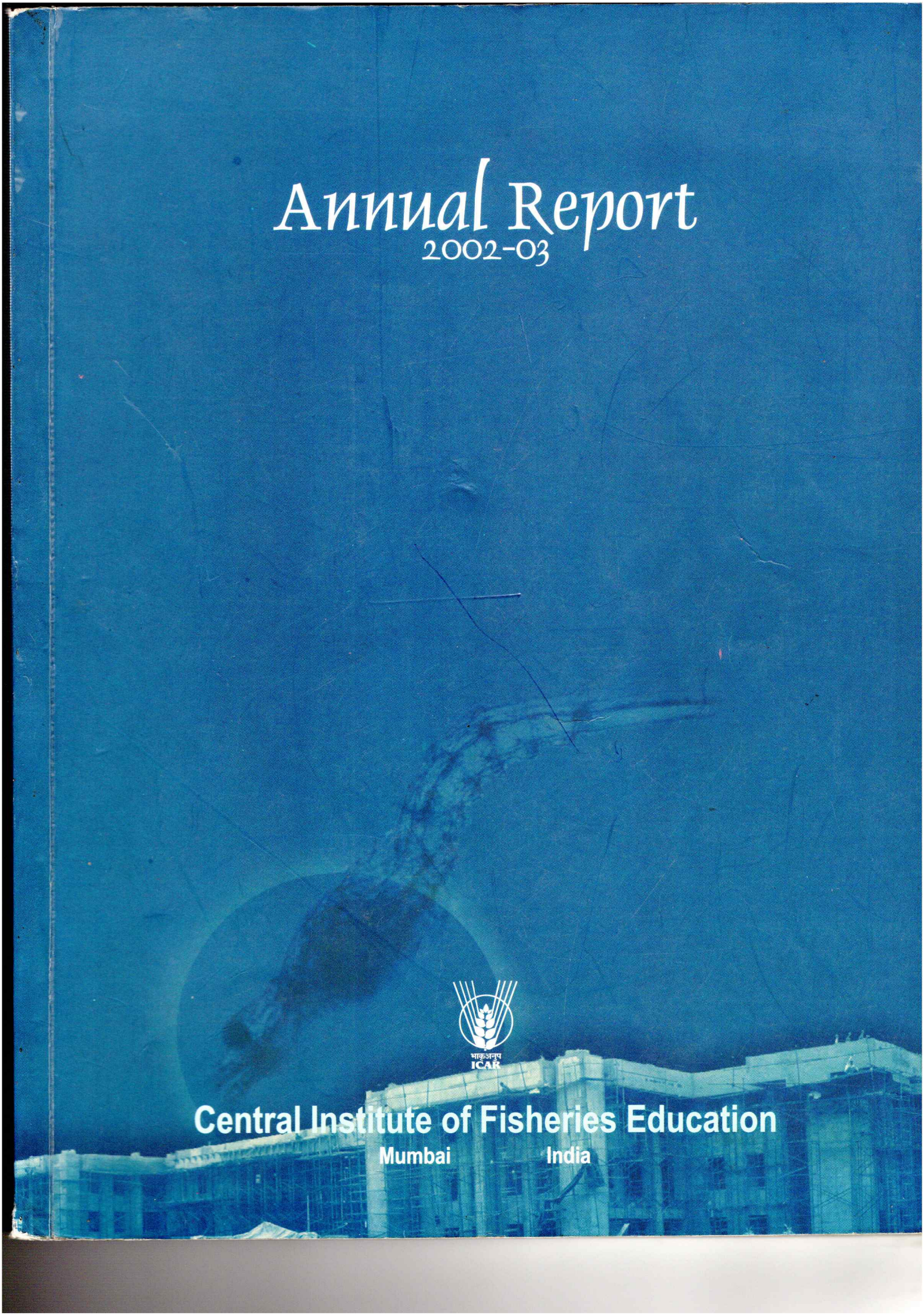
Annual Report
2002-03



भाकृअनुप
ICAR

Central Institute of Fisheries Education

Mumbai India

Annual Report
2002-03

Central Institute of Fisheries Education
Mumbai India

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CIFE always strives for improvement in its academic programmes and continuously aims at excellence in related spherers of research and extension. It is but a logic step forward that the country's as also the regions', first ever Masters course in Fish Business Management was launched this year which has become instantly popular and the full strength of five students were enrolled. Other academic programmes progressed as per schedule. Another first ever project on biodiversity conservation through mass awareness under the DBT/NBDB programme marched on successfully two training programmes one on Aquatic Animal Toxins and Pharmacological Bioresources and other on Taxonomy Genetics and Gene Banking of Coastal and Marine Bio-resources and Biodiversity were conducted besides the CAS in Fishery Science programme on aspects of Fish health management. CIFE faculty was in demand at other institutes to deliver subject specific lectures. The classrooms and laboratories of CIFE continued to be open for specialized academic and research for students from other universities as and when required.

Salient research contributions have been made during the year. One of the most notable research include the standardization of practices for sustainable aquaculture through cage culture, at deifferent reservoirs for varied aquaculture purposes such as fry rearing fingerling rearing, etc. with reference to Indian Major Carps and the Mahseer. Studies conducted at this institute on genetics and breeding of selected finfish and shellfish specieswould a long way in paving the way in augumenting aquaculture productions. Isolation of bioactive peptides with pharmaceutical potential from marine cone snails, development of disease diagnostic kits, standardization and transfer of technology for breeding and culture of Indian Magur in Uttar Pradesh, etc. are but a few other contributions that open up new research vistas.

Upliftment of Women and the rural poor had been always the focal theme of the extension activities of the institute. It is therefore noteworthy that out of a total 26 short term training programmes conducted by the CIFE, 6 were exclusively for fisherwomen. Exhibitions, T.V. shows and Radio talks provided the podia for mass communication by the extension personnel of the Institute. While technical guidance and services were rendered all the year round to various entrenepeurs and farmers who came to the Institute, the scientist fanned out all over the country tomgomto the farmers sites and conduct Farmers' meet to guide them. The award of Dr. Rajendra Prasad Award to the tem led by Dr. S.A.H. Abidi, former Director of this Institute and Member ASRB and comprising of Dr. Sudhir Raizada, Shri R.P. Uniyal for their book *Bharatiya matsya ki.*

The award of Chal Vaijayanti Rajbhasha shield and Ashirwad Rajbhasha Samman once again to CIFE and Dr. Zahoor Quasim Gold Medal to Dr. P.P.Srivastava added feathers to the CIFE's cap. Dr. A. K. Pal, Sr. Scientist was awarded an honorarium of Rs. One Lakh by ICAR for the development of an anti-stress formulation for fish seed transportation while Dr. K. Pani Prasad, Scientist was awarded the Dr. Hiralal Chaudhuri Foundation Best Young Scientist Award on all India basis and Mr. A.K. Reddy, Technical Officer received the Technologist award from Academy of Science Engineering and Technology bringing laurels to the institute.

CIFE, as in yester years won several medals in the ICAR Inter - institutional sports meet and Mrs. Nalini

1. Preface

Poojary was adjudged the Best women athlete of the tournament. Congratulations are due to each and every one of these achievers. The collective wisdom of the research activities of the faculty was disseminated in the form of 42 research papers in National and International journals and 144 abstracts and papers were presented in various seminars and symposia. 16 books on various topics in English and Hindi were published by CIFE. 34 popular articles, 22 pamphlets/brochures/booklets and 22 manuals were brought out this year, which speak volumes of the role of CIFE in dissemination of scientific knowledge. The noteworthy technologies transferred this year were CIFELOSTRESS and antistress formulation which reduces stress during transport, Latex Agglutination Kit for detection of white spot virus and rapid diagnostics kits for diagnosis of bacterial diseases of fishes.

The student community rendered its active cooperation and support in the various activities of the Institute. The PGSSU's role in the students' extra curricular and cocurricular activies had been commendable.

I am extremely thankful to Dr. Panjab Singh, former Secretary, DARE and Director General, ICAR;Dr. Mangala Rai, Secretary, DARE and Director General, ICAR; Dr. S. Ayyappan, Deputy Director General (Fisheries), Dr. J. C. Katyal, Deputy Director General (Education), Dr. A. D. Diwan, Assistant Director General (Marine Fisheries), Dr. V. R. Chitranshi, Assistant Director General (Inland Fisheries), ICAR, for all their cooperation, support and guidance which made all these possible. I am extremely thankful to the Chairman and Members of the RAC as also the distinguished Members, both external and internal, of the Board of Management, Academic Council, Staff Research Council, Extension Council, Board of Examiners, and various other in-house Committees for their constructive criticism, support and guidance. Support was received in different forms from various agencies viz. Fisheries Research Institutes of ICAR, other Institutes of ICAR, Fisheries Colleges, State Agricultural Universities, Department of Biotechnology, Department of Ocean Development, Department of Science and Technology, Department of Environment and Forest, Council of Scientific and Industrial Research, Department of Atomic Energy, Bhabha Atomic Research Centre, Tata Institute of Fundamental Research, Therapeutic Drug Monitoring Laboratory, National Institute of Oceanography, Central Drug Research Institute, Indusrial Toxicology Research Centre, CAS in Marine Biology, Indian National Centre for Ocean Information Sciences, National Bank for Agriculture and Rural Development, and a host of other organizations including INRA, NORAD, ACIAR, ICLARM, DFID, NACA, AKVAFORSK, SARDI and well wishers of this Deemed University; I gratefully acknowledge all their help, support, and cooperation. I thank all the faculty and students, the Senior Administrative Officer and his staff, the Finance and accounts Officer and his staff, and the Sailing Staff of the vessels, for their unstinted support throughout the year. Last but not the least, my special thanks are due to Mr. K. Venkateshvaran, Dr. K. Pani Prasad, Mr. D. Bhoomiah, Ms. Nalini Poojary, and Ms. Sujata Pawar as also Mr. R. P. Uniyal for their efforts in the making of this Report.

CIFE, Mumbai
April 01, 2003

(S.C. MUKHERJEE)
Director

The academic programmes at the Institute progressed satisfactorily and the first ever course in Masters in Fish Business Management was launched this year and five students were enrolled. A total of 80 students were enrolled in various disciplines out of which 20 were registered for Ph. D. During this year 87 students in total obtained various degrees and diploma.

Under the DBT/NBDB programme two training programmes one on Aquatic Animal Toxins and Pharmacological Bioresources and other on Taxonomy Genetics and Gene Banking of Coastal and Marine Bio-resources and Biodiversity were conducted. Under the CAS in Fishery Science one programme was conducted which was attended by 20 participants. The CIFE faculty delivered 31 lectures at other institutes. Along with the regular academic activities training is being offered to students from other universities as and when required.

33 ongoing institutional projects and 13 externally funded projects were carried out. The salient research contributions include standardization of practices for sustainable aquaculture through cage culture, studies on genetics and breeding of selected finfish and shellfish species, isolation of bioactive peptides with pharmaceutical potential from marine cone snails, development of disease diagnostic kits, standardization and transfer of technology for breeding and culture of Indian Magur in Uttar Pradesh, etc.

19 short term training programmes on different aspects related to fisheries were conducted at the CIFE, Mumbai. 6 training programmes were conducted exclusively for fisherwomen on Value added products from low cost fish were conducted. In all 26 short term training programmes at the different subcentres of CIFE. Exhibitions on 20 different occasions were held by CIFE throughout the year. The institutes activities were given wide coverage on T.V. Three Radio talks on different topics were also delivered by the faculty. A farmers' meet comprising of more than 400 farmers was organized at Jaunpur, Uttar Pradesh. The Institute offered technical guidance and services all the year round to various entrepreneurs and farmers.

The outstanding book *Bhartiya Matsyiki* by Dr. S.A.H. Abidi, former Director of this Institute and Member ASRB, Dr. Sudhir Raizada, Sr. Scientist and Shri R.P. Uniyal Asstt. Director (O.L.). bagged the Dr. Rajendra Prasad Award. The *Chal Vaijayanti Rajbhasha* shield and *Ashirwad Rajbhasha Samman* was bagged by CIFE once again. This award was conferred by *Ashirwad* a reputed organization in Bombay. Dr. P.P.Srivastava, Technical Officer was honoured with Dr. Zahoor Quasim Gold Medal for his contribution to Fish Nutrition. Dr. A. K. Pal, Sr. Scientist was awarded an honorarium of Rs. One Lakh by ICAR for the development of an anti - stress formulation for fish seed transportation. Dr. K. Pani Prasad, Scientist was awarded the Dr. Hiralal Chaudhuri Foundation Best Young Scientist Award on all India basis. Letter of Appreciation by the President of Asian Fisheries Society, Phillippines was received by Dr. K. Pani Prasad, Scientist and and Mr. D. Bhoomaiah Technical Officer. Mr. A.K. Reddy, Technical Officer received the Technologist award from Academy of Science Engineering and Technology. 4 staff members were awarded the Ph. D. degree this year. CIFE won several medals in the ICAR Inter - institutional sports meet and Mrs. Nalini Poojary was adjudged the Best women athlete of the tournament.

42 research papers were published in National and International journals and 144 abstracts and papers were presented in various seminars and symposia. 16 books on various topics in English and Hindi were published by CIFE. 34 popular articles, 22 pamphlets/brochures/booklets and 22 manuals were brought out this year.

2. Executive Summary

The noteworthy technologies transferred this year were CIFELOSTRESS and antistress formulation which reduces stress during transport, Latex Agglutination Kit for detection of white spot virus and rapid diagnostics kits for diagnosis of bacterial diseases of fishes.

Infrastructural development included the extension of Aquatic Animal Health laboratory, strengthening of Fish Biochemistry and Molecular Biology labs and renovation of Fish Feed Laboratory and BiotoxinologyLaboratory.

The institute celebrated its Annual Day, Students Day, Hindi Saptah, Hostel Day, etc with great zeal and enthusiasm.

Ever since its establishment in 1961, the Central Institute of Fisheries Education (CIFE), Mumbai, has played a pivotal role in post-graduate fisheries education and training. Research and extension endeavours were strengthened with the transfer of administrative control of CIFE from the Government of India to the Indian Council of Agricultural Research (ICAR) in 1979. In due recognition of its yeomen services to the development of Indian fisheries in general and human resource development for the purpose in particular, CIFE was deservingly conferred the coveted status of Deemed University in 1989. This decade-old deemed university has registered remarkable progress since then. Today, CIFE stands tall as a premier *alma mater* in the global fisheries map. The present campus of CIFE is located in a lush green campus of about 2.22 ha at a distance of about half a kilometer from the Versova beach at Mumbai, in a three-storied building with all essential infrastructural facilities like class rooms, laboratories, library, aquarium, etc.

3.1 Mandate

- To conduct education and research programmes leading to post-graduate (M.F.Sc.) and doctoral (Ph.D.) degrees in specialised disciplines of fisheries science and technology.
- To conduct capsule courses for catering to the refresher training needs of fisheries developmental and extension personnel.
- To conduct basic research in frontier areas of fisheries science and technology through institutional and collaborative efforts.
- To conduct need-based capsule/vocational training on various technologies related to fisheries and allied disciplines.
- To provide institutional support for consultancy and participation in sponsored projects and programmes with other institutions and agencies for fisheries research in inland, coastal and marine (both within EEZ and beyond) sectors.

3. Introduction

3.3 Staff position on 31 March 2003

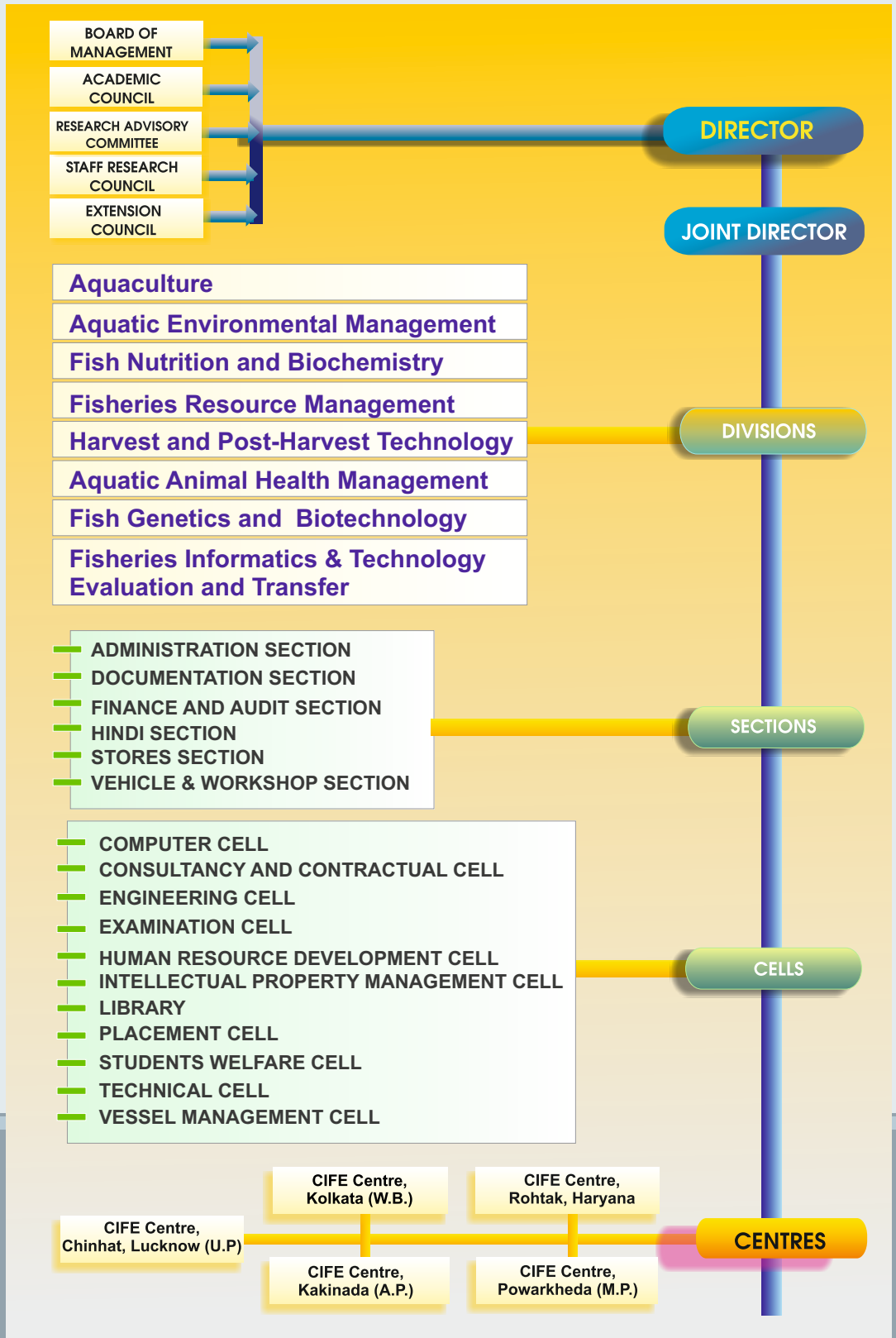
Name of the Post	Sanctioned	Filled	Vacant
SCIENTIFIC			
RMP	02	01	01
PRINCIPAL SCIENTIST	10	07	03
SENIOR SCIENTIST	20	11	09
SCIENTIST	60	37	23
TOTAL	**92**	**56**	**36**
TECHNICAL			
T-7	04	03	01
T-6	03	03	-
T-5	13	13	-
T-4	12	12	-
T-II-3	39	37	02
T-2	12	12	-
T-1	45	43	02
TOTAL	**128**	**123**	**05**
NON-MINISTERIAL	**01**	**01**	**-**
ADMINISTRATIVE			
SR.A.O.	01	01	-
A.O.	01	01	-
F. & A.O.	01	01	-
AAO	05	04	01
ASSTT. DIRECTOR (OL)	01	01	-
PRIVATE SECRETARY	02	02	-
PERSONAL ASSTT.	01	01	-
ASSISTANT	15	14	01
STENOGRAPHER-III	03	03	-
UDC	17	17	-
LDC	21	21	-
TOTAL	**68**	**66**	**02**
SUPPORTING			
S.S.Gr.I	35	33	02
S.S.Gr.II	33	32	01
S.S.Gr.III	20	20	-
S.S.Gr.IV	10	10	-
S.S.Gr.IV (VESSEL)	03	02	01
TOTAL	**101**	**97**	**04**
GRAND TOTAL	**390**	**335**	**55**

3.4 Expendature figures during 2002-2003

Heads	Non Plan	Plan
Establishment charges	52099974.00	--------
TA	793827.00	1999781.00
Other charges	9419764.00	112575333.00
Other Contingent	29088236.00	13211089.00
maintenance & petty Works	1999513.00	-------
Total	**93401314.00**	**127786203.00**

Organization and Management

At the helm of affairs of overall Institutional Management, CIFE has a Board of Management which also forms the highest decision making body at Institute level on all matters. The decisions and recommendations pertaining to academic, research and extension activities of the Institute are made by Academic, Research (RAC & SRC) and Extension Councils, respectively.



4. RESEARCH

4.1 Institutional Projects

STANDARDIZATION OF PRACTICES FOR SUSTAINABLE AQUACULTURE

Sub Project : Trial on cage culture of commercially important fishes in open waters.

M.P.S. Kohli (PI), Ayyappan, S., Kiran Dube, Neelam Saharan, M.B. Patel, A.K. Reddy, R.K. Langer and Chandra Prakash

HDPE cages made of knotless webbing of 4 to 15 mm mesh size, measuring 3 m X 3 m X 3 m, were installed in raft type frame made of metallic pipes / synthetic pipes/ wooden frames of different dimensions. The frames were floated on 200 l capacity synthetic/ metallic sealed barrels. All the four sides and central part of the frames were provided with a catwalk.

Fry to advanced fry of Mahseer

After 159 days yielded advanced fry of average length and weight of 95-145 mm (118.54 ± 13.97 mm), 8.0-27.0 g (13.57 ± 5.29 g) in case of *T. putitora* and 95-157 mm (117.87 ± 21.08 mm), 8.0-35.0 g (15.27 ± 8.29) in case of *T. khudree*. Survival rate in the two species was 89.67 & 91.56 % respectively.

Fry to fingerlings of Mahseer

After a culture period of 391 days the final harvested average length and weight of *T. putitora* and T. *khudree* was 155- 227 mm (181.50 ± 20.16 mm), 40- 120 g (68.77 ± 19.12 g) and 122-165 mm (145.60 ± 11.68 mm), 40-70 g (50.84 ± 10.16 g) respectively. The growth per day in two species was 0.26 mm/0.16 g and 0.19 mm/0.12 g, and the rate of survival was 71.22 and 89.39 % respectively. At Halali Reservoir in Madhya Pradesh, after culture period of 65 days the length and weight of Catla harvested in cage were 80-128mm(103.91±11.27mm) and 8-26g (16.23±3.62g).

Sub-project : Impact of Certain Organophosphorus pesticides and their metabolites on body tissue of a Common teleost

Neelam Saharan (PI). S. Raizada and P.P. Srivastava

Fingerlings exposed to various concentrations of the pesticides exhibited almost identical clinical symptoms of varying degrees depending on the concentrations of the chemical. The test animals showed restlessness, frequent surfacing, and loss of balance and irregular opercular movement. Gradually they became lethargic. In some fishes excessive mucous secretion was noticed. Most of the fishes showed respiratory distress exhibiting opening of the mouth and expanded buccal cavity. The first symptoms of the acute toxicity appeared within 24 h in higher concentration and within 18 to 22h in lower concentration.

Histopathological Studies:

Histopathological studies of these pesticides revealed discernible damage to tissues like gill, liver and alimentary canal of *Labeo rohita.* Liver showed moderately swollen hepatocytes with vacuolation in the cytoplasm. More vacuolation occurred in and - cypermethrin. Gill showed severly damaged and fused gill lamellae and necrosic of epithelial cell. Intestine showed degensation of the villi. The damage was more in cypermethrin than in its metabolites.

Kidney : **96 h LC_{50} of Chloropyriphos - T**ubular cells

4. Research Achievements

showed moderate infiltration of mononuclear cells. Focal areas of haemorrhages were seen at places in the parenchyma. Vacuolated spaces were discerniable in the parenchyma suggesting loss of functional component. **96h LC_{50} of Phosphamidon -** There were marked tubular necrosis at places with focal aggregation of mononuclear cells. Tubules were distended in some cases with flattened epithelial cells and with tissue debris in the lumen. Mild to moderate accumulation of oedema fluid was evident amidst swollen tubular lumen. Empty space could be seen at places due to desquamated tubules.

Gill : 96h LC_{50} of Chloropyriphos - Branchial arch was inflamed due to accumulation of inflammatory cells. In many cases there was complete loss of secondary lamellae leaving the thickened primary filaments isolated. **96h LC_{50} of Phosphamidon -** Fusion of secondary lamellae and moderate congestion of blood vessels were evident. The primary gill filaments were thickened with infiltrating cells.

Liver: 96h LC_{50} of Chloropyriphos - Hepatocytes were moderately swollen exhibiting hydropic degeneration with vacuolation in the cytoplasm. Central veins were mildly congested. ***96h LC_{50} of Phosphamidon -*** Hepatic cells were markedly necrotic with moderate congestion of central vein. Individualisation of hepatocytes with massive granular degeneration was noticed. There was moderate infiltration of mononuclear cells in the liver parenchyma at some places.

Water Quality Parameters:

Water samples collected from Vashi creek, Gadi river, Khopoli Fish Hatchery, Khopoli Fish Pond , Safale creek and Kharekuran creek were analysed for physio-chemical parameters and the results reveal that there were less amount of pollutants in these samples which was expected as the samples were collected immediately after monsoon. These samples were also subjected to pesticide analysis using chloropyriphos and phosphamidon as standards and water : methanol (30: 10 V/V) as solvent system. None of the samples collected from Vashi creek, Khar creek, Gadi River, Khopoli, hatchery and Khopoli pond contained chloropyriphos and phosphamidon. Water samples were also collected from nearby water sources close to agricultural land where there is possibility of water contamination by pesticides.

Water samples collected from Baijnath, Bhuirwadi and Malegaon contained higher amount of pollutants as compared to those from Bhivpuri. The analysis of samples for pesticides like chloropyriphos and phosphamidon was carried out by high precision liquid chromatography and the results revealed the presence of chloropyriphos and phosphamidon in the water used for Aquaculture at Malegaon.

Sub-project : Comparative evaluation of extent of impact of Industry/agriculture/aquaculture on coastal aquatic Ecosystem in selected study areas north and south of Mumbai coast.

Dr. M.P.S. Kohli (PI). Neelam Saharan, M.B. Patel, Chandra Prakash and Ashok Jaiswar

To study environmental impact process, the comparative evaluation of extent of impact of industry/ agriculture /aquaculture on coastal aquatic ecosystem in selected study areas north and south off Mumbai was made to recommend the guidelines for model integrated coastal zone management system. In north and south off Mumbai coast, three (Aagavan, the Boisar MIDC industial effluent zone, Kharekuran brackishwater aquaculture farm and Kharekuran village at the Moorve creek) and six (Bhairau, Sao, Ambet, Umroli, Shaipala and Bankot)sampling spots were selected

North off Mumbai:

The highly acidic pH value, i.e. 4 at Aagavan spot where the industrial wastewater is discharged indiscriminately makes the water body more vulnerable for the survival of the biota. Here due to the less pH, the average minimum alkalinity (6mg/l) further aggravates the water quality deterioration.

The salinity varies from 20 ppt to 40 ppt. The dissolv ed oxygen is noticed from almost nil at Aagavan to 6.8 mg/l at Kharekuran brackishwater aquaculture farm. The mamximum carbondioxide was observed as 60 mg/l at Aagavan, the indistrial effluent zone. The low DO level and higher concentration of CO_2 coupled with higher concentration of ammonia nitrogen (1.55 mg/l) and nitrite nitrogen (1.53 mg/l) turn the creek water unsuitable for culture practices even if the pollution load is diluted upto a extent at Kharekuran village from where the creek water is taken by brackishwater culture farm.

South off Mumbai:

The freshwater of the river Savitri after covering a distance of almost 5 km becomes slightly saline (0 ppt to 5 ppt) during summer otherwise around the year upto 5 km distance it retains its freshwater nature. And then upto a stretch of 70 km it is brackishwater and becomes marine water at Bankot (3 ppt 37 ppt). At the spot Sao which is the MIDC industrial effluent zone,. About 0.5 MLD of wastewater is discharged with partial treatment. In comparision to that of industrial effluent zone of experimental station north off Mumbai this effluent zone, south off Mumbai is relatively less polluted as the quantum of load discharged is comparatively also less. The conclusions drawn from the above study so far are as follows:-

(1) The water in the Moorva creek, north off Mumbai is totally unfit for Brackishwater aquaculture practices. (2) The water of the Savitri river, south off Mumbai can be used for aquaculture Practices after providing some preliminary treatment.
3) The Moorva creek is polluted throughout its 25 km stretch.
(4) The Savitri river stretch is polluted upto a distnce of 5 km.
(5) The causative factors of higher pollution load in the Moorva creek are the comparatively more discharge of industrial waste water quantum and lesser rate of water influx into it.
(6) Frequent occurrence of fish mortality cases more particularly in the Moorva creek.

Sub Project : Genetic variation in Ulva species from natural resources and biotechnically reared sources

Geetanjali Deshmukhe (PI), Singh, S.D., Dwivedi Alkesh and Srivastava, P.P.

During the period, four species, of *Ulva, viz., U. lactuca, U. fasciata, U. reticulata* and *U. lobata* were obtained from Maharashtra coast were preserved at 20° C after wrapped in polythene bag, washing repeatedly with triple distilled water and air drying. Tough cells of *Ulva* species, yielded good genomic DNA. Of the following four random primers designed and used in RAPD-PCR analysis, primer no. 1 & 2 (with G+ C content 70%) generated distinguistiable banding profile in above seaweed species. About 47% of total bands generated by random primer no. 2 were polymorphic and ranged between 300-2500 bp approximately. Some of these polymorphic bands may be exploited as genetic marker for species identification and

stock characterization of Ulva seaweeds. Cultures of *Ulva lobata, U. propenguinensis* established under laboratory conditions and field trials are being held at Kakinada center and Udaipur (in-land saline conditions). At Kakinada, 37% of growth has been observed within 2-week-old cultures. During the period under report Ulva samples: *Ulva lobata, U. lactuca and U. propenguinensis* from different coastal region of Maharastra (viz. Dahanu, Mumbai, Sriwardhan, Murud, Ratnagiri and Malvan) were procured and used for genetic variation studies with the help of RAPD - PCR analysis.

MANAGEMENT OF MARINE FISHERY RESOURCES OF MAHARASHTRA COAST

Sub Project: Development of database for marine fisheries of Maharashtra

R.S. Biradar (PI), G.K. Rao, Madhavi Pikle, S. Gajbhiye and Rajani Pagare

Development of computerized database for marine fisheries of Maharashtra has been attempted based on the data collected for the period 1995-96 to 2001-2002 using MS-Access. The database encompasses important aspects of fisheries such as marine fish landings for different years according to seasons (quarters), districts and fish species (varieties), fleet size and composition, utilization of fish landings, processing units, water quality and fish population parameters etc. The database of about 1500 records were fed into the database. The software developed allows the user to store and retrieve the information in report format. Each report viewed on screen allows the user to take hard copy. The main menu of this software consists of 6 buttons.

Sub Project : Studies on the stock assessment of demersal fishes off Maharashtra.

Chakarborty, S.K. (PI), Biradar, R.S., Jaiswar, A.K. and Palaniswamy R.

Sciaenids form a multispecies group in which nearly half a dozen of species are regularly landed in Mumbai. This group also includes two bigger species the Koth, *Otolithoides. biauritus* and the Ghol, *Nibea diacanthus* Total catch of sciaenids at all India level is around 1.9 lakh tons of which Maharashtra's contribution is around 22,000 t. Nemipterids catch at all India level is around 81,000 t with Maharashtra's contribution around 17,000 t. Separate catch data for *Priacanthus hamrur* & *Epinephelus diacanthus* is not available.

Mean length declined in *J. macrorhynus, J. vogleri, O. cuvieri, N. mesoprion & P. hamrur.* Juveniles of both the nemiprids were recorded in November-January.Young ones of *E. diacanthus* was recorded in September-November period. The exploitation ratio was higher in most of the species except *O. cuvieri, P. hamrur and E. diacanthus*. The yield isopleth diagrams show that for most of the species the optimum yield can be obtained below the present level of Exploitation. The Thompson and Bell analysis show that for most of the species there is a decline in the catch at the present level of fishing.

Fish consumption profile of suburban Mumbai households a pilot study

S.N. Ojha, Shyam S. Salim, R.S. Biradar, G.K.Rao and A.D.Ragabhagat

The preferences among fish and other related products(substitutes) like meat and egg for the surveyed respondents indicated that meat was the most preferred (51.3 percent) followed by fish (37.3 percent).The high cost of meat and meat products and also a sizeable proportion of respondents being fishermen or related to

fishing contributed the varied preferences. Egg also featured as the most preferred product among 11.3 percent of the respondents. The average annual expenditure pattern of the different households indicated that as the income increased the percentage expenditure incurred on the food, decreased, whereas, that on the clothing, education and others (including saving) increases. It was noted that the expenditure incurred on the education was remaining more or less equal in all the categories of householders. The expenditure education on which constitutes around 10-12 percent of the expenditure invariably the entire households lower income group spent most of its income as expenditure on food (55.46) whereas the highest income group has a lesser expenditure on food (35.86 percent) when compared to others including savings (39.31 percent).About 24.3 percent of the annual income was spent on fish/ animal products. This increased with the level of income. The data also depicted that the expenditure on meat was the highest. That was followed by fish and eggs. The data further depicts that excepting for the lower income group, fish was consumed daily by the rest of the population.

Production possibilities of fish products from low cost fish in the coastal village condition

S.N. Ojha, S.Basu, Arpita Sharma and S.S.Salim

The processing plant of women cooperative society was inaugurated by Padma Vibhushan Dr. R.Chidambaram, Principal Scientific Adviser to GOI, on Jan18, 2003. In addition to that following parameters of the potential adopters (members of the women society) were studied through an opinion survey done during this period.

Majority if the members (54.90%) in the society are young. Therefore, there is lot of scope for improvements in the work. The younger groups may lack maturity in organizational aspects and marketing of the products. However, in learning the new things younger groups usually show better response. About half (53.00%) of the members in the society are unmarried. Unmarried women members may go to another village after their marriages. This type of adjustment, because of marriages, will be special feature of women cooperative societies. Unmarried women can, however, also devote their time more for the society. The women members have reasonably good education (100.00% literacy). However, the record keeping by the women was not satisfactory. Majority (76.47%), are coming from farming background, though they are fisherwomen, because their village does not have a landing center and the land is quite good for vegetable cultivation. However, many are dependent on the development of their cooperative society. Since, half of the members (52.94%) are having joint family; the coop. society should not have much problem in getting time from the women. Unmarried women can also devote their time for the society. Mostly (64.71%) participants had appreciated the training programme of CIFE. However, they had also asked for more training. Any business survives on suitable strategies. It was observed that a few women (17.75%) were able to think on these lines. New products, hard work and advertisements can bring their business to an expansion stage, they felt.

The quality of the products prawn pickle and fish papad product by Matsya Gandha Co-Op Society, Vasai were evaluated regularly by Post Harvest Technology Division.

STUDIES ON GENETICS AND BREEDING OF SELECTED FIN FISH AND SHELLFISH SPECIES

Sub Project : Studies on population genetics of marine shrimp *Penaeus monodon*

W.S. Lakra (PI), Gopal Krishna, A. Choudhary, Shrinivas Jahageer, Sanjiv Bandkar

The diploid number and the karyotype of *P. monodon* were established to be as follows: 2n = 88 (10 m + 8 sm + 5 st + 21a pairs). With regard to morphometric analysis, significant difference was estimated between wild and cultured shrimps. No significant morphometric variation was detected between East and West Coast population. The abdominal circumference was found to contribute significantly to the weight of the animal. Biochemical genetic studies were carried out on four populations, Maharashtra, West Bengal, Andhra Pradesh and Andaman. Nine enzymes were stained and 17 loci were observed. Four loci were found to be polymorphic. These are ME, AAT II, ADH II and G6PDH II. A unique locus MDH II was observed in Calcutta population that was absent in others. Growth stage dependent expression of one locus ME I was also observed. The results indicate that there exists significant variation in economically important traits that can be exploited for genetic improvement of the species.

Sub Project : Estimation of rate of inbreeding in fish population of hatcheries of Maharashtra State

Shrinivas Jahageerdar (PI), R.S. Biradar

All the hatchery-bred populations of IMC were found to be inbred. Catla is highly inbred in Karnataka and Maharashtra while rohu is highly inbred in Gujarat. Possibility of introgression also exists in these populations.

Sub Project : Studies on the karyomorphology of brackishwater fishes *Lates calcarifer* and *Chanos chanos* in relation to heavy metal pollution

Gopal Krishna (PI), W.s. Lakra and Sanjeev Bandkar

Copper, cadmium and lead, in sub lethal concentrations, caused damage in terms of chromosomal aberrations. Cadmium caused the maximum damage to the genetic constituents. e MNT was observed to be the fastest test for recording the pollution status of the aquatic environment.

Sub Project : Optimization of Sperm: Egg ratio in Indian carps

Shirinivas Jahageerdar (PI) and R.s. Biradar

A sperm: egg ratio of 12000: 1 gives optimum fertilization rate in rohu, which is comparable with the neat milt. Based on results the following standard dilution rate has been worked out for use of cryopreserved milt. Assuming 50% post thaw motility, 2.9 ml milt with an average of 2.3 $x10^{10}$ concentration of sperm and average 85% motility can be diluted into 82.6 doses of 1 ml each. Each dose would be sufficient for fertilizing 10 ml (about 12,000) ova.

BIODIVERSITY AND FISH HEALTH CONDITIONS OF THE NORTHWEST COAST OF INDIA

Sub Project : Characterization and comparative evaluation of macromolecules associated with virulence of the fish pathogenic bacteria *E. tarda* and *A.hydrophila*.

K. Pani Prasad (PI), A.C. Chaudhari and S.C. Mukherjeee

Antigenic and virugenic studies on different components of purified components of *E.tarda* and *A.hydrophila* have been done. The protective antigen of *E.tarda* and *A.hydrophila* has been purified and tested. The characterization of molecules associated with the virulence of *E.tarda* and *A.hydrophila* are evaluated and the project was completed.

Sub-project: Mapping of the biodiversity along Mumbai coast with special reference to pollution

C.S. Purushothaman, (PI), R.K. Langer, A.K. Padmanabhan, R.D. Tandel and J.M. Koli

Two sets of sampling stations approximately 1 km apart from each other starting with the confluence of the creek with the sea were selected off Mahim and Manori creeks and were sampled during May 2001, September-October 2001, January-February 2002, May 2002, September-October 2002 and February-March 2003. Keeping in view the recommendation by the Research Advisory Committee, a series of five stations selected in a similar manner off Srivardhan was also included and samplings conducted in May 2002, September 2003 and February 2003. At each station, surface and bottom water samples, sediment samples and plankton samples were collected.

Dissolved oxygen levels fluctuated widely with occasional very low values. Chemical oxygen demand was high. Copper, iron, zinc and manganese concentrations in the sediment samples were high. Wide fluctuations were observed in the heterotrophic bacterial populations. Plankton was dominated by zoea larvae in the first 2 km and copepods in the rest. Other plankters were mysids, *Sagitta*, fish eggs, nauplius larvae, fish larvae, *Lucifer*, mysis larvae, ctenophores, *Oikopleura*, siphonophores and alima larvae. Benthos was conspicuous by its almost total absence off Mahim and Manori. Contrary to the expectation, Srivardhan was also polluted with high levels of ammonia. Mahim and Manori were highly polluted with the discharges from the creeks extending to 5 km off shore and beyond. Between Mahim and Manori, Mahim was more polluted. There are indications that pollution extends beyond the 5-km level from the shore and needs further investigations.

Sub-project: Mapping of biotoxins in marine cnidarians and conids and evaluation of their beneficial properties

K. Venkateshvaran (PI), G. Venkateshwarlu, A.T. Landge and Nalini Poojary

MLD for crude venom was found to be 0.60 ml/mouse (with a death time of 46 seconds) in *Conus lentiginosus* and 0.65 ml/mouse (with a death time of 55 seconds) in C*. hyaena*. Symptoms of toxicity included palpitation, excess urination, gasping, exophthalmia/ opaque eyes, tonic convulsions, and paralysis. Autopsy revealed dark discolouration of liver and kidney, while histopathology indicated tubular necrosis in kidney and membrane breakdown in liver. ***C. lentiginosus contained*** four lethal fractions (F1- F4) with death time ranging from 25 to 60 seconds, while that of ***C. hyaena contained*** four lethal fractions (F5- F8) with toxicity in increasing order lasting between 25 and 250 seconds. Analgesic activity of *C. hyaena* venom was 128- 207 times that of paracetamol, whereas the venom of *C. lentiginosus* had 112- 300 times more activity than paracetamol. The sleeper and shaker peptides from *Conus* venom have been identified.

Sub-project: **Bioecology of intertidal macrobenthos in the changing environmentaround Mumbai and their heavy metal bioaccumulation**

P.K. Varshney (PI), A.K. Jaiswar and Chandra Prakash

Gorai creek with low values of DO, pH, salinity and high values of CO_2, NH_4^+ and nutrients (NO_2^-, NO_3^- and PO_4^{3-}) indicated polluted environment. Environmental conditions were moderate and similar at Seven Bungalows, Versova and Madh Island. Soil texture was sandy with low organic carbon in the above three stations, whereas Gorai Creak had a clayey texture with high

organic carbon. Iron and manganese showed little variations at all the stations during the sandy. Benthic groups identified were ploychaetes, amphipods, copepods, isopods, decapods, crabs, hermit crabs, pelecypods, gastropods and fish larvae. Polychaetes, amphipods, crabs and gastropods were common; copepods, decapods and fish larvae were found only at Seven Bungalows and Madh Island. Group diversity was maximum at Madh Island. Poor water quality with less benthic diversity and higher population density at Gorai Creek showed that this area in under severe pollution stress. Physical parameters and composition of benthic fauna and diversity were better at Seven Bungalows and Madh Island when compared to Gorai Creek and Versova.

Sub-project: Development of nitrogenous bacterial fertilizers for aquaculture

P.K. Pandey PI), S. Ayyappan, M. Makesh and Asha Landge

Samples of water and sediment were collected from Mumbai, Kolkata, Somnath, Powarkheda, Chinhat and Kakinada. Samplings were carried out in pre-monsoon, monsoon and post-monsoon seasons. Different parameters of water and sediment were analysed for brackishwater and freshwater fishponds. One hundred isolates of nitrogen fixing bacterial populations of water and sediments are isolated and maintained. Through morphological and biochemical analysis, the nitrogen-fixing bacterial species of *Azotobacter chroococcum* and *A. beijerinckii* have been identified for testing their efficacy in nitrogen fixation. The physico-chemical parameters were correlated with the quantity and quality of nitrogen-fixing bacteria. Different strains of nitrogen-fixing bacteria are being analysed for their efficacy of nitrogen fixation. Based on their efficacy, they will be developed as bacterial fertilizers using suitable carrier materials.

Sub project - Studies on the efficacy of herbal medicines and medicinal plant extracts against microbial diseases of finfish and shellfish

R.P. Raman (PI)

A total of 1000 no. of Catla fry has been procured for experimental purpose. **Collection of selected medicinal plants** - Following **15 medicinal plants** viz. *Tinospora cordifolia, Hollarhina antidysentrica, Moringa oleifera, Adhatoda vasica, Plumbigo zeylinica, Calotropis gigantea, Allium sativum, Ocimum sanctum , Acanthus ilicifolius, Melia azadirachta , Terminalia arjuna, Alstonia scholaris, Acacia nilotica ssp. indica, Nerium oleander* and *Acacia catechu* were collected. **Extraction of active principle:** Methanolic, Ethanolic and Aqueous extracts of above mentioned medicinal plants were prepared. The extracts were subjected to vacuum evaporation by Rotavapor equipment and the solutes were separated from solvents in pure form. **Sensitivity testing of herbal extracts against bacterial pathogens of fish and shellfish:** The sensitivity testing of the above mentioned extracts were done using disc diffusion methods against *Aeromonas hydrophila, Psendomonas fluorescens, P. putida, Edwardsiella tarda, Vibrio anguillarum and V. alginolyticus.* While other herbal extracts were found resistant to the above pathogens, aqueous extracts of *Adhatoda vasica* was found highly sensitive against *P. fluoresens* (z.o.i. 14 mm). *Acanthus ilicifoleus* was slightly sensitive against *P. putida* (z.o.i. 8 mm).

\CHARACTERIZATION AND REFINEMENT OF FISH AND FISHERIES PRODUCTS

Sub-project: Studies on DNA fingerprinting and RAPD profile of commercially important & endangered fish species

S. D. Singh (PI) and S. K. Chakraborty

A total of 38 individuals representing four species of Tor (*T. Khudree, T. putitora, T. tor, T. mussullah*) and 75 seabass from different geographical locations of India were utilized for collection of experimental tissue for genomic DNA extraction Fin, Liver and Kidney gave better yield (about 2.5 ìg/mg tissue). Therefore, a very small edge of fin was clipped off non-invasively for DNA isolation without sacrificing the fish. Fish fin tissue could be preserved in a modified cell lysis buffer at 4^{O}C or even at 25-30^{O}C for several months without any loss of DNA quality and quantity.

The four primers amplified a total of 180 scorable DNA bands ranging from about 185 to 2350 base pairs in the four Tor species. The number of RAPD bands generated per primer range between 6 to 17, with an average of 11 bands per primer. The total numbers of unique bands were 32 with all four primer used in the present study. One hundred and forty eight out of total 180 amplified bands were observed more or less as monomorphic and rest 32 bands were species specific of diagnostic value. Only reproducible and explicit bands were scored for their presence or absence in the gels.

The four species of *Tor* with RAPD-PCR, 12 bands about (490 bp (C-02), 540 bp (C-02), 1390 bp (C-02), 780 bp (C-02), 1120 bp (C-08), 1445 bp (C-08), 590 bp (C-09), 710 bp (C-09), 1490 bp (C-09), 550 bp (C-11), 600 bp (C-11) 1550 bp (C-11) were monomorphic which could be considered as "genus diagnostic" markers. Furthermore, few bands present in specimens of two or more species and absent in remaining species were also detected and termed as shared diagnostic bands which may be considered as 'supragroup markers'. Species-specific DNA marker bands of size 1670 bp for *T. tor*, and 640 bp for *T. mussullah* with C-02 were detected. Similarly with C-08 *T.* mussullah has shown as species-specific DNA marker band of size about 1750 bp and *T. khudree* of about 440 bp. With C-09, *T. tor* gave about 680 bp & 1030 bp and *T. putitora* of about 920 bp DNA band. C-11 could not produce any explicit species-specific DNA band except of about 1220 bp in *T. mussullah.* With random primer C-07, Tor khudree showed 700 bp and 1140 bp unique bands. Thus, one species diagnostic bands were found in *Tor putitora,* two in *Tor mussullah* and three each in *Tor tor and Tor khudree*.

Identification of species-specific genetic marker and Production of species-specific DNA Probe for Seabass and *Tor Khudree* by Gene cloning etc.

A few of the unique polymorphic DNA bands (290 bp amplified by PCR using microsatellite primers, 400 and 700 bp obtained with random primer C-08 and C-07 respectively in *Tor Khudree* and 480bp obtained with primer C-09 and 233 bp (230 bp approx.) and 239 bp (250 bp approx.) DNA fragments obtained with microsatellite primers respectively in Seabass) were cloned in to *E. coli* DH5α cells after elution, ligation with pTZ57 plasmid (2.88 kb) and transformation as per standard protocols. Recombinant plasmid isolated from white recombinant clones selected from X-gal/IPTG/ Ampicillin-LB agar plates were analyzed and characterized by Restriction Endonuclease digestion. Two DNA fragments 233 bp and 239 bp of growth hormone gene amplified from Seabass from Indian waters have been found to contain additional dinucleotide (AC) microsatellite repeats two times $(CA)_2$ and five times $(CA)_5$ respectively in comparison to Seabass of Australian origin (TABLE iii) . In addition single nucleotide polymorphism has also been detected in Seabass of Indian waters at many position of these growth hormone gene promoter region DNA fragments which may be due to

mutation caused by environmental or habitat changes of Seabass of two countries.

Sub Project : Value added products from low cost fish

S. Basu (PI) and A. K. Pal

Flavour was extracted from prawn head by different methods viz. by miofibriller protein extraction, fat extraction, sarcoplasmic protein extraction, 3% salt solution, and by heating for different durations. Steam distillation of the above extracts showed that the yield was maximum with extract obtained by heating prawn head with 3% salt solution. The volatile concentrates were analysed using a Shimadzu QP-5050A GC/MS instrument equipped with a GC-17A gas chromatograph provided with DB-1 capillary column. A total number of 24 compounds, viz., 2 pyrazines, 3 alcohols, 3 ketones, 1 indole, 1 ester, 13 hydrocarbons and 1 miscellaneous compound were identified. Among these compounds 1,4-benzendiol constituted a major portion with a share of 19.77% of total followed by indole, bergamatol acetate and ketoisophorone with a share of 5.56%, 4.99% and 4.52% respectively..

The flavour was extracted from prawn head using 3% salt solution. This powder was packed in aluminium foil-polyester packs and storage life studied. It was found that the flavour of the powder was in good acceptable form upto 4 months. Two extracted products were prepared using twin-screw extruder. In one product 20% fish was used to prepare a product. This product after frying in groundnut oil had good crispy texture and attractive fish flavour. In the development of the product, different parameters like feed moisture, protein concentration, temperature, die diameter and RPM of machine were changed to get a product with maximum expansion ratio resulting in good acceptable crisp texture. The fried product was packed in metalised polyester and aluminium foil-polyester packets and storage life was studied. The product remained in good acceptable form in aluminium foil-polyester packs for 4 months. Another extruded product was prepared from cornstarch using prawn flavour extracted in our earlier experiments. All the parameters described earlier were optimised to get a good crispy product with prawn flavour. The storage life of this product was also found to be 4 months in aluminium foil-polyester packs.

Sub Project: Feed formulation for low-cost diets for *Macrobrachium Rosenbergii* using blood meal as a dietary component.

K.K. Jain (PI), A.K. Reddy and P.P. Srivastava

At the CIFE Centre at Powarkheda a good harvest of *M. roserbergii* with average weight 20-25 gm was recovered after rearing for 3 months approximately 1000 kg/ha/year production of *M. rosenbergii* was achieved, which is a first attempt of its kind at his centre.

CIFE CENTRE LUCKNOW

UTILIZATION OF USAR (ALKALI) LAND FOR AQUACULTURE IN AND AROUND LUCKNOW, UTTAR PRADESH.

P.M. Sherry (P.I.) and Zeba Jaffar

Four blocks of Lucknow region, *viz*. Mohan, Bakshi-ka-Talab, Chinhat and Hassanganj (Unnao) were selected for the project work, because these areas are

marked with sodic soil that covers 3.38% of the total reported area of Uttar Pradesh. Virendra Nagar, (Dhaura Village) worst affected with Usar soil and where KVK is functioning since April, 2001 was selected for construction of a fishpond. A pond measuring 2000 sq.m. was constructed at Krishi Vigyan Kendra. Similarly, another fishpond was constructed in usar land at Mohan. Likewise, two ponds were constructed in usar land belonging to Mr. Surrender Singh and Anookhe Lal at Hassanganj. Two ponds were selected at a fish farm owned by Ashok Yadav at Sautal purva, Bakshi-ka-Talab, which were lying unutilized due to alkaline characteristics of soil and also badly infested with aquatic weeds.

The soil at Hassanganj (Unnao) and Mohan blocks is characterized as silty loamy and surface layers with precipitated sodium and potassium. Soil at KVK, Dhaura and Hassanganj was analyzed to know its physico-chemical characteristics before construction of a fishpond. The pH was 10.0, Electrical conductivity 2.01 millimohs/cm, Organic carbon 0.39%, Av. Phosphorus 21kg/ha, Av. potassium 275kg/ha. Av. Nitrogen 136.46kg/ha, Calcium carbonate 8% and Water retentive capacity 20%. After reclamation of pond soil with gypsum @ 3 tons/ha and gypsum with cow dung@ 2 ton/ha & 5 ton/ha, respectively in ponds of Mr. Surrender Singh and KVK, Dhaura, respectively the chemical parameters of the pond soil were again analyzed and these were pH, 7.7 and 8.1, Organic carbon 1.5 % and 1.2 % , Av. phosphorus 76.6kg/ha, and 64.5kg/ha, Av.nitrogen 271.1kg/ha and 258 kg/ha, Calcium carbonate 7.6% and 6.1% and water retentive capacity 41% and 28%, respectively. Sodium hazard study was also conducted for sodium absorption ratio (SAR) in the pond soil of KVK before and after reclamation. The SAR was reduced after treatment with gypsum and gypsum & cowdung. Fishponds at Dhaura were filled with water drawn by deep bore-well and manured with organic and inorganic fertilizers by following the standard aquaculture method. Paragrass, *Bracharia mutica* and Karnal grass, *Diplanchean fusca* were planted on the slopes and embankments of the pond for preventing soil erosion and to decrease the soil pH. After fertilization of ponds, fingerlings of selected carp species, in compatible proportions, *Catla catla* 2, *Labeo rohita* 1, *Cirrhinus mrigala* 1, *Hypophthalmichthys molitrix* 3, *Ctenopharyngodon idella*, 2 and *Cyprinus carpio* 1 were stoked @ 5000no/ha in August, 2002. Supplementry feeding, as per the standard method, was provided daily to the growing fish stock in two equal divided dosages morning and evening. During culture periodical assessment of benthos and primary productivity was done. Initially, benthic population was negligible but it grew to 3-5 no/sq.m. The primary productivity ranged from 79.33 mg C/m2/day to 85.3 mgC/m2/day. Growth assessment of fish stock was done at the end of six month's culture period. Weight of catla, rohu, mrigal, silver carp, grass carp and common carp was 350g, 250g, 150g, 500g, 300g, and 90g, respectively. Growth rate of surface feeding carps, Catla and silver carp was measured at 41.2g/month and 83.3g/month, respectively and bottom feeding carps, mrigal and common carp was 21.3g/month and 18.4g/month, respectively. While growth rate of rohu and grass carp was 41.2g/month and 50.0 g/month, respectively. Growth studies of Indian major carps and exotic carps indicate that reclaimed alkali soil at Hassanganj block is suitable for aquaculture, preferably by introducing the surface and column feeding carps. Bottom dwelling carps should be restrained from aquaculture due to low production of benthic fauna in ponds constructed in usar land. To boost aquaculture farming in other areas where alkaline soil is predominated, technical know-how was provided to fish farmers at Bakshi-ka-Talab, Goyala, Chinhat for culture of suitable varieties of carps and other freshwater species such as *Pangasius pangasius* and *Pangasius sutchi*.

STANDARDIZATION AND TRANSFER OF TECHNOLOGY FOR BREEDING AND CULTURE OF INDIAN MAGUR, "*CLARIAS BATRACHUS*" IN UTTAR PRADESH.

A.K. Sharma (P.I.), C.S. Chaturvedi, A.K. Yadav, S.K. Upadhya and Sanjay Singh

A successful attempt has been made at Lucknow Center to develop the technology of breeding and culture of Indian magur *clarias batrachus*. For the first time in eastern U.P. induced bred magur 1000 seed (fingerlings) were sold to U.P Fisheries department in Sept., 1999. During the same year 10,000 magur seed were produced and sold to private fish farmers.

Brood Stock Management: During the period, fingerlings of magur (av. wt. 20-30 gm.) purchased from local market were maintained in a semi-circular cemented tank having 2-3" thick mud bottom. These were reared on natural food and also provided indigenously, formulated supplementary feed. These reared fingerling attained maturity in the following year and were used for induced breeding. The fishes, so reared, attained the size of 20-26 cm and wt. of 90 to 120 gm in one year. Brood stock of pond reared magur was used for induced breeding by using synthetic hormones, viz. Ovaprim, Ovatide and Wova FH. The fertilized eggs were later transferred to specially designed portable hatchery.

Identification of constraints in the freshwater prawn culture *Macrobrachium rosenbergii* technology in agroclimatic condition of eastern U.P. and its Extension. (Technology refinement)

P.K. Varshney, (P.I.) and A.K. Yadav

A nursery pond of 450sq.mt. Area was selected at fish farm of CIFE, Lucknow centre. Modification in pond was done by digging a Central trench of 2mt width and 1mt deep having 2mt. distance from bundh on both the side. An air-blower electrically operated of 1hp capacity was installed at site and 9G.I. pipe was fitted up to trench level to provide aeration in pond. The pond muck was cleaned and subsequently prepared for stocking the post larvae. of *Macrobrachium rosenbergii* as per fish culture technique (Jhingran, 1991) in 15 days advance. The post larvae of *Macrobrachium rosenbergii* were procured from CIFA, Bhubaneswar along with feed. Stocking was done in month of and Physico-chemical parameters were analysed, monitored by APHA (1985) and pond hygiene was maintained. The livestock were fed @10% body wt. 3-4 times a day. Intermittently by broadcasting the feed and later through tray feeding. The pond was aerated through air blower 3-4hr. every day early in morning. The rate of stocking was undertaken about 80000 pl/ha in monoculture. Fingerlings of Indian Major Carp were stocked to check the excess of food in the ponds. Growth of prawn was monitored after 3 months and prawns were recorded a wt. of 20-25gm. The final harvesting was done by dewatering the pond some of the male prawn attained 170 mm and 40-45gm. The percentage of survival achieved 60% in 6month time. Production achieved 500kg/ha/6month for first time in Uttar Pradesh. The entire crop was sold at Lucknow wholesale market through open auction. During the culture period temperature were 25-34^{o}C, pH 7.5 to 8.5. Dissolved oxygen 3 to 8 ppm and alkalinity 40-100 ppm were recorded in the first crop which was experimented during July 98 to Jan 99. The successive experimental culture were undertaken between Nov. 1999 to July 2000 in similar pattern of earlier crop however due to severe winter the growth and survival was poor till march and it was just 30-35mm and on final harvesting. The prawn were weighting 40-180mm with 10-1000 gm wt and average weight was 70 gm. A total of 450 specimens could only be realized though physico-

chemical parameters remains supportive of good production except the low temperature. The third culture experiment was done between Oct 2001 to 11 stJuly, 2002 about 8000 no.Of Pl was stocked following the procedure and methods of yester crops. The biomass was fed with feed procured from CIAE, Bhopal @ 15% to 10% Biomass. Though in winter months pond was infested with filamentous algae and mortality of some prawn was also observed and final harvesting was 32 kg of prawn @ 848kg/ha/yr along with 150 kg of fishes. The last and final crop was started from Nov. 2002 to Feb., 2003 was conducted following methodology of earlier crop. The prawns died grow to 30-50 mm size till Dec. but entire crop could not service due to severe cold at Lucknow. The temperature of pond water gone below 7^{O}C and morning temperature remained below 20^{O}C. This inferred from above studies that culture could be done successfully in summer as well as in winters with a production 1000kg/ha/yr especially in this agro-climatic region.

UTILIZATION OF FRESH WATER MUSSEL LAMELLIDENS MARGINALIS (LAMARK) AVAILABLE IN AND AROUND LUCKNOW FOR PEARL CULTURE TECHNOLOGY AND FOR THE THERAPEUTIC PURPOSES (TECHNOLOGY REFINEMENT).

Zeba Jaffer Abidi (P.I.)

Antibacterial, antifungal chemicals and several other substances with therapeutic properties has already been established in marine mussel *Mytilus virdis* but such type of trials have not been done on freshwater mussel *Lamellidens marginalis (Lamark)*. It is therefore felt to take up particular aspect with pearl culture to make the full advantage of this particular genus available in and around Lucknow.

Pearl culture technique has proved successful in agro-climatic conditions around Lucknow. So far the fresh water pearl culture technique has not been tested in this agro- climatic region though it has been done at other places. During the culture period it was observed that in summer the nacre deposition was found to be faster but the survival was only 10%. Whereas in winters the survival was 90%. The most suitable technique is found to be mantle cavity insertion technique. The winter extreme cold 1^{0}C-5^{0}C is not found to be conducive for gonadal insertion technique as the flesh gets stiffened due to cold and the hole made for inoculation could not be healed resulting the death of inoculated mussel with in 15-days. Generally 10-12 operated mussels are cultured per square meter of water surface. The position of culture unit was so adjusted in deeper areas of ponds. In rural India, the general practice of using mussel flesh in different forms on the belief that it cures diseases like rectum prolapse, rickettes in kids and for the enhancement of general stamina. To establish the therapeutic properties freshwater mussel *Lamellidens marginalis* flesh extract was examined for certain pharmacological effects on experimental animals. In antimicrobial screening, antimicrobial activity for fungi was tested following NCCLS method in RPMI 1640 MEDIUM. The activity against bacteria was done in Muller Hinton broth. The minimum inhibitory conc (MIC) against *Steptococcus faecalis* and *Klebsiella pneumoniae bacteria* was found 250 g/ml and 500 g/ml respectively while *Staphylococcus aureus* MIC was recorded as 500g/ml. The antimicrobial activity for fungi *Candida albicans, Cryptococcus neoformans, Sporothrix schenckii, Trichophyton mentagrophytes, Candida parapsirosis and* MIC was found 250 g/ml, 250g/ml, 250g/ml 500g/ml and 125g/ml respectively.

The presence of Donamein a substitute to Adrenalin was also analyzed. The examined/ extract produced only mild blood pressure

lowering effect in anaesthetized rat hence does not seem to have adrenaline like effect.

BIOECOLOGY OF INTERTIDAL MACRO BENTHOS IN THE CHANGING ENVIRONMENT AROUND MUMBAI & THEIR HEAVY METAL BIOACCUMULATION.

P.K. Varshney, P.I.

Gorai creek with low values of DO_2, pH, salinity and higher values of CO_2, NH_4 and nutrients (NO_2,NO_3 & PO_4) associated with black clayey sediment texture indicate polluted environment. The environmental conditions were moderate and similar at stations Seven Bunglows and Madh Island with stressed environment. The water quality showed intermediate conditions at Versova with low values of DO_2, pH, salinity and higher values of CO_2, NH_4 and nutrients compared to Seven Bunglows and Madh Island. Soil texture was sandy with low values of organic carbon and organic matter at Seven Bunglows, Versova and Madh Island. At Gorai creek sediment texture was clayey with higher values of organic carbon and organic matter. Trace metals iron and manganese showed little variations at all the localities during the course of study.

The benthic groups identified were polychaeta, amphipoda, copepoda, isopoda, decapoda, crabs, hermit crabs, pelecypoda, gastropoda and fish larvae. The benthic groups polychaeta, amphidoda, crabs and gastropoda were common and reported from all the four localities. The copepods, decapods and fish larvae have been found only at Seven Bunglows and Madh Island. Polychaeta was the most dominant group encountered from all the four stations. The dominant species of polychaeta reported from Gorai creek, Seven Bunglows & Versova was *Parheteromastus* sp. It was contributed only by polychaetes *Parheteromastus* sp. The polychaete species *Parheteromastus* sp belongs to the family Capitallidae which are the indicator of organic pollution.

Madh Island, which is rocky, had rich fauna of gastropods and bivalves. Gastropod species reported were *Nerita oryzarum, Nerita polita, Thias tissoti, Bursa tuberculata, Trochus radiatus and Clanculus depictus.* The oyster bivalves (Pelycypods) *Saccostrea cuculata* and *Crassostrea gryphoides* were observed only at Madh Island.

The group diversity was highest at Madh Island and lowest at Gorai creek with abundance of polychaetes. Margalef richness index was found maximum at Seven Bunglaws followed by Madh Island and Versova and minimum at Gorai creek. Shannon & Weiner Index ((H), Simpson's diversity index (1-D) as well as reciprocal index (1/D) also follows the same trend. Higher values of diversity indices denote the better living conditions in the ecosystem and lower values indicate the stressful state.

In general highest values of population density and biomass were recorded at lower littoral zone or mid littoral zone. Higher density of polychaetes was associated with clayey soil texture. Rocky or sandy substrates showed higher density of pelecypods and gastropods at Madh Island.

In general the higher accumulation of heavy metals was observed in the benthic organisms of Versova followed by Seven Bunglows and excluding gastropods for Madh Island. In gastropods and rock oyster the values of heavy metals were exceptionally higher this may be perhaps due to their longer life span.

Poor quality of water associated with less benthic diversity and higher population density at Gorai Creek proves that this area is under sever pollution stress. Environmental condition at Versova was better than Gorai creek with moderate faunal composition and represents intermediate condition. Physico- Chemical parameters and composition of benthic fauna and diversity were better at Seven Bunglows and Madh Island compared to Gorai creek and Versova.

Kolkata Centre

ENHANCEMENT OF AQUACULTURE PRODUCTIVITY IN EASTERN INDIA

R.C. Das (PI)

Sub-Project: **Chemical and toxicological studies of some hazardous pollutants in sewage-fed fisheries of Kolkata**.

Subhendu Datta (PI) and A.K. Pal

Concentration of pollutants in the water medium of sewage-fed fisheries of Kolkata was much lower than the dilution factor. It was observed that raw sewage contains many pollutants, but on their way of transport through channels and/or after entering the oxidation ponds their concentration is reduced significantly due to adsorption on charged pseudo-colloidal clay and humus particles (particulate organic carbon) or complexation with dissolved organic carbon and co-precipitation with sediment. In the culturel ponds of sewage-fed fisheries, due to dilution with freshwater, concentration of pollutants was reduced further. In these ponds, water was hard in nature, which prevented pollutants to enter into the fish body due to precipitation or competition reaction of pollutants with hardening cations (e.g. Ca^{2+} and Mg^{2+}). In addition, high organic load in the water medium also competed with pollutants for biological receptor sites (e.g. fish gill, membrane).

In sewage-fed fisheries, fingerlings are raised for a maximum period of 6-9 months, but to bio accumulate the pollutants in the fish body beyond the permissible limits, two years time is required. Therefore, if there were some pollutants in sewage water, chances of accumulation into the fish flesh beyond the permissible limit is almost negligible. In this study levels of metals (Hg, Cd, Pb, As) in fish flesh were found to be below the permissible limits.

Arsenic- the major contaminant in drinking water of South Bengal and Bangladesh, was present in most of the waste water sample collected from sewage channels of Kolkata @ 0.1 ppm to 0.3 ppm. But in the culture ponds of sewage-fed fisheries of Kolkata, its concentration was below 0.1 ppm and fishes were found to be free from arsenic contamination.

Sub-Project: Development of aquafeed for ornamental fishes

Archana Sinha (PI), P.S. Pandey R.K. Biswas and A.K. Mondal

In this study, different non-conventional feed ingredients were selected and tested for their suitability as fish feed. Among them three ingredients,viz., soybean oil cake, fishmeal and wheat flour were selected as basal ingredients. For enhancement of colors, natural carotenoid sources such as china rose petals, marigold petals, orange skin, and *Spirulina* were selected as additives.

The feed comprise of 30% protein, 6% lipid and 8% moisture. The total feed was divided into five test diets

and different color additives were added to different test diets. One diet is kept as control without any color additive. These diets were also evaluated in relation to an imported ornamental fish feed *Tokyu*, for gold fish, black molly, guppy, angel and blue gourami. The observations were made based on the growth rate, survival, biochemical composition and carotenoid content in the skin and muscles of fish. Gold fish absorbed maximum carotenoids (231mg/kg) when fed with feed, having China rose petal @5 mg/kg as color ingredient. Similarly, Angelfish also absorbed maximum carotenoid content when fed with the same feed but, in guppy it was maximum (200 mg/kg) in feed having orange skin as the coloring ingredient (@ 5mg/kg) and in black molly it was maximum (320 mg/kg) in *Tokyu* feed. The enhancement due to color ingredients in gold fish, black molly, guppy and angel were 15.5%, 6.6%, 25% and 10.7% respectively. Addition of Spirulina @0.4% the carotenoid content was the maximum in blue gourami. Marigold petals could enhance the pigmentation in fishes but was found to be at second level. The cost of feed was calculated between Rs. 4/- to 5/- per kg since the non conventional feed ingredients were used with natural carotenoid sources and the possessing was done without using any mechanized tools. Entrepreneurs and hobbyists found this feed suitable for breeding and rearing of ornamental fishes. Application is submitted for grant of patent to the developed feed.

Sub Project :Conceptual framework of a working model of a Women fisher group at a Selected village in W.B.

Arpita Sharma (PI), U.K. Maheshwari, S.N. Ojha and

P.S. Pandey

Women's role in fisheries is very important but their work is not given its due recognition. It is necessary to sensitize and organize women to work in groups. With reference to this a study was performed in a village Tapuriaghata, Kolkata with objectives of generation of information on profile of women of fishing village, identification of problems and training needs of women, formation of women's fisher society, imparting training, to study the work of women, workload measurement and ergonomical evaluation, perception of module on need based techno-organizational training and conceptualization of a working model of a women fishery co-operative. For this, various qualitative and quantitative parameters were studied. Qualitative parameters were studied by questionnaire, observation, focused group discussions, meetings etc. Information was collected form a total of 237 women. Categorization of socio-economic status was done. Quantitative parameters included physiological issues, temporal study, anthropometrical study, biomechanical study and environmental parameters with different instruments. Environmental parameters namely temperature, humidity, sound, air velocity and illumination prevailing indoors and outdoors were measured with the help of instruments hygro-thermometer, sound level meter, lux-meter and anemometer respectively in months March to September. Data was recorded hourly from 9.00 A.M. to 5.00 P.M and compared with standards. Time devoted for activities was noted with a stopwatch and a time activity diary. For anthropometry study height and weight parameters (N=141) were recorded with help of accutape and weighing machine. For physiological study hourly heart rate was measured by polar heart rate monitor Accurex II for a total of 41 women. For biomechanical study flexicurve (N=41) was used. As regards to the village the results revealed that the village has no pucca road, community water taps are present in the village. There is a primary school but no health checkup facility. Only few women members are included in the existing fishery co-operative on compassionate grounds. Profile of village women revealed that average

age of women was 30.82 years, 40% were illiterate, 8.33% were unmarried, 35% had joint family setup, head was male (husband or father). Income information revealed that family income was Rs. 1680.51/month, out of this fishing income was Rs. 1149.28/month. But it was reported that only 40% of male members were contributing full income to the family. Egnel's coefficient was calculated and was found to be 67.11. Most families had kuchha or semi pucca houses. From total scores obtained status categorization was done and it was found that most women belonged to middle and low socio economic strata. They reported problems namely infrastructural, financial, personal and unemployment. Identification of training needs was done and trainings were imparted on topics like preparation of Jute File Folders, tailoring, embroidery, stitching, Carp Breeding and Nursery Management, Preparation of Value Added Fish Products and Integrated fish farming systems. Women of the village were sensitized to form groups. Following this a registered women fishers scoeity 'Tapuriaghatta Nari Unyan Kendra' was formed. This was also registered as a smallscale unit and undertakes social welfare related activities like adult education, children's education, embroidery classes, participation in aids awareness programmes and anti drug campaigns. The project is having a significant positive effect on the women of the community. A website was deigned for this society www.geocities.com/tnariunyankendra. It is to be mentioned here that they have contributed small amount of money and have also opened bank account. Efforts were done to act as a catalyst for providing them financial assistance through some organizations. From the information collected and experience a working model having steps sensitization, initiation, participation, value addition, formation and registration, refinement, and evaluation was formed. It is a continuous process and should go on after the implementation stage also. Ergonomical studies revealed that, temperature and humidity in the village was in uncomfortable zone but air velocity is in the comfortable zone at most times of the day. Illumination and sound conditions are in comfortable zone. From the Body Mass Indicator value it was revealed that the weight of women could be categorized as normal. The mean back curvature angle during standing was 169.96^0 and during squatting the angle was 195.53^0. Physiological study revealed that the work of 'filling and bringing water' (3.51 $Kcal.min^{-1}$), 'snail collection / bathing', 'work of washing clothes', 'moping/washing of floor' (3.42 $Kcal.min^{-1}$) and 'fuel making' (3.48 $Kcal.min^{-1}$) categorizes into 'moderately heavy' activity while the other activities are 'light' activities. Out of the whole working hours the women (approx 16 hours) are devoting 5 hours of work i.e., 31.9 % of working hours which is 'moderately heavy'. If the rest period is excluded form total work hours then 36.6% of their work time is 'moderately heavy'. Women's involvement in fishery related activities are in work of snail collection, removal of meat form snail, marketting, sorting, pond maintenance like removal of leaves. Working hours of the women fishers devoted for snail collection can be categorized into 'moderately heavy' (3.42 $Kcal.min^{-1}$) activity. Removal of leaves for pond maintenance was a 'moderately heavy' activity. It is clear that women fishers are devoting time as well as energy towards performance of domestic as well as fishery related activities. Thus it is very clear that their contribution in fisheries as well as domestic activities is very important and it is an issue in itself not an extension, complementary or supplementary to other works. The women fishers society thus formed is successfully working and this model can be followed in other locales also.

Rohtak Centre

DEVELOPMENT AN DSTADARDIZATION OF TECHNIQUE OF GROW-OUT OF FINFISHES AND

SHELLFISHES AND SEED PRODUCTION OF FRESHWATER PRAWN AND MAGUR USING INLAND UNDERGROUND SALINE WATER

S. Raizada (PI)

Development of packages of grow-out practices of finfishes and shellfishes in low and higher saline underground water

S. Raizada (PI)

Grow-out of Freshwater Prawn

The grow-out of Freshwater prawn in low saline water (4ppt) which was initiated in June 2002 in one earthen pond of 0.16 ha pond and one cement pond of 0.05 ha pond was continued during the above said quarter. The length and weight data were collected and analysed on monthly basis up to six months growth period.

Grow-out of Milkfish

One year old yearlings of milkfish grown at the centres fish farm were further reared for another 11 months in high saline water of 22 ppt in an earthen pond of 0.1 ha. The stocking density was maintained 6500 yearlings per hectare. The initial average size of yearlings was length 260 mm and weight 225 gm. The pond was manured with cow dung and DAP at monthly interval and were also fed with formulated feed prepared on-farm comprising of soybean cake, ground nut oil cake, rice polish containing 25% CP and fed @ 2% of the body weight. After 11 months of culture pond, a production of 263 kg fish was harvested which equals to 2630 kg/ha/11 months with 92% survival. The total biomass produced in the second year was thus worked out to be 111 kg from the pond, which equals to 1110 kg/ha/11 month. The harvesting size of the fish was found length 38.43 SD ± 2.12 cm and weight 403 SD ± 84.29 gm with maximum growth of length 44.4 cm and weight 725 gm respectively.

Grow-out of Seabass

The grow-out of seabass, *Lates calcarifer* was initiated for the first time at the centre's farm in low saline water of 4.0 ppt. Two consignments of 450 advance fry and 3000 of early fry were transshipped from Mumbai and Chennai respectively during July and August months. The advance fry which was brought from Mumbai were stocked in two cement ponds of size 0.02 ha after an initial acclimatization of 5 days period @ 75 per pond i.e. 3750/ha. The fry were allowed to feed on tilapia, which was stocked prior to stocking of seabass seed. The fish was harvested after a 4 months rearing due to severe cold conditions in December 2002. A net recovery of 25 juveniles of average size 30 cm weighing 300 gm were obtained with 33% survival rate in the pond whereas, the other pond gave a survival of 7% only. The juveniles were shifted to deeper earthen pond to save them from severe winter conditions. This is the first reporting of culturing Seabass in inland saline water in northern India.

Grow-out of Grey Mullet

115 number of Grey Mullet (*Mugil cephalus*) early fingerlings were procured from CIFE Kakinada Fish Farm in July 2002 and stocked in 22 ppt saline water earthen pond of size 0.02 ha. The pond was initially manured with cow dung and DAP and the fish were fed on formulated diet comprising of soybean cake, ground nut oil cake and rice polish @ 2% of their body weight. The stock was harvested after 4 months due to severe winter conditions in December 2002. A net production of 26.6 kg fish counted 100 in number was harvested from the pond. After 4 months of

rearing a growth in length 29.53 SD ± 1.70 cm and weight 266 SD± 49.9 gm was obtained with 90% survival. The Grey Mullet is also reared for the first time at the farm with very encouraging results. More trials will be carried out in the coming season.

Sub-project : Development of hatchery technology of Giant freshwater prawn using inland sub-surface water

S. Raizada (PI)

This project was initiated in August 2002. The brooders were procured from Neral, Maharashtra and air-lifted. The brooders mated successfully in inland saline water of 4 ppt in indoor hatchery and berried females were used for larvae production. Since, the larvae did not proceed beyond the III larval stage, an experiments was initiated to rear larvae using various levels of hardness of water ranging from 800-3200 mg/l. eggs of 5-6 females were reared in different levels of hardness but the larvae did not cross the III stage of larval development. This experiment confirmed that the higher levels of hardness in inland saline water may not limit the development process of larvae. Due to shortage of brooders this work was postponed to next season. However, 1250 brooders of prawn have been raised, to commence hatchery seed production of prawn in the coming season.

Sub-Project : Seed production of Asian catfish (magur) in inland saline ecosystem

N.K. Chadha (PI)

The magur hatchery was fabricated and installed at the centre. Efforts were made to procure brood stock from Lucknow and a total of 35 nos. of magur and 100 Nos. of Singhi were procured and stocked in 0.02 ha cement pond. An attempt to breed magur was also made but there was no response as the condition of brood fish was not good.

Procured 2000 seed of average size 1 cm of magur from CIFE Kakinada Centre on 2nd September 2002. The seed was initially reared in FRP tank for 10 days after which 50% survived. 1000 seed were stocked in a cement pond of 0.02 ha size when they attained 2 cm length. The seed was cultured on formulated feed to assess the growth in saline ground water (4 ppt). Till December 2002 they attained growth of 8-10 cm in length but survival was poor which was further affected due to severe winter with low temperature of 0°C for six times in January 2003.

The pond water quality parameters recorded varied temperature 8-33°C, pH 8.4-8.6, DO 6-11.4 mg/l, CO_3 8-16 mg/l, HCO_3 90-220 mg/l. salinity 4-5 gm/l, chlorides 1560-2060 mg/l and hardness 1200-1560 mg/l.

Sub-Project: Recycling of seepage water through sub-surface drainage system in the fish ponds for semi-arid region.

A.K. Verma(PI)

A model was constructed in a nursery pond at the centre where pits at various gradients were formed and laid with perforated PVC pipeline. This pipe line was connected to another large pit to received the seepage water from the pits constructed at various gradients. The seepage rate at various gradients was tested and its performance was evaluated. The study indicated that approximately 35% of the seepage water could be collected through bottom seepage in a well and may be recharged through a small energy consuming pumping device for saving nutrient rich water.

Kakinada Centre

EXPERIMENTS ON ECO-FRIENDLY CULTURE PRACTICES IN BRACKISHWATER AQUACULTURE

G. Venugopal (PI). K. Muralimohan, P. Srinivasa Rao, V.N. Acharyulu and P. Satyanarayana

Experiments on *P.monodon* culture in monoculture and polyculture: Successful crop of *P.monodon* was achieved in monoculture and polyculture system adopting eco-friendly farming method during the period July-Nov.2002. In the context of outbreak of WSSV in and around Kakinada area, where most of the farms lost the crop due to virus infection, the results obtained in the research projects assume special significance. During 126 days of culture period in monoculture a production of 667 kg/ha to 738 kg/ha of *P.monodon* was recorded. And in polyculture *P.monodon* production of 309 kg/ha was obtained. While the *Chanos chanos* recorded a production of 476kg/ha in the polyculture.

Experiments on monoculture of Milkfish: Naturally procured seed was reared up to fingerlings stage and experiments on monculture were taken up in grow-out ponds. The results obtained indicate the production range of 538.75kg/ha to 625.5kg/ha. in 210 days.

Experiments on Seabass culture: For the first time Seabass culture using the formulated artificial diet was attempted during the year 2002-03. The Nutrition division of CIBAChennai has provided formulated diet to CIFE, Kakinada for culture experiments. The larvae of Seabass was weaned to mash feed in the initial stages in the hatchery and subsequently the same feed was continued in nursery pond for a period of 75 days. Later the fingerlings obtained from nursery pond were shifted to grow-out ponds and culture experiments using pelletted feed sinking and floating were attempted to test the acceptance and efficacy. CIBA Chennai is analyzing results for further refinement of the feed. A part of stock was acclimatized to freshwater and it was cultured in freshwater fish farm, Balabhadrapuram.

Powerkheda Centre

INTEGRATED FARMING OF CERTAIN FINFISH, LIVESTOCK AND AGROCROPS

Somdutt (PI), S.S.H., Razvi, K.B.S. Murthy, R.K. Upadhyaya, V.H. Dubey and Gurubachan Singh

Total fish sale during this year was 864 kg of worth Rs.29,223/-. The requirement of farm yard manure as waste product of above proposed livestock was to some extent compensated by the inhabiting birds on tanks bund trees as approximately 1,000 birds (both migratory and local) nests in trees along bund side and their litter in tank making it sufficiently rich in nutrients to support the culture of fishes with very low inputs. Even if 50% of estimated daily excreta of appr. 30 kg from these birds goes to pond water, nearly 450 kg bird litter is added to his pond every month and thus very well compensated for above proposed liverstock in terms of farm yard manure on input of integrated farming system. The wheat produced 31.80 qt was sold and revenue of 20,991/- was generated during this financial year.

Externally Funded Project

INTEGRATED AQUACULTURE FOR SUSTAINABLE RESOURCE MANAGEMENT IN BIOVILLAGES. (Funded by The Department of Biotechnology)

S.N.Ojha, A.K.Reddy, A.Landge, Chandrakant, M.H. and Chandraprakash

Selection of 3 SRFs was made on 01.11.02 and I SRF from the local area was made on 01.02.03.Concept was further improved after making some appropriate reviews Base line survey was conducted. Illustration Based Training Manuals on Carp Culture, Freshwater Prawn Seed Production, Ornamental Fish Culture and Integrated Fish farming are under progress Efforts to build consensus on appropriate sites for taking up the fisheries activities were taken up in accordance with Panchayat rules.

During the time of the base line survey when the project team came in further close contact with the Panchayat leaders and the villagers, the issues of associating fisheries with temple activities and tourism started figuring up as a sentimental issue, probably as a vote catching activities, because of which following deviations of the village leaders are observed. However, the project team felt that if a temple tank and anther tank, which the villagers mark for tourism, can be taken up as a culture pond, both, the villagers and the project will be benefited. Otherwise they even may not support the project properly.

Deviation from the project objectives: 1) Deweeding and renovation of village temple pond of Kurul village (3 ha) was not mentioned in the project objectives2) Renovation of the village pond of Versoli also needs to be included in the objectives as it is observed that renovation is essential to increase the water holding capacity and productivity. For this an additional amount maybe needed.

Considering the difficulties the project area is being shifted to Thane district.

Prioritisation, monitoring and evaluation work under NATP.

A preliminary attempt to prioritise research in Indian fisheries sector using the models of research prioritization was tried. For this, proceedings of various national and international seminars, and published research reports and papers were reviewed in order to find out the policy implications suggested by the experts in this field. MoSCoW system was modified to suit the requirements. The prioritised fields were classified on the basis of aqua-ecological zones (inland and marine) as well as, existing disciplines in fisheries.

CYTOGENETIC AND MOLECULAR CHARACTERIZATION OF GIANT FRESHWATER PRAWN *MACROBRACHIUM ROSENBERGII* (Funded by AP CESS Fund, ICAR)
W.S. Lakra (PI)

Genetic characterization of five populations of *M. rosenbergii* was carried out using morphometric characters and allozyme polymorphism. The populations were collected from

- Ulhas river - Maharashtra
- Narmada river - Gujarat
- Godavari river - Andhra Pradesh
- Ganga river - West Bengal
- Daya river - Orissa

The dendogram below constructed from the Nei's genetic distance values calculated form isozyme data from 14 loci shows the genetic relationships among the five populations. The studies indicate existence of sufficient genetic variability to make a genetic improvement program for the species feasible.

IN-SERVICE TRAINING PROGRAM IN FISH MOLECULAR BIOLOGY (Funded by: Department of Biotechnology, Government of India)
S. Ayyappan (PI), W.S. Lakra, Gopal Krishna, A. Choudhari, S. Jahageerdar, S. Akare and R.S. Rana

Fish Genetic and Biotechnology Division at CIFE, served as the Nodal Centre for coordinating activities like advertising, recruiting candidates, designing certificates, etc. for this project being simultaneously run at CIFT and CIFA also.

Apart from the Course Work component the three students worked on the following six month projects.

- Genetic characterization of *Heteropneusteus fossilis* using morphometric and RAPD markers
- Identification of a Microsporidian parasite (*Agmasoma* spp.) specific DNA with potential application as a diagnostic probe
- Genetic Characterization of East and West Coast populations of *P. merguensis*

WOUND HEALING, ANTINEOPLASTIC AND ANTIOXIDANT COMPOUNDS FROM TWO MARINE CRINOTOXIC FISHES (FUNDED BY CGP/NATP)

K. Venkateshvaran (PI), S. Ayyappan, S. Mukherjee, G. Venkateshwarly, Asha Landge, Nalini Poojary

The quantity of mucus swabbed from fishes in a given month varied in quantity depending on the size of the fish. Upon lyophilization, mucus yielded 300 to 500 mg of crude toxin in powdery form. The highest protein content in the crude toxin was 363 ìg/mg in the case of ***Arius dussumieri*** and 225 ìg/mg in the case of ***Osteogeneiosus*** *militaris.* Crude mucus extract of both the species exhibited toxicity when tested on mice. The crude mucus extract of *A. dussumieri* showed the highest toxicity at a dose of 0.30 ml and the mice were dead in 50 minutes. In the case of *O. militaris,* the most toxic dose was 0.50 ml with a death time of 80 minutes.

LD_{50} values of the crude mucus toxin were estimated to be 20.06 mg/kg and 26.30 mg/kg for *A. dussumieri* and *O. militaris,* respectively. Toxicity of partially purified mucus extracts of *A. dussumieri* upon i.p. injection to the mice revealed three lethal factors, one (U3) in unabsorbed and two (F5 and F8) in adsorbed fractions. Fraction F2, F4, F6, and F7 were not lethal but elicited the symptoms of toxicity. In the case of *O. militaris,* fractions U4, F7 and F10 were lethal to mice upon i.p. injection. Fractions U1 and F6 were not lethal but showed the symptoms of toxicity.

Hemolytic assay conducted against chicken erythrocytes showed the crude mucus extracts as well as partially purified fractions of both fishes to be hemolytic. Crude as well as partially purified fractions of both the fish exhibited edematic activity.

DEVELOPMENT AND CHARACTERIZATION OF CELL LINES FROM SELECTED FISH AND SHELLFISH SPECIES USED IN AQUACULTURE (Funded by Department of Biotechnology, Government of India)

Primary cell cultures in *Lates calcarifer* and *Tor khudree* were developed in a time period of 10-15 days. Excellent results were obtained from the caudal fin in which fibroblast like cells grew successfully.

A cell line from mahseer, *Tor putitora* has been established and deposited at NCCS, Pune for the first time in India.

HUMAN RESOURCE DEVELOPMENT IN COASTAL BIO-RESOURCE DEVELOPMENT AND MANAGEMENT (Funded byNBDB/ Department of Biotechnology, Government of India)
S. Ayyappan (PI), W.S. Lakra and K. Venkateshvaran

Two national training programs were organized on Taxonomy, Genetics & Gene Banking of Coastal and Marine Bio-resources and Biodiversity, CIFE, 17 Jan 6 Feb 2002 and 18 Jun 8 Jul 2002. Four Mass Awareness Programs were organized in coastal areas.

DEVELOPMENT OF INTERACTIVE CD ROM FOR FISH DISEASES (FUNDED BY EDUCATION DIVISION ICAR)
Pani Prasad (PI), R.S. Biradar and D. Bhoomaiah

The interactive CD on fish diseases was developed. Viral, Bacterial, fungal and parasitic disease of fish, prawn and shellfish are covered. It gives information on symptoms and treatment of diseases..

TECHNOLOGY REFINEMENT PROJECT:TECHNOLOGY REFINEMENT OF AQUACULTURE PRACTICES IN SOME SELECTED BHERIS OF WEST BENGAL.
P.K. Roy (PI)

Investigation on various hydrobiological parameters, water management, normal stocking of *Penaeus monodon* with other varieties of fish and stocking of *P. monodon* alone were studied for a period of 90 to 180 days and work was completed in December 2001 in Panchgerii bhery of North 24 Parganas. Stocked species were *P. monodon, Mugil parsia, Oreochromis mossambica* and *Mystus gulio* and were harvested just after completion of 90 to 180 days.During experiments the water level of the bheris were maintained 2½ feet and 4 feet. At 2½ feet water level growth and survival of *P. monodon* and other varieties of stocked finfishes were satisfactory. At 2½ feet and 4 feet water level, stocking of *P. monodon*, *M. parsia* and *Orcochsomis mosambica* were 3000, 2000 and 15000 nos. per ha water area, respectively. Monoculture of *P. monodon* for a period of 180 days was conducted in 2½' & 4' water level. 40% survival achieved from 2½ feet water level whereas 35% survival achieved from 4 feet water level.

IMPACT ASSESSMENT OF WATER POLLUTION BY HEAVY METALS ON COMMERCIALLY IMPORTANT FISHES OF FRESHWATER ECOSYSTEM OF ROHTAK (HARYANA) (ICAR ad-hoc Research Scheme)

This research project is in operation at the Department of Biosciences. M.D. University, Rohtak and Dr. N.K. Chadha is working as Co-Investigator. Total 20 different village ponds in and around Rohtak were selected and monthly sampling of soil and water was done to study physico-chemical characteristics and levels of copper and zinc. An attempt was also made to assess the acute toxicity of copper and zinc to the fry of Indian Major Carps (Catl and Rohu). The LC50 values of copper and zinc in fry of catla were 0.25 mg/l and 0.60 mg/l and in Rohu it was 0.50 mg/l and 0.85 mg/l respectively.

OTHER RESEARCH ACTIVITIES

CIFE Mumbai

Culture of Freshwater Pearls

Culture of freshwater mussels*, Lamillidens marginalis* were operated for pearl formation at AFORD Private Fish Farm, Bramhapuri, Distt. Chandrapur, Maharashtra. During April, 2002 in all 713 mussels were operated. 533 were implanted with nucleus and 166 were implanted with images. During August, 2002 in all 286 mussels were operated. 108 were implanted with nucleus and 178 were implanted with images. The experiment is in progress.

Aquarium breeding unit

Following varieties of ornamental fishes were successfully bred in controlled condition in aquarium

breeding unit.

- ❖ Angel (Pterophyllum scalere)
- ❖ Blue Acara (Aequidens pulcher)
- ❖ Albino Severum (cichlasoma severum)
- ❖ Ramirez'™ Dwarf Cichlid (Papiliochromis ramirezi)
- ❖ Widow tetra (Gymnocorymbus ternetzi)
- ❖ Tiger barb (Capoeta tetrazona)
- ❖ Rosy barb (Puntius conchonius)
- ❖ Gold fish (Carassius Auratus)

Brackishwater fish farm, Kakinada

The following activities were taken up at backishwater fish farm, Kakinada.

Seed collection and rearing: Low-lying areas in and around Kakinada were surveyed and the following varieties of seed were collected. *Chanos chanos* --49,588 Nos. (15-25 mm), .*Mugil cephalus* --3,309 Nos. (20-35mm). Seed of *C.chanos* and *M.cephalus* collected from natural resources were stocked & reared in earthen ponds. During the rearing period, water quality was maintained through periodical water exchange and fishes were fed with mixture of rice bran & oilcake @ 2-3 % of Average Body Weight.

Monoculture of *Chanos*: This culture has been taken up in 0.1 ha pond @ 3000 no/ha (*Avg.Length 160mm /358 gm Avg. Wt.) stocking density. The fishes were fed with DOB + GOC (2:1 ratio) @ 3% of Average Body Weight. After a period of 4 months cultuare period 40.11 kgs of fish (213 nos) having the size of 295 mm in length/192 gm in weight were obtained with 71 % survival.

***Etroplus suratensis* culture:** Natural breeding of existing stock of *E.suratensis* is observed in the ponds and fishes were reared along with *Chanos & M.cephalus* . About 400nos of *E.suratensis* of 65mm/15gm were shifted to 0.08ha pond. The fishes were fed with DOB @ 2 % of Average Body Weight. Water quality is being maintained through water exchange.

Artemia culture: Artemia biomass culture is being maintained in 8 cement cisterns of 300 lit. Capacity at different salinity ranges. The stock is sustained on natural live feed, which was produced by using organic fertilizers. The culture aspects were demonstrated to visitors & trainees.

Freshwater fish farm, Balabadrapuram :

New Catfish hatchery developed: Dr.G.Venugopal, OIC, Sh.J.Krishna Prasad, T-5 & Sh.K.R.K.Reddy, T-4 have designed & developed a new hatchery model exclusively for hatching of eggs and rearing of larvae of Catfishes. The artificially inseminated eggs of Magur (*C.batrachus*) were introduced in the hatching cum larval rearing trays. After hatching larvae were continuously reared for 12 days in the same tray by using water flow-through system. Larvae were fed with Artemia nauplii, sieved zooplankton and specially formulated egg custard at regular intervals

The 12 days old harvested fry was stocked in cemented ponds for raising fingerlings. During the course of 30 days rearing the fry were fed with finely ground formulated artificial feed as well as natural fish food organisms. The water quality was maintained in conducive range. After 30 days, pond were harvested and realized 31,027 fingerlings in the size range of 45mm to 75mm with a survival of 53.49%. Induced breeding techniques, were adopted using portable circular hatcheries 21.75 lakhs of Catla , 18.25 lakh Rohu spawn & 4.0 lakh of Common carp were produced. About 17.5 lakh of Rohu spawn , 21.75 lakh of Catla spawn & one lakh of Common carp were stocked in nursery ponds.

Carp brood stock management: About 685 kgs of brood fishes of Indian & Exotic carps are being maintained in stocking ponds. Regular supplementary feed of DOB, Soyabeen, DOC, sunflower oil cake was given to the stock.
Singhi & Murrel brood stock management: 67 nos (8kg) of Singhi brooders and 18 nos of Murrel brooders are being maintained for future induced breeding studies. Fishes are being fed with formulated diet.

Freshwater prawn culture:

Scampi culture: A total of 42.25 kgs of Scampi were harvested from the culture ponds. About 5000 nos of seed were procured from Vijayawada and reared in cement nurseries. Juveniles obtained from nursery were stocked in earthen ponds and culture is being done to study the effect of artificial substrates on production potential. Regularly water quality was monitored. Artificial feed in the form of pellets was given thrice a day.

Malcolmsonii brood stock management: Katcha nursery ponds were prepared and kept ready to stock M.malcolmsonii adult prawns for using in the center's hatchery. Eleven nos having 150gr weights were procured from nearby village tank and stocked in katcha nursery pond. Regular supplementary feed was given @ 5%ABW.

Seabass culture: One earthen pond of 400 m^2 was prepared and stocked with 70 nos of Lates fish in the size range of 149mm / 41.53gm, after acclimatization. The culture is in progress and stock is being fed with sinking pellet feed supplied by CIBA, Chennai.

Experiments on culture of Magur with carps: Three nursery ponds of 0.02 ha each were prepared and stocked with Magur, Indian & Exotic Carps in combination of Rohu+ Silver carp, Rohu+Catla is being maintained. Regular supplementary feed was given @ 5% of Average Body Weight.

Ph.D. (Fisheries Resource Management)

1. Title: BIOLOGY AND STOCK ASSESSMENT OF SOME SCIAENIDS OFF PARADEEP COAST

Student: SATYAJIT KUMAR BHUYAN (FRM)

More than 16 species of sciaenids are identified from the commercial catch at Paradeep. The species of the present study *viz. Otolithes ruber, Johnius* carutta and *Pennahia macrophthalmus* contributed around 50% of total sciaenids catch at Paradeep. The sciaenids catch was dominant during September to May. Employing von Bertalanffy growth equation, O. *ruber* is estimated to grow 249, 377, 422. 475 and 486 mm in length at the end of 1, 2, 3. 4 and *41/2* yrs respectively. J. *carutta* attains a length of 183. 276, 288. and 295 mm at the end of 1. 2 and *31/2* yrs respectively. Similarly *P. macrophthalrrlus* attains a length of 192, 267 and 295 mm at the end of 1, 2 and 3 yrs respectively. The maximum size recorded for O. *ruber,* J. *carutta* and P. *macrophthalmus* in the catch was 484, 292 and 286 mm respectively. The growth parameters estimated by different methods reveals that O. *ruber* is a fast growing species followed by *P. macrophthalmus* and J. *carutta.* The fishable lifespan based on the Lmax recorded of O. *ruber.* J. *carutta* and *P. macrophthalmus* estimated to be 4.39, 3.22 and 2.54 yrs respectively. The total mortality rate is estimated to be 3.02. 3.79 and 4.34 for O. *ruber. J. carutta* and *P. macrophthalmus* respectively. The natural mortality rate is estimated to be 1.049, 1.41 and 1.81 for O. *ruber,* J. *carutta* and P. *macrophthalmus* respectively. The fishing mortality is estimated as 1.97 for O. *ruber,* 2.38 for J. *carutta : and 2.53 for P. macrophthalmus.* Exploitation rate and exploitation ratio are estimated as 0.62 and 0.65 for O. *Tuber,* 0.61 and 0.63 for *J. carutta* and 0.54 and 0.55 for *P. macrophthalmus.* The length at first capture (Lc) is estimated to be 221.82 mm for O. *Tuber,* 152.50 mm for *J. carutta* and 154.02 mm for P. *macfophthalmus.* The Emax was above 0.65, as estimated by knife-edge selection and 0.60 using selection ogive for all the three species. From the estimated exploitation ratio, it indicates that there is no scope of increase in E as they are already more than the optimum level, except P. *macrophthalmus,* where E is around 0.55. So while increasing the E to 0.65 there is decline in catches as the biomass is reduced to 20% of the virgin biomass. Length cohort analysis shows that the middle length group fishes are fully exploited in the commercial catch rather than smaller and larger length group. The maximum F of 4.60, 4.80 and 3.05 was obtained for O. *Tuber, J. carutta* and P. *macrophthalmus* respectively in the middle length group. The mean F from minimum length ranged from 0.73 in P. *macrophthalmus to 1.143 in J. carutta* with O. *Tuber* lying in between with a value of 0.89. Thomson and Bell long-term prediction analysis indicates that for all the three species at the present level of exploitation no decline in catch is noticed. In O. *Tuber* immediately after the present level of fishing, the decline in catch was noticed. For *J. carutta,* increase in effort by 40% of the present level shows no decline in catch. In P. *macrophthalmus* it is still interesting, even increase of effort by 400% resulted no decline in catch. However, for all the species the biomass has already shown a decline. Thus for the benefit of stock it is better to continue fishing at the present level only.

2) Title: BIOCHEMICAL, IMMUNOLOGICAL AND MOLECULAR PROBES IN STRESS WITH APPLICATION OF AN ANTISTRESS FORMULATION ON GENETICAIIY DIFFERENT FIN FISH

Student: NIRUPAMA CHATTERJEE (FRM)

The aim of the present study is to develop an antistress formulation to reduce stress and mortality during transportation of live fresh water finfishes. This formulation is a mixture of minerals, sedatives, buffers, immunostimulants and antioxidants. It was prepared keeping in mind, the stressors encountered during transportation and changes in the physiology of the fish thereof. The formulation aims to reduce stress by

maintaining water quality, maintaining the metabolic rate and homeostasis, preventing immunosuppression and oxidative injury. Biochemical, immunological and molecular parameters were assayed to assess the effect of stress on the physiology of fish, and to test the efficacy of the formulation in ameliorating the stress effects. The results of biochemical studies indicated lower levels of glucose, cholesterol and higher levels of lipid, phospholipid, and triglycerides in the antistress treated fishes. The activity of lactate dehydrogenase, malate dehydrogenase, glucose 6 phosphatase, fructose 1, 6 biphosphatase, aspartate amino transferase, alanine amino transferase and adenosine triphosphatse was lower in the antistress treated fishes, where as the activity of acetylcholine esterase, glucose 6 phosphate dehydrogense was higher in the antistress treated fishes as compared to control. The activity of aldolase did not show any significant difference between treatment and control. Among the immunological parameters studied, nitroblue tetrazolium reduction by phagocytes and the number of lymphocytes was higher in the antistress treated fish. Heat shock protein 70 was expressed in the fish after 24 and 36 hours of crowding and confinement in both the groups but not at 12 hours. The histopathology of liver tissue indicates that the antistress formulation does not cause any damage to the liver tissue. The formulation reduces the oxygen consumption and, increases the higher temperature tolerance of the fingerlings. The following conclusions can be made from the results obtained. The antistress formulation maintains the metabolic rate and homeostasis, prevents Immunosupresslon, does not damage the vital organ liver, maintains the oxygen consumption rate and increases the thermal tolerance. The formulation has given excellent results in several field trials conducted allover the country. Several leading fish hatchery owners and government officials recommended it for commercialization. The know-how of the formulation has been transferred to private sector by the Central Institute of Fisheries Education. The formulation has been submitted for patent to the Indian Council of Agricultural Research, New Delhi.

3) Title: COMPARATIVE FERFOF\MANCE OF INDIAN MAJOR CARPS *(Catla catla, Labeo rohita* AND *Cirrhinus mrigala)* IN SOUTHERN RAJASTHAN

Student: NEMI CHAND UJJANIA (FRM)

1. Climate of southern Rajasthan is characterized by low temperature during the winter (Dec. - Jan.) and high temperature during the (summer (April - June), high humidity and relatively low rainfall.
2. The water of all the waterbodies was found to be alkaline (pH above 7.0) and favorable in terms of nutrient status and total alkalinity.
3. The Net primary productivity was observed to vary from 0.063 to 0.19 gCm-3hr-1 during different seasons of year being highest during April to June. It indicates of high productivity status of the waterbodies of southern Rajasthan.
4. The conversion ratio of productivity into the fish production was found to be 0.06 %, 2.83 % and 3.23 % comparatively for MBS, SD and AP.
5. A network of various morphometric characteristic on the basis of landmarks of 'Truss network' on the body of fish was developed for all the three species of carps from all the three types of waterbodies. On the basis of 'Truss network' and application of ANOV A both on variables of body sizes and body shapes it was observed that C. *calla* of MBS was different from AP but much close to C. *catla* of SO. The *L. rohita* of these 'waterbodies was observed to have a significant difference in shape whereas, no variability was observed in the body shape of C. *mrigala* of all the three waterbodies.
6. All the landmarks of the 'Truss network' were observed to have a strong correlation with each other and also with standard length of fish body. On the basis of this it is concluded that all the landmarks of 'Truss network' contribute significantly to the body shape of the fish.

The principal component analysis further supported this theory. However, on the basis of PCA it could be observed that intra species \/ariability exists in between three three waterbodies.

7. The growth estimations on the basis of scale studies indicated that the growth rate of all the three species was very low in initial years but it was compensated by fast growth on an average by fourth year onwards.
8. It was observed that in all the waterbodies the fishes attained the harvestable size at an age of 1 to 2 years but the harvesting of fish at these sizes is not considered economically viable. Hence, it is not recommended to harvest the fish before three years in the waterbody of southern Rajasthan specifically large reservoir such as Mahi Bajaj Sagar. 9. The fecundity of the carps was observed to be comparatively high in the waterbodies of southern Rajasthan as compared to the waterbodie of coastal and central part of India. It may possibly be correlated with high temperature and high productivity of the waterbodies of southern Rajasthan.
10. The allozyme analysis could reveal the genetic distance between the three populations of individual carp species, even where the morphometric parameters were non-significantly different. The distances fall in the range expected for sub-populations of a species.

On the basis of all above studies it could be concluded that morphological, physiological and biochemical variability are found in the C. *cat/a, L. rohita* and C. *mriga/a* of waterbodies of three different sizes located in southern Rajasthan. But, all the variability appears to be environmentally manifested. It is further concluded that waterbodies of southern Rajasthan are highly productive and are not being used to their potential. Hence, they need better management strategies to improve the fish production.

4)Title: VALUE ADDED PRODUCTS FROM LOW COST FISH

Student: SHIV KUMAR SHARMA (FRM)

The flavour active components from prawn heads waste were extracted by different methods viz. through myofibrillar protein extraction using 0.67 M Nacl pollution (7.0/100g), enzyme treatment using papain (5.1 Og/1 OOg), fat extraction (1.80g/100g), sacroplasmic protein (water soluble protein) extract (3.00g/100g), using 3% salt solution (8.20g/100g), using 5% salt solution (1 0.20g/100g), by boiling for 10 minutes (3.20g/100g) and boiling with 3% starch and 3% salt solution (54g/250g) were conducted and the best procedure was chosen after chemical and organoleptic evaluation for the extraction of prawn flavour. The same extracted flavour was used to develop a prawn- flavoured corn extruded product. The extracted flavour from prawn heads in dry powder form was packed in aluminium foil and its storage life studied. Up to 4 months the flavour was in very good acceptable form.

The volatile flavour components of different portions namely head, whole and muscle of prawn *(Solenocera indica)* were collected by a combination of distillation extraction techniques using different methods viz. myofirillar protein extract using 0.67 M Nacl solution (27 compounds), among these 10 Alcohols, 1 Aldehyde, 1 Phenol, 7 Hydrocarbons, 1 ester and 4 Ketones were identified. Distillation of sacroplasmic protein extract yielded 7 compounds among these 2 Phenols, 2 Aldehydes, 3 Hydrocarbons were identified. Distillation of 3% salt yielded 6 compounds, among these compounds 1 Phenol, 2 Esters, 1 Alcohol, 2 Hydrocarbons were identified. Distillation of 5% salt extract yielded 8 compounds, among these compounds 2 Phenols, 2 Esters, 2 Alcohols, 5 Hydrocarbons were identified. Diethyl ether extract yielded 43 compounds, among these 12 alcohols, 5 Aldehydes, 3 Esters, 2 Ketones, 2 Phenols, 13 Hydrocarbons and 6 miscellaneous compounds were identified. Distillation of prawn heads in acidic pH yielded 16 compounds, among these 4 Alcohols, 8 Hydrocarbons,

1 Phenol, 1 Ester, 1 Ketone and 1 Miscellaneous compounds were identified. Distillation using alkaline pH (16 compounds), 4 Alcohols, 7 Hydrocarbons, 1 Phenol, 1 Ester, 1 Keton, 1 Aldehyde and 1 Miscellaneous were identified. Extraction using combination of acid and alkaline pH yielded 18 compounds, among these 1 Pyrazine, 3 Alcohols, 9 Hydrocarbons, 1 Phenol, 1 Ester, 1 Ketone, 1 Aldehyde and 1 Miscellaneous compounds were identified. Isolation using Tenax T A column yielded 8 compounds, among these Bezeldehyde, Benzene 1,4-dichloro, Benzene, (1,3- propendiyl) bis"Ethanone, 1-phenyl ,Azulene, Butanediol, Nonadene (6.73%) and Ethyl benzene, were identified. simple distillation of prawn slurry head yielded 24 compounds, edible muscle slurry-22 compounds and whole prawn slurry 21 compounds. The volatiles copmpounds were separated by gas chromatography and identified by mass spectrometry in many different chemical classes. Changes in volatile compounds profile of prawn *(Solenocera chopril)* Y-irradiated at a dose of 2Kgy were investigated. The volatile flavour components of different portions namely head, muscle and whole prawn were collected by a combination of distillation extraction techniques and separated by gas chromatography and identified by mass spectrometry. Head portion had the lowest yield with 22 volatile compounds among which 3 ketones, 1 alcohol, 1 indole, 1 phenol, 3 esters, 11 hydrocarbons and 3 acids were identified. There were increases in percentages detected in 9 compounds as compared to non-irradiated control. Six numbers of identified compounds also recorded a decrease in the quantity as compare to non-irradiated control. In muscle where yield was maximum, out of 23 volatile compounds, 3 alcohols, 2 ketones, 1 phenol, 3 esters, 10 hydrocarbons and 4 acids were identified, the total number of 13 volatile compounds recorded an increase in the quantity white other 6 volatile compounds recorded a decrease. Yield of volatile compound from whole prawn was moderate with a total number 27 volatile compounds among these 3 alcohols, 3 ketones, 3 esters, 1 phenol, 1 indole, 11 hydrocarbons and 3 acids were identified. A total .number of 10 volatile compounds showed quantitative increase and total number of 10 compounds showed decrease in the quantity. The overall effect of irradiation of 2kgy dose on volatile flavour compounds of prawns was very small. Two extruded products were prepared using twin screw extruder- one with corn starch (80%) and 20% fish powder and another with corn starch and prawn flavour. Different trails were carried out changing different parameters to get a fish product with maximum expansion ratio and good soft crisp texture. The parameters studied were moisture, temperature, fish powder percentage, rpm and die- diameter. Using fish powder and corn starch and another similar product was developed using extracted prawn flavour developed in laboratory. Three different packaging materials with different specifications were used to determine the effect of packaging material using modifier atmosphere packaging during storage. Weekly analysis of the samples revealed that, moisture of the product slowly increased, but the rate of increase was faster in metalized polyester compared to alluminium foil. Up to 11th week all the products were crisp and very much acceptable. But on 12th week the product in metalized polyesters were less crispy than that in aluminium foil. So alluminium foil was found to be the best packaging material. It was found that when the moisture level crossed beyond 5% the products were less crispy. Below 5% moisture the products did not loss any crispness. However, the organoleptic evaluation did not identify any rancid flavour in the products even after 12 weeks. So if the products are packed by nitrogen flushing, rancidity will not be any problem.

Ph.D Programmes (Mariculture)

1) Title: BIOCHEMICAL STUDIES AND ENERGETICS OF THE SPINY LOBSTER *PANULIRUS HOMARUS (LINNAEUS, 1758)*

Student: ANIL KUMAR P.K (MC)

1. The estimated spiny lobster landings at Chennai Fisheries Harbour were 5532 kg during February 1999 and January 2000. Good landings were observed between July and January.
2. The landings comprised of *Panulirus homarus* (77.6%), *P. polyphagus* (15.2%), *P. ornatus* (5.0%), and *P. versicolor* (2.2%).
3. The high-value tail muscle constituted 28.9 :!: 0.3% of the total wet weight of P. *homarus.* The tail muscle realised from the landings of *P. homarus* was 1241.1 kg, and 1599.2 kg from the total spiny lobster landings during the 12 month study period.
4. The tail muscle of *P. homarus* yielded 242.3 kg, 32.3 kg and 5.0 kg of protein, lipid and carbohydrate, respectively, equivalent to 6.3 x 106 kj energy; and if all the 4 species yielded 312.3 kg; 41.4 kg and 6.4 kg of protein, lipid and carbohydrate, respectively, equivalent to 8.1 x 106 kj energy during the 12 months.
5. To determine the possible seasonal variations in the proximate composition, samples were collected every fortnight and the water, protein, lipid, carbohydrate, ash and energy contents were analysed in the tail muscle, hepatopancreas and exoskeleton of juveniles (50-100 g size) and maturing (150-200 g size) P. *homarus.*
6. In the hepatopancreas, the water, protein, lipid, carbohydrate, ash and energy contents were 63. 7 ± 1.8%, 56.3 ± 1.2%, 31.6 ± 1.8%, 5.6 ± 0.7%, 6.5 ± 0.9% and 24.6 ± 0.7 kj/g, respectively.
7. In the exoskeleton, the water, protein, lipid, carbohydrate, ash and energy contents were 37. 7 ± 1.7%, 3.5 ± 0.3%, 1.0 ± 0.2%, 1.7 ± 0.2%, 93.8 ± 0.4% and 0.09 ± 0.01 kj/g, respectively.
8. Laboratory experiments were conducted to assess the effect of starvation on the survival, hepatosomatic index, weight loss and changes in the proximate composition and energy contents in the tail muscle, hepatopancreas and exoskeleton of the normal and bilaterally eyestalk ablated P. *homarus.* The starved control P. *homarus* survived for 97.0 ~ 5.3 days but the ablated lobster for only 48.3 ± 4.8 days. The control lobsters did not moult; 3 ablated lobsters moulted once during the period of starvation.
9. The control starved *P. homarus* lost 37.1 % of the initial wet weight, whereas, the ablated lost 51.6% (which includes the weight lost through moult).
10. The dry hepatosomatic index (HSId) decreased from 4.72% to 1.75% in the control and to 1.64% in the ablated P. *homarus.*
11. In the tail muscle of the control and ablated P. *homarus,* the water, protein, lipid, carbohydrate, ash and energy contents changed from 72.9 to 79.4% and 85.5%; from 80.5 to 84.1% and 78.4%; from 10.2 to 5.1% and 6.1%: from1.9 to 1.1% and 1.7%; from 7.4 to 9.7% and 13.8%: and from 21.2 to 19.4 kj/g and 17.7 kj/g, respectively under starvation.
12. In the hepatopancreas of the control and ablated P. *homarus,* the water, protein, lipid, carbohydrate, ash and energy contents changed from 64.2 to 84.3% and 87.6%; from 55.2 to 65.2% and 65.2%; from 33.6 to 17.6% and 14.0%; from 6.0 to 5.3% and 5.7%: from 5.2 to 11.9% and 15.1%; and from 25.7 to 20.3 kj/g and 18.4 kj/g, respectively under starvation.
13. In the exoskeleton of the control and ablated *P. homarus,* the water, protein, lipid, carbohydrate, ash and energy contents changed from 36.4 to 37.7% and 37.8%; from 3.6 to 2.8% and 2.7%; from 0.9 to 0.4% and 0.3%; from 1.5 to 1.0% and 1.0%; from 94.0 to 95.9% and 96.1%; and from 0.08 to 0.03 kj/g and 0.03 kj/g, respectively under starvation.
14. The protein-energy ratio of the control and ablated *P. homarus* in the tail muscle, hepatopancreas and exoskeleton increased from 0.159 to 0.182 and 0.185; from 0.0898 to 0.1343 and 0.1479; and from 1.95 to 2.55 a,1d 5.51 respectively under starvation.

15. The effect of different food items *viz.,* shrimp, squid, clam and mussel on the food utilization of *P. homarus* was studied. The protein content was highest in the shrimp (68.6 ± 0.9%) and lowest in the clam (56.8 ± 1.3%). The lipid content ranged from 5.0 ± 0.7% (squid) to 10.2 ± 1.1% (mussel). The clam had the hlQhest carbohydrate content (24.4 ± 1.4%) and the shrimp the lowest (4.4 ~ 0.8%). Ash content varied between 18.1 ± 0.8% (shrimp) and 11.2 ± 0.6% (clam). Mussel had the highest energy content (18.3 ± 0.7 kj/g) and the shrimp the lowest (16.2 ± 0.4 kj/g).
16. The maximum feeding rate (263.45 ± 20.29 jig/d) was observed in the mussel-fed *P. homarus* and the minimum (209.62 ± 20.68 jig/d) in the squid-fed group.
17. Assimilation efficiency was very high in all the groups ranging from 96.7% to 98.2%.
18. Conversion rate excluding moult was highest in the clam-fed lobsters (23.9 ± 1.0 jig/d) and lowest in the squid-fed lobsters (14.6 ± 1.5 jig/d). The gross (K1) and net (K2) conversion efficiencies were10.2 ± 0.7% and 10.4 ± 0.7% for the clam-fed and 6.9 ± 0.1% and 7.1 ± 0.1% for the squid-fed lobsters. The conversion rate including moult was highest in the clam-fed lobsters (32.4 ± 0.9 jig/d) and the lowest in the lobsters fed with squid (22. 7 ± 1.2 jig/d). The gross (K1) and net (±) conversion efficiencies including moult 13.8 ± 0.8% and 14.1 ± 0.8% for the clam-fed and 1 0.9± 0.5% and 11.1 ± 0.5% for the squid-fed lobsters, respectively.
19. The metabolic rate was highest in the group receiving mussels (227.6 :!: 19.5 j/g/d or 0.47 ± 0.04 ml 02/g/h) and lowest in the squid-fed group (183.2 :!: 19.5 j/g/d or 0.38 :!: 0.04 ml 02/g/h).
20. The intermoult duration was longest in the squid-fed lobsters (52.3 :!: 2.5 days) and shortest (42.7 :!: 1.5 days) in the clam-fed lobsters. Live weight gain excluding moult was maximum in the clam-fed lobsters (66.0 ± 3.2 g) and very low in the squid-fed lobsters (33.9 :!: 0.9 g). The corresponding values including moult were 135.6 :!: 3.8 g and 91.0 :!: 10.3 g.
21. The estimation of energy budget for *P. homarus* revealed that 84.1 to 87.4% of the consumed energy was spent on metabolism, and 1.8 to 3.3% on excretion. Energy used for growth was 10.9 to 13.8% including moult and 6.9 to 10.2% excluding moult. It is estimated that 3.3 , to 3.9% of the consumed energy was used for production of moult.
22. Food Conversion Ratio (FCR) ranged between 2.74:!: 0.17 (clam-fed lobsters) and 4.08 :!: 0.06 (squid-fed lobsters) excluding moult and the corresponding values including moult were 1.33 :!: 0.06 and 1.53.

2) Title: BORING SPONGE INFESTATION ON THE MUSSEL *PERNA INDICA* KURIAKOSE AND NAIR 1976 FROM THE SOUTHWEST COAST OF INDIA

Student: SUNIL KUMAR P. (MC)

Out of a total of 10 species, 9 are seen as pests of brown mussel while one as pest of rock oyster.The following new distributional records have also been made during the present study. *Alectona millari* was here recorded from the Indian Ocean (Locality: Enayam); both *Thoosa hancocki* and *T. armata* were here recorded as pests of brown mussel; *Aka minuta* could be recorded as pest of pearl oyster at Tuticorin and *Halina extensa* was here confirmed as a boring species.

In order to get a synoptic picture of boring sponge infestation in brown mussel six centres were selected and samples were collected statistically. There was no sponge infestation on brown mussel collected from Kanyakumari; but the same noted at Enayam was the highest, 63.16 % and 42.6 % respectively during the first and second seasons. All other centres recorded lower incidence.

Two unconventional boring species *(Cliona*

lobata and C. *margaritifera)* appeared at Vizhinjam around 1980 and started spreading to all natural molluscan beds in and around Vizhinjam. These two new invaders, which were quite notorious for their devastating capacities elsewhere, have effected a sudden hike in the incidence and species composition of boring sponges in every bed. They competed with all conventional species of boring sponges in all beds and suppressed some initially activating others occasionally. In the competition between C. *lobata* and C. *margaritifera* (two new invaders) C. *lobata* dominated in almost all beds and suppression of C. *margaritifera* activated the spreading of C. *vastifica,* a conventional species. Such suppression of C. *margaritifera* indirectly helped to bring down the incidence to a lower level. The lower incidence noticed in the various beds at present may be due to tRis peculiar interaction. But at Enayam all the above 3 species are represented with equal vigor and this may be the reason for a higher incidence seen at Enayam.

. The present study, made after a period of 20 years from the date of first entry of boring sponges to Vizhinjam culture rafts, hence, may be taken as a follow-up on their distribution and abundance in the Indian beds during this interim period. Maximum number of boring sponge species was recorded at Enayam (8 nos.) while in all other centres their number fluctuated between 4 and 5.

Attempts were made to culture brown mussel in the Ashtamudi ke, Kollam, to trace out the pattern of migration of boring sponges to a cultivated) in an estuary.

At Vizhinjam, C. *lobata* (new invader) and C. *vastifica* (conventional ecies) occupied the first two ranks respectively (on rafts) while C. *margaritifera* cupied the third position. The incidence was found to be 23 % which is considerably high when compared to that in the wild stocks off Vizhinjam.

The boring sponge fauna of Ashtamudi lake comprised of one euryhaline ecies, C. *vastifica,* with an incidence of 18 %.

Of some 12 different diseases reported from the molluscan shells to-date, only 6 diseases could be detected during 3 present study. Of these blister formation is quite wide spread followed by ,coloration of mantle tissue and porosis (bifacial).

TEM studies made on soft tissue revealed an array of pathological manifestations. Distinct pathological symptoms like increased secretion of wandering secretory cells, haemocytosis, vacuolisation of mantle epithelial cells, sloughening of upper epithelial layer, increased activiry of lysosomes, rapid degeneration of organelles e nucleus, mitochondria etc, were evident in the host. Cytoplasm of infested tissue loaded with "electron dense bodes'. In adductor muscle myodegradative changes including fragmentation of muscle fibres, were common and this evidently affected the opening and closing of the shell valves of the live mussel.

3) Title: STUDIES ON THE REPRODUCTIVE BIOLOGY, BREEDING AND LARVAL REARING OF SELECTED MARINE ORNAMENTAL FISHES BELONGING TO THE FAMILY POMACENTRIDAE

Student: SREERAJ, G. (MC)

A study of the systematics of commonly available pomacentrids was conducted mainly off Vizhinjam on the south west coast of India. A total of 24 species belonging to 9 genera were collected of which 18 species were available along Vizhinjam coast. The species which were collected from Vizhinjam are *Abudefduf bengalensis, A. notatus, A. septemfasciatus, A.sordidus, A. vaigiensis, Chrtsiptera biocellata,* C. *unimaculata, Neopomacentrus cyanomos, N.nemurus, N. sindensis, N. taeniurus, Neoglyphydodon bonang, Plectroglyphydodon lacrymatus, Plectroglyphydodon leucozonus, Pomacentrus. caeruleus,* P. *pavo,* P. *adelus* and P. *proteus. Amphiprion sebae* was collected from Rameswaram,

Chromis viridis, Chrysiptera rollandi, Dascyllus aruanus, D. carneus, D. trimaculatus and P. *pavo* were collected from Minicoy. Among these *Chrysiptera rollandi, Neopomacentrus sindensis, Neoglyphydodon bonang, Plectroglyphydodon leucozonus, Pomacentrus adelus* and P. *proteus* have been reported as new records from Indian waters.

One of the most important aspects of the reproductive biology of pomacentrids is the phenomenon of sex change exhibited by many members of the family. Reproductive biological aspects of two species *viz., Amphiprion sebae* and *Neopomacentrus Grandmas* were investigated in the present study. Size frequency distribution of males and females clearly indicated protandry in the anemonefish and protogyny in the damselfish.

Histological analysis of gonads confirmed the ambisexual nature of the anemonefish testis. Gonads in the transitional stage contained lesser testicular area than ovarian areas. Ovaries with mature eggs did not contain any testicular tissue. This points to the possible irreversible nature of the sex change. However, ambisexual gonads were not obtained from *N. cyanomos.* So the sex transformation in *N. Grandmas* may be slower than that of the anemonefish. In the anemonefish a fully transformed gonad resembled a maturing ovary which may swiftly become a ripening ovary. The ripening ovary of both species contained mainly 3 different size groups of eggs and thus the egg development is mostly a continuous process enabling them to spawn throughout the year. In pomacentrids, sexual maturity and spawning are socially controlled. The anemonefish was monogamous and all other damselfishes studied were polygynous at least occasionally under captive conditions. Experiments were done using the above two species to observe whether two individuals of the initial sex that were kept together in a container were able to form a functional pair after transformation in one of them. Pairing and transformation was observed in anemonelish in all the three trials. However, in the case of *N. cyanomos,* both fishes in each group were functional or maturing females. Therefore more number of fishes of the initial sex may be required to cause a female to male transformation in one of them. From this, it is inferred that polygyny is favoured in the damselfish and monogamy in the anemonefish. The possibility of inducing a sex change in anemonefish was studied by removal experiments.The duration between the introduction of the subadult and first spawning after transformation varied between 61 to 135 days. All the five species - A. *sebae, N. GranDmas,* P. *caeruleus,* P. *pavo* and O. *carneus* - for which round the year data were collected exhibited continuous spawning without any seasonality. *N. nemurus* and *N. sindensis* also spawned continuously during the six month period of observation. The average number of eggs laid in a single spawning by the anemonefish was 569 :t 181.3 and ranged from 100 to 1450. The average annual fecundity of a pair was 10231 :t 1473 and the number of spawnings per year by a pair was 18.3 :t 2.01. The spawning cycle was mostly of 11 days for A. *sebae* and 12 days for o. *carneus.* All other species spawned continuously , and a clutch often contained eggs laid on different days. Average clutch size was 4065 :t 421.62 for o. *carneus,* 2656 :t 78.74 for P. *pavo,* 2867 :t 137.21 for P. *caeruleus,* 3611 :t 203.11 for *N. cyanomos,* 2788:t 282. 24 for *N. nemurus* and 4912 :t 276. 74 for *N. sindensis.* In P. *pavo* the new eggs were mostly laid contiguous to the existing clutch if the latter is one or two days old but laid as a separate clutch afterwards. Parental care was exhibited exclusively by male in all damselfish species whereas females also took part occasionally in clownfish. The early embryological development was studied for all species which spawned in captivity. The egg size and development were similar for the five species - *Neopomacentrus GranDmas, N. nemurus, N. sindensis, Pomacentrus caeruleus* and *P. pavao* The eggs were capsule shaped in all the above species and also in the anemone fish. In *D.*

carneus the size of eggs were less and also it was oval in shape. All the species laid demersal attaching type eggs typical to the family. The incubation period was mostly 7.5 to 8.5 days for anemonefish, 2.5 days for *D. carneus,* and 3.5 days for the rest of the species studied. Larvae were reared successfully for the five species: *Amphiprion sebae, Neopomacentrus GranDmas, N. nemurus, Pomacentrus caeruleus* and P, *pavao* The development of the larvae till metamorphosis was also studied for four species. The studies on reproductive biology and captive breeding have to be intensified to generate information required for the hatchery production of pomacentrids. Observations from the present study indicated that pomacentrids are a group of fishes of ornamental importance which can be maintained and bred in captivity rather easily but the larval rearing of many species other than anemonefishes is the most complicated aspect. Therefore, more thrust must be given to develop technologies of mass culture of appropriate live feeds and suitable larval rearing systems which can pave the way for the development of ornamental fish mariculture capable of meeting the increasing demand.

Ph.D Programmes (Inland Aquaculture)

1)Title: PURIFICATION AND CHARACTERIZATION OF VITELLOGENIN IN CATLA *Catla catla*(HAMILTON)

Student: BIPULENDU JENA (IAC)

The aim of the present study was to synthesize vitellogenin *in vivo* in immature catla by administering estradiol and purifying the E2 inducible protein from estrogenized sera of catla in its native state. Subsequently the protein was characterized at biochemical and also at molecular level by gel electrophoresis. Immunochemical detection of the protein was done in serum as well as in different tissues of catla using polyclonal antisera developed against the purified protein. Firstly, immature catla of body weight 100-200g were chosen for *in vivo* synthesis of vitellogenin. The fishes were injected with acetone dissolved 172 estradiol, in a coconut oil carrier. A dose of 50 µg(single injection) and 100 µg of estradiol (E2) per fish at weekly interval could enhance the serum vitellogenin level significantly from the undetectable level to a maximum of 0.6 *mg/ml* and 1.4 mg/ml respectively (as determined by alkali labile protein phosphorous assay). Simultaneously in response to E2 blood parameters like total protein and total lipid registered an increase of 14.5mg/ml to the highest value of 42.5 mg/ml and 18.01 to 62.05 *mg/ml* respectively in treatment groups. Vitellogenin from the above sera samples was purified by a selective precipitation method, followed by gel filtration chromatography. In short, to the 2 ml *of* E2 treated catla serum, 4 volumes of 0.02 M di-sodium EDTA (pH 7.7) and 0.3 volumes of MgCl2 (molar ratio 1:2) was added. The mixture was kept overnight at 4°C. The precipitate after centrifugation was dissolved in 0.O2M Tris HCl buffer (pH 7.4) with 5% sucrose and was loaded onto a column (1.5 X 28 cm) of Sephadex G200. Two ml fractions were collected and absorbance of the eluted protein was monitored. Upon elution, two distinct peaks were observed. The first peak contained the VTG as determined by the alkali labile protein phosphorous content of the pooled fractions. Purified protein was concentrated in a centrifuge filter. Around 400-600 µg of protein could be recovered from 2ml of E2 treated serum by this method. To determine the purity of vitellogenin, samples were run in native gradient PAGE with acrylamide concentration gradient of 2.8 to 22.5%. A single clear band was obtained.This protein was identified to be vitellogenin convincingly as the band stained positively with methyl green for phosphorous, sudan black for lipid and alcian blue for carbohydrate component of the molecule. This result confirmed the status of the molecule as phospholipoglycoprotein. The molecular weight of the native purified protein was determined to be 503.47 kDa. Under similar condition of purification and electrophoresis

the vitellogenin purified from the heavily estrogenized catla group, produced a double band in native PAGE. The molecular weight of the both the bands was calculated to be 503.47 kDa and 317 kDa. Both the bands reacted positively with the anti catla vitellogenin antibodies in western blot. However, the repeated occurrence of single continuous peak in gel filtration chromatography rejected its possibility of being a second form of vitellogenin. It is hypothesized that under the influence of high estrogen dc ses there might have been some modification within the native structure of the same molecule which showed the existence of sub populations of vitellogeniin with different degrees of non-covalent bonding. The second band was considered as a redox form of native VTG molecule. When the purified VTG subjected to 50S-PAGE (12% separating and 5% stacking) in the presence of a reducing agent 2-ME three major bands of molecular weights 120 kDa, -100 kDa and -72 kDa along with few minor bands were observed. All of those might have emerged out of vitellogenin as in western blot they reacted positively with anti-catla vitellogenin antibodies. Biochemical characterization of the purified protein showed that the protein bound phosphorus constituted 8%, lipid constituted 35% and carbohydrate constituted 15% of the purified protein. Differential staining (Methyl green, Sudan Black, and Aidan Blue) of catla sera in PAGE collected from different age and sex of fish revealed presence one more molecule in the sera of catla, apart from VTG which is phospholipoglycoprotein in nature. The molecular weight of the said protein was determined to be 245kDa c i under native condition. Immunoblot results obtained from natjve PAGE transfer of the protein showed that the molecule was different from VTG, as it did not react against the anti-catla vitellogenin antibodies. Polyclonal antibodies were raised in rabbits against purified catla vitellogenin. Each animal was injected subcutaneously with 200g of freshly purified protein in 400~1 of Tris HCI buffer, pH 7.4 emulsified in Freund's complete adjuvant, followed by two boosters at 14 days interval in Freund's incomplete adjuvant containing one and half times of the primary dose and in the same route of the primary injection. Blood was collected from the ear vein on 42nd day of immunization and the serum I separated was stored at -20°C for future use.

VTG like material was immunologically detected in liver of estrogenized catla and ovary of a gravid female catla. Using anti-catla vitellogenin rabbit sera a field based kit could be developed for sexing adult catla before the morphological distinction of sex could occur. Serum collected during the end of January and the first week of February gave indication for the presence of vitellogenin which could be used for distinguishing the female of the species. The specificity of vitellogenin antibodies with the serum of matured female fish, egg extract of brood catla and vitelline envelope protein was tested in western blotting. Standard procedure was followed for the irnmunostaining of the nitrocellulose membrane. The polydonal antiserum developed against purified vitellogenin was found to be specific that reacted positively with related compounds. The polydonal antibody raised in rabbits was used to develop an indirect ELISA for detection of vitellogenin in unknown samples. The optimal assay concentration for VTG antibody and the working conditions were determined. It was seen that in a normal sexual cycle of catla the vitellogenin concentration varied from 1.2 mg/ml to 5.0 mg/ml with the highest being in the month of May *i.e.* the peak of vitellogenesis and lowest during the month of February. Also quantification of vitellogenin of E2 induced serum showed that the level grew from non-detectable level to a maximum of 32.00 *mg/ml* in treated group.

M.F.Sc. (Inland Aquaculture)

1)Title: DEVELOPMENT OF RADIATION PROCESS FOR SHELF LIFE EXTENSION OF FRESH WATER FISH

Student: S. PANCHAVARNAM

Gamma irradiation at 1 kGy gave a shelf life of 28 days and 36 days in ice *for* l whole and steaks of rohu respectively, against a shelf life of 14 and 18 days *for* l respective unirradiated control samples. Irradiation at 2 kGy of whole rohu gave shelf life of 35 days. Acceptability of the samples was determined using chemical, microbiological and sensory evaluation. Washed rohu meat could be converted into a gel by lowering its pH with acetic acid. The .gel dispersion could be used as an edible coating to enhance the chilled shelf life of rohu steaks. Irradiation at 1 kGy in conjunction j with dispersion glazing further enhanced the refrigerated shelf life of the fish steaks. The enhanced chilled shelf life is beneficial in better distribution of the fish and aquatic fishery products to the interior consumer centers.

2)Title: BIOMEDICAL COMPOUNDS FROM FRESHWATER CATFISHES *OMPOK BIMACULATUS* (BLOCH, 1797) AND *MVSTUS VITTATUS* (BLOCH, 1797)

Student: A. KATHIRVELPANDIAN

The present study was conducted with the aim of understanding the toxicity and the biomedical activity of the freshwater catfishes, *Ompok bimaculatus* (Siluridae) and *Mystus vittatus* (Bagridae). The specimens were obtained in fresh condition from the fish market at 4 Bungalows, Mumbai. In the case of *Ompok bimaculatus,* the average size and weight of the fishes were 28.5 cm and 153.8 g while in the case of *Mystus vittatus* the average size and weight of the fishes were 10 cm and 20.9 g. Using methanol extraction, 250 mg of crude mucus was extracted from *Ompok bimaculatus* and 610 mg of mucus was extracted from *Mystus vittatus.* The extracted mucus toxin was lyophilized and stored at -20°c for further use. Fractions of mucus toxin were obtained by ion exchange chromatography, using DEAE cellulose. Protein estimation was carried out by using Peterson (1977) method and the amount of protein in the mucus of *Ompok bimaculatus* was estimated as 1.76 *mgl* ml and in the fractions it varied between 0.172-0.332 *mg/ml;* the amount of protein in the mucus of *Mystus vittatus* was 1.94 mg/ml and in fractions, it ranged from 0.134-0.414 *mgl* ml. Male albino mice 20:.t2 g were used for mice bioassay. The lowest lethal dose for the mice injected with the crude mucus toxin of *Ompok bimaculatus* was found to be 0.6 ml at which death occurred in 3 minutes and 55 seco"nds, and for *Mystus vittatus* it was 0.4 ml and death occurred with in 3 minutes and 40 seconds. Restlessness, lethargy, frothy mucus from mouth, convulsion, and paralysis of hind limbs were the symptoms observed. In the histopathogical studies, heart of the mice envenomated with crude mucus toxin of *Ompok bimaculatus* had shown fragmentation of myofibrils, areas of vacuolation and gliosis in the brain. Distended bronchiole in the lungs, necrotic changes in the liver and scattered hemorrhages in kidney were observed. Granular appearance of liver with pleomorphic nuclei, gliosis in the brain, scattered hemorrhages in the kidney, congested vessels with hemolysed blood in the lungs were observed in the mice envenomated with the crude mucus toxin of *Mystus vittatus.* Both the toxins showed hemolytic activity, and for the *Ompok bimaculatus* specific hemolytic activity was 4.54 and for *Mystus vittatus* it was 8.25. The fractions did not show any hemolytic activity. Analgesic activity was also tested using tail flick analgesia meter; the crude mucus toxin of *Ompok bimaculatus* exhibited analgesic activity against control with AR values between 1.05 to 1.32, and

for the crude mucus toxin of *Mystus vittatus* it was 1.21 to 1.65. In the antibacterial activity, the mucus toxin of *Ompok bimaculatus* had sensitive reaction against *Aeromonas hydrophilla, Vibrio anguillarum* and *Vibrio parahemolytlcus* and among fractions 0.4M fraction had shown sensitive reaction against *Aeromonas hydrophila.* The crude mucus toxin of *Mystus vittatus* had shown sensitive reaction against *Aeromonas hydrophila, Pseudomonas florescens* and *Vibrio parahemolyticus.* fractions 0.2M and 1 M fractions had shown sensitive reaction against *Aeromonas hydrophila.* In the cell line bioassay, mouse muscular cell line (L929) obtained from National Centre for Cell Science (NCCS), Pune was used. In the cell line assay the morphological changes like granulation and rounding of the cells were observed. MTT assay was used to find the number of viable cells. The calculated t value were greater than that of t table value at 95% level of confidence, both the mucus toxins produced cellular changes at various dilutions (10-1 to 10-7)

3) Title : AXENIC CULTURES FOR MICROALGAE TO BE USED AS FEED IN AQUACULTURE

Student: ANAND, N.

A study was conducted to identify the best media suitable for axenic cultures for the Prasinophyte *Tetraselmis striata. Four* media were selected *viz*. F/2, Plain filtered seawater, artificial seawater, and Diatom medium. Over a continuous culture period *of* eight days, cellular density (cells ml-1) and chlorophyll content (g/ml-1) were checked. Maximum growth occurred in F/2 medium, wherein peak cellular density was observed on the fourth day and the maximum chlorophyll content on the sixth day. Cellular densities reached a peak *of* 1 x1 ^{07} cells ml^{-1} and the chlorophyll content reached a peak *of* 28 g ml^{-1}. The second best media was found to be Plain filtered seawater. The Diatom medium was found to be inferior to other media in terms *of* growth stimulation and chlorophyll content *of* the microalgae.

M.F.Sc. Mariculture

1) Title: CHARACTERIZATION OF HAEMOCYTES AND HAEMOPOIETIC TISSUE OF THE MUD CRAB *SCYLLA* SPP.

Student: SUSANTA KUMAR BEHERA

Characterization of the haemocytes in the peripheral circulation as well as in the haemopoietic tissue of *Scylla tranquebarica* and *S. serrata was* carried out, using factors such as morphology, cytochemistry and defense functions. Total haemocyte counts and differential haemocyte counts were estimated in 14 numbers of *S.tranquebarica* (7 males + 7 females) and 12 numbers of *S.serrata* (6 males + 6 females). Mudcrab haemocytes were characterized into 3 groups (Hyalinocytes, semigranulocytes/ small granule haemocytes and large granule haemocytes/ eosinophilic granulocytes) based on size, morphology, ultrstructure, presence of granules, number, size and staining reactions of granules. The total haemocyte counts (THC) ranged from 38 to 53X10^{6} cells/ml of haemolymph. There was no significant difference in THC between the two species or between males and females. Differential haemocyte counts (DHC) indicated that large granule haemocytes (LGH) are the predominant type of cells in the haemolymph, followed by hyalinocytes and then by semigranulocytes. DHC also did not vary significantly between species and sex. . Cytochemical studies indicated that all the three types of cells are positive for lipids with a more intense sudanophilia in hyalinocytes. All types of cells tested positive for carbohydrates also, with comparatively strong reaction in the granules of granular haemocytes. Only large granule haemocytes showed a positive reaction for

Prophenoloxidase, Peroxidase and Acid phosphatase. Alkaline phosphatase and Lysozyme could not be demonstrated in any of the cell types. . Light microscopical and ultrastructural studies on haemolymph clotting reaction indicated that hyalinocytes are cells initiating clotting and granulocytes remain intact for upto 5 minutes *in vitro* and by 10 minutes they showed signs of degranulation. . Studies on phagocytosis using various particles showed that, granulocytes are the cells, which readily adhere and spread to from a monolayer on glass surfaces and play an active role in phagocytosis of foreign particles. Among various particles like goat RBC, yeast and bacterial cells studied, goat RBC was found to be the best for studying phagocytosis by crab haemocytes *in vitro.* Ultrastructural studies on the haemopoietic tissue revealed that the differentiation of haemocytes begins in the haemopoietic tissue and also that the two categories of haemocytes, i.e., hyaline cells and granular cells represent separate cell lineages.

2) Title: EFFECT OF CRYOPROTECTANTS ON THE MORPHOLOGY OF FISH SPERMATOZOA

Student: BHAVANI, C. N. (MC)

An investigation was carried out to identify the best cryoprotectant for the spermatozoa of *Liza parsia* on the basis of morphological changes observed in Transmission Electron Microscopic (TEM) images. Male *Liza parsia (*10-12cm) were collected from the wild and milt collected by manual stripping. Motility score and percentage intact spermatozoa on TEM images were used for evaluation of sperm fitness before and after cryopreservation. A combination of 5% DMSO and 5% glycerol in V2E extender appeared to be better than 10% DMSO alone as cryoprotectant. Toxic effects of high concentrations of DMSO can be minimized by a combination of reduced quantity of DMSO and glycerol. Dead and live count of spermatozoa by Nigrosine-eosin staining combined with motility score is sufficient to evaluate sperm fitness and cumbersome tests can be avoided.

3) Title: STUDIES ON THE INFLUENCE OF ANDROGENS ON THE REPRODUCTIVE PHYSIOLOGY OF THE GROUPERS

Student: C. ANAND

E. diacanthus, a protogynous hermaphroditic grouper was used as a model fish to study the influence of the androgen, 17cx-Methyl testosterone (MT) on the reproductive physiology mainly with reference to sex reversal. Prior to conducting actual experiments to achieve the main objective, detailed studies in relation to the maturity stages of wild fish were conducted. These studies proved that *E. diacanthus* is a protogynous fish. For the experimental study on the influence of MT, three groups of fishes of 12 numbers were reared in similar rearing containers of 5 ton capacity provided with inbuilt biofilters. One of them was used as a control and the fishes were fed with a formulated diet without MT. Group two and three were fed with 0.5mg and 1.0 mg MT/kg body weight incorporated in formulated diets. Fishes were fed at 2% of their body weight. The fishes were reared for a period of 80 days. The special diet formulated for the experiment was observed to be eagerly accepted by the groupers. Periodically (25th day, 40th day, 60th day and 80th day of experiment) representative samples of fish from each group were sacrificed and their gonads subjected to detailed morphological and histological studies. The detailed data collected from the experimental fishes show that feeding of methyl testosterone was accompanied by a drastic shrinkage of the gonads. Gonads of control fishes remained roundish and bulgy. The shrinkage of the gonad of the experimental fishes continued till the 80th day of the experiment. The GSI of the 1.0 mg MT fed fishes

decreased gradually from 0.03 on the 25th day to 0.0258 on the 40th day. Further decrease in the GSI was very drastic. The GSI of the 0.5 mg MT fed fishes also decreased from 0.027 on the 25th day to 0.0148 on the 40th day. The GSI of the 0.5 mg showed a slight increase on the 60th day and again decreased on the 80th day. The GSJ values of the control fishes were always above that of the MT fed fishes.The detailed changes in the histology of the gonads in MT treated and untreated gonads were studied in detail. Initiation of the process of sex reversal with the gonads reverting to maleness could be seen on the 25th day in the MT treated fishes. Both the dosages initiated sex reversal and were equally effective. Sex reversal was complete by 40th day. Degeneration of the ovarian tissue continued from the 25th day till the end of the experimental period. Spermatogenic activities continued in the degenerating gonad tiil the 80th day. Inspite of the sex reversal, functional maturity of the testes did not take place in androgen fed fishes even on the 80th day.

4) Title: CHANGES IN BACTERIAL FLORA DURING STORAGE OF SELECTED AQUACULTURE FEED AND FEED INGREDIENTS

Student: RAJANNA, M. R.

Two fish feeds, one a commercial shrimp 'grower' feed (Feed I) and another a cost effective shrimp feed formulated at CMFRI, Kochi (Feed II) and three protein rich feed ingredients (fish meal, ground nut oil cake and soybean flour) were stored at room temperature and were analysed quantitatively and qualitatively for their bacteriological profile, on 0, 30 and 60 days. TPC of both the feeds were in the range of 2. *7x1* 03 to 8.8x104 cfu/g, whereas, TPC of fish meal was 2.7 to 5.12 x 103 cfu/g, groundnut oil cake 3.3 to 5.1 x 103 cfu/g and soybean flour 2.075 to 3.15 x 103 cfu/g during 60 d storage period. Vibrio spp., count in both the feeds was in the range of 2 x 101 to 6.2 x 101 cfu/g. Fish meal showed *Vibrio* spp., count in the order 2-3 x 101 cfu/g, ground nut oil cake had *Vibrio* spp., count in the range 3 x 101 cfu/g. t01.2 x 102 cfu/g and soybean flour in the range of 10 x 10' - 2.0 x 101 Faecal *streptococci* count was in the range of 2.9 x 101 to 4.5 x 101 cfu/g in Feed I, while, it was absent in Feed II. In fishmeal, it ranged from 5.1 x 102 to 6.5 x 102 cfu/g in groundnut oil cake it was found to be between 4.9 x 10' to 6 x 101,while it was absent in soybean flour during the storage period. *Esherichia coil* count was 3 x 101 cfu/g in the Feed I, whereas, it was absent in Feed II. Fishmeal has shown *E.coli* count of 2.0 x 10' cfu/g, groundnut oil cake 3 x 10' cfu/g and soy bean flour nil during storage. *Staphylococcus aureus* count ranged from 0 to $2.2x10^2$ cfu/g in Feed I, whereas, it was absent in Feed II. Fishmeal, groundnut oil cake and soybean flour had *Staphylococcus aureus* within 102 cfu/g during the 60 d storage period. Qualitatively, in both the feeds, *Micrococcus* was predominant, followed by *Arthrobacter* and *Bacillus,* with marginal decrease in *Micrococcus* and proportionate increase in *Bacillus* in 60d.In fishmeal, *Micrococcus* spp. (65-73%) was predominant, followed by *Arthrobacter* spp., (6-7.4%) and *Bacillus* spp., (5.3-5.74%). Gram-negative bacteria ranged from 15.7% to 22.0%. In groundnut oil cake *MicrococcUs* spp., (48 to 73%) was dominant, followed by *Arthrobater* spp (6-13.3%) and *Bacillus* spp., (2-13.3%). Gram-negative bacteria varied between 19.04 - 37.8%. In soybean flour, *Micrococcus* sp was dominant in the range of 42.8- 51.72%, followed by *Arthrobacter* spp. showing variation between13.79- 28.55% and *Bacillus* spp. in the range of 10.7 - 28.5%. Gram-negative bacteria showed slight reduction during storage (28.57- 24.13%). Overall, short-term storage of 60 days had no drastic effect on the bacterial flora of feeds and feed ingredients. Yet, the effect on long-term storage cannot be overruled, especially of qualitative changes. So, there is a wide scope in this area for further studies.

5) Title: PCR BASED GENETIC ANALYSIS OF *AEROMONAS HYDROPHILA* ISOLATED FROM THE AOUACULTURE SYSTEMS

Student: DIVYA P. R.

Molecular genetic characterization of *A.hydrophila* isolates from aquaculture systems was carried out using PCR - RAPD technique. DNA from 18 isolates were amplified with 10 numbers of Operon decamer random primers, of which five were found to generate reproducible RAPD patterns with several bands on resolving with agarose gel electrophoresis. PCR amplification of the DNA with these primers resulted in 46 amplicons which were consistent and reproducible. RAPD was found to have high level of discriminatory ability between isolates of *A. hydrophila.* Choice of the primer was found to be important as the discrimination ability of RAPD varied with the primer used for amplification. The usefulness of RAPD-PCR for the evaluation of genomic diversity was demonstrated. Two species specific amplicons generated by OPA-O1 were identified which could serve as species-specific markers. RAPD profile revealed considerable genomic heterogeneity within the species, which were otherwise homogenous in morphological and biochemical characterization. Polymorphism of the RAPD profile was evident. Each isolate had a unique pattern. Variations were evident in respect of the size and number of amplicons generated by the isolates. The overall polymorphism was 95.65 percent. No polymorphism was observed in the cellular protein profile as all the isolates had uniform pattern. The homogeneity of the cellular protein profile among all the isolates within the species indicates its usefulness as a tool *for* species identification. Nei's coefficient of genetic identities between the isolates estimated *from* POPGENE software were generally high, but did not reach unity and coefficients of genetic distances were generally moderate. Phylogenetic tree of the 18 isolates depicting the genetic relationship among them was constructed. While thirteen of the isolates were grouped into a major cluster, only four were in another cluster with a single isolate placed between the two. RAPD was found to be an attractive technique to evaluate interspecies genomic heterogeneity, which may remain hidden, by other techniques of characterization like morphological, biochemical and cellular protein profile.

6) Title: MANGROVE ECOSYSTEM BIODIVERSITY: A CASE STUDY

Student: S. EDWIN R.

Biodiversity of a mangrove ecosystem, Mangalavanam in the Cochin City has been conducted Tidal water enter in to the mangrove through a canal from the Vembanad lake, therefore the salinity is always comparatively low which is evidenced by the emergence of terrestrial vegetation in the mangrove ecosystem. True mangrove vegetation is represented by *Avicennia marina, Rhizophora mucronata and Acanthus ilicifolius.* The littoral flora comprises *Tectoma grandis, Mangifera indica, wietenia macrophylla, Artocarpus hirsute, Hydnocarpus aurifolia,* and *Artocarpus heterophyllus,* which. showed decrease of salinity in the water. The present study shows that while species diversity is less, population density of available species are more. Avian fauna comprised mostly species of little cormorants *(Phalactocorax niger)* and blue crowned night herons *(Nycticorax nycticorax).* The other arboreal fauna was dominated by Indian flying fox *(Pteropus giganteus).* The microalgae was dominated by species of acillariophyceae, which reveals more amount of silicate in the water, since silicate is essential for skeletal formation of diatoms. The respiratory demand of the aquatic community was more which was evidenced by average DO content of 3.5ml/l, despite the fact that phytoplankton was abundant in the water. Zooplankton community comprised copepods, amphipods, decapods, cladecera and mysids. The benthic community was

dominated by polychaetes and decapods. The finfish fauna comprised mostly brackishwater species such as *Chanos spp., Liza spp., Etroplus spp., 5ilago spp., Lethrinus spp.* and *Lutjanus spp.* The Crustacean fauna was dominated by *Penaeus spp., Metapenaeus spp., Macrobrachium spp., Acetes spp., Metaplex spp., Sesarma spp., Uca spp.,* and *Scylla spp.* The molluscan fauna was very poorly represented. A comparison between the present data and the past reveals that the mangrove area has been shrinked and number of resident species has been vanished. The major cause of the general degradation in anthropogenic activities, which resulted heavy cultural eutrophication in the ecosystem Trapping the juveniles of finfish and shellfish with different type of gears during the migration has also adversely affected the general fish fauna of the ecosystem. Topographical survey reveals that there are scopes for afforestation with true mangrove plants such as *Rhizophora spp.* for the reclamation and restoration of the naturality of this small saline biotope

7) Title: GENETIC PROFILiNG OF GROUPERS OF THE GENUS *EPINEPHELUS* (FAMILY: SERRANIDAE) USING DNA-LEVEL MARKERS

Student: GOVINDARAJU, G.S.

Sheared Principal Component Analysis (SPCA) and Discriminant Analysis of truss landmark distance measures were performed in *Epinephelus areolatus, E. bleekeri,* E. *chlorostigma,* E. *diacanthus* and E. *longispinis.* E. *diacanthus* is clearly differentiated from other species based on size and shape variations. Using truss morphometrics, the five species of the genus *Epinephelus* can be distinguished mainly based on variations in the area encompassing the vertical, horizontal and diagonal distance measures between the second dorsal fin and anal fin. A minimally invasive tissue sampling technique has been standardized in grouper which ensures continued survival of these specimens after sampling. Arbitrary primers OPA 01, OPA 07, OPF 08 and OPF 10 generated 59 RAPD loci in the size range of 70-4500 bp in the individuals of *E. diacanthus, E. areolatus, E. chlorostigma, E. bleekeri, E. coioides, E. quvina* and *E. malabaricus.* All the major RAPD loci amplified by primers OPA 01, OPA 07, OPF 08 and OPF 10 were found to be reproducible. Average number of genotypes per primer was 30.3 in *E. diacanthus,* 26.0 in *E. areolatus,* 21.5 in E. *chlorostigma,* 17.8 in *E. bleekeri,* 19.9 in *E.* coioides, 26.8 in *E. tauvina* and 30.8 in *E. malabaricus.* Based on genetic distance values, *E. malabaricus* was observed to be most distantly related to *E. diacanthus* and *E. bleekeri,* where as very close genetic relation was seen between *E. coioides* and *E. tauvina* and also between *E. chlorostigma* and *E. bleekeri.* By and large individuals of each species formed separate clusters indicating their distinct genetic identity. Both intraspecies and interspecies genetic distance values were found to be highly significantly different among the seven species of groupers. Interspecies genetic distance values were significantly higher than the intraspecies values. Highest and lowest within species genetic diversity was found in *E. coioides and E. tauvina,* respectively. *E. chlorostigma* and *E. tauvina* exhibited maximum and minimum levels of polymorphism, respectively. All the seven species of groupers have shown at least one species-specific diagnostic marker, with maximum in *E. bleekeri* and minimum in *E. tauvina and E. malabaricus.* Truss morphometrics has proved to be a useful supportive tool to differentiate among grouper species. The present study has clearly demonstrated the utility of RAPD technique for ratification of taxonomic status of *Epinephelus* spp. Misidentification (based on morphological characters) made in three closely similar species was detected in the UPGMA dendrogram generated from RAPD marker data. It is suggested to examine more specimens of *Epinephelus tauvina, E. coioides, E. bleekeri* and *E. chlorostigma* using DNA-level markers for unambiguously establishing their species identity in Indian waters.

8)Title: SEAWEEDS AS BIOFILTER FOR MONITORING WATER QUALITY IN AQUACULTURE SYSTEMS

Student: SEEMA.C.

The efficiency of macroalgae to remove toxic metabolites in the aquaculture system has been attempted in the present study. Fish and shrimp effluents were treated by seaweeds like *G.corticata, U./actuca* and *U.reticu/ata* respectively. Water quality parameters such as pH, BOD and DO, nutrient parameters such as ammonia, nitrate, nitrite, phosphate and silicate and pigment characterization such as .chlorophyll, phycoerythrin, phycocyanin and allophycocyanin were monitored at regular intervals of treatment from both control and treated tanks. The pH values did not show wide variations in different treatments. The change in pH value of fish effluent treated with G. *corticata* corresponding to the increase in dissolved oxygen explained the efficient utilization of dissolved carbon in the system. The Biochemical Oxygen Demand in fish effluent was observed to be comparatively lower than shrimp effluent. The possibilities of other microorganisms in the shrimp effluent collected afresh from the pond might have helped in increase of BOD content. Nitrogenous compounds such as ammonia, nitrate and nitrite, were found to be in a higher concentration was found to be effectively removed from the effluents to the cultivable limit by different seaweeds. In the polyculture system, both the commodities should generate a good revenue for the aquaculture industry. Seaweeds have been shown to reduce efficiently the level of eutrophication in the integrated system. Thus seaweeds of economical importance can be used as a nutrient trap in the aquaculture system to improve water quality and also a good yield of the by product.

Although species of *Ulva* is an ubiquitous chlorophyte showing high efficiency in water quality management of fish and shrimp effluent, the biomass produced from the seaweed has got less importance. Thus, valuable Rhodophytes especially different species of *Graci/aria* can be a better substitute for water quality management in fish and shrimp effluent treatment. In the polyculture system, atmost care should be given in the stocking density of marine organisms with seaweeds. Excess seaweed may lead to anoxia of the aquaculture system especially during night, when the respiration rate increases. So, mechanical aeration need to be provided to oxygenate the water. Effective and periodic harvest of seaweeds is important for balancing the stocking density and to maintain the water quality parameters in the system.

It can be concluded that locally available and commercially important macroalgae can be applied to the mariculture activities for water quality management and also to generate income both from fish or shrimp and seaweed. The scientific input from this study will give a new dimension in water quality management to the aquaculture industry.

9)Title: EFFECT OF PROBIOTICS INCORPORATED FEED ON SERUM FACTORS OF SHRIMP

Student: SMITHA. P.R

Two experiments were conducted with probiotic *Lactobacillus acidophilus* In the experiment1, lyophilised *Lactobacillus acidophilus* bacteria were coated on shrimp feed at the rate of 106 cells /kg of feed. In the experiment 2, broth cultured *Lactobacillus acidophilus* cells were coated at the rate of 106cells /kg of feed. These two experiments were run for 30 days with separate controls. In both the experiments total haemocyte number/count were studied in the experimental and the control groups. Total haemocyte count were significantly increased in both the experimental groups compared to control groups. Total proteins were estimated in the experimental and the control groups. In experiment 1, where lyophilised bacteria was

incorporated in the feed, total protein values were enhanced in the third and fourth week of the experimental group. In the experiment 2, the total protein increased in first, third and fourth week in the experimental group compared to the control group. There was a slight fall in the protein value of the experimental group in the second week. Otherwise there was significant mean total protein value increase in the experimental group. The phenoloxidase values were estimated in the control and in the experimental groups at weekly interval in both the experiments. In the first experimental group, there was significant increase in the enzyme values on first three weeks followed by a slight fall in the fourth week compared to the control. In the experimental group of the second experiment, there was a fall in the phenoloxidase values in all four weeks. Probably this was due to a relative increase in the total protein values noticed in this group. Lysozymes did not show any significant variation between the control and the experimental groups in the both the experiments.Acid phosphatase values were significantly increased in the experimental groups compared to the control in both experiments indicating an influence of probiotics on these enzymes.

10)Title: QUALITY MANAGEMENT IN FISH DISEASE DIAGNOSTIC LABORATORIES EXEMPLIFIED BY ISO GUIDELINES AND STANDARDS

Student: VIKAS KUMAR

The present study "Quality management in fish disease diagnostic laboratories exemplified by ISO guides and standards" was conducted during December 2001 to June 2002. The objective of the study was:

a) To know the present level of quality mangement in laboratories operating in Cochin for testing the fish and fishery products for the presence of pathogens.

b) To describe the quality assurance programme for the laboratory and its implementation process, and;

c) To describe the registration/ accreditation process in India along with the guidelines for laboratory preparation for the accreditation.

v) Three laboratories namely Centre for Fish Disease Diagnosis and Management, CUSAT, Cochin (laboratory A), Quality Control laboratory, MPEDA, Cochin (laboratory B) and Quality control laboratory, Export inspection agency, Cochin (Laboratory C) were visited.

. vi) None of the three laboratories were accredited to NABL and none had a quality assurance programme for the laboratory. Two out of three did not have a quality manual and a quality policy statement. vii) Two out of the three laboratories were planning to get accreditation from NABL. While one laboratory have not even heard of NABL, it showed interests in getting accreditation.

viii) In the present work, FAG manual for food quality control laLJoratories (FAG 1976) and FAO manual for microbiological laboratories (FAO, 1991) were considered along with NABL criteria for laboratory accreditation 'while formulating the programme for the fish disease diagnostic laboratories. The programme is described in detail in order to ensure an efficient implementation of the programme.

ix) The actual implementation of the programme requires co- operative efforts from management, members of quality assurance unit, section t leaders and analysts.

x) Introduction/ implementation of the programme can be a simultaneous laboratory wide basis, or a step-by-step process.

xi) Once a programme is included in the daily routine work management is responsible for ensuring that all staff at the laboratory adhere to the requirements of the programme.

xii) Frequent audit checking and prompt corrective

actions are necessary for maintaining the quality control parameters long after the programme is implemented.

xiii) Though quality assurance programme ensures the quality work, laboratories can apply for accreditation to go one step further towards quality Improvement.

xiv) Accreditation is a formal recognition that the laboratory is competent enough to perform certain types of test(s). This competence is assessed by the accreditation body based on international or national schemes.

xv) In India NABL is responsible for accrediting laboratories performing tests in accordance with NABL criteria, which is based on internationally accepted standards ISO/IEG guide25.

xvi) Accreditation process is described and guidelines are also given for the preparation of the laboratory for the process.

xvii) Accreditation provides better control of laboratory operations and feedback to the laboratory as to whether they have sound quality assurance system, and are technically competent. It enhances the confidence of the customer in the validity of the test results, thereby increasing the share of the laboratory in the market of the disease diagnosis.

xviii) India earns a good amount of foreign exchange through export of fish and fishery product. Production and subsequent movement of these products requires a major fish health support network to provide diagnostic and inspection/ certification services as all efforts should be taken to prevent the international spread of diseases of aquatic organisms.

xix) If the laboratory wishes to provide the diagnostic services also to the exporting companies, it has to be at international level of competence, which is ensured by gening accreditation in accordance with international standards.

XX) The laboratory management decides whether it can afford the cost of the accreditation process. There is no meaning in getting the accreditation if tne cost of accreditation exceeds the profits, expected through enhanced number of customers.

xxi) It is recommended that action should be initiated at the national level for implementation of quality assurance programme in fish disease diagnostic laboratories

M.F.Sc. Fisheries Resource Management

1)Title: ROLE OF PHOSPHATE FERTILIZER IN THE PRODUCTIVITY OF SOME SELECTED FISH PONDS

Student: NGIL YANG PUSSANG

Four number of existing ponds of almost uniform size holding water volume of 95111.5 litres, 94050 litres, 104920 litres and 96596.5 litres in pond No.1, 2, 3 and 4 respectively were selected for experimental study. In corresponding to the water volume, liming was done 951.12 gm, 940 gm, 1049.2 gm and 965.97 gm in all above mentioned ponds at the rate of 10 mg l^{-1} of water. Single super phosphate fertilizer (SSP) was applied 37.62 gm. 20.98 gm and 28.98 gm in pond No.2, 3 and 4 respectively at the rate of 0.4, 0.3 and 0.2 1 mg 1^{-1} of water on monthly installment basis for the three months. To pond No.1 no single super phosphate fertilizer was applied as it was kept as a control pond. Considerable fluctuations in the physico-chemical conditions of the pond water were noticed in all the four ponds. There was no significant difference in temperature variation between control and treated ponds. The water temperature values in the ponds were between 11°C to 26°C throughout the three months study periods. The water pH was also found to vary. There was no major significance difference in water pH values of the ponds, but it a difference of 0.1 to 0.7 pH values was noted among all

ponds. The phenolphthalein alkalinity of the ponds water was f.ound to be absent in all the ponds. The methyl orange/total alkalinity was found to vary between 24 to 34 mg 1-1 of water. Almost similar total alkalinity values were found irrespective of treated or control ponds. Dissolved oxygen content was found to be within 5.2 to 5.9 mg 1^{-1} of water in all the ponds. The D.O. content of pond 2, 3 and 4 was found to be inversely proportional to the temperature. Free carbon dioxide content of pond water was found to fluctuate within the range values of 0.02 mg 1^{-1} to 0.8 mg 1^{-1} of water. In control pond, the gross primary productivity values were found to be within 216-248 mgC/m3/hr. Net primary productivity values were 186-210 mgC/m3/hr and tertiary productivity values were 608.6 to 687.1 kg/ha/yr. In pond No.2 where 0.4 mg 1^{-1} of water was fertilized with sirgle super phosphate fertilizer, the gross primary productivity values were 222 to 270 *mgC/m3/hr,* Net primary productivity values were 198-210 *mgC/m3/hr* and tertiary productivity values were 647 to 687 *kg/ha/yr.* In pond No.3 where phosphate fertilizer was applied in lesser Idoses compared to pond No.2, the better primary productivity was performed i.e. gross primary productivity values were within 228-276 *mgC/m3/hr,* net primary productivity 186-228 *mgC/m3/hr* and tertiary productivity values were 608.57 to 745.98 *kg/ha/yr.* Similarly in pond No.4, the gross primary productivity values were 264 to 288 *mgC/m3/hr,* net primary productivity 210 to 246 *mgC/m3/hr* and tertiary productivity values were 687.10 to 804.88 *kg/ha/yr.* The treated single super phosphate ponds exhibited relatively high values of phosphate than that in control pond. Phosphate concentration values I' were found to be in the range of 0.06 to 0.3 mg $1^{-1}$of water in treated ponds : whereas in untreated pond the phosphate values were found to range from 0.04 to 0.06 *mg/l-1* of water. It has been found that, when phosphate value in water, was less at that time plankton density was also less and when it was higher, the plankton density was also found to be higher. It has been also noticed that where single super. phosphate fertilizer was applied in ponds, the plankton number was found to be more i.e. 235-5022 *No./litre* of water whereas in control pond, the plankton number was found to be 464-679 *No./litre* of water.) Growth performance of some fish seed fingerlings in treated ponds was better than in the untreated pond. In case of *Ctenopharygondon idella,* control pond, the absolute growth was found to be 10.16 gm in three periods, whereas in treated ponds absolute growth was minimum 11.09 gm and maximum 13.7 gm in three month period. In *Hypophthalmichthys molitrix* (silver carp), absolute growth performance in control pond was 0.3gm in three month periods. In treated ponds, it was 44.57-66.00 gm in three months. In control pond absolute growth of *Cirrhinus mrigala* was 17gm and in treated ponds its growth was 5.06 gm, 41 gm and 77 gm in pond No.2, 3 and 4 respectively. Absolute growth of *Cyprinus carpio* was 4.88 gm in control pond, whereas in treated ponds 2.06, 3.02 and 20.72 gm in three months. The present study was carried out to compare the effect of phosphorus in different doses on the growth of fishes, such as *Ctenophryngodon idella, Hypophthalmichthys molitrix, Cirrhinus mrigala* and *Cyprinus carpio,* etc. . Three. different doses of phosphorus viz.0.4 mg 1^{-1}, 0.3 mg 1^{-1} and 0.2 mg 1^{-1} i were applied and one pond was kept control. The effect of Phosphate fertilization Ion increasing aquatic primary productivity was also studied. It has been found that monthly application of 0.2 mgl-1 phosphate- fertilization was apparently as effective as an equal number of application 0.3 mgr1 and 0.4 mgl^{-1} in increasing i the primary production and expected fish production. Sometimes, there was a great variability in terms of productivity on monthly basis estimation. Hencethere is a need for more replications before recommending the dose of Phosphorus fertilization for optimum production of pond.

2)Title: BIOMEDICAL PROPERTIES OF MUCUS OF CERTAIN FLATFISHES FROM MUMBAI WATERS

Student: S. SANGEETHA

The flatfishes *Cynoglossus arel* (Family: Cynoglossidae) and *Paralichthodes alogoensis* (Family: Pleuronectidae) were procured from Versova landing centre, Ferry Warf landing centre and from Narmada vessel. As soon as they brought to the lab, the mucus was removed manually by scrapping the surface of the fishes. The scrapped mucus was diluted in phosphate buffer saline (pH 7.5) and centrifuged thrice at 5000 rpm for 10 minutes. After completing the centrifugation the supernatant was subsequently lyophilized and then stored at 4 °C. The sample thus obtained was partially purified in lon-exchange chromatography using DEAE cellulose column. DEAE . cellulose slurry was packed carefully in the column with any air entrapment upto a height of 22cm in 2 x 45 cm size column. The flow rate of the column was adjusted to 45 mil hour. The lyophilized mucus samples were eluted using different concentration of NaCl (0.2 M to 1 M) dissolved in 0.01 M Tris-Hcl Buffer. Since the crinotoxic fishes posses protein in their mucus it is necessary to estimate the protein content in the mucus following Peterson (1977) modified by Venkateshvaran and Pani prasad (1997). The protein content in the crude mucus toxin of C. *arel* was found to be 1.2 *mg/ml* and the protein content in the purified fractions ranging from 0.11 mg/ml1 00.31 mg/ml. Similarly the protein content in the crude mucus toxin of P. *algoensis* was found to be 0.9 *mg/ml* and in the partially purified samples it is ranging from 0.135 to 0.25 mg/ml. The crude mucus toxins of both the flatfish toxins were subjected to various bioactivity tests such as mice bioassay, antibacterial activity, analgesic activity and cell line toxicity. For carrying out mice bioassay, the clinically healthy male albino mice (Kasauli strain) of 20 2 g weight were procured from MIS Haffkines Biopharma Ltd., Mumbai. The bioassay was carried out only for observing crude mucus toxicity. The crude mucus toxins of both the flatfishes were injected intraperitoneally in varying doses from 0.2 to 1 ml into the mice. Triplicate sets of mice were maintained for each dose. The crude mucus toxin of C. *arel* was found to be toxic at 0.5 m1 (2.5 mg) and the death of mice occurred at 4 minutes 36 seconds, whereas in the case of P. *algoensis* the lethal dose was found to be 0.4 ml and the death of mice occurred with in 7 minutes 20 seconds. The mice showed behavioral changes such as jumping, oozing of froth from mouth, gasping, convulsions etc. The effect of crude mucus toxin of C. *arel* was found to be severe as compared to P. *algoensis* which was found to be 0.4 ml (2.0 mg) and the death of mice occurred at 7 minutes 20 seconds. The mice showed behavioral changes such as jumping, scratching the face, urination etc. The crude mucus toxin of C. *arel* exhibited severe effect on mice as compare to the crude toxin of P. *algoensis.* The effect of mucus f toxicity on mice was observed by histopathological studies of injected mice. The target organs like kidney, brain, lungs, liver, heart were taken for histopathological studies and it was observed that the mucus toxin affected kidney, liver and lungs severely. The crude mucus toxins as well as the purified fractions were subjected to antibacterial activity. The antibacterial assay was carried out using eight pathogenic bacterial cultures , such as *Aeromonas hydrophila, Pseudomonas fluorescens, Vibrio anguillarium,* V. *parahaemoluticus, Escherichia coli, Salmonella typhi, Streptococcus aureus* and *Klebsiella pneumoniae.* Among the eight cultures *A. hydrophila,* P. *fluorescens,* V. *anguillarium,* V. *parahaemolyticus* were exhibited antibacterial activity. Of which *A.*
hydrophila and P. *fluorescens were found* to be more sensitive to crude mucus toxin at i three different concentrations such as *4mg/ml, 8mg/ml* and *12mg/ml* as well as DEAE purified fractions of toxin of C. a *rel.* The crude mucus toxin of P. *algoensis* @ 4 *mg/ml,* j *8mg/ml* and

12 *mg/ml* and DEAE purified fractions inhibited the growth of *A. hydrophila,* P. *fluorescence* and V. *parahaemolyticus.* Among these V. *parahaemolyticus* and P. *fluorescens* were found to be more sensitive to the mucus toxin of P. *algoensis.* The hemolytic activity of crude mucus toxins was tested against chicken RBC. The crude mucus toxin of C. *arel* exhibited 2.64 HU/mg of protein but the partially purified fractions didn't showed hemolytic activity. Similarly the crude mucus toxin of P. *algoensis* showed - 3.47 HU/mg of protein against chicken RBC. Here also the partially purified toxin of P. *algoensis* doesn't exhibited hemolytic activity. The crude mucus toxins were subjected to analgesic activity to study its painkilling capacity against commercial drug, paracetamol. The pain bearing capacity was observed at different light strengths viz. 3, 3.5, 4, 4.5 A The maximum analgesic ratio (AR) of crude mucus toxin of C. *arel* against normal saline was 1.35 and that against paracetamol was 0.71 and the minimum was 1.08 and 0.41 respectively. In case of P. *algoensis* the analgesic ratio of crude mucus against normal saline was 1.55 and that against paracetamol was found to be 0.82 and the minimum was 0.86 and 0.33 respectively. This shows that the mucus of both the flatfishes posses painkilling effect. Tissue culture assay was carried to estimate the cytotoxic effect of the mucus toxin. The cell viability after treatment was quantified following MTT [3, (4,5- dimethyl thiazol-2, 4) 2-5 diphenyl tetrazolium bromide] assay. The crude mucus toxin of both the flatfishes C. *arel* and P. *algoensis* exhibited significant effect and changes on the mouse muscular cell line (L 929). Between the two species of flatfishes P. *algoensis* . showed severe cytotoxic effect on muscular cell line. The toxic effect was observed as rounding of cells, lysis and detachment from the substratum.

3) Title: STUDIES ON MOLECULAR CHARACTERIZATION OF DNA FRAGMENT ENCODING MOLT INHIBITING HORMONE IN GIANT FRESHWATER PRAWN, *MACROBRACHIUM ROSENBERGII* (DE MAN)

Student: BANESHWAR SINGH

The size of the nested PCR fragment obtained was much higher than 146 bp expected in the cDNA indicating the presence of intron(s). The size of 1200 bp fragment, which would be 650 bp in cDNA also, seems due to presence of intron(s). The 1200 bp fragment and the nested 490 bp fragment were cloned in the vector pTZ57RfT using a AfT based InstaT/A Cloning Kit. Recombinant clones were checked for the presence of insert by PCR. The t clones, which were found positive in PCR, were further double digested using 1 *Eco RI* and *Hind III* restriction enzymes. The double digestion released the insert of 1200 bp from the plasmid. The positive clones shall be further characterized by nucleic acid sequencing. The total RNA prepared from the eyestalk of *Macrobrachium rosenbergii* was utilized for RT -PCR amplification of MIH encoding cDNA. The primers that generated 1200 bp product in PCR and the nested set of primers were used in separate reactions. The RT -PCR did not generate any amplification. The result indicates absence of specific mRNA due to either non-expression of gene or RNA degradation. Overall the PCR based strategy for MIH amplification and cloning seems difficult since PCR generates multiple bands even with homologous primers due to high degree of sequence hom.ology between various class of neuropeptide and clusteral arrangements of neuropeptide encoding genes. The 1200 bp and the 490 bp fragment clones have been generated in the study. The cloned MIH encoding fragments might be useful in genomic library screening to obtain complete MIH gene sequence in further studies. Also they could be used as probes in MIH RFLP to tap MIH gene variation in the population.

4) Title: COMMUNICATION BEHAVIOUR OF FISH FARMERS IN BARPETA DISTRICT OF ASSAM

Student: BIPUL KHATANIAR, M.F.Sc. (FRM)

The study was conducted in Barpeta District in lower Assam because its fish production is on the higher side and therefore, the communication behaviour of fish fanners would be prominent. Five development blocks were selected randomly out of 12 blocks in the district. Further two villages, which had more number of fish farmer, to ensure the required numbers of fish farmers, were selected from each block. Thus, a total 10 villages belonging to 5 development blocks were selected for the study. A sample of 80 fish farmers was selected from these villages with proportional allocation of sampling units in each village. Data were collected by personal interview method with the help of structured interview schedule. 2

Majority of the respondents (46.25%) were middle age groups and as much as 86.25% were literate. However, the majority of the literate respondents (23.75%) studied only up to high school level. Most of the respondents belonged to nuclear family (6.2.5%), big sized family (81.25%), medium income group (76.25%) and large land holding farmer (40.00%). They were having medium level experience (60.00%) and small sized fish pond (46.25%). Only 22.50 percent of the respondent had fisheries as their main occupation and rest of them had it as their subsidiary occupation.

The main source of information of fish farmers of the study area for composite fish culture was fellow fish farmers (66.25%), followed by fish seed vendors (57.50%), fishery extension agents (51.25%), family members (41.25%), and fisheries scientists (7.50%) .Among the various information channels, majority of the fish fanners (61.25%) obtained information through radio, followed, by newspaper (46.25%). television (43.75%), meeting (38.5%), extension literature (35.00%), training (26.25%), demonstration Programme (22.5%) and magazine (8.75%). Processing behaviour Majority of the fish farmers (81.25%) stored the information by memorizing. About 28.5 and 18.75 % of the respondent stored the information by *i* taking notes in general notebook and specified notebook respectively. 31.25 %of the respondent stored the information by keeping printed material in specified places. Majority of the fish fanners (58.75%) discussed the information with fellow fish farmers, followed by fishery extension agents (42.5%), family members (36.25%), fish seed vendors (31.25%) and fisheries scientists (5.00%) Most of the fish fanners (87.5%) evaluated the information by considering economic profitability followed by availability of input (57.5%) and simplicity of innovation (46.25%),). Only 13.75 % of the respondents considered the innovation conducting the trials. Majority of the respondents (66.25%) knowledge had medium level knowledge, followed by low (18.75%) and high (15.00%) knowledge levels. Although most of the respondents had correct knowledge about some knowledge items, they lack knowledge of some important aspects like, recommended doses of liming manuring fertilization, stackable size of fish seed, stocking density and interval of application of subsequent doses of manures alternating with fertilizers. The distribution of the respondents based on their extent of adoption of composite fish culture practices revealed that majority of the respondents (62.5%)belonged to medium category followed by 20% and 17.5%in high and low categories respectively. *T*here was a Positive and significant relationship between the knowledge level of the respondents and their extent of adoption of composite fish culture technology. A Significant Positive relationship between adoption and other variables like, family income, occupation, land holdings and experience were obtained. The finding also showed that age, caste and family type had significant negative Correlation with the extent of adoption. On the other hand family and pond size had no significant relationship with e.xtent of adoption of composite fish culture. The study revealed that lack of

finance, non-availability of quality fish seed, fish disease problem, high cost of feed and fertilizers, lack of adequate extension service, slow growlth of fish, lack of easily available credit, lack of knowledge, composite fish culture, frequent occurrence of flood, poaching and poisoning were the major constraints for adoption of composite fish *culture* in *the study* area. The study reveals that fish seed vendors were the second most important source of *technical* information to the fish farmers of the district. But, most of the vendors did not have full knowledge of the composite fish culture technology. As a result they are likely pass on half-truths or hearsay things to the fish farmers, which can be counter productive. Hence, suitable provision should be made by the govermment to organize special training programmes for fish seed vendors, so that they can provide more precise information to the fish farmers particularly regarding optimal stocking , density, stocking, ratio and stocking size. Fishery extension agents play an important role for effective dissemination of modern scientific fish culture technology. It was observed during the study period that a few development blocks of the district had no post of Fishery Extension Officers (FED) and the fishery demonstrators had to run the extension service. The staffing pattern amended by Government of India i.e. one extension worker for every 100 hectares water area and one extension officer for five extension workers should be implemented in the state. The existing fishery extension agents should also increase their frequency of visit to communicate more number of fish farmers Provision should be made by them to arrange the input material like feed, fertilizer etc. for the fish farmer at reasonable prices. It is also suggested that the Govemment should provide vehicle loans to the extension staff for reaching farmers especially in areas having poor public transport system. Travelling allowance should be paid regularly to the extension service staff to undertake frequent extension related trip, The study revealed that fisheries scientists were the least available source of information. Thus a direct linkage between fish farmers and fisheries scientists should be developed, so that the farmers can approach the scientists to solve their problems. Provisions should also be made to arrange regular interaction between fishery extension personnel and scientists to solve the feed back problem of farmers. The new model of the farmer field school developed and propagated by FAO can be introduced in Assam, where farmers, fishery extension agents and researchers will work together , on farmer's fields. The study revealed that there was a positive and significant relationship ; between knowledge level of the fish farmer and their extent of adoption, which indicates that effort to improve knowledge level of fish farmer, would help in increasing their adoption level of composite fish culture technology. Thus, training programme should be organized at various levels at regular intervals, as it is one of the most important channels of information to acquire the knowledge of scientific fish culture technology. Although the Department of Fisheries is organizing training programme, their coverage is not adequate, Hence frequent. number of training programmes on pisciculture should be increased so as to cover larger number of farmers, Refresher training programme may be arranged for the already trained farmers. The content of the training programme should be carefully chosen to suit the target groups while including up-to-date information. Proper care should be taken while selecting trainees, so that only genuine fish farmers get opportunity. Keeping the concept of learning by doing in mind, demonstration programme should be conducted at farmers field at regular intervals to impart hands- on the knowledge and confidence to the farmers. The Government should make provisions for special budgetary allocations for demonstration programmes. Both formal and informal meetings for the fish farmers need to be organized frequently. Farmers should be invited to attend one-day meetings at district or sub-divisional office levels every month to discuss the important aspects related to fish culture. The fishery

extension agents should also arrange meetings in each village on a particular day at regular intervals so that large number of farmers get the opportunity to acquire knowledge on fish culture technologies.There was high demand for extension literature- in local language such as folders and leaflets. The Department of Fisheries and other agencies should meet this demand by providing these extension literatures at regular intervals. The government should allot special funds for printing these literatures regularly. Publicity vans and other equipments like printing machines should be provided at the district level for effective publicity. Exhibition and film show should be organized at regular interval. , The finding reveals that the lack of finance was the major problem, hindering the adoption of scientific fish farming practices. Micro-finance schemes, like, Self help group should be encouraged in the area. Non-availability of quality and quantity of fish seed was the major problem in the study area. As a result adoption of most of the stocking practices by the farmer was generally unsatisfactory; hence action should be taken by the concerned to produce and supply good quality and quantity of fish seed of all the species of composite fish culture. The bank or other financial institute could not encourage the fish farmers to extend financial support for adoption of composite fish culture. Farmers also get difficulties to obtain loan due to complicated and delay procedure. Hence bank or other institute should provide financial help to the fish farmer by making self help group in every village. The amount of loan provided by bank should meet the farmers need to adopt the culture practice. Bank should also make procedures easy to obtain loan.

5)Title: PREDICTIVE MODELLING OF MARINE FISH LANDINGS OF MAHARASHTRA COAST

Student: GRINSON GEORGE, (FRM)

The data for the present study were obtained from reports of Central Marine Fisheries Research Institute, Kochi and Department of Fisheries, Government of Maharashtra. The annual landings during the last two decades 1980-1989 and 1990-1999 were analyzed for estimation of compound growth rates. The quarterly total landings and landings of Bombay duck, Carangids, Cat fishes, Mackerel and Non-penaid prawns during the IJil period 1975-1999 were used for fitting ARIMA models. Auto correlation and partial auto correlation were worked out for identifying the seasonality or otherwise of the time series. Akaike Information Criterion (AIC) and Schewatz Bayesean information Criterion were used for the estimation of the order of the model. An algorithm using "trends" module in SPSS software was used for estimation of model parameters. For realizations, which contained both seasonal and non- seasonal patterns, the general ARIMA model is used. The general ARIMA model is specified as ARIMA (p,d,q)(P ,D,Q)4. That is the order of auto regression is p, order of differencing is d, order of moving average term is q, order of seasonal auto regression is P, order of seasonal differencing is 0, order of seasonal moving average term is Q and seasonality is 4. Mackerel landings increased considerably during the last two ~ decades. During eighties its average landings were only 3,2250 tonnes which , . rose to 21,196 tonnes in nineties. Compound growth rate was as high as 89.66%. In eighties the species, which was occurring as a stray catch, has emerged as a major resource contributing on an average about 5% to the J total marine fish landings of Maharashtra during nineties. Biotic and abiotic factors responsible for this change need to be investigated further. Though average carangid landings remained almost the same during both the decades, there was a negative growth of about 16% during 1990-1999. Cat fishes showed declining trend in nineties as compared to eighties. Non-penaeids though had higher average landings during nineties, growth rate during both the decades were however negative. The models identified in the present study are ARIMA (0,0,0)(0,1,1) for total landings, ARIMA

(0,1,1)(2,1,3) for Bombay duck, ARIMA (0,1,1)(2,1,1) for carangid landings, ARIMA (0,1,1)(0,1,1). for catfish, ARIMA (2,1,3)(2,1,1) for Mackerel, and ARIMA (0,1,1)(0,1,4) for non-penaeid prawns. T -ratio showed that the fitted models are adequate to explain the data. Fitted models were used to forecast landings for the next two years 2000 and 20010n quarterly basis. It is observed that total landings estimated for 1999 were 4,11,594 tonnes against observed value of 3,90,541 tonnes indicating about 5.4% error. Similarly the estimated landings of Bombay duck landings and catfish had an error of 6% and 2.5% respectively for 1999. About 12% error was noticed in the case of estimated landings of Mackerel for 1999. The estimated landings based on the identified models for non-penaeid prawns and carangids showed larger variation between observed and estimated values with an error Of.34% and 46% respectively. Hence further refining of models for non-penaeld prawns and carangids is required. However the ARIMA models developed in the present study can be usefully employed in forecasting of total landings as well as landings of Bombay duck and cat fishes. Advance information about future landings will help in proper planning, storage and distribution. The results of the present study are thus expected to go a long way in improving management of marine fisheries of Maharashtra.

6)Title: PRELIMINARY STUDIES ON MELANOPHORE RESPONSES OF GOURAMI (LABYRINTH FISHES) TO DIETARY INCORPORATED PHOTOSENSITIZER

Student: OYAS AHMED ASIMI

The purpose of present study was to evaluate the effects of a photosensitizer (Methoxsalen), on dietary supplementation, on melanophores/ pigmentation and to evaluate the persistence of change in melanophores after discontinuing the feeding of photosensitizer supplemented feeds to labyrinth fishes, giant Gourami *(Colisa fasciatus)* , blue Gourami *(Trichogaster trichopterus)* and kissing Gourami *(Helostoma temminckl)*. The fishes were procured from local fish shop and were acclimatize for 15 days with laboratory made balance basal feed. Nine fishes of average size 2-4" were stocked in plastic tubs (capacity 10L). Each tub was covered with net and filled with 10L water. Total number of four feeds (E1-E3 and control) were made and fed in three replicates. The concentration of Methoxsalen was added in basal feed @ 0.0, 20 mg/kg, 100 mg/kg and 500 mg/kg. Experimental tubs were cleaned manually by siphoning 90% of water along with faecal matter and left over feed. The siphoned water was replaced by an equal volume of fresh chlorine free borewell water. Fishes were fed *ad libitum* at 12:00 noon on every day. Fishes were exposed for 30 minutes to sunlight after 1 hour of the feeding. Fishes were fed for 15 days with feeds E1 to E3 & control and after 15 days they were fed with the same control diet. Scales were removed from lateral line from each fish on day-O and at the end of experimentation and preserved in 6% formalin. The range of physico-Chemical parameters of water during the experimental period was recorded and found congenial for the ornamental fish culture and the values for water temperature, DO, alkalinity, pH was recorded 21-26°C, 6.62-92 ppm, 152-165 ppm and 7.2-7.8 respectively. Whereas, there was no CO2 recorded during the experimental period Fish body colouration The control fishes of giant Gourami *(Colisa fasciatus)* is compared with experimental fish and it was found, on visual study, that there was a marked difference in the body/scale colouration on during experimental period. There is a marked difference recording in the skin colouration of blue Gourami *(Trichogaster trichopterus),* which persists even after 15 days of stopping the feed containing photosensitizer at graded levels. A clear difference on the lateral line, operculum, caudal and ventral fins and near the

head region is seen. After feeding the photosensitizer @ 20 mg/kg, 100 mg/kg and 500 mg/kg. There was no colour appearance notice in the experimental fishes of kissing Gourami *(Helostoma temminckl).* Giant Gourami *(Colisa fasciatus)* The experimental (E1. Methoxsalen @ 20 ppm) shows a marked darkening of the scale. On feeding higher concentration of Methoxsalen (100 mg/kg *feed)* the darkening of scale appears more with increased number of pigment granules. On addition of Methoxsalen @ 500 mg/kg in the diet showing further darkening of the scale and increased number of pigments/ chromatophores. At higher magnification the aggregation of melanophore is very well seen. Blue Gourami *(Trichogaster trichopterus).* The control scale of blue Gourami *(Trichogaster trichopterus)* showing no pigmentation, other than normal, either on the center or scale ridge. On higher magnification the greenish colour ridge is very well noticed. On feeding higher concentration of Methoxsalen (20 mg/kg feed) showing more darkening and increased number of chromatophores. Methoxsalen @ 100 mg/kg in the diet showing darkening of scale more than 20 mg/kg and methoxsalen per kg diet and also increased pigmentation. On addition of methoxsalen @ 500 mg/kg of diet shows darkening of scale and increase in pigmentation more than 20 mg/kg and 100 mg/kg dietary methoxsalen. On feeding Methoxsalen @ 500 mg/kg showing aggregation of Melanophores, increased in numbers as well as dispersed melanophores. Kissing Gourami *(Helostoma temminckl}*The control scale of kissing Gourami *(Helostoma temminckl)* showing no pigmentation, other than normal, either on the center or scale ridge. On feeding the Methoxsalen @ 20 mg/kg 0: feed showing little darkening of the scales. In comparison to control. Addition of Methoxsalen @ 100 mg/kg of feed showing increased number of melanophores However, the darkened experimental scales are seen at lower magnification. At highest concentration of methoxsalen @ 500 mg/kg addition, the higher colouration in the scale is observed on the ridges of the scale which is not recorded in other Gouramis in the present experiment. Among all the Gouramis, the addition of graded levels of Methoxsalen, the best corouratjon effect, due to this photosensitizer, observed in blue Gourami *(Trichogaster trichopterus)* followed by giant Gourami *(Colisa fasciatus)* and kissing Gourami *(He/ostoma temminecki).* The findings is of very useful to understand changes brought in the behavior of melanosomes in the melanophores on feeding with photosensitizers, through dietary supplementation, to render ornamental fishes to look paler and/or darker. And this findings, that aggregation and dispersion phenomenon of chromatophores, has direct impact relation with the market value of ornamental fishes, but a lots of studies are needed to evaluate physiological stresses and biochemical changes in the fish before taking any commercial advantages out of it.

7)Title: STUDIES ON THE FOOD AND FEEDING AND, REPRODUCTIVE BIOLOGY OF TWO SCIAENID FISHES FROM MUMBAI WATER

Student: PRASHANTA. TELVEKAR (FRM)

In the present investigation the food and feeding, length weight relationships and reproductive biology *of* two species *of* lesser Sciaenids occurring in Mumbai waters *Viz. Otolithes cuvieri* (Trewavas, 1974) and *Johnius macrorhynus* (Mohan, 1976) have been studied. The all India catch *of* Sciaenids in the year *2000* was about 1,80,000 tones contributing nearly 6.69 % *to* the total fish landings *of* India. Index *of* preponderance (Natarajan and Jhingran, 1961) was employed for the analysis *of* different food items in the stomach. Month wise, size wise, sex wise and maturity wise analysis *of* food elements and feeding intensity were done for both the species. The month wise analysis *of* the stomach contents indicated fish as the principal food item *of* O. *cuvieri* while in case *of J. macrorhynus, Acetes spp.* found as the principle food item.

The present study revealed that both the fishes are demersal and carnivorous, feeding mainly on fish and crustaceans. Both in O. *cuvieri* and *J. macrorhynus.* higher feeding intensity coinciding with the advancement *of* reproductive process and poor feeding coinciding with the spawning activity were observed. Analysis *of* covariance revealed no significant difference among males and females in the Length-Weight relationship *of* O. *cuvieri* and *J. macrorhynus* . Hence a common equation was obtained for each species as given below: O. *cuvieri* - Logarithmic equation: Log W = - *4.440* + 2.7977 Log L,*J. macrorhynus*- Logarithmic equation: Log W = -5.1806 + 3.1189 Log L. In reproductive studies, month wise distribution of sex ratios, maturity stages. length at first maturity, condition *factor,* spawning season, spawning periodicities and fecundity was worked out for both the species. Two spawning seasons for both the species were observed during present investigation. All citations whether direct or indirect has been presented in Bibliography.

M.F.Sc. Programmes (Post Harvest Technology)

1)Title: STUDIES ON THE THERMAL DENATURATION OF PROTEINS FROM *CHANOS CHANOS* AND C*YPRINUS CARPIO*

Student: TERESA NEELIMA GILES

The unique properties of fish proteins were fairly evident in the studies conducted in the two different fishes belonging to 2 different environments.-one fresh water and the other brackish. A comparative evaluation of the difference in thermal denaturation properties points to several significant conclusions, which can be of use during thermal processing of seafoods. The actomyosin content of fish is species dependent. In carp it was 5.06g per 100g while in milkfish it was 2.19 g per 100g meat. The turbidity patterns of both milkfish and common carp actomyosin were similar till 30°C, but above that they showed slight variations. The total salt soluble proteins were slightly lower and they differed significantly during heat treatment. The solubility profile of carp and milkfish actomyosin was entirely different, solubility in the case of carp showed an increasing trend right from 10°C. When total salt soluble proteins were compared, the difference in pattern was notable. The electrophoretic studies conducted helped to confirm the differences in solubility pattern. The Ca-A TP ase activity -both specific and total - which gives a direct index of nativity of actomyosin showed significant variations. With increasing temperature, both carp and milk fish showed characteristic difference. In carp, the ATPase activity decreased gradually from 10°C itself, which in the case of milkfish, there was gradual decrease up to 40°C and then dropped. In the case of total soluble protein, the decrease was noticed from 20°C itself in carp and from 30°C in chanos. There were differences in sulfhydryl content of both fishes. But the changes in sulfhydryl group during heat treatment followed almost the same pattern.Thus in common carp. the actomyosin begins to undergo unfolding at around 30°C with more unfolding of actomyosin being between 35°C to 50°C.In the case of chanos, even though there was unfolding right from 20°C itself, major changes were noticed at 40°C.

2)Title: STUDIES ON FISH SAUSAGE FROM FRESH WATER FISH-ROHU *(Labeo rohita)*

Student: SINI. T.K

The present work was under taken to study the suitability of freshwater fish rohu for the preparation of high quality sausage. The raw material, rohu for the studies were procured from a farm near to our laboratory. Washing of mince was found to. improve its colour and odour but It resulted in a loss of more than 30% of solid -matter. Hence unwashed mince with the addition of guar gum to improve the resilient properties of the sausage was used. Manual filleting of the fish and subsequent removal of the exposed

bones and pin bones before mincing resulted in bringing down the bone content well within the permissible limit. Proximate composition did not show any striking difference between the raw rohu muscle and minced meat. A recipe was formulated taking into consideration the peculiar nature of freshwater fish and the prepared sausage was filled in commercially available 25 mm dia. natural casing. Sausage was also prepared incorporating permitted level of potassium sorbate to study its effect on the quality and storage characteristics. The evaluation of physical, chemical, organoleptic and microbiological characteristics of the prepared sausage and their storage characteristics at different temperatures such as ambient temperature, 5°C, -10°C and -20°C were carried out. The proximate composition of the prepared sausage was found to be in the range reported by earlier workers. Fish sausages generally exhibit a dull white colour, but in the present study the colour of the sausage was almost the .same with a slight greenish tinge due to the incorporation of green spices such as mint and green chilly. Immediately after processing sausage indicated good and appealing appearance with characteristic resilient texture. After 2 days storage at ambient temperature the control samples lost their cohesive nature and appeared pasty and sticky accompanied by water oozing out from the meat, and detachment from the casing, due to fermentation and gas formation as evidenced by fermented odour, lowering of pH and also increase in total bacterial count. This is in agreement with the work of Tanikawa (1971). However, the frjed sausage was found organoleptically acceptable. But after 3 days storage the sausage was found to be highly spoiled and had to be rejected. In the case of treated samples these symptoms of spoilage were observed after 4 days of storage. In the case of samples stored at 5º C the spoilage symptoms mentioned above began appearing. In the control samples .from. the 9th day .and on the 13th day samples, were found unacceptable. In treated samples the onset of spoilage was . noticed on the 12th day and on the16th day samples were found unacceptable. The samples, both control and treated, stored at -10°C indicated storage life of 14 weeks. During storage, control samples exhibited slightly better textural quality compared to treated samples probably due to the effect of potassium sorbate on protein denaturation in treated samples.

The samples stored at -20°C, both control and treated, were in good acceptable condition even after 27 weeks. Here also control sample indicated slightly better textural characteristics compared to the treated samples, because of the reasons already explained above. One peculiarity noticed in the case of samples stored at frozen condition was the absence of fermentative deterioration, oozing out of water from the meat, and detachment from casing.

During storage at ambient temperature, compressibility, piercing strength and biting strength were found to decrease gradually as the storage time progressed, pointing to a fall in firmness of the product. At 5ºC also, the hardness of the product was found to increase slowly with simultaneous rise in expressible water may be because of protein denaturation and subsequent alteration in the protein moiety. During storage at -10 and -20°C the above mentioned trend of increasing hardness was more prominent. The addition of chemical preservative is seen to have no apparent effect in retaining the textural quality of the sausage. No significant changes in the biochemical characteristics were noticed during storage except at . ambient. temperature. where slight increase in TVBN and pH occured. During storage at ambient temperature remarkable increase in total bacterial count was also noticed in both control and treated samples. However. the counts of treated samples were always slightly less than that of the control due to the preservative effect of added potassium sorbate. At 5°C, an initial decrease in count was noticed in both control and treated samples and thereafter a gradual increase in count was noticed in both casea. At -10 and -20°C both control and treated samples showed a

decrease first and thereafter the count. was more or less.steady.

M.F.S.c. Programmes (Freshwater Aquaculture)

Title: BIOCHEMICAL CHARACTERIZATION OF SERUM \IMMUNOGLOBULINS OF MRIGAL *CIRRHINUS MRIGALA* (HAMILTON-BUCHANAN, 1822)

Student: MANORANJAN SAHOO

With an objective to purify and characterize Mrigal serum immunoglobulins, mrigals of 250-300g size were immunized with bovine serum albumin to raise immune sera. The mean protein concentration of immune sera was 37.24 mg/ml and found to increase around 14.37% than the normal level. Similarly, the anti BSA antibody activity (in terms of IHA titer) was also found to increase in immune sera to 210 to 216 from the pre-immune titre of 0-24. The immune sera were used in subsequent experiments of purification and characterization. Immunoglobulins were purified from anti-BSA-mrigal sera by affinity chromatography on BSA-Sepharose 4B column. The bound Ig was eluted with 0.1 M glycine-NaOH, pH 11.0 buffer, neutralized the high pH with 2M tris HCI, pH 2.5, and brought to more physiological conditions with dialysis against 0.02M tris I-ICI, 0.15M NaCl, pH - 7.4. The sample was then concentrated in a centrifuge filter (Vivaspin-2, Sartorius, Germany). The concentrated Ig sample was subjected to native gradient polyacrylamide gel electrophoresis (PAGE) 2.8%-22.5% acrylamide gradient. The sample showed only one band and thus indicated the purity and homogeneity of the product. The presence of single band in native PAGE also indicated that mrigal possesses only one type of immunoglobulin, like other osteichthyan species. The molecular weight of this Ig molecule was determined to be 894.68 kD. On SOS-PAGE of 12% acrylamide concentration in reducing conditions, the purified Ig was reduced to one heavy chain and one light chain isotypes and the molecular weights were estimated to be 83.60 and 27.53 kD respectively. Calculations based on the molecular weights of native Ig and its constituent Hand L chains proved the mrigal Ig to be tetrameric, (H2L2)4 in nature as in other osteichthyan species. The purified mrigal Ig when was subjected to SOS-PAGE in 2.8%-10% gradient gel with continuous phosphate buffer system in non reducing conditions, the native Ig was dissociated into 3 separate bands, with approximate molecular weight of 857.92 kD, 428.86 kD and 209.86 kD. They were identified to be tetrameric, dimeric and monomeric populations of native Ig molecule. This clearly indicated the presence of different sub populations of same tetrameric Ig possessing various patterns of non-covalent interactions amongst the monomeric units. Mrigal Ig in native PAGE took Alcian blue stain proving the glycoprotein nature of Ig. Both the Hand L chains in SOS-PAGE stained positively with alcian blue and thus could be proved that the carbohydrate components are linked to both heavy and light chains of Ig. Purified mrigal Ig and immune sera was exposed for 30 minutes to varying temperatures within 25°C to 100°C, In order to check the temperature sensitivity of mrigal antibody. It was found that the anti BSA antibody activity of purified Ig sample remained constant up to 25°C, reduced slightly at 35°C, then reduced suddenly at 56°C and came down to zero after treating at 70°C and 100°C. But in case of anti BSA mrigal sera, the IHA titre remained constant up to 45°C, reduced suddenly at 56°C, was quite low at 70°C and lost at 100°C. 2-Mercaptoethanol sensitivity study of purified mrigal Ig showed that the antibody activity of purified Ig was greatly reduced upon one hour treatment with 0.1 M 2-ME and completely lost when treated with 0.5M 2-ME. The anti-BSA antibody activity of mrigal serum was greatly reduced upon treatment with 0.1 M 2. ME as well as 0.5M 2-ME. This shows the susceptibility of mrigal Ig to reducing agents like 2-ME. Antisera to mrigal Ig were

raised in rabbits. It was observed that the anti mrigal antisera was quite specific in its action against heavy and light chains in western blotting. Using this rabbit anti-mrigal Ig antiserum, an indirect ELISA was designed to quantify the normal serum Ig level in mrigal. The mean Ig concentration in mrigal (250-300 g) normal sera was found to be 7.72 *mg/ml* which is around 23.71 % of total serum proteins.

5.1 New Academic Programmes

Central Institute of Fisheries Education started a new course, M.F.Sc. (Business Management) from this academic year. The course was inaugurated on 16 September, 2002 by Dr. Vinaysheel Gautam, Former Director IIM (K) and Professor IIT New Delhi, in presence of Dr. S. Ayyappan, D.D.G. (Fisheries) ICAR.

All the faculty members and new students of the course were present in this function. Dr. S. C. Mukherjee, Director, CIFE, welcomed the chief guest and all guests of honour. Shri M. A. Upare, NABARD, Mumbai, was also present on the occasion. The outline of the course was presented by Dr. R.S. Biradar, Principal Scientist. Dr. K.K. Jain, Sr. Scientist gave a vote of thanks. The programme was compered by Dr. S.N. Ojha, Sr. Scientist.

5.2 Academic Programmes

The details of enrolments and results declared pertaining to the various academic programmes offered by the Institute for the year 2002-2003 are as follows :

Results

Name of the programme	Year	Number of successful candidates
Ph.D. (Fisheries Resource Management)		
Ph.D. (Inland Aquaculture)		
Ph.D. (Mariculture)		
M.F.Sc.(Fisheries Resource Management)	2000-2002	10
M.F.Sc (Inland Aquaculture)	2000-2002	16
M.F.Sc (Mariculture)	2000-2002	10
M.F.Sc. (Freshwater Aquaculture)	2000-2002	5
M.F.Sc (Post-harvest Technology)	2000-2002	5
P.G. Diploma in Inland Fisheries Development & Administration	2001-2002	41
Total		**87**

Enrolments during 2002-2003

Programme	No. of students admitted
Ph.D. (Fisheries Resources Management)	5
Ph.D. (Inland Aquaculture	7
Ph.D. (Mariculture)	4
Ph.D. (Post Harvest Technology)	4
M.F.Sc. (Fisheries Resources Management)	6
M.F.Sc. (Inland Aquaculture)	5
M.F.Sc. (Mariculture)	5
M.F.Sc (Freshwater Aquaculture)	6
M.F.Sc. (Post-harvest Technology)	5
M.F.Sc. (Fish Pathology & Microbiology	6
M.F.Sc. (Fish Nutrition & Biochemistry)	5
M.F.Sc. (Fish Business Management)	5
P.G. Diploma in Inland Fisheries Development & Administration	17
Total	**80**

5.Education Achievements

5.3Guest lecture

Sl.No.	Name	Topic	Date
1.	Mr. Anand Pendarkar, Bombay Natural History Society	Wildlife Diversity and Consrvation	April 17, 2002
2.	Dr. Rajesh Mishra, Joint Director, Nature Group, Goregaon, Mumbai	Medicine free life (Naturopathy) (Lecture-cum-demonstration)	May 17, 2002
3.	Dr. K.R. Prasad, President, Confederation of Fisheries and Aquaculture Welfare organization, Viskhapatnam	An Overview on the Agriclinic-Agribusiness	March 15, 2003

5.4 Lectures delivered

Dr. S. Raizada, Sr. Scientist
Suitable Technologies of Aquaculture
for Inland Saline Soil and Water
Aquaculture Research and Training Institute (ARTI)
Hisar, Haryana
April 03, 2002

Dr. S. Raizada, Sr. Scientist
Prawn Farming prospects and methodology
with reference to Haryana
Aquaculture Research and Training Institute (ARTI)
Hisar, Haryana
April 17, 2002

Dr. S. Raizada, Sr. Scientist
Saline Water Fish/Prawn in Haryana Status Report
Aquaculture Research and Training Institute (ARTI)
Hisar, Haryana
May 07, 2002

Dr.N.K. Chadha, Sr. Scientist
Techniques of Freshwater Prawn Farming
Hisar, Haryana
May 7-8, 2002

Dr. S. Raizada, Sr. Scientist
Biology and Culture of Milkfish in India
and the Southeast Asia
Rajasthan State Fisheries
Udaipur
May 16, 2002

Dr. C.S. Purushothaman, Principal Scientist
Marine Ecosystem in Relation to Environment
Haffkine Institute for Training, Research
and Testing, Mumbai
June 5, 2002

Dr. K. Pani Prasad, Scientist(SS)
Recent Advances in Fish Disease Diagnosis
Vikram University, Ujjain, Madhya Pradesh.
August 9, 2002

Dr. K. Pani Prasad, Scientist(SS)
Shrimp Diseases On farm Diagnostics
Nellore, Andhra Pradesh.
August 26, 2002

Dr. K. Pani Prasad, Scientist (SS)
Rapid Techniques in identification of Fish diseases
India International Centre (Annexure)
August 29-30, 2002.

Smt Asha T. Landge, T-6
Coastal Aquaculture
Rambhaw Mhalagi Prabodhini,
Uttan Village, Bhaiynder

Dr.G.Venugopal, Sr. Scientist
Scampi Culture
Karimnagar Dt. A. P.

Dr.G.Venugopal, Sr. Scientist
Prospects of Freshwater Prawn Farming
MPEDA
Devarapalli,Visakhapatnam
A.P.

C.S. Purushothaman
Principal Scientist
Marine Biodiversity
Food Technology Division
Bhabha Atomic Research Center, Mumbai
September 30, 2002

Mrs. Asha T. Landge
Technical Officer
Coastal Aquaculture
Global Ballast Water (Indian) project
Rambhau Mhalgi Prabodhini
Uttan Village, Bhayinder

Mr. A.K. Reddy
Tech. Officer
Environmental Impact Assessment
related to Coastal Aquafarms
Lalbahadur Sastri College of Advanced Maritime
Studies and Research,
Mumbai
12 October, 2002

Mr. A.K. Reddy
Tech. Officer
Coastal Aquaculture of Finfish and Shellfish
Lalbahadur Sastri College of Advanced Maritime
Studies and Research,
12 October, 2002

Mr. A.K. Reddy
Tech. Officer
Sea Ranching
Maritime Studies and Research,
13 October, 2002

Mr. A.K. Reddy
Tech. Officer
Polyculture of Carps and Giant Freshwater Prawn
Krishivignan Kendra,
Mahatma Phule Agricultural University, Dhule
10 October, 2002.

Mr. A.K. Reddy
Tech. Officer
Carp Seed Production
Krishivignan Kendra, Mahatma
Phule Agricultural University, Dhule
10 October, 2002.

Mr. A.K. Reddy
Tech. Officer
Recent trends in Carp Culture
Krishivignan Kendra, Mahatma
Phule Agricultural University, Dhule
11 October, 2002

Mr. A.K. Reddy
Tech. Officer
Management Giant Prawn Hatchery and Grow Out Technology
Krishivignan Kendra, Mahatma
Phule Agricultural University, Dhule
11 October, 2002

Dr. Radha C. Das, Principal Scientist
Recent Advances on Fish reproduction
WBUA&FS, Mohunpur
7 November 2002.

Radha C. Das, Principal Scientist
Hormonal Control of Fish Reproduction and Application of Genetics in Aquaculture
North Bengal University,
Siliguri
21-22 November 2002

Mrs. Nalini Poojary
Tech. Officer
Fish Diseases Diagnosis and Treatment an overview
Bhavan's College
Andheri, Mumbai
20 December, 2002

Dr.G.Venugopal, Sr. Scientist
Air-breathing Fish Culture as Alternative to Carp Culture
Aqua Expo-2002
Bhimavaram, A.P.
27-29 December, 2002

Sh.P.Rami Reddy, Tech. Officer
Alternative species in brackishwater ponds
Aqua Expo-2002
Bhimavaram, A.P.
27-29 December, 2002

Mr. K. Venkateshvaran, Scientist (SG)
Organisms Dangerous to Divers
The Marine Medical Society at INS Ashwini,
Naval Hospital, Colaba
January 18, 2003.

Mr. G. K. Rao, Technical Officer
Diploma in Inland Fisheries
CIFE Kolkata Centre
August 2 - 11, 2002.

Mr. G. K. Rao, Technical Officer
M.Sc. (Life Sciences) Students of Mumbai University
Kalina Campus, Mumbai

Mr. A.K. Reddy
Tech. Officer
Probiotics and their use in Aquaculture
Farmers Meet at Palghar
organised by MPEDA
25 March, 2003.

Dr. S. Raizada, Sr. Scientist
Prawn Farming
Experience Sharing on Prawn Farming
Aquaculture Research and Training Institute (ARTI)
Hisar, Haryana
March 27, 2003

5.4 CAS Training programme

1. CAS Training Programme on Advances in Fish Disease Diagnostics (February 25 to March 17, 2003)

5.5 DBT/NBDB Training programme

1. Aquatic Animal Toxins and Pharmacological Bioresources (March 22 to April 11, 2003)
2. Taxonomy, Genetics & Gene Banking of Coastal and Marine Bio-resources and Biodiversity (18 June 8 July 2002)

5.6 Research Guidance and training to students from other Universities

Sl.No.	Guide name	No. of Students	University	Period
1.	Shri P.K. Pandey, Scientist (SS)	1	Amravati University	May 1 -July 1, 2002
2.	Dr. K.K. Jain, Principal Scientist	5	College of Fisheries Ratnagiri	
3.	Dr. K. Pani Prasad, Scientist	3	K.S.R. College of Arts and Science, Tamilnadu	May 1 May 31, 2002
4.	Dr. K. Pani Prasad, Scientist	2	K.S.R. College of Arts and Science, Tamilnadu	May 1- June 30, 2002
5.	Shri K. Venkateshvaran, Scientist (SG)	1	Fisheries College and Research Institute, Thoothukkudi	May 4- August 4, 2002
6.	Dr. K. Pani Prasad, Scientist	1	Srimad Andaman Arts & Science College, Thiruchirapalli, Tamilnadu	25 February-17 March, 2003

5.7 Duties as external examiner/experts/thesis evaluator/paper setters for M.Sc./ Ph. D. students in other universities.

Name of Scientist	Name of Universities/College etc.
Dr. K.K. Jain, Principal Scientist	1. Barkatullah Vishwavidyallaya, Bhopal, 2. K.R. College, Mathura
Dr. S.D. Singh, Principal Scientist	1. M. Sc. Students of All India Institute of Medical Sciences, New Delhi; 2. G. G. University, Bilaspur (Biotechnology), 3. C.S. Azad university of Agriculture, Kanpur (Biochemistry) & Kanpur university, Kanpur (Life Sciences): 4. IVRI- Izatnagar(Biochemistry & Biotechnology) 5. J. N. Krishi Vishwavidyalaya Jabalpur (Animal Biochemistry). 6. Univ. of Agri. Sciences Bangalore, Fisheries College, Mangalore. 7. Barkatullah Vishvidyalaya, Bhopal
Dr. S. Basu, Sr. Scientist	1. Cochin University of Science and Technology 2. Konkan Krishi Vidhyapeeth, Ratnagiri 3. College of Fisheries, Mangalore

Dr. S.D. Singh, Principal Scientist, acted as referee for research articles for the following journals:

1. *Indian Journal of Animal Sciences*
2. *Indian Journal of Marine Sciences*
3. *J. Indian Fisheries Association*

Sl.No.	Name of the training programme	Date	No. of participants
1.	Coastal Bio Resources Development And Management	April 4-6, 2002	37
2.	Freshwater Giant Prawn Hatchery Management	April 16-24, 2002	14
3.	Prawn Nutrition And Feed Technology	May 8-14, 2002	15
4.	Product Development And Quality Control	June 5-11, 2002	18
5.	Biochemical And Molecular Techniques In Aquaculture	June 19-25, 2002	16
6.	Carp And Catfish Breeding And Culture	July 16-22, 2002	13
7.	Management Of Giant Freshwater Prawn Hatchery And Growout Technology	August 20- Sept.,02, 2002	25
8.	Pearl Culture	September 2-9, 2002	08
9.	Ornamental Fish Culture	September 17-23, 2002	40
10.	Fish And Prawn Aquaculture (For The Entrepreneurs Of The Andaman And Nicolar Island)	September 26-October 9, 2002	25
11.	Entrepreneurship Development And Project Formulation	October 16-21, 2002	09
12.	Aquatic Environment And Its Management In The Context Of Aquaculture	December 4-7, 2002	05
13.	Environmental Management In Fisheries	December 4-12, 2002	05
14.	Live Feed Culture	January 4-10, 2003	05
15.	Culture Of Live Food Organisms	January 08-14,2003	09
16.	Carp Meat Processing, Shark Fishery, Fish Air Bladder Processing	January 21-February 3, 2003	01
17.	Computer Applications In Fisheries	January 29-February 4, 2003	01
18.	SPSS Software Training	March 17, 2003	
19.	Modern Techniques In Molecular Biology And Biotechnology Research	March 31-May 31, 2003	2

6. Extension Achievements

The following training programmes were organized for fisherwomen in Mumbai and different parts of West Bengal on preparation of value added products from low cost fish:

Place of training	Topic	Duration	No. of participants
CIFE Mumbai	Value added products from low cost fish	June 5-11, 2002	18
Briji Patuli Co-operative Society, Jadavpur, W.B	Value added products from low cost fish	July 9-13, 2002	20
Sindrani Co-operative Soc., 24 Pgs (N), W.B.	Value added products from low cost fish	July 15-18, 2002	22
Captain Bheri, Dhapa, Kolkata	Value added products from low cost fish	August 22-24, 2002	18
Junput, Contai, Midnapur (W), W.B.	Value added products from low cost fish	August 27-30, 2002	34
Namkhana, 24 pgs (S), W.B.	Value added products from low cost fish	September 1-4, 2002	14

CIFE Centre Kolkata

Sl.No.	Name of the Training Programme	Date	No. of participants
1.	Farming System	June 10-15, 2003	12
2.	Induced Breeding of Fish and Nursery Pond Management	July 3-22, 2002	
3.	Integrated Fish Farming Systems	June 10-15, 2002	12
4.	Development of Fish Products	July 15-22, 2002	15

CIFE Centre, Kakinada

S. No.	Title of the programme	Period	No. of participants
1.	Freshwater Giant Prawn Hatchery Management	April 16-24, 2002	14
2.	Culture Of Brackishwater Finfish And Shellfish	June 12-21, 2002	11
3.	Brackishwater Aquaculture for The Inservice Officers Of A.P.	June 24-29, 2002	17
4.	Breeding and Culture Of Carps	July 10-19, 2002	25
5.	Carp Seed Production Technology	July 22-27, 2002	26
6.	Breeding & Culture of Air-Breathing Fishes	August 2-8, 2002	13
7.	Freshwater Giant Prawn Hatchery Management	September 12-21, 2002	17
8.	Culture Of Brackishwater Finfish And Shellfish	October 3-11, 2002	7
9.	Freshwater Prawn & Fish Culture	November 7-16, 2002	12
10.	Brackishwater & Freshwater Shellfish & Finfish Farming	December 10-15, 2002	37
11.	Culture Of Finfish & Shellfish In Brackishwater & Freshwater	January 17-27, 2003	14

CIFE Centre, Powerkheda

S. No.	Title of the programme	Period	No. of participants
1.	Fish Seed Production and Rearing	July 31- August 1, 2002	30
3.	Fish Farm Management	September 16-25, 2002	32
5.	Fish/Shell Fish Aquaculture for Andaman & Nicobar	October 3-8, 2002	25

CIFE Centre, Rohtak

S. No.	Title of the programme	Period	No. of participants
1.	Grow Out of Freshwater Prawn In Inland Saline Water (In Hindi)	December 8-13, 2002	26
2.	Importance of Soil and Water Testing and Management for Aquaculture	February 11-15, 2003	

CIFE Centre, Lucknow

S. No.	Title of the programme	Period	No. of participants
1.	Grow-out Aspects and Hatchery Management of freshwater fishes	April 16- October 15, 2002	30 In-service personnel of Jammu & Kashmir & U.P. State Fisheries Dept.
2.	Matsya Palan evam Talab Prabhand	April 23-May 2, 2002	40
3.	Carp Culture (In Hindi)	May 14-23, 2002	05
4.	Carp Breeding	August 12-21, 2002	03
4.	Magur Culture and Breeding	August 24-September 2, 2002	05
6.	Grow-Our Aspects and Hatchery Management of Freshwater Fishes	October 16, 2002- April 15, 2003	30 In-service personnel of Jammu & Kashmir & U.P. state fisheries Dept.

6.2 Fisheries Awareness Programme/Visit Coordination

Visitors at CIFE, Mumbai coming from different parts were given an exposure on the activities of the institute. Visitors were further categorized as given below.

Sl.No.	Category	Number
1.	Fisheries College students	211
2.	Post graduates from different colleges	41
3.	Graduates from different colleges	583
4.	Primary school children	678
5.	CIFE Lucknow centre	14
6.	CIFE Kolkata centre	28
7.	Other	225
	Total	**1780**

Awareness Programme On Scampi Farming

CIFE Kakinda center in collaboration with Department of Fisheries (Govt. of A.P.) had initiated for the first time Awareness camp on Scampi farming in Telangana region of A.P. which has rich potential of seasonal, long-seasonal and perennial tank. Dr.G.Venugopal, Officer in charge, P.Srinivasa Rao, Tech. Officer, R.R.S.Patnaik, Tech. Asst. have delivered talks on various aspects of Scampi farming and write-up in the form of popular articles were prepared in Telugu and distributed to the participants. The details of venue of Awareness programmes conducted and number of participants attended are given below;

	Place	Date	No.of participants
1.	Nizamabad,	22.7.02	120
2.	Pochampod	23.7.02	80
3.	Kamareddy	24.7.02	140
4.	Medak	05.9.02	225
5.	Sangareddy	04.9.02	650
6.	Siddipet	06.9.02	600
7.	Rangareddy	09.9.02	110
Total no. of participants:			**1925**

Dr.G.Venugopal, Officer in charge, has handled technical sessions on Scampi culture methods at one-day workshop-cum-awareness programmes conducted by MPEDA and Dept. of Fisheries, (Govt. of A.P.) at the following places;

Place	Date	No.of participants
Karimnagar	22-10-02	200
Devara palli(Anakapalli)	23-11-02	250

Sl.No.	Title	Organized by	Duration
1.	Exhibition on Bio-resource Development and Management at Madh Island	CIFE, Mumbai	April 4-6, 2002
2.	Exhibition on Bio-resource Development and Management at Narakkal, Vipen Island, Kerala	CIFE, Mumbai	April 17-19, 2002
3.	Exhibition during the Workshop on Fisheries Forecasting in collaboration with INCOIS, Hyderabad	CIFE, Mumbai	April 22, 2002
4.	Exhibition on Bio-resource Development and Management at Kovalam, Chennai, Tamil Nadu	CIFE, Mumbai	April 26-28, 2002
5.	Exhibition on National Symposium Fisheries Enhancement in Inland Waters – Challenges Ahead, CICFRI, Kolkata	CIFE, Mumbai	April 27-28, 2002
6.	Exhibition on Bio-resource Development and Management at Vasanthnagar, Chennai, Tamil Nadu	CIFE, Mumbai	April 27-28, 2002
7.	Exhibition on Bioresources at Junput (W.B.)	CIFE, Mumbai	May 29-31, 2002
8.	Exhibition on Bioresources at Sultanpur	CIFE, Mumbai	June 13-15, 2002
9.	Exhibition on Bioresources at Palghar	CIFE, Mumbai	July 16-18, 2002
10.	Exhibition on Bioresources at Hasnabad	CIFE, Mumbai	June 17-19 , 2002
11.	Aquafair at Barrackpore (W.B.)	CIFE, Mumbai	June 17-19 , 2002
12.	Krishak Sangosthi at Powerkhda Centre of CIFE	CIFE Centre Powerkhda	June 29, 2002
13.	Maharashtra: Tradition and Progress, Maharshi Dayanand College of Arts, Science and Commerce, Parel, Mumbai	CIFE, Mumbai	September 6-7, 2002
14.	Exhibition at Nainital (U.P.) National Seminar on Hill Fisheries and Resource Management	CIFE, Mumbai	October 4-5, 2002
15.	Exhibition during Brain Storming Session on Govt. Industry partnership in fisheries and aquaculture at Vishakhapatnam at Kakinada Centre of CIFE	CIFE Centre Kakinada	November 20, 2002
16.	Kisan Ghosti	CIFE Centre Rohtak	December 8, 2002
17.	3 day exhibition on the occasion of Kisan Samman Divas at IARI, Pusa, New Delhi	CIFE, Mumbai	December 23, 2002
18.	Exhibition during National Conference on Recent Trends in Aquatic Biology at Nagarjuna Unversity Campus, Guntur (Kakinada Centre of CIFE)	CIFE Centre Kakinada	December 29-31, 2002
19.	Exhibition at Schumacher Institute of Appropriate Technology, a Lucknow based NGO	CIFE Centre Lucknow	January 13, 2003
20.	Kisan Mela, Powerkheda Centre	CIFE Centre Powerkhda	March 8, 2003

6.3.1 Fish Farmers' meet

A fish farmers' meet was organized at Jaunpur, Uttar Pradesh on 25 October, 2002. About 400 fish farmers participated in the meet. Lectures were delivered on composite fish culture by Dr. A.K. Jain, utilization of alkaline soil for aquaculture by Dr. P.M. Sherry & freshwater gaint prawn culture by Dr. P.K. Varshney. Shri Chandra Bhanu, District Magistrate, Jaunpur, Dr. S. Ayappan, DDG (Fy), ICAR, New Delhi & Dr. S.C. Mukherjee, Director, CIFE, Mumbai were the guests of honuor. Fish farmers belonging to Jaunpur district were benefited immensely from the technical session. A colorful & impressive exhibition was also setup with a purpose of creating awareness, among the gathering, of various fisheries technologies developed by CIFE & multifarious activities of this centre through display panels, working model of CIFE, D-85 hatchery, laminated photographs, charts & posters.

6.4 Television Coverage

A interview of Dr. S.C. Mukherjee, Director and Vice-chancellor, CIFE and Dr. M.V. Gupta, Director (IR), ICLARM was telecasted on 22 December, 2002, Dr. S.C. Mukherjee as an expert gave a separate interview to In time, In Mumbai T.V. Channel on coastal fisheries and it was given a wide coverage in the morning and evening news of In Mumbai in English, Hindi, Marathi and Gujarati.

Eenadu TV (a popular local T.V. Channel) had visited the Freshwater Fish Farm, Balabhadrapuram and shot a video film an Magur Seed production during the month of August. Dr. G.Venugopal, Officer Incharge, Sh J.Krishna Prasad, Farm Supdt., (T-5) and Sh. K.R.K. Reddy (T-4) had explained all the activities of induced spawning, hatchery management and culture aspects of *Clarias batrachus*.

Bhopal Doordarshan team arrived at the Powarkheda centre on August 14, 2002 and covered the Farm activities. This programme was telecasted from Bhopal Doordarshan on August 29, 2002. Dr. R.K. Upadhyay, Tech. Officer was called as an expert to give a talk by Bhopal doordarshan which was telecasted on February 17, 2003.

6.5 Training programme for Andaman & Nicobar Islands Farmers

In order to update the knowledge of farmers and officials of Andaman & Nicobar Islands, a training programme on “Fish and Prawn Aquaculture” was organised at CIFE, Mumbai and its centres at Powerkheda, M.P. from 26 Septenmber to 9 October, 2002. This training programme was totally financed by DST, Govt.of India, New Delhi.

A total of 25 fish farmers and panchayat officials were participated in the training programme. The programme was organized by CIFE, Mumbai in association with Madhya Pradesh Consultency Organisation (MPCON), Bhopal. On the occasion Dr. S.C. Mukherjee, Director, CIFE, Mumbai welcomed the chief guest Dr. Laxman Prasad, Advisor, DST and President, Dr. S.N.Dwivedi, Ex. Add.Secretary, DOD, Govt.of India and Dr. Lahri, Managing director, MPCON, Bhopal. Mr. A.K.Reddy, Co-ordinator of the training programme delt about the course content. The valedictory function was held at Central Soil Research Institute, Bhopal on 9th October, 2002. Hon'ble Shri Malthuram, Chairman, MPFDC, Bhopal was chief guest of the function. Dr. S.N.Dwivedi, Dr. S.C. Mukherjee and Dr. Lahri spoke on this occassion.

6.6 Radio Talk

Sl.No	Name	Topic & Venue	Date
1.	Shri P. Srinivasa Rao, Technical Officer (T-5)	*Chepalu royyala cheruvulalo kalupu mokkalu – Jala Keetakala nirmulana padhatulu*, All India Radio, Vishakhapatnam	August 31, 2002
2.	Sh.V.Narasimhacharyulu, Tech. Officer, T-5	*Manchineeti chepala pempakamulo neeti yajamanyam,* All India Radio, Vishakhapatnam	September 11, 2002
3.	Dr. N.K. Chadha, Sr. Scientist	Prospects of Prawn Farming in Haryana (in Hindi) at All India Radio, Rohtak	January 8, 2003

6.7 Technical guidance/Fishery advisory services

Officer-in-charge and technical officers of Kakinada and Balabhadrapuram have extended technical guidance to the farmers on the aspects of carp culture and seed production of freshwater prawn farming, Magur seed production & grow-out technologies. Brackishwater finfish and shellfish farming and health management. Besides this, water and soil management aspects were also attended.

A site survey was made on the request of the Director of Fisheries, Govt. of Haryana in five districts of Haryana namely Rohtak, Faridabad, Gurgaon, Sonipat and Jhajjar to identify the suitable land sites for prawn farming. The staff of this centre personally visited the sites and collected the soil and water samples along with the other supporting land data. The soil and water samples were analyzed in laboratory of the centre on payment basis and a printed report of 85 pages containing recommendation was published and submitted to the Director of Fisheries, Govt. of Haryana. During the work, various meetings organized at the department level and district administration levels were attended by the scientists of this centre for rendering suggestions.

Besides carrying out site survey work as mentioned above, 55 samples each of soil and water were received from the Haryana State Fisheries and Private farmers were also analyzed in the laboratory of CIFE Rohtak Centre on payment basis. Evaluation of quality and quantity of prawn seed of Haryana Fisheries was done. Approximately 50 entrepreneurs and fish farmers were given technical know how on fish and prawn farming and disease problems.

The staff at the CIFE centre Rohtak evaluated the water quality of River Yamuna at 4 spots located between Shahadara and Okhla and submitted the report to the Deputy Director General (Fisheries), ICAR, New Delhi.

Consultancy on breeding of silver carp & grass carp was provided to the College of Fisheries Science, G.B. Pant University of Agriculture & Technology, Pantnagar from July 24-29, 2002. Dr. A.K. Jain was deputed to College of Fisheries Sciences, G.B. Pant University of Agriculture and Technology to identify and

assess constraints coming in way of successful breeding of Indianised silver carp & grass carp.

Consultancy on culture of Indian *magur* (*Clarias batrachus*) & *singhi* (*Heteropneustes fossilis*) was provided to Dr. Sirohi, Incharge for Indo-Israel project at Indian Agricultural Research Institute (IARI), New Delhi. This work is being monitored by this Center under the guidance of DDG (Fy), ICAR. Results of singhi magur culture is satisfactory till date.

Technical guidance on fish Powarkheda culture aspects was given to a score of fish farmers who visited CIFE centre, Powarkheda besides a number of students and other entrepreneurs.

Fisheries Advisory Services were provided to 170 clients an various aspects of fisheries at CIFE, Mumbai.

About 75 pisciculturists were benefited through advisory services offered by CIFE Centre, Lucknow. They were advised on various aspects of aquaculture disease control, selection of new candidate species, hatchery establishment, farm construction, *etc.*

Technical know-how was provided to Dr. A.N. Kar, Prof. & Head, Deptt. of Neurology, Chatrapati Shahuji Maharaj Medical University, Lucknow on carp culture & freshwater giant prawn culture at his environmentally controlled pond internally lined with glazed tiles . The growth of prawns at the end of 6 months' culture period reached to a maximum weight of 60 g. The poly-culture of carps at his another pond is progressing , satisfactorily.

- A Indian magur hatchery is being setup on a request received from a private fish farmer, Shri Shyam Prakash, resident of Beniganj, Hardoi district, U.P. The installation of hatchery & construction of fish pond are under progress at Beniganj. Considering the congenial

6.8 REVENUE GENERATED

S.No.	Particulars	Amount (Rs.)
1.	Soil and Water Analysis	7,750/-
2.	Sales of Publications	1,000/-
3.	Training Fee	71,000/-
4.	Annual maintenance contract of IIT, Powai	65,000/-

CIFE Centre Rohtak :

The centre generated a net revenue of Rs.51,000/- under the following heads.

a) Fee from STP participants Rs.26,000.00
b) Soil and water analysis fee Rs.20,000.00
c) Fish and prawn sale Rs. 5,000.00

Total Rs.51,000.00

CIFE Centre Kakinada

The details of the revenue obtained through the sale of farm production (fish/shrimp/fish seed/crab /etc) at the Brackishwater Fish Farm are as follows:

Production item	Nos.	Qty. in Kg	Amount (Rs)
Milk fish	1,504	325.4	8,134/-
Milk fish seed	46,300	-	47,28/-
Milk fish yearlings	1,050	129.9	5,250/-
Seabass	2	1.9	96/-
Tiger prawn	8,070	203.7	67,102/-
White prawn	719	8.5	1,037/-
Misc. prawns	--	55.475	1,089/-
Misc. fish	--	27.9	251/-
Crabs	2	1.0	156/-
		Total	**1,30,396/-**

Total Kakinada Centers' total revenue: A record revenue of Rs.3,03,026/- was generated this year and the details are as follows:

Source	Amount (Rs) realized
Brackishwater fish farm	1,30,396/-
Freshwater fish farm	62,751/-
Auction proceeds of FWFF items	48,423/-
Training programmers	41,900/-
Hostel/dormitory charges	8,050/-
Books & manual sales	2,240/-
Miscellaneous	9,266/-
Total:	3,03,026/-

CIFE Centre Powerkheda

Fish Seed Production during financial year 2002-03 (in lakhs)

Species	Spawn production	Spawn sold	Spawn stocked
Catla	31.5	15.0	16.5
Rohu	08.0	--	08.0
Mrigal	46.0	17.5	28.5
C. carp	01.0	--	01.0
Total	86.5	32.5	54.0

Fish Seed Sale during 2002-03 (Till 31.03.2003)

Species	Fry/Fingerling Sold	Fingerling Stocked
Catla	3,22,900	05,000
Rohu	2,02,000	40,000
Mrigal	5,28,850	50,000
C. carp	-	00,500
Total	10,53,750	95,500

Total revenue of the centre during financial year 2002-03

Sl.No.	Name of head under which revenue	Amount (Rs.) Released
1.	Fish Seed Sale	1,68,551
2.	Dead Fish Sale	0,00,145
3.	Fish Sale	0,29,223
4.	Fodder Sale	0,00050
5.	Sale of Wheat	0,20,991
6.	Registration fee	0,39,000
7.	Hostel Rent	0,09,715
8.	Book Sale	0,00,258
	Total	Rs.2,67,933

The significant achievement of this year is the record revenue generation of Rs.2.68 lac at this centre during last decade and 2nd best in history of this farm. Also the progress of revenue generation is consistently on higher side during last five years.

CIFE Centre Lucknow

During field training programme, 5 lakh spawn of IMC were produced. Details of the livestock marketed from fish farm are given below.

Fry and Fingerlings	19,650
Table size fish:	442 kg
Freshwater Prawn:	32 kg
Revenue realized:	**Rs. 27,428/-**

6.9 Transfer of technology

6.9.1 Technology transfer of Milk fish culture:

CIFE Centre Kakinada

In order to introduce *Chanos chanos* culture in private farms some of the shrimp farmers of Kakinada region, who were continuously losing shrimp crop due to WSSV disease were identified and motivated to start Milkfish farming as a additional crop during August-December.

Chanos chanos fingerlings were supplied on cost basis and technical know-how of Milkfish culture was extended to the farmers. The details of the farmers' name and pond area are given below:

S.No.	Name of the farmer & place	Area of the pond (ha)	No. of fingerlings supplied
1.	Mr.K.Sivakumar, Gurajanapalli	2.0	2,000
2.	Mr. P.Gova Raju, Gadimoga	2.0.	5,000
3.	Mr.P.Satyanarayana, Gadimoga	5.0	15,700
4.	Mr. P.Venkata Rao, Gadimoga	3.0	7,100
5.	Mr. M.T.Raju , Pedagadimoga	2.0	5,000
6.	Mr. S.Narayana Rao, Pedagadimoga	2.0	4,500
7.	Mr. E.Raghava, Chollangi	4.0	4,000
8.	Mr. Ch.Surya Rao, Matlapalem	2.0	3,000
9.	Mr. Srinivasa Raju, Karapa	4.0	1,050

CIFE Centre Lucknow

In a maiden attempt in eastern Uttar Pradesh, culture of freshwater giant prawn (*Macrobrachium rosenbergii*) has been successfully carried out at a private fish farm in Barabanki district. The technology of freshwater giant prawn culture was transferred to one, Shri Misba -Ur-Rahman at his Kidwai Fish Farm, Bada Gaon.

Chal Vaijayanti Rajbhasha and Ashirwad Rajbhasha Samman

Arshirwad a reputed organization of Mumbai declared CIFE as the best Govt. office among all Central Government offices located in Mumbai for its contribution in the field of Hindi. The **Chal Vaijayanti Rajbhasha shield and Ashirwad Rajbhasha Samman** was received by

Dr.S.C.Mukherjee, Director. Shri R.P.Uniyal, Shri P.K.Das and all the staff of Hindi section on September 11, 2002. Smt.Smita Thackarey, Film Director was the chief guest of the function

Academy of Science, Engineering and Technology Award

The Academy of Science, Engineering and Technology

conferred "Plaque D' Honneur" upon Dr. S.C. Mukherjee, Director on 8th October 2002 in recognition of his outstanding development of CIFAX a chemical formulation which has enabled the aquaculture sector of the country to tide over a period of crisis.

Mr. A.K. Reddy, Technical Officer received the distinguished `Technologist Award' from the Academy of Science, Engineering and Technology, Bhopal on October 8, 2002 in recognition of his outstanding contributions for

the development of technology related to giant freshwater prawn hatchery based on artificial seawater.

Dr. Rajendra Prasad Award

Dr.S.A.H. Abidi, Former Director of this Institute & Member ASRB, Dr. Sudhir Raizada, Sr.Scientist and Shri Rajeshwar Uniyal, Asstt.Director (O.L.) were awarded the **Dr. Rajendra Prasad Award** for their outstanding book ***Bhartiya Matsyiki*** for the year of 2002-2003. The award was given by Hon'ble Minister of Agriculture, Shri Ajit Singh on 16.8.03 at Vigyan Bhavan, New Delhi.

Dr. Zahoor Qasim Gold Medal

Dr. P.P. Srivastava was honoured with Dr. Zahoor Qasim Gold Medal for 2001 for his contribution in Fish Nutrition, Nutritional Biochemistry and fish

7. Honours/Awards

Feed Technology. The award has been given by State Agriculture and Fisheries Minister of Uttranchal at National Research Centre on Coldwater Fisheries, Bhimtal, Nainital in October, 2002.

Honorarium for Development of antistress formulation

Dr. A.K. Pal was Awarded an honorarium of Rs One lakh by CIFE, Indian Council of Agricultural Research for the development and commercialization of antistress formulation for fish seed transportation. The award was received from Padma Vibhushan Dr R. Chidambaram, Scientific Adviser, Govt. of India on 18 January,2003.

Young Scientst Award

Dr. K. Pani Prasad was awareded the Dr. Hiralal Chaudhruri Fisheries Foundation Best Young Scientist on all India basis on June 27, 2002

Letter of Appreciation

Dr. K. Pani Prasad, organizing Secretary of the Sixth Indian Fisheries Forum received the Letter of Appreciation and Memonto from Dr. Clarissa Marte, President, Asian Fisheries Society, Phillipines on December 20, 2002

Shri. Dasari Bhoomaiah, Technical Officer received the letter of Appreciation from Dr. Clarissa Marte,

President, Asian Fisheries Society, Phillipines on 20 December 20, 2002 for his contributions in designing for Fifth Indian Fisheries Forum Proceedings cover page.

NATCON Environmental Conservation Award

Dr. Archana Sinha, Sr. Scientist received the "NATCON Environmental Conservation Award" for the best paper presented in National Seminar on "Relevance of Biosphere Reserve National Parks and Sanctuaries (Protected Habitats) in Present Context on May 26, 2002.

Nominations

The Atomic Energy Regulatory Board, Govt. of India has nominated Dr. K.K. Jain, Senior Scientist, as a member of a Task Group to review and recommended guidelines for irradiation of products including food products under the Chairmanship of Dr. A.K. Sharma, Head, Food Technology Division of the Bhabha Atomic Research Centre (BARC), Mumbai.

Dr S.D.Singh has been nominated as a member of IDP for assessing the export unit of fish and fishery products situated at Mumbai region by Govt. of India Min. of Commerce, Export Inspection Agency- Mumbai.

Dr S.D.Singh has been nominated a Fellow of National Academic of Sciences India (Allahabad) 2003.

Fellowships

Dr. U.K. Maheshwari, Principal Scientist has been awarded the Fellowship of Nature Conservators at Gurukul Kangri Universiry, Hardwar on May 25, 2002.

Best Research Paper

Dr. Archana Sinha, Senior Scientist received the award for writing the best research paper in Hindi at the National Symposium held at CICFRI, Barrackpore on February 23-24, 2003.

Best Paper Presentation

Shri P.K.Das, Technical Officer (Hindi), Kum.Revati Dhongade, Hindi Translator, Smt.Smita Koli & Shri Premshankar, F & A.O. were awarded the First Prize by Rajbhasha Sansthan, New Dehli for best paper presentation at Solan (Simla) on 22-24 April 2002.

Invitation

- Dr W S Lakra was invited to act as co-opted member of the Executive Committee of Centre of Biotechnology, Anna University, Chennai, for 3 years (2001-2003).

- Dr W S Lakra was invited to be on the editorial board of Asian-Australasian Journal of Animal Sciences, Korea, for 3 years.

Dr. Hiralal Chaudhari Annual Awards (2001-2002)

The CIFE Dr. Hiralal Chaudhari Annual Awards (2001-2002) were given to the following persons in June, 2003 by Dr. Panjab Singh, Secretary, DARE, and Director General, ICAR, New Delhi

Best Division
Division of Fish Nutrition and Biochemistry

Best Young Scientist
Dr. Subhendu Datta, Scientist, Kolkata Centre

Best Teacher
Dr. A.K. Pal, Sr. Scientist
Dr. K. Pani Prasad, Scientist

Award for Technology Transfer
Dr. S.N. Ojha, Sr.Scientist

Best Technical Staff
Mr. A.K. Reddy, Technical Officer

Best Administrative Staff
Mrs. Pragati Gadre, LDC
Mrs. Anagha Joshi, LDC

Best Supporting Staff
Shri Gyani Ram, Rohtak Centre

Award for best Hindi Work
Dr. Archana Sinha, Sr. Scientist, Kolkata Centre

Best fish farmer
Shri Mehmood Yakub Syed

Best School Children X Class
Mr. Naveen Prabhat, s/o Dr. P.K. Varshney, Sr. Scientist

Best School Children XII Class
Ms. Vidya Krishnan, D/o Mrs. Thilgavati Krishnan, T.O.

Felicitations to **Shri Neel Ratan Ghosh**

Ph.D. degree awards

The following staff member have been awarded the Ph.D. degree

Sl.No.	Name	Unversity
1.	Dr. R.K. Upadhyay, Tech. Officer	Barkatullah University, Bhopal
2.	Dr. V.K. Tiwari, Scientist	Barkatullah University, Bhopal
3.	Dr. N.P. Sahu, Scientist	IVRI, Bareilly
4.	Mr. P.K. Pandey, Scientist	CIFE
5.	Ms. A. Vennila, Scientist	Indian Agriculture Research Institute , New Delhi

ICAR SPORTS TOURNAMENTS

CIFE, Mumbai participated in the Inter-Institutional Sports Tournament (Zone-II) held at NBSSLUP, Nagpur during October 28-31, 2002 and won prizes :

Ms. Nalini Poojary was adjudged the Best Women athletic of the tournament (Zone-II)

Women		
100 mt	First	Nalini Poojary
200 mt	First	Nalini Poojary
High Jump	First	Nalini Poojary
Long Jump	Third	Nalini Poojary
Discus throw	First	Revati Dhongde
Discus throw	Third	Nalini Sawant
Short Put	Second	Madhavi Pikle
Badminton Singles	Runner-up	Revati Dhongde
Men		
800 mt	Third	Mohd. Baqar
1500 mt	Third	Mohd. Baqar
4X100 mt relay race	Third	Mahesh Waghela Janardan M. Koli Surajbali R. Jaiswar Vijay Kuveskar
Kabbadi	Winners	Bhaskar Mandare Ravindra R. Kadam Raju Deshmukh Mahesh Waghela Janardan M. Koli Jagdish N. Dhanu Pradeep Angane Narendra Aglave Dhanpat Singh Vasant Ondkar

Contract Research : "Evaluation of organic acids as growth promoter in *Macrobachium rosenbergii* (de Mann)

MOU was signed on 12 July ,2002 by

1. Dr.S. Ayyappan, Director, CIFE
2. Dr. C.S. Bedi, Chief Executive, Gybro Chemicals, Mumbai
3. Dr A.K. Pal, Sr. Scientist, CIFE

Collaboration with other Institutes

MPCST Bhopal is running an ICAR funded project on Conservation of Mahaseer at CIFE Centre, Powerkheda. Dr. Somdutt is the project co-ordinator of the above project. Besides providing technical guidance on demand, CIFE centre Powarkheda is providing infrastructure facilities like ponds, hatchery and water supply etc.

A Project on Natural resources management for sustainable agriculture production in vertisols of Central India is conducted in collaboration with MSSRF-OSU-JNKVV Jabalpur. Under this project fish culture was started in fallow watersheds used for irrigation purpose in Seoni Malwa Tehsil of Hoshangabad District.

A collaborative project titled "Genetic improvement of *Penaeus monodon* (tiger shrimp) through selective breeding for growth and white spot disease resistance" with CIBA, Chennai and AKVAFORSK Norway has been submitted for international funding by NORAD, Norway. The project with a budget of 150 lakhs has been accepted in principle by NORAD.

8. Linkages and Collaboration

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Pamphlets/Booklets/Bulletin

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Hand folder on Importance of soil and water testing in aquaculture and the testing facility available at CIFE Rohtak Centre.

Samanwit machhlee palan (Integrated fish farming)

Nimkha ya Panyatil Kolambi Sheti - A.Ragabhagat

Mase evam Kolambipasun Khadya Padarth - S.Basu

Matsya Eklan Upakarne - S.Kamat & Lata Shenoy

Godya Panyateel Zhinga Palan - A.K.Reddy & A.Ragabhagat

Masemariteel Dhoke Aani Kharch Vachvinyasathi Sampark Evam Noukayan Upakarne - A.Padmanabhan

Meetha Pani Zhinga Palan - A.K.Reddy (Page 16)

Matsya evam Zhinga Aahar - K.K.Jain & P.P.Srivastava (Page 24)

Training Programme Calender 2002-2003

Sampreshan evam Nou Sanchalan Upkarno Dwara Matshiki Kshetron me Honewala Katare evam Lagat me Kami (Bilingual) Page 7

Alplavaniya Jal me Zhinga Palan - A.K.Reddy (Page 13)

Machali Evam Zhingon se Khadya Padarth - S.Basu

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Matsyavyapar

Integrated aquaculture for sustainable resource management in bio villages for SC/ST.

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Report

Deshmukhe, Geetanjali, 2003. Restoration of mangroves along the Gulf of Khambhat, Gujarat. Technical report submitted to Gujarat Ecology Commission, Vadodara, Gujarat (Consultancy project).

Report on selection of sites for freshwater prawn farming in Haryana, CIFE Centre Rohtak.

Manuals

Anthlavniya jal mein Mahajhinga Palan (Hindi).

Course Manual on Fisheries Statistics

Importance of Soil and water testing and management for aquaculture.

Advances in fish disease diagnostics.

Computer application in fisheries

Freshwater Giant prawn hatchery management

Taxonomy, Genetics and gene banking of coastal and marine bioresources and biodiversity

Brackishwater finfish and shellfish culture

Freshwater prawn and fish culture

Fish and Prawn Aquaculture

Prawn Nutrition and Feed Technology

Carp and Catfish Breeding and Culture

Management of Giant Freshwater Prawn Hatchery and Grow out Technology

Pearl Culture

Fish and Prawn Aquaculture for the Entrepreneurs of the Andaman and Nicobar Islands

Aquatic Environment and its Management in the Context of Aquaculture

Live Feed Culture

Fresh Water and Marine Aquarium Management

Biochemical and molecular techniques in aquaculture

Fish nutrition & feed technology a short term course

Fish Nutrition and Feed Technology

Anthalavniya jal mein Mahajhinga Palan (Hindi)

Syllabui Prepared

Fish seed production. NCERT. Competency based vocational curriculum for + 2 students. Revised syllabus is printed in January, 2003.

Newsletter

Matsya Darpan, Quarterly Magazine, CIFE, Mumbai, Volume 18

1 INTEGRATED AQUACULTURE FOR SUSTAINABLE RESOURCE MANAGEMENT IN BIOVILLAGES. (Funded by The Department of Biotechnology)
S.N.Ojha, A.K.Reddy, A.Landge, Chandrakant, M.H. and Chandraprakash

CYTOGENETIC AND MOLECULAR CHARACTERIZATION OF GIANT FRESHWATER PRAWN *MACROBRACHIUM ROSENBERGII* (Funded by AP CESS Fund, ICAR)
W.S. Lakra (PI)

IN-SERVICE TRAINING PROGRAM IN FISH MOLECULAR BIOLOGY (Funded by: Department of Biotechnology, Government of India)
S. Ayyappan (PI), W.S. Lakra, Gopal Krishna, A. Choudhari, S. Jahageerdar, S. Akare and R.S. Rana

WOUND HEALING, ANTINEOPLASTIC AND ANTIOXIDANT COMPOUNDS FROM TWO MARINE CRINOTOXIC FISHES (FUNDED BY CGP/NATP)
K. Venkateshvaran (PI), S. Ayyappan, S. Mukherjee, G. Venkateshwarlu, Asha Landge, Nalini Poojary

DEVELOPMENT AND CHARACTERIZATION OF CELL LINES FROM SELECTED FISH AND SHELLFISH SPECIES USED IN AQUACULTURE (Funded by Department of Biotechnology, Government of India)

HUMAN RESOURCE DEVELOPMENT IN COASTAL BIO-RESOURCE DEVELOPMENT AND MANAGEMENT (Funded byNBDB/ Department of Biotechnology, Government of India)
S. Ayyappan (PI), W.S. Lakra and K. Venkateshvaran

DEVELOPMENT OF INTERACTIVE CD ROM FOR FISH DISEASES (FUNDED BY EDUCATION DIVISION ICAR)
Pani Prasad (PI), R.S. Biradar and D. Bhoomaiah

TECHNOLOGY REFINEMENT PROJECT:TECHNOLOGY REFINEMENT OF AQUACULTURE PRACTICES IN SOME SELECTED BHERIS OF WEST BENGAL.
P.K. Roy (PI)

IMPACT ASSESSMENT OF WATER POLLUTION BY HEAVY METALS ON COMMERCIALLY IMPORTANT FISHES OF FRESHWATER ECOSYSTEM OF ROHTAK (HARYANA) (ICAR ad-hoc Research Scheme)

10. List of approved on-going projects

I CIFE{M)/I-AQ-I
Standardisation of practices *of* sustainable aquaculture
Kohli, M.P.S.

CIFE(M)-2000/1-AQ-1 (S1)
Trials on cage culture of commercially important fishes in open waters
Kohli, M.P.S. (PI), Ayyappan, 5., Dube Kiran, Saharan Neelam, Patel, M.B., Reddy, A.K., Langer, R.K. and Chandra Prakash

CIFE(M)-2000/1-AQ-I(S2)
Impact of certain organophosphorus pesticides on body fluids and tissue of a common teleost *Labeo rohita*
Saharan Neelam (PI), Raizada, S. and Srivastava, P.P.

CIFE(M)-2000/1-AQ-I(S3)
Comparative evaluation of extent of impact of Agriculture / Industry / Fisheries and Aquaculture on the coastal aquatic ecosystems in selected study areas
Kohli, M.P.S. (PI), Saharan Neelam, Patel, M.B. Chandra Prakash and Jaiswar, Ashok

CIFE(M)-2001/1-AQ-I(S5)
Genetic variation in Ulva species from natural resources and biotechnically reared sources Deshmukhe Geetanjali(PI), Singh, S.D., Dwivedi, Alkesh and Srivastava, P.P.

2 CIPE{M)/2-FGB-1
Studies *on* population genetics and breeding of selected finfish and shellfish species Lakra, W.S. (PI)

CIFE(M)2000/2-FGB-I(S1)
Studies on population genetics of marine shrimp, Penaeus monodon
Lakra, W.S.(PI), Gopal Krishna, Chaudhari, A.C., Jahageerdar, Shrinivas and Bandkar, Sanjeev

CIFE(M)-2000/2-FGB-I(S2)
Estimation of rate of inbreeding in fish population of hatcheries of Maharastra. Jahageerdar, Shrinivas (PI) and Biradar, R.S.

CIFE(M)-2000/2-FGB-I(S3)
Studies on the karyomorphology of Brackishwater fishes *Lates calcarifer* and *Chanos chonos* in relation to heavy metal pollution
Gopal Krishna (PI), Lakra, W.S. and Bandkar, Sanjeev

CIFE(M)-2000/2-FGB-I(S5)
Optimisation of sperm:egg ratio in Indian carps
Jahageerdar Shrinivas (PI), Gopal Krishna and Bandkar, Sanjeev

CIFE(M)-20001/2-FGB-I(S6)
Development of genomic library of WSSV for identification, cloning and expression of major
antigenic protein(s)
Akare Sandeep (PI), Makesh, M., Lakra, W.S., Mukherjee, S.C. and Bandakar, S.

3 CIPE(M)/3-PUM-I
Biodiversity and fish health conditions of the northwest coast *of* India
Purushothaman, CS. (PI)

CIFE(M)-2000/3-FHM-I(S1)
Mapping of the biodiversity along Mumbai Coast with special reference to pollution
Purushothaman, C.S. (PI), Langer, R.K., Padmonabhan, A.K., Tandel, R.D. and Koli, J. M.

CIFE(M)-2000/3-FHM-I(52)
Mapping of biotoxins in marine Cinidarians and coniids properties and Evaluation of their Beneficial Properties
Venkateshvaran, K. (PI), Venkateshwarlu, G., Landge, A. T. and Poojary Nalini

CIFE(M)-2000/3-FHM-I(53)
Parasitological and histopathological investigations of few selected marine food fishes. Rajendran, K. V. (PI) and Patel, M.B.

CIFE(M)-2000/3-FHM-I(54)
Characterisation and comparative evaluation of macromolecules associated with virulence in, pathogenic bacteria, *Edwardsiella tarda* and *Aeromonas hydrophila*
Pani Prasad, K. (PI), Chaudhari, A.C and Mukherjee, S.C.

CIFE(M)-2001/3-FHM-I(55)
Studies on efficacy of herbal medicines and medicinal plant extracts against microbial diseases of finfish and shel fish
Raman, R.P. (PI), Venkateshwarlu, G., Deshmukhe Geetanjali, Patel Mahesh and Koli. J.M.

CIFE(M)-2001/3-FHM-I(56)
Development of Bacterial Fertilizer for Aquaculture
Pandey, P.K. (PI), Ayyappan, S.,Makesh, M. and Landge A.T.

CIFE(M)-2001/3-FHM-I(57)
Bioecology of intertidal macrobenthos in changing environment around Mumbai and their heavy metal bioaccumulation
Varshney, P.K. (PI), Jaiswar, A.K. and Chandra Prakash

4 CIFE(M)/4-IT-1
Management of marine fishery resources of Maharastra coast
Biradar, R.S. (PI)

CIFE(M)-2000/4-IT -1(51)
Development of database for marine fisheries of Maharastra
Biradar, R.S. (PI), Rao, G. K., Pikle Madhavi, Gajbhiye, S.B. and Pagare Rajani

CIFE(M)-2000/4-IT -1(52)
Fish stock assessment and management of some demersal fishery resources of Maharashtra coast
Chakarvarty,S.K. (PI), Biradar, R.S., Jaiswar, A.K. and Palaniswamy R.

CIFE(M)-2000/4-IT -1(54)
Fish consumption profile of Mumbai Households - pilot study
Shyam S. Salim (PI), Ojha, S.N., Ragabhagat, A.D. and Rao, G. K.

CIFE(M)-2001/4-IT -1(56)
Production Possibilities of Fish Products from low cost fish in the coastal village condition Ojha, S.N. (PI), Shyam S. Salim, Basu, S., Sharma Arpita and Ragabhagat A.D.

5 CIFE (M)-2000/5-PUT-1
Characterisation and refinement offish and fisheries products Singh, S.D. (PI)

CIFE(M)-2000/5-PHT -1(51)
Studies on DNA fingerprinting and RFLP profiles of commercially important and endangered fish species
Singh, S.D. (PI) and Chakarborty, S.K

CIFE(M)-2000/5-PHT -1(52)
Value-added products from low-cost fish Basu, S. (PI) and Pal, A. K.

CIFE(M)-2000/5-PHT -1(53)
Feed formulation for the low cost diets for *Macrobrachium rosenbergii* using blood meal as dietary component
Jain, K. K. (PI), Reddy and Srivastava, P.P.

CIFE(M)-2000/5-PHT -1(54)
Screening, characterization and evaluation of feeding stimulants and flavour attractants
Venkateshwarlu, G. (PI) and Pal, A.K.

6 CIFE(C)/6-CAL-I
Aquaculture productivity enhancement in Eastern India
Das, R.C. (PI)

CIFE(C)/6-CAL-I(51)
Development of indigenous feed for ornamental fishes
Archana Sinha (PI), Pandey, P.S., Biswas, R.K. and Mondal, A.K.

CIFE(C)-2000/6-CAL-I(53)
Chemical and toxicological studies of some hazardous pollutants in sewage-fed fisheries of Kolkata
Datta,S. (PI) and Pal, A.K.

CIFE(C)-2001/6-CAL-I(55)
Conceptual frame work of a working model for women fisheries co-operative at a selected village in West Bengal: A Pilot Study
Arpita Sharma (PI), Maheshwari, U.K., Ojha, S.N. and Pandey, P.S.

CIFE(C)-2001/6-CAL-I(56)
Toxicity of Microcystin - IR in pond water and its effect on Hepatic and Reproductive System of *Hypophthalmichthys molitrix*
Maheshwari,U.K. (PI), Arpita Sharma and Pandey, P.S.

7 CIFE(L)/7-LUC-I
Evaluation offish and shellfish species for aquaculture in Uttar Pradesh
Sharma, A.K. (PI)

CIFE(L)-2000/7 -LUC-I(51)
Utilization of freshwater Mussel, *Lamellidens marginalis* (lamark) available in and around lucknow for pearl culture technology and for therapeutic purposes
Zeba Jaffar (PI) and Sherry, P.M.

CIFE(L)-2000/7 -LUC-I(52)
Integrated aquaculure in Usar land Sherry, P.M. (PI) and Zeba Zaffar

CIFE(L)-2000/7 -LUC-I(S3)
Identification of constraints in freshwater prawn *Macrobrachium rosenbergii* culture technology in agro climatic conditions of eastern UP and its extension
Yadav, A.K. (PI), Sharma, A.K., Chaturvedi, C.S., Upadhya, S.K., San jay Singh and Ravi Kumar

CIFE(L)-2000/7 -LUC-I(S4)
Standardisation and transfer of technology for breeding and culture of *Clarias batrachus*
Sharma, A.K. (PI), Chaturvedi, C.S., Yadav, A.K., Upadhya, S.K. and Sanjay Singh

CIFE(K)-200I/S-KAK-I
Experiments on Eco-friendly Culture Practices in Aquaculture
Venugopal, G. (PI), Muralimohan, K, Srinivasa Rao, P., Acharyulu, V.N., Satyanarayana, P., Patnaik, R.R.S. and Murthy, S.S.N.

CIFE(P)-200I/9-POW-I
Integrated farming of certain finfish, livestock and agrocrops
Somdutt (PI), Rizvi, S.S.H., Murthy, K.B.S., Upadhyaya, R.K., Dubey, V.G. and Singh Gurubachan

CIFELOSTRESS

CIFE Mumbai developed CIFELOSTRESS an anti stress formulation which reduces stress and resultant mortality of fish seed during and post-transport. The formulation has been developed by Dr. A.K. Pal and his associates Mr. Manash Choudhury and Ms. Nirupama Chatterjee thorough straineous research on fish physiology and biochemistry. The health status of the fishes was evaluated under GLP by observing biochemical

parameters of different tissues as indices which are Glycogen. Glucose, plasma cortisol by RIA, ascorbic acid, LDH, MDH, ICDH SDH, ATPase, AchE, , Alkaline phosphatase, Alanine amino transferase, Aspartate amino transferase, Glucose-6 phosphatase, Frucose 1,6 di phosphatase, Glucose 6-phosphate dehydrogenase, Prophenol Oxidase besides HSP's by SDS-PAGE and Western Blotting, immunoglobulins by latest methods and fatty acids profile from fish oils by GCMS.

A series of laboratory and field trials were conducted by this research group and managers of leading fish seed hatcheries as well as government hatcheries. The formulation has shown excellent results and there was satisfactory response from the users.

The technology has been transferred to M/s. Aqua-Vet Laboratories, 16 Mahavir Tower, Main Road, Ranchi-834007 for its commercialization. An application for patenting the formulation has also been submitted to the ICAR, New Delhi.

LATEX AGGLUTINATION KIT FOR DETECTION OF WHITE SPOT VIRUS

Latex agglutination kit for detection of white spot virus in shrimps was developed. This test is an on-farm and rapid diagnostic kit and test is completed with 3-4 minutes. This is the only on-site test for WSSV detection in shrimps. It does not require either instrumentation or technical manpower. WSSV could be detected from post larvae to any stage of the life cycle. In broodstock also it can be detected without sacrificing the animal as it requires only a drop of haemolymph.

Latex agglutination

This kit along with the kits the detection of

11.Consultancy, Patent & Commercialisation of Technology

bacterial diseases of fishes are commercialized and taken by Glaxosmithkline Pharmaceuticals Ltd., Mumbai at a cost of Rs. 20.00 lakhs and the MOU was signed on 24th March, 2003.

RAPID DIAGNOSTIC KITS FOR DIAGNOSIS OF BACTERIAL DISEASES OF FISHES

i. ELISA, Dot-ELISA and latex agglutination kits for *P.f luorescens* in fishes
ii. ELISA, Dot-ELISA and latex agglutination kits for *A. hydrophila* in fishes
iii. ELISA, Dot-ELISA and latex agglutination kits for *V. alginolyticus* in fishes
iv. ELISA, Dot-ELISA and latex agglutination kits for *E. tarda* in fishes

Sl.No	Meeting, Seminar etc.	Place	Date	Name
1.	Meeting on Import Risk Analysis of Fish and Fishing Products	Ministry of Agriculture, Govt. of India, New Delhi	April 2, 2002	Dr. K.V. Rajendran, Sr. Scientist
2.	Workshop on Agricultural Policy	ICAR, New Delhi	April 10, 2002	Dr. S. Ayyappan, Director
3.	Zero based budgeting meeting of fisheries division	ICAR, New Delhi	April 11, 2002	Dr. S. Ayyappan, Director
4.	The meeting of Consultative Group of FSI, Mumbai	Fishery Survey of India, Mumbai	April 18, 2002	Dr. R. S. Biradar, Principal Scientist
5.	The National Workshop on Animal-climate Interaction and presented a poster entitled 'The Influence of Climate on Aquatic Life	DST, GOI & CAS in Veterinary Physiology, Indian Veterinary Research Institute, Izatnagar	April 19-20, 2002	Dr.C.S. Purushothaman, Principal Scientist
6.	National Symposium on Fisheries Enhancement in Inland Waters – Challenges	CICFRI, Kolkata	April 27-28, 2002	Dr. S. Ayyappan, Director Dr. Subhendu Datta, Scientist
7.	Workshop on Profile of People, Technologies and Policies in Fisheries	Delhi	May 1-5, 2002	Dr. S. Ayyappan, Director
8.	Core Committee Meeting on Sustainable Solutions, Relating to Environmental Pollution in Maharashtra	Mumbai	May 7, 2002	Dr. C.S. Purushothaman, Principal Scientist
9.	Workshop on Fisheries Development Strategy for the 10th Five Year Plan	Aquaculture Research and Training Institute of State Fisheries of Haryana at Hissar	May 7-8, 2002	Dr. S. Raizada, Officer Incharge and Dr. N.K. Chadha, Scientist(SS)
10.	Meeting in connection is the M.F.Sc. (EBM) Syllabus	Symbiosis Institute of Business Management, Pune	May 16-17, 2002	Dr. K.K.Jain, Principal Scientist
11.	Symposium on seafood safety: status and strategies at Cochin	CIFT Cochin	May 28-30, 2002	Dr. S. Basu, Principal Scientist
12.	TES meeting of BRNS,DAE	BARC, Mumbai	May 2002	Dr. A.K. Pal, Sr. Scientist
13.	First meeting of SS-STAC	Kochi	June 2-5, 2002	Dr. R.S. Biradar, Principal Scientist
14.	The Ninth Annual General Body Meeting of NAAS	New Delhi	June 5, 2002	Dr. S. Ayyappan, Director
15.	National Workshop on Soil Biotechnology	Govt. of Maharashtra and Indian Institute of Technology, Mumbai	June 7-8, 2002	C.S. Purushothaman Principal Scientist
16.	Workshop and Meeting of the Co-ordinators and Nodal Officers of the PME Cell	NCAP, New Delhi	June 2-29, 2002	Dr. P.K. Varshney, Scientist
17.	Farmer's Meet	Powarkheda	June 28-29, 2002	Dr. S. Ayyappan, Director
18.	Meeting for collaborative research among CDRI, ITRC and CIFE Centre	Lucknow	July 5-6,2002	Dr. S. Ayyappan, Director
19.	National Fish Farmers' Day	Loktal Lake, Imphal	July 7, 2002.	Dr. S. Ayyappan, Director
20.	Workshop on Soil Biotechnology	Indian Institute of Technology, Mumbai	June 8, 2002	Dr. C.S. Purushothaman, Principal Scientist

12. Participation of faculty in conferences, meetings, training programmes, etc. in India and abroad

21. Task Force Meeting at DBT/NBDB "Human Resource Development for Coastal Bioresource Development and Management"	New Delhi	July 8, 2002	Dr. S. Ayyappan, Director Dr. W.S. Lakra, Principal Scientist, Mr. K. Venkateshvaran, Scientist (SG) and Dr. S.N. Ojha, Senior Scientist
22. 73rd AGM meeting	ICAR, New Delhi	July 15-16, 2002	Dr. S. Ayyappan, Director
23. Graduation Ceremony at College of Fisheries	Lembucherra, Agartala	July 18, 2002	Dr. S. Ayyappan, Director
24. Summer School on methods of Assessment of Aquatic Ecosystem for Fish Health Care	CIFRI, Barrackopore	July 18 to August 16, 2002	Dr. P.K. Pandey, Scientist
25. Task Force Meeting	DBT, New Delhi	July 24-25, 2002	Dr. S. Ayyappan, Director
26. Task Force Meeting	DBT, New Delhi	July 29-30, 2002	Dr. S. Ayyappan, Director
27. National Seminar on Environmental Pollution and Fishery Management.	Vikram University, Madhya Pradesh	August 9-10, 2002	Dr.K. Paniprasad, Scientist
28. Hindi Seminar	CIFT, Cochin	August 16, 2002	Dr. S.C. Mukherjee, Director
29. Aquaculture Expo 2002	Nellore, Andhra Pradesh	26 August, 2002	Dr.K. Paniprasad, Scientist
30. National Conference on Impact of Environmental Pollution on Health: Problems and Solutions	India International Centre (Annexe), New Delhi	August 29-30, 2002	Dr.K. Paniprasad, Scientist
31. Meeting with the Director of Fisheries Rajashthan and Director, CAZRI, Jodhpur	Jodhpur-Udaipur	September 1-2, 2002	Dr.S.C. Mukherjee, Director
32. Presentation of technical and financial proposals of CIFE for finalization of EFC documents	KAB-II, Pusa, New Delhi	September 3-5, 2002	Dr.S.C. Mukherjee, Director
33. Module-II Retreat programme for Senior Executives of ICAR	IIM, Ahmedabad	September 6-8, 2002	Dr.S.C. Mukherjee, Director
34. NAAS Round Table on Agri Industries Interface – Value Added Farm Product	Indian International Centre, New Delhi	September 14, 2002	Dr.S.Basu, Principal Scientist
35. Sensitization Meeting of Senior Research Mangers in ICAR SAU's	NCAP, New Delhi	September 21, 2002	Dr. S.C. Mukherjee, Director
36. International Congress on Asian Australasian Association of Animal Production Societies	New Delhi	September 23-27, 2002	Dr. A.K. Pal, Sr. Scientist
37. National Seminar on Hill Fisheries & Resource Management	NRC, Bhimtal	October 4-5, 2002	Dr.N.K. Chadha, Sr. Scientist, Dr. M. Ali, Technical Officer
38. Meeting on Phase II AHRD Project	ICAR Krishi Anusandhan Bhavan, New Delhi	October 17, 2002	Dr. S.C. Mukherjee, Director
39. Seminar on Freshwater Prawn Culture, MPEDA	Karimnagar, A.P.	October 22, 2002	Dr.G.Venugopal, Sr. Scientist & Shri V.N.Acharyulu, T-5
40. Second Indian Fisheries Science Congress	CIAE, Bhopal	October 23-25, 2002	Dr. S.C. Mukherjee, Director Dr. M.P.Singh Kohli, Principal Scientist Dr.R.K. Upadhyay, Scientist (SG)Shri S.S.H. Razvi, Scientist(SG), Dr.

41. Workshop on Aquaculture Drug Regulations	CFDDM, Cochin and Aquaculture Aquaculture, Govt of India, Office of Bay of Bengal Programme, Chennai	October 29- 30, 2002	Dr. A.K. Pal, Sr. Scientist
42. Meeting on Community participation in research – A conceptual frame work for research partnerships	Integrated Coastal Management, Kakinada.	October 30-31, 2002	Dr.G.Venugopal, Sr. Scientist
43. World Ayurveda Congress 2002	Kochi, Kerala	1-4 November, 2002	Shri R.P. Raman, Scientist
44. TES meeting of BRNS, DAE	Kaiga	November 7-8, 2003	Dr. A.K. Pal, Sr. Scientist
45. Workshop on PCR technology & Ecofriendly disease management strategies in shrimp and scampi hatcheries and farms	State Institute of Fisheries Technology, Department of Fisheries, Government of A.P., Kakinada & Mangalore biotech lab, Mangalore	November 14-15, 2002	Shri P.Srinivasa Rao, Technical Officer
46. National Seminar on Environmental pollution and measures for doubling of fish production	Department of Zoology, Patna University, Patna	November 16-18, 2002	Dr. Archana Sinha, Senior Scientist
47. The brain storming session on Government – industry partnership in fisheries and aquaculture	Visakhapatnam	November 20, 2002	Dr. R. S. Biradar, Principal Scientist Dr. K. Paniprasad, Scientist
48. Round table conference of Govt. Industry Partnership on Antibiotic residue in fish and fishery Product	Vizag	November 20, 2002	Dr. A.K. Pal, Sr. Scientist
49. Meeting with Director of Fisheries, A.P.	Hyderabad	November 21, 2002	Dr. S.C. Mukherjee Director
50. Workshop on DFID Peri-urban farming and livelihood project for Kolkata	Department of Fisheries, Government of West Bengal, Kolkata	November 23, 2002	Dr. R.C. Das, Principal Scientist Dr. Archana Sinha, Senior Scientist
51. Seminar on Prospects of Freshwater Prawn Farming	Devarapalli, Anakapalli (AP)	November 23, 2002	Dr.G.Venugopal, Officer-In- charge & Shri P.Rami Reddy, Technical Officer (T-6)
52. Discussions and interaction meeting with scientists of IIRS	Fisheries Division, ICAR, New Delhi	November 28, 2002	Dr. R. S. Biradar Principal Scientist
53. Awarded Young Scientist Travel Fellowship by CSIR to attend the Symposium on 'The Current Excitement in Biology', ,	CCMB, Hyderabad	November 24 – 29, 2002	Dr Aparna Chaudhari, Sr. Scientist
54. XXI Annual Conference of Society of Toxicology, India	Regional Occupational Health Centre (Eastern), ICMR, Salt Lake City, Kolkata	December 3-5, 2002.	Dr. Subhendu Datta, Scientist

12. Participation of faculty in Conference/Meetings etc. in India

12.1 Participation of faculty in Conference/Meetings etc. in India

55.	Farmers Meet	CIFE Rohtak Centre	December 8, 2002	Dr. K. Paniprasad, Scientist
56.	Meeting of the Network of Social Scientist	Fisheries Division of ICAR, New Delhi	December 10, 2002	Dr. R. S. Biradar Principal Scientist
57.	Workshop on Bio- safety issues related to Genetically Modified Organisms (GMOs)	Biotech Consortium India Limited, New Delhi	December 12, 2002	Dr. P.K. Varshney, Sr. Scientist, Dr. C.S. Chaturvedi, T.O. and Shri A.K. Yadav, T.O.
58.	Workshop on Patent Awareness	Department of Biosciences, M.D. University	December 21, 2002	Dr. N.K. Chadha, Sr. Sceientist
59.	Seminar at Bhimavaram		December 27-29, 2002	Dr. G. Venugopal, Officer incharge CIFE Kakinada Centre & Shri P. Rami Reddy, J. Krishna Prasad & R.R.S. Patnaik
60.	NCAP NATP Workshop	New Delhi	January 13-14, 2003	Dr. K.K. Jain, Principal Scientist
61.	National Seminar on finfish and shellfish culture for NE India	CIFE Kolkata Centre	January 21-22, 2003	Dr. R.C. Das, Principal Scientist Dr.G.Venugopal, Officer –In- charge Dr. Subhendu Datta, Scientist Dr. Archana Sinha, Senior Scientist
62.	National Networking meeting on Fish Nutrition including Biochemistry	KAB-II, ICAR, NewDelhi	January 21, 2003	Dr. K.K. Jain, Dr. P.P. Srivastava and Dr. S.D. Singh, Principal Scientist, Dr. A.K. Pal, Sr. Scientist
63.	National Seminar on Fish & Prawn Culture in NE Region	Kolkata Centre	January 20-25, 2003	Dr. S.C. Mukherjee, Director
64.	Network of Fish Health Management	ICAR, New Delhi	January 27-28, 2003	Dr. S.C. Mukherjee, Director, Dr. K. Paniprasad, Scientist
65.	National Conference on recent trends in Aquatic biology		January 28-31, 2003	DR.G.Venugopal, Officer –In- charge, Shri V.N.Acharyulu, Technical Officer, (T-5) & R.R.S.Patnaik, T-4
66.	National Conference on Recent Trends in Aquatic Biology. Nagarjuna University	Nagarjuna Nagar, Andhra Pradesh	January 29-30, 2003	Dr. K. Paniprasad, Scientist
67.	CAS Meeting	UAS, Banagalore	January 30 to February 1, 2003	Dr. S.C. Mukherjee, Director
68.	NATP Meeting at the College of Agricultural Science	Pune	January 31, 2003	Mr. K. Venkateshvaran, Scientist (SG), Dr. S.N. Ojha, Sr Scientist, Dr. A.K. Jain, Scirntist (SS) and Shri S. Natrajan, Librarian
69.	Meeting for Networking of Aquatic Environmental Management programmes	Krishi Ausandhan Bhavan, New Delhi	February 4, 2003	Dr. C.S. Purushothaman, Principal Scientist

70. To meet the Director and Faculty in connection with syllabus and library consultation	MANAGE, Hyderabad	February 4, 2003	Dr.K.K. Jain, Principal Scientist
71. International Seminar on Reproductive Physiology and Endocrinology	Department of Zoology, Banaras Hindu University, Varanasi	February 10 – 14, 2003	Dr. R.C. Das, Principal Scientist
72. National Conference on Prospects and Challenges for Better Livestock Health Management Employing Conventional and Molecular Approaches	ICAR Research Complex, Guwahati	February 6-11, 2003	Dr. S.C. Mukherjee, Director
73. Meeting of the Planning Commission	Kochi	February 12-14, 2003	Dr. S.C. Mukherjee, Director
74. DBT meeting	New Delhi	February 19-20, 2003.	Dr. S.C. Mukherjee, Director
75. Meeting regarding finalization of AP- Cess funded Collaborative project on Seabass	NBFGR-Lucknow	February 19, 2003	Dr. S.D. Singh, Principal Scientist
76. First Indian Pearl Congress and exposition	CMFRI, Cochin	February 5-8, 2003	Dr. R.K. Upadhyay
77. National symposium on Ecology and Biodiversity of Aquatic Environment	Allahabad Univ, Allahabad	February 15-17, 2003	Dr. S.D. Singh, Principal Scientist
78. National Symposium on Jaliye paryavaran evam matsyki-samasyan evam samadhan	Central Inland Fisheries Research Institute, Barrackpore	February 23-24, 2003	Dr. R.C. Das, Principal Scienitst Dr. Archana Sinha, Senior Scientist
79. 4th Asian Buffalo Congress	Surya Hotel, New Delhi	February 25, 2003	Dr. W.S. Lakra, Principal Scientist
80. Workshop on Marketing of fish and fish products	Vaikunth Mehta National Institute of Co-op Management, Pune	February, 25-28 2003	Dr.S. Basu, Principal Scientist
81. International Workshop on 'Genetic Status and Strategies for Improvement of Carps for Low Input Aquaculture' organised by Fisheries Research Station UAS, Hesarghatta, Bangalore and DFID Aquaculture and Fish Genetics Research Programme, University of Stirling, Scotaland, U.K.	Ramanshree California Resorts, Bangalore	26 to 28 February 2003	Dr S Jahageerdar, Scientist
82. To select the site for videography on fish culture	Fish Seed Farm, Naihati	March 13-16, 2003	Dr. K.K. Jain, Principal Scientist
83. Fish Farmers Meet	Rohet Village near Jodhpur	March 16, 2003	Dr. S.C. Mukherjee, Director and Dr. K. Paniprasad, Scientist
84. Workshop on Experience Sharing on Prawn Culture	Aquaculture Research Training Institute, Hisar	March 27, 2003	Dr. S. Raizada, Sr. Scientist, Dr. N.K. Chadha, Sr. Scientist
85. Fish Seed Farm & Fish Seed Production Farm	Lonavala & Khopoli		Dr. K.K. Jain, Principal Scientist

12.2 MANPOWER DEVELOPMENT

Sl.No.	Name	Title	Place	Period
1.	Shri K.R.K.Reddy, T-4	Importance of soil and water testing and management for aquaculture	CIFE Rohtak Centre	March,11-15 2002
2.	Mr. G.S. Fernandes, Personal Assistant	Improving Organisational/Office Effectiveness	Goa	March 25-29, 2002
3.	Dr Gopal Krishna, Sr. Scientist	Training programme on Application of Statistical Analysis Software for the analysis of the Field Data	SAS Institute	April 4- 10, 2002
4.	Dr. R.S. Biradar, Principal Scientist, Dr. K.K. Jain, Sr. Scientist, Dr. s.N. Ojha, Sr. Scientist, Shri Suresh Kumar, S. A.O., Mr. M.K. Pachauri, A.O.	Small and medium enterprises programme	Indian Institute of Management, Ahmedabad	April 7-20, 2002
5.	Mr. K. Mohamood, AAO	Pay Fixation under Fundamental Rules of Central Govt.	Bangalore	April 10-12, 2002
6.	Mr. R. Palaniswamy, Tech. Officer	Modern Food Processing	Small Industries Service Institute, Mumbai	April 15-May 14, 2002
7.	Shri Ashok Kumar, Tech. Asst. and Shri Hassan Javed, Tech. Asst.	A short term training on Freshwater Prawn Hatchery Management from	CIFE Kakinada Centre	April 16-24, 2002
8.	P.K. Das, Tech. Officer (Hindi), Koli, Smita, Sr.Clerk	Hindi workshop organized by Rajbhasha Sansthan, New Delhi	Solan, Simla	22-24 April 2002
9.	Dr Gopal Krishna, Sr. Scientist	Training programme on 'Cytogenetic techniques and banding pattern studies'	NDRI Karnal	April 23 to May 4, 2002
10.	Dr. S. D. Singh, Principal Scientist	Hands on training on Molecular Biological Tools on DNA fingerprinting and Fish Tangencies	CCMB, Hydrabad	April 2002
11.	Mrs. Anu Grover, LDC	Women in Management	New Delhi	May 1-3, 2002
12.	Mrs. Madhavi Pikle, Technical Assistant from	Training on "Remote Sensing and GIS"	Indian Institute of Remote Sensing (IIRS), Dehradun	May 1-10, 2002
13.	Mr. G.S. Fernandes, Personal Assistant	Seniority & Promotion of Non Executive Staff	Nainital	May 16-18, 2002
14.	Dr. Gopalkarishna, Sr. Scientist	Leadership and Personality Development	Hyderabad	June 10-15, 2002
15.	Dr. C.S. Purushothaman, Principal Scientist, Mr. K. Venkateshvaran, Scientist, P.K. Varshney, Scientist, P.K. Pandey, Scientist, Dr Aparna Chaudhari Sr. Scientist, K. Paniprasad, Scientist	One day training programme on `ISO 9001'	Indian Bureau of Standardization	June 11, 2002
16.	Uniyal, R.P. Asstt.Director (O.L.), Das, P.K. Tech. Officer (Hindi) and Dongde, Revati Hindi Translator	All India Hindi Journalism/Commercial Hindi Training, Bangalore	National Minerals Development Corporation, Hyderabad	12-14 June 2002.
17.	Shri A.K. Yadav T.O. & Amit Singh Bisht, T-II-3	Refresher Course on *Role of* Bio-informatics in Biological Research	ITRC, Lucknow	June 24-26, 2002

18. Mrs. Rajani Khandagale, Technical Assistant	Linux System and Network Administration	LINUX Learning Centre, Bangalore	June 24-27, 2002
19. Mrs. Rajani Khandagale, Technical Assistant	Advanced LINUX Administrator	LINUX Learning Centre, Bangalore	June 28-30, 2002
20. Mr. S.S. Kocharekar, Asstt.	Error prone aspects of disciplinary proceedings and supreme court judgement	Bangalore	July 19-21, 2002
21. Dr. Radha C. Das, Principal Scientist	Senior Management Training Programme on "Management of Agricultural Education"	NAARM, Hyderabad	23-25 July, 2002
22. Mr. P.B. Tandav, AAO & Mr. Y.P. Belgaonkar, Asstt.	Accounting for Non-profit organisations	Faridabad	July 22-26, 2002
23. Nr. Mohd. Baqar, Tech. Asstt.	Computer Applications MS-Office 2000 (I) & (II)	New Delhi	July 29-August 10, 2002
24. Mr. K. Mohamood, AAO & Mrs. Valsa Pavithran, AAO	Constitutional Amendments & Operation of Reservation Orders for SC/ST/OBC in Governments	Trivandrum	August 1-5, 2002
25. Mr. B.L. Kokkula, Asst. & Mrs. S.R. Wadhavkar, Asstt.	Pension and other retirement benefits	New Delhi	August 8-10, 2002
26. Mr. Suresh Kumar, S.A.O.	Role of Information Technology in University Management	Indore	August 19-23, 2002
27. Mrs. Madhavi Pikle, T-4		Pune	September 2-13, 2002
28. Mr. R.K. Palaniswami, Tech. Officer	Central Govt. Employees Welfare Coordination Committee Meeting	Aayakar Bhavan Mumbai	September 4, 2002
29. Dr Aparna Chaudhari Sr. Scientist, ,	10 days training on 'Softwares used in Phylogenetic Analysis in Molecular Genetics'	CCMB, Hyderabad	September 6 –15, 2002
30. Mr. V.K. Sinha, UDC Mrs. F.G. Fernandes, UDC, Mr. P.R. Ninawe, Steno, Gr.III, Mr. D.V. Raorane, Mr. Pradeep angne, Mr. Suresh Bhosale, Mr. M.B. Waghela, LDC	Office Management, Noting & Drafting and Computer Application Tools	New Delhi	September 12-14, 2002
31. Dr. Sudhir Raizada, Sr. Scientist, Mr. Hassan Javed, Tech.Asstt.	Soil Testing	New Delhi	September 16 – October 11, 2002
32. Dr. Mahesh Patel, Scientist	Animal Biotechnology & Allied Subjects for University Teachers & Researchers	Bareilly (U.P.)	September 17- October 31, 2002
33. Shri Suresh Kumar, Sr. A.O.	Role of Information Technology in University Management	Association of Indian Universities, Indore	September 19-23, 2003
34. Dr. K.K. Jain, Principal Scientist	Finance Act 2002	Institute of Socio-economic Research and Action, New Delhi	September 21, 2002
35. Mrs.T. Padamavti, Asstt.	133rd Advanced Training Programme on Operation of Reservation Orders	Third World Development Cetre, Goa	September 23-27, 2002
36. Dr. R. S. Biradar, Principal Scientist	A short term training programme on 'Remote Sensing : An Overview for decision makers'	IIRS, Dehradun	24-27 September, 2002
37. Dr. Shrinivas Jahageerdar, Scientist(SS)	Quantitative Genetics & its Application in Aquaculture	Thailand	October 1-21, 2002

38.	Uniyal, R.P. Asstt.Director (O.L.)	Parliamentary official language committee questionire workshop	Bangalore	10-11 October 2002
39.	Mr. R.P. Uniyal, Asstt. Director	Intended for the visit of the Hon'ble Committee of Parliament on Official language	Bangalore	October 11-12, 2002
40.	Dr. R. S. Biradar, Principal Scientist, Mrs. Rajani Khandagale, Technical Assistant, Mrs. Madhavi Pikle, Technical Assistant, Mrs. Gajbjiye, Technical Assistant	A training programme on 'Introduction to Arc View GIS 8.1 & 8.2'	M/s. NIIT & GIS, Mumbai	October 14-19, 2002
41.	Mr. R.K. Palaniswami, Tech. Officer	Central Govt. Employees Welfare Coordination Committee Meeting	Aayakar Bhavan Mumbai	October 23, 2002
42.	Mr. D. Bhoomaiah, Tech. Officer	Educational Video Production	Hyderabad	October 23 – November 2, 2002
43.	Mr. A.K. Padmanabhan, Tech. Officer	Introduction to Marine Instruments	Kochi	November 11-15, 2002
44.	Mrs. Arpita Sharma, Scientist, sponsored by,	Refresher course on 'Women's studies and interdisciplinary knowledge'	UGC at Academic Staff College, Jadavpur University, Jadavpur, Kolkata	November 12 to December 6, 2002
45.	Mr. B.N. Tiwari, Scientist (SG)	Winter School on Advances in Harvest Technology	CIFT, Ernakulam	November 19 –December 20, 2002
46.	Dr. M. Ali, Tech. Officer	Recent Advances in Participatory Extension Methodology for Agriculture & Rural Development	West Bengal	December 2-31, 2002
47.	Dr. K.K. Jain, Principal Scientist & Dr. N.P. Sahu, Scientist (SS)	Role of unconventional feeds n future live stock production	Indian Veterinary Research Institute, Bareilly, UP	December 13- January 2, 2002
48.	Mr. Sunil Kumar, AAO	Purchase Policy & Procedure in Government Deptts., Autonomous Bodies & PSU's	New Delhi	January 23-25, 2003
49.	Mr. K.P. Khalsa, Tech. Officer	Agricultural Information Resources & Services in a Digital & Networked Environment in India	Tirupati	February 8-9, 2003
50.	Shri Natarajan, T-6		Ahmedabad	February 13-15, 2003
51.	Smt. Asha T. Landge, T-6	Coastal Zone Management	IIT Chennai	February 17-19, 2003
52.	Mrs. Nalini Poojary, T-5, Miss Chanda K., UDC, Miss Asha Durve	Gahan Hindi Prashikshan & Karyashala	NAARM, Hyderabad	February 18-22, 2003
53.	Shri Ravi Kumar, T-II-3	Computer Application in Fisheries	CIFE, Mumbai	February 29- March 04, 2003
54.	Mrs. Madhavi Pikle, Technical Assistant	GRAM++ Software demonstration at CSRE Division	IIT, Powai, Mumbai	March1-14, 2003
55.	Ms. Asha T. Landge Technical Officer	Coastal Zone Management	IIT, Chennai	March 17-19, 2003

13.1Meetings organised

CIFE , Mumbai

Sl.No.	Meeting	Date
1.	Hindi Official Language Implementation Committee	April 20, 2002
2.	Extension Council Meeting	May 20, 2002
3.	Staff Research Council	June 25, 2002
4.	30th Meeting of the Academic Council	July 2, 2002
5.	Board of Management at CIFE Centre, Kolkata	July 9, 2002
6.	Quarterly Meeting of Staff Research Committee	October 5, 2002
7.	31st Meeting of the Academic Council	November 14, 2002
8.	Quarterly Meeting of Staff Research Committee	January 15, 2003
9.	Meeting of Board of Examiners	February 19-20, 2003
10.	Meeting of Annual Staff Research Council	April 23, 2003

Besides the above meetings Director connect regular monthly meetings of Scientists, Technical staff and Administrative staff.

13.2Workshop, Seminars, Symposia, etc. 0rganised

Sl.No.	Meeting	Place	Date
1.	Workshop on Fisheries Forecasting	CIFE , Mumbai	April 22, 2002
2.	Awareness Programme on ISO: 9001	CIFE , Mumbai	June 11, 2002
3.	VI Convocation of CIFE, Mumbai	CIFE , Mumbai	November 14, 2002
4.	VI Indian Fisheries Forum Brainstorming Session on Government Industry partnership	CIFE , Mumbai	December 17-20, 2002
5.	National Seminar on *Bharatiya Jalkrishi ka vistar*	CIFE , Mumbai	January 15-16, 2003
6.	National Seminar on Fish and Shellfish Culture for North-Eastern India	CIFE Kolkata Centre	January 21-22, 2003
7.	National Symposium on Genetics and Gene Banking of Fish and Shellfish	CIFE , Mumbai	March 29-30, 2003

13.Workshop, Seminars, Symposia, Meeting/workshop, etc. Organised

Workshop on Fisheries Forecasting

A Workshop on Fisheries Forecasting in collaboration with IFA and INCOIS was held on April 22, 2002 in the Institute. Dr. S. Ayyappan, Director, CIFE welcomed all the participants. Two technical sessions were conducted in the workshop. Dr. K. Radhakrishnan, Director, INCOIS, Hyderabad, Dr. V.S. Somvanshi, DG, FSI, Mumbai, Dr. H.U. Solanki, Scientist SE, Space Applications Centre, Ahmedabad, Dr. M. Ravichandran, Shri T. Srinivasa Kumar, Shri M. Nagaraja Kumar, and Shri T. Trivikran Prasad, all from INCOIS, Hyderabad, were resource persons of this workshop.

Sixth Indian Fisheries Forum

The Sixth Indian Fisheries Forum was organized in collaboration with the Indian Fisheries Association at CIFE, Mumbai during December 17-20, 2002. It was inaugurated by Dr. Panjab Singh, Secretary Department of Agricultural Research and Education (DARE) and Director General, Indian Council of Agricultural Research (ICAR) on 17th December, 2002. The Inaugural Session was presided over by Padmabhushan Dr. S. Z. Qasim, Former Member Planning Commission, Government of India, New Delhi.

About 400 participants consisting of scientists, students, entrepreneurs, farmers and policy makes attended the Forum. Among the participants were scientists from Isreal, Philippines, Malaysia and Bangaldesh. An exhibition "FISHCOVERY" was inaugurated by Padmbhushan Dr. S. Z. Qasim depicting fisheries development activities in Asia.

Dr. S.A.H. Abidi, Member Agricultural Scientists Recuitment Board, New Delhi and Sri Jose Cyriac, Chairman. MPEDA, Kochi were the guests of honour. Dr. Clarissa Marte, President, Asian Fisheries Society, Dr. M.V. Gupta, Director, International Relations. World Fish Centre and Vice-President of Asian Fishries Society, Dr. Pedro Bueno, Director General, NACA, Dr. K. Gopakumar, Former DDG (Fisheries), ICAR and Chairman of AFSIB,

Dr. S. Ayyappan, D.D.G. (Fy.), ICAR and convenor, Dr. S.C. Mukherjee, Director, CIFE and Dr. K. Pani Prasad, General Secretary, Indian Fisheries Association and the Organizing Secretary of the forum were on the dais. A key note address entitled "Indian in International Fisheries trade" was delivered by Jose Cyriac at the inaugural session. The inaugural function ended with vote of thanks by the Organizing Secretary of the forum Dr. K. Pani Prasad.

The triennial award for excellence in fisheries research and/or development, instituted by Prof. H. P. C. Shetty Felicitation Committee, was awarded to Dr. S.

Ayyappan, Deputy Director General (Fisheries), ICAR, New Delhi during the inaugural function. Seven enterprising farmers were felicitated with shawl and plaque of honour by Dr. Panjab Singh, Director General, ICAR. Young Scientist Award for the best research paper was also awarded to Dr. K. Pani Prasad on the last day of the Forum.

Presentations by participants were divided into eight sessions, viz. aquaculture, aquatic resources management, environment management, genetics and Bio-technology, nutrition, physiology and bio-chemistry, aquatic animal health management, harvest and post harvest technology and social sciences. Poster sessions were also held simultaneously. There were two open sessions, one on Professional Fisheries Societies in India and the other for interaction with farmers and industry. A special session on Women Enterpreneurshp in Fisheries and Aquaculture was also held during the Forum.

In the plenary session, on the concluding day a few important recommendations were drawn up for continuation same to various agencies for implementation.

A interview of Dr. S.C. Mukherjee, Director and Vice-chancellor, CIFE and Dr. M.V. Gupta, Director (IR),

ICLARM was telecasted on 22 December, 2002, Dr. S.C. Mukherjee as an expert gave a separate interview to In time, In Mumbai T.V. Channel on coastal fisheries and it was given a wide coverage in the morning and evening news of In Mumbai in English, Hindi, Marathi and Gujarati.

National seminar on *Bhartiya Jalkrishi ka Vistar* (Extension of Indian Aquaculture)

A two days National seminar in Hindi on *Bhartiya Jalkrishi ka Vistar* (Extension of Indian aquaculture) was organized by CIFE Mumbai on 15-16 January 2003. The seminar was inaugurated by Shri Mukesh Sharma, Director, Prasar Bharati, Mumbai. A total of 52 papers were presented in the seminar. On this occasion Dr.S.C.Mukherjee, Director delivered the welcome address and also released the Proceedings of the seminar.

National Seminar on Fish and Shellfish Culture for North-Eastern India

A National Seminar on Fish and Shellfish Culture for North-Eastern India was organized by CIFE, Mumbai during January 21-22, 2003 at CIFE Centre Kolkatta

In the plenary session following recommendations were proposed:-

1. Horizontal expansion of fishery activities through exploitation of water resources:
   a. Utilization of water resources as much as possible
   b. More water bodies are to be brought under fish culture

2. Training for prawn culture in North Eastern region for which field staff may be deputed for such purposed from state government level.

3. Transfer of technology through hatchery construction for seed production.

4. Polyculture of finfish and shellfish is to be initiated and manipulated by suitably modifying the stocking densities and stocking ratios, under this inclusion of air breathing fishes is also recommended.

5. Conservation of original germ plasm of fishes.

6. Pen and or cage culture or running water culture of any available species.

7. Beels and lakes are to be exploited through extensive culture systems (manipulating the stocking density depending on condition of beels).

8. Importance should be given at the initial stage of reservoir culture system.

9. Paddy cum fish and or integrated farming with liverstock is suggested.

10. Ornamental fishes (indigenous species): Their rearing and breeding are to be initiated and for such purpose training should be provided by the appropriate institute.

11. Area (middle altitude 2000 4000 feet at 15-20°C) specific research activities should be emphasized.

12. Culture of common eatable fish species should be initiated

6th Convocation

The 6th Convocation of CIFE was held on November 14, 2002. It was presided over by Dr. Panjab Singh, Secretary, DARE and DG, ICAR. Hon'ble Union Minister of Agriculture, Shri Ajit Singh was the Chief Guest and delivered the Convocation Address. A total 35 M.F.Sc. Students and 3 Ph.D. students received their degree in person from the Director and Vice Chancellor, Dr. S.C. Mukherjee. Doctor of Science (*Honoris causa*) was conferred upon Dr. S.A.H. Abidi, Member (AS), ASRB; Dr. P.V. Dehadrai, former DDG(Fy), ICAR, and Dr. S.N. Dwivedi, former Addl. Secretary, DOD in recognition of their yeomen service to the field of fisheries.

14.DISTINGUISHED VISITORS

Peer Review Team

Peer Review Team comprising of Dr. K.V. Devaraj, Chairman; Dr. M. Babu Rao, Member; Dr. V. Sundararaj, Member; Dr. N.L. Maurya, Member Secretary, for according Accreditation to CIFE at September 9,2002.

Dignitaries	Date
Dr Panjab Singh, D.G. ICAR, New Delhi	June 01, 2002
Dr. M.V. Gupta, Director (International Relations & Research Coordinator, ICLARM, Penang, Malaysia	June 10-11, 2002
Dr A. R. Kidwai, Former Governer of Bihar & Hon'ble M.P. (Rajya Sabha)	June 27, 2002
Dr. K. Gopakumar, Former Deputy Director General (Fisheries), ICAR, New Delhi	July 27, 2002
Honble Shri Hiralal Silavat, Minister of Fisheries, Govt. of Madhya Pradesh	August 28, 2002
Dr. S.D. Tripathi, Former Director, CIFE, Mumbai	September 16, 2002
Shri M.a. Upare, NABARD, Mumbai	September 16, 2002
Dr. S. Ayyappan, D.D.G. (Fy.) ICAR, New Delhi	September 16, 2002
Dr. Vinayshil Gautam, Founder Director, IIM (K) Professor, IIT, New Delhi	September 16, 2002
World Bank Supervision Mission along with other higher officials from NATP under the Chairmanship of Dr. S.L. Mehta, New Delhi	September 30, 2002
Dr Ajit Singh, Union Minister of Agriculture & President, ICAR	November 14, 2002
Dr Panjab Singh, D.G. ICAR, New Delhi	November 14, 2002
Dr Mangla Rai, D.G. ICAR, New Delhi	April 18, 2003

14.Distinguished Visitors

Rohtak Centre Visitors

Visitor	Date of Visit
Dr. John Skeritt ACIAR, Canberra, Australia	November 27, 2002
Mrs. Kuhu Caterjee ACIAR Indian Representative, New Delhi	November 27, 2002
Mrs. Vicki Pule ACIAR Indian Representative, New Delhi	November 27, 2002
Dr. S.D. Sharma Director Indian Statistical Research Institute New Delhi	February 24, 2003
Dr. H.V.L. Bathla Head, Division of Sample Survey I.A.S.R.I., New Delhi	February 24, 2003
Dr. Barney Smith Research Programmer Manager ACIAR, Australia	March 26, 2003
Dr. Stewart Flelder NSW Fisheries, Australia	March 26, 2003

Documentation Services

The documentation section continued to render active support services towards external reporting of the Institute's progess.

Library Services

Dr. Hiralal Choudhuri Library, CIFE is a national facility for fisheries and allied disciplines. The library houses a total of 17667 books, 30,000 back valumes (journals) 10543 donated publications and reports 1211 micro-films, 1226 post-graduate dissertations and 44 Ph.D. Thesis. The library has on its role 125 members comprising Scientists and Technical Staff, 200 M.F.Sc. Students, 50 Doctoral Students and 12 Research Fellows. The library also serves about 25 visitors per day. It has got 25 computers including 4 servers (CD-Net, Internet, LAN and Libsys). It has an internet connectivity through BSES leased line 512 Kbps connected to 15 computers in the library and 75 computers in various divisions/laboratories and students' hostel. Audio-Vidio facility is also created with two TV sets, two audio VCD/DVD player and one video cassette player. Library function is computerized and the issue/retrieval of books is being done through barcoding using Libsys Software. During the last year 914 books were procured for library. The library also procured 79 Foreign and 78 Indian Journals through subscription. CIFE Library is providingCurrent Contents Page Service of the latest Jornals for the Scientists at the head quarters and centres. Library provides photocopying facilities to student users and staff members. The library also provides binding and lamination services.

Library at CIFE Centre Kakinada was enriched by addition of 15 textbooks and 8 journals

A small library facility was created at Freshwater Fish Farm Balabhadrapuram for the benefit of staff and students.

15 new books, 218 books donated by Dr. Baleshwar Gupta, former Joint Director, U.P. State Fisheries, 12 periodicals & 15 other arrivals were added.

Development of Infrastructure

Extension of Aquatic Animal Health laboratory

A new laboratory was added to the existing pathology laboratory. The new laboratory is being specially used to carry out histopathology work. Besides the Microtome and cryostat it houses instruments like tissue homegeniser, tissue embedder (with cooling unit) ultra centrifuge and sonic dismembrator. A digital microcope and 6 binocular microscopes were also procured.

Strengthening of Fish Biochemistry and Molecular Biology labs.

The existing labs have been further renovated and developed with the procurement of modern equipment like UV transilluminator, UV-spectrophotometer, microwave Oven, rocking shaker, DNA concentrator deionizer, hot air oven, autoclave and other sophisticated research accessories.

Renovation of fish feed laboratory

The existing space of fish feed laboratory was renovated and equipped with refrigerator, deep freezer, incubator, hot air oven, autoclave and other lab accessories.

15. Others

Biotoxinology Laboratory

The existing laboratory was equipped with shelves and work tables for student research.

CIFE Centre Lucknow

- Renovation of teaching block & hostel
- Renovation works assigned to CPWD, Lucknow for Bio-lab, lecture hall, & attached toilets and block II of hostel were continued.
- Hostel
- One fridge of 220 lt & a colour TV were added to the existing amenities for the hostel inmates.
- Chemistry laboratory
- New equipments, *viz spectro-photometer, electronic balance, water bath, hot-air oven, electronic pH meter, pen type pH meter, conductivity meter, auto-clave & DO meter were added.*
- Biology laboratory
- One research microscope (Olympus make, model CX 31) with camera attachment (model SC 35), received from CIFE, Headquarter was added to the existing facilities.

CIFE Centre Rohtak

Establishment of Soil and Water Testing Laboratory

The existing small laboratory of the centre was upgraded to analyze soil and water parameters by enriching modern gadgets and tools. Equipments like Spectrophotometer (U.V.), Flame Photometer, Laboratory Stirrer, Bouyoucous Hydrometer, Refrigerator, and Electronic Balance were purchased and added in the laboratory.

Renovation of High Saline Baniyani Saline Fish Farm

Approximately 2.5 ha pond area comprising of 9 rearing and 10 nursery ponds was reclaimed and developed for culture operation. A drain-cum-supply open channel was also constructed through CPWD, which can circulate water of one pond to the other pond.

Reclaimation of 4 ponds in Low Saline Lahli Fish Farm

3 nursery ponds of 0.02 ha and one rearing pond of 0.05 ha were reclaimed and made suitable for fish farming.

Development of hostel

The arrangements were made to accommodate 10-12 trainees in the hostel. Furniture, television and bedroles have been purchased to enrich the hostel.

Krishak Samman Divas

At CIFE Mumbai Kisan Divas was celebrated commemorating the centenary celebrations of Choudhary

Charan Singh, Former Prime Minister of India on December 23,2002 as Farmers' Day in all the centres of CIFE and enterprising farmers were felicitated. On the occasion an article titled 'Fish aplenty' by Dr. S.C. Mukherjee, Director CIFE was published in the special issue of Indian Express Newspaper, Mumbai Edition. For this function at Kakinada Shri J. Muralidhar, Addl. Superintendent of Police, E.G. Dt. was the Chief Guest and Dr. B. Chandrasekhar, M.D., Muncipal Chairperson of Kakinada was the guest of honour. In this occasion two progressive farmers Sh. Ch. V. Surya Rao of E.G.Dt and Sh. B. Laxma Reddy, of Guntur district were feliciatated and presented with mementoes and certificates. About 100 aquafarmers participated in the function. At the CIFE Centre Powerkheda Best Krashak Samman award was given to the progressive fish farmer Shri Ashok Kumar Choudhary from Raisalpur Village, Hoshangabad (M.P.). Several other fish farmers attended the programme and the exhibition arranged at this centre. At CIFE Centre Kolkata the function was presided by Dr. P. Das, Ex Director NBFGR, Lucknow and Shri Kiranmay Nanda, Hon'ble Minister of Fisheries, Govt. of West Bengal was the chief Guest. Shri Nilratan Ghosh, a progressive fish farmer of Naihati, West Bengal, had been honoured on the occasion for his lifetime achievements in fisheries development and aquaculture. Shri Ashish Kumar Sarkar, a progressive fish farmer from Raiganj, West Dinajpur had also been felicitated for his contribution in the field of aquaculture. A round table conference was arranged for the 20 visiting fish farmers with the experienced retired and in-service scientists to discuss the problems of the farmers facing in fish farming and to suggest the remedial measures for the same.

Dr. S. Ayyappan Appointed as DDG (Fisheries)

Dr. S. Ayyappan, Director handed over charge to Dr. S.C. Mukherjee on August 01, 2002 upon joining as Deputy Director General (Fisheries) at the ICAR, New Delhi.

Felicitation to Dr. Panjab Singh, Secretary, DARE and Director General, ICAR, New Delhi

Dr. Dr. Panjab Singh, Secretary, DARE and Director General, ICAR, New Delhi visited CIFE on 1 June, 2002. Later he was felicitated by ARSS Forum, CIFE, Institute Joint Staff Council, Post Graduate School

Students Union, Indian Fisheries Association and CIFE Contract Labours. On this occasion, the Director General inaugurated the Institute's Gymnasium. He visited the new campus of the Institute, where construction of the new building has been initiated and he further visited the other facilities and laboratories of this Institute. Dr. S. Ayyappan, Director welcomed the Director General and thanked for the keen interest that he is taking in the progress of the Institute. Dr. S.C. Mukherjee, Jt. Director prosposed the vote of thanks. The Director General presented the CIFE Dr. Hiralal Chaudhuri Awards for the year 2001-02, to the awardees at the function.

Dr. Panjab Singh released the following publications of CIFE.

1. Fishing Craft and Gear Technology
Latha Shenoy, Y. Sreekrishna, Satish Kamat
2. Practical Manual on Fish Biology
A.K. Jaiswar, S.K. Chakraborty, Palaniswami.
3. Practical Handbook of Principles of Fish Breeding
Gopal Krishna
4. Matsya Ekalan Sadhan/Fish Aggregating Devices
Satish Kamat and Latha Shenoy
5. Matsya Darpan Newsletter No.17 (January-March, 2002)

IJSC

The IJSC committee for the period 2001-03 includes Shri C.B. Kareer, Secretary (SS), Shri G.S. Fernandes, Member CJSC, Shri R. Palaniswamy, Member, Shri J.D. Chandramore, Member, Shri S.R. Jaiswar, Member and shri M.H. Reddy, Member.

The above committee attended the IJSC meetings to solve the grievances of the staff and for the welfare of the staff, apart from this the members also attended other meetings of the Institute.

The members attended to the Central Government Employees Welfare Coordination Committee meetings on September 4, 2002 and October 23, 2002 at Aayakar Bhavan, Mumbai.

The members visited the CIFE Centres at Kakinada, Kolkata, Chinhat, Powarkheda and Rohtak between July-August 2002 to collected fresh hand information from the staff of the centres, to place their problems before the Director, CIFE, Mumbai. The CJSC Member attended the meeting at Jaipur and Karnal during the above period.

The IJSC received the award of Rajbhasha Puraskar Shield from CIFE for the period 2002-03.

41st ANNUAL DAY

The 41st Annual Day of the Institute was celebrated on June 06, 2002, Dr. (Mrs.) H. Santhanam, Director, Jamnalal Bajaj Institute of Management Science, Mumbai was the Chief Guest during the forenoon session and she distributed the various prizes and awards to the staff and students for sports and literary competitions. During the afternoon a grand cultural programme was organized. Dr. A.E. Eknath, Vice President, Geho Mar Norway was the Chief Guest on this occasion. Dr. S. Ayyappan, Director of CIFE in his welcome address said that fisheries research and HRD training programmes of the Institute has made and impact on national level. The Chief Guest in her address gave special emphasis on fisheries management. Dr. S.c. Mukherjee proposed a

grand cultural programme was organized.

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LIST OF STAFF* (AS ON MARCH 31, 2003)
(This is not a seniority list)

CIFE Headquarters, Mumbai

Director

Joint Director
Dr. S.C. Mukherjee

Principal Scientists
Dr. M.P. Singh Kohli
Dr. R.S. Biradar
Dr. C.S. Purushothaman
Dr. S.D. Singh
Dr. W.S. Lakra
Dr. Subrata Basu
Dr. S.K. Chakraborty
Dr. K.K. Jain

Senior Scientists
Dr. (Ms.) Kiran Dube
Dr. (Mrs.) Neelam Saharan
Dr. (Ms.) Latha Shenoy
Dr. S.N. Ojha
Dr. K.V. Rajendran
Dr. A.K. Pal
Dr. G. Venkateshwarlu
Dr. Geetanjali Deshmukhe
Dr. Gopal Krishna Saxena
Dr. (Mrs.) Aparna Chaudhari

Scientists-SG
Mr. K. Venkateshvaran

Scientists (SS)
Dr. M.B. Patel
Dr. S. Jahageerdar
Mr. P.K. Pandey
Mr. R.P. Raman
Mr. S.K. Patil
Dr. K. Pani Prasad
Dr. N.P. Sahu

Scientist
Dr. B.B. Nayak (Deputed abroad)
Dr. Sanjay Jadhav
Dr. Makesh. M.
Mr. Shyam Salim
Dr. Sandeep J. Akare
Mrs.Arpita Sharma
Ms. A. Vennila, Scientist
Dr. P.S. Ananthan

Technical Officers T - 8
Mr. S.K. Pal
Mr. Nandlal Singh

T - 7
Mr. A.K. Reddy
Mr. S. Natarajan

T - 6
Mr. R.K. Langer
Dr. Chandra Prakash
Mr. A.K. Padmanabhan
Mr. A.R. Warange
Dr. Ashok Kumar Jaiswar
Dr. R.S. Rana
Mr. Alkesh Dwivedi
Dr. Prem Prakash Srivastava
Mr. R.D. Tandel
Mr. S.G.S. Zaidi
Ms. Rama Sharma (On study leave)
Mr. G.K. Rao
Mr. S.K. Pandey(On study leave)

16. Personalia

Mrs. Asha T. Landge
Mr. A.D. Ragabhagat
Mr. M.K. Chouksey
Mr. Satish Kamat

T - 5
Ms. Ujwala Gadre
Mr. Chandrakant M.H
Mr. D.L. Sawant
Mr. Deepak Khogre
Mr. Dasari Bhoomaiah
Mr. K.P. Khalsa
Mr. J.P. Patil
Ms. Aravindra Mehta
Ms. K. Thilagavathi
Mr. Palaniswamy
Ms. Nalini Poojary
Mr. K.P. Shetty
Mr. P.K. Das

Technicians T - 4
Ms. Madhavi Pikle
Mr. A. Sadanandan
Ms. S.M. Bagwe
Mr. S.M. Shinde
Ms. S.P. Nalawade
Mr. Chandrakant Kareer
Ms. S.S. Gajbhiye
Mr. B.G. Mandhare
Mr. R.G. Kudale
Mr. Bhagat Singh Rawat
Ms. Rajani Pagare
Mr. J.M. Koli
Ms. Revati Dhongde
Ms. Rekha Nair

T - II - 3

T - I 3
Mr. S.V. Patil
Mr. B.J. Rathod
Mr. Sanjeev Bandkar
Mr. N.K. Aglave
Ms. B.S. Ghagre
Mr. Avinash Sable
Mr. Baburam Jaiswar
Mr. S.L. Koli
Mr. B.T. Phande

T - 2
Mr. S.R. Vinarkar
Mr. A. L. Kokane
Mr. Arun Puri (Gosavi)
Mr. Sikander Sheikh
Mr. R. D. Deshmukh

T-1
Mr. Dhanpat Singh
Mr. A.N. Mahadik
Ms. V.D. Misale
Mr. V.K. Bhave
Mr. Mohd. Baqar

Administration & Finance
Senior Administrative Officer
Mr. Suresh Kumar

Finance & Accounts Officer
Mr. Prem Shankar

Administrative Officer
Mr. M.K. Pachauri

Assistant Director (Official Language)
Mr. R.P. Uniyal

Assistant Administrative Officer
Mr. K. Mahmood
Mr. P. B. Tandav
Mr. Sunil Kumar
Ms. Valsa Pavitran
Mr. S.S. Kocharekar

Private Secretary
Ms. T. Kuruvilla
Mr. G.S. Fernandes

Stenographer (Grade III)
Ms. S. R. Arutla
Mr. P.R. Ninawe

Assistants
Mr. T.D. Kumar
Ms. S.S. Parab
Mr. Y.P. Belgaonkar
Mr. B.L. Kokkula
Ms. N.Y. Raorane
Mrs. Sushma Singh
Mrs. S.R. Wadhavkar
Mrs. Deepika N. Behl

Upper Division Clerks
Mrs. S.V. Kadam
Mrs. A.A. Shukla
Mrs. D.S. Naik
Mr. J.D. Chandramore
Mrs. F. G. Fernandes
Ms. Chandrarekha S. Khundol
Mr. R.R. Shah
Mr. D.S. Ingle
Mr. R.R. Kadam
Mr. R.G. Gamare
Mrs. Swati S. Koli
Mr. Vijay S. Kuveskar

Lower Division Clerks
Mr. Devendra Raorane
Mrs. Sujata V. Pawar
Mrs. Anagha U. Joshi
Ms. Yashoda S. Dhatavkar
Mr. A.G. Kolambkar
Mr. Bharat Kumar P. Chauhan
Mrs. Sanyuja S. Parab
Mr. Pradeep G. Angane
Mrs. Chaitali C. Raut
Mrs. Pragati R. Gadre
Mrs. Anu Grover
Mr. K.K. Jagtap
Mr. Suresh.H. Bhosle
Ms. Nalini A. Sawant
Mr. M.B. Waghela
Mr. Nandu L. Ghane
Mr. Sajivan Lal

Supporting Staff
Grade IV
Mr. S.L. Garate
Mr. B.K. Raut

Grade III
Mr. K.D. Solanki
Mrs. S.M. Supat
Mr. Madhu Wasnik
Mr. S.V. Gawade
Mr. Vinod P. Tiwari
Mr. Surajbali R. Jaiswar
Mr. B.S. Tamankar
Mr. Ashok R. More
Grade II
Mr. D.B. Gaikwad
Ms. Vandana Tambe
Ms. K.R. Ahire
Mr. T.G. Gaikwad
Mr. J.K. Makwana
Mr. Ankush R. Dore
Mr. Bandu R. Chavan

Grade I
Mr. M.P. Kotian
Mr. G. B. Kamble
Mr. Ashok R. Shingade
Mr. Jagdish Namdev Dhanu
Mr. Vasant N. Ondkar
Mrs. Shantabai Kamble
Mr. S.P. Malvankar
Mrs. R. H. Chavan
Mr. R.N. Kamble
Smt. Siddhi J. Kolambkar
Mr. Ganesh N. Zendekar
Mr. Ankush N. Joyashi

Vessel Staff
Skipper In-charge
Mr. K. Satyanarayana(T-7)

Engineer F.T.V. (T-8)
Mr. Josey Jacob

Engine Driver (T-5)
Mr. S.K. Chodankar

Additional Engine Driver(T-5)
Mr. S.L. Kotian

Mate (T-II-3)
Mr. S. Maity

Deckhand (T-2)
Mr. K.A. Shirogaonkar
Mr. K.V. Rajendran
Mr. S.L. Mungekar
Mr. A.P. Dhawde
Mr. V.B. Khandalgaonkar

Cook
Mr. S. Kamaraju

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Mr. Ayubkhan Bijali (Gr. IV)
Mr. G.G. Zendekar (Gr. III)
Mr. Vishnu Patil (Gr. III)
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Scientist
Mr. Ajit Kumar Verma

Technical Officers T-7
Dr. M. Ali

T-II-3
Mr. Hasan Javed
Mr. Sanjeevan Kumar

T-1
Mr. K. Dhana Raju
Mr. Kishan Kumar

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Mr. Vijay G. Dubey

T-II-3
Mr. L.P. Bamalia

T-2
Mr. Gurbachan Singh

T-1
Mr. Anup Singh

Administrative Staff

Senior. Clerk
Mr. Abhilash Tankappan

Junior Clerk
Ms. Asha Dhurve

Supporting Staff
Grade (II)
Mr. Hari M. Potpose,
Mr. Lallu Prasad
Mr. Vishnulal
Mr. Mangali Prasad
Mr. Surendra Kumar
Mr. Hari Singh

Grade (I)
Mr. Ram Kewal Prasad
Mr. Raghuvir Prasad
Mr. Ram Swaroop
Mr. Manoharlal
Mr. Shambhu Dayal
Mr. Satyander Prajapati

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Mr. J. Krishna Prasad
Mr. K. Murali Mohan
Mr. P. Sreenivasa Rao
Mr. V.N. Acharyulu

Technicians-T-4
Mr. J. Satyanarayana
Mr. K. Radhakrishna Reddy
Mr. Ravi Shankar Patnaik
Mr. B. Krishna Rao

T-2
Mr. V. Das
Mr. Shankar Lal
Mr. K. Rangiah
Mr. S.S. Murthy
Mr. Y.S. Murthy

T-1
Mr. B. Satyanarayana
Mr. M. Satyanarayana

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Assistant
Mr. T. Padmavathy
Mr. P.V.G.K. Murthy
Mr. B. Veera Raju

Junior Clerk
Mrs. M. Rama Mani

Supporting Staff
Mr. K. Pothu Raju, Gr. (IV)
Mr. M.Harichandra Reddy, Gr. (III)
Mr. M. Krishna, Gr. (III)
Mr. Sivaram Kale, Gr. (III)
Mr. M. Gandhi Prasad, Gr. (III)
Mr. M. Ch. Appa Rao, Gr. (II)
Mr. K. Malliah, Gr. (II)
Mr. K. Satyanarayana, Gr. (II)
Mr. Shaikh Nana Saheb, Gr. (II)
Mr. K. Niranjan, Gr. (II)
Mr. N. Venkata Ramana, Gr. (I)
Mr. K. Prasad, Gr. (I)
Mr. V. Shivaji, Gr. (I)
Mr. O. Veeraraju, Gr. (I)
Mr. K. Dharma Raju, Gr. (I)
Mr. P. Brahmaananda Rao, Gr.(I)
Mr. T. Satyanarayana, Gr. (I)
Mr. P. Venkata K. Reddy, Gr. (I)
Mr. P. Dora Reddy, Gr. (I)
Mr. Shaikh Valisha, Gr. (I)
Mr. A. Lakshman Reddy, Gr. (I)
Mr. S. Subba Reddy, Gr.(I)
Mr. Y. Batchilingam, Gr.(I)
Mr. M. Govindu, Gr. (I)
Mr. A. Anandu, Gr.(I)
Mr. A. Gurriah, Gr.(I)
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Sr. Scientists
Dr. (Ms.) Archana Sinha

Scientist-SG
Mr. P. K. Roy (on study leave)
Mr. B.N. Tiwari

Scientists-SS
Dr. Shubendhu Datta

Scientist
Dr. Parimal Sardar

Technical Officers (T - 5)
Mr. Rakesh Kumar
Mr. P.S. Pandey
Mr. S. K. Sharma
Mr. R.K. Biswas
Mr. A.K. Mondal

T-1-3
Mr. R.K. Mondal
Mr. P.K. Patra
Mr. S.K. Das, Engine Driver

T-1
Mr. T.K. Ghosh, Driver
Mr. M. Satyanarayana, Driver

Adminstrative Staff
Assistant
Mr. B. Veera Raju,

Jr. Stenographer
Ms. Kaberi Biswas,

Upper Division Clerks
Mrs. G. Prameela,
Mr. C.N. Sahani,

Lower Division Clerks
Mr. P.K. De,
Mr. B. Laxmana Rao

Supporting Staff
Mr. G.C. Saha, Jr. Deckhand, (Auxillary)
Mr. B. Dhar, Masalchi, Gr. (IV)
Mr. B.L. Mahato, Cook, Gr.(III)
Mr. B.D. Mondal, Gr. (III)
Mr. T.C. Balmiki, Gr. (III)
Mr. Manju Paul, Gr. (III)
Mr. Raghunath Das, Gr. (III)
Mr. Ram Narain Prasad, Gr.(III)
Mr. Ramesh chowdhary Gr.(II)
Mr. Ram Milan Singh, Gr. (I)

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Mr. P. M. Sherry
Dr. P.K. Varshney

Scientist-SS
Dr. Alok Kumar Jain

T-6
Dr. C.S. Chaturvedi,
Dr. (Ms.) Zeba Jaffar

T-5
Mr. S.P. Singh
Mr. A.K. Yadav

T-4
Mr. S.K. Upadhyay
Mr. Mohmood Gayas
Mr. P. Satyanarayana

T-3
Mr. Ravi Kumar
Mr. S.K.Singh

T-1
Mr. Om Prakash
Mr. P.C. Jaiswar
Mr. Ram Bharosi

Administrative Staff
Assistant
Mr. Pooranchand,
Mr. Jogendra Singh

Upper Division Clerks
Mr. P.K. Awasthi

Lower Division Clerks
Mr. P.C. Verma

Supporting Staff
Mr. Narayan, Gr. (IV)
Mr. K. Dush Raj, Gr. (II)
Mr. Suneet Kumar, Gr. (I)
Mr. Ram Lakhan, Gr. (I)
Mr. Anwar, Gr. (I)
Mr. J.N. Tiwari, Gr. (I)
Mr. Mahesh Chand, Gr. (I)
Ms. Kamla Jai Kishore, Gr. (I)

Promotions

The following staff members were promoted.

S.No.	Name	From	To
1.	Dr. K.K.Jain	Sr. Scientist	Principal Scientist
2.	Dr. P.M. Sherry	Scientist (SG)	Sr. Scientist
3.	Mr. S.S. Kocharekar	Assistant	Asst. Admn. Officer
4.	Mrs. Valsa Pavitran	Assistant	Asst. Admn. Officer
5.	Mr. S.K. Pal	T-8	T-9
6.	Mr. M.K. Chowksey	T-5	T-6
7.	Mr. A.D. Ragabhagat	T-5	T-6
8.	Mr. A.K. Yadav	T-5	T-6
9.	Mr. S.S. Kamat	T-5	T-6
10.	Mr. R. Palaniswamy	T-4	T-5
11.	Ms. Arvinder Mehta	T-4	T-5
12.	Mr. K.P. Shetty	T-4	T-5
13.	Mrs. Nalini Poojary	T-4	T-5
14.	Mrs. T. Krishnan	T-4	T-5
15.	Mr. Vijay Dube	T-4	T-5
16.	Mr. P.K. Das	T-4	T-5
17.	Mrs. Rekha Nair	T-II-3	T-4
18.	Mr. Gurubanchan Singh	T-2	T-II-3
19.	Mr. S. Satyanarayana	T-2	T-I-3
20.	Mr. Y. Y. Samba Murty	T-2	T-I-3
21.	Mr. Gurubachan Singh	T-2	T-I-3
22.	Mr. A.A. Gosavi	T-1	T-2
23.	Mr. R.D. Deshmukh	T-1	T-2
24.	Mr. N.L. Ghane	SSGr.I	LDC
25.	Mr. Ram Milan Singh	SSGr.I	LDC
26.	Mr. Sajivan Lal	SSGr.I	LDC

Transfers

S.No	Name	From	To
1.	Dr. S. Kannappan, Scientist	CIFE, Mumbai	CIBA, Chennai
2.	Mrs. Arpita Sharm, Scientist	Kolkata Centre	CIFE, Mumbai
3.	Mr. K.B.S.Murty, T-6	Powerkheda Centre	Kakinada Centre
4.	Ms. A. Vennila, Scientist		CIFE, Mumbai
5.	Mr. B. Veera Raju, Assistant	Kolkata Centre	Kakinada Centre
6.	Mr. B. Laxman Rao, UDC	Kakinada Centre	Kolkata Centre
7.	Dr. U.K. Maheshwari, Principal Scientist	Kolkata Centre	Rohtak Centre
8.	Mr. Vinod Kumar Yadav, SSGr.I	CIFE, Mumbai	Lucknow Centre
9.	Mr. P. Satyanarayana, T-4	Kakinada Centre	Lucknow Centre
10.	Mr. Sajivan Lal	Lucknow Centre	CIFE, Mumbai
11.	Dr. Krishna Chandra, Principal Scientist	CICFRI, Barrackpore	Kolkata Centre
12.	Mr. Abilash Thankappan,LDC	Kolkata Centre	Powerkheda Centre
13.	Dr. A.K. Jain, Sr. Scientist	Rohtak Centre	Aquaculture Research Laboratory, Udaipur
14.	Mr. K.D. Dhanaraju, T-1	Rohtak Centre	Aquaculture Research Laboratory, Udaipur

New appointments

S. No	Name	Date	Posting at
1.	Mr. Ankush N. Joyashi	01.04.2002	SSGr.I

The following staff were upgraded under ACP Scheme

S. No	Name	From	To
1.	Ms. Kaberi Biswas	Jr. Stenographer	Sr. Stenographer
2.	Mrs. Sanyuja S. Parab	LDC	UDC
3.	Mr. P.C. Verma	LDC	UDC

4.	Mr. B.P. Chauhan	LDC	UDC
5.	Mr. P.K. De	LDC	UDC
6.	Mr. A.L. Reddi	SS Gr.I	SS Gr.II
7.	Mr. S.s. Reddi	SS Gr.I	SS Gr.II
8.	Mr. M. Govindu	SS Gr.I	SS Gr.II
9.	Mr. M.A. Rao	SS Gr.I	SS Gr.II
10.	Mr. Ram M. Singh	SS Gr.I	SS Gr.II

Voluntary Retirement

S. No	Name	Date
1.	Mr. Shantaram Jadhav	1**5.05.2002**
2.	Mr. A.B. Birade	01.07.2002
3.	Mrs. Kamala Menon	24.09.2002
4.	Mr. I.R. Solanki,SSGr.II	01.02.2003

Retirements

Sl.No.	Name	Date
1.	Mr. P.B. Sonawane	30.04.2002
2.	Mr. R.L. Mohite	31.05.2002
3.	Mr. R.H. Rajguru	30.06.2002