150	M: 9.50±0.42 (8)	12.58	115.75±1.90 (8)	4.66
	F: 10.00±0.37 (12)	12.79	113.92±1.37 (12)	4.14
	P: 9.80±0.27 (20)	12.65	114.65±1.11 (20)	4.31

M: Males F: Females P: Pooled over sexes. Figures in parentheses indicate the number of observations.

Table 4. Relationship between weight and total length in *M. japonicus*

Age	Regression	Correlation
PL 15	0.0017	0.60
PL 30	0.0099	0.89
PL 45	0.0184	0.90
PL 60	0.0236	0.79
PL 75	0.0451	0.90
PL 90	0.0702	0.90
PL 100	0.0768	0.86
PL 115	0.1163	0.86
PL 135	0.1768	0.82
PL 150	0.1476	0.58

Regression values significant at  $P < 0.01$

#### *Fenneropenaeus indicus*

#### Evaluation of reproductive performance and rearing of *F. indicus*

An experiment was conducted to evaluate the performance of morphometrically different (body weight and total length) broodstock of *F. indicus*. A total of 20 adult (immature) *F. indicus* was obtained from wild catches (Table 5) and they were segregated into 3-groups i.e. small (30-40g), medium (40-50g) and large (> 50g). Each group comprised 2 females and 1 male and

the trial was carried out with two replicates in 200 l FRP tanks. The females were ablated. Water was exchanged daily and the shrimps were fed with clam meat @ 10% body weight. The salinity and temperature ranged between 34 to 35 ppt and 29 to 31°C. The reproductive performance of the animal is given in Table 6. The latency period as well as spawning were significantly lower in large size groups (2 and 4 days, respectively). However, fecundity and number of protozoa were significantly higher in medium size groups, but there is no significant difference among the experimental groups (Table 6). The results indicate that medium sized shrimps are better useful for seed production. Further experiments are in progress to confirm the results.

**Table 5. Morphometric characteristics of wild *F. indicus* broodstock**

Male			
Total length (mm)	156.3	6.7	147-167
Total weight (g)	37.9	7.5	31.8-52.5
Female			
Total length (mm)	165.8	10.6	147-179
Total weight (g)	45.1	9.2	29.5-57

**Table 6. Reproductive performance of different size groups of *F. indicus***

	Small	Medium	Large
Date of ablation	June 2, 04	June 2, 04	June 2, 04
Latency period (days)	4	4	2
Days between ablation and spawning	6	6	4
Fecundity (no.)	23735	163333	98314
Hatching rate (%)	87	90	89
Nauplii (no.)	20650	147000	87500
Protozoa † (no.)	8467	66150	39375

### Broodstock development of *F. indicus*

About 1300 post larvae of *F. indicus* obtained from WSSV negative wild spawners were reared since last year in a 20t fiber glass tank. They were fed with polychaete worms, molluscan meat and a formulated feed and reared for 8 months. They attained average final weight of 12.2 g. The specific growth rate was 1.89% initially which however gradually reduced to 0.99% (Fig.1). Fifty animals from this group were reared in an earthen pond. The ponds were damaged by tsunami waves and the stock was lost

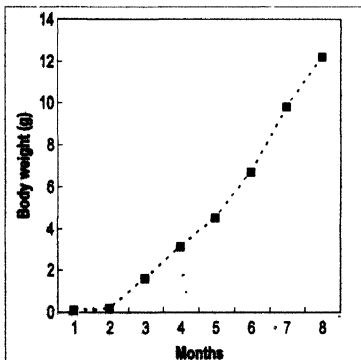


Fig. 1. Specific growth rate of *F. indicus*

### CULTURE OF MUD CRABS (CCD/CF/1)

#### Breeding of mud crabs

Adult female crabs, *Scylla serrata* and *Scylla tranquebarica* were collected from the Pulicat Lake and acclimatized in the hatchery for 3-7 days. The female crabs were unilaterally ablated for induced maturation and spawning. They were stocked individually in 0.3 t, 0.5 t and 1.5 t FRP tanks provided with sand bottom 100% water exchange was done daily and the crabs were fed with fresh clam meat. The salinity and temperature of the rearing water is given in Fig.2.

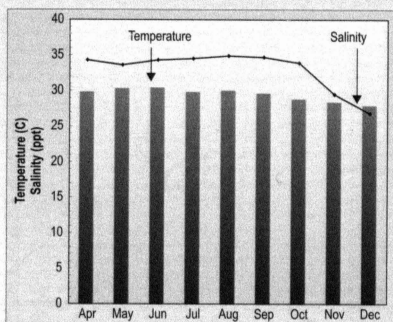


Fig.2 Water quality of crab broodstock tanks

### *Scylla serrata*

3 sets of induced maturation experiments were conducted, the first during March -June, the second between June-August and the third during August and November 2004. The results are shown in Table 7.

Table 7. Breeding and larval production of *S. serrata*

No.	No. of crabs ablated	Length and weight (Range) (mm/g)	Berried females (no.)	Latency period (days)	Total larvae produced (lakhs)
1.	10	95-113;195-225	2	64-72	14.5
2	14	98-133;155-325	3	16-34	23.2
3	11	105-125;205-335	10	17-38	51.1

### Culture of mud crabs at Chennai

#### Fattening of *S. tranquebarica*

An experiment was conducted to evaluate the efficacy of a formulated feed for the fattening of mud crab, *S. tranquebarica*. Two ponds of 50 sq m each were stocked @ 1 crab/m<sup>2</sup>. Salinity and temperature of these ponds were in the range of 25-32 ppt and 30.3-35.5°C, respectively.

The crabs in control pond were fed with clam meat @ 7.6% throughout the experiment, where as in the experimental pond the crabs

The best performance was obtained in the third experiment. About 90% of the ablated females spawned and 0.51 million zoea 1 were produced. The latency period was more in the first experiment wherein the size of the mother crabs was small compared to the other two trials.

#### Larval rearing

A total of 1.26 lakh zoea of *S. serrata* were mass reared under three hatchery runs. The larvae were fed with rotifer and *Artemia*. Although survival rate was very less, the larval cycle could be completed and baby crab was produced. Further trials are underway to improve the survival rate and standardize the hatchery methods.

#### *Scylla tranquebarica*

A total of 13 adult females in the size range of 140-165 mm CW; 485-715 g were unilaterally ablated and maintained individually. However, the experiment was vitiated by the tsunami waves.

were fed with a formulated feed @ 5%, 2.5%, 2.3%, 2.2% and 1.9% respectively during the



Crab culture ponds

1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> week of the culture. The details of the experiment are given in Table 8.

**Table 8. Details of fattening of *S. tranquebarica***

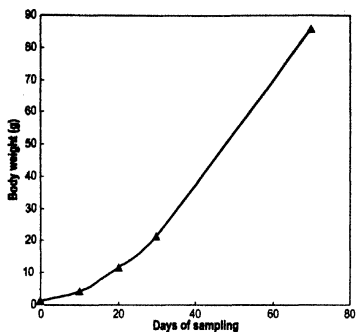
	Experimental		Control	
	Stocking	Harvest	Stocking	Harvest
Crabs (no.)	50	50	50	20
Survival (%)		100		40
Bodyweight (g)	313	330	271	348
Weight gain (g)		17		79

#### Culture of *S. tranquebarica*

A total of 100 hatchery raised juveniles of *S. tranquebarica* obtained from a private hatchery were stocked in two 50m<sup>2</sup> ponds. They were daily fed with clam meat @ 10% body weight. In 75 days, the crabs have reached average weight of 85g (Fig.3). However, the stock was lost in the tsunami waves.

#### Culture of mud crabs at Kakdwip

Pond culture of mud crab *S. serrata* was conducted in three compartments made within a 0.1 ha pond. Each compartment (A, B and C) was stocked with 200 crabs having carapace length of



**Fig.3. Growth of *S. tranquebarica* in pond**

61.75 to 61.9 mm and weight of 47-51g. The crabs were fed with pellet feed (A), trash fishes (B) and poultry offal (C). In 120 days of culture, they attained final average weight of 117.7g, 100.6g and 103.5g in A, B and C compartments, respectively with FCR of 11.18, 17.45 and 12.85. The results indicated that the pellet feed resulted in higher FCR compared to trash fishes and poultry offal.



## FISH CULTURE DIVISION

### RESEARCH PROJECTS

- ◆ **Title of project** Broodstock development, breeding, seed production and culture of Grey mullet, *Muqil cephalus* and Pearlsplit, *Etroplus suratensis* (FCD/B&C/1)
- Principal Investigator** Dr M Natarajan
- Location of project** Chennai and Kakdwip
- Co-Investigators** Dr Mathew Abraham, Dr C P Rangaswamy, Dr M Kailasam, Dr (Mrs) Shiranee Pereira, Dr J K Sundaray
- Shri R K Chakraborti, Dr G. Gopikrishna, Dr K K Krishnani, Dr (Mrs) B Shanthi, Dr S V Alavandi, Dr Debasish De
- ◆ **Title of project** Culture of Asian seabass, *Lates calarifer* (FCD/B&C/3)
- Principal Investigator** Dr A R Thirunavukkarasu
- Location of project** Chennai and Kakdwip
- Co-Investigators** Dr Mathew Abraham, Dr M Kailasam, Dr J K Sundaray
- Dr T C Santiago, Dr S A Ali, Dr N Kalaimani, Dr IS Azad, Dr K K Vijayan, Dr J Syama Dayal

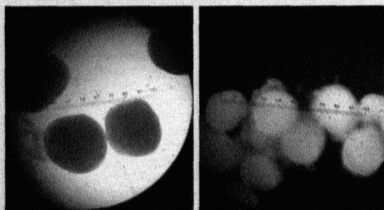
## **BROODSTOCK DEVELOPMENT, BREEDING, SEED PRODUCTION AND CULTURE OF GREY MULLET, *MUGIL CEPHALUS* AND PEARLSPOT, *ETROPLUS SURATENSIS* (FCD/B&C/1)**

### **Development and maintenance of *Mugil cephalus* broodstock.**

During October to December 2004, adult *Mugil cephalus* collected from the coastal waters off Kovalam and Muttukadu bar mouth area were transported to the fish hatchery in oxygen filled polythene bags for quarantine. A total of 74 fishes were maintained in two 100 t RCC tanks with water exchange on alternate days. The stock was fed twice daily *ad libitum* with a formulated broodstock feed pellets (6 mm dia.). Health of the broodstock was monitored regularly and necessary prophylactic measures were adopted, whenever found necessary. The tsunami waves destroyed the broodstock facilities and 17 adult fishes were lost. Now 57 fishes comprising 36 females (650 – 1300 g) and 21 males (480 – 750 g) are available.

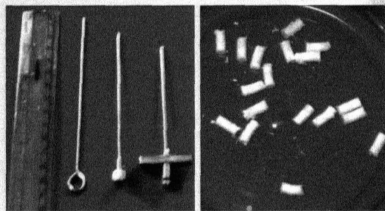
### **Induced maturation of *M. cephalus***

Three experiments were carried out to induce maturation in female *M. cephalus* with freshly collected fishes from the sea as well as that maintained in the broodstock tanks. In the first trial, a female *M. cephalus* (42.5cm/880g) having vitellogenic ova of 493 $\mu$  diameter was subjected to hormone treatment for *in situ* maturity of the ova. The fish was maintained at 27 ppt salinity in



Developing eggs of *Mugil cephalus*

a 5 ton FRP tank. HCG @ 500 IU was administered in two doses at 48 h intervals followed by implantation of one 1000 IU HCG pellet. The fish was then maintained at 30 ppt salinity for one month for further development of ovary. The second fish (45.5cm/1100g) collected from the wild with 498 $\mu$  ova diameter was maintained at 27 ppt salinity in a tank without hormone treatment for observation of maturity. However, even after 30 days, there was no significant development of the ovary in both the females.



Hormone pellet preparation

The second experiment was conducted during June to December 2004 with three groups (A, B and C), each consisting of five captive adult females. The A group (854 to 1486 g) received intramuscular implants of 200 $\mu$ g LHRHa pellets once a month from June 2004, the B (795 to 980 g) 100 $\mu$ g LHRHa pellets at fortnightly intervals and the C (540 to 750 g) served as control without any hormone treatment. All the groups were regularly monitored for ovarian development. The treated groups (A and B) failed to show any positive developments while the control group showed normal gonadal maturation.

In the third experiment salinity manipulation was done when the source water salinity dropped to 22ppt due to rains during October to December 2004. Five females in the size range of 600 to 900 g were maintained in a 25 t RCC tank containing 32 ppt seawater. This salinity level was maintained constantly by using sea salt and the water was re-circulated after purification

through a system of sand and charcoal filters. The fishes were examined by ovarian biopsy at fortnightly intervals. Steady increase in ova diameters was noticed due to maintenance of constant salinity level. The per day growth of ova were between 4.65 to 5.07  $\mu$ . In one month the ova diameter increased from 343  $\mu$  to 503  $\mu$  and it reached 558  $\mu$  at the end of December (Fig. 4). However all these fishes were lost in the tsunami.

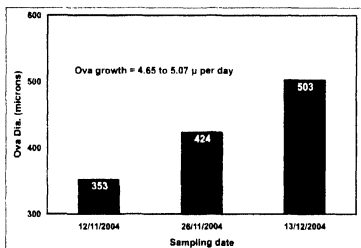


Fig. 4. Oocyte growth in captive *Mugil cephalus*

#### Induced spermiation in captive male *M. cephalus*

Seven adult captive non-oozing males in the range of 650 to 850 g were intramuscularly implanted with 17 $\alpha$ -methyl testosterone pellets @ 5 mg/kg fish at monthly intervals from August to December 2004. Two males without hormone implantation served as control. The fishes were maintained in 32 ppt salinity. The results of this experiment is depicted in Fig. 5.

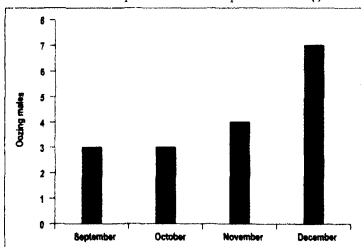


Fig. 5. Spermiation in captive male *Mugil cephalus* treated with methyl testosterone

One month after the first implant, 3 of the implanted males had freely oozing milt. By December all the implanted fishes as well as the control fishes were found in oozing condition.

#### Induced breeding trials

A female *M. cephalus* (440mm/1040g) collected from Kovalam coastal waters having ova diameter of 577  $\mu$  was maintained in a fine meshed hapa, placed inside a 5 t round FRP tank containing 33ppt seawater. The fish was given priming dose of HCC @ 10000 IU / kg. Three captive oozing males in the size range of 390-460mm and 680-760g were also released into the same tank, but outside the hapa. The female after receiving the resolving dose of LHRHa @ 200  $\mu$ g/kg was released from the hapa to enable interaction with males. Although there was bulging of the abdomen after the initial priming dose, there was no further development in the female after administering the resolving dose.

#### Cryopreservation of milt

Milt from four oozing male *M. cephalus* was collected during November - December 2004 and cryopreserved using the standardised protocol developed during the previous years. A total volume of 5 ml milt was preserved in liquid nitrogen.

#### Culture of live food organisms

Outdoor cultures of *Chlorella* were maintained in 500 l and 10 t FRP tanks throughout the year using ammonium sulphate, superphosphate and urea (10:1:1).

Mass cultures of rotifer *Brachionus plicatilis* were also maintained in 5 t and 10 t FRP tanks.

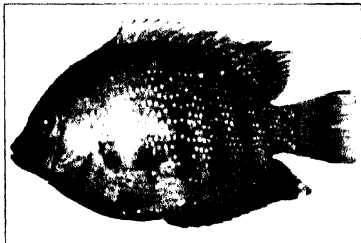
#### Culture of *M. cephalus*

Culture of *M. cephalus* was initiated in a 0.33 ha farmer's pond at Poompuhar. The pond with sandy bottom was prepared two weeks before stocking by filling seawater and fertilizing with

urea and super phosphate (3:1) @ 50 kg/ha. The water salinity, pH, ammonia nitrogen and Nitrite-N were in the range of 31 – 41 ppt, 8.24 – 8.47, 0.468 – 0.511 ppm and 0.003 – 0.012 ppm, respectively. The pond was stocked on 19 October 2004 with 162 nos. juvenile *M. cephalus* (100 to 200g) collected locally. The fishes were daily fed @ 2% total biomass with a mixture of rice bran and groundnut oil cake (4:1) in dough form. During samplings, significant increase in the size of individual fish was noticed with 98% survival. However, the trial was terminated due to tsunami.

#### Broodstock development of pearlspot

Pearlspot fingerlings (average wt. 18.4 g) collected from Muttukadu lagoon were reared in two net cages (2 X 1 X 1.25 m) fixed in the lagoon waters. The fishes were fed daily with a feed mixture containing 28% groundnut cake, 70% rice bran, 1% vitamin and mineral mixture, and 1% binder. The growth was monitored at monthly intervals and fishes above 50g were selected for breeding purposes.

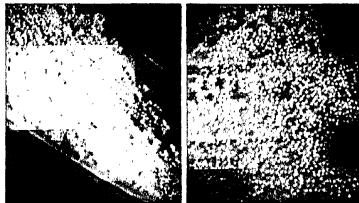


*Etroplus suratensis* broodstock

#### Breeding and seed production of pearlspot

16 adult *E. suratensis* in the size group of 50 to 91 g were transferred from the cages into a 20 tonne RCC tank provided with 100 cm of clayey soil. Earthen roof tiles were suspended in the water column as substrata for attachment of eggs. The salinity was maintained at 20 ppt. The physico-

chemical characteristics of the water were recorded at regular intervals. The spawners were fed *ad libitum* with a formulated broodstock diet. Pairing, courtship and spawning were observed from August to December 2004 and the fishes bred regularly at 15 to 19 day intervals. Egg depositions occurred mostly on tiles (both on the smooth as well as the rough side) and sometimes on bricks placed at the bottom. The minimum number of eggs laid was 1322. The fertilization rate was as high as 98%. About 700 to 2100 fry were obtained from each batch with 49% recovery rate. In all eight batches of fry were produced.



Developing eggs of *Etroplus suratensis*

At Kakkwip, adult pearlspot fishes, ranging in size from 130 to 250 g were stocked in an earthen pond. Palmyra leaves were fixed at the pond bottom for egg attachment. The spawners were daily fed with a formulated feed @ 2% body weight. Profuse breedings were noticed during April - May 2004. Few selected breeders maintained as control in a plastic pool provided with palmyra leaf also bred freely.

#### Culture of Pearlspot

Monoculture of *E. suratensis* was initiated in a 405m<sup>2</sup> farmer's pond at Poompuhar. The pond was stocked in November 2004 with 1200 nos. fry produced at Muttukadu hatchery. The mean weight of the fry was 0.021g. The stocked fishes were fed with particles of a formulated growout feed @ 5% body weight per day. However, the culture could not be completed due to tsunami.

At Kakdwip, a 1960 m<sup>2</sup> pond was stocked in April 2004 with 4000 nos. of pearlspot seed collected locally. The mean stocking size was 31.7 g. The stock was fed with a formulated dough feed (CP 30%) @ 1.25 to 2% body weight per day in two installments. The growth of the stocked fish is depicted in Fig. 6. After 5 months of culture, the fishes have attained the size range of 50 to 150 g. In December 2005, the culture was terminated due to disease problems and 51.25 kg of fishes were harvested.

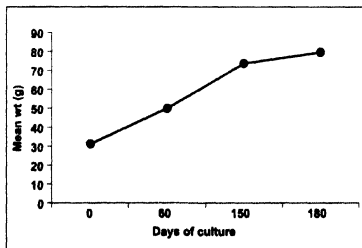


Fig. 6. Growth of *Etroplus suratensis*

## CULTURE OF ASIAN SEABASS, *LATES CALCARIFER* (FCD/B&C/3)

### Broodstock development of Asian seabass, *Lates calcarifer*

About 43 Asian seabass *L. calcarifer* in the range of 2.0 to 12 kg were maintained under captive conditions in RCC tanks at a stocking density of 1 kg/m<sup>3</sup>. F4 generation fishes in the range of 1-1.5 kg raised in ponds at headquarters of the Institute at R.A.Puram were also added to broodstock. Daily the fishes were fed with frozen forage fishes @ 5% of the body weight. Water exchange was done daily to an extent of 70-80%. The broodstock tanks were cleaned on alternate days for removing the waste feed materials and other debris. Water salinity varied from 25 to 30 ppt, temperature between 26.5 to 34°C, dissolved oxygen from 4.0 to 5.0 ppm and

ammonia level between nil to 1.78 ppm. The tsunami tidal waves damaged the hatchery facilities and only 20 broodstock fishes could be saved. To this stock, 30 fishes ranging in size from 0.50 to 2.6 kg were added as new stock and maintained.

The maturity of the broodstock fishes was assessed by regular monitoring as well as ovarian biopsy. The fishes showed gonadal development from March and gravid fishes could be obtained in the last week of May 2004. Females with ova diameter of 0.440-0.450 mm and oozing males were selected for induction of spawning trials from May to November 2004.

### Induced breeding

A total of 16 induced breeding trials were carried out. In all the cases, induction of spawning was done through intramuscular administration of LHRHa hormone @ 60-70 µg/kg body weight for females and 30-35 µg/kg body weight for males. Successful spawning took place in 12 cases and in 10 cases second spawning was also observed during subsequent days. A total of 6.0 million fertilized eggs were obtained with fertilization rate ranging from nil to 90%. The hatching rate varied from 20 to 83%. A total of 4.8 million hatchlings were obtained.

### Larval rearing and seed production trials

For feeding the fish larvae, cultures of *Chlorella* sp. and *Nanochloropsis* sp. were maintained continuously in 500 litres FRP tanks. Stock cultures of rotifer *Brachionus plicatilis* and *B. rotundiformis* were also maintained. Culture of copepod *Oithona brevecornis* was also maintained in the hatchery.

The seabass larvae were stocked at 20-50 nos./l in FRP tanks and further reared to fry size. A total of 6 lakhs 21 day old fry were obtained. The survival rate ranged from 2.0 to 43.4% with an average of 12.5%. Nursery rearing was carried out on experimental basis in the hatchery by feeding the fry with *Artemia* biomass and fish /

shrimp meat. The survival rate in a rearing period of 30-45 days ranged from 56 to 95%. A total of 5,00,000 lakhs seed were produced and supplied and generated a revenue of Rs.2.30 lakhs. Seeds were also supplied for research studies.

#### Demonstration of seabass culture

Seabass culture was demonstrated in selected farmers ponds with hatchery produced seed.

- i) In a brackishwater farm at Vembar near Bhimavaram, (Andhra Pradesh) seabass seeds were reared in the nursery for 30 days with boiled fish meat as feed. The juveniles were then released in to the grow out farm at a density of 1500 / ha. In 4 months, the fishes fed with trash fish have attained size range of 250 to 500g.
- ii) At Velankanni, near Nagapattinam, Tamil Nadu, seabass seed were stocked @ 10,000/ha in a brackishwater pond, after nursery rearing in the hapa. They were fed with trash fish and after a culture period of 105 days the fishes attained 100-200 g weight.
- iii) Seabass culture was taken up in a coastal farm at Athirampattinam, Tamil Nadu. The pond was stocked @ 10,000/ha. The fishes were fed with trash fish. In 6 months, the fishes reached the size of 450-500g.
- iv) A pond at Kotta (A.P.) was stocked @ 8,000/ha with seabass seed. The fry were

initially reared in hapas and released in to the pond. Both in nursery and grow out culture, fishes were fed with CIBA feed. In a culture period of 6 months, the fishes attained size range of 250-300g.

- v) Seabass culture was demonstrated in a 25 ha irrigation tank at Kovilpatti (T.N.). As extensive culture, 5000 nos. of hatchery reared seabass seed were stocked in the tank with Indian major carp seeds which have already been stocked in the tank. Over a period of 63 days, seabass attained the size of 350g with survival rate of 80%, feeding on natural feed available in the tank.
- vi) At Chengalpet (T.N.), seabass seed were stocked @ 10,000/ha in a fresh water pond. Polyculture method was followed alongwith forage fishes like Tilapia. After 5 months, the fishes reached the size of 40-400g.
- vii) Seabass fry of 3000 nos. from CIBA hatchery were transported to Kakdwip Research Centre of CIBA and acclimatized to the pond salinity of 3 ppt. They were then reared in hapa for a month with live feed comprising of zooplankton and small sized mysids. A total of 1226 nos. were recovered from the hapa with a survival rate of 41% which were released in a 1840 m<sup>2</sup> pond in November 2004. After six months of rearing, the fishes attained the size of 32-220g.



Harvest of Seabass *Lates calcarifer*

## **AQUATIC ANIMAL HEALTH MANAGEMENT SECTION**

### **RESEARCH PROJECT**

- ◆ **Title of project** : Fish health management in brackishwater aquaculture using epidemiology, diagnostics, prophylactics and molecular biology (AAHMS/DIS/1)
- Principal Investigator : Dr.T.C.Santiago
- Location of project : Chennai
- Co-Investigators : Dr. N. Kalaimani, Dr. K.P. Jithendran, Dr. I.S. Azad,  
Dr. K.K. Vijayan, Dr. S.V. Alavandi
- Dr. A.R. Thirunavukkarasu

### **FISH HEALTH MANAGEMENT IN BRACKISHWATER AQUACULTURE USING EPIDEMIOLOGY, DIAGNOSTICS, PROPHYLACTICS AND MOLECULAR BIOLOGY (AAHMS/DIS/1)**

#### **Health monitoring of shrimp farms**

Monitoring of shrimp farms in Andhra Pradesh and Tamil Nadu for disease incidences was continued. WSSV problem dominated the shrimp farming sector with crop losses right from the first week of stocking to harvesting. Mortality ranged from 30-100%. WSSV problem in the hatcheries has been greatly reduced or almost nil due to the practice of screening the tiger shrimp (*Penaeus*

*monodon*) using nested PCR. However occurrence of monodon baculo virus (MBV) in the hatchery produced seeds was a major problem. Though the virus is enzootic and not causing any major mortality during the hatchery or farm phase, farmers select MBV free shrimp seeds. Screening of broodstock for MBV using non-lethal DNA based diagnostic methods is one of the management approach to control MBV in shrimp hatcheries.

#### **Disease investigations in the fingerlings of seabass**

Juveniles of seabass of 4-10g from Rajiv Gandhi Centre of Aquaculture, Mayiladuthurai had reddish discoloration at the base of the fins and showed disoriented swimming behaviour. Microscopic examination of samples of gills and

skin revealed the presence of the protozoan parasites, *Tricodina* group in both the samples. Swabs from haemorrhagic lesions at the base of the fins and gill samples were inoculated on TCBA and ZMA plates. *Vibrio splendidus*, *V. ordalii* and *V. logei* were recovered from these samples. Histological sections of brain, eye and gill of about 5 $\mu$  thickness stained with hematoxylin and eosin showed normal histology and there was no characteristic sign of any disease. RT-PCR for nodavirus gave negative result indicating that the disease was not viral encephalopathy (viral nervous necrosis).

#### Development of probiotics

Two putative probiotics identified from earlier studies were selected for mass production and evaluation. Four culture media were evaluated for optimal biomass production using bench-top fermenter (Bio Eng., KLF 2000) in 2.5 L volumes at various pH (6.0 to 8.5, at intervals of 0.5) and temperature (26, 28, 30, 32, 37°C) ranges. M9 medium fortified with 1% peptone proved to be cost effective and provided optimum biomass production at pH 7.5 and 32°C of the probiotics. The biomass of putative probiotic was harvested by centrifugation of fermentation broth at 6500g at 4°C using Sorvall 5C centrifuge, washed twice in phosphate buffered saline (pH 7.4) and resuspended in 1 L volume. Humectant, stabilizer, spreader and photoprotectant were incorporated in the suspension to provide a stable formulation with following composition:

#### Composition per litre of formulation

Active ingredient	3.1x10 <sup>8</sup> cells per ml	2.5x10 <sup>8</sup> cells per ml
Humectant	3%	3%
Stabilizer	2.5%	2.5%
Spreader	0.2%	0.2%
Photoprotectant	0.2%	0.2%

At 4°C, the formulation was found to be stable even after 81 days of storage with a viability loss of 10<sup>3</sup> cells.

Evaluation of probiotics formulation for survival and protection against challenge with *V. harveyi* showed that *P. monodon* nauplii treated with the formulation was useful in improving the survival (40 and 52% respectively for formulations PSH 1 and PSH 2) compared to untreated controls (24%) up to mysis III (Fig. 7).

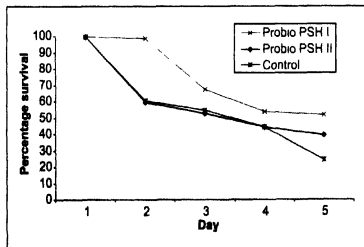


Fig. 7. Survival of *Penaeus monodon* larval stages treated with probiotics formulations

#### Vaccination trials using vitamin (C & E) fed milk fish juveniles against *Vibrio vulnificus*

*Chanos chanos* juveniles vaccinated with formalin inactivated *Vibrio vulnificus* (107 CFU / fish) were fed with two levels each of vitamins C & E and a control group with un-supplemented control diet. Antibody response and protective response of the fish were evaluated using ELISA and virulent bacterial challenge, respectively. Vitamin C at 1500 mg/kg diet produced significantly better immune response than the fish fed un-supplemented or vitamin C supplemented at 500 mg/kg diet. However, the fish fed with vitamin E supplemented at 150 mg produced lower response than that of the 50 mg levels (Fig. 8).

Specificity of immunological memory was evaluated using the memory factor and it was significantly enhanced in the fish fed with vitamin C & E supplemented (1500 mg and 50 mg/kg) diets (Fig. 9).



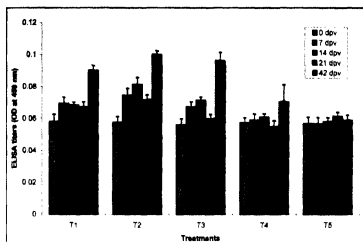


Fig. 8. Immune response of *Chanos chanos* juveniles fed dietary Vitamins (C & E) to injected *Vibrio vulnificus*

Relative percent survival calculated based on the challenge experiments revealed vaccine potency and the results indicated higher vaccine potentiating capacities of dietary vitamins (C & E) fed at 1500 mg/kg and 50 mg/kg diet, respective (Fig. 10).

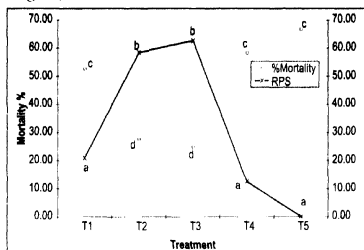


Fig. 10. Protective response of milk fish juveniles fed dietary vitamins (C & E) (treatment means with a common label are not significantly ( $P=0.05$ ) different)

#### Studies on VNN related mortalities in hatchery produced seabass larvae

Seabass larval mortalities encountered in hatchery produced seed during 2003-2004 were analysed for the sequential pathology and probable route of entry of the causative agent following gross examination, histopathology, bacteriology and electron microscopy. The results indicated severe necrosis and evidence of horizontal spread of piscine nodavirus infections in the co-habited larvae. Viral particles were noticed in the interspaces of the musculature prior to the nerve

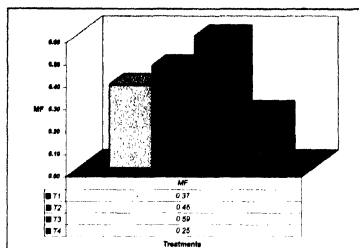


Fig. 9. Influence of dietary Vitamins (C&E) on memory factor (MF) of immune response in *Chanos chanos*

cells and the extensive damage to the nerve cells coincided with the clinical manifestations typical of VNN in the cohabited fish fry.

Infectivity of seabass nodavirus using frozen samples of nodavirus infected seabass larvae was conducted. A total of 200 larvae (7g) were homogenized and centrifuged to yield supernatant containing the suspected pathogen (virus and bacteria). The suspension was filtered using 0.2µ Millipore syringe filter. The resultant eluant and the crude suspension were injected (0.1 ml) intraperitoneally for infecting *Chanos chanos* juveniles (5g) with 4 fishes in each replicate, while the control set received PBS injection. No specific clinical symptoms and/or mortality were recorded in any of the treatment groups. After two weeks, the fishes were studied for RT-PCR, histopathology and immunohistochemistry. RT-PCR revealed negative to nodavirus coat protein gene (430 bp). Immunohistochemistry using SJNNV specific anti-VNN antibodies carried out to detect the possibility of the nodavirus in a carrier state in the experimentally infected milkfish fry failed to detect the virus in the challenged fish.

Immunoperoxidase and immunofluorescence assays were carried out on the sections of biopsies of eggs and larvae at 0, 2, 6, 10, 19 and 40 days post hatch (dph) to investigate on the probable mode of viral transmission (vertical). The results indicated

that the eggs and the subsequent stages of larvae were immunopositive reflecting on a probable vertical transmission.

#### **Health monitoring of fish in the hatchery**

Investigation on mortality among two batches of hatchery produced *E. suratensis* fry stock was found to be due to severe infestation with copepodids (*Caligus* sp.) and monogenean (*Dactylogyru* sp.) infections. The fishes were successfully treated with 100 ppm formalin for 1hr. Mortality among mullet seed collected from the wild and maintained in the hatchery was found to be due to mixed infections of *Trichodina* sp and *Dactylogyru* sp. and treated successfully with formalin (50 ppm) and acriflavine (10 ppm).

#### **Novel chemotherapeutants for parasite control**

Prophylaxis and control of crustacean parasites infecting fishes were studied using caprylic acid and ivermectin in various fish species (mullet, milk fish, seabass etc.). Ivermectin injection @200 µg/kg bw (i/p) in mullet effectively controlled *Caligus* sp. infection from 3 days post treatment up to an observation period of 60 days in mullet. Bath treatment of caprylic acid, a medium chain fatty acid at 1mM for 10 minutes showed parasitocidal effect against copepod parasites. *Caligus* stages were reduced to 94.6% with ivermectin and 70.7% with caprylic acid compared to untreated control fishes. However, caprylic acid at 2 mM exhibited mild detrimental effect especially in larger fishes.

# NUTRITION PHYSIOLOGY AND BIOCHEMISTRY SECTION

## RESEARCH PROJECT

◆ Title of project	Development and demonstration of balanced feeds for Asian seabass crabs and improvement of shrimp feeds (NPBS/NT/2)
Principal Investigator	Dr S A Ali
Location of project	Chennai and Kakdwip
Co Investigators	Dr J Syama Dayal Dr Debasis De Dr K Ambasanakar Dr M Natarajan Dr C Gopal

### DEVELOPMENT AND DEMONSTRATION OF BALANCED FEEDS FOR ASIAN SEABASS, CRABS AND IMPROVEMENT OF SHRIMP FEEDS (NPBS/NT/2)

#### Testing of specific amino acid incorporated diets for seabass larvae

The efficacy of freeze dried micro diets incorporated with specific amino acids alanine glycine glutamic acid and taurine were tested on 20 day old (post hatch) seabass larvae in a 16-day feeding trial. The test results revealed that the incorporation of these amino acids improved the performance of the diet in terms of growth and survival rates of the larvae (444.7% weight increase with 74% survival) compared to the control diet (406% weight increase with 62% survival) with no additional amino acids.

#### Development of formulated feed for grow-out culture of seabass

A practical grow-out feed with 37% protein was formulated using locally available raw materials.

The feed was produced as dry pellets. Seabass seed was supplied to a farmer from Gudur in Andhra Pradesh and it was stocked in a 0.4 ha pond @ 18750/ha. The farmer used pellet feed in one pond and conventional feed in another pond. The fish had attained 250 g in four and half months out of which one month was in the nursery. Harvesting of the fish was done in the middle of March 2005 and 2000 nos were retrieved from the test pond. The total fish produced was 500 kg.

#### Testing of micro-particulate diet for Kuruma shrimp larvae

A micro-particulate diet (50 micron size) prepared by freeze drying technique was tested for its usefulness to the larvae of Kuruma shrimp *Marsupenaeus japonicus* in combination with live algal feed replacements at different levels. At 50% replacement of live algal feed with particulate diet, the larvae attained PL1 in 9 days with a survival rate of 70.4% compared to the control (100% live algal food) where the larvae reached PL1 in 10 days with a survival rate of 59.4%.

### Vitamin C requirement in the diet of mud crab.

The dietary requirement of vitamin C for the mud crab *Scylla tranquebarica* juveniles (35g) was determined using test diets containing graded levels of vitamin C from 0.2-1%. Feeding trials have shown that inclusion of 0.6% of vitamin C in crab diet is useful for achieving better growth, FCR and survival compared to the control diet.

### Effect of Vitamin E in the diet of mud crab

A practical feed with 35% protein was fortified with vitamin E at 0 to 200 mg/kg levels to assess the effect of vitamin E on growth of juvenile *Scylla serrata* (30 g) in a short term laboratory feeding

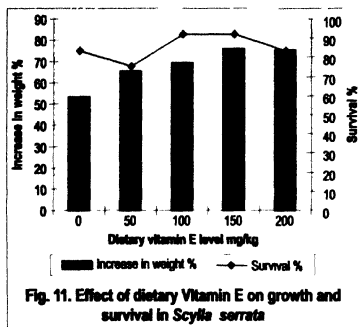


Fig. 11. Effect of dietary Vitamin E on growth and survival in *Scylla serrata*

trial. The weight gain in crabs fed with 0 mg/kg vitamin E diet (Control) was 55.3%, with 83% survival rate while it was 76% in the crabs fed with feed @ 150 mg/kg. The addition of vitamin E in diet on growth of mud crab juveniles is shown in Fig.11.

### Formulated feed for fattening of mud crabs

A formulated pellet feed with 38% protein was developed for feeding mud crabs through laboratory experiments. This feed was successfully tested for fattening *S. tranquebarica* in ponds and the results of this study has been given under project CCD/CF/1.

At KRC, pellet feed, trash fish and poultry offal were tested as feeds for mud crabs. A 1000 m<sup>2</sup> pond was divided into three compartments, A, B & C of equal size. In each compartment 200 nos. of mud crab juveniles (*S. serrata*) were stocked. In compartment A, the crabs were fed with pellet feed prepared at KRC of CIBA while the crabs in compartments B and C were fed with trash fish and poultry offal respectively @ 1.5 to 2.0 % of body weight. The feeding trial was conducted for 120 days. The crabs fed with pellet feed attained 117.7g weight, those fed with trash fish attained 100.6g and the group fed with poultry offal had 103.5g body weight (Table 9).

Table 9. Results of mud crab fattening trials at Kakdwip

Compartment	A	B	C
Stocking density	200 nos.	200 nos.	200 nos.
Initial carapace length (mm)	61.75	61.75	61.9
Final carapace length (mm)	84.4	82.15	88.32
Initial carapace width (mm)	49.25	42.95	44.5
Final carapace width (mm)	61.2	58.65	64.48
Average body weight (g)	51	50	47
Feed Used	CIBA Pellet feed CP-35.24%, OM-84.69%	Trash fish CP-56.45% OM-72.33%	Poultry offal CP-53.09% OM-95.40%
Final body weight (g)	117.7	100.62	103.56
Weight gain (g)	66.7	50.62	56.56
Growth rate (g/d)	0.56	0.42	0.47
Total no. harvested	36	32	38

The survival of crabs in the trial was very low (16-20%), which might be due to cannibalism of crabs. Feeding with pellet feed resulted in better growth of crabs than with trash fish and poultry offal.

#### Effect of oral administration of aflatoxin on shrimp

The dietary effect of oral administration of aflatoxin B1 on the growth of shrimp was studied in a 30 day feeding trial by incorporating the mycotoxin in diet at six different levels of 0, 50, 100, 200, 500 and 1000 ppb to understand the influence of oral administration of this mycotoxin. The results indicated that the growth and feed conversion ratio in shrimp fed with diets having aflatoxin had significantly decreased from 273% for control to 183% for the test group although there was no mortality of the shrimp up to 1000 ppb of aflatoxin.

#### Tolerance limits of aflatoxin on shrimp through muscular administration

In a static bioassay experiment, the tolerance of aflatoxin B<sub>1</sub> on juveniles (5-6g) of *F. indicus* was studied by injecting different doses of the toxin ranging from 0 to 150 ppb to the shrimp. The results indicated that up to 100 ppb level there was no mortality of the shrimp. However, at 125 ppb level of the toxin there was 100% mortality of the shrimp after 108 hrs.

#### Tamarind seed powder as feed binder

The usefulness of tamarind seed rich in starch, as a binder in shrimp feed was evaluated at different levels (0.5-2%). The results revealed that tamarind seed powder at 1% level in feed is useful as a binder with a water stability of 80-85% in 3 hrs.

#### Testing of L-Carnitine as a beneficial additive in shrimp feed.

The effect of different levels (0.25 - 1.0%) of L-Carnitine, as a growth promoting additive in shrimp feed was evaluated in a 45 day feeding trial

of *P. monodon*. The feed supplemented with 0.125% of L-carnitine improved weight gain (101.3%) and FCR (1.69) of the animal compared to the control (weight gain 80.6%; FCR 1.83). Higher levels of the additive resulted in decline in growth and FCR.

#### Determination of calorific values of feed ingredients

The calorific values of selected feed ingredients used in shrimp/fish feeds have been analyzed using bomb calorimeter and the data are presented in Table 10.

Table 10. Calorific values of selected feed ingredients used in shrimp/fish feeds

I. Marine Protein Sources		
1.	Dry Fish	3046.34
2.	Acetes	3602.72
3.	Squilla	2858.01
4.	Chilean Fish meal	4649.47
5.	Taiwan Fish meal	4942.99
6.	Indian Fish meal	4732.59
II. Plant Protein Sources		
1.	Soya cake	4507.20
2.	Soya flour	4850.63
3.	Ground nut cake	4665.02
4.	Cotton seed cake	5049.14
III. Cereal Products		
1.	Maize	4382.99
2.	Wheat flour	4251.92
3.	Wheat bran	4117.70
4.	Rice flour	4077.79
5.	Rice bran	4244.65
6.	Maida	4223.80

#### Evaluation of some formulated feeds for Pearls spot at Kakkwip Research Centre

In an initial feeding trial, four isoproteic (40% C.P) formulated feeds A, B, C & D were evaluated for *E. suratensis* juveniles (0.28-0.42 g) with respect to feed intake and growth along with a control feed

(E). Feeds A, B, C were of pellet type while D was mash type (Tables 11 & 12). The experiment was conducted in 400 l FRP tanks with triplicates for

each treatment. After six weeks, it was found that feed B & C showed better growth than A and D (Table 13).

**Table 11. Composition of different types of feed for pearlspot**

Wheat flour	20	—	20	—
Meize flour	—	20	—	25
Rice bran	12	—	10	15
Wheat bran	—	11	—	—
Soybean meal	13	15	—	10
Mustard cake	15	20	19	25
Groundnut cake	15	—	15	—
Fish meal	19	25	27	19
Shrimp meal	4	7	7	4
Mineral mix.	1.5	1.5	1.5	2
Soya oil (ml)	20	20	20	—
Guar gum	0.5	0.5	0.5	0.5
Chromic oxide	0.5	0.5	0.5	0.5

**Table 12. Proximate composition (% DM basis) of different types of feeds for *E. suratensis***

	Types of feed			
	A	B	C	D
DM (%)	94.21	92.24	93.12	90.64
OM (%)	89.79	88.74	86.77	87.62
CP (%)	32.21	33.31	34.48	29.95
CF (%)	9.21	9.60	6.72	13.29
Ash (%)	10.21	11.26	13.23	12.38
GE (Cal/g)	4303.19	4083.03	4242.57	4124.09

**Table 13. Results of feeding trials on *E. suratensis***

Initial body weight (g)*	0.28 <sup>a</sup> ± 0.02	0.337 <sup>a</sup> ± 0.022	0.333 <sup>a</sup> ± 0.022	0.353 <sup>a</sup> ± 0.027	0.428 <sup>a</sup> ± 0.039	0.52
Final body weight (g)**	1.772 <sup>a</sup> ± 0.026	2.934 <sup>a</sup> ± 0.105	2.421 <sup>b</sup> ± 0.111	1.752 <sup>b</sup> ± 0.041	1.553 <sup>b</sup> ± 0.206	0.576
Total weight gain (g)**	1.489 <sup>a</sup> ± 0.009	2.597 <sup>a</sup> ± 0.102	2.088 <sup>b</sup> ± 0.133	1.398 <sup>b</sup> ± 0.014	1.125 <sup>b</sup> ± 0.168	0.594
Ax. Daily Gain (mg)**	15.19 <sup>a</sup> ± 0.09	26.50 <sup>a</sup> ± 1.04	21.30 <sup>b</sup> ± 1.35	14.27 <sup>b</sup> ± 0.15	11.48 <sup>b</sup> ± 1.71	6.065
Initial body Length (mm)	24.72 ± 0.29	25.07 ± 0.18	25.07 ± 0.44	25.47 ± 0.84	28.27 ± 1.10	0.594
Final body length (mm)**	45.53 <sup>a</sup> ± 0.47	52.80 <sup>a</sup> ± 0.61	49.33 <sup>b</sup> ± 1.57	45.53 <sup>b</sup> ± 0.58	42.91 <sup>b</sup> ± 2.51	3.798

\* p<0.05; \*\* p<0.01, a, b, c, d bearing different superscripts in a row differ significantly

# AQUACULTURE ENGINEERING AND ENVIRONMENT SECTION

## RESEARCH PROJECTS

- ◆ **Title of project** : Development of technology for the waste water treatment of shrimp farms (AEES/DWT/1)
- Principal Investigator** : Dr.B.P.Gupta
- Location of project** : Chennai
- Co-Investigators** : Dr.K.K.Krishnani, Dr.M.Muralidhar, Dr.(Mrs.) M.Jayanthi, Dr.(Mrs.) R.Saraswathy, Dr.(Mrs.) P.Nila Rekha,  
Dr.S.M.Pillai, Dr.C.Gopal, Dr. M.Shashi Shekhar, Dr.S.Kannappan,  
Dr.(Mrs.)Ch. Sarada
- ◆ **Title of project** : Assessment of brackishwater land resources (AEES/RA/1)
- Principal Investigator** : Dr.(Mrs.) M.Jayanthi
- Location of project** : Chennai
- Co-Investigators** : Dr.B.P.Gupta, Dr.M.Muralidhar, Dr.(Mrs.) P.Nila Rekha  
Dr.M.Kailasam

## DEVELOPMENT OF TECHNOLOGY FOR THE WASTE WATER TREATMENT OF SHRIMP FARMS (AEES/WT/1)

### Characterisation of shrimp farm wastewater

Wastewater/discharge water was collected from shrimp farms at the time of harvest. It was analysed for various water quality parameters particularly for N and P loading. Total nitrogen concentration in the discharge water varied between 2.49 and 3.76 ppm, out of which, inorganic and organic nitrogen fractions ranged from 2.1 to 3.0 ppm and 0.18 to 1.39 ppm, respectively. Total phosphorous concentration ranged from 1.21 to 1.65 ppm with similar trend of higher inorganic fraction of phosphorous than organic fraction. The study revealed that inorganic forms of nitrogen (63 - 93%) and phosphorous (81 - 97%) were higher than organic forms of N and P.

**Evaluation of physical methods for the removal of TSS and turbidity and testing of materials for the removal of nutrients load from discharge water in shrimp ponds**

### Field Experiment

Two field experiments were carried out in a shrimp farm near Mahabalipuram in Kancheepuram District, Tamil Nadu to



Field experiment on quality of shrimp farm discharge water

improve the quality of discharge water at harvest time by reducing the nutrient load and physical parameters such as TSS and turbidity. The farm had 4 ponds of 0.75 ha each. The farmer practiced shrimp farming with stocking density of 10/m<sup>2</sup> and the shrimp production realised was 1680 kg/ha. During harvest, 80 cm of water was drained out of the pond. This discharge water was used and the experiments were conducted at the farm site in plastic pools (1t capacity) filled with farm discharge water upto 1 metre level, simulating the conditions of settlement ponds.

In the first experiment, discharge water was allowed to settle in the plastic pools (i) without any chemical treatment and (ii) with addition of chemical treatments; Alum (90 ppm), FeCl<sub>3</sub> (90 ppm) and Alum + FeCl<sub>3</sub> (90 ppm) were used for treatment separately. Water samples were collected from both bottom (1m depth) and surface water in plastic pools at different time intervals and analysed for turbidity and TSS. It was observed that turbidity and TSS values of the surface water had decreased by 73.2 and 62.8 % with in 54 hours in the control (Fig. 12). FeCl<sub>3</sub> treatment was found to be comparatively better than all other treatments which resulted in the reduction of turbidity and TSS by 88%.

In the second experiment, the discharge water was treated with fermented filtrates from rice husk (FFRH - 5ml/lit) and bagasse (FFB - 5 ml/lit). Surface water samples were analysed for TAN and NO<sub>2</sub>-N concentrations. FFB treatment reduced TNA level from 1.32 to 0.61 ppm and NO<sub>2</sub>-N level from 0.185 to 0.049 ppm in 54 hrs while the FFRH treatment resulted in a reduction of TAN level from 1.32 - 0.71 ppm and NO<sub>2</sub>-N concentration from 0.185 to 0.05 ppm (Table 14 & 15).



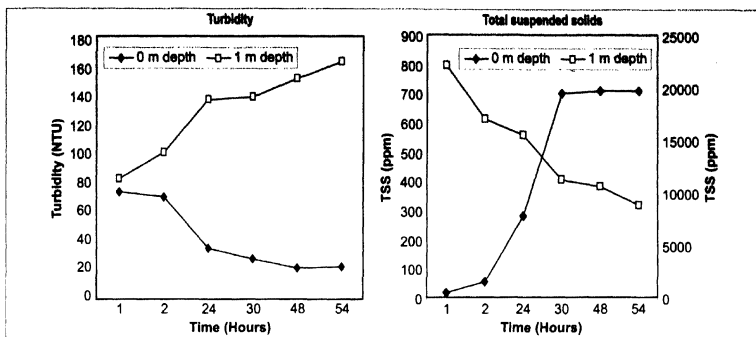


Fig. 12. Settling of suspended particles in shrimp pond discharge water at different time intervals

Table 14. Effect of FFRH and FFB treatments on TAN content in shrimp farm discharge water at different time intervals

Initial TAN value : 1.32 ppm

Treatment	TAN concentration (ppm)					
	1 hr	2hr	24hr	30hr	48hr	54hr
Control	1.507	1.519	1.33	1.104	0.973	1.154
FFRH	1.215	1.156	0.913	0.897	0.864	0.718
FFB	1.204	1.142	0.801	0.782	0.725	0.612

Table 15. Effect of FFRH and FFB treatments on nitrite N concentration in shrimp farm discharge water at different time intervals

Initial NO<sub>2</sub>-N value : 0.185 ppm

	1hr	2hr	24hr	30hr	48hr	54hr
Control	0.173	0.169	0.141	0.139	0.122	0.123
FFRH	0.102	0.096	0.078	0.069	0.074	0.05
FFB	0.09	0.082	0.079	0.064	0.056	0.049

#### Laboratory experiment

The usefulness of four coconut husk materials viz., raw coconut husk fibre (RCF), dried coconut fibre (DCF), oven dried coconut powder (OCP) and charred coconut powder (CCP) were evaluated @ 2 g/l for the removal of ammonia and nitrite-N from brackishwater and the results are depicted in Fig. 13. The study indicated that the levels of ammonia and nitrite-N decreased from the initial levels in 96h after treatment of water with these

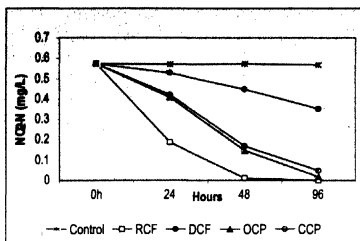
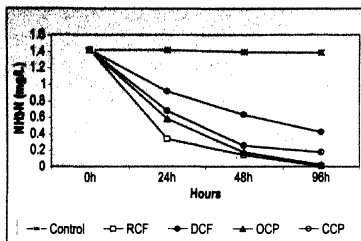
materials. Low cost of these materials is an added advantage and these are suitable options for the bio-remediation of ammonia and nitrite in aquaculture water. Further evaluation of these products for the bioremediation of shrimp farm culture / wastewater in the zero water exchange field conditions is in progress.

#### Use of probiotics for the improvement of water quality

Fermented filtrates from different substrates (rice husk, coconut husk and bagasse to which jaggery, yeast and curd were added) were evaluated for their effect on improvement of water quality. The materials were found to be effective in decreasing the total ammonia N and nitrite N from water. The decrease in the metabolites is prominent at higher initial concentrations of total ammonia N and nitrite N.

#### Isolation of bacteria from Rice Husk Fermented Filtrate (RHFF)

*Bacillus sp.* was isolated from the rice husk fermented filtrate (FFRH) and a bacterial formulation was made ( $6.74 \times 10^8$  cells/ml) using this bacteria. The formulation was applied at different concentrations ( $1 \times 10^5$  and  $1 \times 10^6$  cells/ml) for the improvement of water quality. Results showed that total ammonia nitrogen content was



RCF : Raw coconut husk fibre, DCF: Dried coconut fibre, OCP: Oven dried coconut powder, CCP: Charred coconut powder  
**Fig. 13. Effect of different coconut husk materials on the removal of ammonia N and nitrite N from brackishwater**

10 times lower than initial value (Table 16) and nitrite-N content was 25% less than the initial value (Table 17) after 48 hours of application with  $1 \times 10^6$  bacterial cells/ml concentration.

**Table 16. Effect of bacterial formulation on the TAN content in brackish water**

	Initial TAN level - 0.602 ppm				
Control	0.458	0.443	0.483	0.496	0.476
$1 \times 10^6$ bacterial cells	0.468	0.418	0.174	0.248	0.404
$1 \times 10^8$ bacterial cells	0.410	0.390	0.073	0.088	0.294

**Table 17. Effect of bacterial formulation on the NO<sub>2</sub>-N content in brackish water**

	Initial NO <sub>2</sub> -N level - 0.004 ppm				
Control	0.004	0.005	0.007	0.007	0.013
$1 \times 10^6$ bacterial cells	0.003	0.004	0.009	0.009	0.015
$1 \times 10^8$ bacterial cells	0.007	0.002	0.003	0.003	0.009

### Design and development of different filters

#### Biological media contact filters

Five filters were fabricated and tested for their efficiency. Two were four layered filters and three were three layered filters, with the following composition.

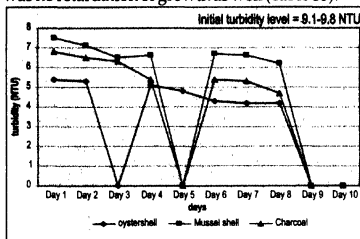
1. Pebbles, blue metal, coarse sand and mussel shells

2. Pebbles, coarse sand, fine sand and oyster shells
3. Charcoal, coarse sand and blue metal
4. Oyster shells, coarse sand and blue metal
5. Mussel shells, coarse sand and blue metal

The results indicated that among the three layered filters, oyster shell based filter unit was effective (Fig. 14) and further trials on its efficacy are to be conducted.

#### Biological Filters

Mangroves, grasses and other hydroponic plants can filter the nutrients in wastewater. Mangrove seedlings were collected from Divi point in Krishna District in Andhra Pradesh and from Thoothukudi in Tamil Nadu and planted in pots containing different soils *viz.*, sandy soil, loamy sand and clayey loam. The seedlings were irrigated with shrimp farm wastewater. The experiments showed that though there was no appreciable growth of mangrove plants, there was no retardation of growth as well (Table 18).



**Fig 14. Effect of biological media contact filters on turbidity**

**Table 18. Biometric parameters of mangrove seedlings**

Time Week	Height (cm)			No. of nodes / leaves			No. of branches		
	Sandy loam	Loamy sand	Clayey loam	Sandy loam	Loamy sand	Clayey loam	Sandy loam	Loamy sand	Clayey loam
1	12.5	8.9	5.3	5	9	6	-	-	1
2	12.8	9.1	5.8	5	10	7	-	1	1
3	13.5	9.5	7.2	6	13	7	-	1	1
4	14.7	13.8	8.5	6	13	8	-	1	1
5	15.8	15.6	9.8	6	14	10	-	1	1
6	20.3	17.3	10.2	8	14	12	-	1	2
7	21.2	18.3	11.3	8	15	14	-	1	2
8	24.3	18.7	12.4	10	16	15	-	1	2

### Carrying capacity assessment of source water bodies surrounding the Polekurru Island, East Godavari District, Andhra Pradesh for shrimp farming

Polekurru Island is situated around 30 km away from Kakinada in Tallarevu Mandal of East Godavari District. The Island is surrounded by 4 major source water bodies *viz.*, Bandha, Sarihaddu Kaluva, Gaderu river and Vadalanalani creek. In this region, in general the summer crop is raised from February/March to May/June, wherein the maximum area is under culture. During the second crop (July/August to October/ November), the area under shrimp culture is very minimal and scampi culture is practiced wherever freshwater facility is available.

In order to assess the carrying capacity of these source water bodies, the study was initiated in

the last week of May 2004 during the first crop, when 85 % of the shrimp farms have been harvested. Sampling stations were fixed on the source water bodies and at the outlet of some of the farms (Fig.15). The study area covers an approximate length of 3, 7, 3 and 4 km on Bandha, Sarihaddu Kaluva, Gaderu river and Vadalanalani creek respectively. Water and soil samples were collected every month regularly



Polekurru Island - source water

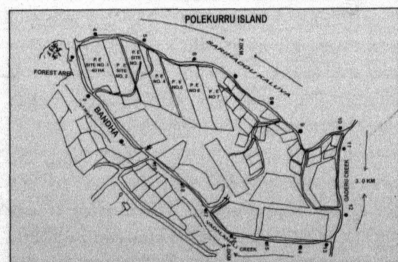


Fig. 15. Study area map showing sampling points on the source water bodies



Polekurru Island - shrimp farm

from these sampling stations. The month-wise analysis of data indicated the temporal and spatial variation in the water quality of the source water bodies.

The estimation of the carrying capacity was done with suitable mathematical models, developed as computer package in Visual Basic. Assessment of carrying capacity was done for each month separately on these source waters with respect to N and P. The N and P loading of Bandha creek (Fig.16) and Sarihaddu Kaluva will be exceeding the carrying capacity in May

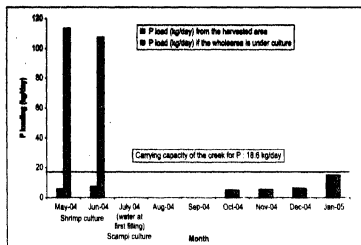


Fig.16. Carrying capacity of Bandha creek with respect to N and P loading

and June, if the whole area is under culture, whereas the nutrients loading is within the carrying capacity of Gaderu creek and Vadalanal creek (Fig.17).

As the first crop was not covered from the beginning and the area taken up for culture in the second crop is very less, the area calculations for culture, based on the assessment of carrying capacity during these months will not be valid. After completion of the first crop during 2005, the final area calculations will be done based on the carrying capacity estimates.

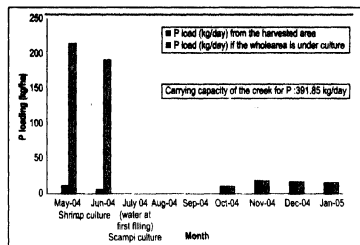


Fig.17. Carrying capacity of Vadalanal creek with respect to N and P loading

## ASSESSMENT OF BRACKISHWATER LAND RESOURCES (AEES/RA/1)

The toposheets of Krishna district namely 65D-9,10,11,12,13,14,15 and 16,H-1,2,3,4,5,6,7,9,10 and 11D were received from Survey of India. The toposheets are rectified to geographic coordinates in GIS platform. The rectified toposheets are mosaiced for Krishna district. The satellite data received from National Remote Sensing Agency for Krishna district with Path 103/062 and 103/061 were converted to image and rectified using ground control points derived from the toposheets. The digital data was imported to ERDAS Imagine image

format. The image was rectified in such a manner that the spatial coordinates correspond to their geographic coordinates. The projection applied was geographic Lat/Lon with Spheroid Everest and datum undefined. The rectified image was mosaiced and Krishna image was prepared using Krishna boundary as area of interest. The image was rectified using image characteristics given in Table 19.

The digital image was registered using the resampled output toposheet to its corresponding geographic coordinates. It was registered by assigning 40 ground control points approximately. Accuracy of geometrically corrected image was checked by overlaying the

rectified toposheet on the digital imager and swiped vertically or horizontally to check any shift in the corresponding categories. The shifts in the image corresponding to the toposheet were again resampled with additional ground control points. The classified image is given in Fig.18.

The validation of the information derived from remote sensing data was checked by ground truth information. Field checks were made in doubtful areas and the necessary corrections were made in the interpreted maps. The thematic maps were prepared in 1:50000 scale.

GPS measurements were taken in different land use in entire Krishna district.

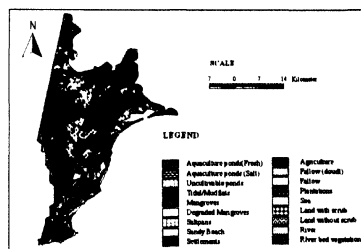


Fig. 18. Landuse map of coastal area in Krishna District

Table 19. Image characteristics of coastal wetland classes

Creek	Blue	Smooth	Intricate network of narrow inlets of sea water in tidal flats
Mudflat	Grayish	Medium	Usually clayey & silty, Vegetation may be present, slightly rough pattern
Aquaculture	Dark blue, light blue	Smooth	Slightly rough pattern
Crop land	Bright red	Medium to Smooth	Continuous to non-continuous pattern
Agricultural plantation	Dark red to red	Coarse to Medium	Dispersed, Continuous
Fallow	Yellow to Greenish blue	Medium to Smooth	Dispersed, Continuous
Sand/Beach	White/Half white	Fine	Smooth Pattern
Mangrove			
Dense	Dark red	Medium	Smooth pattern, Occurs with coastal elements categories such as mud/tidal flats, water ways, beach sand, etc
Degraded	Light red	Coarse	

The soil samples collected from the Krishna district from different places at different locations were analyzed. The results at different land use class were given in Table 20. The

soil salinity was high in aquaculture pond. Though aquaculture farms are situated nearer to agriculture lands, no problems were reported.

**Table 20. Soil quality at different land class**

	Aquaculture pond	Agriculture field	Forest without culture	Aquaculture farms converted into agriculture
pH	7.97-8.52	7.96-8.1	7.80-8.49	7.91-8.07
EC (ds/m)	8.12-9.85	0.47-0.85	7.50-8.03	3.57-4.12
Organic carbon (%)	0.48-1.05	0.58-0.84	0.34-0.67	0.52-0.76

The water qualities of aquaculture ponds, drains, borewells at agriculture lands and Krishna river (Table 21) were analyzed. The

observed values were within the permissible limits in all the categories.

**Table 21. Water quality at different places**

	Aquaculture pond	Agriculture field	Forest without culture	Aquaculture farms converted into agriculture
pH	7.82-8.67	7.31-7.98	7.92-8.15	7.12-7.46
Salinity (ppt)	15.4-30.2	19.2-24.30	0-0.5	0-0.1
Ammonia (ppm)	0.20-0.36	0.30-0.51	0.12-0.41	0.28-0.54
Nitrite (ppm)	0.08-0.18	0.21-0.35	0.09-0.11	0.07-0.12

## TECHNOLOGY TRANSFER, EVALUATION AND INFORMATICS SECTION

### RESEARCH PROJECT

- ♦ **Title of project** : Technology transfer, socio economic aspects and informatics in brackishwater aquaculture (TTEIS/EXTN/3)
- Principal Investigator** : Dr.M.Krishnan
- Location of project** : Chennai
- Co-Investigators** : Dr.T.Ravisankar, Dr.V.S.Chandrasekaran, Dr.(Mrs.) B.Shanthi, Dr.(Mrs.) D.Deboral Vimala, Dr.M.Kumaran and Dr.(Mrs.) Ch. Sarada

### TECHNOLOGY TRANSFER, SOCIO ECONOMIC ASPECTS AND INFORMATICS IN BRACKISHWATER AQUACULTURE (TTEIS/EXTN/3)

#### Knowledge level of shrimp farmers

A case study was undertaken in Visakhapatnam and Vizianagaram districts of Andhra Pradesh on knowledge level of farmers about shrimp farming. Principal Coordinate Analysis was done on responses of farmers with different education levels *viz.*, primary, secondary and above graduation. The results indicated that there is difference in pattern of answering the questions *i.e.*, there is difference in knowledge level between the three groups of farmers.

#### Diversification of fisheries exports in Asian countries

Simpson index was developed to study diversification pattern of seafood exports of Asian countries *viz.*, Bangladesh, China, India, Indonesia, Philippines, Thailand, Malaysia and Vietnam. Since shrimp farming is on the increase in all the major shrimp producing Asian countries,

the growth and the instability associated with production were also high. Malaysia has maintained low growth, low instability and higher diversification. Bangladesh and Vietnam diversified their exports and India, Indonesia, Thailand and Philippines were moderate in growth in shrimp farming and diversification. India along with China has seen mixed trends of ups and downs in diversification of the exports.

#### Impact of disease incidences on shrimp farming

The expansion of area and fluctuations in production of shrimp farming highly varied in Andhra Pradesh, Tamil Nadu and Goa in pre-disease period. Gujarat, Maharashtra and Tamil Nadu showed high variation in area expansion and production in post disease period. The analysis revealed that at national level the average area developed has doubled from 72,262.57 ha (pre disease) to 1,42,250.50 ha (post disease). Coefficient of variation analysis revealed that the irregular expansion of area has stabilized in the post disease period with a CV of 20.55% (pre disease) and 8.11% (post disease). This may be due to the stringent regulations

made by Aquaculture Authority and the problems experienced by farmers due to diseases. Similar results were obtained from CV analysis of production and productivity. Further, the linear regression analysis resulted in a negative and significant coefficient for disease dummy variable indicating there is a significant negative effect of disease occurrence on production.

#### **Capacity building of women in aquaculture**

To assess the status of rural women in aquaculture, a case study was undertaken in Andhra Pradesh. 20 women from Akivedu of West Godavari district and 22 from Krishnapatnam of Nellore district of Andhra Pradesh were selected by random sampling and data was collected by structured personal interview schedule. As per this study, status of women can be classified under four categories. Firstly the farm owners who took a lead role in day to day management of aquaculture in small water bodies such as backyard ponds. The second category was heads of households and farm owners involved in a wide range of farm activities and wholly responsible for the care of the family. The third category was unpaid domestic labour like wives, sisters or daughters of farm owners who worked in their own farms. They prepared feed and engaged in marketing too. The last category was paid labourers or wage earners from nearby villages who generated income for the family. They are employed in pond preparation, feeding, stocking and harvesting of shrimp crops and other agricultural activities. Rural women engaged in aquaculture should be made direct beneficiaries of training. They have to be empowered in areas of pond preparation, shrimp feed preparation and feeding, water management, harvesting by hand picking, processing, backyard hatcheries, preparation of cages, traps and small nets to make aquaculture activities more rewarding.

#### **Export demand model for Indian seafood to USA and Japan**

An export demand model has been developed for the Indian seafood exported to Japan and USA based on demand determinants like population of the country, total fish production of India, Real Gross Domestic Prices (at constant prices) (RGDP) of the country, unit value realization, exchange rate and trend. A log linear model is utilized to develop the model. The analysis resulted with  $R^2 = 95.4\%$  indicating good fit but the coefficient estimated for population, RGDP were negative which negates the practical situation. Further, multicollinearity statistics *viz.*, variance inflation factor and tolerance for all the dependent variable indicated high collinearity between the variables. To handle the problem of multicollinearity Principal Components Regression (PCR) technique was utilized. As there is no readymade procedure or function in standard statistical software packages to carry out PCR a computer programme was written in S-Plus to carry out the analysis. The PCR analysis resulted in stable and meaningful estimates of regression coefficients.

The major dimensions that emerged from the analysis are that Japanese market is sourcing increasingly larger quantities of Indian seafood and India needs to upgrade its marketing strategies by incorporating the demanding standards of the HACCP regime especially to increase its share of the USA market. Incorporation of labeling standards, chain store wholesale and retailing system and value added products are some of the features of the discerning consumers in the USA. With improving RGDP of the Japanese and American economies and increasing disposable income, Indian seafood is more likely to capture a larger share of these prime markets. Competitive pricing, value added products, product diversity and innovative marketing strategies hold the key to the success of Indian seafood in the US and Japanese markets.



## GENETICS AND BIOTECHNOLOGY UNIT

### RESEARCH PROJECT

- ♦ **Title of project** : Genetic characterization of brackishwater shellfishes and finfishes through molecular techniques (GBU/MG/1)
- Principal Investigator** : Dr. G. Gopikrishna
- Location of project** : Chennai
- Co-Investigator** : Dr. M. Shashi Shekhar

### GENETIC CHARACTERIZATION OF BRACKISHWATER SHELLFISHES AND FINFISHES THROUGH MOLECULAR TECHNIQUES (GBU/MG/1)

Dendrogram analysis of samples of *P. monodon* collected from Chilka and Kakkdwip regions showed that they form a single cluster with genetic distance of 0.89 and 0.85, 0.71, 0.60, 0.39 for the samples from Cochin, Goa, Kakinada and Chennai regions to this cluster, respectively. Dendrogram analysis of *L. calcarifer* showed that the samples from Kakinada and Goa form a single cluster with genetic distance of 0.73 and a genetic distance of 0.66, 0.62, 0.50 with samples from Chilka, Kakkdwip, Chennai regions to this cluster, respectively.

The amplified 520 bp of 16s rRNA mitochondrial gene segment of *P. monodon* isolated from the samples collected from east coast (Kakkdwip, Kakinada, Chennai, Chilka) and west coast (Cochin, Goa), on sequencing revealed similar sequence identity and no apparent sequence variation could be observed in this amplified segment. Amplification of 16s rRNA mitochondrial gene segment was also carried

out from *M. japonicus* and *F. indicus*. The sequence identity of 16s rRNA mitochondrial gene segments between *P. monodon* and *M. japonicus*, between *P. monodon* and *F. indicus* and between *M. japonicus* and *F. indicus* was found to be 91%, 92% and 91%, respectively. The high level of sequence identity observed in the amplified PCR products of 16s rRNA mitochondrial gene segment of *P. monodon* isolated from samples of east and west coast regions of India suggests that it will be more useful to focus on other variable mitochondrial DNA regions which may be more phylogenetically informative for genetic characterization.

Comparison of the efficiency of the PCR and dot blot diagnostic techniques for detection of white spot syndrome virus (WSSV) was evaluated in different tissues of infected *P. monodon* such as eyestalk, eyestalk with eye ball, gills, cuticle, pleopod, periopods, uropods and telson. Quantification of the experimental labeled probe on comparison with the labeled control DNA showed positive reaction upto  $0.1 \text{ pg } \mu\text{l}^{-1}$  dilution. Dot blot of crude DNA extracted from infected tissue samples showed positive

reactions with all the samples, however, the sensitivity of the dot blot reduced with the purification of DNA samples extracted from pleopod, telson and uropod. PCR was found to be more sensitive when compared to dot blot. Both crude and purified DNA samples extracted from all the tissues except eyestalk with eye ball showed single step nested PCR positive reaction. The amplification of all or either of the three bands of 941 bp, 525 bp and 204 bp size varied with the tissues analysed. The severity of infection assessed by PCR amplification was found maximum in cuticle and telson followed by gill. Other tissues such as eye stalk, pleopod, peripods and uropod were observed to have mild infection. The maximum intensity of the PCR product was for the smallest amplified product of 204 bp followed by 525 bp and the weakest intensity was observed for the 941 bp size. The limitation of PCR due to inhibiting factors present in tissues could be overcome with the use of dot blot which gave positive

reaction from the DNA extracted from eye stalk containing the eye ball but yielded no amplification by PCR.

White tail disease caused by *Macrobrachium rosenbergii* nodavirus (MrNV) is a recently reported disease of giant freshwater prawn, *Macrobrachium rosenbergii*. RT-PCR and sequence analysis of MrNV of Indian isolate confirmed the nodavirus infection in *M. rosenbergii* from India. Total RNA was extracted and the cDNA was synthesized from the infected post larvae collected from a hatchery located in Chennai. A 850 bp amplified product could be obtained by RT-PCR. The nucleotide sequence analysis of 850 bp segment amplified from nodavirus RNA-1 genome, showed 98% and 95% nucleotide identity with West Indies and Chinese isolates respectively whereas 99% amino acid sequence identity was observed with the reported amino acid sequences of West Indies and Chinese isolates.

## PRODUCT DEVELOPMENT UNIT

### RESEARCH PROJECT

- ♦ **Title of project** : Effect of specific spoilage bacteria in the changes of spoilage indices of brackishwater fin and shellfish (PDU/SB/1)
- Principal Investigator** : Dr.N.Kalaimani
- Location of project** : Chennai
- Co-Investigator** : Dr.S.Kannappan

The *Lb. rhamnosus* strain GG procured from the Institute of Microbial Technology, Chandigarh was used to conduct studies on bacterial inhibition on Specific Spoilage Bacteria (SSB). The GG attained growth to 4.6 log load on the third day in Brine Heart Infusion (BHI) broth. GG inhibited *S. putrefaciens* on the second day by 2.0 log differences as compared to control in BHI broth where as it inhibited *P. fluorescens* on the second day by 1.0 log difference. Lb.GG cells were able to reduce the Trimethylamine – nitrogen (TMA-N), 95 mg% as compared to control where as Total volatile base nitrogen (TVB-N) was 45-50 mg %. The reduction of TMA-N may be due to inhibition of amines producing SSB by GG. But in this study  $10^3$ - $10^4$  cfu/gm of *S. putrefaciens* is able to produce 160 mg/g of TMA-N in the control. Reduction in population of amines producing bacteria are also responsible for the production of fishy odor and this would enhance consumer preference and eatibility of brackishwater fishes. Moreover GG coat is cheaper than any other chemicals used for fish preservation.

Crude spent culture of *Lb. rhamnosus* GG showed highest inhibition against *P. fluorescens*

(25 mm) than *S. putrefaciens* (23 mm) at 121°C. However the spent culture of GG after concentrating to 5.0 ml at 100°C showed higher bacterial inhibition on *P. fluorescens* (50 mm) than *S. putrefaciens*. It is evident that the spent culture of GG showed higher inhibition on bacteria at a minimal volume and therefore it can also be used to preserve brackishwater fish, as nisin used in milk in place of chemical preservatives.

#### **Inhibitory potential of *Lactobacillus* GG against various native spoilage bacteria of seabass fish**

Lb. GG inhibited *E. coli* on the third day of storage by 2.0 log difference as compared to control, whereas SSB also got inhibited by equal growth difference. Proteolytic bacteria, thermophilic and mesophilic sporeformers were inhibited by GG. These native brackishwater fish-borne bacteria cause various spoilages to the fish after death and sporeformers could withstand higher than cooking temperature. Therefore inhibiting them by GG coat on fish would reduce the entry of these bacteria in human beings.

## TECHNOLOGY ASSESSED AND TRANSFERRED

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

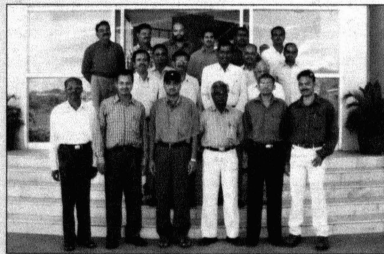
### Training programmes organized by CIBA

- ◆ "Seabass breeding and culture" during 28 July to 6 August 2004. Four officials from MPEDA, two officials each from the Dept. of Fisheries, Govt. of Tamil Nadu, Dept. of Fisheries, Govt. of Orissa and Dept. of Fisheries, Govt. of West Bengal, three private entrepreneurs and three research scholars participated.
- ◆ "Soil and water quality management in brackishwater aquaculture" during 17-26 August 2004. Two Research Assistants from the Dept. of Fisheries, Govt. of Tamil Nadu and two Technical Officers from private shrimp hatcheries participated.
- ◆ "Basic statistical tools for aquaculture and data analysis with SPSS" during 30 August to 4 September 2004 for the scientists of the Institute.
- ◆ "Shrimp breeding and hatchery technology" during 16-30 September 2004. Two officials each from the Dept. of Fisheries, Govt. of Tamil Nadu and Gujarat, respectively and a private entrepreneur participated.
- ◆ Shri V.N.Acharyalu, Technical Officer (T-5), CIFE, Kakinada was trained in "Methodology of water and soil analysis", during 4-8 October 2004.
- ◆ Dr.Haney Ibrahim Elmarakby of Egypt, under the Indo-Egyptian work programme was trained in "Technology of encapsulation of fish feeds", during 15-24 December 2004.
- ◆ A training programme on "Value addition of low cost marine fish of West Bengal", was organized by the West Bengal University of

### TRAINING PROGRAMME



Basic statistical tools for aquaculture



Shrimp breeding and hatchery technology

Animal and Fisheries Sciences, Kolkata in collaboration with Kakdwip Research Centre of CIBA at Kakdwip, on 17 March 2005.

The following field-level training / orientation programmes were conducted by CIBA under the NATP/IVLP project for Technology Assessment and Refinement in Coastal Agro-ecosystem of Kattur Village, Tiruvallur District of Tamil Nadu.

- ◆ Immunostimulation techniques in aquaculture for 10 farmers, at Kattur, on 7 July 2004
- ◆ Ornamental fish culture for 10 farmers from Kattur at Kolathur, on 21 August 2004.
- ◆ Value addition in fisheries for 50 farmers, at Kattur, on 15 September 2004.
- ◆ Biological pest control in rice for 50 farmers, at Kattur, on 15 September 2004.
- ◆ Integrated nutrient management in rice for 50 farmers, at Kattur, on 17 December 2004.
- ◆ Vaccination in animals for 50 farmers at Kattur, on 17 December 2004.
- ◆ Palm products making for 30 farmers from Kattur at Palm Products Centre, Madhavaram, on 22 December 2004.
- ◆ Mushroom cultivation for 30 farmers from Kattur at KVK, Kattupakkam, on 23 December 2004.



Trainees of seabass breeding and culture

## TRAINING AND EDUCATION

The Institute conducted short-term training programmes on several aspects of brackishwater aquaculture regularly, on a calendar-basis. (The training programmes conducted by CIBA during April 2004 to March 2005 are mentioned in Chapter 5).

### HUMAN RESOURCE DEVELOPMENT

#### Scientific/Technical/Administrative

##### International

- ♦ Dr.P.Ravichandran, Director has been deputed to Norway for training under the INDO-NORAD project "Genetic improvement of *P. monodon* (tiger shrimp) through selective breeding for growth and white spot disease resistance", during 1-17 October 2004.

##### National

- ♦ Dr.(Mrs.) Ch. Sarada, Scientist (SS), attended the training programme on "Multivariate statistical methods for fisheries research", conducted at Central Marine Fisheries Research Institute, Kochi, during 18 March to 7 April 2004.
- ♦ Dr.S.A.Ali, Principal Scientist, attended the training programme on "Management development programme on performance assessment of agricultural research organizations", at National Academy of Agricultural Research Management (NAARM), Hyderabad, during 18-22 May 2004.
- ♦ Dr.M.Kailasam, Senior Scientist and Shri D.Raja Babu, T-6, underwent training in "Phytoplankton identification / taxonomy", at Central Marine Fisheries

Research Institute, Kochi, during 14-19 June 2004.

- ♦ Shri R.K.Chakraborti, Principal Scientist, participated in the training course on "Leadership and personality development", at NAARM, Hyderabad, during 17-23 June 2004.
- ♦ Dr.(Mrs.)M.Jayanthi, Senior Scientist underwent training in "Satellite oceanography", at Integrated Coastal and Marine Area Management - Project Directorate (ICMAM-PD), Chennai, during 12-23 July 2004.
- ♦ Dr.J.Syama Dayal, Scientist (SS) attended the training programme on "Fisheries Research Prioritisation Techniques", at NAARM, Hyderabad, during 5-11 August 2004.
- ♦ Dr.C.Gopal, Senior Scientist participated in the training workshop on "Developing winning research proposals", at NAARM, Hyderabad, during 18-21 August 2004.
- ♦ Shri Shenbagakumar, T-5 and Shri S.Rajukumar, T-4 underwent training in "Networking and ERNET connectivity", at NAARM, Hyderabad, during 23-27 August 2004.
- ♦ Dr.J.K.Sundaray, Scientist, participated in the training programme on "Mangrove based aquaculture / agriculture", at the Kolkata Research Centre of Central Inland Fisheries Research Institute (CIFRI), Kolkata, during 14-23 September 2004.
- ♦ Shri P.S.Samanta, T-2, Kakdwip Research Centre of CIBA, underwent training in "Brackishwater aquaculture vis-à-vis mangrove conservation", at Kolkata

Research Centre of CIFRI, during 1-6 November 2004.

- ◆ Shri M.Shashi Shekhar, Scientist (SS), attended the winter school on "Production of recombinant proteins in heterologous host systems and purification", at Indian Veterinary Research Institute, Bangalore, during 4-24 November 2004.
- ◆ Dr.K.Ambasankar, Scientist, attended the winter school on "Animal feed manufacturing technologies and quality control", at Dept. of Animal Nutrition, CCS-Haryana Agricultural University, Haryana, Hisar during 4 November to 3 December 2004.
- ◆ Dr.(Mrs.) Shiranee Periera, Scientist (SS) participated in the training programme on "Computer based multimedia presentation", at NAARM, Hyderabad, during 5-25 January 2005.
- ◆ Shri S.Sivagnanam, T-5 underwent training in "Effective technical assistance in management of agricultural research", at NAARM, Hyderabad, during 3-9 February 2005.
- ◆ Shri K.Ponnusamy, Scientist (SS) attended the training programme on "Recent developments in health foods and nutraceuticals", at National Dairy Research Institute, Karnal, during 8-28 February 2004.
- ◆ Dr.K.K.Krishnani, Senior Scientist participated in the training programme on "Web version (WOS) (SCI database), at NAARM, Hyderabad, on 21 March 2005.

Lectures and demonstrations were arranged for the following:

**CIBA headquarters and Muttukadu Experimental Station**

- ◆ 10 students from the Dept. of Zoology, Madras Christian College, Chennai, on 8 June 2004.
- ◆ 15 farmers and two extension officials from Freshwater Fish Farmers Development Agency, Karaikal, on 2 July 1004

- ◆ 45 students (III B.F.Sc.) from College of Fisheries, Mangalore, during 9-10 July 2004.
- ◆ 25 Final year B.Sc. Zoology students from Islamiah College, Vaniyambadi, on 27 July 2004.
- ◆ 32 Post graduate students from Jamal Mohammed College, Tiruchirapalli, on 10 August 2004.
- ◆ 71 students from Balalok Matriculation School, Chennai, on 28 August 2004.
- ◆ 25 trainees of the DEBRA project from MS Swaminathan Research Foundation, Chennai, on 25 November 2004.
- ◆ M.Sc. Life Science students from Meenakshi Ramasamy Arts and Science College, Perambalur, on 13 January 2005.
- ◆ 4 B.F.Sc. students from College of Fisheries, Rangailunda, Berhampur, Orissa, on 15 January 2005.
- ◆ 11 B.F.Sc. students from Central Agricultural University, Lembucherra, Tripura, during 9-11 February 2005.
- ◆ 20 Postgraduate students from Department of Zoology, Scott Christian College, Nagercoil, on 17 February 2005.
- ◆ 35 M.Sc. Zoology students from Pachaiyappa's College, Chennai, on 25 February 2005.
- ◆ 60 UG and PG students from Department of Zoology, Presidency College, Chennai, on 25 February 2005.
- ◆ 18 trainees from CIFE, Kolkata Centre, Kolkata, during 17-18 March 2005.

**KAKDWIP RESEARCH CENTRE**

Trainees from Kolkata Centre of CIFRI, on 9 December 2004.

- ◆ Dr.S.M.Pillai, Principal Scientist and Dr.M.Muralidhar, Senior Scientist, delivered lectures on "Good management practices in shrimp farming" and "Soil management in

shrimp farming”, respectively, to the Under Graduate students of the “Certified Course on Aquaculture”, organized by the State Institute of Fisheries Technology, Dept. of Fisheries, Kakinada, on 2 June 2004.

- ◆ Dr.C.Gopal, Senior Scientist delivered lecture on “*Marsupenaeus japonicus* seed production and its culture prospects” in the short term training programme on Alternative species culture in brackishwater, organized by the CIFE, Kakinada, during 13-19 October 2004.
- ◆ Dr.M.Kumaran, Scientist (SS) gave a guest lecture on “Commercial aquaculture projects, potential of financing, experiences and export potential” to the trainees of Indian Overseas Bank on “High Tech Agro-projects”, organized by the Indian Overseas Bank Staff College, Chennai, on 27 December 2004.
- ◆ Dr.A.R.T.Arasu, Principal Scientist delivered a lecture on “Inland saline water aquaculture and seabass seed production technology” to the participants of the Summer School on

Development of sustainable saline water aquaculture technology at CCS Haryana Agriculture University, Hisar, during 28-29 June 2004.

- ◆ Shri R.K.Chakraborti, Principal Scientist delivered a lecture on “Brackishwater prawn and fish farming in West Bengal” for the trainees of CIFRI Kolkata Centre, on 6 September 2004.
- ◆ Shri R.K.Chakraborti, Principal Scientist delivered a lecture on “Ecofriendly and sustainable aquaculture” for MPEDA trainees at the training programme on Sustainable Aquaculture for SC/ST on 20 September 2004.
- ◆ Dr.J.K.Sundaray, Scientist (SS) delivered a lecture on “Scientific management of shrimp farming in lower Sunderban area” at Sunderban Kalpataru, Kakdwip on 1 October 2004.
- ◆ Dr.Debasis De, Scientist (SS) delivered a lecture on “Fish and shrimp nutrition” at Sunderban Kalpataru, Kakdwip on 5 October 2004.



## AWARDS AND RECOGNITIONS

**Dr. J.K. Sundaray**, Scientist was awarded the Ph.D. Degree in March 2004 in "Animal and Marine Bioresource Science" by the Kyushu University, Fukuoka, Japan, 2004, for his thesis entitled "Steroid biosynthesis in the secondary testis and molecular cloning of some steroidogenic key enzymes in protogynous wrasse, *Pseudolabrus sieboldi*".

**Dr.(Mrs.) P.Nila Rekha**, Scientist was awarded the Ph.D. Degree in Civil Engineering by Anna University, Chennai, on 19 March 2004, for her thesis entitled "Impact assessment of paper mill effluent irrigation".

The NATP-IVLP team led by **Dr. I.S. Azad**, Senior Scientist won the second prize in the poster presentation held in connection with the National Symposium on "Enhancing productivity and sustainability in coastal agro-ecosystem" organized by AED (Coastal) at Central Tuber Crops Research Institute, Thiruvananthapuram, during 9-11 June 2004.

**Dr. K. Ambasankar**, Scientist was awarded the Ph.D. Degree in Animal Nutrition by the Tamil Nadu Veterinary and Animal Sciences University, Chennai, on 29 October 2004 for his thesis entitled "Nutritional evaluation of

sardine products in the diet of lactating does".

**Dr. M. Shashi Shekhar**, Senior Scientist was awarded the Ph.D. Degree in Biotechnology by the School of Biosciences and Bioengineering, Indian Institute of Technology, Bombay for his thesis entitled "Cloning and sequence analysis of genes coding for galactosyl - and sialyl - transferases".

**Dr. K. Ambasankar**, Scientist received the Young Scientist Award for the best research paper entitled "Assessment on the presence of toxic minerals and nutritional evaluation of amino acid / fatty acid profile in sardine meal / oil to induce interventions for value added produce", presented at IV Convention and National Seminar on "Application of nuclear and non-nuclear techniques in the detection of residues in food and feed", held at Madras Veterinary College, Chennai, during 18-19 March 2005.

**Dr.(Mrs.) R. Saraswathy**, Scientist (SS) has been awarded Brandiz prize by The Indian Forester for the year 2003 for the best research paper entitled "Residual effect of agroforestry landuses on soil fertility" in the field of Silviculture".

# LINKAGES AND COLLABORATION

## INCLUDING EXTERNALLY FUNDED PROJECTS

### LINKAGES AND COLLABORATION

During the year the Institute had linkages with the following:

#### National

#### ICAR Institutes

#### CIFE

The Central Institute of Fisheries Education, Mumbai is a collaborating Institute under the Indo-Norwegian project on "Genetic improvement of *Penaeus monodon* (Tiger shrimp) through selective breeding for growth and white spot disease resistance"

#### Other Institutes /SAUs / State Agriculture Depts.

- ♦ College of Fisheries, University of Agricultural Sciences, Mangalore
- ♦ College of Fisheries, ANG Ranga Agricultural University, Muthukur
- ♦ Fisheries College and Research Institute, Tamilnadu Veterinary and Animal Sciences University, Tuticorin
- ♦ West Bengal University of Animal and Fisheries Sciences, Kolkata
- ♦ CCS - Haryana Agricultural University, Hisar
- ♦ Gujarat Agricultural University, Okha
- ♦ Rice Research Station, Tamil Nadu Agricultural University (TNAU), Tirur
- ♦ State Dept of Agriculture (Govt of Tamil Nadu) at Ponneri and Minjur
- ♦ Livestock Research Station, Tamilnadu Veterinary and Animal Sciences University (TANUVAS), Kattupakkam
- ♦ Poultry Research Station, Tamilnadu Veterinary and Animal Sciences University (TANUVAS), Nandanam
- ♦ Dept of Horticulture, Govt of Tamil Nadu, Chennai

- ♦ Dept of Animal Husbandry, Govt of Tamil Nadu, Chennai
- ♦ Tamil Nadu Rice Research Institute, TNAU, Aduthurai, Tanjore District
- ♦ Tamil Nadu Agricultural College and Research Institute, Tiruchirapalli

#### Ministry of Agriculture, Govt. of India

- ♦ Aquaculture Authority, Chennai

#### State Fisheries Departments/BFDAs

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

#### International

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

The Institute has taken up an Indo-French Collaborative Project entitled 'Seabass Pilot Unit' with M/s COFREPECHE / Govt of France for a period of three years from November 1999 which was subsequently extended upto June 2005

#### World Bank

The Institute received World Bank aid under the following programmes

- (i) The World Bank-aided National Agricultural Technology Projects (NATP) of the ICAR, viz.,
  - a) Shrimp and fish health management
  - b) Fish production using brackishwater in arid ecosystem
  - c) Institutional Village Linkage Programme for technology assessment and refinement in coastal agro-ecosystem of Tiruvallur district of Tamil Nadu
  - d) Integrated national agricultural resources information system

## EXTERNALLY FUNDED PROJECTS

Projects funded by AP Cess Fund of ICAR

### DEVELOPMENT AND EVALUATION OF SHRIMP IMMUNOSTIMULANTS USING WHOLE CELL PREPARATION OF *VIBRIO*.

Project Investigator : Dr. I.S. Azad

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

Project location : Chennai

#### Work done:

The project was extended upto June 2004. A total of 33 field trials were conducted with immunostimulant during the grow-out culture of tiger shrimp in different locations, north and south of Chennai. The field trials resulted in better cost benefit ratio in immunostimulants treated shrimp ponds and consistently registered higher growth and productivity compared to the control.

Pro phenol oxidase (PPO) activity of the immunostimulant treated shrimps sampled from ponds at 1, 3 and 5 days post treatment recorded significantly higher PPO levels compared to the control shrimps.

Bacterial load (Total *Vibrio* Count and Total Bacterial Counts) from the randomly selected shrimp ponds under field testing trials was also monitored. All the untreated ponds showed higher TVC and TBC compared to the ponds treated with immunostimulants.

## NATIONAL RISK ASSESSMENT PROGRAMME FOR FISH AND FISH PRODUCTS FOR DOMESTIC AND INTERNATIONAL MARKETS

Principal Investigator : Dr.B.P.Gupta

Co-Investigators : Dr.M.Muralidhar,  
Dr.K.K.Krishnani, Dr.C.Gopal,  
Dr.S.V.Alavandi  
Dr.K.P.Jithendran

This project was started from July 2003 with the objective to detect the presence of heavy metals, pesticides, antibiotics, human pathogenic bacteria and parasites in harvestable size of cultured *Penaeus monodon*. During the period under report *P. monodon* samples from 55 farms (harvestable size) and landing stations / markets (19 samples from domestic markets and 4 samples of export quality) in the coastal districts of Nellore (Andhra Pradesh), Cuddalore and Nagapattinam (Tamil Nadu) were procured and analysed for heavy metals (Lead, cadmium, chromium, zinc, mercury and arsenic) by atomic absorption spectrophotometer and pesticides (αBHC, BHC, βBHC, Heptachlor, Aldrin, Dieldrin, Endrin, ppDDE, Heptachlor epoxide, opDDT, ppDDT) by Gas Chromatograph. Microbial load (*Vibrio cholerae*, *V.parahaemolyticus*, *Salmonella* spp., *Aeromonas* spp. and *Plesiomonas shigelloides*) and screening of parasites (protozoan and metazoan) have also been carried out. All the shrimp samples analysed showed heavy metals and pesticides levels within the permissible limits. In majority of the samples the microbial load was also found within the permissible levels.

**EVALUATION OF NUTRITIVE VALUE OF DIFFERENT STRAINS OF ROTIFERS (*BRACHIONUS* SPP.) AND THEIR SUITABILITY FOR LARVICULTURE OF ASIAN SEABASS *LATES CALCARIFER* (BLOCH)**

*Principal Investigator* : Dr. M. Kallasam

*Co-Investigators* : Dr. A.R. Thirunavukarasu  
Dr.J.Syama Dayal

This project was started in November 2004 with an outlay of Rs.23,27,000/- for a period of three years. The morphometric characteristics of rotifers (*Brachionus plicatilis*) collected from Adyar estuary was carried out for their lorica length and the number of egg carrying rotifers were estimated. A total of 200 rotifers representing all the size groups were randomly measured. Lorica length of *B. plicatilis* ranged from 112.5 to 250  $\mu$ m and were categorized into three size groups such as super small (SS), small (S) and large (L) with lorica length of 100-140  $\mu$ m, 140-220  $\mu$ m and 221-280  $\mu$ m respectively. SS, S and L rotifers constituted 19%, 76% and 5% respectively. About 53.5% of the rotifers were carrying eggs with the dominance of Stype rotifer (63.82%).

Stock culture of the green algae, *chlorella* was maintained in Conway Medium at 24°C temperature, 34 ppt salinity and 7.8 pH. The concentration of chlorella cells increased to 5 million per ml in two weeks. Stock culture of *chlorella* was expanded to mass culture at Muttukadu and maintained in 300 l FRP tanks filled with sand filtered seawater at 25 ppt salinity using the Modified Yashima Medium.

**PARTICIPATORY TECHNOLOGY TRANSFER MODEL FOR SUSTAINABLE COASTAL AQUACULTURE**

*Principal Investigator* : Dr. M. Kumaran

*Co-Investigators* : Dr. N. Kalaimani,  
Dr. I.S. Azad,  
Dr.V.S.Chandrasekaran,  
Dr.(Mrs.) D. Deboral Vimala,  
Dr.(Mrs.) Ch. Sarada

The project has been sanctioned for a period of two years with a financial assistance of Rs.8,25,140/-. The project aims to investigate the information management and extension needs of coastal aqua farms, to assess the "Adoption-gap" in Good Management Practices (GMP) for coastal aquaculture, to study the "Research-Extension-Farmers linkage" in coastal aquaculture and to evolve a model for participatory approach in technology transfer for sustainable coastal aquaculture.

Five comprehensive questionnaires have been prepared to collect both primary and secondary data from the aqua-farmers, hatchery operators, public and private extension agencies, NGOs etc. Conducted two pilot surveys in Thoothukudi and Cuddalore districts of Tamil Nadu to study the reliability and validity of the developed questionnaires. Two data collection surveys have been completed during this period in Srikakulam district of Andhra Pradesh and Kanyakumari and Tirunelveli districts of Tamil Nadu.

Projects funded by ICAR / National Agricultural Technology Project (NATP) – (World Bank funded projects)

## COASTAL AGRO-ECOSYSTEM

### SHRIMP AND FISH HEALTH MANAGEMENT

Principal Investigator : Dr.T.C.Santiago

Project Associates : Dr.K.K.Vijayan and  
Dr. S.V.Alavandi

Project location : Chennai

CIBA is the lead centre for this project and the cooperating centres are College of Fisheries, University of Agricultural Sciences, Mangalore; ANG Ranga Agricultural University, Muthukur; Fisheries College and Research Institute (Tamil Nadu University of Veterinary and Animal Sciences), Tuticorin; and West Bengal University of Animal and Fisheries Sciences, Kolkata. The total outlay of the project is 142.27 lakhs. CIBA has been allotted an amount of 49.04 lakhs. The project has a duration of 4 years from July 1999 and extended upto Novemebr2004.

#### Work done

Shrimp viral diseases like monodon baculovirus (MBV) and white spot disease (WSD), suspected baculoviral midgut gland necrosis (BMN) in mysis larvae and luminescent bacterial disease in hatcheries were diagnosed using histopathological, microbiological and molecular biological techniques. Investigations were conducted on the white muscle disease (WMD) of freshwater prawn *Macrobrachium rosenbergii*. The RNA virus (MrNV) causing WMD was purified and characterized. A nested RT-PCR diagnostic kit was developed for early detection of this disease and it was released in November 2004 for the benefit of the scampi farmers.

## INSTITUTIONAL VILLAGE LINKAGE PROGRAMME FOR TECHNOLOGY ASSESSMENT AND REFINEMENT IN COASTAL AGRO-ECOSYSTEM OF TIRUVALLUR DISTRICT OF TAMIL NADU

Principal Investigator : Dr.T.Ravisankar

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

Project location : Chennai

CIBA is the lead centre for this new project. The project work was carried out in close linkage with Rice Research Station, Tamil Nadu Agricultural University, Tirur; Poultry Research Station, Tamil Nadu Veterinary and Animal Sciences University, Chennai and the departments of Agriculture/ Horticulture/ Animal Husbandry/Fisheries of the Government of Tamil Nadu. The total outlay for the project is 28.27 lakhs and it was started in April 2000 and completed in April 2005.

#### Work done

During the current year, twelve technological interventions in aquaculture, agriculture, horticulture and livestock systems were carried out. Low cost immunostimulant developed by CIBA was administered to fresh water prawn which increased their resistance to diseases. Farm women through interventions and training programmes on value added fish products like pickles, cutlets and wafers were benefited with satisfactory income. Biocontrol of pests in paddy using *Trichogramma japonicum*, *T. chilonis* and *Pseudomonas fluorescense* yielded remarkable results. Application of *Azolla* in rice fields helped the farmers to increase the yield and profit. Coconut dehusker has reduced the dehusking time considerably, which was well received. Women were encouraged to maintain kitchen garden in the backyard spaces of their houses which fetched additional income. Control of both external and internal parasites in cattle was

effectively done with deltamethrin, albendazole and ivermectin distributed among the selected farm families. Milch buffaloes fed with compounded feed formulations yielded more milk.

## **INTEGRATED NATIONAL AGRICULTURAL RESOURCES INFORMATION SYSTEM**

*Principal Investigator* : Dr.P.Ravichandran

*Project Associate* : Dr.(Mrs.)Ch. Sarada

*Project location* : Chennai

Three databases viz., Research Projects, Fish Statistics and Fish Technology have been developed under the project. The information for the above database was collected from the State fisheries and MPEDA and also from published papers and other gray literature. Queries and reports were developed for the databases in order to make it user friendly for the users. The databases developed under this project have been incorporated in the Datawarehouse. Web pages were developed for the databases and hosted in ICAR and CIBA web sites for public use.

## **ARID AGRO-ECOSYSTEM**

### **FISH PRODUCTION USING BRACKISHWATER IN THE ARID ECOSYSTEM**

*Principal Investigator* : Dr.A.R.Thirunavukkarasu

*Project Associate* : Dr.M.Kailasam

*Project location* : Chennai

CIBA is the lead centre for this project and the cooperating centres are Central Institute of Fisheries Education, Mumbai; Fisheries Station, Gujarat Agricultural University, Okha and Haryana Agricultural University, Hissar. The total outlay for the project is Rs.119.62 lakhs with budget allotment for CIBA being Rs.44.61 lakhs. The duration of the project is three years from May 2000 to December 2003 and extended upto November 2004.

## **Work done**

Seeds of grey mullet (*Mugil cephalus*), milk fish (*Chanos chanos*) and pearlspot (*Etroplus suratensis*) were procured and transported by air and road to co-operating centres at Hisar (Haryana) and Udaipur (Rajasthan) for culture after acclimatization and rearing for 15 to 30 days depending upon the size. The survival rate during rearing ranged from 38 to 82%. Based on size the seeds were transported under oxygen packing with varying densities of 150-1500 nos./litre. The survival rate of seed at the destination point was as high as 98%.

## **Indo-French Collaborative Project**

### **SEABASS PILOT UNIT HATCHERY AND CULTURE**

*Principal Investigator* : Dr.A.R.Thirunavukkarasu

*Project Associate* : Dr.M.Kailasam

*Project location* : Chennai (Muttukadu)

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

## **Work done**

The legal clearance for the establishment of the seabass hatchery facilities at Muttukadu was received. The necessary permissions from the Coastal Zone Management Authority, Local Town and Country Planning and the Tamil Nadu

Pollution Control Board were obtained. The revised work schedule was finalized in consultation with the COFREPECHE consultant from France. The construction work will be resumed by the CPWD. An EFC memo for the remaining project period was prepared and submitted for approval. Repayment of Rs.57,07,941/- of the loan was made during the year.

#### Indo-Norwegian Collaborative Project

### **GENETIC IMPROVEMENT OF *PENAEUS MONODON* (TIGER SHRIMP) THROUGH SELECTIVE BREEDING FOR GROWTH AND WHITE SPOT DISEASE RESISTANCE**

*Principal Investigator* : Dr.P.Ravichandran  
*Core Staff* : Dr.G.Gopikrishna, Dr.C.Gopal  
*Project Associates* : Dr.S.M.Pillai, Dr.K.K.Vijayan,  
Dr.S.V.Alavandi,  
Dr.C.P.Balasubramanian,  
Dr.M.S.Shekhar

This project was started in July 2004 with a duration of 4 years. The project aims to develop breeding programme for domestication and

development of fast-growing disease-resistant strain of *Penaeus monodon* for sustainable shrimp production in India.

#### **Work done**

Four full-sib families of *P. monodon* (PL 20) procured from a private hatchery in Chennai were reared in the Muttukadu hatchery in four separate larval rearing tanks. Conventional management practices were followed. The PL was initially fed with polychaete worms and clam meat. Commercial feed was provided from September 2004 onwards. In 135 days, the average weight of shrimps ranged from 5.94 to 7.25g. The survival rate was 60%.

In November 2004, about 380 shrimps from two families were tagged with the Visible Implant Elastomer Tags using a trial injection kit in the sixth abdominal segment. The shrimps retained the tag and there was no mortality. The shrimps were divided into two groups of large (7g) and small (2g). The wet weight at 20 days post tagging was 8.8g. The entire stock of shrimps was lost in the tsunami.

## LIST OF PUBLICATIONS

### CIBA PUBLICATIONS

- ◆ CIBA Annual Report for the year 2003-2004
- ◆ Training Programme Calendar 2004-2005
- ◆ CIBA News Vol.9 No.1 & 2
- ◆ Artemia Culture - Special Publication
- ◆ Technologies of CIBA for Women Self Help Group - Special Publication

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## LIST OF ON-GOING RESEARCH PROJECTS

Title of the Project	Principal Investigator
<b>CRUSTACEAN CULTURE DIVISION</b>	
Captive broodstock development, breeding, seed production and culture of <i>Penaeus monodon</i> , <i>Marsupenaeus japonicus</i> and <i>Fenneropenaeus indicus</i>	Dr.P.Ravichandran Principal Scientist
Culture of mud crabs ( <i>Scylla</i> spp.)	Shri M.Kathirvel Principal Scientist
<b>FINFISH CULTURE DIVISION</b>	
Broodstock development, breeding, seed production and culture of Grey mullet <i>Mugil cephalus</i> and Pearlsplit <i>Etroplus suratensis</i>	Dr.M.Natarajan Principal Scientist
Culture of Asian seabass <i>Lates calcarifer</i>	Dr.A.R.Thirunavukkarasu Principal Scientist
<b>AQUATIC ANIMAL HEALTH MANAGEMENT SECTION</b>	
Fish health management in brackishwater aquaculture using epidemiology, diagnostics, prophylactics and molecular biology	Dr.T.C.Santiago Principal Scientist
<b>NUTRITION, PHYSIOLOGY AND BIOCHEMISTRY SECTION</b>	
Development and demonstration of balanced feeds for Asian seabass, crabs and improvement of shrimp feeds	Dr.S.A.Ali Principal Scientist
<b>AQUACULTURE ENGINEERING AND ENVIRONMENT SECTION</b>	
Development of technology for the waste water treatment of shrimp farms	Dr.B.P.Gupta Principal Scientist
Assessment of brackishwater land resources	Dr.(Mrs.)M.Jayanthi Senior Scientist
<b>TECHNOLOGY TRANSFER, EVALUATION AND INFORMATICS SECTION</b>	
Technology transfer, socio economic aspects and informatics in brackishwater aquaculture	Dr.M.Krishnan Principal Scientist
<b>GENETICS AND BIOTECHNOLOGY UNIT</b>	
Genetic characterization of brackishwater shellfishes and finfishes through molecular techniques	Dr.G.Gopikrishna Senior Scientist

**PRODUCT DEVELOPMENT UNIT**

Effect of specific spoilage bacteria in the changes of spoilage indices of brackishwater fin and shell fish

**Dr.N.Kalaimani**  
Principal Scientist

**FUNDED PROJECTS****AP CESS FUND**

Development and evaluation of shrimp immunostimulants using whole cell preparations of *Vibrio*

**Dr.I.S.Azad**  
Senior Scientist

National risk assessment programme for fish and fish products for domestic and international markets

**Dr.B.P.Gupta**  
Principal Scientist

Participatory technology transfer model for sustainable coastal aquaculture

**Dr.M.Kumaran**  
Scientist (SS)

Evaluation of nutritive value of different strains of rotifers (*Brachionus* spp.) and their suitability for larviculture of Asian seabass *Lates calcarifer* (Bloch)

**Dr.M.Kailasam**  
Senior Scientist

**NATIONAL AGRICULTURAL TECHNOLOGY PROJECT**

Integrated national agricultural resources information system

**Dr.P.Ravichandran**  
Principal Scientist

Shrimp and fish health management

**Dr.T.C.Santiago**  
Principal Scientist

Fish production using brackishwater in arid ecosystem

**Dr.A.R.Thirunavukkarasu**  
Principal Scientist

Institute Village Linkage Programme for technology assessment and refinement in coastal agro ecosystem of Tiruvallur district of Tamil Nadu

**Dr.I.S.Azad**  
Senior Scientist

**IFREMER**

Seabass Pilot Unit (Indo-French Collaborative project)

**Dr.A.R.Thirunavukkarasu**  
Principal Scientist

**NORAD**

Genetic improvement of *Penaeus monodon* (Tiger shrimp) through selective breeding for growth and white spot disease resistance

**Dr.P.Ravichandran**  
Principal Scientist

## CONSULTANCY / COMMERCIALISATION OF TECHNOLOGY

### Shrimp Immunostimulant (CIBA-STIM)

The unplanned and unregulated development of shrimp farming have resulted in a number of techno-socio-economic and environmental problems. Disease of cultured shrimps is one among them. Shrimp and other decapod crustaceans have a well defined mechanism of clearing bacteria and other invading foreign particles from their haemolymph. Modulator proteins in crustaceans can recognize various cell wall components of bacteria and fungi resulting in enhanced fighting capabilities against the invading pathogen. This mechanism of recognition of cell wall components of bacteria is being used in stimulating the immune responses in shrimp. *Vibrio* is one of the most important groups of gram negative bacteria present in the brackishwater and seawater environments. They possess an important cell wall component, the lipopolysaccharides (LPS) which have the capabilities of triggering and activating the shrimp immune elicitors. These components can activate both the transglutamase and phenoloxidase pathways of shrimp immune response. Hence, immunostimulation, supported by judicious water quality management, has immense potentialities in maximizing production from shrimp aquaculture systems. Laboratory studies involving inactivated *Vibrio alginolyticus*, *V. anguillarum*, *V. harveyi*, *V. vulnificus* and *Aeromonas hydrophila* have all shown that the stimulation with each of these, individually and in combinations have no significant influence on the intensity of immune response elicited in tiger shrimp (*Penaeus monodon*) and white shrimp (*Fenneropenaeus indicus*).

Since shrimps possess negligible immune memory, frequent administration of

immunostimulants is needed to sustain immune response. It is therefore necessary to apply the immunostimulants through feed during culture of shrimps at specific intervals.

CIBA has developed a *Vibrio* based immunostimulant CIBA-STIM and extensive field studies were conducted with CIBA-STIM during the culture of *P. monodon* in 33 farmer's ponds. The results of these trials have shown that the CIBA-STIM treated shrimp farms constantly yielded higher growth and production of shrimps compared to control ponds.

### Diagnostics for white muscle disease in scampi

The giant fresh water prawn *M. rosenbergii* is one of the commercially important candidate species for aquaculture. Due to expansion and intensification of aquaculture, serious disease problem like white muscle disease (WMD) has been reported in scampi from Andhra Pradesh and Tamil Nadu. This disease affects all the stages of the prawn. WMD is characterized by whitening of abdominal musculature, associated with anorexia and lethargy. The moribund postlarvae appear milky white and result in heavy mortalities. Histopathological, microbiological and electron microscopic studies of WMD indicated a viral etiology. The virus was purified and characterized at molecular level. The Institute has developed an *rt*PCR (nested) diagnostic kit for the early diagnosis of white muscle disease.

### Patent applied for disease diagnosis in brackishwater fishes using rapid anti-mullet serum

An application for the grant of patent for method of disease diagnosis in brackishwater fish has been submitted to ICAR by Dr.I.S.Azad and Dr.M.Poornima in August 2004.



## RAC, IMC, SRC AND IJSC MEETINGS

### RESEARCH ADVISORY COMMITTEE (RAC)

The Research Advisory Committee of CIBA was constituted by ICAR for a period of 3 years from 25 July 2001 (Council's order F.No.18-3/2001-ASR-I dated 30 August 2001).

The composition of the Research Advisory Committee is as follows :

Dr. P.V. Dehadrai Ex-DDG (Fisheries) D-III/3403, Vasant Kunj New Delhi 110 070	Chairman
Dr. I. Karunasagar Professor and Head Department of Microbiology College of Fisheries Mangalore	Member
Dr. M. Devaraj Ex-Director, CMFRI & Emeritus Scientist CMFRI, 68/3, Grems Road Chennai 600 006	Member
Dr. Sher Ali Head, Dept. of Molecular Biology National Institute of Immunology New Delhi	Member
Dr. Y.S. Yadava National Co-ordinator Bay of Bengal Programme (BOBP) 91, St. Mary's Road, Abhiramapuram Chennai 600 018	Member
Dr. A.D. Diwan Assistant Director General (M.Fy.) Fisheries Division, ICAR New Delhi	Member
Dr. Mathew Abraham Director, CIBA, Chennai	Member
Dr. S.M. Pillai Principal Scientist & OIC, Technical Cell CIBA, Chennai	Member Secretary

## **RESEARCH ADVISORY COMMITTEE (RAC)**

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Dr.M.Devaraj Ex-Director, CMFRI & Emeritus Scientist CMFRI, 68/3, Greams Road Chennai 600 006	Member
Dr.Sher Ali Head, Dept. of Molecular Biology National Institute of Immunology New Delhi	Member
Dr.Y.S.Yadava National Co-ordinator Bay of Bengal Programme (BOBP) 91, St. Mary's Road, Abhiramapuram Chennai 600 018	Member
Dr.A.D.Diwan Assistant Director General (M.Fy.) Fisheries Division, ICAR New Delhi	Member
Dr.Mathew Abraham Director, CIBA, Chennai	Member
Dr.S.M.Pillai Principal Scientist & OIC, Technical Cell CIBA, Chennai	Member Secretary

The 9<sup>th</sup> Research Advisory Committee meeting was held on 20 April 2004. The major recommendations are:

- ♦ Since culture of *P. monodon* is widely practiced in low saline / fresh water conditions and also during monsoon season, the role of osmoregulatory parameters of the shrimps are to be studied at molecular level.
- ♦ Captive broodstock development of shrimps being an important issue, facilities need to be established with the involvement of shrimp industry and other organizations and a national level interaction meeting may be organized to address this very important aspect of shrimp aquaculture.
- ♦ The problem of larval feed for mud crab rearing may be tackled with intensive research to identify, isolate and mass culture of a suitable species as live feed for crab larvae.
- ♦ More experimental trials on grow-out culture technology of seabass *L. calcarifer* should be taken up and the technology should be standardized for adoption by farmers.

- ♦ For commercialization of CIBA shrimp feed technology, attention should be focused towards secondary feed players for marketing the feed technology.
- ♦ Development of feeds whether larval or grow-out should go hand-in-hand with culture technologies of target species.
- ♦ A suitable probiotic bacteria may be identified, isolated and mass cultured for bioremediation of nutrients from shrimp farm discharge water.
- ♦ The role of sea weeds such as *Gracilaria* may be studied in reducing the progressive build up of nutrients in shrimp culture ponds.



9th Research advisory committee meeting

The Council vide letter F.No.18-2/2004-ASR-I, dated 10.6.2004 has constituted the new Research Advisory Committee of CIBA for a period of three years from 25 July 2004.

Dr.S.N.Dwivedi  
Ex-Additional Secretary  
Department of Ocean Development  
E-1/106, Arera Colony  
Bhopal 462 016

Chairman

Dr.N.R.Menon  
Former Director  
School of Marine Sciences  
Cochin University of Science  
and Technology  
Fine Arts Avenue,  
Ernakulam, Cochin 682 016

Member

Dr.C.V.Mohan Associate Professor Department of Aquaculture College of Fisheries Mangalore 575 002	Member
Dr.Rakesh Bhatnagar Professor Centre for Biotechnology Jawaharlal Nehru University New Delhi 110 067	Member
Dr.(Mrs.) Katre Shakunthala Professor Department of Zoology Bangalore University Bangalore 560 056	Member
Dr.P.Keshavanath Director of Instruction College of Fisheries Mangalore 575 002	Member
Dr.A.D.Diwan Assistant Director General (M.Fy.) Fisheries Division, ICAR New Delhi	Member
Dr. P. Ravichandran Director, CIBA, Chennai	Member
Dr.S.M.Pillai Principal Scientist & OIC, Technical Cell CIBA, Chennai	Member Secretary

**The 10<sup>th</sup> Research Advisory Committee Meeting was conducted on 25<sup>th</sup> January 2005. The following were the major recommendations of this meeting.**

- ♦ Raising hatchery produced seed of tiger shrimp *P. monodon* may be undertaken at grow-out facility of Kakkwip Research Centre of CIBA, so as to overcome the mortality experienced in indoor tanks rearing trials at Muttukadu hatchery facility.
- ♦ The breeding performance of wild spawners of tiger, white and kuruma shrimps in post-sunami period has to be studied.
- ♦ Based on the successful rearing of larvae of two species of mud crab (*Scylla tranquebarica*

and *Scylla serrata*) with live copepods and smaller sized rotifers, further trials may be



10th Research advisory committee meeting

carried out to establish the scientific relevance of the results.

- ◆ Implantation of hormonal pellet in matured males of *M. cephalus* may be carried out in a more organized manner.
- ◆ Re-circulation system for captive breeding of females of *M. cephalus* may be created and trials may be carried out.
- ◆ Standardization of seed production technology for Pearlsport (*Eetroplus suratensis*)

under captive condition may be continued and the results transferred for application in the field.

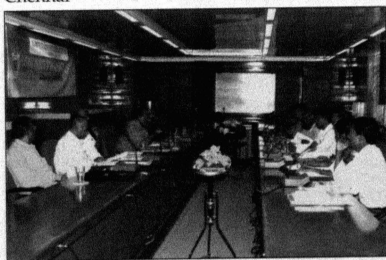
- ◆ A clear cut time frame may be worked out to conduct field trials of *Lates calcarifer* based on the results and success achieved so far.
- ◆ Quick diagnostic procedure for Monodon Baculo Virus (MBV) may be developed for quicker identification and management.

### **INSTITUTE MANAGEMENT COMMITTEE (IMC)**

The Institute Management Committee was reconstituted by ICAR for a period of 3 years with effect from 28.5.2001 (Council's office order F.No.6-9/96.IA-VI, dated 28.5.2001, F.No.6-9/96-IA-VI, dated 13.9.2002, F.No.6-25/2003-IA.VI, dated 9.2.2004).

**The composition of the IMC is as follows:**

Director, CIBA, Chennai	Chairman
Shri Durgesh Rai Lohiya Ashram Behind DRM Office Samastipur Bihar	Member
Shri Koslender Prasad Singh P.O.Halder Chak Distt. Nalanda Bihar	Member
Director of Fisheries Govt. of Tamil Nadu Chennai	Member



**Institute Management Committee Meeting**

Director of Fisheries Govt. of Andhra Pradesh Tank Bund Road Hyderabad	Member
Dean Fisheries College and Research Institute Tamil Nadu Veterinary and Animal Science University Tuticorin, Tamil Nadu	Member
Senior Finance & Accounts Officer Central Marine Fisheries Research Institute Cochin, Kerala	Member
Dr.A.D.Diwan Asst. Director General (M.Fy.) ICAR, New Delhi	Member
Dr.S.Kulasekarapandian Principal Scientist CIBA, Chennai	Member
Dr.A.R.Thirunavukkarasu Principal Scientist, CIBA, Chennai	Member
Dr.T.C.Santiago Principal Scientist CIBA, Chennai	Member
Shri.R.K.Chakraborti Principal Scientist Kakdwip Research Centre of CIBA Kakdwip	Member
Administrative Officer CIBA, Chennai	Member Secretary

**The Council vide letter F.No.6-25/2003 IA-VI, dated 15 December 2004 has nominated the following members in the IMC of the Institute for a period of three years w.e.f. 8.12.2004:**

Shri Ajitsinha Bajran Patil H-6, Haliopolis, 58-Colaba Mumbai - 5 103-B, Mittal Tower, Nariman Point Mumbai - 21	Member
Shri Chidipothu Murali Chellamma Thota Thangatur Post & Mandal Prakasam Dist. Andhra Pradesh 523 274	Member

The 26<sup>th</sup> and 27<sup>th</sup> meetings of the Institute Management Committee were held on 18 May 2004 and 24 January 2005, respectively at CIBA, Chennai. The major recommendations were:

- ◆ Speedy settlement of outstanding advances with CPWD
- ◆ Annual maintenance of the headquarters building
- ◆ Procurement of equipments
- ◆ Execution of minor works
- ◆ Repairs and renovation of approach road, shrimp, fish and crab hatcheries and renovation of A series ponds at Muttukadu

Dr.P.S.B.R.James, Chairman, Quinquennial Review Team (QRT) presented the recommendations of the QRT for the period April 1999 to March 2004 to the IMC and they were approved.

### STAFF RESEARCH COUNCIL (SRC)

The Annual Staff Research Council meeting was held at CIBA headquarters, Chennai on 21 April 2004 under the Chairmanship of Dr.P.Ravichandran, Director, CIBA, Scientist-in-Charge of Divisions and Principal Investigators of on-going projects and other scientists of the Institute participated in the meeting. The progress of research work was reviewed and the major recommendations of the SRC are as follows:

- ◆ The successful raising of generations of Kuruma shrimp, *M. japonicus* may be replicated for *P. monodon* considering the economic significance of this species. The genomics of disease free stock of *M. japonicus* has to be studied at molecular level.
- ◆ Well planned challenge experiments with regard to white spot virus in *M. japonicus*

may be conducted to substantiate the resistance capacity of this species to WSSV.

- ◆ A technology package for culture of *P. monodon* in tide-fed system may be brought out incorporating monsoon culture of the species.
- ◆ Considering the risk involved in the large scale use of copepodites as larval diets for mud crabs in the tanks, alternate larval diets such as molluscan larvae may be tried for larval rearing of both the species of mud crabs and the seed production technology should be standardized.
- ◆ With fully domesticated broodstock of seabass, the possibility of year-round breeding of the fish may be attempted by adopting recycling and recirculation of seawater to maintain the required salinity for breeding and larval rearing of seabass.
- ◆ The problem of low salinity conditions experienced during the winter months (November – January) which coincides with the breeding season of *M. cephalus* may be overcome through recirculation system and the seed production of this species should be standardized.
- ◆ The microparticulate diets developed for shrimp larval rearing should be tested in commercial hatcheries for their acceptability by the industry.
- ◆ The results of dietary requirement studies conducted at laboratory level with seabass larvae should be incorporated in the formulation of grow-out diet and should be tested in the field.
- ◆ The real causative agent / agents for loose shell disease in shrimp may be investigated.
- ◆ Challenge experiments should be conducted with *Pseudomonas* 99 H and its antibacterial

activity should be characterized with regard to disease prevention.

- ◆ To prevent the infestation of external parasites in broodstock fishes / shrimps, the mode of treatment and dose of the medicines to be used are to be standardized, keeping in view the value of the broodstock.
- ◆ The model developed for estimation of carrying capacity of the water body may be tested in a larger area before its release for user departments / institutions.
- ◆ The survey reports on shrimp farming followed in different coastal states have to be completed and published by July 2004.
- ◆ Genetic characterization studies of seabass and *P. monodon* at molecular level should be completed by September 2004.
- ◆ Soil and water quality parameters of coastal areas studied under different projects have to be processed and documented without further delay.

### **INSTITUTE JOINT STAFF COUNCIL (IJSC)**

(Reconstituted by CIBA for a period of 3 years with effect from 6 May 2003, vide office order F.No.13-1/90-Admn. dated 6 May 2003). The composition of the Institute Joint Staff Council (IJSC) is as follows:

#### **Official side**

Director, CIBA	Chairman
Dr.P.Ravichandran, Principal Scientist	Member
Dr.S.Kulasekarapandian, Principal Scientist	Member
Dr.S.M.Pillai, Principal Scientist	Member
Dr.A.R.Thirunavukkarasu, Principal Scientist	Member
Junior Accounts Officer	Member
Administrative Officer	Member

#### **Staff side**

Shri P.Manickyam, Technical Assistant (T-2)	Secretary
Shri V.R.Senthilkumar, Tech. Officer (T-5)	Member
* Shri.R.Kandamani, Assistant	Member
Shri.S.Pari, Upper Division Clerk	Member
Shri.N.Harinathan, SS.Gr.II	Member

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

The IJSC meeting was held on 22 February 2005 at CIBA headquarters.



## **PARTICIPATION IN CONFERENCES/MEETINGS/ WORKSHOPS/SYMPOSIA**

**Dr. Mathew Abraham, Director, attended the following workshops/seminars/ symposia/ meetings:**

- ◆ Workshop on “HACCP in Aquaculture”, organized by the Marine Products Export Development Authority, Cochin, at Chennai, on 3 May 2004.
- ◆ 37<sup>th</sup> Meeting of the Aquaculture Authority, at Chennai, on 28 May 2004.
- ◆ Mid-term Appraisal Meeting of the ICAR Regional Committee No.II, at Guwahati, during 8-9 June 2004.

**Dr. P. Ravichandran, Director, attended the following meetings/ Workshops etc.**

- ◆ Meeting of the Network Project on Organic farming at ICAR, New Delhi during 3-5 May 2004.
- ◆ National workshop on broodstock development, hatchery standards and bio-security under FAO technical co-operation programme on health management of shrimp aquaculture in Andhra Pradesh, organised by Bay of Bengal Programme at Chennai during 8-10 June 2004.
- ◆ Project Launch Workshop on “Genetic improvement of *P. monodon* (tiger shrimp) through selective breeding for growth and white spot disease resistance”, at CIBA, Chennai, during 4-5 July 2004.
- ◆ Directors’ Conference of ICAR Institutes at New Delhi, during 14-16 July 2004.
- ◆ Meeting at State Planning Commission, Chennai to prepare the project proposal on “Integrated Coastal Area Development

Programme in Tamil Nadu”, on 31 August 2004.

- ◆ INARIS Fisheries Review Meeting at IASRI, New Delhi, during 13-14 September 2004.
- ◆ First Interface on Aquaculture at CIFA, Bhubaneswar, during 27-28 September 2004.
- ◆ Meeting of Directors of Fisheries Institutes on Perspective Plan - VISION 2020 of the Institute at ICAR, New Delhi, during 26-27 October 2004.
- ◆ 39<sup>th</sup> Meeting of the Aquaculture Authority at Chennai, on 5 November 2004.
- ◆ National Workshop on “Commercialization of agricultural technologies”, organized by NAARM for the Directors’ of ICAR Institutes at Hyderabad, during 30 November to 2 December 2004.
- ◆ International workshop on “Policy research for sustainable shrimp farming in Asia”, at Bangalore, during 9-10 December 2004.
- ◆ Meeting to finalise the Perspective Plan of the Institute at New Delhi, during 16-18 December 2004.
- ◆ 40<sup>th</sup> Meeting of the Aquaculture Authority at Diu, on 10 January 2005.
- ◆ Seminar on “Biotechnology”, organized by the Royal Norwegian embassy, at Bangalore, on 5 February 2005.
- ◆ Meeting of the TANSA 2004 Expert Committee for selection of Awardees in Biological Sciences by the Tamil Nadu State Council for Sciences and Biotechnology, at Chennai, on 9 February 2005.
- ◆ International Workshop on “Genetics and health management in aquaculture and the

tagging workshop – demonstration” organized jointly by CIFE, CIBA and AKVAFORSK, at CIFE, Mumbai, during 10-11 February 2005.

- ♦ 9<sup>th</sup> Meeting of the National Committee to oversee and regulate introduction of exotic aquatic species in Indian waters, at New Delhi, on 23 February 2005.
- ♦ Meeting of the Aquaculture Authority to discuss the issues relating to use of prohibited antibiotics and pharmacologically active substances in shrimp farming, at New Delhi, on 24 February 2005.
- ♦ Visited the tsunami affected areas in Andamans for selecting sites for demonstration of shrimp / fish culture in collaboration with CARI, Port Blair, during 8-9 March 2005.

The scientists / technical staff attended the following Meetings / Seminars / Workshops etc.

- ♦ Dr.T.C.Santiago, Principal Scientist attended the interaction meeting on Development of transgenic fishes and shrimps for aquaculture, at ICAR, New Delhi, during 14-15 April 2004.
- ♦ Dr.T.C.Santiago, Dr.A.R.T.Arasu and Dr.S.A.Ali, Principal Scientists, Dr.K.K.Vijayan, Dr.S.V.Alavandi and Dr.C.P.Balasubramanian, Senior Scientists, attended the Indo-Singapore workshop on Aquaculture and Marine Biotechnology, at Kochi, during 22-24 April 2004.
- ♦ Dr.S.A.Ali, Principal Scientist, Dr.K.K.Vijayan and Dr.V.S.Chandrasekaran, Senior Scientists, participated in the National Aquaculture Seminar organized by the American Soybean Association, Society of Aquaculture Professionals, at Chennai, on 26 April 2004.

- ♦ Dr.K.K.Vijayan and Dr.V.S.Chandrasekaran, Senior Scientists, participated in the Workshop on Loose shell problems in farmed black tiger shrimp, organized by the Society of Aquaculture Professionals, at Chennai, on 28 April 2004.
- ♦ Shri M.S.N.Murty, Administrative Officer and Shri Mahesh Kumar, Hindi Translator (T-3) attended the Town Official Language Implementation Committee Meeting at Southern Railway, Chennai, on 29 April 2004
- ♦ Dr.T.C.Santiago, Principal Scientist and Dr.I.S.Azad, Dr.K.K.Vijayan and Dr.S.V.Alavandi, Senior Scientists, attended the meeting of the Network project on Health Management, at ICAR, New Delhi, during 29-30 April 2004.
- ♦ Dr.M.Muralidhar, Senior Scientist participated in the Workshop on Introduction of HACCP in aquaculture, organized by the Marine Products Export Development Authority, at Chennai, during 3-5 May 2004.
- ♦ Dr.S.M.Pillai, Dr.A.R.Thirunavukkarasu, Principal Scientists and Dr.C.Gopal, Senior Scientist, attended the meeting of the Network project on Organic farming, at ICAR, New Delhi, during 3-5 May 2004.
- ♦ Dr.M.Krishnan, Senior Scientist, participated in the meeting of the Network project on Role of social sciences in fisheries, at ICAR, New Delhi, during 6-7 May 2004.
- ♦ Dr.S.M.Pillai, Principal Scientist, attended the meeting on Sub-Group-II on Responsible Aquaculture Development and Application of Fisheries Research at ICAR, New Delhi, on 20 May 2004.
- ♦ Dr.S.M.Pillai, Principal Scientist, participated in the Round Table on Impact of Interlinking of River Basins on Fisheries, at National Academy of Agricultural Sciences, New Delhi, during 21-22 May 2004.
- ♦ Dr.S.A.Ali, Principal Scientist, attended the meeting of the Network project on Fish

- nutrition, at ICAR, New Delhi, during 27-28 May 2004.
- ◆ Dr.(Mrs.)M.Jayanthi, Senior Scientist and Dr.(Mrs.)P.Nila Rekha, Scientist (SS), participated in the Seminar on What is new in Arc GIS9, organized by NIIT GIS Ltd., at Chennai, on 3 June 2004.
  - ◆ Dr.B.P.Gupta, Principal Scientist, participated in the Workshop – Brainstorming Session on Water and waste water management, organized by the Central Institute of Fisheries Education and Technology Information Forecasting and Assessment Council, at CIFE, Mumbai, during 8-9 June 2004.
  - ◆ Dr.S.M.Pillai, Principal Scientist and Dr.I.S.Azad, Senior Scientist, attended the National workshop on Broodstock development, hatchery standards and bio-security, under FAO technical cooperation programme on health management of shrimp aquaculture in Andhra Pradesh, organized by Bay of Bengal Programme at Chennai, during 8-10 June 2004.
  - ◆ Dr.A.R.Thirunavukkarasu, Principal Scientist attended the PRT Review Meeting on NATP project “Fish production using brackishwater in arid eco-system” at Arid Agro Eco-system Directorate, Central Arid Zone Research Institute (CAZRI), Jodhpur, on 16 June 2004.
  - ◆ Dr.A.R.Thirunavukkarasu, Principal Scientist participated in the Sensitization workshop on “Data Management” held at Arid Agro Eco-system Directorate, CAZRI, Jodhpur, on 17 June 2004.
  - ◆ Dr.A.R.Thirunavukkarasu, Principal Scientist participated in the one day workshop on “Command area development” organized by the Commissioner, Command Area Development (CAD), Indira Gandhi National Pariyojana at Bikaner, Rajasthan, on 27 June 2004.
  - ◆ Dr.S.M.Pillai, Principal Scientist, Dr.G.Gopikrishna, Dr.C.Gopal, Dr.K.K.Vijayan, Dr.S.V.Alavandi, Dr.C.P.Balasubramanian, Senior Scientists and Dr.M.Shashi Shekhar, Scientist (SS) attended the Project Launch Workshop on “Genetic improvement of *P. monodon* through selective breeding for growth and white spot disease resistance”, at CIBA, Chennai, during 4-5 July 2004.
  - ◆ Dr.B.P.Gupta, Principal Scientist attended the Sub Committee meeting of the Aquaculture Authority to finalise the guidelines for Common Effluent Treatment System, at Chennai, during 6-7 July 2004.
  - ◆ Shri R.K.Chakraborti, Principal Scientist and Dr.J.K.Sundaray, Scientist (SS) participated in the Farmers Day organized by the Central Inland Fisheries Research Institute, Barrackpore at Namkhana, West Bengal, on 10 July 2004.
  - ◆ Dr.A.R.Thirunavukkarasu, Principal Scientist participated in the 27<sup>th</sup> Meeting of Tamil Nadu State Fisheries Research Council, on 12 July 2004.
  - ◆ Dr.B.P.Gupta, Principal Scientist and Dr.M.Muralidhar, Senior Scientist attended the annual review meeting of the AP Cess Fund Project “National risk assessment programme for fish and fishery products for domestic and international markets”, at ICAR, New Delhi, on 21 July 2004.
  - ◆ Dr.M.Muralidhar, Senior Scientist participated in the seminar on “Sustainable Fisheries Development : Focus on Andhra Pradesh”, organized by the Society of Fisheries Technologists of India, at Visakhapatnam, on 23 July 2004.
  - ◆ Dr.S.M.Pillai, Dr.C.P.Rangaswamy, Principal Scientists, participated in the Course Writers Workshop organized by the Indira Gandhi National Open University, at New Delhi, during 12-14 August 2004.

- ♦ Dr.(Mrs.) M.Jayanthi, Senior Scientist and Dr.(Mrs.) P.Nila Rekha, Scientist attended the Network Project meeting on "Aquaculture Engineering" at ICAR, New Delhi, on 17 August 2004.
- ♦ Dr.S.M.Pillai and Dr.A.R.Arasu, Principal Scientists participated in the Network Project meeting on "Developmental Biology", at ICAR, New Delhi, on 19 August 2004.
- ♦ Dr.G.Gopikrishna and Dr.M.Kailasam, Senior Scientists attended the State level seminar on "Animal Biotechnology - Challenges in Biology", at Jamal Mohamed College, Tiruchirapalli, during 23-25 August 2004.
- ♦ Dr.V.S.Chandrasekaran, Senior Scientist, participated in the National seminar on "Gender concerns and food security issues in rice livelihood systems in India : Challenges and opportunities", at M.S.Swaminathan Research Foundation, Chennai, on 2 September 2004.
- ♦ Shri R.K.Chakraborti, Principal Scientist, Dr.J.K.Sundaray and Dr.Debasis De, Scientists (SS) attended the All India Seminar on Sustainable Aquaculture for Augmentation of Export with Special references to Environment, Engineering and Value addition, at Institute of Engineers, Kolkatta, during 3-4 September 2004.
- ♦ Dr.(Mrs.)D.Deborah Vimala, Scientist (SG) participated in the international seminar on the "Role of Fishermen's Association in promoting sustainable fisheries", at Islamic Republic of Iran, during 4-9 September 2004.
- ♦ Dr.T.Ravisankar, Senior Scientist attended the National seminar on "Information and communication technologies for agricultural and rural development", at NAARM, Hyderabad, during 9-10 September 2004.
- ♦ Mrs.S.Nalini, Stenographer Gr. II and Mrs. K.Hemalatha, Stenographer Gr.III participated in the Workshop on "Behavioural skills" at Institute of Secretariat Training and Management, New Delhi, during 27 September to 1 October 2004.
- ♦ Shri R.K.Chakraborti, Principal Scientist attended the 4<sup>th</sup> Meeting of Research and Extension Education Council of West Bengal University of Animal and Fishery Science, at Kolkata on 30 September 2004.
- ♦ Shri M.Kathirvel and Shri R.K.Chakraborti, Principal Scientists participated in the Colloquium on "South Asian artisanal fishing – past tradition, contemporary reality" organized by the India International Centre at New Delhi, during 8-9 October 2004.
- ♦ Dr.S.M.Pillai, Principal Scientist participated in the Workshop on "Development of eco friendly shrimp farming in Tamil Nadu", organized by the Aquaculture Authority at Thanjavur, on 11 October 2004.
- ♦ Dr.V.S.Chandrasekaran, Senior Scientist, participated in the National Workshop on "Integrated aquafarming for rural development", organized by the College of Fisheries, G.B.Pant University of Agriculture and Technology, at Pantnagar, during 14-15 October 2004.
- ♦ Shri M.Shashi Shekhar, Scientist (SS), attended the Workshop on "Agri-Informatics 2004", organized by the Indian Institute of Spices Research, Calicut, during 15-16 October 2004.
- ♦ Dr.S.M.Pillai, Principal Scientist attended the meeting of the Committee constituted by MPEDA for the Registration of Technical Consultants for Aquaculture, at Cochin, on 18 October 2004.
- ♦ Dr.B.P.Gupta, Principal Scientist and Dr.M.Kumaran, Scientist (SS) attended the third Indian Fisheries Science Congress organized by the Society of Fisheries Professionals, Mumbai, held at New Delhi during 4-6 November 2004.
- ♦ Dr.K.K.Vijayan, Senior Scientist participated in the Workshop on MPEDA-NACA Village Demonstration Programme in West Godavari

- District – 2004, organized by MPEDA and NACA, on 6 November 2004.
- ♦ Dr.(Mrs.)Ch.Sarada, Scientist, attended the NATP / INARIS training workshop at Indian Agricultural Statistics Research Institute, New Delhi, during 8-10 November 2004.
  - ♦ Dr.A.R.Thirunavukkarasu, Principal Scientist, attended the State Planning Commission Meeting on Integrated Coastal Zone Management in Tamil Nadu at Chennai, on 9 November 2004.
  - ♦ Dr.(Mrs.)Ch.Sarada, Scientist, participated in the Conference on “National priorities in agricultural statistics and computer applications”, organized during the XIV National Conference of Agricultural Research Statisticians, held at Jabalpur, Madhya Pradesh, during 17-19 November 2004.
  - ♦ Shri Mahesh Kumar, Hindi Translator (T-3) attended the 30<sup>th</sup> Meeting of the Town Official Language Implementation Committee, at Chennai, on 24 November 2004.
  - ♦ Dr.M.Krishnan, Principal Scientist and Dr.(Mrs.) C.Sarada, Scientist participated in the 64<sup>th</sup> Annual Conference of the Indian Society of Agricultural Economics, at Tamil Nadu Agricultural University, during 15-17 December 2004.
  - ♦ Dr.V.S.Chandrasekaran, Senior Scientist, Dr.(Mrs.)D.D. Vimala, Scientist (SG) and Dr.(Mrs.)P.Nila Rekha, Scientist participated in the Conference on “Recent trends in fisheries education and research”, organized by the Fisheries College and Research Institute, TANUVAS, at Thoothukudi, during 3-4 December 2004.
  - ♦ Dr.M.Krishnan, Principal Scientist participated in the International Workshop on “Policy research for sustainable shrimp farming in Asia”, at Bangalore, during 9-10 December 2004.
  - ♦ Dr.(Mrs.)M.Jayanthi, Senior Scientist participated in the International Conference on “Emerging technologies in agricultural and food engineering”, organized by the Agricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur, during 14-17 December 2004.
  - ♦ Dr.A.R.Thirunavukkarasu, Principal Scientist participated in the Workshop on “Sea ranching programme”, organized by the Department of Fisheries, Government of Tamil Nadu at Chennai, on 16 December 2004.
  - ♦ Dr.C.Gopal, Senior Scientist participated in the Regional workshop on “Hatchery standards and bio-security measures”, organized by the State Fisheries Department of Andhra Pradesh at Nellore and Kakinada, on 18 and 21 December 2004, respectively.
  - ♦ Shri S.R.Das, Principal Scientist participated in the “Inception Workshop on the Formulation of comprehensive fishery policy, Orissa”, organized by the Directorate of Fisheries, Orissa, at Bhubaneswar, on 5 January 2005.
  - ♦ Dr.A.R.Thirunavukkarasu, Principal Scientist participated in the workshop / discussion on “Beyond tsunami – saving lives and livelihoods”, organized by the M.S.Swaminathan Research Foundation, Chennai, on 10 January 2005.
  - ♦ Dr.M.Krishnan, Principal Scientist participated in the 58<sup>th</sup> Annual Conference of the Indian Society of Agricultural Statistics, held at Central Marine Fisheries Research Institute, Cochin, during 20-22 January 2005.
  - ♦ Dr.S.M.Pillai, Principal Scientist and Dr.M.Muralidhar, Senior Scientist attended the meeting convened by the Deputy Director General (Fy.), ICAR to finalise the research projects related to tsunami at CIIFT, Cochin, during 21-22 January 2005.
  - ♦ Dr.(Mrs.) B.Shanthi, Senior Scientist attended the Scientific Advisory Committee Meeting of Dr.Perumal KVK, Krishnagiri, Tamil Nadu, at Krishnagiri, on 24 January 2005.

- ◆ Dr. Debasis De and Dr. T.K. Ghoshal, Scientists (SS) attended the 10<sup>th</sup> Agricultural Industry Tourism and Science Festival, at Baruiapur, Purba Medinipore, during 23-30 January 2005.
- ◆ Dr. C. Gopal, Senior Scientist participated in the National Hindi Seminar on "Issues in aquatic bio-diversity", organized by the Central Marine Fisheries Research Institute, Cochin, at Cochin, on 1 February 2005.
- ◆ Shri R.K. Chakraborti, Principal Scientist, Dr. J.K. Sundaray, Dr. T.K. Ghoshal, Scientists (SS) and Shri P.S. Samanta, Technical Assistant (T-2) participated in the Science Fair of Pashimbanga Bigyan Manch at Sunderban Adarsha Vidya Mandir, Kakdwip, during 5-6 February 2005.
- ◆ Dr. S.M. Pillai, Principal Scientist, Dr. G. Gopikrishna, Dr. C. Gopal, Dr. S.V. Alavandi, Dr. C.P. Balasubramanian, Senior Scientists participated in the International Workshop on "Genetics and health management in aquaculture and the tagging workshop - demonstration" organized jointly by CIFE, CIBA and AKVAFORSK, at CIFE, Mumbai, during 9-12 February 2005.
- ◆ Dr. S.M. Pillai, Principal Scientist participated in the National Seminar on Oil Palm, organized by the National Research Centre for Oil Palm at Pedavegi, during 19-20 February 2005.
- ◆ Shri R.K. Chakraborti, Principal Scientist, Dr. Debasis De, Dr. J.K. Sundaray and Dr. T.K. Ghoshal, Scientists (SS) attended the Krishi Mela at Swami Vivekananda Gram Panchayat at Kakdwip, during 19-21 February 2005.
- ◆ Dr. K.K. Vijayan, Dr. C. Gopal, Dr. C.P. Balasubramanian and Dr. M. Muralidhar, Senior Scientists attended the "Aqua India 2005", organized by the Society of Aquaculture Professionals, at Nellore, during 25-26 February 2005.
- ◆ Dr. (Mrs.) D. Deboral Vimala, Senior Scientist participated in the workshop on "Capacity building for women in science and technology" and the International colloquium on "Role of women scientists and technologists for societal development", organized by the Centre for Empowerment of Women, Anna University, Chennai, during 9-12 March 2005.
- ◆ Dr. S.M. Pillai, Principal Scientist attended the meeting to scrutinize the applications for renewal of registration of aquaculture consultants, at MPEDA, Cochin, on 28 February 2005.
- ◆ Dr. S.M. Pillai, Principal Scientist visited the tsunami affected areas in Andamans for selecting sites for demonstration of shrimp / fish culture in collaboration with CARI, Port Blair, during 8-9 March 2005.
- ◆ Dr. T. Ravisankar, Senior Scientist participated in the Sensitisation workshop-cum-training being organized for co-ordinator-cum-members of PME Cell of ICAR Institutes, organized at National Centre for Agricultural Economics and Policy Research, New Delhi, during 17-18 March 2005.

## SERVICES IN COMMITTEES

### **Dr.Mathew Abraham, Director, CIBA served in the following committees (April to June 2004)**

- ◆ Member, Executive Committee and Governing Body, Rajiv Gandhi Centre for Aquaculture (MPEDA), Mayiladuthurai.
- ◆ 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, New Delhi.
- ◆ Member, Aquaculture Authority, Ministry of Agriculture, Govt. of India.
- ◆ Member, Tamil Nadu State Marine & Inland Fisheries Advisory Council.
- ◆ Member, ICAR Regional Committee
- ◆ Member, Expert Committee constituted by the Andaman & Nicobar Administration to scrutinise applicants for giving permission to set up Nauplii Production Centres in Andaman & Nicobar Islands.
- ◆ Member, Sub Group-II on Responsible Aquaculture Development and Application of Fisheries Research, Aquaculture Authority of India.
- ◆ Member, Expert Group to prepare guidelines on Good management practices in shrimp aquaculture.
- ◆ Member, Expert Group to formulate guidelines for setting up and operation of shrimp hatcheries, Aquaculture Authority of India.

- ◆ Member, Expert Committee on Fisheries – Improvement of Fisheries Sector –Department of Fisheries, Andhra Pradesh.
- ◆ Member, Task Force Committee on Fisheries Development Mission, Department of Fisheries, Tamil Nadu.

### **Dr.P.Ravichandran, Director, CIBA served in the following committees (June 2004 to March 2005)**

- ◆ Member, Executive Committee and Governing Body, Rajiv Gandhi Centre for Aquaculture (MPEDA), Mayiladuthurai.
- ◆ 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, New Delhi.
- ◆ Member, Aquaculture Authority, Ministry of Agriculture, Govt. of India.
- ◆ Member, Tamil Nadu State Marine & Inland Fisheries Advisory Council.
- ◆ Member, ICAR Regional Committee
- ◆ Member, Expert Committee constituted by the Andaman & Nicobar Administration to scrutinise applicants for giving permission to set up Nauplii Production Centres in Andaman & Nicobar Islands.
- ◆ Member, Sub Group-II on Responsible Aquaculture Development and Application of Fisheries Research, Aquaculture Authority of India.

- ◆ Member, Expert Group to prepare guidelines on Good management practices in shrimp aquaculture.
- ◆ Member, Expert Group to formulate guidelines for setting up and operation of shrimp hatcheries, Aquaculture Authority of India.
- ◆ Member, Task Force Committee on Fisheries Development Mission, Department of Fisheries, Tamil Nadu.
- ◆ Member, Scientific Advisory Committee for Dr.Perumal KVK, Krishnagiri Dist.
- ◆ Member, Institute Management Committee, Central Inland Fisheries Research Institute, Barrackpore.
- ◆ Dr. S.M. Pillai, Principal Scientist served as an expert member in the 15<sup>th</sup> Extension Education Council meeting of the Tamil Nadu Veterinary and Animal Sciences University, Chennai.
- ◆ Dr.B.P.Gupta, Principal Scientist served as a member of the Aquaculture Authority Sub-Committee of CETS for cluster based shrimp farms.
- ◆ Dr.S.A.Ali, Principal Scientist served as a member of the Institute Management Committee, Central Marine Fisheries Research Institute, Cochin.
- ◆ Dr.B.P.Gupta, Principal Scientist served as Nodal Officer for conducting All India Combined Examination at Chennai for admission to ICAR's JRF and admission to Master's degree programme of IARI, IVRI, NDRI, CIFE, CAU, SAUs for the academic session 2004-05.
- ◆ Dr.M.Natarajan, Principal Scientist served as a member of the Institute Management Committee, Central Institute of Freshwater Aquaculture, Bhubaneshwar.



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

- ✦ The 9<sup>th</sup> Meeting of the Research Advisory Committee was held on 20 April 2004.
- ✦ The 17<sup>th</sup> Meeting of the Annual Staff Research Council was held on 21 April 2004.
- ✦ The 26<sup>th</sup> Meeting of the Institute Management Committee was held on 18 May 2004.
- ✦ The 8<sup>th</sup> Meeting of Official Language Implementation Committee was held on 19 June 2004.
- ✦ First Planning Meeting of the Quinquennial Review Team (QRT) of CIBA at ICAR, New Delhi, on 23 August 2004.
- ✦ First Review Meeting of the QRT for the period 1999-2004 was held during 20-22 September 2004.
- ✦ A meeting to prioritize the research programmes for revising the Vision 2020 document of CIBA with external experts was organised on 10 September 2004.
- ✦ The 9<sup>th</sup> meeting of the Official Language Implementation Committee was held on 30 September 2004.
- ✦ The Chairman and Members of the QRT had an interactive meeting with the Officer-in-



**Meeting on Vision 2020**

Charge and scientists of the Kakkwip Research Centre on 28 October 2004 at Kakkwip. The team also held discussions with the Director and scientists of Estuarine Division of Central Inland Fisheries Research Institute, Barrackpore, on 29 October 2004.

- ✦ The meeting of the QRT to finalise the draft report was held during 18-20 November 2004.
- ✦ The 27<sup>th</sup> meeting of the Institute Management Committee was held on 24 January 2005
- ✦ The 10<sup>th</sup> meeting of the Research Advisory Committee was held on 25 January 2005



**QRT Meeting at Chennai**



**QRT team at Kakkwip**



QRT team at Kakdwip farm

- ◆ The Institute Joint Staff Council meeting was held on 22 February 2005

#### ICAR FOUNDATION DAY

ICAR Foundation Day was celebrated on 16 July 2004. Dr.P.Ravichandran, Director presided over the function. Prof. M.Arumugham, Professor and Head, Dept. of Zoology, University of Madras, Chennai delivered a special talk. Dr.S.K.Pandian and Dr.S.A.Ali, Principal Scientists, CIBA and three students from Queen Mary's College, Chennai also spoke on the occasion.



ICAR foundation day celebration

#### HINDI DAY

The Institute celebrated Hindi Day on 15 September 2004 under the chairmanship of Dr.P.Ravichandran, Director, CIBA. The Chief guest, Prof. (Mrs.) Nirmala Maurya, Head, Uchha Siksha Aur Shodh Sansthan, Dakshin Bharat Hindi Prachar Sabha, Chennai gave away prizes to the winners of elocution and singing

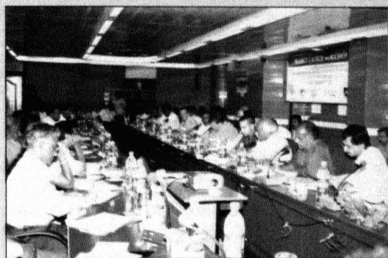
competitions. An exhibition of the Hindi publications of the Institute was also arranged on this occasion.

#### NATIONAL TECHNOLOGY DAY

The Institute celebrated the National Technology Day at its headquarters, Chennai, on 11 May 2004. Dr.S.J.Kaushik, Director, Fish Nutrition Laboratory, INRA, France, delivered a talk on "Future challenges in fish aquaculture and nutrition research".

#### WORKSHOP

- ◆ The INDO-NORAD project launch workshop on "Genetic improvement of *P. monodon* (tiger shrimp) for selective breeding through growth and white spot disease resistance", was conducted at CIBA, Chennai, during 4-5 July 2004.
- ◆ The Workshop on Fish and Shrimp Health Management under National Agricultural Technology Project was conducted during 16-17 November 2004 at CIBA, Chennai.
- ◆ The Institute organized a two day training workshop for Women Self Help Groups (SHGs) on selected technologies of CIBA during 23-24 November 2004. About 30 representatives from Women Self Help Groups of Kattur village participated. Lectures on role of women in aquaculture, women empowerment and technologies for adoption were delivered.
- ◆ A one day Hindi Workshop was organized on 22 December 2004 at CIBA headquarters, Chennai. Dr.P.Ravichandran, Director, CIBA inaugurated the workshop. Dr.R.M.Srinivasan, Retd. Deputy Director, Hindi Teaching Scheme, Department of Official Language, Ministry of Home Affairs, was the Chief Guest and delivered a talk on "Official language rules and regulations". Officers and staff of CIBA participated.

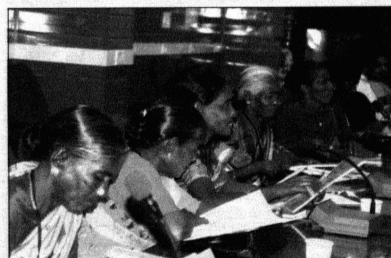


INDO-NORAD project launch workshop

#### FARMERS' MEET

- ◆ CIBA organized an Aqua Farmers' Meet at Kumta, Karnataka, in collaboration with the Department of Fisheries, Govt. of Karnataka, on 15 September 2004. About 60 farmers participated.

- ◆ Under the NATP / IVLP project, two field visits were arranged for the farmers of Kattur village to Palm Products Service Centre, Madhavaram, Chennai on 22 December 2004 and Livestock Research Station and KVK, Kattupakkam, Kanchipuram Dist., Tamil Nadu on 23 December 2004.



Training workshop for women self help groups



Farmers' meet at Kumta

## PARTICIPATION IN EXHIBITION

The Institute participated in the following exhibitions:

- ◆ Agri Intex 2004: An International Exhibition organized by the Coimbatore District Small Industries Association (CODISSIA), Coimbatore, during 20-25 August 2004.
- ◆ All India Exhibition on sustainable aquaculture for augmentation of export with special reference to environment, engineering and value addition, Kolkata, during 3-4 September 2004.
- ◆ Third Indian Fisheries Science Congress, Society of Fisheries Professionals, Mumbai held at IARI, New Delhi, during 4-6 November 2004.
- ◆ 10<sup>th</sup> Agricultural and Industry Tourism and Science Festival, Baruipur (Midnapore Dist.) during 23-31 January 2005.



Dignitaries at CIBA stall



Dr.Ta Quang Ngoc, Hon'ble minister of Fisheries, Socialist Republic of Vietnam at CIBA

## PARTICIPATION IN SYMPOSIUM

The Institute participated in the National Symposium on "Enhancing productivity and sustainability in coastal agro-ecosystem" organized by AED (Coastal) at Central Tuber Crops Research Institute, Thiruvananthapuram, during 9-11 June 2004.

## VIDEO FILM

A video film on "Brackishwater shrimp farming" was produced in three languages *viz.*, Tamil, Telugu and Hindi.

## VISIT OF COMMITTEE OF PARLIAMENT ON OFFICIAL LANGUAGE TO PURI RESEARCH CENTRE OF CIBA

The Second sub-committee of Committee of Parliament on Official Language had inspected Puri Research Centre of CIBA, Puri on 3<sup>rd</sup> November 2004. Dr.A.D.Diwan, Assistant Director General (M.Fy.), Shri A.K.Dubey, Director (Hindi) and Shri Manoj Kumar, Technical Officer (Hindi), ICAR also visited the Centre.

## VISIT OF HON'BLE MINISTER OF FISHERIES, SOCIALIST REPUBLIC OF VIETNAM

Dr.Ta Quang Ngoc, Hon'ble Minister of Fisheries, Socialist Republic of Vietnam alongwith a delegation of officials had an interactive meeting with the Director and Scientists of CIBA and stakeholders of the brackishwater aquaculture sector at CIBA, Chennai, on 21 March 2005.



## VISITORS

The following visited the Institute :

### CIBA Headquarters / Muttukadu Experimental Station

Shri Gorekh Megh, IAS, Commissioner of Fisheries, Maharashtra, Mumbai	19 April 2004
Dr.P.V.Dehadrai, Ex-Deputy Director General (Fy.), ICAR, New Delhi	20 April 2004
Dr.Sher Ali, Head, Dept. of Molecular Biology, National Institute of Immunology, New Delhi	20 April 2004
Dr.M.Devaraj, Ex-Director, CMFRI, Cochin	20 April 2004
Dr.Y.S.Yadava, National Coordinator, Bay of Bengal Programme, Chennai	20 April 2004 3 July 2004
Dr.A.D.Diwan, Assistant Director General (M.Fy.), ICAR, New Delhi	20-22 April 2004 3 July 2004
Dr.C.Vasudevappa, Professor & Head, UAS, Bangalore	5 May 2004
Dr.S.J.Kaushik, Director, Fish Nutrition Laboratory, INRA, France	11 May 2004
Shri Muthusamy, Joint Director, Department of Fisheries, Govt. of Tamil Nadu, Chennai	18 May 2004
Shri V.Suresh, Joint Director, Department of Fisheries, Govt. of Andhra Pradesh, Hyderabad	18 May 2004
Dr.R.Santhanam, Dean, Fisheries College & Research Institute, Thoothukudi	18 May 2004
Dr.Samar K.Dutta, Professor, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad	25 May 2004
Dr.S.Ayyappan, Deputy Director General (Fy.), ICAR, New Delhi	3 July 2004 16-17 November 2004 30-31 December 2004

<b>Dr.M.Arumugam, Professor &amp; Head, Department of Zoology, University of Madras</b>	3 July 2004
<b>Dr.G.D.Chandrapal, Deputy Commissioner (Fisheries), Ministry of Agriculture, New Delhi</b>	3 July 2004
<b>Dr.B.Haynes, Dr.J.Thodesan and Dr.M.Rye, AKVAFORSK, Norway</b>	3 July 2004
<b>Shri P.L.Narayana, Chief of Monitoring Unit, INPIC, New Delhi</b>	3 July 2004
<b>Dr.S.C.Mukherjee, Director, CIFE, Mumbai</b>	3 July 2004
<b>Dr.V.R.Chitranshi, Assistant Director General (I.Fy.) ICAR, New Delhi</b>	3 July 2004
<b>Shri G.Sudarshan, Administrative Officer, Central Leather Research Institute, Chennai</b>	27 July 2004
<b>Dr.S.Edison, Director, CTCRI, Trivandrum</b>	17 September 2004 12 January 2005
<b>Shri S.R.Chauhan, Section Officer, Law Section, ICAR, New Delhi</b>	22 September 2004
<b>Shri Nandi, Director of Fisheries, Govt. of West Bengal</b>	22 September 2004
<b>Dr.K.Muralidhar, Prof. &amp; Head, Dept. of Zoology, Delhi University</b>	20-22 September 2004 18-20 November 2004
<b>Dr.T.J.Varghese, Former Director of Instructions (Fisheries), Mangalore</b>	20-22 September 2004 18-20 November 2004
<b>Dr.K.A.Narasimham, Retd. Principal Scientist, CMFRI, Kakinada</b>	20-22 September 2004 18-20 November 2004
<b>Dr.T.Subramoniam, Professor &amp; Head (Rtd.), Dept. of Zoology, University of Madras</b>	20-22 September 2004 18-20 November 2004
<b>Dr.P.S.B.R.James, Ex-Director, CMFRI, Cochin</b>	20-22 September 2004 18-20 November 2004 24 January 2005
<b>Dr. I.S.Bright Singh, Cochin University of Science and Technology, Cochin</b>	16-17 November 2004
<b>Dr.Rabindranath, Dean, APAU, Fisheries College, Muthukur</b>	16-17 November 2004
<b>Dr.T.J.Jawahar Abraham, Head, Microbiology Division, WBUAFS, West Bengal</b>	16-17 November 2004

Dr.Mangala Rai, Secretary, DARE & Director General, ICAR, New Delhi	31 December 2004
Shri L.Jangira, Director (Finance), ICAR, New Delhi	18-21 January 2005
Shri A.K.Sharma, Asst. Finance & Accounts Officer, ICAR, New Delhi	18-21 January 2005
Dr.Ta Quang Ngoc, Hon'ble Minister of Fisheries, Socialist Republic of Vietnam	21 March 2005
Shri A.S.Bhatia, Under Secretary (Fy.), ICAR, New Delhi	21-24 January 2005
Ms.Shashi Misra, IAS, Addl. Secretary, DARE and Secretary, ICAR, New Delhi	22 January 2005
Dr.E.G.Silas, Ex-Director, CMFRI	22 January 2005
Dr.G.Subramanian, Retd. Professor, Bharathidasan University	22 January 2005
Prof. Amalesh Choudhari, Retd. Professor, Calcutta University	22 January 2005
Dr.R.Santhanam, Dean, Fisheries College and Research Institute, Tuticorin	24 January 2005
Shri Ajit Sinha	24 January 2005
Shri B.Patil	24 January 2005
Dr.N.R.Menon, Retd. Director, School of Marine Sciences, Cochin University, Cochin	25 January 2005
Dr.P.Keshavanath, Director of Instructions, College of Fisheries, Mangalore	25 January 2005
Dr.Rajesh Bhatnagar, Professor, JNU, New Delhi	25 January 2005
Shri V.P.Kothiyal, Director (Works), ICAR	3-4 February 2005
Dr.Arne Guttvik, Scientific Officer, National Centre for Veterinary Contract Research and Commercial Services Ltd., Norway	7 February 2005
Shri A.Mohan, Deputy Director General, National Informatics Centre, Tamil Nadu	16 February 2005
Dr.P.K.Palanisamy, Professor & Head, Department of Physics, Anna University, Chennai	16 February 2005
Dr.T.N.Shanmugam, Professor, Department of Mathematics, Anna University, Chennai	16 February 2005

**Kakdwip Research Centre**

Shri Shyamal Raychowdhury, Asst. Station Director, Doordarshan Kendra, Kolkata	1 May 2004
Shri Biplop Mukherjee, Deputy Magistrate, Shri Santanu Saha, Sub-Division Officer, Shri Arun Roy, Block Division Officer	24 May 2004
Shri B.K.Pal, Senior Audit Officer, CPWD	4 June 2004

**Puri Research Centre**

Shri Vidya Nivas Mishra, M.P. (Lok Sabha)	3 November 2004
Shri Uday Pratap Singh, M.P. (Rajya Sabha)	3 November 2004
Shri Kunwar Sarvaraj Singh, M.P. (Lok Sabha)	3 November 2004
Smt. Poonam Juneja, Secretary, Committee of Parliament on Official Language	3 November 2004
Shri Dinesh Kumar Pandey, Under Secretary (Research), Committee of Parliament on Official Language	3 November 2004
Dr.A.D.Diwan, Assistant Director General (M.Fy.), ICAR, New Delhi	3 November 2004
Shri A.K.Dubey, Director (Hindi), ICAR, New Delhi	3 November 2004
Shri Manoj Kumar, Technical Officer (Hindi), ICAR, New Delhi	3 November 2004
Shri Hari Om, P.A. to the Director (Hindi), ICAR, New Delhi	3 November 2004



# PERSONEL

(Not a Gradation List)

## DIRECTOR

**Dr. Mathew Abraham**  
(upto the forenoon of 14.6.2004)

**Dr. P. Ravichandran**  
(from the afternoon of 14.6.2004)

## PRINCIPAL SCIENTIST

Dr.Mathew Abraham  
Shri S.R.Das  
Dr.P.Ravichandran  
Shri M.Kathirvel  
Dr.S.Kulasekarapandian  
Dr.S.M.Pillai  
Dr.T.C.Santiago  
Dr.A.R.Thirunavukkarasu  
Dr.Syed Ahamad Ali  
Shri R.K.Chakraborti  
Dr.C.P.Rangaswamy  
Dr.B.P.Gupta  
Dr. N.Kalaimani  
Dr.M.Natarajan  
Dr.(Mrs.) Munawar Sultana (VRS on 31.5.2004)  
Dr.M.Krishnan (w.e.f. 29.3.2003)

## SENIOR SCIENTIST

Dr.G.Gopikrishna  
Dr.K.P.Jithendran  
Dr.Azad Ismail Saheb (on deputation to Kuwait  
Institute of Scientific Research, Kuwait from  
8.10.2004)

Dr.K.K.Vijayan  
Dr.C.Gopal  
Dr.(Ms.) Shiranee Periera  
Dr.T.Ravisankar  
Dr.V.S.Chandrasekaran  
Dr.K.K.Krishnani  
Dr.M.Muralidhar  
Dr.(Mrs.) M.Jayanthi  
Dr.(Mrs.) B.Shanthi  
Dr. S.V.Alavandi  
Dr.C.P.Balasubramanian  
Dr.M.Kailasam  
Dr.(Mrs.) D.Deborah Vimala  
Dr. M.Shashi Shekhar

## SCIENTIST

(Senior Scale)  
Dr.P.S.Sudheesh  
Dr.J.Syama Dayal  
Dr.M.Kumaran  
Dr.S.Kannappan  
Dr.Debasis De  
Shri K.Ponnusamy  
Mrs.M.Poornima

Dr.(Mrs )R.Saraswathy  
Shri Akshaya Panugrahi  
Dr.(Mrs ) Saradha Chundari  
Dr J K Sundaray  
Dr (Mrs ) PNilā Rekha  
Dr K Ambasanakar  
Dr T K Ghoshal

### **SCIENTIST**

Shri V Chellapandian (resigned on 30 9 2004)  
Mrs P Mahalakshmi

### **TECHNICAL OFFICER**

T-6

Shri R Elangovan

T-5

Shri S Krishnan (retired on 30 6 2004)  
Shri M Shenbagakumar  
Shri S Sivagnanam  
Shri D Rajababu  
Shri S Rajamanickam  
Shri R Puthiavan  
Shri V R Senthil Kumar

### **TECHNICAL ASSISTANT**

T-4

Shri M G Subramani (Driver)  
Shri M Gopinathan Nair (Driver)  
Shri B B Roy (Driver)  
Shri S Stanline  
Shri S Rajukumar  
Shri Joseph Sahayarajan  
Shri Marella Ravi  
Shri A Nagavel  
Shri R Subburaj

T-3

Shri Maheshkumar (Jr Hindi Translator)

T-2

Shri N Ramesh  
Shri S Samunathan  
Shri C Ananthanarayanan  
Shri PC Mohanty (Driver)  
Shri K Paranthaman (Driver)  
Shri R Balakumaran (Driver)  
Shri P Manickyam  
Shri PS Samantha  
Ms Chanda Mazumdar  
Shri N Jagan Mohanraj  
Shri D M Ramesh Babu  
Shri G Thiagarajan  
Shri K Karaiyan

### **ADMINISTRATION & FINANCE**

**Administrative Officer**

Shri M S N Murty

**Finance & Accounts Officer**

Shri K U K Menon (joined on 5 4 2005)

**Assistant Finance & Accounts Officer**

Shri T S N Murthy (relieved on 17 2 2005)

**Junior Accounts Officer**

Mrs K Nandini

**Superintendent**

Mrs S Bhagirathi

**Assistant**

Shri A B Mondal (retired on 31 7 2004)

Shri R G Ramesh

Shri R Kandamani

Shri PK Roy (w e f 2 8 2004)

**Stenographer****Grade II**

Shri S.K.Halder

Ms.S.Nalini

**Grade III**

Mrs.K.Hemalatha

Mrs.K.Subhashini

**Senior Clerk**

Mrs.V.Usharani (under suspension)

Shri S.K.Bindu

Shri S.Pari

Mrs.E.Amudhavalli

Shri A.Manoharan (w.e.f. 2.8.2004)

**Junior Clerk**

Shri A.Sekar

Mrs.E.Mary Desouza

Shri P.Srikanth

Mrs.R.Vetrichelvi

Shri H.Pandarath, Hindi Typist

**SUPPORTING STAFF****S.S.Gr.IV**

Shri N.C.Jana

Shri S.C.Mondal

Shri L.C.Manna

Shri Prakash Chandra Saha

Shri Badlu Dhanuk (VRS on 28.2.2005)

Shri R.K.Behera (w.e.f. 5.4.2004)

Shri Shyam Bhoi (w.e.f. 5.4.2004)

**S.S.Gr.III**

Shri Sita Ram Bahadur (Retd. on 31.3.2005)

Shri M.N.Biswas

Shri A.K.Biswas

Shri Biswanath Mondal

Shri N.N.Mondal

Shri Amulya Bijali

Shri N.C.Samanta

Shri P.Arumugam

Shri Baman Jally

Shri Sasidar Betal (w.e.f. 5.4.2004)

Shri Rash Behari Das (w.e.f. 5.4.2004)

Shri Gaur Hari Jena (w.e.f. 5.4.2004)

Shri Kalipada Mondal (w.e.f. 5.4.2004)

Shri M.C.Behera (w.e.f. 5.4.2004)

Shri K.C.Samal (w.e.f. 5.4.2004)

**S.S.Gr.II**

Shri Pani Gharami (ACP w.e.f. 19.8.2001)

Shri Sudarshan Naik (ACP w.e.f. 25.1.2002)

Shri Bijay Bhoi (ACP w.e.f. 25.1.2002)

Shri Balram Das (ACP w.e.f. 6.4.2002)

Shri Patit Paban Halder

Shri Abhimanyu Naskar

Shri R.K.Roy

Shri Pranesh Chandra Saha (ACP w.e.f. 10.6.2001)

Shri M.Santhosam

Shri Maharaga Majhi

Shri N.Harinathan

Shri Narendra Nath Jana

Shri V.Jeevanandam (w.e.f. 5.4.2004)

Shri Amar Gharami (w.e.f. 5.4.2004)

Shri K.Mariappan (w.e.f. 5.4.2004)

Shri Krishna Pada Naskar (w.e.f. 5.4.2004)

Mrs.S.Santhi (w.e.f. 5.4.2004)

Shri Premananda Bisoi (w.e.f. 5.4.2004)

Shri K.Nityanandam (w.e.f. 5.4.2004)

Shri V.M.Dhanapal (w.e.f. 5.4.2004)

Shri B.C.Paik (w.e.f. 5.4.2004)

Smt Lashmi Rani Bhuiya (w.e.f. 5.4.2004)

**S.S.G.r.I**

Shri M.Subramani

Shri V.Kumar

Shri E.Manoharan  
Shri K.V.Delli Rao  
Shri C.Saravanan (ACP w.e.f. 22.8.2003)  
Shri S.Kuppan (ACP w.e.f. 12.10.2003)  
Shri Uttam Kumar Santra  
Shri M.Pichandi  
Shri R.Kumaresan  
Shri S.Selvababu  
Shri D.Senthilkumaran  
Shri C.Raghu  
Shri P.G.Samuvel

Shri M.Sakthivel  
Shri R.Mathivanan  
Shri A.Paul Peter  
Shri R.Indrakumar  
Shri G.Dayalan  
Shri Kanaka Prasad  
Ms.M.Annamary  
Mrs.S.Premavathy  
Shri Bholalal Dhanuk  
Shri Purna Chandra Das  
Shri J.Devaraj

# INFRASTRUCTURE DEVELOPMENT

The following works were completed at headquarters, Muttukadu and Kakdwip :

## Headquarters

- ◆ Construction of cubicles in the first floor

## Muttukadu Experimental Station

- ◆ Landscaping
- ◆ Installation of a fresh water borewell
- ◆ Reconstruction of retaining wall on the rear side of the mud crab hatchery
- ◆ Reconstruction of the approach road damaged by the tsunami waves
- ◆ Repairs and renovation of shrimp, fish and crab hatcheries damaged by the tsunami waves
- ◆ Repairs and renovation of Pathology wet laboratory
- ◆ Construction of raised platform for keeping sea water storage tanks
- ◆ Construction of rain water harvesting system

## Kakdwip Research Centre

- ◆ Construction of barbed wire fencing in A & B Sector of the farm
- ◆ Construction of a shed for conducting yard experiments
- ◆ Construction of security cabins

# **LIBRARY, INFORMATION AND DOCUMENTATION**

## **Library holdings**

The Library acquired 39 books during the period. Subscriptions were made to 25 foreign and 25 Indian journals. The library had a total holding of 1400 books, 1500 nos. of journal back volumes, 550 reprints and photocopies, 650 reports / bulletins and 1750 miscellaneous publications.

## **Exchange services**

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

## **Information services**

The Library extended information service to the scientific personnel of research organizations, universities, college students, research scholars, and other agencies / individuals through reference of books and journals.

## **National Agricultural Technology Project - Library Sub Project**

The sub-project on Library information system under the information system development of the organization and management reforms component of the National Agricultural Technology Project (NATP) was implemented. A sum of Rs.1,50,000/- allotted under this scheme is used for the procurement of the following items:

### **● Software items**

- ◆ Adobe Creative Suite
- ◆ Visual Studio
- ◆ Foreign journals
- ◆ Online Database Access (CSA-USA) + Print Editio + Annual Cumulative Index on CD-ROM
  - ASFA 2: Ocean Technology 2005
  - ASFA 3: Aquatic Pollution & Environmental Quarterly 2005
  - Pollution Abstracts with Annual Index - 2005

## **Automation of Library**

Retrospective conversion of library holdings in the library management software is taken up.

## सारांश

संस्थान के लिए 2004-05 एक यादगार वर्ष रहेगा, चूंकि 26 दिसंबर 2004 को आई भयंकर सुनामी लहरों के कारण संस्थान ने अपने एक वरिष्ठ अध्येता श्री विजय कुमार को खो दिया तथा सीबा के मुत्तुकाडु प्रायोगिक केंद्र की आधरभूत संरचना व स्फुटनशाला सुविधाओं को अत्यधिक हानि पहुँची। कूरमा झींगा *मासूंपेनिअस जर्पॉनिकस* के प्रजनक व पीढ़ियाँ तथा मड केकड़ा *साइला ट्रंक्युबेरिका* तथा *साइला सेरेटा*, ग्रे मुल्लेट *मुगिल सेफालस* तथा सीबास *लैटिस कैलकैरिफर* के प्रजनक जैसी बहुमूल्य सजीव शोध सामग्री नष्ट हो गई। झींगा, मछली व केकड़ा स्फुटनशालाएं बुरी तरह से क्षतिग्रस्त हो गईं, केवल बाह्याकार को छोड़कर सब कुछ नष्ट हो गया। संस्थान तुरंत सजग हो गया तथा सुविधाओं को फिर से जुटाने व आधरभूत संरचना के पुनर्निर्माण हेतु कार्रवाई आरंभ कर दी गई। भाकअनुप के महानिदेशक, उपमहानिदेशक, सचिव, निदेशक (वित्त) तथा निदेशक (निर्माण) ने केंद्र का निरीक्षण किया तथा उसको पुनः क्रियाशील बनाने हेतु आवश्यक सहायता प्रदान की।

यद्यपि सुनामी के पश्चात् मार्च 2005 तक मुत्तुकाडु प्रायोगिक केंद्र की सुविधाओं में सुनामी के कारण हुई क्षति को पूरा करने का कार्य चलता रहा। फिर भी संस्थान ने वर्ष 2004-05 के दौरान 10 गृह शोध परियोजनाओं, 8 बाह्य आर्थिक सहायता प्राप्त परियोजनाओं के माध्यम से खारेपानी जलकृषि में महत्वपूर्ण योगदान दिया। संस्थान के शोध कार्यक्रम, शोध सलाहकार समिति द्वारा दिशा-निर्देशित होते हैं तथा शोध के भावी क्षेप क्षेत्रों का कर्मचारी शोध परिषद् द्वारा आयोजन किया जाता है। यह परिषद् शोध प्रगति का मूल्यांकन भी करती है। संस्थान के सभी कार्य संस्थान प्रबंधन समिति की देख-रेख में संपन्न होते हैं। संस्थान की महत्वपूर्ण शोध उपलब्धियाँ निम्नलिखित हैं:

- ♦ PL 20 अवस्था से पालित F3 पीढ़ी के कूरमा झींगा *मासूंपेनिअस जर्पॉनिकस* का वजन 7 माह में 19.0 ग्रा. रहा तथा परिपक्व होने के बाद स्फुटनशाला परिस्थितियों में नेत्रोच्छेदन के बिना प्रजनन किया गया। F4 पीढ़ी के डिंबकों का पालन भी पूर्ण हो चुका है।
- ♦ काकद्वीप, पश्चिम बंगाल में वारपूरित तालाबों में पी. मोनोडान का व्यापक पालन किया गया। परिणामस्वरूप 1.8 टन/हे./फसल पैदावार हुई।
- ♦ संस्थान ने सीकाली, नागपट्टिणम, तमिलनाडु में एक कृषक के 0.09 हे. तालाब में कूरमा झींगा *मासूंपेनिअस जर्पॉनिकस* का ताल-पालन किया। 113 दिन की पालनावधि में झींगे 12.5 ग्रा. औसत आकार के हुए तथा उत्तरजीविता 83% पाई गई। उत्पादन 1018 कि.ग्रा./हे. प्राप्त हुआ।
- ♦ प्लास्टिक तालों व सीमेंट के टैंकों के तल में अंडों के संयोजनार्थ टाइलों, ईंटों तथा ताड़ की पत्तियों को रखकर पर्लस्पॉट एट्रोप्लस सुराटेनसिस का बंदा प्रजनन व बीज उत्पादन किया गया।
- ♦ *लैटिस कैलकैरिफर* के कुल 16 प्रजनन परीक्षणों में 12 सफल अंडजनन तथा 10 में दुबारा अंडजनन हुआ। करीब 4.8 मिलियन स्फुटनिकाएं व 21 दिन के 6 लाख पोना उत्पादित किए गए।
- ♦ तमिलनाडु व आंध्र प्रदेश में कृषक तालाबों में *लैटिस कैलकैरिफर* के वर्धन-पालन का प्रदर्शन किया गया।
- ♦ झींगा आहार सूत्रन में 0.5 से 2% स्तरों पर अत्यधिक स्टार्च युक्त इमली के बीजों के चूर्ण का बंधक गुणता हेतु परीक्षण किया गया। इसका 1% समावेशी स्तर 3 घंटे

हेतु 80-85% स्थिरता के लिए आहार बंधक के रूप में उपया । किया जा सकता है ।

- ✦ मड केकड़ा साइला ट्रंकबोरिका के अल्पवयस्क के लिए आहार परीक्षण द्वारा विटामिन 'सी' की आवश्यक मात्रा का पता लगाया गया । 0.6% विटामिन 'सी' युक्त आहार देने से केकड़ों, की वृद्धि, आहार रूपांतरण अनुपात व उत्तरजीविता अच्छी रही ।
- ✦ झींगों को आहार के साथ 0, 50, 100, 200, 500 तथा 1000 ppb एफ्लटॉक्सिन B1 देकर उसके आहारीय प्रभाव संबंधी अध्ययन किए गए । 30 दिनों में परीक्षण समूह हेतु वृद्धि व आहार रूपांतरण अनुपात, नियंत्रण में 273% से एफ्लटॉक्सिन युक्त आहार देने से गिरकर 183% हो गया । जबकि आहार में 1000 ppb एफ्लटॉक्सिन तक झींगों में मर्त्यता नहीं थी ।
- ✦ PCR तकनीक के द्वारा पेनिअस मोनोडान तथा मैक्रोब्रेकियम रॉजेनबर्गी के जीनोम में अनुमानित प्रतिविषाण्विक जीन का पता लगाया गया ।
- ✦ स्कैपी एम. रॉजेनबर्गी के डिंबकोत्तर में व्हाइट मजलस रोग का प्रारंभ में ही पता लगाने हेतु rtPCR (नेस्टेड) निदान किट का विकास किया गया । डॉ. एन. बलरामन्, कुलपति, तनुवास, चेन्नई ने डॉ. एस. अय्यप्पन, उप महानिदेशक (मा.), भाकृअनुप, नई दिल्ली की उपस्थिति में 16 नवंबर 2004 को इस किट का विमोचन किया ।
- ✦ विब्रियो हर्वेयी विद्युक्त के DNA अंगुलि छाप लिये गये । स्यूडोमोनास PS 102 के प्रोबार्बोट के जीवन क्षमता का मूल्यांकन किया गया तथा रोगजनक विब्रियो हर्वेयी को रोकने हेतु इसकी क्षमता की जांच की गई । व्हाइट स्पॉट वाइरस का पता लगाने हेतु अरेडियोधर्मी अंकित प्रोब का विकास किया है तथा उसकी संवेदनशीलता का मूल्यांकन किया जा रहा है ।
- ✦ घायल के भूसे के किण्वित निरस्यंद से अलग किए गए जीमित कोशिका युक्त जीवाण्विक सूत्रीकरण को झींगा

प्रक्षेत्र के उन्मुक्त जल से  $10^6$  cells/ml अमोनिया निकालने हेतु प्रभावी पाया गया । कुल आमोनिया N सांद्रता 0.602ppm को 24 व 48 घंटों में क्रमशः 0.07ppm तथा 0.068ppm तक कम किया गया । जबकि नियंत्रण में 48 घंटों में 0.48ppm तक कम हुई ।

- ✦ कृष्णा जिले के IRS 1C की सैटलाइट इमेज को ERDAS इमेज में संसाधित किया गया । भूमि की उपयोगिता की पहचान करने तथा उसकी सही जानकारी के सत्यापनाथ कृष्णा जिले के तटीय मंडलों का सर्वेक्षण किया गया । मुख्य भू-उपयोगी वर्ग कृषि, जलकृषि, मैयूव, बंजर भूमि, लवणपटल, आवास वजल निकाय की पहचान की गई ।
- ✦ भारत में पहली बार व्हाइट टेल रोग से प्रभावित मैक्रोब्रेकियम रॉजेनबर्गी से लिए गए विषाण्विक रोगाणुओं के संपूर्ण RNA को अनुक्रमित किया गया । RT-PCR से 850bp एंजिफाइड उत्पाद प्राप्त किया गया । विश्लेषित अनुक्रम से वेस्ट इंडिज से लिए गए मैक्रोब्रेकियम रॉजेनबर्गी नोडोवाइरस के अनुक्रम में 96% समानता दिखाई पड़ी, जबकि अमिनो अम्ल से तुलना करने पर 94% समानता दिखाई दी । परिणाम यह दर्शाते हैं कि मैक्रोब्रेकियम रॉजेनबर्गी में व्हाइट टेल रोग, नोडोवाइरस के कारण हुआ ।
- ✦ काकट्टीप, चिल्का, काकिनाडा, चेन्नई, कोचिन व गोआ से एकत्र पी. मोनोडान के RAPD को विश्लेषित किया गया तथा उनका डेंडोग्राम काकिनाडा, चिल्का व कोचिन समूह, गोआ, काकिनाडा व चेन्नई से आनुवंशिकतः समानता दर्शाता है ।
- ✦ झींगा कृषि में रोग के पूर्व व रोग के पश्चात् के दृश्यलेखों के सांख्यिकीय विश्लेषण बताते हैं कि आंध्र प्रदेश तमिलनाडु व गोआ में क्षेत्र विस्तार तथा उत्पादन में उतार-चढ़ाव में काफी अंतर है । जबकि गुजरात महाराष्ट्र, तमिलनाडु रोग के बाद की अवधि में क्षेत्र विस्तार व उत्पादन में उतार-चढ़ाव में काफी भिन्नता



दशांते हैं । रोग डमी वेरियेबल हेतु लिनियर रिग्रेशन विश्लेषण का परिणाम नकारात्मक था जो उत्पादन पर रोग के अत्यधिक नकारात्मक प्रभावों को दर्शाता है ।

- ♦ रासूके, चेन्नई के सहयोग से मात्स्यकी, सांख्यिकी, संस्थान शोध परियोजनाओं तथा जलकृषि प्रौद्योगिकियों हेतु डायनामिक वेब पेजों का विकास पूर्ण कर लिया गया है तथा उसे संस्थान की वेबसाइट फाइल [www.cibatn.nic.in](http://www.cibatn.nic.in) हेतु अपलोड कर लिया गया है ।
- ♦ खारेपानी जलकृषि के विभिन्न पहलुओं पर 15 प्रशिक्षण कार्यक्रम आयोजित किए गए । संस्थान ने 4

कार्यशालाओं तथा एक कृषक सभा का आयोजन किया तथा 4 प्रदर्शनियों व एक परिसंवाद में भाग लिया ।

राष्ट्रीय व अंतर्राष्ट्रीय पत्रिकाओं में वैज्ञानिकों के शोध प्रपत्रों के प्रकाशन के अलावा संस्थान में 2004-05 के दौरान वर्ष 2003-04 की वार्षिक रिपोर्ट, सीबा समाचार, विशेष प्रकाशन, प्रशिक्षण कैलेंडर तथा पुस्तिका का प्रकाशन किया गया ।

शोध में उत्कर्ष हेतु संस्थान के वैज्ञानिकों को पुरस्कार प्रदान किए गए । मानव संसाधन विकास को परम् अग्रता प्रदान की गई तथा संस्थान के वैज्ञानिकों व कर्मचारियों को देश-विदेश के अलग-अलग संस्थानों में मासवि के विभिन्न पहलुओं पर प्रशिक्षण दिलाया गया ।

