Cifri CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE BARRACKPORE

Annual Report

1999-2000

वार्षिक प्रतिवेदन

ANNUAL REPORT

1999-2000

केन्द्रीय अन्त:स्थलीय प्रग्रहण मात्स्यिकी अनुसंधान संस्थान

(भारतीय कृषि अनुसंधान परिषद्)

बैरकपुर - 743101 : पश्चिम बंगाल

CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

BARRACKPORE - 743101 : WEST BENGAL, INDIA

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Published by	:	Dr. M. Sinha Director CIFRI, Barrackpore
Printed at	:	M/s. Toparts Private Ltd. 8/2, Dr. Biresh Guha Street Calcutta-700017

☞ The activities and achievements reflected in this Annual Report covers the period April 1999 to March 2000 only.

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ISSN 0970-6267

CONTENTS

1 PREFACE

The Annual Report of CIFRI for the year 1999-2000 presented before you contains a comprehensive information on the achievements of the various research projects and other activities under taken by the Institute.

The major emphasis of the Institute during the period has been on i) assessing the production potential and fisheries resources of reservoirs, the floodplain wetlands and the rivers *viz.* Ganges, Yamuna and Godavari, ii) assessment of the ecology and fisheries of the Hooghly, Narmada and other west coast estuaries and their wetlands, iii) monitoring the environmental and fishery status of river Ganges and Yamuna, iv) genetic study of Hilsa population, v) standardising the various parameters for monitoring fish and prawn health and controlling disease outbreak.

Consultancy assignments were taken up regularly by the Institute for resource generation. Resources were also generated by organising training programmes on various specialized topics. External fund mobilisation through ad-hoc schemes supported by ICAR etc.were also done.

The Institute further strengthened its research activities through linkages with other national/international organizations. The technologies developed by the Institute were effectively transferred.

M. Sinha
Director

2 EXECUTIVE SUMMARY/SALIENT ACHIEVEMENTS

Present status of fishery resources of Kerala backwaters

The fishery resources of ten backwaters viz. Kadinamkulam, Anchuthengu, Ashtamudi, Kayamkulam, Azhikode, Chettuva, Ponnani, Mahe, Valapattanam and Neleswaram were assessed. A systematic data base was created for the first time for the fishery of these ecosystems. Ninetyfour species of fish and shell fishes (excluding molluscs) were identified contributing to the fishery of these backwaters. Of these 63 were recorded from marine waters earlier, thereby establishing a close relationship of the backwaters fishery with that of the marine system. The average yield per hectare varied from 246 kg to 2747 kg. An analysis of the income distribution of the fishermen showed that they receive only 48-78% of the market price at the landing site. Over 30 type of gears were observed during the study and their density ($no.km^{2-1}$) ranged from 52 to 174 nos. The fishing in these backwaters suffers from both intensive fishing and irresponsible fishing thereby harvesting tremendous quantity of undersized fishes.

Econometric model for beel fisheries

CIFRI has initiated studies to develop models especially for culture-based fisheries in floodplain lakes of Assam and West Bengal. Two natural lakes in Manipur (Loktak and Takmu) have been selected for the purpose. Relevant informations were collected and prototype of questionnaire developed for testing. A comprehensive study has been initiated to understand the steps of detritus formation and its role in energy transformation in beels.

Inland Fisheries Resource Evaluation through G.I.S.

Satellite images of IRS-IC were obtained for the selected area falling under latitude 22°45′N -23°N and longitude 88°25′E - 88°40′E and the available water units were estimated with respect to their size, shape and other quantitative parameters. The intensity of colour of water was measured from the composite image (red, green and blue combined) and also from the individual colour band image. The maximum value was correlated with different physico-chemical parameters and soil characteristics recorded from selected water bodies. It was observed that there is no significant correlation in case of composite colour. However, significant correlation was found in case of red, green and blue colour with pH, specific conductivity and free carbon dioxide.

The data collected on different parameters were structured in order to develop Geographical Information System.

Assessing physiological response in fish to stressors

Fishes *R. rita* and *L. rohita* were subjected to stress of high temperature of 36 ° C and of domestic sewage at various concentration. A significant increase in plasma cortisol, glucose and cholesterol values and decrease in chloride and muscle/liver glycogen values were observed.

Survey of River Sutlej

An approximate 250 km stretch down stream of Sutlej within the state of Punjab from Roopnagar to Harike was surveyed to find out its ecological status, fish composition of river and nature of the effluent load getting inducted into it.

At Roopnagar two large pulp and paper mills and a big medicinal plant "Ranbaxy" discharge their effluents into Sutlej at Tajowall village. The character of this Nalla shows that effluents coming from it are highly acidic in nature, and fish kills are reported in the vicinity of discharge point. Thereafter the Sutlej is affected by sewage and industrial effluents at Ludhiana.

The effect of effluent from its tributary Chitti Bein persists even upto tail end of Sutlej. Fish kills are also reported in this "Bein" and were observed during pre-monsoon sampling.

Impacts of the tributaries Sone and Tons on river Ganges

Impacts of tributaries 'Sone' and 'Tons' on main river Ganges were discerningly marked. River Sone showed considerable impact in respect of chemical parameters on river Ganges, resulting in their decline trend at confluence which continued below confluence in river Ganges. Primary productivity and biotic communities viz. plankton, periphyton and macrobenthic communities were lesser in Sone than in river Ganges. After mixing, these values of river Ganges below outfall were also affected and resulted in decline, but phytoplankton percentage contribution to total plankton increased in river Ganges at the confluence.

Considerable impact of Tons tributary has been observed in respect of water quality at confluence and below confluence. Plankton and periphyton density decreased and macrobenthic population increased in river Ganges after mixing.

Fisheries of Hooghly estuarine system and its wetlands

Total fish yield from the Hooghly estuarine system and Digha centre was estimated as 62,025.2 t during the period February, 1999 to January 2000. The hilsa fishery of the estuarine system and Digha centre during 1999-2000 yielded an estimated catch of 5,377.5 t and 1,191.1 t totalling 6,568.6 t contributing 11% of the total catch. Fish production from the selected wetlands in low, medium and high saline areas was 541.477 to 795.871 kg ha^{-1} yr^{-1}. Investigations to assess soil and water quality pertaining to physico-chemical parameters, primary production, community organisation of plankton, macro-zoobenthos were undertaken at different centres of Hooghly estuarine system including its tributary, important distributaries as well as low, medium and high saline estuarine wetlands. Sociological investigations of the prawn and fish seed collections in lower estuarine system (Sunderbans) were carried out and at the same time mass awareness programmes were conducted to restrict indiscriminate destruction of post larvae of fin and shell fish. Biochemical changes in hilsa during different stages of its migration were studied.

Environmental impact assessment studies in rivers and associated eco-system

To assess the environmental perturbations and its impact on ecology of river Ganges, Yamuna, Hooghly, Haldi, and Tapti at various points, studies were undertaken on hydro-biological, bio-chemical, microbiological parameters. Bio-assay with fish in the laboratory and *in situ* experiments were undertaken with industrial wastes. Standardization of pH and D.O. was continued this year also to suggest minimal standards permissible for industrial wastes discharge into aquatic system to safeguard aquatic resources of riverine system. The metal and pesticides residue in water samples also indicated more values at Delhi, Agra, and Haldia oil refinery industrial complex.

Genetic structure of Hilsa population

Sub-populations of *H. ilisha* below and above Farakka barrage, Brahmaputra and Mahanadi were studied using isozyme markers. It was inferred that the hilsa populations of Ganges and Brahmaputra system may be part of the same random mating population, whereas, that of Mahanadi is a different subpopulation.

Training in North-East

A training programme on Conservation and Sustainable Fishery Management of the flood plain wetlands in the North-East was organised for fishery personnel of North-Eastern States by the Floodplain Wetlands Division of CIFRI at Guwahati.

3 INTRODUCTION

The Government of India, in a memorandum brought out in 1943, stressed the need for having a separate central department in the best interest of the development of fisheries resources of the country. This memorandum was later endorsed by the Fisheries Sub-Committee of the Central Government Policy Committee on Agriculture, Forestry and Fisheries. Based on this, the Central Inland Fisheries Research Station was formally established on 17th March, 1947 in Calcutta under the Ministry of Food and Agriculture, Government of India. From the modest beginning as an interim scheme, the organisation has since grown to the status of a premier research institution in the field of inland fisheries in the country and has completed 53 years of its existence on March 17, 2000. By the year 1959, the Station acquired its status as Central Inland Fisheries Research Institute (CIFRI) and moved to its own buildings at Barrackpore, West Bengal. Since 1967, the Institute is under the administrative fold of Indian Council of Agricultural Research (ICAR).

The main objectives of the Institute were to conduct investigations for a proper appraisal of inland fisheries resources of the country and to evolve suitable methods for their conservation and optimum utilization. While fulfilling the above objectives, the Institute directed its research efforts towards understanding the ecology and production functions of inland water bodies available in the country like the river system, lakes, ponds, tanks, reservoirs and floodplain wetlands. These studies have unravelled the complex trophic structure and functions *vis-à-vis* the environmental variables in different aquatic ecosystems. During the early 1970s, the Institute expanded its activities by initiating various All India Coordinated Research Projects; such as Composite fish culture and fish seed production, Airbreathing fish culture, Ecology and fisheries management of freshwater reservoirs, and Brackishwater fish farming.

The Institute has the distinction of evolving and popularising technologies on fish seed prospecting from rivers; fish seed transportation; induced breeding and nursery management of carps; bundh breeding of Chinese carps; composite fish culture; aquatic weed control; air-breathing fish culture; integrated fish farming; sewage fed fish culture; fisheries management of small reservoirs; brackishwater fish farming and farming of edible snails. The country has witnessed a phenomenal increase in production of inland fish (0.22 million t in 1950-51 to 2.6 million t in 1998-99) which can be mainly attributed to the above technologies.

At the beginning of Seventh Five Year Plan three Institutes (Central Institute of Freshwater Aquaculture, Central Institute of Brackishwater Aquaculture and National Research Centre on Coldwater Fisheries) were carved out from this Institute and the parent Institute was rechristened as Central Inland Capture Fisheries Research Institute

A haul of fish from backwaters of Kerala

A view of the Ashtamudi backwater with a battery of stake nets

Drag net in operation in a beel in Assam

Jute retting – offseason activity of beel fisheries in West Bengal

In situ bioassay at industrial waste discharge point

Chemical waste discharged in River Tapti at Ukai (Gujarat)

River Ganga at Kanpur

Sewage outfall, Mehdaurighat, Allahabad, Ganga

Gear used by women collecters of fish/prawn seed in Sunderbans

Seed of *P. monodon*

Demonstration of pen culture of fish/prawn in Amdah beel

Dr. M. Sinha, Director CIFRI releasing fish seed
in pens at amdah Beel

(CIFRI) with effect from 1st April 1987. Under the changed set up, CIFRI is entrusted with the responsibility to conduct research on open water bodies where the fisheries management norms are closely associated with environmental monitoring and conservation.

Mandate

The CIFRI is presently mandated to :

1 study fish population dynamics of exploitable inland water bodies exceeding 10 ha in water area;

2 evolve management systems for optimising fish production from such water bodies;

3 investigate causes, effects and remedies of their degradation/pollution and provide research support for mitigation and for conservation of such resources;

4 study the impact of river valley projects on the fisheries of the basins concerned and evolve strategies for their management;

5 act as national data centre on inland fisheries; and

6 conduct training and provide extension/consultancy services.

Organisational set-up (chart)

In tune with the above mandate, the research activities of CIFRI have been organised under seven divisions, corresponding to the major fishery resources and other research needs of the country related to fisheries development.

The ***Riverine Division,*** with its headquarters at Allahabad, strives to develop systems for effective management of the vast riverine fisheries resources of the country with adequate emphasis on the conservation of riverine environment. The research projects under the Division cover the rivers Ganges, Brahmaputra, Mahanadi, Narmada and Godavari and their important tributaries.

The ***Reservoir Division*** is based at Bangalore with centres in Tamil Nadu, Andhra Pradesh and Madhya Pradesh. The investigations being carried out at the Division are aimed at developing management norms for optimising fish yield from large, medium and small reservoirs of the country.

The Barrackpore-based ***Estuarine Division,*** presently works on the Hooghly-Matlah and Narmada Estuarine systems. The effluents from a number of industrial units, agricultural wastes, municipal wastes, etc. make the Hooghly estuary one of the most polluted stretches of the Ganga river system which is being investigated by the Division. Biotic and abiotic features of estuarine tributaries and mangroves of Sunderban region are also being studied.

The ***Environmental Monitoring and Fish Health Protection Division,*** stationed at Barrackpore, is mandated to monitor the man-made changes in the riverine, reservoir and estuarine ecosystems and to evolve suitable amelioration measures. Experiments are also being carried out under the laboratory conditions to substantiate the findings from natural resources. The studies under the Division include collection of basic information on habitat variables, impact identification through known indicators and biodiversity, screening of toxicants in controlled conditions, microbiological studies to ascertain organic load in aquatic environment and fish/prawn health, stress and disease diagnosis and control. Development of mitigating action plan for ecosystem restoration is also the responsibility of this Division.

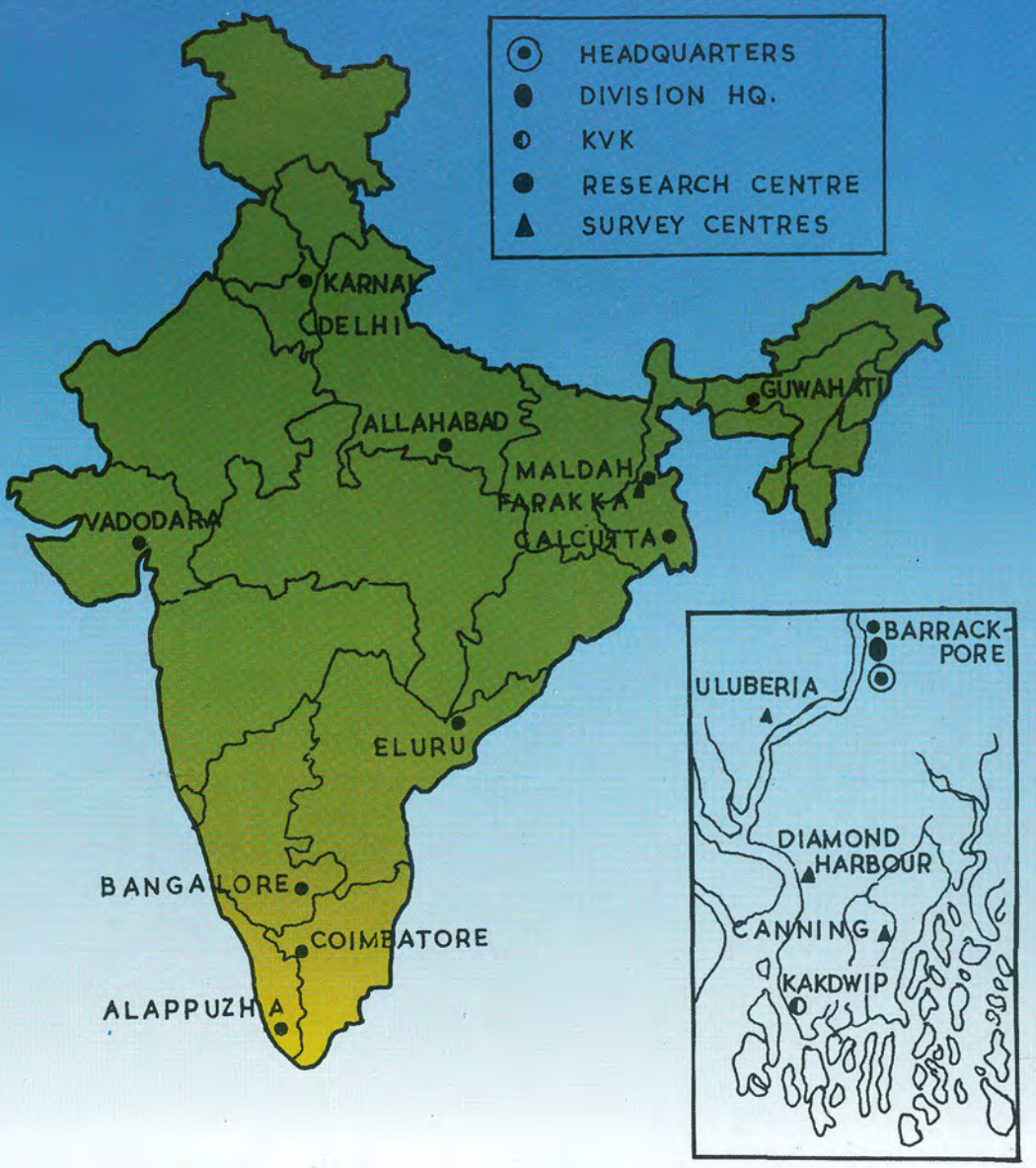
The ***Floodplain Wetlands Division*** has its headquarters at Guwahati. The ecodynamics of wetlands spread over the floodplains of Ganga-Brahmaputra basins are being studied in order to evolve management norms for their sustainable development. The wetlands associated with the floodplains of Ganges and Brahmaputra rivers are not only unique in their rich biodiversity, but they also constitute an important fishery resource in the states of Bihar, West Bengal and Assam. The Division carries out research on the ecosystem processes and fish productivity from this resource with special attention on protection of biodiversity and development of environment-friendly technologies.

The ***Resource Assessment Division*** is located at Barrackpore and conducts research aiming at creating a database on the fish stocks and fishery resources. The Division is geared up to develop various population models that can lead to scientific exploitation of inland fisheries resources.

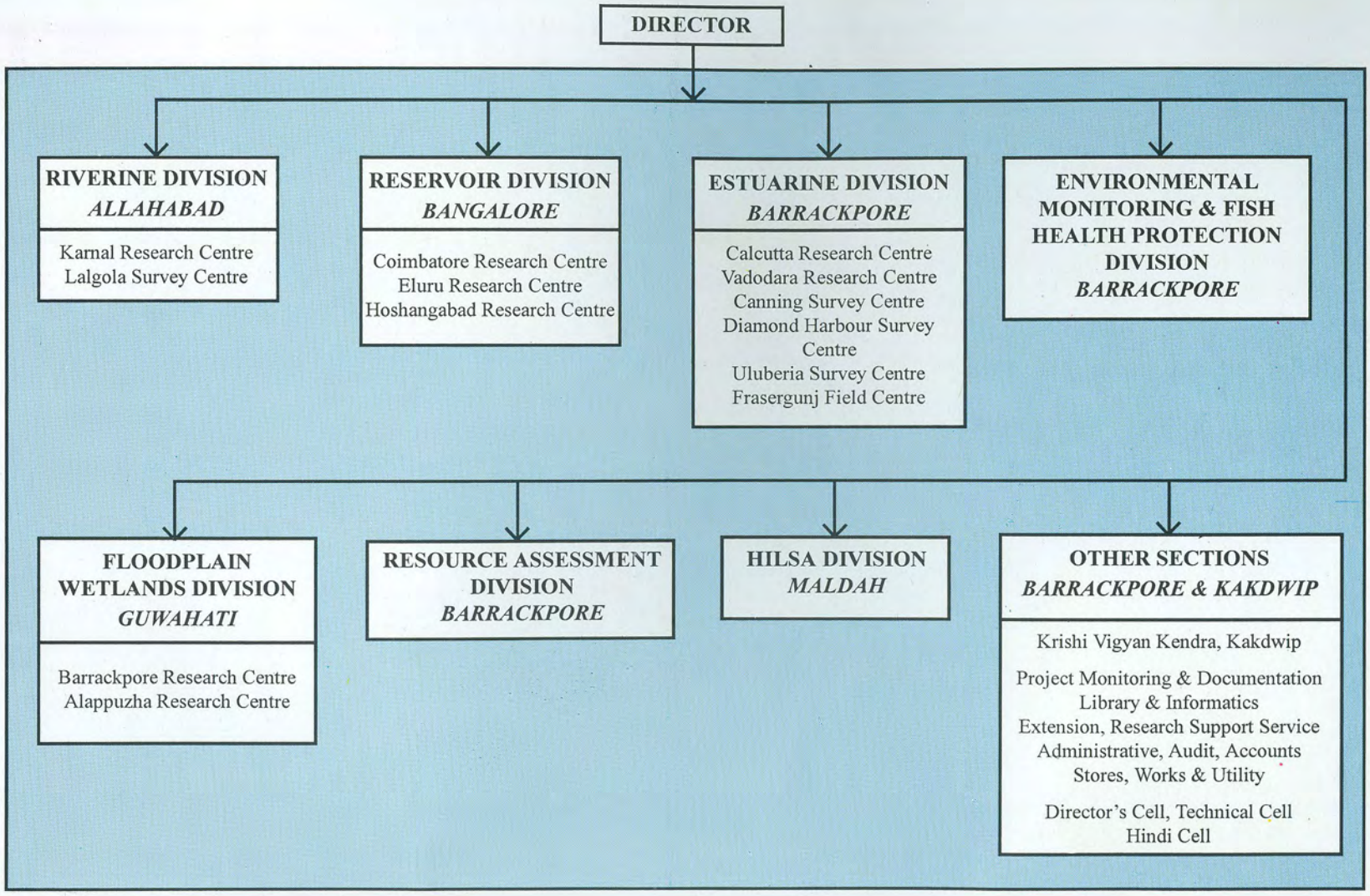
The main aim of the ***Hilsa Division,*** located at Maldah, West Bengtal is to carry out research on biology, and migratory behaviour of hilsa, leading to development of measures for the recovery of its fishery in the depleted stretches of the river Ganges. It is also undertaking study on genetic characteristics of hilsa from different stretches to know its population structure.

The Institute's research activities have been organised under 17 research projects which are operated from the Headquarters at Barrackpore, 12 Research Centres, 5 Survey Centres and a Krishi Vigyan Kendra covering 10 states of the country. The distribution of research and survey centres and different sections are shown in the organisation chart.

DIVISIONS, RESEARCH CENTRES & SURVEY CENTRES
of Central Inland Capture Fisheries Research Institute



ORGANIZATIONAL SET-UP OF CIFRI



Library services

CIFRI Library provides its services to the scientists of the Headquarters and centres, and research scholars, teachers, students and officials from other organizations. The library added 240 books, 124 miscellaneous publications and 675 loose issues of journals to its collection and subscribed 19 foreign and 57 Indian journals during the year. The current total holding of the library comprises : 8276 books, 4265 reprints, 945 maps, 3797 miscellaneous publications and 52 thesis.

The library maintained free mailing of the Institute's publications to various research organizations, Universities, entrepreneurs and farmers to keep them abreast with the latest developments in fisheries research. As a part of resource sharing, it extended inter-library loan of 20 publications to other libraries. Rs.18,39,874.00 was spent during the year 1999-2000 for procuring library books, journals and other reading materials. Library also brought out Indian Fisheries Abstracts Volume 32(1-4), 1998 and 33(1-4)), 1999 and Current Contents for the period July-September, October-December 1998, Jan-June, July-September, October-December, 1999.

Project Monitoring & Documentation Service

The section monitored the progress of Research Projects of the Institute and organised Staff Research Council Meeting. It also assisted the Director in policy formulation and technical guidelines on plan scheme preparations, apart from publishing reports, write ups, bulletins, project programmes, and newsletters. The section processed the research papers, submitted by the scientists for their publications in different journals and for presentation in symposia/workshops/summer school, etc. Participation of scientists in seminars, symposia, conferences, etc. was also monitored by the section.

The section maintains an active DTP, photocopy, lamination, duplicating (cyclostyling), and binding units to cater to the needs of the Institute.

Research Project Files

Annual progress reports of all the research projects and the contribution made by individual scientist are being maintained and monitored through the Primary Project Files and Scientists Files. Monitoring of research progress through RPF I, II and III, Activity Milestones and Monthly, Quarterly and Annual Reports were some of the major responsibilities performed by the section.

Technical Reports/queries

More than 25 Technical reports pertaining to progress of research activities of the Institute were compiled and sent to the Council, Ministry of Agriculture and other agencies. Technical queries regarding the activities of the Institute from various quarters of the country and abroad were attended to by the section.

Personal Information System (PIS)

During the reported period, biodata of 75 scientists of the Institute have been updated in the PIS based database which is being maintained at the Institute and ICAR.

Publications

The following departmental publications were brought out by CIFRI during the year.

Bulletin

1 No.89 Short Course Training on Fish Yield Enhancement in Open Water Based on Ecological Management, 5^{th}-14^{th} May, 1999

2 No.90 Ecology, Fisheries and Fish-Stock Assessment of Indian Rivers(Summer School on Ecology, Fisheries and Fish Stock Assessment in Indian Rivers, CIFRI, Barrackpore, 14 July to 12 August 1999

3 No.91 Short Term Training for Progressive Fish Farmers on Management of Open Indian Waters, 25^{th} August – 8^{th} September, 1999

4 No.92 Ikkesvin Shatabdi me Matsyaki Anusandhan Evom Vikas ki Sambhavit Disyayen (In Hindi)

5 No.93 Ecology and Fish Yield Potential of Selected Reservoirs of Karnataka

6 N0.95 Fish Yield Optimization in Thirumoorthy Reservoir, Tamil Nadu

7 No.96 Open Water Fisheries Technologies and Extension Methods

Annual Report

CIFRI Annual Report 1998-99.

Newsletter

1 The Inland Fisheries News (Vol.4, No.1, January'99 to June'99).
2 The Inland Fisheries News (Vol.4, No.2, July'99 to December'99).
3

Current Contents

July-September, October-December 1998 and January-June, July-September, October-December 1999.

Financial statement

For the year 1999-2000

		B.E.	R.E.	Actual expenditure
Plan	:	250.00	250.00	249.11
Non-Plan	:	499.00	635.00	635.00
TOTAL	**:**	**749.00**	**885.00**	**884.11**

Staff Position

Statement showing the total number of employees in the CIFRI, Barrackpore pertaining to the employees under Scheduled Castes and Scheduled Tribes categories (Period from 1.4.1999 to 31.3.2000

Sl. No.	Class of Posts	Total No. of posts sanctioned	Total No. of employees in position	Total No. of Sch. Caste among them	S.C. in % of total employees	Total No. of Sch.Tribe among them	S.T. in % of total emplo-yees	Remarks
1	**SCIENTIFIC POSTS**							
	Experimental Scientist							
	Scientist	76	63	5	7.94	-	-	
	Sr.Scientist/Scientist(Sel.Grade)/ Scientist(Sr.Scale)	16	2	-	-	-	-	
	Principal Scientist	8	7	1	12.50	-	-	
	RMP Scientist	1	1	-	-	-	-	
	TOTAL	**101**	**73**	**6**	-	-	-	
2	**TECHNICAL POSTS**							
	Category – I	60	55	11	20.37	3	5.36	This includes 2 (two) posts under C.S.S. and 15 (fifteen) posts under KVK
	Category – II	60	52	12	25.53	4	2.84	
	Category – III	11	5	1	10.00	-	-	
	TOTAL	**131**	**112**	**24**		**7**		

3	**ADMINISTRATIVE POSTS**							
	Sr.A.O.s/A.Os/Accounts Officer, etc.	2	1	1	100.00%	-	-	This includes 1 (one) Assistant, 1 (one) Stenographer and 1 (one) L.D.C. posts under C.S.S., 1 (one) Asstt.. 1 (one) Jr. Steno. Under KVK and 1 (one) L.D.C. under N.F.
	A.A.Os/Superintendent(Accounts)/Supdt.	7	7	3	43.00%	-	14.29%	
	Assistant Director (O.L.)	1	1	-	-	-	-	
	Assistants	25	22	5	23.00%	1	5.00%	
	Sr. Stenographer, Stenographer, Sr.P.A.	5	4	2	50.00%	-	-	
	Jr. Steno., Sr. Clerk/U.D.Cs	46	42	10	24.00%	-	-	
	L.D.Cs/Hindi/Time Keeper	16	13	2	15.00%	1	8.00%	
	TOTAL	**102**	**90**	**23**		**2**		
4	**SUPPORTING STAFF**							
	Grade - I	86	77	27	35.00%	4	5.19%	This includes 1 (one) post of SSG under C.S.S. and 7 (seven) post of SSG under KVK
	Grade - II	62	61	20	32.70%	4	6.56%	
	Grade - III	37	37	13	35.14%	3	8.11%	
	Grade - IV	18	18	11	61.11%	2	11.11%	
	TOTAL	**203**	**193**	**71**		**13**		
5	**AUXILLIARY POSTS**	10	4	2	50.00%	-	-	

4 RESEARCH ACHIEVEMENTS

PROJECT : RI/A/1

ECOLOGY AND PRODUCTION RELATIONSHIPS IN PENINSULAR RIVER SYSTEMS.

Sub-Project : **Investigations on ecology, bio-diversity and production function in river Cauvery**

Personnel **:** *Scientific :*
C. Selvaraj (upto 31.5.1999), M. Ramakrishniah, D.N. Singh, D.S. Krishna Rao, P.K. Sukumaran, M. Karthikeyan, A.K. Das, V.K. Murugesan, Rani Palaniswamy,
Technical :
M.F. Rahman, S. Manoharan

Duration **:** April 1999-March 2001

Location **:** Bangalore

River Cauvery

Soil and water quality

Soil texture was sandy loam to sandy clay in upper stretch and sandy throughout the lower stretch. Soil pH was slightly acidic (4.1-6.2) near its origin and progressively increased to become alkaline (7.2-8.0) in the lower reaches.

Water temperature was lower (20-21°C) near the origin, but gradually increased along the course (25-31°C). Chemical characters such as pH (6.1-8.1), alkalinity (6-190 mgl^{-1}), conductivity (28-600 µmhos cm^{-1}), calcium (1.25 to 32.0 mgl^{-1}) and magnesium (0.21-13.6 mgl^{-1}) progressively increased along the course.

Primary production

The gross primary production (mg C $m^{3-1}d^{-1}$) ranged from 224 - 520 and 216-528 in the upper stretch, 481-2375 and 250-2000 in lower stretch during monsoon and post-monsoon respectively. Higher phosphate levels in lower stretch reflected in the primary productivity.

Biotic communities

Phytoplankton contributed overwhelmingly (95%) to the plankton population. Chlorophyceae was predominant during monsoon and it was replaced by bacillariophyceae in the post monsoon season. Zooplankton occurred only during monsoon in the upper stretch.

Benthic fauna in general was rich in Cauvery predominated by gastropods and bivalves. Highest concentration was recorded in Coleroon at Kollidam (7396 no m^{2-1}).

Periphyton deposits were lowest near the source (Bhagamandala) but improved along the course with diatoms as the most dominant group (73-100%).

Fishery

The fishery of Cauvery is a mix of indigenous fishes, Gangetic major carps and exotic fishes like Tilapia (*O. mossambicus),* Silver carp *(H. molitrix),* Grass carp *(C. idella)* and Common carp *(C. carpio).* Of these, Tilapia is well established throughout the course from Bhagamandala to the lower stretch. Fry and fingerlings of Tilapia (12-50 mm) occurred throughout the upper stretch.

The native Cauvery carps such as *P. carnaticus, P. dubius, L. kontius, L. ariza* occurred in considerable proportion in the landings especially at Hogenakal above Stanley reservoir. *L. fimbriatus, M. punctatus, T. khudree* occurred below K.R.Sagar till Mekedatu. Below Stanley reservoir large catfishes *M. seenghala, M. aor* and carps *C. cirrhosa* occurred along with major carps.

PROJECT : RI/B/1

INVESTIGATIONS ON ECOLOGY, BIODIVERSITY AND PRODUCTION POTENTIAL OF TRIBUTARIES AND THEIR IMPACT ON RIVER GANGA

Sub-project : (1) Investigations on ecology, biodiversity and production relationships of tributaries of river Ganga (Lower stretch of river Yamuna; Ghagra, Tons and Sone) – Allahabad.

Personnel : *Scientific :*
R.S. Panwar, A.K. Lal, R.N. Seth, Shree Prakash, R.K. Dwivedi, R.K. Tyagi, V. Pathak, B.K. Singh, P.N. Jaitly, Sandeep Bhatia (upto 11.6.1999)
Technical :
R.C. Singh, B.D. Saroj, L.R. Mahavar, S.K. Srivastava, Ramji Tiwari, J.P. Mishra, Kalpana Srivastava

Duration : Sub-Project 1 : June 1996-March 2001

Location : Allahabad/Karnal

River Sone

Soil and water quality

Both sp. conductance and free calcium carbonate were comparatively higher in Ganges (178 μmhos cm^{-1} & 5.5% respectively) than in Sone and except in these two parameters practically no impact of tributary on the main river was observed in respect of soil quality.

Nutrients status both in respect of nitrate and phosphate were poor in all the stretches (0.042 to 0.076 mgl^{-1} and 0.028 to 0.057 mgl^{-1} respectively) but dissolved organic matter was quite high (0.49 to 0.99 mgl^{-1}) being comparatively higher in Ganges than Sone. The water quality parameters *viz.* alkalinity, conductance dissolved solids, calcium, magnesium, hardness and chloride all showed an increasing trend from upper stretch Moharghat to the down stretch Maner. But their values were comparatively much lower in Sone.

Heavy metal concentration

The accumulation of copper, chromium, lead and zinc showed a slight declining trend from upper to lower stretch in the sediment phase and their values were comparatively higher in Ganges (8.15 μgg^{-1}, 14.18 μgg^{-1}, 20.04 μgg^{-1} and 24.1 μgg^{-1} respectively) than Sone (4.36 μgg^{-1}, 13.35 μgg^{-1}, 15.7 μgg^{-1} and 16.41 μgg^{-1} respectively).

Primary production

Both gross and net production rates were comparatively much higher in Ganges (690.0 & 406.5 $mgCm^{-2}d^{-1}$ or 6776 & 3992 $calm^{-2}d^{-1}$) than Sone at the same point (343.0 & 231.0 $mgCm^{-2}d^{-1}$ or 3368 & 2268 $calm^{-2}d^{-1}$).

Biotic communities

Plankton

Annual average plankton and its diversity were more in river Ganges 390 ul^{-1} than river Sone 184 ul^{-1} at Maner. On an average, phytoplankton percentage contribution was 93% in river Sone and in river Ganges, 67% but after convergence of river Sone with Ganges it enhanced to 86% in river Ganges.

Periphyton

River Sone at Maner (above confluence) showed periphyton abundance to the tune of 2519 ucm^{-2}, whereas river Ganges at Maner (above confluence) displayed quite low abundance of 718 ucm^{-2}.

Benthic fauna

The benthic fauna was moderate (517 nm^{-2}) at Maner in Ganges and minimum (160 nm^{-2}) at confluence point. The percentage contribution of various groups were gastropods (48.8%), Pelecypoda (32.1%), Insects (15.5%) and Annelida (3.6%).

Availability of spawn

Investigations were carried out on river Sone at Dehrionsone where three floods frequency and four spawning spurts were encountered and 3987 ml of spawn were collected. Analysis showed 35.7% desirable spawn. Among the desirable ones the most abundant was *C. mrigala* (17.5%) followed by *C. catla* (12.5%), *L. rohita* (8.0%) and *L. calbasu* (1.5).

Periphyton

Etma recorded the highest density (5760 ucm^{-2}) followed by Maihar (4932 ucm^{-2}) and Teother stretch (2972 ucm^{-2}). Among the dominant forms, diatoms were maximum followed by blue green, green and least by the Desmids.

Macrobenthic organisms

In general, the stretch of river Tons adjoining river Ganges at Sirsa ghat represented maximum population of benthic organisms being 1840 nm^{-2} and 1188 nm^{-2} during summer months while river Ganges represented poor benthic organisms (364 nm^{-2}). Their population further dwindled at confluence (4 nm^{-2}).

Spawn availability

Spawn analysis yielded 14.3% desirable spawn. The index of spawn quantity was estimated at 93 ml and index of quality was estimated 19.43% which contributed major carp, namely *Catla catla* 9.7%, *Labeo rohita* 5.7% and *Cirrhinus mrigala* 4.0%. Minor and other carps contributed 28.3 and 52.3% respectively.

PROJECT : RI/B/2

ASSESSMENT OF ECOLOGY, BIODIVERSITY AND PRODUCTION POTENTIAL OF INDUS RIVER SYSTEM

Sub-project : **Evaluation of ecology and fish community structure of river Sutlej.**

Personnel : *Scientific :*
D.N. Mishra, Usha Moza
Technical :
C. Lakra, Sushil Kumar

Duration : June 1999 – March, 2001

Location : Karnal

River Sutlej

An approximate 350 km of Sutlej within Punjab state from Roopnagar to Harike was surveyed.

Water quality

Water characterisation of river showed pH range of 7.0 to 7.5 except at Roopnagar OF having pH 6.35. The physical characteristics like D.O., free CO_2 and dissolved organic matter do not differ much between non discharge points (AOF) and discharge point (OF to BOF). At the above discharge points (AOF) the water has comparatively low specific conductance range of 201-270 µmhos cm^{-1}, total hardness 71.6 to 123.7 mgl^{-1}, chloride 5.23 to 7.36 to 7.36 mgl^{-1} . The effluent loaded sites have high sp. conductance of 300-640 µmhos cm^{-1}, total hardness 106.1 to 140.6 mgl^{-1} and chloride 15.4 to 25.2 mgl^{-1} thereby showing that effluents especially from Roopnagar Nalla and Chitti Bein degrade the water ecology.

Soil of river Sutlej had pH range of 7.8 to 8.4 with low percentage of sand 58.8-65.5% and sufficient silt 14.0-34.8% and clay 6.6 to 20.33%.

Primary productivity

The gross primary production values ranged between 109.37 to 140.5 $mgCm^{3-1}$ hr^{-1}. The carbon production diminished at BOF sites 93.75 to 78.12 $mgCm^{3-1}$ hr^{-1} under the influence of effluents. The low values of G.P. 62.5 $mgCm^{3-1}$ hr^{-1} of Sutlej at Harike show the effect of Chitti Bein as well as the effect of agricultural wastes.

Biotic communities

Plankton : The surface plankton study showed that maximum planktons were present at AOF stations in the range of 283-375 u l^{-1}. The density increased down the gradient. Total density range of 33-150 u l^{-1}at OF stations showed drastic decrease due to effluent input. Density range of 234-251 u l^{-1}at BOF stations showed persistence of effluent effect. Presence of chlorophyceae in the range of 28-40%, rotifers 7-16%, cladocerans 7-13%, copepods 9-14% from Ludhiana onwards, denote whole of Sutlej to be organically rich.

Periphyton : Maximum periphyton were present at AOF stations in the range of 350 to 500 u cm^{2-1} except at AOF Ludhiana (183 u cm^{2-1}). The density decreased drastically to 33-134 u cm^{2-1} at OF sites especially at Ludhiana and Gidderpindi.

Macrobenthos : Macrobenthic population within Sutlej as a whole was poor. The average density being low 22.177 u cm^{2-1}.

Population composition was mainly composed of gastropods (50-100%) at Roopnagar, by both gastropods (33%) and odonate nymphs (66%) at tail end and exclusively by molluscs at Harike.

Macrophytes : The biomass (dry wt.) varied between 0.095 to 0.360 kg m^{2-1} at AOF Roopnagar and between 0.01 to 2.8 kg m^{2-1} at tail end of Harike.

Macrophyte associated fauna : Macrophyte associated fauna was encountered maximum at Harike 40 u $kg^{-1}m^{2-1}$, minimum 3-10 at sites not influenced directly (BOFsites) and almost negligible at OF sites, nil to 5 u $kg^{-1}m^{2-1}$.

Fishery

Fish catch along river Sutlej was estimated from 5 landing centres down the stretch at Roopnagar, Ludhiana, Jallandhar, Sultanpur and Harike.

The fishery of Sutlej was dominated by major carps 1.338 t (45.23%), followed by miscellaneous group 1.102 t (37.25%), *C. carpio* 0.313 t (10.58%), large sized cat fish 0.204 t (6.90%) and *Tor* sp. 0.001 t (0.03%).

PROJECT : ES/B/1

INVESTIGATIONS ON THE FISHERIES OF HOOGHLY ESTUARINE SYSTEM AND ITS WETLANDS.

Sub-projects :

1 **Investigations on the fisheries of Hooghly estuarine system**

2 **Ecological changes in the estuarine wetland impoundments and its effect on production potential**

Personnel : *Scientific :*
Ajoy Kumar Ghosh, D.K. De (upto 31.12.1999), D. Nath, P.M. Mitra, U. Bhaumik, H.C. Karmakar, R.N. Misra, Ansuman Hajra,Amitava Ghosh, P.K. Kathia
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N.C. Mandal, H.K. Sen, N.N. Mazumder, A.R. Paul, Sukumar Saha, T. Chatterjee, B.B. Das, P. Biswas, A. Mitra, D. Sanfui, B.N. Das, A. Sengupta, A. Roy Choudhury, P. Singh, L.K. Parbat, A.K. Barui, B. D. Saha, S. Mandal, C.P. Singh

Duration : May 1998-March 2003

Location : Barrackpore and Calcutta

Sub Project - I

Water and soil quality

The distributaries of Hooghly estuary were rich in nitrogen, sulphate, hardness, Calcium and magnesium but silicate and phosphate contents were generally low presumably due to their utilisation by phytoplankton and algae.

The soil reaction was slightly alkaline (pH 8.1 to 9.26). Soil texture was silty clay loam, which is conducive for retention of nutrients in the soil.

Primary production

Maximum gross primary production was recorded at Thakuran (average 66.7 mg C cubic metre^{-1} hr^{-1}), followed by Ichamati (56.3 mgC), Haldi (55.2 mgC) Hooghly (54.1 mgC), Bidya (53.1 mgC) and Matla (53.1 mgC).

Similarly maximum net primary production was observed at Thakuran (average 43.8 mgC cubic metre^{-1} hr^{-1}) followed by Matla (37.5 mgC), Haldi (36.5 mgC), Ichamati (35.4 mgC), Hooghly (33.3 mgC), Bidya (32.3 mgC) and Saptamukhi (29.1 mgC cubic metre^{-1} hr^{-1}).

Biotic communities

Plankton and *Macro-zoo benthos :* At Hasnabad the average value of plankton concentration was 1049 u l^{-1} and the average concentration of macro-zoobenthos was 172 nos. sq.m^{-1}.

At Haldia the concentration of plankton was 1198 u l^{-1} and the macro-zoobenthic concentration was 219 nos. sq.m^{-1}. At Dhamakhali the annual mean value of plankton was 3321 u l^{-1} and the macro-zoobenthic concentration was 187 nos. sq.m^{-1}. At Harwood point the average concentration of plankton was 1456 u l^{-1} and benthos was 386 nos.sq.m^{-1}. At Bhagabatpur the average concentration of plankton was 1882 u l^{-1} and the macro-zoobenthic concentration mean annual value was 577 nos.sq.m^{-1}. At Jharkhali the mean value of plankton cencentration was 1584 u l^{-1}, and the macro-zoobenthos annual average was 84 nos.sq.m^{-1}. At Moipeeth the annual average of plankton was 2064 u l^{-1} and macro-zoobenthos annual average was 486 nos. sq.m^{-1}.

Winter migratory fishery

The winter migratory bagnet catch in lower estuary was estimated as 28417.4 t during November 1999 to January 2000 contributing 63.5 % of total catch of the Hooghly estuary with an average CPUE of 64.85 kg as compared to 25575.5 t with an average CPUE of 58.11 kg during similar period last winter exhibiting marginal increase of both catch (by 2841.9 t i.e. 11 %) and CPUE (by 6.74 kg i.e. 12 %). The

increased yield was particularly due to increase in catch in January 2000 by 2096.3 t as compared to January 1999.

Hilsa catch from the estuarine system

An estimated catch of 5377.5 t (12 % of total catch) of Hilsa was netted out from Hooghly estuarine waters while at Digha it amounted to 1181.1 t (combined catch : 6558.6 t , 11 % of total catch) during February 1999 to January 2000 as compared to 9108.8 t and 2590.5 t (combined catch : 11700.3 t) respectively during February 1998 to January 1999 exhibiting sharp decline in catch by 3731.3 t (41 %) from the Hooghly estuary and by 1409.4 t (54 %) at Digha. The combined hilsa catch showed a decrease of 5141.7 t (44 %).

Biochemical changes in hilsa during migration

In the test fishes the percent moisture varied from 62.0 to 69.0 %, blood serum glucose measured between 49.0 to 55.0 mg 100 ml^{-1}. Both the liver glycogen (9.5 to 17.5 mg g^{-1} wet tissue) and muscle glycogen (0.7 to 1.4 mg g^{-1} wet tissue) recorded depletion in levels as the hilsa performed its ascending migration through the Hooghly estuary.

Levels of blood serum protein recorded no appreciable change, varying only between 4.0 to 4.9 g/100 ml for either sex. Muscle total lipids (triglycerides) ranged between 67.0 to 130.0 mg g^{-1} wet tissue.

Sociological aspects of the prawn and fish seed collectors in Sundarbans

78 percent of collectors preserve tiger shrimp seeds in hundi. Maximum of them (83 percent) destroy other seeds retaining only *P. monodon* during collection. It is interesting to note that due to the awareness campaigns of CIFRI 17% of the respondents have released back other seeds to river instead of destroying them.

Sub Project - II

Low - Saline Zone (Machhibhanga) wetlands

Water and soil quality

In these wetlands the mean water depth was 64.6 cm, transparency 26.5 cm, pH 7.16 to 8.59, mean salinity 3.104 ppt, primary productivity mean value 204.67 $mgCm^{-1}$ hr^{-1}, while ammonia mean value was 2.21 mg l^{-1}. The bottom soil (dry) of the two wetlands was alkaline (7.6 - 8.95), with available nitrogen (17.60-38.71)mg $100gm^{-1}$ of soil. Average phosphorus and organic carbon were (1.6-8.0)mg $100gm^{-1}$ and (0.46-1.04) % respectively.

Biotic communities

The average plankton concentration in the low saline wetlands was 83.5 u l^{-1} with phytoplankton contributing 40.22% and zooplankton 59.78%. The macro-zoobenthos in the low saline zone was represented by annelids, taenaids, amphipods, mysids, prawn larvae, insect larvae and nymphs and molluscs.

Medium-saline zone (Harishpur) wetlands

Water and soil quality

The average values recorded were transparency (16.33 cm), pH (7.27 to 8.94), salinity 5.01 ppt, primary productivity (103.130 $mgCm^{-1}hr^{-1}$), while ammonia was 2.37 mg l^{-1}. The bottom soil of the wetland had alkaline pH (average 8.67).

Biotic communities

The average plankton concentration in the medium saline wetland was recorded as 78.67 u l^{-1}. Taenaids were found to be the most dominating amongst macro-zoobenthos (37.58%) followed by Amphipods (26.49%), Mysids (15.73%), prawn larvae (8.44%) and Gastropods (5.46%).

High-saline zone, Sarberia (Charavidya) wetlands

Water and soil quality

These wetlands had a mean water depth of (43.1 cm), transparency (23.5 cm), salinity (13.51), primary productivity (138.77 $mgCm^{-1}hr^{-1}$) and ammonia (2.63 mg l^{-1}).

The bottom soil had pH (8.82) on an average. The pH of wet-soil ranged between 7.2 and 8.46.

Biotic communities

Average plankton concentration was found to be 73.1 u l^{-1} in the high saline wetlands. Gastropods (69.17%) dominated the macro-zoobenthos population followed by Taenaids (12.58%).

Rivers feeding wetlands

Investigations on the ecology of the rivers supplying waters to the wetlands in the low, medium and high saline zones were studied. The rivers under investigations were - Vidyadhari (low - saline), Ichamati (medium saline) and Bani-boala (high-saline).

Water and soil quality

The mean salinity of water of river Vidyadhari was 3.30 ppt, river Ichamati was3.62 ppt, and River Bani-boala at Charavidya (Sarberia) was13.28 ppt.

The soil pH in all the rivers were found to be alkaline. E.C. (m.mhos cm^{-1}) ranged as 0.1 to 1.0, 0.1 to 0.8 and 0.1 to 0.9 in low-, medium- and high saline zones respectively. The mean value of E.C., however, was highest in river Bani-boala in the high saline zone.. Organic Carbon was found to be highest in the low saline zone.

Biotic communities

Plankton : The plankton population was poor in all the rivers studied. The highest mean value was obtained in the low saline zone (83 u l^{-1}) followed by high saline (68 u l^{-1}) and medium saline (62 u l^{-1}) zones.

Macro-zoobenthos : Gastropods were found to dominate in the river Vidyadhari (79.14%), crab larvae (43.03%) dominated in the river Ichhamati. In river Bani-boala polycheates formed the major macro-zoobenthic fauna (62.25%).

Fishery

The estimated annual production from the wetlands in low saline zone (Machhibhanga) was recorded as 541.477 kg ha^{-1} (*P. monodon* : 118.181 kg ha^{-1}). In the medium saline zone the production was estimated at 251.448 kg ha^{-1}. In the high saline zone the total estimated production was 241.116 kg ha^{-1}.

Disease prevalence

White spot disease was found to affect the *P. monodon* crop both in low- and high saline wetlands under investigations. In high saline zone (Sarberia) the outbreak of white spot disease adversely affected the total prawn production. Intensity of infestation was around 50 to 82%.

Socio-economics study of estuarine wetlands

In the sampled bheries paddy cum fish culture was practiced at Minakhan and Harishpur, while at Machhi Bhanga fish culture (locally known as tank fisheries) was the prevalent production system. The lessee conducted the fish culture, while for paddy cum fish culture system , paddy cultivation was done by the landowners. Due to this activity, the lease a mount of bheries adopting latter system was lower.

For all the bheries the fish catch was disposed to wholesalers, who either procured it at assembly centre or at landing centre. Generally, the lessee was bound to send their catch to particular wholesaler. It was due to the fact that wholesaler had paid a sizeable amount as advance. It was utilised by lessee to pay a part of lease amount.

The analysis of the data on employment status at the bheries revealed both the types of employees ; the permanent and casual. But the number of casual employees was less. They were engaged only for harvesting during peak harvesting months and for watch and wards during April to October. The wage rate for permanent employees varied between Rs.1400 to Rs.2000 per month, which included the expenses on meals for them. At Minakhan the lessee has also remunerated the permanent labour with 1% of sale proceeds in addition to wages. The casual labour performing the harvesting operations either received the royalty based on the catch or daily wage @ Rs.25/-. Regarding casual labour for watch and ward, the wage rate varied from Rs.1400 to Rs.1500 per month inclusive of expenses on meals.

PROJECT : ES/B/2

ECO-STATUS OF SELECTED WEST COAST ESTUARIES OF INDIA

Sub-Projects :

a) Development of a model for assessing salinity intrusion in Narmada estuarine system vis-à-vis freshwater inflow dynamics for forecasting salinity relevant changes in the fishery spectrum.

b) Exploratory survey of river Narmada in relation to fisheries and environment.

c) Eco-status of Mandovi-Zuari estuarine complex and other estuaries of west coast.

d) Confirmation of the endemic population of *Tenualosa ilisha* in Ukai reservoir, Dist. Surat, Gujarat.

Personnel : *Scientific :*
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Technical :
R.C. Mandi,N.K. Srivastava, Ramji Tiwari,M.P. Singh, R.K. Sah, Subrato Das, Ram Prasad

Duration : April 1998-March 2003
Sub-Project (b) in October, 1999

Location : Vadodara (Gujarat)

Development of model for assessing salinity intrusion (Narmada estuary)

To develop a mathematical model for assessing the salinity intrusion in Narmada estuarine system *viz-a-viz* freshwater inflow dynamics for forecasting the salinity relevant changes in fishery spectrum a collaborative project has been initiated with (C-MMACS), Bangalore. Relevant data, maps, etc. have been accessed and made available to this agency.

Ecology of river Narmada

Water and soil quality

The transparency values ranged from 6.0 to 218 cm and the dissolved oxygen values ranged from 5.6 to 8.35 mgl^{-1} for the whole river. Total alkalinity varied from 42.5 to 194.0 mgl^{-1} .The nutrients' status as reflected by the major nutrients (phosphate : Tr - 0.055 and nitrate : Tr - 0.30 mg l^{-1}), was poor but silicate (6.0 - 24.3 mg l^{-1}) was abundantly available. The soil texture varied from sandy loam to clay loam .

The gross production varied from traces to 270.8 mg C m^{-3} hr^{-1} for the entire stretch of river Narmada.

Biotic communities

The plankton abundance varied from 20 to 3027 nos. l^{-1} for the entire stretch. Phytoplankton dominated with Bacillariophyceae (23.1 to 90.6%) in the stretch Amarkantak to Gadarwada; Chlorophyceae (50.0 to 76.3%) in the stretch Piparia to Harsud. Chlorophyceae (32.10 to 60.85%) and Bacillariophyceae (11.62 to 29.29%) in the stretch below Harsud to Surpan.

Macrobenthic abundance varied from 259 to 7685 nos m^{2-1} in different stretches. Mollusca and oligochaeta/polychaeta were the major groups. The cacrophytic biomass varied from 0.45 to 39.13 kg m^{2-1} and the stretch Piparia to Harrud harboured intense macrophytic infestation.

Eco-status Mandovi-Zuari estuarine complex

Water and soil quality

The Eco-status of Mandovi - Zuari estuarine complex and other estuaries of the west coast showed the water reaction was alkaline, pH varied from 6.9 to 8.16.

The specific conductance and total dissolved solids exhibited similar trend and the higher values of these two attributes were associated with the lower estuarine extents (30.53 mS m^{-1} and 13.7 ppt in Mandovi and 29.11 mS m^{-1} and 13.0 ppt in Zuari estuary respectively)

Phosphate content of Mandovi estuary varied from 0.002 to 0.016 mg l^{-1} while the same varied from 0.002 to 0.02 mg l^{-1} in Zuari estuary.The nitrate content of the Mandovi estuarine system was more or less evenly distributed (av. 0.09 to 0.126 mg l^{-1}). An identical trend was evident in Zuari estuary (av.0.135 to 0.145 mg l^{-1}. The silicate content of the Mandovi estuarine system fluctuated from traces to 2.20 mg l^{-1} while the same varied from 0.56 to 1.56 mg l^{-1} in Zuari estuary and reflected a horizontal demarcation.

The soil reaction was alkaline (6.8 to 8.24) in Mandovi and 6.68 to 7.90 in Cumbarjua - Zuari estuarine system. The high conductance was associated with Cumbarjua canal (6.97 to 44.76 mS m^{-1}) as compared to Mandovi (1.20 to 14.07 mS m^{-1}) and Zuari (1.53 to 10.27 mS m^{-1}). The organic carbon was high in Zuari (0.32 to 5.14 %) than Mandovi (0.11 to 4.74%).

Organic production studies

Cumbarjua canal recorded higher gross production (av. 130.21 $mgCm^{-3}$ hr^{-1}) followed by Mandovi and Zuari estuarine system. The observations revealed that the producers retained energy varying from 33.33 to 90.0% for other consumers after their utilisation for respiration .

Biotic communities

Plankton

The average planktonic abundance of Mandovi-Cumbarjua-Zuari estuarine complex varied from 92 (Cortalim) to 25676(Candola). Phytoplankton dominated (60.87 to 99.57%).

Macrobenthos

The average macro-benthic fauna ranged from 251 (Old Goa) to 3844 (Candola) in Mandovi estuarine system while the same varied from 406 to 1371 nos. m^{-2} in Zuari estuarine system.

Fishery (Ukai Reservoir)

The scanning of fish landings in Ukai reservoir revealed the occurrence of young ones of *T.ilisha* varying from 57.0 to 86.0 mm in length and 0.94 to 5.91 g in weight and adult specimens of length range 172.0 to 331.0 mm and 59.2 to 340.0 g in weight during August to September,1999. The catch statistics data procured from the Commissionerate of Fisheries , Gandhinagar, projected the contribution of *T. ilisha* catch to the tune of 199.0 m t. in 1998 - 99. The abundance of multi-size fishery of *T. ilisha* and its annual contribution of 2.28% (1998 - 99), indicated very conspicuously towards an endemic population of this fish taxum in Ukai reservoir.

PROJECT : RS/A/1

ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS

Sub-projects :

1. **Ecology and fisheries of Manchanbele reservoir (Karnataka).**
2. **Assessment of production potentiality of reservoirs in Tamil Nadu.**
3. **Ecological investigations in selected reservoirs in Madhya Pradesh**
4. **Ecological investigations in selected reservoirs in Rajasthan.**
5. **Impact of stocking of carps on the poductivity of Yerrakalva reservoir (Andhra Pradesh).**

Personnel **:**

Scientific :
M. Ramakrishniah, D.N. Singh, D.S. Krishna Rao, P.K. Sukumaran, M. Karthikeyan, A.K. Das , V.K. Murugesan, Rani Palanisamy, N.P. Srivastava, B.L. Pandey, D.K. Kaushal, V.K. Sharma
Technical :
S. Manoharan, Kuldeep Singh, P.S.C. Bose

Duration **:**

Sub-project 1 July 1996 - March 2001
Sub-project 2 April 1996-March 2000
Sub-project 3 April 1998-March 2000
Sub-project 4 April 1999-March 2000
Sub-project 5 July 1998 - March 2000

Location **:** Bangalore, Coimbatore, Hoshangabad, Karnal, Eluru.

Sub Project 1 :Ecology and fisheries of Manchanbele reservoir

Soil and water quality

The pH of soil was distinctly acidic (4.8) with higher available N and P.

Primary production

Primary production exhibited two peaks, a major peak in summer and a minor one in rainy season. Daily gross production varied from a low of 700 to a high of 4800 mg C m^{2-1} with an annual mean of 2.1 g m^{2-1}. Community respiration (CR) varied from 400 mg C (April) to 1800 mg C m^{2-1} d^{-1} (Feb). P-R ratios are within the range of 1 and 2 indicating that the lake is productive.

Biotic communities

Plankton density was distinctly lower this year as compared to previous year. Phytoplankton (*Microcystis*) population declined by 40% while zooplankton improved by 15.2%. Benthic fauna exhibited an increase of about 23% over previous year. Chironomid larvae accounted for 92% of benthic populations.

Sub Project 2 : Assessment of production potentiality of reservoirs in Tamil Nadu

After the completion of exploratory survey of 17 reservoirs during 1996-99, two more reservoirs, the Odathurai and the Orathupalayam were taken up during 1999-2000 and monsoon and post-monsoon samplings conducted.

Odathurai is a 76 ha reservoir formed in 1937 impounding local catchment near Gobichettipalayam (Dt. Erode) and Orathupalayam is a 425 ha reservoir on the river Noyyal, a tributary of Cauvery near Tirupur, the knitting city (Dt. Coimbatore). Both are minor irrigation projects. The dye and bleaching factories of Tirupur numbering over 120 discharge untreated effluents into Noyyal which finally enter into Orathupalayam.

Soil and water quality

Organic C of soil was low in Orathupalayam and fairly high in Odathurai. Available N and P were low in both the reservoirs. Water recorded high alkalinity around 265 mgl^{-1} during post - monsoon in both the reservoirs. However, in Orathupalayam conductivity (2700-3500 µmhos), TDS (1728-2240 mgl^{-1}), hardness (580-832 mgl^{-1}), calcium (25-112 mgl^{-1}) and magnesium (88-140 mgl^{-1}) were in extremely high concentration due to pollution load. In Odathurai, the levels of conductivity (490-540 µ mhos cm^{-1}), TDS (313-345 mgl^{-1}), calcium (19-33 mgl^{-1}), magnesium (23-45 mgl^{-1}), and silicate (24 mgl^{-1}) indicated productive character of the impoundment. Nutrients (N&P) also recorded higher values in both the reservoirs.

The rich water quality reflected in the gross primary production which ranged from 2.0-2.9 g m^{2-1} d^{-1} in Odathurai and 1.5-2.6 g m^{2-1} d^{-1} in Orathupalayam.

Biotic communities

Plankton production was extremely rich in Odathurai with diatom blooms occurring during monsoon. Zooplankton was poor. In Orathupalayam myxophyceae bloom occurred in monsoon. Diatoms and desmids were predominant during post-monsoon. Zooplankton was generally poor.

Macrobenthic fauna was rich in Orathupalayam compared to Odathurai, inspite of the pollution load. Larvae of *Chironomous* and *Chaoborus* and oligochaetes formed bulk of the benthic fauna.

Fishery

Odathurai is being managed by the Department of Fisheries, Tamil Nadu. The reported annual stocking rate varied from 2250 to 4470 fingerling/ha which included catla, rohu, mrigal and common carp. On some occasions exotic fishes like silver carp, grass carp and mirror carp were also stocked. The high stocking rate has not adequately reflected in the catches as they formed only 49%, with tilapia contributing in equal proportion. Grass carp, showed good growth in this reservoir. The yield from Odathurai varied from 277 to 406 kg ha^{-1} during the last decade. Orathupalayam is not being stocked due to the pollution load it receives. Tilapia accounted for 95% of the catch. The yield varied from 95-314 kg ha^{-1} during the period 1993-98.

Sub-project 3 : Ecological investigations in selected reservoirs of Madhya Pradesh.

After the completion of exploratory survey of three reservoirs in M.P. during 1998-99, Sarni reservoir, on river Tawa was taken up for investigation during 1999-2000.

Sarni reservoir

Sarni is a 1012 ha reservoir meant exclusively to meet the water requirements of Sarni Thermal Power Station. It has moderate mean depth of 9.1 m and the catchment to reservoir ratio is 35. Water from the reservoir is continuously taken to the power plant for cooling various systems and the hot water, 7 to 8° C above the ambient temperature is discharged into the reservoir.

Soil and water quality

In sediment organic carbon and available N were medium while available P was low. Alkalinity ranged between 62 and 94 mgl^{-1}, nitrate at 0.16 mgl^{-1}, phosphate 0.03 mgl^{-1} and silicate 4.6 mgl^{-1}.

Biotic communities

Macrophytes such as *Hydrilla, Vallisneria, Potamogeton, Nymphea* and *Eichchornia* have established in Sarni and were particularly abundant during summer.

Fishery

Fish yield varied from 8.0 kg (7.3 t, 1978-79) to 72 kg ha^{-1} (65.0 t, 1985-86). Major carps formed between 20 and 70% while indigenous carps and catfishes accounted for 30 to 80%. Since 1985, the proportion of major carps has been declining inspite of the reported stocking to the tune of 400 fry $fingerlings^{-1}ha^{-1}$ annually.

Productivity status

The morphometric and drainage characteristics indicate medium productivity of Sarni. The phytoplankton primary production was estimated at 82 mgC $m^{3-1}h^{-1}$. At 60% exploitation rate the estimated potential fish yield from the reservoir is about 140 kg ha^{-1}.

Sub Project 4 : Ecological investigations in selected reservoirs in Rajasthan

After completion of exploratory survey of six selected reservoirs of Rajasthan during 1998-99, four old (40-100 years) and shallow (m.d. 3-5 m) minor irrigation reservoirs from eastern Rajasthan, *viz.* Mavshi (1600 ha), Silished (275 ha), Guda (1859 ha), and Mansarovar (306 ha) were studied. The ratio of catchment to reservoir area is highest in Mavshi (348) followed by Silished (49.7) and lowest in Mansarovar (11.4).

Soil and water quality

Soil texture varied from silt-loam to loam with poor organic carbon. Available phosphorus was low to medium and available N was medium. Water temperature varied from 16° to 30°C. pH was alkaline (7.9-8.4). Total alkalinity ranged from 84 (Silished) to 106 mgl^{-1} (Mavshi). Electrical conductivity was also highest in Mavshi (946.0 µmhos cm^{-1}) while hardness showed highest value in Silished (198 mgl^{-1}). Dissolved organic matter ranged from 5.2 to 7.6 mgl^{-1}. PO_4-P was relatively high in Mansarovar (0.04 mgl^{-1}) followed by Silished (0.03 mgl^{-1}), Mavshi and Guda (0.02 mgl^{-1}).

Biotic communities

Plankton density was relatively low in Mavshi (1022 u l^{-1}) while it was highest in Mansarovar (3377 u l^{-1}). Phytoplankton was dominant varying from 77 (Silished) to 87% (Guda). Barring Mansarovar where myxophyceae was prevalent (42%), chlorophyceae formed significant component of plankton (30-52%). Among zooplankton, rotifers were prevalent. Rich concentration of benthic macrofauna was recorded in Mansarovar (2716 no m^{2-1}) followed by Guda 866 (no m^{2-1}), contributed by chironomid and chaoborid larvae, molluscs and tubificids. The density of periphyton ranged from 1520 (Mavshi) to 1875 u cm^{2-1} (Silished), contributed mainly by diatoms (70-72%).

Aquatic weeds (*Hydrilla, Potamogeton* and *Vallisneria*) were recorded in all reservoirs barring Silished. Highest concentration (wet weight 1.4 kg m^{2-1}) occurred in Mavshi followed by Mansarovar (0.8 kg m^{2-1}) and Guda (0.33kg m^{2-1}).

Fishery

The fish yield from the reservoirs (at 60% of FRL area) during 1997-98 was 202 kg ha^{-1} in Mansarovar, 144 kg ha^{-1} in Silished, 118 kg ha^{-1} in Mavshi and 34 kg ha^{-1} in Guda. However, during 1999-2000 period the fish yield for the above reservoirs were 81

kg, 155 kg, 37.5 kg and 30.0 kg respectively. It is obvious that proper management norms are not followed.

The stocked species (catla, rohu & mrigal) contributed 54 - 68% in 1998-99 and 42- 65% in 1999-2000. The indigenous species (*W. attu, N. notopterus, C. marulius, L. gonius, M. armatus, P. sarana, C. reba, O. bimaculatus* etc) accounted for substantial part of the catch.

Sub Project 5 : Impact of stocking of carps on the productivity of Yerrakalva reservoir

The studies on Yerrakalva reservoir (dt. W.Godavari, A.P.,1737 ha, m. d - 4.0 m) initiated during 1998 continued. Before the introduction of major carps (catla and rohu in 1995), the fish yield was 56 kg ha^{-1} (1993-94), consisting of native carps, catfishes, prawns and other fishes. The introduction of major carps has changed the complexion of the fishery and fish productivity of the reservoir.

The contribution of major carps increased from 36 to 60%. *C. catla* increased by 30% and *L. rohita* by 250%. The performance of *C. mrigala* which has been stocked accidentally was remarkable as the catches rose from a meagre 0.98 t to 28 t. Indigenous species like *W. attu, P. sarana* and the prawn *M. malcolmsonii* declined while *N. notopterus* and *C. striatus* registered increased landings.

There are clear signs of successful breeding and recruitment of major carps, a rare occurrence in small and medium reservoirs. The impressive performance of *L. rohita* and *C. mrigala* is noteworthy.

PROJECT : RS/A/2

STUDIES ON ECOLOGY AND FISHERIES OF SMALL RESERVOIRS OF EASTERN UTTAR PRADESH

Personnel **:**

Scientific :
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Technical :
R.C. Singh, B.D. Saroj, L.R. Mahavar, S.K. Srivastava, Ramji Tiwari, J.P. Mishra, K. Srivastava

Duration : May 1999-March 2002

Location : Allahabad

The four reservoirs studied were Lower Khajuri (110 ha), Sirsi (800 ha), Musha Khar (300 ha) and Latif Shah (260 ha).

Soil and water quality

Amongst four reservoirs of Eastern Uttar Pradesh, the highest (83%) and the lowest 55% percentage of sand were observed in Musakhar and Sirsi respectively. The sediments were little acidic (6.15) to alkaline (7.5) in reaction with low (0.28%) to high (1.05%) content of carbon. Both free $CaCO_3$ (3.75%) and specific conductance (280 $\mu mhoscm^{-1}$) were comparatively higher at Latifshah than Lower Khajuri (0.75% and 55.6 $\mu mhoscm^{-1}$) respectively. Calcium was comparatively higher (28.0 mgl^{-1}) in Musakhar than other reservoirs. Primary productivity showed higher (28.0 $mgCm^{-2}h^{-1}$) at Lower Khajuri whereas at Sirsa it was 54.65 $mgCm^{-3}h^{-1}$, indicating minimum value. Diurnal variation did not show any correlation except higher value of oxygen (12.4 to 13.0 mgl^{-1}) at 12.0 to 18 hr at Lower Khajuri.

Biotic communities

Lower Khajuri was richer in plankton diversity and population. It offers conducive condition for wider diversity of cladoceran representatives and also periphyton and macrobenthos.

Sirsi was poor in plankton, periphyton and bottom biota. Presence of *Kellikotia, Euchlanis,* amongst rotifers and presence of *Meyenia robusta* (Porifera) indicated its primitiveness free from any human interference. Musakhar is good reservoir and its fish yield was 20 kg ha^{-1} whereas Lower Khajuri was giving poor fish yield 2.9 kg ha^{-1}.

Tor sp. has been reported from Sirsi only in addition to commonly available Indogangetic fish species present in other reservoirs.

PROJECT : FW/A/3

ECOLOGY, FISHERY BIOLOGY AND FISH PRODUCTION DYNAMICS OF FLOODPLAIN WETLANDS IN INDIA

Sub-project : 1 Assam Centre
2 West Bengal Centre

Personnel : *Scientific :*
V. V. Sugunan, P. K. Saha, M. Choudhury,
B.K. Bhattacharjee, Md. Aftabuddin, G. K. Vinci,
K. Mitra, M. K. Bandopadhyay P.K. Katiha, M A. Hassan
Technical :
Alok Sarkar, B.K. Biswas, M.P. Singh, D.K. Biswas,
S. Saha

Duration : April 1999-March 2002

Location : Guwahati, Assam
Barrackpore, West Bengal

Sub Project 1. Assam Centre

Population model development in beels

Samaguri beel in the Nagaon district of Assam was selected for culture based fishery modelling studies.

Stocking and harvesting details of Samaguri beel, Assam

Species	Stocking			Harvesting		
	Date	Av. Size	Number	Date	Size	Number
Catla	20-28 August	20 cm (15 g)	12,000	15 February 15 March	500 g	6,600
Rohu	5 September	15 cm (10 g)	10,000	-do-	450 g	4,200
Mrigal	-do-	15 cm (8 g)	8,000	-do-	410 g	2,700

Econometric model for beel fisheries

Two natural lakes in Manipur namely, Loktak and Takmu were studied for this purpose. The relevant information have been collected and prototypes for questionnaires have been developed for pre-testing.

Soil and Water quality

Water and soil quality of Loktak and Takmu lake

Parameter	Loktak	Takmu
WATER		
Water Temp (°C)	15.0- 18.0	15.0- 18.0
pH	6.8- 7.0	7.1- 7.2
D.O. (mg/l)	3.7- 4.8	5.6- 5.9
Free CO_2 (mg/l)	4.8- 5.7	4.7- 5.7
Total alkalinity (mg/l)	32.0- 33.0	39.5- 45.5
Hardness (mg/l)	32.7- 43.6	43.6- 49.0
Specific cond. (u mhos/cm)	67.8- 78.3	65.3- 70.8
T.D.S (mg/l)	34.4- 40.5	33.6- 36.2
Chloride (mg/l)	18.4- 36.8	23.0- 36.8
Silicate (mg/l)	4.0	3.6- 3.8
Calcium (mg/l)	8.7- 10.9	6.5- 10.9
Magnesium (mg/l)	1.3- 5.8	4.0- 8.0
Iron (mg/l)	0.18- 0.66	0.20- 1.6
Po_4-P (mg/l)	Tr.	Tr.
No_3-N (mg/l)	0.02- 0.10	0.02- 0.10
Diss. Org. carbon (mg/l)	1.7- 7.4	2.3- 3.0
Net P.P ($mgCm^2$/day)	468	320
SOIL		
pH	4.2	4.2
Organic carbon (g/kg)	35.5	39.6
Available nitrogen (mg/kg)	380	415
Available phosphorus (mg/kg)	43.0	34.8
$CaCo_3$ (g/kg)	42.5	117.5
Sand (%)	86	93
Silt (%)	8	5
Clay (%)	6	2

Biotic communities

Plankton

Subsurface net plankton of the twin lakes were studied. Average plankton in Loktak lake were 51u l^{-1} compared to 39u l^{-1} in Takmu.

Plankton abundance(ul^{-1}) in Loktak and Takmu lake in Manipur

Name of lake	Average plankton(ul^{-1})	Phytoplankton ($u\ l^{-1}$)	Zooplankton ($u\ l^{-1}$)	Phytoplankton groups (ul^{-1})	Zooplankton groups ($u\ l^{-1}$)
Loktak	51	35 (68.63)	16 (31.37)	Dinophyceae 14 (40.0) Chrysophyceae 8 (22.8) Chlorophyceae 6 (17.2) Bacillariophyceae 3 (8.6) Euglenophyceae 3 (8.6) Xanthophyceae- 1 (2.8)	Copepoda 11(68.8) Rotifera 4 (25) Cladocera 1 (6.2)
Takmu	39	34(87.2)	5(12.82)	Dinophyceae 13 (38.2) Chlorophyceae 9 (26.5) Bacillariophyceae 8 (23.5) Euglenophyceae- 2 (5.9) Myxophyceae- 2 (5.9)	Copepoda 3 (60) Rotifera 2 (40)

(Percentage within the parenthesis)

Macrophytes

All possible species of tropical aquatic plants have been recorded from the lake. Weevils introduced in the late eighties have controlled water hyacinth. The new floral associations, after the disappearance of water hyacinth are being worked out.

Fishery

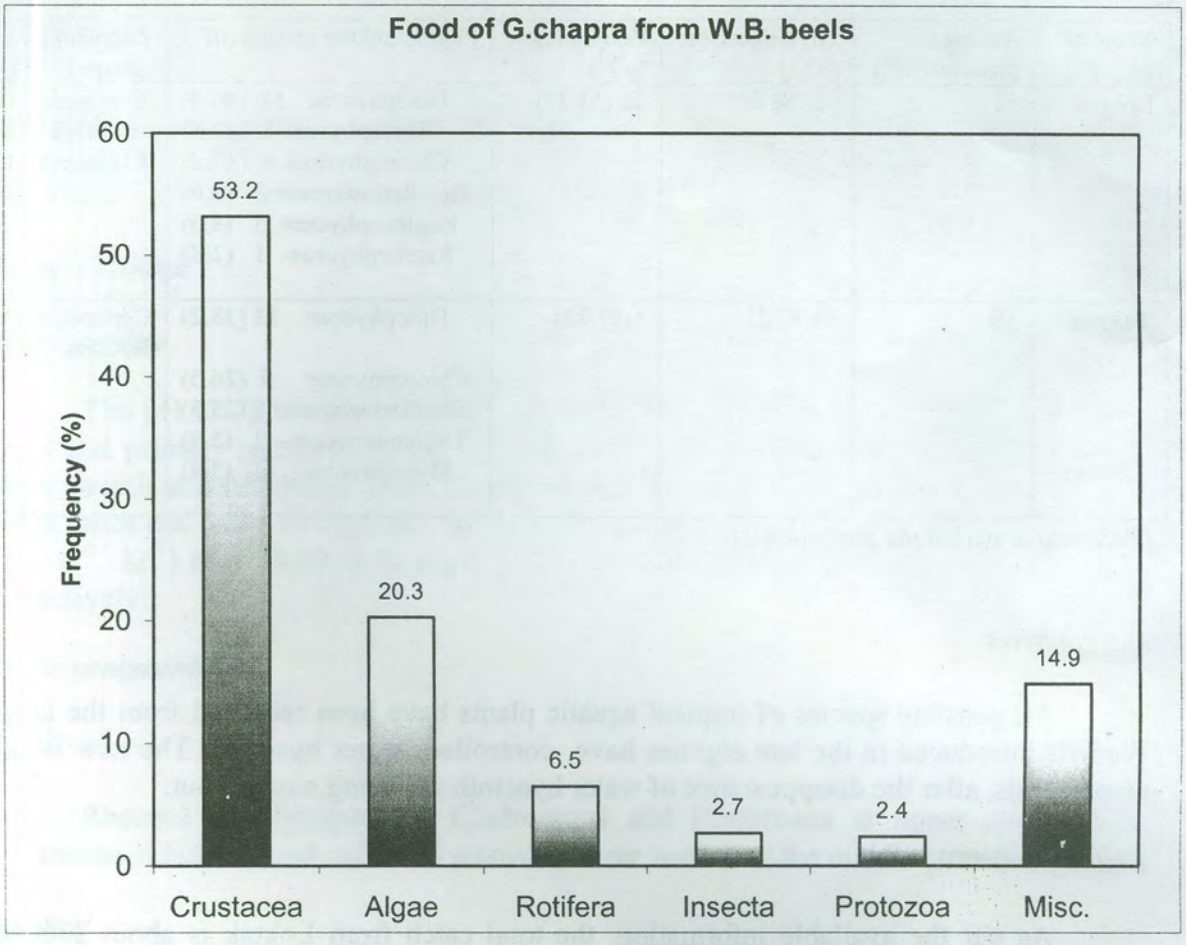
As per the available information, the total catch from Loktak is about 2000 t, which is equal to 104 kg/ha on the basis of average lake area. The estimated catch structure is minnows (47%), live fish (15%), Indian major carps (9%), common carp (15%), *Notopterus* spp (5%), minor carps (4%), catfishes (5%).

Compared to the pre- water hyacinth eradication stage, there has been a marginal increase in catch from 1,500 t to 2,000 t. The percentage of minnows increased from 37 to 47% with a corresponding decrease in the catch of live fishes (30% to 15%).

Sub Project 2. West Bengal Centre

Biology of indigenous fish species of beel ecosystem

Food of G. chapra : A total of 150 specimens of *G. chapra* (60-203 mm) from Panchita and Ganrapota beels were studied for food and feeding habits.



Breeding biology

A total of 150 gonads of *G.chapra* were analysed for breeding biology studies. The number of ova per gm body weight (fecundity factor) ranged from 78- 3561 with an average of 1265 (Panchita Beel) and 191-1918 with an average of 894 ova (Garapota Beel). Availability of *Amblypharyngodon mola* was erratic. The ova diameter ranged from 3-60 mm. It breeds once for a short period. The work is in progress.

Detrital dynamics study

The studies on detrital dynamics have been mainly aimed at estimating the rate of deposition of detritus and quantification of detritus loading in a weed-infested system. Two devices have been designed and fabricated for this purpose viz.,

- Detritus trap
- Bottom core sampler for collecting detritus from the bottom

The results obtained were

Detrital load in water phase and its food value

Detrital load $g\ m^{2-1}\ day^{-1}$	Protein $g\ m^{2-1}\ day^{-1}$	Fat $g\ m^{2-1}\ day^{-1}$	Organic matter $g\ m^{2-1}\ day^{-1}$
Set – I 9.01	0.65	0.28	3.51
Set –II 10.00	0.68	0.34	3.51

Organic matter content in different fractions of bottom borne detritus

Detritus size group	Organic matter (%)
>1000 μ	13.85
>500 μ	68.97
>250 μ	19.12
>150 μ	17.35
>75 μ	14.37
>37.5 μ	12.12
<37.5 μ	11.08

Eco-status of oxbow lakes in Bihar

During the year 1999-2000, two oxbow lakes each from East (Sirsa and Major) and West Champaran (Amua, Lal Saraiya) districts of Bihar were selected for ecological assessment.

Water and soil quality

Physico-chemical characteristics of the four oxbow lakes *viz.*, Sirsa, Majhori, Amua, and Lal Saraiya were studied during summer and winter 1999 and results obtained show the soil reactions of the oxbow lakes were near neutral. (pH- 7.18 – 7.53) with high organic carbon (1.53 to 12.27 %) . Average nitrogen contents ranging from (32.2 to 203.84 mg $100gm^{-1}$) were recorded at Sirsa, Majhori, Amua and Lal Saraiya oxbow lakes. Available phosphorous contents ranged between 1.2 and 3.6 mg 100 g^{-1}. The soil texture were recorded as sand (70-87 %), clay (4.5 –16.5 %) and silt (1.0 –17 %) respectively.

Dissolved oxygen ranged at surface from 4.2 to 9.69 mg l^{-1}. The water reaction of the all the lakes was alkaline (pH to 7.36 to 9.11). The nutrient content in the form of phosphate and nitrate ranged from trace to 0.05 mg l^{-1} and 0.06 to 0.19 mg l^{-1}.

Primary productivity

The net production ranged from 303.48 to 742.68 mgC m^{3-1} day^{-1}. Among the four oxbow lakes, Amua was the most productive with an average carbon fixation rate of 523.08 mgC m^{3-1} day^{-1}, although the lake was weed infested to the extent of 30-35 percent. Similarly, Lal Saraiya in spite of being infested with weeds (20-25 %), recorded high rate of primary production at phytoplankton phase (453.06 mgC m^{3-1} day^{-1}).

Biotic communities

The total phytoplankton count in the oxbow lakes under study ranged from 260 to 6120 u l^{-1}. Numerical abundance of zooplankton was much low in the range of 95 - 1200 u l^{-1}. In all, 12 species of phyto- and 13 species of zooplankton were recorded from different lakes. Shanon–Weaver Diversity Index (H) in respect of phytoplankton varied from 0.442 to 1.910. The index for zooplankton was in the range of 2.461 to 2.866. *Microcystis, Oscillatoria, Scenedesmus* and *Gloeotrichia* in phytoplankton and nauplii, *Brachionus* in zooplankton were the dominant forms. Benthic community was rich and varied.

Fishery

Both capture and culture-based fishery are practiced in all the lakes except Majhori where the fishery is entirely based on capturing wild stock of fishes. The common fishing gear used were gill nets (different meshes) , drag nets, cast nets, hooks and lines, traps and spear. Small wooden boats locally known as *dingi* were used for fishing operations. The peak fishing season is winter (Dec – Feb). Apart from the three Indian major carps viz., *Catla catla, Labeo rohita* and *Cirrhinus mrigala*, the exotic carps *viz., Ctenopharyngodon idella, Cyprinus carpio* and *Aristichthys nobilis*, were stocked. The wild stock caught were mainly *Wallago attu, Heteropneustes fossilis, Channa striatus, C. marulius, Notopterus notopterus, Anabas testudineus, Colisa fasciatus, Amblypharyngodon mola, Gudusia chapra, Puntius* spp. and small prawns.

PROJECT : FW/A/4

POPULATION DYNAMICS OF SELECTED FISH SPECIES IN BACKWATERS

Personnel : *Scientific :*
V. K. Unnithan
Technical :
S. Bijoy Nandan, C. K. Vava

Duration : April 1999-March 2002

Location : Alappuzha, Kerala

Fishery survey was conducted on a fortnightly basis from all the major landing centres around the lake which brought ashore the target species. The chief landing centres were : (1) Mahadevikadu, (2) Choolatheruvu, (3) Vettathu kadavu, (4) Kanakakkunnu, (5)Kochiyude Jetty, (6) Muttathumannel, (7) Ayiramthengu.

Fishery

Fish landings and catch composition

The gear-wise estimated catch for the year for the 11 months of the study (May-1999 to March 2000) was as follows:

Total landings including other species were estimated from November 99 to March 2000. The percentage composition was: *E. suratensis* 23.8%, *G. filamentosus* 2.4%, *L. tade* 13.0%, *V. seheli* 4.6% and others 56.3%.

Craft and gear

About six major types of fishing gear are regularly being employed in the fishing of the species at the seven landing centres listed in this project. The distribution of the major gear units in lake for the target species was as follows:

Gear	Av. No. of units/day	Gear	Av. No. of units/day
Cast net	42	Dip net	11
Gill net	93	Ring net	28
Scoop net	15	Seine net	110
Others	6	**TOTAL**	**305**

Catch per unit of effort

The CPUE for major gear for the target species were as follows:

Gear	*E. suratensis*	*G. filamentosus*	*L. tade*	*V. seheli*	TOTAL
Cast net	1.5	0.2	0.9	0.4	2.9
Dip net	0.1	0.2	0.5	0.5	1.3
Gill net	1.0	0.1	0.8	0.3	2.3
Ring net	2.9	-	-	-	2.9
Scoop net	2.8	-	0.2	-	3.0
Seine net	1.1	0.2	1.0	0.5	2.9
Average	1.4	0.2	0.8	0.4	2.7

PROJECT : FW/A/5

FISH PRODUCTION DYNAMICS OF FLOODPLAIN WETLANDS OF UTTAR PRADESH

Personnel : *Scientific :*
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Technical :
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Duration : May 1999-March 2002

Location : Allahabad, Uttar Pradesh

Description of beels studied

District	Name	Area (ha)	River Basin
Ballia	Rewati tal Mundiyari	150 250	Ghagra
Jaunpur	Rohua tal Gujar tal	27 88	Gomti
Raebareli	Samaspur jheel Naraini tal	800 15	Ganga
Pratapgarh	Loshar tal Raini tal	88 20	Ganga

Soil and Water quality

Sediment reaction in all the beels was alkaline (pH. 7.5-8.1) and were rich in organic carbon (1.01-2.05%) and available nutrients (nitrogen 19.6-52.8 and phosphorus 1.97-4.2 mg $100g^{-1}$). Water quality parameters *viz.* alkalinity, conductance, dissolved solids, calcium and hardness showed considerable variation in different beels being maximum in Narainital (284.1 mgl^{-1}, 504 μmohs, 252 mgl^{-1}, 29.2 mgl^{-1} and 275 mgl^{-1} respectively).

Primary productivity

The rate of energy fixation by producers (both phytoplankton and macrophytes) was in the range of 30687-55974 $calm^{-2}d^{-1}$ (Gross) and 18412-37070 $calm^{-2}d^{-1}$ (Net) of which only 25.0 % was contributed by phytoplankton.

Biotic Communities

Plankton population ranged between 155 ul^{-1} (Mundiyari) and 638 ul^{-1} (Rohua tal).Benthic communities ranged widely in the beels between 159 to 1194 nm^{-2}, mainly dominated by molluscs. Higher abundance of periphyton was recorded in Samaspur (5365 ucm^{-2}) and lowest in Rewati (1252 ucm^{-2}).The abundance of associated microfauna was in the range of 54 ug^{-1} to 95 ug^{-1} .Beels were mostly infested with aquatic macrophytes (40-90%).

Fishery

Fisheries of beels was dominated by trash fishes (50%) followed by major carps (15-25%). Based on energy flow studies the fish production potential of beels was estimated as 638 to 1283 $kgha^{-1}y^{-1}$ but the actual fish production was in the range of 43-112.7 $kgha^{-1}y^{-1}$ and thus only 4.72 to 16.4% of the potential was actually harvested.

PROJECT : EM/B/1

ASSESSMENT OF ENVIRONMENTAL IMPACT ON BIOTIC COMMUNITY IN RIVERS AND ASSOCIATED ECOSYSTEMS

Sub-Project :
1. **Environmental assessment of selected river systems**
2. **Bio-integrity assessment and evaluation**

Personnel **:** *Scientific :*
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Technical :
S.P. Ghosh, S. Bhowmik, Keya Saha, Ranjana Sinha, S. Bandopadhya, K.K. Das, Arijit Ghosh, B.K. Naskar, S.C. Biswas, L.R. Mahavar, J.P. Mishra

Duration : April 1998-March 2003

Location : Barrackpore, Allahabad, Karnal

River Yamuna

Water quality

The pH (7.7), dissolved oxygen (8.2 mg l^{-1}), specific conductance (523 μ mhos cm^{-1}) and primary productivity (133.33 mgC m^{3-1} hr^{-1}) indicated better environment in upper stretch at Hathnikund as compared to Okhla, Mathura and Agra (7.71, 1.49 mg l^{-1}, 796 μ mhos cm^{-1}, 108.33 mgC m^{3-1} hr^{-1}), (8.51, 8.40 mg l^{-1}, 923 μ mhos cm^{-1}, and 154.16 mgC m^{3-1} hr^{-1}) and (8.39, 6.71 mg l^{-1}, 1153 μ mhos cm^{-1}, and 131.24 mgC m^{3-1} hr^{-1}) respectively.

Biotic communities

Plankton

Absence of Myxophycea, Cladocerans and Protozoans at upper stretches of R.Yamuna at Hathnikund indicated relatively clear zone than the middle stretches.

Benthos

The benthic density was maximum at Okhla, polluted zone, due to presence of more number of *Chironomous* larvae (89.3%).

Biochemical studies

Acetyl cholinesterase activity of enzyme remained higher (55.0-70.0 micromoles mg^{-1} protein hr^{-1}.) in the reference zone as compared to sampling sites (41.5-54.0,48.5-55.5,34.0-58.5 micromoles mg^{-1}protein^{-1}hr^{-1}) of Delhi (Okhla), Mathura and Agra respectively.

River Ganga around Kanpur

Water quality

Rich dissolved oxygen (6.3 to 8.3 mgl^{-1}) alkaline pH (7.8 to 8.2 mgl^{-1}) and low carbon dioxide (1.05 to 6.0 mgl^{-1}), suggested healthy condition of the river in the entire stretch.

Heavy metal concentrations in different stretches showed considerably higher concentrations of chromium (35.9 ugl^{-1}), lead (62.9 ug l^{-1}) and zinc (126.8 ugl^{-1}) in the lower stretch.

The heavy metal accumulation in the sediments also showed higher values of copper (8.85 ugg^{-1}), chromium (24.8 ug g^{-1}), lead (25.78 ugg^{-1}) and zinc (53.9 ugg^{-1}) in the lower stretch than the upper stretch Bithur (3.17 ugg^{-1}, 9.27 ugg^{-1}, 17-145 ugg^{-1} and 19.16 ugg^{-1}) respectively.

Biotic communities

Plankton and benthos

Total plankton population ranged between 182 ul^{-1} (Bithor) and 795 ul^{-1} (Shekhpur). Abundance of plankton at Shekhpur indicated nutrient enrichment.

Macrobenthic fauna ranged between 172 nm^{-2} (Sattichaura) and 344 nm^{-2} (Shekhpur).

River Ganga around Patna

Water and soil quality

The river Ganga at Patna up stream indicated normal values of D.O. (7.76 mg l^{-1}), BOD (1.36 mg l^{-1}) and COD (32 mg l^{-1}). The values at the outfall and below outfall indicated very narrow range of variations during monsoon months.

The sediment quality assessment of the rivers indicated more values of metals and pesticides residue as compared to water and fish samples.

Biotic communities

The abundance and texture of plankton and macrobenthic population indicated moderate to highly stressed aquatic regime

The fish fauna of river Ganga as observed from the commercial catch in and around Patna revealed the greater dominance of medium to small size catfish like *C.garua, E.vacha, R.rita* etc. followed by miscellaneous fishes and medium carps.

The fish landing at Patna indicated dominance of miscellaneous groups (72.77%) followed by large cat fishes (17%) and major carps (9.50%) and Hilsa (0.73%). Similar trend was also recorded at Kanpur center excepting absence of Hilsa specimens.

Fish biology in riverine stretches.

A total number of 64 fish species belonging to 7 orders, 18 families and 44 genera were recorded from river Ganga at Patna. The biotic index based on trophic status of fish community indicated predators population much higher (45.95%) instead of usual (25%).

EIA of River Tapti

Water quality

Pulp and paper mill effluent resulted in acidic pH (6.61) higher specific conductance (1870 µmhos cm^{-1}), low D.O. (0.5 mg l^{-1}) , high alkalinity (1386 mg l^{-1}) and high chloride values (860 mg l^{-1}). While Thermal Power Plant at Ukai discharging its effluent through open channel increased temperature by 5 to 8°C from the ambient temperature.

Biotic Communities

The plankton abundance in river Tapti fluctuated between 340 u l^{-1} and 690 u l^{-1}. It was evident from the qualitative texture of planktonic organisms that the river has relatively less organic load.

The macro-benthic fauna of the river varied between 59-167 nos m^{2-1}.

Assessment of toxicants.

Pesticide and metals in water, sediment and fish were also monitored in river Yamuna, Hooghly – Haldi and river Tapti (Gujarat). Most of the samples of river Yamuna from Hathnikund (upstream) to Delhi, Mathura and Agra were contaminated with γ BHC. However, levels of γ BHC and α BHC was below detection limits at both Haldi-Hooghly river. DDT was detected Op'-DDE (0.022) at Hathnikund (upstream) and 0.032 ppb at Mathura. Analysis of water and soil for cadmium , lead, chromium and zinc indicated higher values at industrial areas, at Delhi , Agra on river Yamuna, Kanpur and Patna on Ganga and at Haldia Refinery Complex. The metal contents of soil indicated much higher values than water samples.

Lead accumulation was maximum at Okhla in *M. seenghala* (kidney : 343.33 mg l^{-1}) followed by *L. rohita* (282.27 mg l^{-1}) at Mathura.

Bacterial status

Hetrotrophic bacterial load in confluence water was many times higher than the above out falls of both the rivers possibly, because of sedimentary microbes. Toxic effect of industrial discharge was not evident but was prominent in sediment. Haldi river had

sewage pollution as indicated by coliform group presence in more numbers than river Hooghly.

Experiments on optimum pH measurement

Significant variations in the weight with change in pH of the environment was observed. A steady fall in growth performance was recorded with the lowering of pH. The pH above 9.0 was detrimental for the fish indicating weight fall by 5.21-5.70%. The pH 7.0-8.5 was favorable for the fishes in respect of growth performance and best growth was recorded at pH 8.5.

PROJECT : EM/B/2

STUDIES ON THE AETIOLOGY, PATHOPHYSIOLOGY AND IMMUNOLOGY OF FISH AND PRAWN DISEASES

Personnel : *Scientific :*
Manas Kr. Das, S. Samanta, S.K. Manna, S. Bhatia (up to 11.6.1999)
Technical :
S.P. Ghosh, S. Bhowmick

Duration : April 1998-March 2003

Location : Barrackpore

During the period under report environmental and disease investigations were conducted in the water areas as tabulated below.

Site	Kulia (B1)	Habibpur (B2)	Kantatala (B3)	Hathgachi (B4)	Barachok (B5)
Water quality					
PH	8.0	8.0	8.0	8.6	8.2
Alkalinity (mgl^{-1})	131-150	172-188	130-145	102-111	114-120
Hardness (mgl^{-1})	125-170	320-345	202-225	166-200	>2000
UIA (mgl^{-1})	Nil-0.1	0.1-0.2	0.8-2.0	0.2	0.1-0.2
DO (mgl^{-1})	6-9	7-8	7-8	8-8.6	8-9
Salinity (ppt)	-	-	-	-	10.1
Bacterial load (ml^{-1})	1300	8000	11700		2700
Fish/prawn species affected	*C. catla* *L. rohita*	*C. catla* *L. rohita* *C. mrigala* *L. bata*	*L. rohita* *C. mrigala*	*C.catla* *C. mrigala*	*L. rohita* *C. mrigala* *P. monodon*
Pathogens isolated & identified	*Neothelohanellus krishnagarensis* *Myxobolus catlae* *M.rohitae* *Tripartiella copiosa*	*Argulus sp.* *Tripartiella bulbosa* *Myxobolus bengalensis*	*Tripartiella bulbosa* *Dactylogyrus sp.* *M.mrigalae*	*M.hosadurgensis* *Trichodina reticulata* *Dactylogyrus sp.*	*Thelohanellus rohitae* *Vibrio sp.* *Unidentified virus*

Determination of normal values of blood parameter of *R. rita*

The normal ranges of the stress sensitive haematological parameter of *Rita rita* (av. length 103-265 mm and weight 44-300 g) inhabiting the river Hooghly and of the fish reared in laboratory tanks were determined. The values obtained were haemoglobin (7.0-9.0 g 100 ml^{-1}), haematocrit (26-38%), leucocrit (1.03-2.0%), clotting time (39-46 sec.), plasma chloride (88.6-104.2 $meql^{-1}$), glucose (26.9-108.28 mg 100 ml^{-1}), cholesterol (266.08-508.3 mg 100 ml^{-1}), protein (2.7-4.5 g 100 ml^{-1}), cortisol (29-90 ng ml^{-1}). The range of water quality parameter were pH (7.9-8.0), alkalinity (83-293 mg l^{-1}), hardness (60-258 mg l^{-1}), dissolved oxygen (6.3-7.0), unonised ammonia (nil).

Assessing physiological response to environmental stressors

A series of experiments were conducted on *R. rita* (length 80-150 mm and weight 8-40 g) and *L. rohita* (length 120-135 mm and weight 12-15 g) acclimated in the laboratory. They were subject to thermal stress of 36^0C for one hour. In another set of experiment the fishes were subjected to stress by domestic sewage of 50% concentration and 75% concentration for one hour. In all the experiments controls were maintained. The results showed both in *R. rita* and *L. rohita* a significant increase occurred in plasma cortisol (21-42 and 250 mg ml^{-1}), glucose (72.5-102.9 and 128 mg 100 ml^{-1}) and cholesterol (225.8 and 354.2) respectively from their normal values in control. Decrease in chloride and protein concentration and muscle and liver glycogen occurred.

White spot disease in *P. monodon*

The nature of *'white spot disease'* outbreak in *P. monodon* was studied in some bheries of North 24 Parganas, West Bengal.

Symptoms : Affected shrimps showed lethargic movement, reddening whitish spots on inner surface of carapace and sometimes softening of shell. Morbidity and mortality reached 90-100%.

The water quality of bheries investigated showed suboptimal quality with high levels of unionised ammonia creating stress.

Aetiological study : 10% (W/V) suspension of hepatopancreas and midgut of affected shrimps was prepared and the filtrate was inoculated intramuscularly into healthy *P. monodon* in laboratory condition. Mortality started from 8 hrs post-infection in the test group and was completed within 48 hrs post infection with symptoms of darkening and few whitish spots on the carapace.

10% (W/V) suspension of gills, gut and eye stalk was made in TNE buffer, clarified and virus was purified by ultracentrifugation. Attempt was made to elucidate the virus morphology by TEM.

PROJECT : HL/A/1

IMPACT OF FARAKKA BARRAGE ON RECRUITMENT OF HILSA

Personnel : *Scientific :*
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Technical :
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Duration : April 1993-March 2000

Location : Malda

Farakka region

The total fish landing from the Farakka region, above and below the Farakka barrage, has been estimated to be 145.29 t, exhibiting an increase of 3.19% from that of the corresponding period of 1998-1999. Taltala contributed 46.93% to the total fish landing of the region followed by Beniagram (26.68%) and Feeder Canal (26.39%).

Miscellaneous varieties of fishes formed the bulk (47.68%) of the total fish landing of the region followed by catfishes (18.84%), hilsa (13.68%), Indian major carps (12.50%), prawns (3.06%), featherbacks (2.94%) and murrels (1.30%).

Feeder canal fish landing centre

It contributed 29.3% to the total fish landing of the Farakka region during the period under report. Miscellaneous varieties of fishes formed the bulk of the catch (35.27%) followed by catfishes (23.53%), hilsa (17.87%), Indian major carps (16.78%), prawns (3.57%) and featherbacks (2.98%).

Beniagram fish landing centre

The centre contributed 26.68% to the total fish landing of the Farakka region. Hilsa formed the bulk of the catch and contributed about 33.27% to the total catch of this centre followed by miscellaneous varieties of fishes (32.47%), catfishes (19.66%), Indian major carps (8.09%), prawns (3.32%) and featherbacks (3.19%).

Taltala fish landing centre

The centre contributed 46.93% to the total fish landing of the region. Hilsa contributed only 0.19% to the total catch of the centre. Major catch of the centre was dominated by the miscellaneous fishes (63.31%) followed by catfishes (15.73%), Indian major carps (12.60%), featherbacks (2.77%), murrels (2.77%) and prawns (2.63%).

Hilsa fishery at the Farakka region

The total catch of hilsa, *Tenualosa ilisha* from the Ganga River system at the Farakka region during the period under report has been estimated to the tune of 19.88 t forming 13.68% of the total fish landing from the region.

When compared with the hilsa catch of the corresponding period of 1998-1999, the total hilsa catch depicts a decrease of 19.95%.

Manikchawk fish landing centre

Total fish landing has been estimated to be 58.80 t, depicting an increase of about 90.78% when compared with the catch of the corresponding period of 1998-1999.

The total estimated catch of hilsa during the period has been estimated to be 286 kg, depicting an increase of 73.6% when compared with the catch of the corresponding period of 1998-1999.

Rajnagar fish landing centre

The total fish landing has been estimated to the tune of 34.19 t, showing an increase of about 38.78% when compared with the catch of the corresponding period of 1998-1999.

The total catch of hilsa during the period has been estimated to be 305 kg, which is about four and half times more when compared with that of the previous year.

Rajmahal fish landing centre

Total fish landing during the period has been estimated to be 49 t.

The total catch of hilsa has been estimated as 603.08 kg depicting a decrease of 68.93% when compared with the catch of the corresponding period of 1998-1999.

Water and soil quality

During the period under report, water and soil sediments were collected from different centres and analysed for different physico-chemical parameters to assess their quality above and below the Farakka barrage. The results are tabulated.

Physico-Chemical Characteristics of water of River Ganga at selected centres

Parameters	Manikchawkghat			Taltalaghat			Beniagram		
	Summer	Monsoon	Winter	Summer	Monsoon	Winter	Summer	Monsoon	Winter
Air temperature (°C)	29.0	28.5	24.0	30.0	29.0	25.0	31.5	30.0	22.0
Water temperature (°C)	31.0	28.0	22.0	31.5	30.0	21.0	31.0	30.5	19.5
Transparency (Cm)	18.0	12.0	21.0	20.0	13.5	26.0	17.0	11.0	28.0
Free CO_2 (mgl^{-1})	Nil	1.0	Nil	Nil	1.0	Nil	Nil	1.0	Nil
Carbonate (mgl^{-1})	1.0	Nil	2.0	3.0	Nil	3.0	4.0	Nil	3.0
Bicarbonate (mgl^{-1})	82.0	84.0	92.0	102.0	104.0	108.0	1.6.0	108.0	110.0
D.O. (mgl^{-1})	8.2	8.0	10.4	8.0	7.6	10.8	8.80	8.7	10.8
Hardness (mgl^{-1})	98.0	97.0	100.0	100.0	98.0	104.0	100.0	98.0	104.0
Chloride (mgl^{-1})	26.0	24.0	20.0	22.0	22.0	21.0	25.0	24.0	22.0

Population genetics of Tenualosa ilisha

With a view to understand the genetic structure of *T. ilisha* population and to determine if the subpopulation below and above Farakka barrage were genetically different or not work was conducted in collaboration with NBFGR, Lucknow.

A total of 290 samples were analysed as tabulated below :

Location	Sample size (n)
Ganga Down Farakka barrage (Beniagram)	90
Above Farakka barrage (Varanasi)	05
Bhagirathi (Hooghly) Feeder Canal (Farakka)	50
Calcutta	110
Brahmaputra (Guwahati)	17
Mahanadi (Cuttack)	18

The samples were analysed using isozyme markers. Genetic distance as represented by coefficient of co-ancestery theta values for *T. ilisha* from Calcutta, Feeder canal, Beniagram and Allahabad along with Brahmaputra does not differ significantly from zero. The samples from these locations appear to be drawn from same panmictic population. Mahanadi stock differed significantly from that of Ganges. The hilsa population in Ganga system appears not be composed of distinct subunits but part of the some random mating population. There is possibility that the Mahanadi stock is genetically distinct. Further work in this regard is in progress to arrive at definite conclusion.

PROJECT : RA/A/1

INLAND FISHERIES RESOURCE EVALUATION THROUGH REMOTE SENSING TECHNIQUES

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Technical :
S. Majumder, K. Jacquiline, A. Sengupta

Duration : April 1995-March, 2000

Location : Barrackpore

Satellite images of the selected areas in the districts of Nadia and 24-Parganas(North) of West Bengal were analysed for estimation of numbers, size and shape of waterbodies. The relationship between intensity of colour band and water quality parameters was non-significant in most cases. Significant relationship was found in case of water temperature and NO_3 for all bands, silicate for red band, gross primary production for green and blue band, net primary production for blue band and respiration for green and blue band. It is obvious that electro magnetic radiation (EMR), the basis of satellite image, increases with the rise in temperature and the correlation is positive and significant. It has been observed that linear model and in some cases quadratic models are suitable for assessing the productive potential of waterbodies. Observations on biological parameters were also taken from the selected water bodies in two districts namely Nadia and North 24-Parganas of West Bengal. But they did not show any significant correlation with intensity of colour band. GIS was created on the basis of data collected from the field from the above mentioned two districts. The satellite imagery of the selected places in the districts of Nadia and North 24-Parganas was used to sketch the vector maps. The data structure of GIS includes various important parameters like name of the centre, date of sampling, location, water temperature, transparency, dissolved oxygen, pH, specific conductivity, total dissolved solid, total alkalinity, free CO_2, chlorinity, salinity, NO_3, total nitrogen, PO_4, silicate, hardness, Ca, Mg, primary productivity (gross and net), respiration along with soil characteristics namely pH, specific conductivity, total nitrogen, available nitrogen available P_2O_5, organic carbon, free $CaCO_3$, percentage of sand, siltation percentage, clay percentage and C/N ratio.

Correlation coefficient between physico-chemical parameters of the selected water bodies and intensity of colour band

Parameters	Correlation with red band	Correlation with blue band	Correlation with green band	Correlation with comp-osite band
1.Water temp.	0.73**	0.64**	0.80**	0.45*
2.Transparency	-0.11	-0.35	-0.35	0.14
3.D.O.	0.11	0.00	0.19	-0.22
4.pH	-0.17	-0.12	0.14	-0.27
5.Sp.conductivity	-0.18	-0.14	0.05	0.15
6.Total alkalinity	-0.35	-0.33	-0.28	0.10
7.Free CO2	-0.26	-0.19	-0.29	0.09
8.Chlorinity	0.03	0.12	0.36	0.04
9.Salinity	0.25	0.22	0.47*	0.07
10.PO4	0.38	0.31	0.41	0.40
11.NO3	0.72**	0.56**	0.66**	0.47*
12.Silicate	-0.54**	-0.40	-0.35	-0.31
13.Hardness	0.23	0.07	0.19	0.38
14.Ca	0.37	0.11	0.22	0.60**
15.Mg	0.07	-0.08	-0.10	0.15
16.Gross pri. pro.	0.19	0.42*	0.56**	-0.21
17.Net pri.pro.	0.11	0.34	0.43*	-0.22
18.Respiration	0.27	0.45*	0.64**	-0.14

*-Significant at 5% level, **-Significant at 1% level.

PROJECT : RA/A/2

ASSESSMENT OF CATCH AND CATCH STRUCTURE OF FISH SPECIES OF INLAND OPEN WATER SYSTEMS

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Duration : April 1999-March, 2004

Location : Barrackpore

Database has been developed on fish catch data collected at various centres of the Institute from different inland water systems. The data from Ganga river system have been collected at Allahabad, from Bramhaputra river at Guwahati, from Hooghly-Matlah estuary at Barrackpore, from Yamuna river and West Yamuna canal at Karnal, from Manchanbele and Yerrakalva reservoirs at Bangalore and Eluru Kayamkulam backwater at Allapuzha and Narmada river at Vadodara.

Hooghly-Matlah Estuary

Stratified multistage sampling was followed for data collection from Hooghly-Matlah estuarine system. Monthly catch estimates were worked out species-wise and gear-wise. An estimated total of 44721.7 t of fish was caught from the Hooghly estuary while at Digha the catch was 17303.5 t (combined catch being 62025.2 t) during the period February 1999 to January 2000 as compared to 47344.3 t and 17682.6 t (total being 65026.9 t) respectively during corresponding period last year showing a marginal decrease in catch by 2622.6 t (5.5 %) and 379.1 t (2 %) from the Hooghly estuary and Digha respectively. The combined catch showed a marginal decline of 3001.7 t (4.6 %). The main factor for the marginal decreased yield from the Hooghly estuary was decline in Hilsa, *Tenualosa ilsha* landing by 3732.3 t.

In order of abundance, *Harpodon nehereus, Setipinna spp., Tenualosa ilisha, Pama pama, Trichiurus* spp., *Coilia spp.*prawns, *Tachysurus jella* constituted the dominant fishery of the Hooghly estuary contributing 78.5 % of the total yield. The dominant species at Digha landing centre were : *Pama pama, Sciaena biauritus, Tachysurus jella, Tenualosa ilisha, Setipinna spp., Trichiurus spp., Ilisha elongata, Stromateus cinereus* and prawns constituted 74 % of the total catch.

Ganga river system

Only one centre at Sadiapur had been selected for recording catch and catch structure from Ganga river system at Allahabad.

Fish landings at Sadiapur (Allahabad) were estimated at 58.65 t, registering an increase of 38.3% over preceding year. The maximum increase was in miscellaneous group (42.4%) followed by selected catfishes (34.00%). The group-wise catch was as follows :

Group	Landings(t)
Major carps	5.75
Selected catfishes	14.05
Hilsa	0.31
Miscellaneous	38.54
Total	**58.65**

The yield rate for the stretch was estimated at 12.75 $kgha^{-1}$ y^{-1} (MC - 1.25, CF - 3.05, Hilsa - 0.07; Miscellaneous - 8.38).

At Lalgola, fish landings were estimated at 132.0 t (MC -13.6, CF - 18.5, Hilsa - 30.5 and Miscellaneous - 69.4t. As compared to preceding year, the fishery showed a marginal increase of 6.5%, mainly in hilsa and miscellaneous group.

Yamuna River system

The catch from Yamuna river and West Yamuna canal near Karnal in Haryana was not of a high order. However, catch data are being collected at selected places to know the trend of catch and catch structure.

Brahmaputra River system

One centre has been selected for recording the catch from the river Brahmaputra at Guwahati. Systematic sampling is followed for the selection of days in a month.

A total fish landings of 234.91 t were estimated at Uzanbazar fish assembly centre of the river Brahmaputra, as compared to 311.08 t during the corresponding period of the previous year thereby indicating 24.0% decline in the overall catch.

The significant feature observed in the landing is substantial decline in the major carps from 21.53% (1998-99) to 15.45% (1999-2000) and increase in miscellaneous species from 41.05% to 54.22%.

Kayamkulam backwater

Landings (in t) of the target species from Kayamkulam lake from May-99 to March 2000

Gear	*E.suratensis*	*G.filamentosus*	*L. tade*	*V. seheli*	TOTAL
Cast net	20.97	3.0	12.02	5.03	41.0
Dip net	0.23	0.90	2.05	1.87	5.04
Gill net	29.90	4.51	25.21	10.72	70.34
Ring net	26.96	0.05	0.01		27.01
Scare net	1.12	0.28			1.40
Scoop net	13.39	0.07	0.91	0.8	14.55
Seine net	39.61	7.65	37.91	19.76	104.94
Trap	6.16	0.29	1.18	0.61	8.24
TOTAL	**138.34**	**16.74**	**79.29**	**38.18**	**272.54**

Manchanbele Reservoir

Fish yield of Manchanbele reservoir after attaining a peak of 139 kg ha^{-1} in 1997-98, exhibited declining trend to 96 kg in 1998-99 and 45.5 kg in 1999-2000. The effort decreased further this year by 18%, the catch per unit by 42%.

The dominance of *O. mossambicus* (84%) continued and miscellaneous fishes (*O. bimaculatus, C. marulius, P. sarana, G. giuris* etc) contributed 1.7 t.

Juveniles of *O. mossambicus* occurred throughout the year in dragnet collections revealing that the fish breeds alround the year with peak during early monsoon (May-June) and winter (Nov-Dec).

Yerrakalva Reservoir

The fish yield which reached 113 kg ha^{-1} in 1998-99 in Yerrakalva reservoir, registered further hike to 167 kg ha^{-1} (190 t) during 1999-2000.

PROJECT : RA/A/3

DEVELOPMENT OF COMPUTERISED INFORMATION SYSTEM ON FISH PATHOGENS

Personnel : *Scientific :*
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Technical :
K. Jacquiline

Duration : April 1999-March, 2000

Location : Barrackpore

The data on fish pathogens available in bibilographic literature, reports, publications, etc. were collected in structured formats and classified into bacterial, virus, fungus, nematodes, protozoa, EUS, etc. for developing information systems. Each pathogen, it's common name, scientific name, primary host, secondary hosts (if any), nature of damage, control measurs etc., whereever available, are maintained in the database. This database could be run under multi – users computer platform. Query on database could be made. Thus a Computerised Information System on Fish Pathogens has been developed.

An attempt on diagnoses of fish diseases have also been made. Image signature of disease symptoms, which are already available in different published literatures, are digitised and stored in computer. Programme modules are made in Hyper Text Mark-up Language (HTML). Image file of fish disease and module for control measure of the same disease are linked, giving an user friendly diagnostic system for fish pathogens.

PROJECT : EX/A/1

DEMONSTRATION OF PEN CULTURE TECHNOLOGY

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Duration : July 1999-June, 2001

Location : Barrackpore

Saguna and Amda beels in Nadia district of West Bengal were selected for demonstration of pen culture of fish and prawns and refinement of the technology for the farmers. In Saguna beel the pen size was 31 m X 9 m while in Amda beel two pens of 33 m X 24 m size each were made of split bamboo screens, nylon nets and iron wire nets. The culture was initiated in middle of January 2000 with only *M. rosenbergii* in Saguna beel and *M. rosenbergii* and *L. rohita, C. catla, C. mrigala, C. idella* and *H. molitrix* in Amda beel.

Amda beel

Monoculture of M. rosenbergii

In monoculture the prawns grew to 123.75 mm/12.5 gm and 132.44/40.53 gm on an average on 37th and 59th day respectively from the initial size of 100 mm/5.5 gm with 25,000 ha^{-1} stocking density. Mixed feeding of molluscan meat and pelleted feed was continued at the rate of 10% and 4% of the body weight respectively on alternate days. Demonstration is still continued.

Composite fish culture

In mixed culture with Indian and exotic carps *L. rohita* grew from 164.7 mm/50.0 gm to 175.0 mm/71.5 gm, *C. mrigala* from 184.0 mm/60 gm to 199.2 mm/74.0 gm, silver

carp from 155.0 mm/30 gm to 190.0 mm/65.0 gm in 59 days rearing period under 5000 per ha stocking density. The fishes were fed with conventional feed mixture of rice bran and mustared oil cake at the rate of 4% of body weight. Demonstration is still continued.

Saguna beel

Monoculture of M. rosenbergii

Prawns attained an average size of 121.80 mm/11.25 gm on 38th and 125.62 mm/25.6 gm on 58th days from the initial size of 100 mm/5.5 gm under 25,000/ha stocking density. Demonstration is still continued.

5 TECHNOLOGY ASSESSED AND TRANSFERRED

Extension activities

Advisory services were rendered to a total of 286 clientele owning 296 ponds, 6 bheries, 5 jheels, 19 entrepreneurs and 14 extension functionaries of state fisheries department and 2 development officers of state development department/NGOs.

Mass awareness campaigns were organised in coastal districts of Sunderbans towards conservation of fish and prawn seed. A sizeable number of fish seed collectors of the area were educated to stop destruction of fish/shell fish seed. Proper linkage was established with the local panchayat bodies to monitor the same. Hand bills were distributed to the masses and two Doordarsan programmes and one Radio programme on fish conservation were arranged.

Three **fish farmers' days** were organised at Shibrampore, Habra, Habibpur where 834 nos. fish farmers/fishermen and interested persons were present.

KRISHI VIGYAN KENDRA

During the year the Kendra organised and conducted On-Campus and Off-Campus vocational training programmes for practicing farmers, rural youth and extension functionaries. During the period 127 number of training programmes were organised covering 3126 beneficiaries. Out of total beneficiaries 1135, 206 and 1785 beneficiaries belonged to Schedule Caste, Schedule tribes and general categories, respectively. Three technologies namely Integrated Pest Management in Boro rice, Integrated Nutrient Management in Betelvine and Epizootic Ulcerative Syndrome disease control in Indian major carps were transferred. The percentage of acceptance of the above technologies are as tabulated below.

Technology assessed and transferred

Name of the technology transferred	No. of beneficiaries			Assessment	
	Male	Female	Total	Percentage of acceptance	Percentage of rejection
IPM in Boro rice	45	35	80	90	10
INM in Betelvine	30	10	40	95	5
EUS in IMC	40	30	70	100	Nil

Training Programme : On-Campus (April, 1999 to March, 2000)

Discipline	No. of course	No. of participants			Schedule Caste			Schedule Tribe			Others		
		M	F	Total	M	F	Total	M	F	Total	M	F	Total
Fishery	3	20	10	30	2	2	4	3	-	3	15	8	23
Agronomy	5	30	20	50	7	9	16	-	-	-	23	11	34
Horticulture	5	30	26	56	17	16	33	-	-	-	13	10	23
Animal Science	3	30	-	30	11	-	11	-	-	-	19	-	19
Home Science	4	-	40	40	-	17	17	-	-	-	-	23	23
Total	20	110	96	206	37	44	81	3	-	3	70	52	122
I. Practicing Farmer													
Fishery	2	10	10	20	1	2	3	3	-	3	6	8	14
Agronomy	2	20	-	20	5	-	5	-	-	-	15	-	15
Horticulture	3	30	-	30	17	-	17	-	-	-	13	-	13
Animal Science	1	10	-	10	5	-	5	-	-	-	5	-	5
Home Science	2	-	20	20	-	8	8	-	-	-	-	12	12
Total (A)	**10**	**70**	**30**	**100**	**28**	**10**	**38**	**3**	**-**	**3**	**39**	**20**	**59**
II. Rural Youth													
Fishery	1	10	-	10	1	-	1	-	-	-	9	-	9
Agronomy	3	10	20	30	2	9	11	-	-	-	8	11	19
Horticulture	1	-	10	10	-	6	6	-	-	-	-	4	4
Animal Science	1	10	-	10	3	-	3	-	-	-	7	-	7
Home Science	1	-	10	10	-	4	4	-	-	-	-	6	6
Total (B)	7	**30**	**40**	**70**	**6**	**19**	**25**	-	-	-	**24**	**21**	**45**
III. Extension Functionaries													
Horticulture	1	-	16	16	-	10	10	-	-	-	-	6	6
Animal Science	1	10	-	10	3	-	3	-	-	-	7	-	7
Home Science	1	-	10	10	-	5	5	-	-	-	-	5	5
Total (C)	**3**	**10**	**26**	**36**	**3**	**15**	**18**	**-**	**-**	**-**	**7**	**11**	**18**

Training Programme : Off-Campus (April, 1999 to March, 2000)

Discipline	No. of course	No. of participants			Schedule Caste			Schedule Tribe			Others		
		M	F	Total	M	F	Total	M	F	Total	M	F	Total
Fishery	23	492	88	580	144	28	172	12	5	17	341	60	401
Agronomy	24	457	208	665	180	78	258	50	28	78	227	102	329
Horticulture	20	565	127	692	241	52	293	60	16	76	264	59	323
Animal Science	23	342	267	609	128	103	231	11	6	17	203	158	361
Home Science	17	-	364	364	-	97	97	-	18	18	-	249	249
Total	**107**	**1861**	**1059**	**2920**	**693**	**358**	**1051**	**133**	**73**	**206**	**1035**	**628**	**1663**
I. Practicing Farmer													
Fishery	16	360	76	436	99	24	123	8	3	11	253	49	302
Agronomy	16	303	148	451	118	54	172	30	18	48	155	76	231
Horticulture	13	434	81	515	194	34	228	38	10	48	202	37	239
Animal Science	14	222	139	361	81	57	136	7	4	11	134	78	212
Home Science	4	-	92	92	-	27	27	-	8	8	-	57	57
Total (A)	**63**	**1319**	**536**	**1855**	**492**	**196**	**688**	**83**	**43**	**126**	**744**	**297**	**1041**
II. Rural Youth													
Fishery	6	132	12	144	43	2	45	4	2	6	85	8	93
Agronomy	8	154	60	214	62	24	86	20	10	30	72	26	98
Horticulture	7	131	46	177	47	18	65	22	6	28	62	22	84
Animal Science	9	120	128	248	47	46	93	4	2	6	69	80	149
Home Science	13	-	272	272	-	70	70	-	10	10	-	192	192
Total (B)	**43**	**539**	**518**	**1055**	**199**	**160**	**359**	**50**	**30**	**80**	**288**	**328**	**616**

6 EDUCATION AND TRAINING

Training course on Openwater Fisheries Technologies and Extension Methods

A 8 day training programme was organised at Barrackpore during November 2-9, 1999. A total of eleven fishery officers from various states participated. Theoretical and practical classes with practical assignments and field visits were organised on technologies relevant to open water system.

Mass awareness campaign for fish conservation

KVK scientist examining betel leave of adopted farmers

Training course on Conservation and Sustainable Fishery Management of the Floodplain Wetlands in the North-East

A training programme on Conservation and Sustainable Fishery Management of the Floodplain Wetlands in the North-East was organised by the Floodplain Wetland Division of CIFRI at Guwahati from 29th November to 5th December 1999.

Shri Babul Das, Hon'ble Minister for Fisheries, Govt. of Assam, inaugurated the training. While welcoming the guests and the participants, Dr. M. Sinha, Director of the Institute stated that there was an urgent need to provide extra research thrust to the fishery development activities in the northeast.

The training was attended by 14 personnel sponsored by the Department of Fisheries, Fisheries Development Corporation, Panchayat & Rural Development Department, ICAR Research Complex for NEH Region besides two constituent Colleges of Gauhati University.

Scientists and technical officers of the Institute imparted theoritical and practical training on various aspects of ecology and fisheries of flood plain wetlands.

Training on fish yield enhancement in open waters

Short Course Training on Fish Yield Enhancement in Open Waters based on Ecological Management, 5-14 May, 1999 was also organised for University teachers, State fishery officials and research scholars .

A programme for college students and researchers entitled Lectures on Recent advances and Potential of Biotechnology in Aquaculture was organised on 2nd December 1999. The programme was sponsored by the Department of Biotechnology, Govt. of India and CIFRI, Barrackpore.

7 AWARDS AND RECOGNITIONS

Dr. M. Sinha, Director was awarded Fellowship by the Association of Aquaculturists, Bhubaneswar.

Dr. R.S. Panwar, Principal Scientist and Dr. R.N. Seth, Sr. Scientist were awarded Fellowship by Bioved Research and Communication Centre, Allahabad.

Dr. K. Chandra, Principal Scientist was awarded Fellowship by the Royal Society of Chemistry, London and also was authorized to use the designation Chartered Chemist.

Dr. M.A. Khan, Dr. B.C. Jha and Shri A. Hajra, Senior Scientists were awarded the Fellowship of Inland Fisheries Society of India.

Dr. V.V. Sugunan, Principal Scientist was invited to act as an Expert Panel Member in the Conference on Aquaculture in the third millennium, conducted as a part of the Aquaculture and Seafood Fair-2000 held at Hotel Central Plaza, Bangkok from 20 to 25 February 2000.

8 LINKAGES AND COLLABORATION IN INDIA AND ABROAD INCLUDING EXTERNALLY FUNDED PROJECTS

Consultancy projects

1 The World Bank-aided Assam Rural Infrastructure and Agricultural Services Project (ARIASP) has appointed the Floodplain Wetlands Division of Central Inland Capture Fisheries Research Institute at Guwahati as the nodal agency for vetting and evaluating beel fishery development schemes. Under this arrangement, the centre has already evaluated 36 project reports prepared by the State Fisheries Department. The Schemes will soon be submitted by the State Fisheries Department and the Assam Fishery Development Corporation to the World Bank/ARIASP for funding support.

Collaborative project

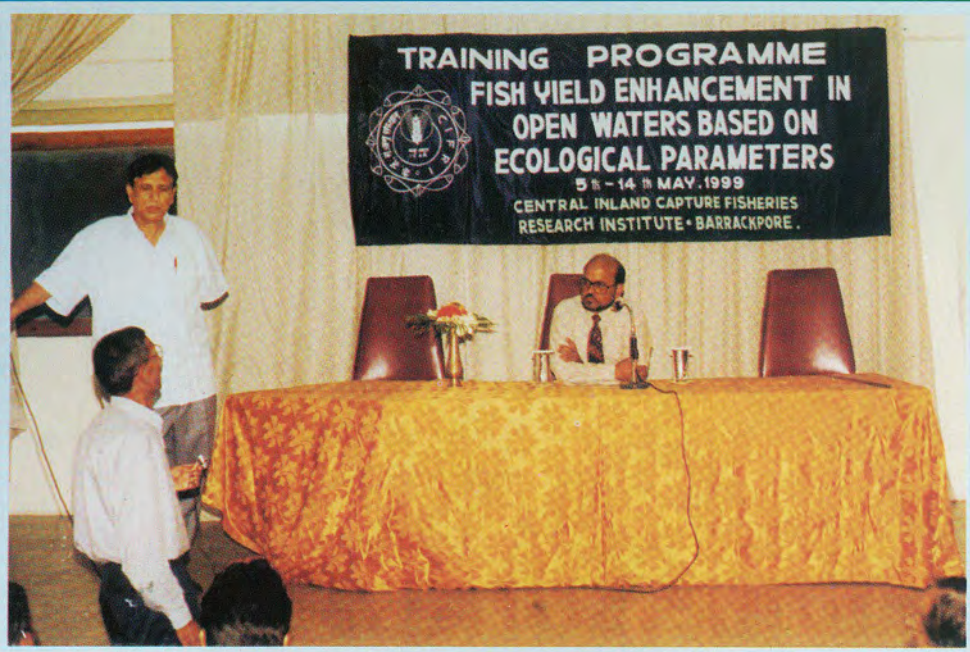
1 The Floodplain Wetlands Division is a collaborating Centre for the NATP Project, Germplasm inventory and gene banking of freshwater fishes run by the National Bureau of Fish Genetic Resources, Lucknow. The project comprises a systematic survey of the fisheries resources of the North-Eastern region. The scheme gives special emphasis on the topical and commercial importance of fish germplasm of the region, which needs to be carefully conserved and protected.

2 Vadodara centre of the Institute has identified a collaborative project with the C-MMACS, Bangalore on eco-modelling.

3 CIFRI is collaborating with NBFGR, Locknow for studying the population genetic structure of Hilsa *Tenualosa ilisha* from different river systems.

9 AICRP/COORDINATION UNIT/NATIONAL CENTRES

Nil



Discussion in progress with the trainees

A trainee explaining his assignment through flip chart

Inaugural session of the training programme

10 LIST OF PUBLICATIONS

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11 LIST OF APPROVED ON-GOING PROJECTS (TITLE ONLY)

Project No.	Name of Project
RI/A/1	ECOLOGY AND PRODUCTION RELATIONSHIPS IN PENINSULAR RIVER SYSTEMS
RI/B/1	INVESTIGATIONS ON ECOLOGY, BIODIVERSITY AND PRODUCTION POTENTIAL OF TRIBUTARIES AND THEIR IMPACT ON RIVER GANGA
RI/B/2	ASSESSMENT OF ECOLOGY, BIODIVERSITY AND PRODUCTION POTENTIAL OF INDUS RIVER SYSTEM
ES/B/1	INVESTIGATIONS ON THE FISHERIES OF HOOGHLY ESTUARINE SYSTEM AND ITS WETLANDS
ES/B/2	ECO-STATUS OF SELECTED WEST COAST ESTUARIES OF INDIA

RS/A/1	ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS
RS/A/2	STUDIES ON ECOLOGY AND FISHERIES OF SMALL RESERVOIRS OF EASTERN UTTAR PRADESH
FW/A/3	ECOLOGY, FISHERY BIOLOGY AND FISH PRODUCTION DYNAMICS OF FLOODPLAIN WETLANDS IN INDIA
FW/A/4	POPULATION DYNAMICS OF SELECTED FISH SPECIES IN BACKWATERS
FW/A/5	FISH PRODUCTION DYNAMICS OF FLOODPLAIN WETLANDS OF UTTAR PRADESH
EM/B/1	ASSESSMENT OF ENVIRONMENTAL IMPACT ON BIOTIC COMMUNITY IN RIVERS AND ASSOCIATED ECOSYSTEMS
EM/B/2	STUDIES ON THE AETIOLOGY, PATHOPHYSIOLOGY AND IMMUNOLOGY OF FISH AND PRAWN DISEASES
HL/A/1	IMPACT OF FARAKKA BARRAGE ON RECRUITMENT OF HILSA
RA/A/1	INLAND FISHERIES RESOURCE EVALUATION THROUGH REMOTE SENSING TECHNIQUES
RA/A/2	ASSESSMENT OF CATCH AND CATCH STRUCTURE OF FISH SPECIES OF INLAND OPEN WATER SYSTEMS
RA/A/3	DEVELOPMENT OF COMPUTERISED INFORMATION SYSTEM ON FISH PATHOGENS
EX/A/1	DEMONSTRATION OF PEN CULTURE TECHNOLOGY

12 CONSULTANCY, PATENTS, COMMERCIALISATION OF TECHNOLOGY

Completed consultancy

Title of project	Name of funding agency	Date of start
1. Likely impact on Aquatic Ecology in the Context of Barrage Construction across the river Ganga at Kanpur	Deptt. of Irrigation, Govt. of U.P.	December 1997

Ongoing consultancy

Title of project	Name of funding agency	Date of start
1. Ecological and conservational perspectives of river Narmada with special reference to Sardar Sarovar Project	Deptt. of Fisheries, Govt. of Maharastra	February 1995
2. Environmental Monitoring of Oxbow Lakes fisheries impact in the State of Bihar and Uttar Pradesh	Ministry of Agriculture, Govt. of India	January 1998
3. Developing Monitoring Mechanism for theWorld Bank assisted Shrimp and Fish Culture Project (Inland Fisheries Component)	Ministry of Agriculture, Govt. of India	July 1998

13 RAC, MANAGEMENT COMMITTEE, SRC, QRT, ETC. MEETINGS

Fifth Research Advisory Committee Meeting

The Fifth Research Advisory Committee Meeting of the Institute was held at Central Inland Capture Fisheries Research Institute, Barrackpore, on 19th & 20th April, 1999 under the Chairmanship of Prof. H.P.C. Shetty and in the presence of other members *viz* Dr. P. Das, Dr. V.C. George, Shri S. Halder, Dr. M. Sinha and Shri R.A. Gupta.

After the introductory remarks of the committee members and discussion on the Action Taken Report of the last meeting, the Heads of Divisions presented the progress and achievements under various projects. After a thorough discussion on various research projects, recommendations for future research programmes were formulated. In his concluding remarks Director, CIFRI, assured the Chairman and RAC members that the suggestions given will be incorporated while formulating the research programme of the Institute for the period 1999-2000.

Annual Staff Research Council Meeting

The Annual Staff Research Council meeting of the Institute, was held on 22-23 April 1999. Progress achieved under all the 11 projects of the Institute was presented by respective project leaders. After elaborate deliberations future project work for 1999-2000 was decided.

Sixth Research Advisory Committee meeting

A mid-term appraisal by Research Advisory Committee (RAC) of the Institute was done in its meeting held at CIFRI, Barrackpore on 20th December 1999 under the Chairmanship of Prof. H.P.C. Shetty. The following members attended the meeting :
Dr. K. Gopa Kumar, DDG(F), ICAR – Special Guest,
Dr.J.R.B. Alfred, Director, ZSI – Member
Dr. V.C. George, Ex.P.S. – Member
Mr. S. Halder, Progressive Farmer – Member
Dr. B.N. Singh, ADG(F), Representative ICAR
Dr. M. Sinha, Director, CIFRI
Mr. R.A. Gupta, - Member Secretary

Quinquennial Review Team

The ICAR has constituted a Quinquennial Review Team (QRT) in November, 1999 to review the work done by CIFRI, Barrackpore during the period 1992-97. The composition of the QRT is as follows :
Dr. K.V. Devaraj, Chairman
Dr. C.S. Singh, Member
Prof. N.C. Dutta, Member
Dr. V.D. Singh, Member
Dr. V.C.George, Member
Dr. B.C. Jha, Member Secretary

The committee held its first meeting at CIFRI, Barrackpore on 21st December 1999 to formulate its work programme. Other than the members, Dr. K. Gopa Kumar, DDG (F) and Dr. B.N. Singh, ADG (F), ICAR also attended the meeting.

The committee visited the Hoshangabad and Bangalore centres of the Institute on February 25th and March 23rd - 24th, 2000 resoectively and discussed with scientists the progress made in research project programmes undertaken during the period 1992-97.

Joint Staff Council Meeting

Two meetings of the Joint Staff Council of CIFRI was held on 5th May, 1999 and 30th December 1999 at Barrackpore under the Chairmanship of Dr. M. Sinha, Director. The members, official side as well as the staff side attended the meetings and deliberated on the agenda.

14 PARTICIPATION OF SCIENTISTS IN CONFERENCES, MEETINGS, WORKSHOPS, SYMPOSIA, ETC. IN INDIA AND ABROAD

The scientists of the Institute participated in various conferences/symposia/seminars/workshops and meetings held during April 1999 to March 2000, wherein they presented their research findings and exchanged views with the other delegates. List of scientists who participated/presented papers in such gatherings are given below :

Conference/Symposium/ Seminar/Workshop, etc.	Paper presented	Authors/Participants
Workshop on current status and future of fish seed industry in Assam, organised by Assam Rural Infrastructure and Agricultural Services Project (ARIASP), NABARD & Gauhati University at Raha from 8-9 April 1999	-	V.V. Sugunan
-do-	-	P.K. Saha

Members of the QRT discussing a point

Research Advisory Committee meeting in progress

Staff Research Council meeting in progress

National Symposium on Sustainable Development of Fisheries towards 2020 A.D. – Opportunities and challenges, 21-23 April, 1999, organised by School of Industrial Fisheries, Cochin University of Science and Technology, Fine Arts Avenue, Cochin	The riverine fisheries of large size Siluroids with special reference to *Aorichthys seenghala* (Sykes).	R.N. Seth and P.K. Katiha
Workshop on Application of Ionizing Radiation in Industry and Agriculture, organised by Allahabad University, Deptt. of Chemistry, 27 March to 3rd April 1999	Evaluation of productivity potential of aquatic ecosystem using Radio-isotope C-14	V. Pathak and R.S. Panwar
State level Workshop on reservoir fisheries in Orissa, Bhubaneswar, organised by World Bank Project on fish and shrimp culture & Department of Fisheries, Orissa from 5-6 May, 1999	Delivered key note speech	V.V. Sugunan
Seminar on Institutional Credit flow for Agriculture and Rural Development, organised by National Bank for Agriculture and Rural Development (NABARD) & RBI & SBI, at Guwahati from 26-27 May, 1999	-	V.V. Sugunan
Workshop on Development of sustainable management practices in shrimp farming sponsored by World Bank, 30-31 July, 1999	-	M.K. Das
International conference on Tropical Aquatic Ecosystems – Health, Management and Conservation, organised by Dr. Brij Gopal, School of environmental Sciences, Jawaharlal Nehru University, New Delhi on 1st October 1999	Population dynamics and production of a cyclopoid *(Thermocyclops hyalinks)* in tropical man-made lake (Bangalore, South India)	D.S. Krishna Rao & Katre Sakuntala

National Symposium on Aquatic Biodiversity and emerging Trends in freshwater Biology, 22-24 October, 1999, organised at Deptt. of Zoology, H.N.B. Garhwal University, Srinagar, Garhwal	Observations on the ecotypic differences and fisheries of saline wetlands in North and South 24 Parganas districts, West Bengal	A.K. Ghosh, Amitabha Ghosh, H.C. Karmakar, P.K. Pandit & R.N. Mishra
National Seminar on Eco-friendly Management of Resources for doubling fish production – Strategies for 21st Centuary. Jointly organised by Inland Fisheries Society of India and Central Inland Capture Fisheries Research Institute, Barrackpore, from 22-23 December 1999	Migratory behaviour of hilsa, *Tenualosa ilisha* (Ham.) based on recovery of tagged specimens	D.K. De & M. Sinha
-do-	Fishery resources of the North-East and scope for their development	V.V. Sugunan
-do-	Environmental perturbation in the upper stretch of river Yamuna	K. Chandra, A. Hajra, U. Moza, D.N. Mishra and R.S. Panwar
-do-	Fisheries of vengalrayasagar (Dist. West Godavari, Andhra Pradesh) and impact of stocking major carps on the fish production	M. Ramakrishniah, P.S.C. Bose & M. Karthikeyan
-do-	Preliminary observations on water quality and biotic diversity in beels in eastern Uttar Pradesh.	Balbir Singh, Sree Prakash, R.K. Dwivedi, V. Pathak, L.R. Mahawar and Kalpana Srivastava
-do-	Changes in the haematological profile of fish in response to some biotic and abiotic stressors	Manas Kr. Das, S. Manna, S. Bhowmick, S.P. Ghosh
-do-	Nutrient regime in Karnataka reservoir	A.K. Das & D.S.K. Rao
-do-	Status of plankton in river Godavari	D.N. Singh, A.K. Das, N.P. Srivastava & P.K. Sukumaran
-do-	Plankton abundance in relation to physico-chemical features in a peninsular man-made lake	P.K. Sukumaran & A.K. Das
-do-	Phytoplankton primary production and fish production efficiency of Manchenbele reservoir (Bangalore, South India)	D.S. Krishna Rao, A.K. Das, M. Karthikeyan, M. Ramakrishniah

-do-	Periphytic structure of river Ghagra with special reference to its impact on river Ganga	B.K. Singh and Kalpana Srivastava
-do-	A study on the present Socio-economic status of the fishermen engaged in three ecologically different zones of estuarine wetlands	H.C. Karmakar, P.K. Pandit & A.K. Ghosh
-do-	Significance of ecological parameters in fisheries management of Dholbaha reservoir, Punjab	D.K. Kaushal & V.K. Sharma
-do-	Intended aquaculture technology development and transfer in resource poor conditions	Utpal Bhaumik, S.K. Saha & A. Mitra
-do-	In Situ toxicity of industrial effluents in Hooghly estuarine system – A comparative evaluation on early life stages of major carps	M.K. Mukhopadhyay, Krishna Mitra, S. Samanta, S. Bandyopadhyay, D.K. Biswas
-do-	Anatomy of fish markets in upper stretch of river Yamuna	Pradeep K. Katiha, R.S. Panwar, D.N. Mishra and Usha Moza
-do-	Measurement of interrenal cell size and some blood parameters of normal *L. rohita* and subjected to stress by cultural practices	Ranjana Sinha, Tanusree Dutta & Manas Kr. Das
-do-	Plasma cortisol levels of L. rohita fingerlings at rest and subjected to confinement, handling and hypoxia	Tanusree Dutta & Manas Kr. Das
-do-	Primary productivity of Narmada for the stretch Sandia to Mola in the context of construction of dams on the river and its tributaries	D. Nath and N.P. Srivastava
-do-	Studies on the macro-zoobenthic production from two ecologically different fish culture ponds at Patna	Dhirendra Kumar
-do-	Studies on stock assessment of *Setipinna phasa* (Ham.) of Hooghly-Matlah Estuarine System and conservation measures for suitable yield.	P.M. Mitra & S.K. Mondal
-do-	Some aspects of dietary shift in *Tenualosa ilisha* (Ham.) in the freshwater zone of Hooghly estuary	Amitabha Ghosh & D.K. De
-do-	Changing face of Aquatic Biodiversity – A case study from Bihar wetlands	B.C. Jha
-do-	Plankton diversity and soil - water relationship of a typical ox-bow lake in Dinajpur district, West Bengal India	M.K. Bandyopadhyay & D.K. Biswas

-do-	Status of fisheries in the freshwater stretch of Hooghly estuary, West Bengal and required conservation.	D.K. De, P.M. Mitra, N.C. Mondal & H.K. Sen
-do-	Impact of dams and barrages on riverine fisheries.	R.K. Tyagi, R.S. Panwar & Ravish Chandra
-do-	Spawn production and fisheries from river Yamuna – a case study	R.K. Dwivedi and R.K. Tyagi
-do-	Plankton biodiversity of river Ghagra and impacts of thermal power plant and city sewage thereon	A.K. Laal, R.S. Panwar, M.A. Khan and P.N. Jaitly
-do-	Macrobenthos fauna of middle stretch of river Ganga and their role as an indicator of environmental quality	M.A. Khan, R.S. Panwar, A. Mathur, Rekha Jaitly
-do-	Hydrology and productivity of some important tributaries of river Brahmaputra	V. Pathak, Alok Sarkar and L.R. Mahawar
-do-	River Lohit – a potential cold water stream of north-east India	B.K. Bhattacharjya, V. Pathak, Aloke Sarkar and M. Chaudhury
-do-	Studies on bacterial diversity in river Yamuna	Sree Prakash and Kalpana Srivastava
-do-	Phytoplankton abundance of river Mahanadi in time and space	Kalpana Srivastava and Sree Prakash
-do-	Effects of some heavy metals on carbohydrate metabolism in the serum, muscle and liver of *Cirrhinus mrigala* (Ham.) fingerlings	R.N. Seth, A. Hajra, R.S. Panwar and L.R. Mahawar
-do-	Charged characteristics of soil as affected by phosphate absorption	R.N. Mishra & Asit Kumar Mukherjee
-do-	White spot disease outbreak in *Penaeid monodon* in some bheries of West Bengal	S.K. Manna, M.K. Das, S. Bhowmick & S.P. Ghosh
-do-	Management of Reservoir Fisheries through private entrepreneurs – case studies	V.K. Murugesan
State level Workshop on Front line demonstration for rabi on oilseed and pulses held at R.K. Ashram KVK, Nimpith, South 24 Parganas on 26th Novemaber 1999.	-	R.L. Sagar & P.K. Dhara
Fifth Indian Fisheries Forum, organised by Asian Fisheries Society, Indian Branch in collaboration with Association of Aquaculturists, Bhubaneswar, 17-20 January, 2000	Indices of fecundity in the Silver carp, *Hyophythalmicthy molitrix* (Val.) from a pond near Pune, Maharashtra	B.K. Singh

-do-	Rotifers as bio-indicator of ponds	A.K. Laal
-do-	Biology of Ganga river prawn *Macrobrachium gangeticum* (Choprai)	Sree Prakash
-do-	Studies on bacterial diversity in river Yamuna	Sree Prakash and Kalpana Srivastava
-do-	Studies on affinities of Ganga river prawn *Macrobrachium choprai (gangeticum)*	Sree Prakash
-do-	Observations on duration of brood care and breeding activities of a large size cat fish *Aorichthys seenghala* (Sykes) in nature	R.N. Seth and P.K. Katiha
-do-	Effect of lime on transformation of organic nitrogen in sewage fed pond soil	P.K. Saha
-do-	Chemical parameters of soil and water of beels of Assam	P.K. Saha, V. Pathak & Alok Sarkar
-do-	Fish health hazards and monitoring in aquatic environment	M.K. Mukhopadhyay
-do-	Stress diagnosis in fish in relation to environmental stressors	M.K. Das
-do-	Emerging challenges of extension towards sustainable Inland fisheries development in the coming century	Utpal Bhoumik, S.K. Saha & A. Mitra
-do-	Economics and constrains of reservoir fisheries in Himachal Pradesh	P.K. Katiha, Y.S. Negi S.C. Tewari
-do-	Effects of aluminium toxicity toxicity on ion and acid-base regulation in *Cyprinus carpio* var. *communis*	R. Palaniswamy
-do-	Changes in selected haematological paramaeters in *Cyprinus carpio* var. *communis* subjected to aluminium toxicity	R. Palaniswamy
-do-	Affect of environment perturbation on the fishery – A case study of river Ghaggar, Haryana	U. Moza & D.N. Mishra
-do-	An assessment on the exploitation of fisheries resources in Kerala backwaters	V.K. Unnithan & S. Bijoy Nandan

-do-	Hydrobiology of Kayamkulam – A tropical backwater system in Southern Kerala	S. Bijoy Nandan
-do-	Fish yield in relation to Algal chlorophyll in reservoirs	Aji C. Panicker, V.K. Unnithan & V.A. Jamuna
-do-	Water quality parameters in relation to organic production in selected peninsular reservoirs	V.A. Jamuna, V.K. Unnithan & Aji C. Panicker
-do-	Physico-chemical characteristics of two ecologically different ponds.	Dhirendra Kumar
-do-	Environmental impact assessment in middle stretch of River Yamuna	M.A. Khan, R.S.Panwar, A. Mathur & Rekha Jaitly
National Symposium on Conservation of Biodiversity, D.A.V.(P.G.) College, Muzaffarnagar, 27-28 November 1999	Ecosystem oriented approach towards management and conservation policy formulation in Nangal lake, Punjab	D.K. Kaushal & V.K. Sharma
National Conference on Fisheries Economics, Extension and Management, CIFE, Mumbai, 5-6 January 2000	Inland Fisheries Development wants strengthening of fish farmers' participation	Utpal Bhaumik, S.K. Saha & A Mitra
2nd Indian Agricultural Scientist and Farmers Congress, organised by Bioved Research Society, Allahabad, 19-20 Feb. 2000	A comparative hydrology and production dynamics of important tributaries and their impact on the main river Ganga	V. Pathak, R.S. Panwar, L.R. Mahavar and J.P. Mishra
-do-	Impact of paper factory's effluent on algal communities	A.K. Laal
-do-	On the production of stocking material and cultural prospects of a large sized catfish *Aorichthys seenghala* (Sykes)	R.N. Seth
Workshop on North-East Indian fish germplasm inventory and conservation, organised by NBFGR, Lucknow and N.E.C. Shillong held at Shillong from 10-11 February 2000	-	V.V. Sugunan
-do-	-	P.K. Saha
Workshop on Reservoir Fisheries Biology and Management, organised by Australian Council for International Agricultural Research (ACIAR) and the Mekong River Commission (MRC) at Bangkok from 15-18 February 2000	Status paper on Culture-based fisheries of small reservoirs in India	V.V. Sugunan

Conference on Aquaculture in the third millennium, organised by FAO and the Network of Aquaculture Centres in the Asia-Pacific (NACA) at Bangkok from 20-25 February 2000		V.V. Sugunan
Eighty Seventh Session of the Indian Science Congress, Pune, 2000, 3-7 January 2000	Fisheries of river Mahanadi in relation to biotic abundance.	Shree Prakash and Kalpana Srivastava
National Seminar on Strategies for Agricultural Research in the North-East (National Academy of Agricultural Sciences), ICAR Research Complex for NEH Region, Meghalaya, 26-29 April 1999	Environmental constraints vis-à-vis Aquatic Productivity in the North-East region	Krishna Chandra
National Workshop on Freshwater Prawn Farming, CIFA, Kaushalyagang, Bhubaneswar, 20-21 April 1999	Biology of Ganga river prawn *Macrobrachium choprai* (= gangeticum)	Sree Prakash

15 WORKSHOPS, SEMINARS, SUMMER INSTITUTES, FARMERS' DAY, ETC.

National Seminar on Eco-Friendly Management of Resources for Doubling Fish Production – Strategies for 21st Century

A National Seminar on Eco-Friendly Management of Resources for Doubling Fish Production – Strategies for 21st Century was organised jointly by the Inland Fisheries Society of India and Central Inland Capture Fisheries Research Institute on 22nd and 23rd December 1999 at Barrackpore. The seminar was inaugurated by Dr. G.N. Mitra a leading fishery scientist of 20th century in a function presided over by Dr. K. Gopa Kumar, Deputy Director General (Fy), ICAR. Dr. H.L. Chaudhuri, Dr. P.V. Dehadrai and Dr. H.P.C. Shetty were guests of honour. More than 167 participants representing Research Institutes, Universities, State Governments, N.G.Os presented 74 research papers.

There were six technical sessions covering various aspects of inland fisheries *viz. Biodiversity, conservation and sustainable production; environmental issues; fish physiology and pathology; resource management; aquaculture; socio-economics, extension information and fisheries education.*

The fruitful deliberations by participants brought into focus the status of various inland fisheries resource in terms of their biodiversity, environmental constraints, cultural aspects, socio-economic aspects and their management strategies for sustained development.

The seminar concluded with the plenary session chaired by Dr. P.V. Dehadrai and Dr. M. Sinha. After elaborate discussions on the various points of the draft recommendation the house finally approved the recommendations of the seminar.

Summer School on Ecology, Fisheries and Fish Stock Assessment of Indian Rivers

A 30 day Summer School on Ecology, Fisheries and Fish Stock Assessment of Indian Rivers was organised by CIFRI at Barrackpore from 14th July to 12th August 1999. A total number of 25 participants from across the country representing Agricultural and conventional Universities, State Fishery Departments, ICAR Institutes participated in the Summer School. Altogether 38 lectures were delivered on water chemistry, ecology, river pollution and its monitoring, environment and fisheries – case studies, resource/production functions and stock assessment and socio-economics. The lectures were compiled in the form of a book and distributed among the participants.

16 DISTINGUISHED VISITORS

A number of distinguished personalities including national leaders visited the Institute's Headquarters and its Centres during 1999-2000. This included Hon'ble Union Minister of State for Agriculture, Shri Hukumdeo Narayan Yadav .

Shri Hukumdeo Narayan Yadav, Union Minister of State for Agriculture visits CIFRI Allahabad Centre

The Hon'ble Union Minister of State for Agriculture, Shri Hukumdeo Narayan Yadav paid a visit to the Institute's Allahabad Centre on 12th December 1999. Dr. R.S. Panwar, Principal Scientist and Officer-in-Charge of the Centre apprised him of the activities and achievements of the CIFRI Centre. The Hon'ble Minister showed keen interest in the research work being conducted and expressed satisfaction over the performance of the Centre.

Fish disease Team visits CIFRI

A distinguished team of fish pathologist consisting of Dr. Richard Callinan, NSW Fisheries, Australia, Dr. J. Lilley, Sterling University, Dr. Supranee Chinabut, Director AAHRI and Dr. C.V. Mohan, College of Fisheries, Mangalore, visited CIFRI and discussed the status of research on various aspects of the aetiology, pathology and control measures of EUS with scientists of the Institute.

Other distinguished visitors were :

Dr. Md. Fazlul Haque, Bangladesh Agricultural Research Institute, Bangladesh
Dr. Md. Jahangir Alam, -do-
Dr. Md. Abdul Quddus, Bangladesh Rice Research Institute, Bangladesh
Md. M.A. Momin, Sr. Scientific Officer, OFRD, Bangladesh Agricultural Research Institute, Bangladesh
Dr. Sankar P. Paul, Soil Science Division, Bangladesh Forest Res. Inst. Chittagong, Bangladesh
Md. Azizur Rahman, Divisional Head, On-Farm Res. Division, Bangladesh Jute Res. Institute, Bangladesh
Md. A.K.M. Hafizur Rahman, Principal Scientific Officer, Bangladesh Agricultural Research Institute, Bangladesh
Dr. Mafizul Islam, Principal Scientific Officer, BLRI, Dhaka, Bangladesh
Mr. D.P. Banerjee, Joint Secretary to the Govt. of West Bengal, Fisheries Department, Calcutta
Dr. S.A.H. Abidi, Member, ASRB, New Delhi
Mr. M.P. Chaturvedi, IAS, Secretary, Deptt. Of Fisheries, Govt. of West Bengal
Prof. H.R. Singh, Head, P.G. Zoology, Allahabad University
Prof. P.K. Mondal, Zoology Deptt., Allahabad University
Dr. S.C. Aggarwal, Director of Fisheries, Govt. of Punjab, Punjab
Mr. Ranjeet Singh, IAS, Secretary Fisheries, Govt. of Kerala, Kerala
Dr. M.P.S. Kohli, Principal Scientist, CIFE, Mumbai
Mr. Naresh Chaturvedi, IAS, Principal Secretary (Fisheries) Govt. of Gujarat
Prof. V.D. Pathak, Applied Mathematics, Dept. Faculty of Technology and Engineering, M.S. University of Baroda, Vadodara, GuJarat
Dr.Thomas Rozario, Director, CARITAS Agricultural and Environment Programme with a team of 10 programme officers of Social Forestry Programme, Govt. of Bangladesh
Mr. Samuel, Director (Works), ICAR, New Delhi
Dr. A.G. Ponniah, Director, NBFGR, Lucknow
Dr. K.K. Vass, Director, NRC on Cold Water Fisheries, Bhimtal
Dr. Madan Mohan, Principal Scientist, NRC on Cold Water Fisheries, Bhimtal
Dr. P.C. Mahanta, Adviser, NEC, Shillong

17 PERSONNEL *(MANAGERIAL POSITION ONLY)*

Director, CIFRI, Barrackpore, West Bengal

Dr. M. Sinha

Riverine Division, Allahabad, Uttar Pradesh

Dr. R.S. Panwar, Principal Scientist, Head of Division (Acting)

Reservoir Division, Bangalore, Karnataka

Shri C. Selvaraj, Principal Scientist, Head of Division (Acting) (up to May 1999)
Dr. Ramakrishniah, Principal Scientist, Head of Division (Acting) (from June 1999)

Estuarine Division, Barrackpore, West Bengal

Dr. A.K. Ghosh, Principal Scientist, Head of Division (Acting)

Environmental Monitoring & Fish Health Protection Division, Barrackpore, West Bengal

Dr. Krishna Chandra, Principal Scientist, Head of Division (Acting)

Floodplain Wetlands Division, Guwahati, Assam

Dr. V.V. Sugunan, Principal Scientist, Head of Division (Acting)

Resource Assessment Division, Barrackpore, West Bengal

Shri R.A. Gupta, Principal Scientist, Head of Division (Acting)

Hilsa Division, Maldah, West Bengal

Shri H.P. Singh, Senior Scientist, Head of Division (Acting)

Senior Administrative Officer, CIFRI, Barrackpore

Vacant

Finance & Accounts Officer, CIFRI, Barrackpore

Shri S.K.C. Bose

Dr. M. Sinha, Director, CIFRI, delivering his lecture

Award of certificates to the participants of Summer School

Distinguished guest at inaugural function of the National Seminar

Shri Hukumdeo Narayan Yadav visiting the
Allahabad centre of CIFRI

Delegates from Bangladesh discussing with Director, CIFRI

Dr. R. Callinan, Dr. J. Lilley, Dr. S. Chinabut and
Dr. C.V. Mohan interacting with CIFRI Scientists
on fish disease research

18 ANY OTHER RELEVANT INFORMATION SUCH AS SPECIAL INFRASTRUCTURAL DEVELOPMENT

A new Office-cum-Laboratory building is being purchased at Guwahati for housing the Northeastern Regional Centre of the Institute. The 16,400 sq ft ready made building complex is being purchased from the HOUSEFED, a State owned undertaking. This new premises is located near Janata Bhavan, the Assam State Secretariat. An agreement has already been signed between HOUSEFED and CIFRI to complete the deal by middle of 2000.

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19 SUMMARY IN HINDI

आमुख

इस संस्थान का वर्ष 1999-2000 का वार्षिक रिपोर्ट का सारांश आपके समक्ष प्रस्तुत है, जिसमें संस्थान की उपलब्धियाँ आदि का संक्षिप्त विवरण है ।

इस वर्ष के दौरान संस्थान का ध्यान विशेषकर निम्नलिखित विषयों की ओर था :

1. भारतीय जलाशयों एवम् बाढ़कृत आर्द्र क्षेत्रों की मात्स्यिकी संसाधनों तथा नदियों जैसे गंगा, यमुना और गोदावरी की उत्पादन क्षमता का मूल्यांकन ।

2. हुगली तथा नर्मदा ज्वारनदमुखी परितंत्रों एवम् इनके आर्द्र क्षेत्रों की पारिस्थितिकी एवम् मात्स्यिकी का मूल्यांकन ।

3. गंगा एवम् यमुना नदियों के पर्यावरण तथा मात्स्यिकी का अनुमापन ।

4. मत्स्य एवम् झींगों के स्वास्थ्य के अनुमापन एवम् रोग नियंत्रण हेतु विभिन्न प्राचलों का मानकीकरण ।

5. हिल्सा मछलियों का अनुवांशिक अध्ययन ।

संस्थान ने बाहरी स्त्रोतों से धन प्राप्ति के लिए विभिन्न प्रकार के परामर्शक कार्य, परिषद् की तदर्थ योजनाओं के माध्यम से समपन्न किया । विशिष्ट विषयों में प्रशिक्षण के माध्यम से भी वित्तीय संसाधनों को प्राप्त किया गया ।

संस्थान के अनुसंधान कार्यक्रमों को अन्य राष्ट्रीय व अन्तर्राष्ट्रीय संगठनों के संपर्क से और निखारा गया । इस संस्थान द्वारा विकसित तकनीकों को सफलतापूर्वक हस्तांतरण किया गया ।

डॉ. मणीरंजन सिन्हा
निदेशक

संस्थान की मुख्य अनुसंधानात्मक उपलब्धियाँ

केरल के पश्च-जल क्षेत्रों की वर्तमान स्थिति

केरल राज्य के दस पश्च-जल मात्स्यकी स्त्रोतों जैसेः- काडीनमकुलम, अन्चुथेंगू, अश्थामुडि, कायमकुलम, अजिकोड, चेट्टुआ, पोन्नानि, मही, वलापट्टनम और नालेश्वरम का मूल्यांकन किया गया है । इन जलीय परितंत्रों से मात्स्यिकी से संबंधित आंकड़े पहली बार एकत्रित किया गया । इन जलीय स्त्रोतों में मत्स्य व कवच-मीन के 94 प्रजातियों (मोलस्कों को छोड़कर) की पहचान की गई । इन मत्स्य प्रजातियों में से 63 प्रजातियाँ ऐसी हैं जो समुद्रीय जल में भी देखी गई है, अत: इससे इन पश्चजल क्षेत्रों तथा समुद्रीय परितंत्रों की घनिष्ठता ज्ञात होती है । इन क्षेत्रों में औसत उपज दर प्रति हेक्टयर 246 कि.ग्रा. से 2,747 कि.ग्रा. पाई गई है । मछुआरों की आय के विश्लेषण से यह देखा गया है कि उन्हें मत्स्य-स्थलन क्षेत्र में बाजार मूल्य का 48.78% मूल्य ही प्राप्त होता है । इन क्षेत्रों में लगभग 30 प्रकार के मत्स्य-संभारों का उपयोग होते पाया गया है, और इनकी सघनता 52 से 174 संभार प्रति वर्ग किलोमीटर है । ये जल अत्यधिक एवं विवेकहीन मत्स्यन कार्य से प्रभावित हैं, जिसके परिणामस्वरूप छोटी मछलियों को अत्यधिक मात्रा में पकड़ लिया जाता है ।

बील मात्स्यिकी हेतु आर्थिक मॉडल

संस्थान ने असम एवं पश्चिम बंगाल के बाढ़कृत मैदानी झीलों में मत्स्य-पालन पर आधारित मॉडल तैयार करने का कार्य प्रारंभ किया है तथा इसके लिए मणीपुर राज्य के 'लोकतक' एवं 'तकमु' प्राकृतिक झीलों का चयन किया गया है । संबंधित सूचनाओं को एकत्रित करने हेतु तथा परीक्षण के लिए एक प्रश्नावली तैयार की गई ।

जी.आई.एस. (भौगोलिक सूचना प्रणाली) के माध्यम से अंतःस्थलीय मात्स्यकी संसाधनों का मूल्यांकन

अक्षांश के 22° 45' उत्तर - 23° उत्तर तथा देशान्तर रेखा के 88° 25' पूर्व - 88° 40' पूर्व के बीच पड़नेवाली क्षेत्र में से कुछ चयनित क्षेत्रों का उपग्रह *आई.आर.एस.- आई.सी.* द्वारा चित्र प्राप्तें

किए गए हैं, जिससे जलीय संसाधन का विशेष आकार, क्षेत्रफल तथा अन्य प्राचलों के आधार पर जलीय परिमाणों का आंकलन किया गया है। प्राप्त चित्रों के मिश्रित छाया (लाल हरा व नीला मिलाकर) एवं अलग-अलग रंगों के आधार पर जल के रंग की गहनता का अध्ययन किया गया । प्राप्त चित्रों में उपस्थित सघन तथा अलग-अलग रंगों की गहनता के आधार पर इन जलों पर विस्तृत अध्ययन किया गया है । साथ ही रंग विशेष की अधिकतम गहनता को विभिन्न भौतिक-रसायनिक प्राचलों तथा मृदा अभिलक्षणों से ताल-मेल बैठाने का भी प्रयास किया गया है ।

मछलियों में विभिन्न प्रकार के पारिस्थितिक दबाव सहन करने की शारीरिक क्षमता का मूल्यांकन

आर.रीता तथा *एल.रोहिता* मछलियों को उच्च तापमान 36^0 सेन्टीग्रेड और विभिन्न प्रकार के घरेलू मलजल के दबाव में परीक्षण किया गया । इस परीक्षण द्वारा *प्लाज्मा कोर्टिसॉल, ग्लूकोज* और *कोलेस्ट्राल* स्तर में काफी बढ़ोतरी एवम् *क्लोराइड* और *ग्लाइकोजोन* स्तर में कमी होते देखी गई है।

सतलज नदी का सर्वेक्षण

पंजाब राज्य में स्थित सतलज नदी की निचली प्रवाह का 250 किलोमीटर लम्बा क्षेत्र, रूपनगर से हरिके तक, सर्वेक्षण किया गया ताकि इसकी पारिस्थितिकी स्तर विभिन्न प्रकार की मछलियों की उपलब्धता तथा इसमें बढ़ती अपरद के प्रकारों की जानकारी प्राप्त कर सके ।

रूपनगर क्षेत्र में दो बड़े *पल्प और पेपर* कारखाने तथा एक बड़ी दवा कम्पनी **रेनबक्सी** से अपरद पदार्थ तजोवाल गाँव के निकट सतलज नदी में प्रवाहित किया जाता है । ये अपरद अत्यधिक लवणीय हैं, जिससे प्रवाहित क्षेत्र में मछलियों की मृत्यु हो जाती है ।

तत्पश्चात् यह नदी लुधियाना शहर के निकट मलजल एवम् औधोगिक अपरद से प्रभावित होते पाया गया है । इस क्षेत्र का नदीय जल काफी प्रदूषित है एवम् घुले ऑक्सीजन की कमी पायी गयी ।

इसकी उपनदी *चिट्टी बेन* द्वारा प्रवाहित अपरद इस नदी को अन्त तक प्रभावित करती है । अतः इस उपनदी में भी मछलियों की मृत्यु हो जाती हैं, विशेषकर मानसून से पूर्व ।

सोन एवम् टोंस उपनदियाँ का गंगा नदी पर प्रभाव

गंगा नदी पर *सोन* एवम् *टोंस* उपनदियाँ के प्रभाव को काफी प्रभावशाली पाया गया है । सोन उपनदी मुख्य नदी के रसायनिक प्राचालों को काफी प्रभावित करता है, विशेषकर संगम स्थल क्षेत्र में । मुख्य नदी की तुलना में सोन में प्राथमिक उत्पादकता एवम् जैव-समुदाय जैसे, प्लवक, परिपादप तथा नितल जीव-जन्तु आदि कम पाए गए हैं ।

टोंस उपनदी ने मुख्य नदी गंगा को इनके संगम क्षेत्र में जलीय गुणवत्ता के संदर्भ में काफी प्रभावित करता है । संगम के बाद प्लवक एवम् परिपादपों की सघनता में कमी एवम् नितल जीव-जन्तु (मेक्रोबेन्तिक) की संख्या में बढ़ोतरी देखी गई है ।

हुगली ज्वारनदमुख एवम् इसके आर्द्र क्षेत्र की मात्स्यिकी

हुगली ज्वारनदमुख एवम् दीघा केन्द्र का कुल मत्स्य उपज फरवरी 1999 से जनवरी 2000 के दौरान 62,025.2 टन आंका गया है । इस ज्वारनदमुखी परितंत्र एवम् दीघा केन्द्र से प्राप्त कुल हिल्सा मछलियों की ऊपज वर्ष 1999-2000 में 6,558.6 टन है, जो कुल मत्स्य ऊपज का 11 प्रतिशत भाग है । चयनित किए गए निम्न, मध्यम एवम् उच्च क्षारीयता वाले आर्द्र क्षेत्रों से 541.477 से 795.871 किलोग्राम प्रति हेक्टर प्रतिवर्ष मत्स्य ऊपज प्राप्त हुई ।

हुगली ज्वारनदमुख के विभिन्न स्थानों, उपनदियों एवम् इसके निम्न, मध्यम तथा उच्च लवणता वाले आर्द्र क्षेत्रों में भौतिक-रसायनिक प्राचलों, प्राथमिक उत्पादकता, प्लवक समुदाय तथा नितल प्राणीजात के संदर्भ में मृदा तथा जलीय गुणवत्ता संबंधी अन्वेषण कार्य किये गये।

ज्वारनदमुखी परितंत्र के निचले क्षेत्र (सुन्दरवन) में झींगा एवम् मत्स्यबीज एकीकरण केन्द्रों में सामाजिकी का अध्ययन किया गया साथ ही पख और कवक मीन के बीजों को नष्ट करने के प्रति जागरूकता के लिए जन जागरण कार्यक्रमों का भी आयोजन किया गया ।

हिल्सा मछलियों में पारगमन के दौरान होने वाले जैव- रसायनिक परिवर्तनों का भी अध्ययन किया गया ।

नदियों एवम् संबंधित पारिस्थितिक तंत्रों में पर्यावरणीय प्रभाव का मूल्यांकन

गंगा, यमुना, हुगली, हल्दी एवम् ताप्ती नदियों में पर्यावरणीय प्रभाव के मूल्यांकन हेतु विभिन्न संसाधनों में जैविक अवस्था, जैव-रसायनिक, सूक्ष्म-जैविकी संबंधी आदि का अध्ययन किया गया । प्रयोगशाला में मछलियों का जैव-आमापन परीक्षण औधोगिक अपरद्द के परिपेक्ष में किया गया । इस वर्ष भी नदीय परितंत्रों में जलीय संसाधनों को सुरक्षित रखने के लिए किस सीमा तक औधोगिक अपरद्दों को सहन किया जा सकता है । इसका निर्धारण हेतु पी.एच. एवम् डी.ओ. के मानकीकरण संबंधी अध्ययन किया गया । दिल्ली, आगरा एवम् हल्दिया *ऑयल रिफाइनरी इन्डसट्रियल कम्प्लेक्स* क्षेत्रों से प्राप्त जलीय नमूनों में धातु पीड़कनाशी दवाओं का स्तर अधिक पाया गया ।

हिल्सा मत्स्य समुदाय में अनुवांशिकी अध्ययन

फरक्का बाँध के निचले एवम् ऊपरी क्षेत्र में *आइसोजाइम मार्करों* की सहायता से हिल्सा अपसमष्टि का अध्ययन किया गया । यह अनुमान लगाया गया है कि गंगा परितंत्र का हिल्सा मछलियाँ बेतरतीब संगम के कारण है ।

उत्तर-पूर्व में प्रशिक्षण कार्यक्रम

संस्थान के बाढ़कृत मैदानी आर्द्र क्षेत्र प्रभाग द्वारा उत्तर-पूर्व राज्यों के मात्स्यिकी क्षेत्र से संबंधित लोगों के लिए इस प्रदेश के बाढ़कृत आर्द्र क्षेत्रों के प्रबंधन एवम् संरक्षण विषय पर गुवाहाटी में एक प्रशिक्षण कार्यक्रम का आयोजन किया गया ।

संस्थान का संक्षिप्त इतिहास

भारत सरकार ने सन् 1943 के अपने एक ज्ञापन में देश के मात्स्यिकीय संसाधनों के विकास के लिए एक केन्द्रीय विभाग की स्थापना पर विशेष बल दिया था । तत्पश्चात्, केन्द्रीय सरकार की कृषि, वानिकी तथा मात्स्यिकी से संबंधित उप-समिति ने भी इस प्रस्ताव का पृष्ठांकन

नदियों एवम् संबंधित पारिस्थितिक तंत्रों में पर्यावरणीय प्रभाव का मूल्यांकन

गंगा, यमुना, हुगली, हल्दी एवम् ताप्ती नदियों में पर्यावरणीय प्रभाव के मूल्यांकन हेतु विभिन्न संसाधनों में जैविक अवस्था, जैव-रसायनिक, सूक्ष्म-जैविकी संबंधी आदि का अध्ययन किया गया । प्रयोगशाला में मछलियों का जैव-आमापन परीक्षण औधोगिक अपरद्द के परिपेक्ष में किया गया । इस वर्ष भी नदीय परितंत्रों में जलीय संसाधनों को सुरक्षित रखने के लिए किस सीमा तक औधोगिक अपरद्दों को सहन किया जा सकता है । इसका निर्धारण हेतु पी.एच. एवम् डी.ओ. के मानकीकरण संबंधी अध्ययन किया गया । दिल्ली, आगरा एवम् हल्दिया *ऑयल रिफाइनरी इन्डसट्रियल कम्प्लेक्स* क्षेत्रों से प्राप्त जलीय नमूनों में धातु पीड़कनाशी दवाओं का स्तर अधिक पाया गया ।

हिल्सा मत्स्य समुदाय में अनुवांशिकी अध्ययन

फरक्का बाँध के निचले एवम् ऊपरी क्षेत्र में *आइसोजाइम मार्करों* की सहायता से हिल्सा अपसमष्टि का अध्ययन किया गया । यह अनुमान लगाया गया है कि गंगा परितंत्र का हिल्सा मछलियाँ बेतरतीब संगम के कारण है ।

उत्तर-पूर्व में प्रशिक्षण कार्यक्रम

संस्थान के बाढ़कृत मैदानी आर्द्र क्षेत्र प्रभाग द्वारा उत्तर-पूर्व राज्यों के मात्स्यिकी क्षेत्र से संबंधित लोगों के लिए इस प्रदेश के बाढ़कृत आर्द्र क्षेत्रों के प्रबंधन एवम् संरक्षण विषय पर गुवाहाटी में एक प्रशिक्षण कार्यक्रम का आयोजन किया गया ।

संस्थान का संक्षिप्त इतिहास

भारत सरकार ने सन् 1943 के अपने एक ज्ञापन में देश के मात्स्यिकीय संसाधनों के विकास के लिए एक केन्द्रीय विभाग की स्थापना पर विशेष बल दिया था । तत्पश्चात्, केन्द्रीय सरकार की कृषि, वानिकी तथा मात्स्यिकी से संबंधित उप-समिति ने भी इस प्रस्ताव का पृष्ठांकन

किया था । फलस्वरूप, भारत सरकार के खाद्य तथा कृषि मंत्रालय के अन्तर्गत केन्द्रीय अन्तःस्थलीय मात्स्यिकी अनुसंधान केन्द्र की स्थापना 17 मार्च 1947 को कलकत्ता में हुई । एक अंतरिम योजना के रूप में प्रवर्तित यह केन्द्र अब देश की अन्तःस्थलीय मात्स्यिकी क्षेत्र में एक प्रमुख अनुसंधान संस्थान का रूप ले चुका है तथा यह संस्थान 16 मार्च 1999 को 53 वर्ष पूरा किया । वर्ष 1959 में इस केन्द्र को केन्द्रीय अन्तःस्थलीय मत्स्य अनुसंधान संस्थान का पूर्ण दर्जा प्राप्त हुआ तथा पश्चिम बंगाल के बैरकपुर स्थित नवनिर्मित भवन में इसका स्थानान्तरण हुआ । वर्ष 1967 में यह संस्थान भारतीय कृषि अनुसंधान परिषद् का विधिवत् सदस्य बना ।

संस्थान का मुख्य उद्देश्य देश के अन्तःस्थलीय मात्स्यिकी संसाधनों का उचित मूल्यांकन एवम् इनके संरक्षण तथा अधिकतम समुपयोजन के लिए उपयुक्त प्रणालियों को विकसित करना था । इन उद्देश्य की पूर्ति के लिए संस्थान ने देश में उपलब्ध अन्तःस्थलीय जल संसाधनों जैसे नदी, झील, पोखर, टैंक, जलाशय तथा बाढ़कृत आर्द्र-क्षेत्र आदि के पारिस्थितिकी तथा इनकी उत्पादन क्षमताओं का अध्ययन किया तथा इन अध्ययनों द्वारा विभिन्न प्रकार के जलीय परितंत्रों की जटिल पोषी संरचना एवम् पर्यावरणीय प्रकार्यों को सुलझाया ।

1970 के दशक में संस्थान ने चार अतिविशिष्ट समन्वित राष्ट्रीय परियोजनाओं का कार्य आरंभ किया ये परियोजनाएँ थीं, *मिश्रित मत्स्य पालन व मत्स्य बीज उत्पादन, वायुश्वासी मत्स्य पालन, अलवणीय जलाशयों की पारिस्थितिकी एवम् मात्स्यिकी प्रबंधन* तथा *लवणीय जल मत्स्य पालन* ।

इस संस्थान को निम्नलिखित मत्स्य पालन तकनीकों के विकास करने एवम् उन्हें लोकप्रिय बनाने का श्रेय प्राप्त है ।

- *नदीय संसाधनों से मत्स्य बीज संचयन*
- *मत्स्य बीज परिवहन संबंधित तकनीक,*
- *कार्प मछलियों का प्रेरित प्रजनन एवम् नर्सरी प्रबंधन प्रणाली,*
- *चाईनिज कार्प मछलियों का बंध प्रजनन,*
- *मिश्रित मत्स्य पालन,*
- *जलीय खरपतवारों का नियंत्रण,*
- *वायु-श्वासी मछलियों का पालन,*

- *एकीकृत मत्स्य पालन,*
- *मलजल पर आश्रित मत्स्य पालन,*
- *छोटे जलाशयों में मात्स्यिकीय प्रबंधन,*
- *लवणीय जल में मत्स्य पालन,*
- *घोंघा का पालन आदि ।*

उपर्युक्त तकनीकों एवम् शोध प्रणालियों के फलस्वरूप ही आज देश का अन्तःस्थलीय मत्स्य उत्पादन 0.22 लाख टन (1950-51) से बढ़कर 2.1 लाख टन (1994-95) तथा मत्स्य बीज उत्पादन 409 लाख टन (1973-74) से बढ़कर 14,500 लाख टन (1994-95) हो गया है।

7वीं पंचवर्षीय योजना के आरंभ में ही इस संस्थान ने तीन अन्य संस्थानों (*केन्द्रीय अलवणीय जलीय कृषि संस्थान, केन्द्रीय खाराजल कृषि संस्थान* और *राष्ट्रीय शीतजल मात्स्यिकी केन्द्र*) को जन्म दिया तथा इस मूल संस्थान का पुनर्नामकरण 1.4.87 से *केन्द्रीय अन्तःस्थलीय प्रग्रहण मात्स्यिकी अनुसंधान संस्थान* हुआ । इस परिवर्तित व्यवस्था में केन्द्रीय अन्तःस्थलीय प्रग्रहण मात्स्यिकी अनुसंधान संस्थान का दायित्व उन विवृत जल संसाधनों में शोध कार्य करना है, जिनमें मत्स्य प्रबंधन कार्य पर्यावरणीय अनुमापन तथा उसके संरक्षण से संबद्ध है।

अधिदेश

इस संस्थान के वर्तमान अधिदेश निम्नलिखित हैं :

1. *10 हेक्टर क्षेत्रफल से बड़े जलीय संसाधनों में मत्स्य संख्या गतिकी का अध्ययन ,*
2. *उक्त प्रकार के जलीय संसाधनों से अधिकतम मत्स्य उत्पादन प्राप्त करने हेतु प्रबंध प्रणालियों को विकसित करना ,*
3. *इन जलीय संसाधनों में अपकर्षण/प्रदूषण के कारण एवम् उनके प्रभाव का अध्ययन कर इन जलीय संसाधनों के संरक्षण के लिए अनुसंधानामक कार्य करना,*
4. *नदीय घाटी परियोजनाओं के कारण संबंधित बेसिन की मात्स्यिकी पर पड़ने वाले दुष्प्रभावों का अध्ययन एवम् इनकी प्रबंधन के लिए प्रणालियों को विकसित करना,*

5. *अन्तःस्थलीय मात्स्यिकी से संबंधित आंकड़ों के संदर्भ में राष्ट्रीय केन्द्र के रूप में कार्य करना,*

6. *प्रशिक्षण कार्यक्रमों का आयोजन एवम् विस्तारापरामर्शक संवाएँ उपलब्ध करना* आदि ।

संगठन

उपर्युक्त अधिदेश की पूर्ति एवम् देश के मात्स्यिकीय विकास हेतु केन्द्रीय अन्तःस्थलीय प्रग्रहण मात्स्यिकी अनुसंधान संस्थान के अनुसंधान कार्यों को प्रमुख मात्स्यिकीय स्त्रोतों के अनुरूप सात प्रभागों के अन्तर्गत संगठित किया गया है ।

नदीय प्रभाग का मुख्यालय इलाहाबाद में स्थित है और यह प्रभाग नदीय पर्यावरण के संरक्षण पर पर्याप्त ध्यान देते हुए देश के नदीय मात्स्यिकीय संसाधनों के प्रभावशाली प्रबंधन हेतु तकनीकी प्रणालियों को विकसित करने का प्रयास कर रहा है । इस प्रभाग के अनुसंधान प्रकल्प गंगा, ब्रह्मपुत्र, महानदी एवम् नर्मदा नदियों तथा उनके मुख्य परितंत्रों से संबंधित है ।

बंगलोर स्थित **जलाशय प्रभाग** के केन्द्र तमिलनाडु, आंध्र प्रदेश एवम् मध्य प्रदेश राज्यों में हैं । इस प्रभाग की कार्य दिशा छोटे, मध्यम तथा बड़े जलाशयों में मत्स्य उत्पादन की वृद्धि हेतु प्रबंधन प्रणालियों को विकसित करने की ओर है ।

बैरकपुर स्थित **ज्वारनदमुखी प्रभाग** इस समय हुगली-मातलह तथा नर्मदा ज्वारनदमुखी परितंत्रों पर कार्य कर रहा है । अनेक औधोगिक इकाईयों से प्रवाहित वहिःस्त्राव, कृषि एवम् नगरपालिकाओं के अपरद्द आदि ने गंगा नदीय तंत्र के हुगली ज्वारनदमुख को एक अति प्रदूषित क्षेत्र बना दिया है । यह प्रभाग इसका अध्ययन कर रहा है । सुन्दरवन के ज्वारनदमुख परितंत्रों एवम् मंगलो का जैविक एवम् अजैविक अध्ययन भी यह प्रभाग कर रहा है ।

बैरकपुर स्थित **पर्यावरणीय अनुमापन एवम् मत्स्य स्वस्थ्य परिरक्षण प्रभाग** को यह अधिदेश दिया गया है कि नदीय, जलाशय एवम् ज्वारनदमुखी परितंत्रों में मानवीकृत परिवर्तनों का अनुमापन करे, एवम् उपयुक्त सुधारात्मक उपायों को विकसित करें । प्राकृतिक स्त्रोतों से प्राप्त सूचनाओं के

निर्धारण के लिए प्रयोगशाला स्थितियों में भी अन्वेषण कार्य किया जा रहा है । प्रभाग द्वारा किए गए अध्ययनों से मत्स्य निवास स्थान की विभिन्नता, जैव-विविधता तथा ज्ञात सूचकों के माध्यम से दुष्प्रभाव का शिनाख्त करना, नियंत्रित स्थितियों में विषैले पदार्थों को परखना, जलीय पर्यावरण में कार्बनिक पदार्थों के परिमाण के लिए सूक्ष्म जैविकी का अध्ययन और मत्स्य रोगों की पहचान तथा इनके उपचार से संबंधित मौलिक सूचनाएँ भी सम्मिलित हैं । इस प्रभाग को जलीय परितंत्रों के सुधार के लिए एक कार्य योजना तैयार करने का दायित्व भी सौंपा गया है ।

बाढ़कृत मैदानी आर्द्र-क्षेत्र प्रभाग का मुख्यालय भी बैरकपुर में स्थित है । इस प्रभाग के अन्तर्गत गंगा तथा ब्रह्मपुत्र बेसिन के आर्द्र-क्षेत्रों की पारिस्थितिक गतिकी का अध्ययन किया जा रहा है, ताकि इनके विकास के लिए उपयुक्त प्रणालियों को विकसित किया जा सके । गंगा तथा ब्रह्मपुत्र बेसिन के आर्द्र-क्षेत्र अपनी जैव-विविधता के कारण महत्वपूर्ण ही नहीं, बल्कि बिहार, पश्चिम बंगाल तथा असम राज्यों के मात्स्यिकी का प्रमुख अंग हैं । यह प्रभाग इन पारिस्थितिक परितंत्रों की प्रक्रिया एवम् इनकी मत्स्य उत्पादन क्षमता का अध्ययन करता है, जिससे इनकी जैव-विविधता को नुकसान पहुँचाए बिना पर्यावरण के अनुकूल तकनीकी प्रणालियों को विकसित किया जा सके ।

मत्स्य स्त्रोत मूल्यांकन प्रभाग बैरकपुर में है और इस प्रभाग का लक्ष्य मत्स्य सम्पदा और मात्स्यिकीय स्त्रोतों से संबंधित आंकड़ों को एकत्रित करना है । इस प्रभाग को विभिन्न जलीय स्त्रोतों में उपलब्ध मछलियों की संख्या निर्धारण कार्य का दायित्व सौंपा गया है, ताकि इन अन्तःस्थलीय मत्स्य स्त्रोतों का वैज्ञानिक समुपयोजन किया जा सके ।

हिल्सा प्रभाग पश्चिम बंगाल राज्य के मालदह में स्थित है । इस प्रभाग का मुख्य लक्ष्य हिल्सा मछलियों की जैविकी स्वभाव तथा आचरण आदि पर अनुसंधान कार्य करना है, जिससे गंगा नदीय क्षेत्र से कम हुई इन मछलियों की पुनर्स्थापना के उपाय किए जा सके ।

संस्थान का अनुसंधान कार्य कुल 17 अनुसंधान परियोजनाओं में विभाजित किया गया है । इन अनुसंधान परियोजनाओं का कार्य मुख्यालय के अलावा 10 राज्यों में फैले संस्थान के 13 अनुसंधान एवम् 5 सर्वेक्षण केन्द्र तथा एक कृषि विज्ञान केन्द्र से किया जा रहा है ।

संस्थान का पुस्तकालय

इस संस्थान के पुस्तकालय ने अनुसंधान एवम् विकास कार्यों में महत्वपूर्ण योगदान दिया है । इस पुस्तकालय का उपयोग न केवल संस्थान के वैज्ञानिकों ने किया, अपितु अनेक विश्वविद्यालय एवम् संस्थाओं से आए प्राध्यापक, विद्यार्थी एवम् शोधकर्ताओं ने भी इसका सार्थक उपयोग किया । इस वर्ष पुस्तकालय ने 240 पुस्तकें तथा 124 विविध प्रकाशनों की वृद्धि किया साथ ही 19 विदेशी तथा 57 देशी शोध जरनलों को भी मंगाया । आज संस्थान के पुस्तकालय में कुल 8276 पुस्तकें, 3797 अन्य प्रकाशन, 4265 पुनर्मुद्रित लेख, 945 नक्शें तथा 52 शोध-प्रबंध उपलब्ध हैं । इस वर्ष पाँच राष्ट्रीय एवम् अन्तर्राष्ट्रीय संगठनों के साथ विनिमय संबंध स्थापित हुए ।

परियोजना अनुमापन एवम् प्रलेखन सेवाएँ

संस्थान का यह अनुभाग विभिन्न अनुसंधान परियोजनाओं के कार्य का अनुमापन तथा कर्मचारी अनुसंधान परिषद् की बैठकों का आयोजन करती है । विभिन्न प्रकार के रिपोर्ट, बुलेटिन, न्यूज लेटर आदि के प्रकाशन कार्य के अलावा, यह अनुभाग विभिन्न तकनीकी योजनाओं की तैयारी में निदेशक महोदय को सहायक सेवाएँ प्रस्तुत करती है ।

वर्ष 1999-2000 के दौरान निम्नलिखित प्रकाशनों को प्रकाशित किया गया ।

बुलेटिन

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वार्षिक रिपोर्ट

संस्थान का *वार्षिक रिपोर्ट - 1998-99*

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