CIFRI

ANNUAL REPORT
2000-2001

CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE

वार्षिक प्रतिवेदन
ANNUAL REPORT
2000-2001

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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☞ The activities and achievements reflected in this Annual Report covers the period April 2000 to March 2001 only.

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CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
BARRACKPORE-743101, WEST BENGAL

1 PREFACE

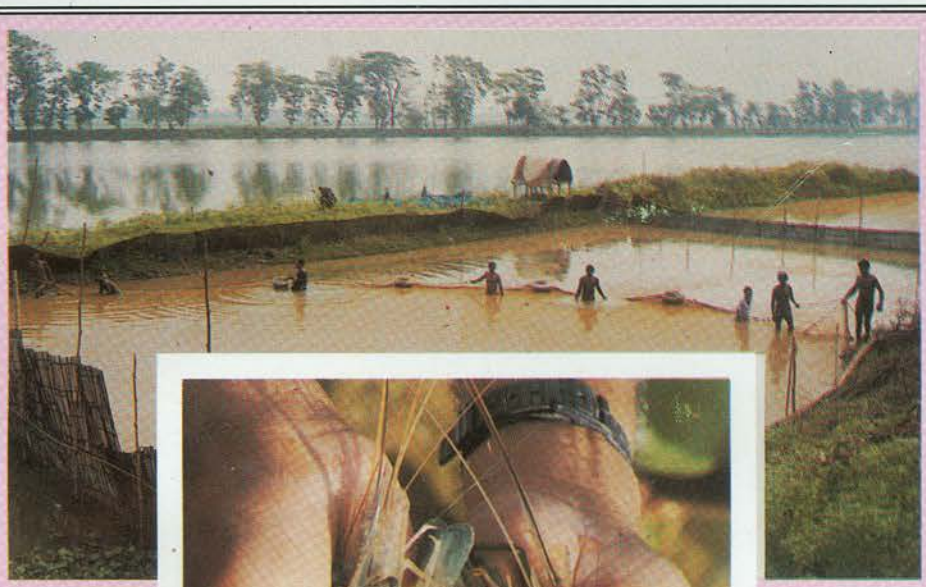
The Annual Report of CIFRI for the year 2000-2001 contains a comprehensive information on the achievements of the various research projects and other activities undertaken by the Institute.

Major emphasis of the Institute during the period has been on i) assessing the production potential and fisheries resources of reservoirs, floodplain wetlands and rivers *viz.* Ganga, Yamuna and Cauvery, ii) assessment of the ecology and fisheries of the Hooghly, Narmada and other estuaries along with the associated wetlands, iii) monitoring the environmental and fishery status of river Ganga and Yamuna, iv) genetic study of hilsa population, v) standardization of various paraneters 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 organizing training programmes on various specialized topics. External funds were mobilized through ad-hoc schemes supported by ICAR and other agencies.

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

Director



Pen culture of *Macrobrachium rosenbergii*

2 EXECUTIVE SUMMARY/SALIENT ACHIEVEMENTS

1 Studies on the ecology, biodiversity and production potential of two tributaries of the Ganga viz., Sone and Tons and their impact on the main river showed distinct variations in the biotic and abiotic parameters. Accomulation of Cu, Cr, and Zn was higher in Ganga than Sone and Tons. The rate of primary carbon production of river Ganga was higher compared to the tributaries.

2 Ecological investigations of five reservoirs of southern Rajasthan were conducted. They were shallow reservoirs with alkaline water. The fish yield in the reservoirs ranged from 23.0 to 172 kg/ha with dominance of major and minor carps. Based on the production potential ranging from 350 in Kothari to 500 kg/ha in Khari and Udaisagar, these reservoirs can be categorised as highly productive. Stocking of Indian major carps @ 150 fingerlings in Kothari to 1500 fingerlings/ha in Khari and Udaisagar reservoirs have been suggested.

3 *M. rosenbergii* cultured in pens installed in beels for a period ranging from 92-95 days attained a size range of 135 mm/38 g to 148 mm/57 g at a stocking density ranging from 21,000 to 25,000 nos/ha. A production of 484 to 588 kg/ha was harvested in 92-95 days of culture.

4 A qualitative health assessment index (HAI) for rapid evaluation of fish condition in the field was tried successfully to evaluate the general health status of fish populations in river Hooghly from a polluted and non-polluted site. It revealed higher HAI (61.5) in polluted site compared to non polluted site (26.5) in fish *R. rita.*

5 Satellite USS-III images of IRS-IC/ID in respect of West Bengal were analysed for estimation of size and shape of the water bodies in different districts. Water temperature, pH, salinity, NO_3, total nitrogen, Ca, GPP and respiration were analysed in selected water bodies and the results indicated that these parameters can be estimated using properties of satellite images pertaining to the water body. GIS was created on the basis of data collected from the field.

6 Data base has been developed on fish catch data collected at various centres of the Institute from different inland water systems.

7 Identification and cataloguing of potential ornamental fish species have been done in the North-eastern states and West Bengal. Breeding of ornamental fishes is being standardized.

8 The fishery and biology of prawns in Kayamkulam backwater of Kerala was studied. *Penaeus indicus, Metapenaeus dobsoni* and *M. monoceros* contributed substantially (830.88 t) to the total catch. These species fished with fine mesh, seine nets

and gill nets are subjected to both recruitment overfishing and growth overfishing. Strict regulation of exploitation by enhancing the mesh size of seine nets has been suggested.

9 Hilsa catch during the reported period from Hooghly river was highest ever recorded (9780.8 t). Hilsa is the major component of estuarine fishery contributing 48% of the total yield from Hooghly estuary and 32% of the combined catch of Hooghly estuary and Digha.

3 INTRODUCTION

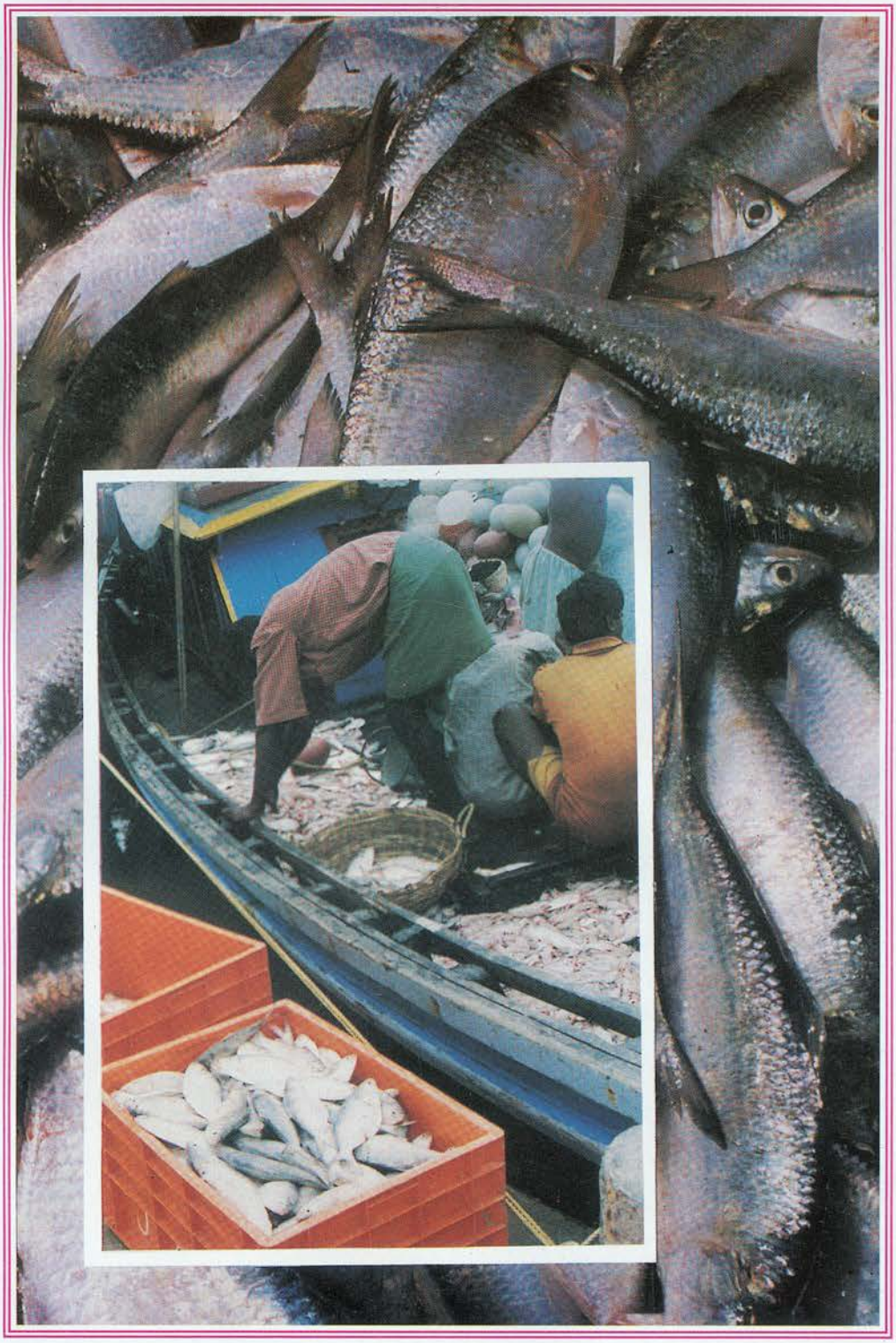
The Government of India, in a memorandum brought out in 1943, stressed the need for having a separate central department in the best interest of the development of fisheries resources of the country .This memorandum was later endorsed by the Fisheries Sub-Committee of the Central Government Policy Committee 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 54 years of its service to the nation on March 17, 2001. By the year 1959, the Station acquired its status as Central Inland Fisheries Research Institute (CIFRI) and moved to its own building 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 systems, lakes, ponds, tanks, reservoirs and floodplain wetlands. These studies have unravelled the complex trophic structure and functions *vis-a-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 2.8 million t in 1999-2000) which can be mainly attributed to the above technologies.

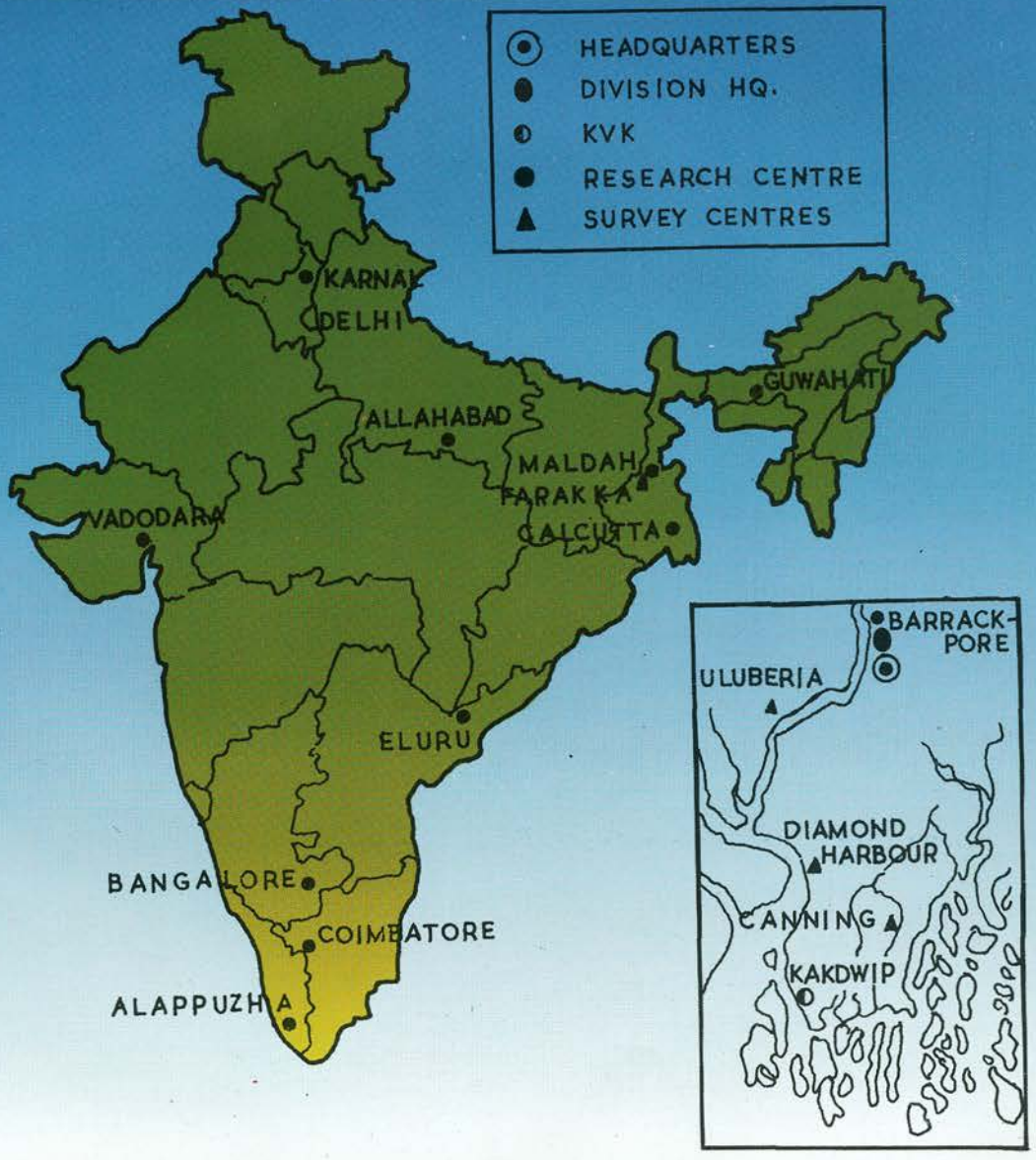
Backwaters of Kerala

Breeding of ornamental fish setup



Hilsa catch from Hooghly estuary and Digha

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



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 (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.

Organizational set-up (chart)

In tune with the above mandate, the research activities of CIFRI have been organized 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 Ganga, 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 Namada Estuarine systems. Biotic and abiotic features of estuarine tributaries and mangroves of Sunderban region are also being studied.

Research on biology and migratory behaviour of hilsa, aims at development of measures for the recovery of its fishery in the depleted stretches of the river Ganga. It is also undertaking study on genetic characteristics of hilsa from different stretches to know its population structure.

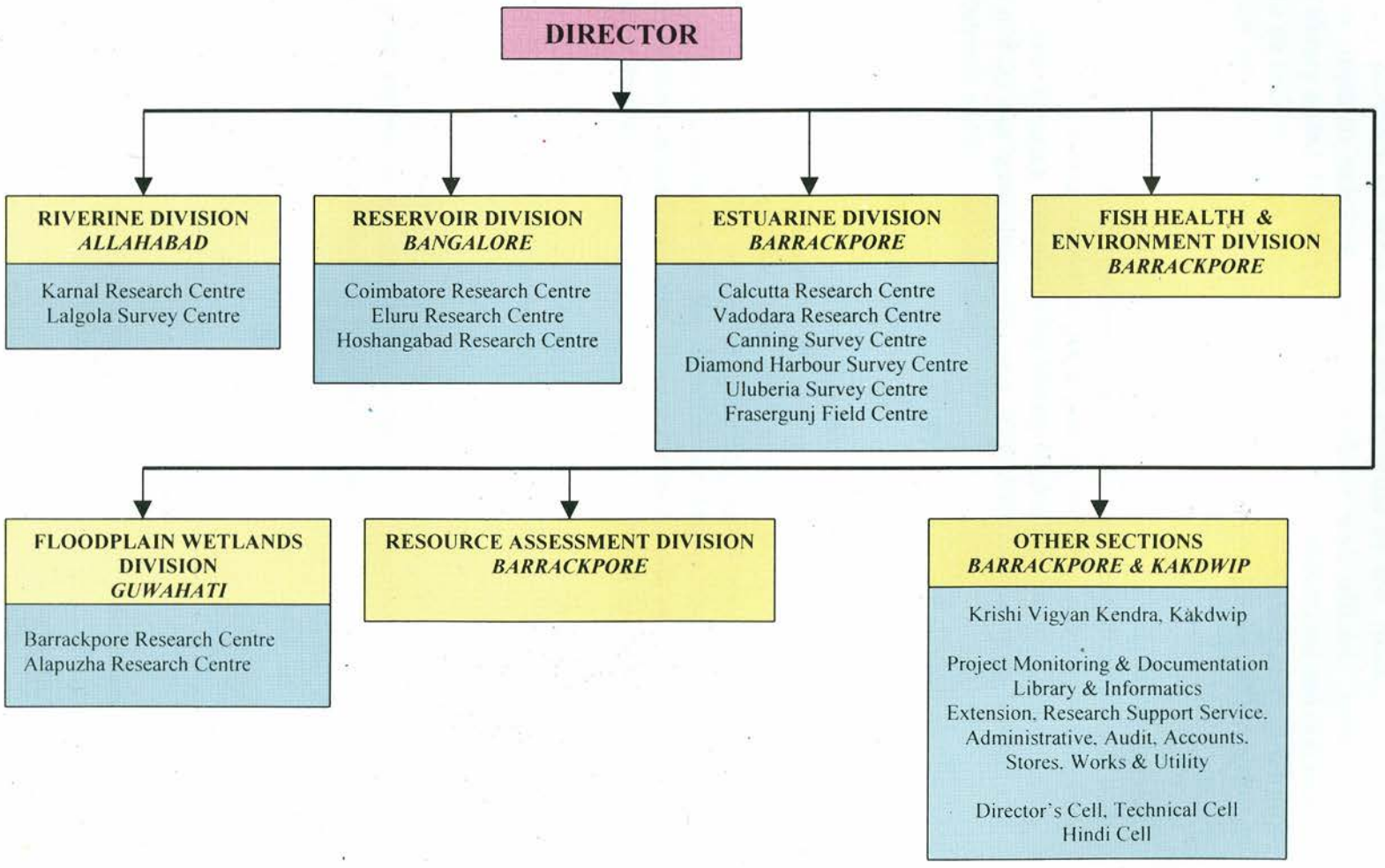
Fish Health and Environment Division, stationed at Barrackpore, is mandated to monitor the man-made changes in the riverine, reservoir and estuarine ecosystems and to evolve suitable amelioration measures. Experiments are also being carried out under the laboratory conditions to substantiate the findings from natural resources. The studies under the Division include collection of basic information on habitat variables, assessment of impact on biodiversity through known indicators, 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 Ganga and Brahmaputra rivers are not only unique in their rich biodiversity, but 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 aimed 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 Institute's research activities are organised under 18 research projects which are operated from the Headquarters at Barrackpore, 12 Research centres, 6 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 organization chart.

ORGANIZATIONAL SET-UP OF CIFRI



Library services

CIFRI Library provides its services to the scientists of the Headquarters and centres, apart from research scholars, teachers, students and officials from other organizations. The library added 217 books, 149 miscellaneous publications and 660 loose issues of journals to its collection and subscribed 19 foreign and 60 Indian journals during the year. The current total holding of the library comprises : 8493 books, 4265 reprints, 945 maps, 3946 miscellaneous publications and 53 theses.

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 to other libraries. For procuring library books, journals and other reading materials Rs.14,93,699.00 was spent during the year 2000-2001. Library also brought out Indian Fisheries Abstracts and Current Contents.

Project Monitoring & Documentation Service

The section monitored the progress of Research Projects of the Institute and organized Staff Research Council Meeting. It also assisted the Director in policy formulation and technical guidelines on plan and scheme preparations, apart from publishing reports, writeups, 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 scientists 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 are some of the major responsibilities of the section.

Technical Reports/queries

More than 25 Technical reports highlighting the progress of research under various projects 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.

Annual Report

1 Annual Report 1999-2000

News letter

1 The Inland Fisheries News (Vol.5, No.1, January 2000 to June 2000)
2 The Inland Fisheries News (Vol.5, No.2, July 2000 to December 2000)
3 *Antasthaleey matsyaki* (Vol.4, Nos.2/3, July, 1999 to June 2000 in Hindi)

Bulletin

4 Bull.No.97 : Ecology and production dynamics of river Brahmaputra with special emphasis on its tributaries

5 Bull.No.98 : Success stories of fisheries management in small reservoirs .

6 Bull.No.98 (Hindi): *Chota Jalasay ke matsyaki prabandhan myen sansthan upalabdhiya – Ek jhalak*

7 Bull.No. 99: CIFRI's environment impact assessment (EIA) technology – finding users

8 Bull.No.99 (Hindi): *CIFRI dwara vikashit paryavaraniya prabhab ankalan (EIA) padhati – viswa manyata ki aor*

9 Bull.No. 100: Ecology and Fisheries of Tawa Reaservoir (Hoshangabad, M.P.)

10 Bull.No. 101: Environmental Impact Assessment of Inland Waters for Sustainable Fisheries Management and Conservation of Biodiversity

11 Bull.No. 102: River Godavari -Environment and Fishery

12 Bull No. 103: Ecology and Fisheries of *Beels* in West Bengal

13 Bull.No. 104: Ecology and Fisheries of *Beels* in Assam

14 Bull.No.105 : Training on Pen Culture of Fish and Prawn

15 Bull.No.106 : Management of Fisheries in Small Reservoirs

Current Contents

January-March, April-June, July-September & October-December, 2000

Indian Fisheries Abstracts

Vol.**33**(4) 1999 & **34**(1-2) 2000.

Financial statement
(Rs. In lakhs)

	For the year 2000-2001		
	B.E.	**R.E.**	**Actual expenditure**
Plan	415.00	367.94	367.94
Non-Plan	645.00	687.22	687.22
TOTAL	**1060.00**	**1055.16**	**10.55.16**

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 1.4.2000 to 31.3.2001

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	59	5	8.47	-	-	
	Sr.Scientist/Scientist(Sel.Grade)/ Scientist(Sr.Scale)	16	5	-	-	-	-	
	Principal Scientist	8	7	1	12.50	-	-	
	RMP Scientist	1	1	-	-	-	-	
	TOTAL	**101**	**72**	**6**	-	-	-	
2	**TECHNICAL POSTS**							
	Category – I	58	53	11	20.75	3	5.66	This includes 2 (two) posts under C.S.S. and 5 (fifteen) posts under KVK
	Category – II	53 + 5	51	12	23.52	4	7.84	
	Category III	1	5	-	-	-	-	
	TOTAL	**112+5=117**	**109**	**23**		**7**		

3	**ADMINISTRATIVE POSTS**							
	Sr.A.O.s/A.Os/Accounts Officer, etc.	2	2	-	-	-	-	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	42.85%	1	14.28%	
	Assistant Director (O.L.)	1	1	-	-	-	-	
	Assistants	23	20	4	20.00%	1	5.00%	
	P.S., P.A.	5	3	2	66.66%	-	-	
	Jr. Steno., Sr. Clerk/U.D.Cs	44	43	11	25.58%	-	-	
	L.D.Cs/Hindi/Time Keeper	14	13	2	15.38%	1	7.69%	
	TOTAL	**96**	**89**	**22**		**3**		
4	**SUPPORTING STAFF**							
	Grade - I	82	80	27	33.75%	6	7.5%	This includes 1 (one) post of SSG under C.S.S. and 7 (seven) post of SSG under KVK
	Grade - II	59	62	20	32.26%	4	6.45%	
	Grade - III	35	36	12	33.33%	3	8.33%	
	Grade - IV	18	17	10	58.82%	2	11.76%	
	TOTAL	**194**	**195**	**69**		**15**		
5	**AUXILLIARY POSTS**	4	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 functions in river Cauvery**

Personnel **:** *Scientific :*
M. Ramakrishniah, D.. Singh, D.S. Krishna Rao, P;K. Sukumaran, M. Karthikeyan, A.K. Das, V.K. Murugesan, Rani Palaniswamy
Technical :
S. Manoharan

Duration **:** April 1999-March 2001

Location **:** Bangalore

Soil and water quality (in Tamil Nadu stretch) of Cauvery river

The soil was sandy loam at Mettur and sandy at all other sampling stations in the river course. The sediment had a pH range of 7.2 to 7.7 except at Poombukar where it was slightly acidic (6.6) in reaction. The sediment content of organic carbon (0.045 to 0.45%), total nitrogen (0.007 to 0.055 mg/100 g) and the available nitrogen (3.68 to 15.9 mg/100 g) were in the low productive range in the entire stretch.

The water was slightly acidic (pH : 6.0 to 6.8) at Mettur during monsoon, but the value increased to alkaline side in the other stations. The total alkalinity was in the productive range (141.5 to 246.0 mg/l). Among the essential nutrients in water, NO_3-N was generally low (1.5 to 140.0 µg/l) during pre and post monsoon seasons in most of the stations, except Poombukar where higher value (280 µg/l) was recorded. While PO_4-P showed a narrow range of variations (10-50 µg/l) in the entire stretch during pre-monsoon. The variation was wider (39-350 µg/l) during post monsoon.

Biotic communities

Plankton : The plankton community (mainly phytoplankton) was dominated by diatoms (69.12%), followed by green algae (16.49%) and blue greens (10.44%). A few zooplankters, consisting of rotifers (0.88%), copepods (1.18%) and nauplii (1.91 %) were present in the plankton samples from Vennar and Vettar distributaries.

Periphyton **:** The periphytic population was dominated by Bacillariophyceae (980 to 7675 u/cm), followed by Chlorophyceae (380 to 2130 u/cm).

Primary production: The gross primary production at Mettur was 66.mgC/m^3/hr, but the value increased to 265.62 mC/m^3/hr at Poombukar with similar trend in the net primary production and community respiration and this positive trend could be related to the favourable qualities of soil and water in the lower stretch.

Fish and fisheries

The catch per unit of effort during this unfavourable period varied from 1 to 6 kg/day. However, fishes were extensively trapped near the regulators and anicuts by making use of their jumping habits against the current. A bamboo frame with a gunny cloth forming a wall like structure and trap at the bottom was allowed to hang above the sluice gate of the regulator using coir ropes. A sizeable quantity of fish (50 to 3000 kg/day) was caught with minimum labour of 2 to 3 fishermen through this type of fishing at the regulators. When releasing of water from Mettur dam was stopped, fishing was done extensively throughout the river stretch using all types of gear and the CPUE ranged from 10 to 100 kg/day. The fish catch consisted of Gangetic carps, Cauvery carps, cat fishes, murrels, eels, mullets and exotic fishes like tilapia and common carp.

Pollutional status

Analysis of sediments collected from the river stretches revealed the presence of heavy metals such as zinc, copper and lead at a range from 29.4 to 746.22, 6.22 to 82.35 and from 20.05 to 137.4 mg/kg, respectively.

Among the heavy metals in the water, zinc was recorded in the range of 0.015-0.156 mg/l in the entire stretch. While, cadmium was detected during monsoon and post monsoon seasons.

PROJECT : RI/B/1

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

Sub-project : **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, R.S.Srivastava
Technical :
B.D. Saroj, L.R. Mahavar, S.K. Srivastava, Ramji Tiwari, J.P. .Misra, Kalpana Srivastava

Duration : Sub-project : June 1996-March 2001

Location : Allahabad/Karnal

River Sone

Sediment and water quality

In general, the sediment quality of tributary Sone did not show any remarkable impact on river Ganga. The water quality parameters alkalinity, conductance, dissolved solids, calcium, hardness and chloride were comparatively higher in Ganga (165.0 mg/l, 385 µmhos, 193.0 mg/km 28.0 mg/l, 139.0 mg/l and 26.7 mg/l, respectively) than tributary Sone (78.8 mg/l, 176.4 µmhos/cm, 88.2 mg/l, 19.5 mg/l, 93.5 mg/l, and 10.4 mg/l, respectively) before their confluence.

Primary productivity

The rate of carbon production and energy transformation also showed considerable impact of tributary on the main river. Both gross and net production were comparatively much higher in Ganga (586.0 and 378.0 $mgC/m^2/d$ or 5,757 and 3,810 $Cal/m^2/d$ than the tributary (340.7 and 192.0 $mgC/m^2/d$ or 3,346 and 1,885 $Cal/m^2/d$) before their confluence.

Biotic communities

Plankton : Total plankton population (22 u/l) in river Sone was lesser than River Ganga (231 u/l) which increased to 258 u/l at out fall and 454 u/l at below out fall Digha. The impact of the tributary, Sone was evident from the enhancement of plankton population in River Ganga. River Ganga is characterised by true potamoplankton community whereas plankton community of Sone clearly indicated presence of exoplankton influenced by litter discharge throughout the year and washings of nearby stagnant and polluted water bodies during flood. Impact of litter discharge on Sone was clearly observed and revealed especially by the presence of *Netrium* sp.

Periphyton : The significant abundance of desmids showed the 'oligotrophic' nature of the river. The dominating forms recorded were *Synedra, Fragiaria, Melosira, Navicula, Gyrosigma, Tabellaria, Cymbella* and *Asterionella* among diatoms and *Cladophora, Mougeotia* and *Ankistrodesmus* among green algae.

Macrobenthos : The benthic fauna was moderate 411 cc/m^2 at Maner below confluence of Ganga and Sone and minimum 146 cc/m^2 at confluence point. Molluscan population dominated in all the stretch and varied between 80.0 and 100.0%.

Spawn availability : First flood contributed 25.0%, second 43.5% and third flood 31.5% of spawn. Analysis showed 37.3% of desirable spawn.

Fish and Fisheries

The details are presented in the following table.

Fish landings (t) at Sadiapur, Allahabad

Species	Catch (t)	(%)	Yield (kg/km)
C. mrigala	1.49	1.9	6.48
C. catla	1.84	2.4	8.00
L. rohita	1.51	1.9	6.57
L. calbasu	2.23	2.9	9.70
Major carps	7.07	9.1	30.75
M. aor	7.43	9.5	32.30
M. seenghala	4.58	5.9	19.91
W. attu	2.46	3.2	10.70
Selected catfishes	14.47	18.6	62.91
H. ilisha	0.38	0.5	1.65
Miscellaneous	55.96	71.9	243.30
Total	**77.88**		**338.61**

As compared to the preceding year, fishery registered an increase of 36.1%. The main increase was in the catch of miscellaneous species (55.3%). Among miscellaneous group, the fishery of rita, garua and vacha showed an increase of 57.8%. However, this year hilsa landings were very poor and it was almost one fourth of the preceding year.

At Lalgola fish landings were estimated at 143.10 t. Group-wise contribution was as major carps, 13.62 t; selected catfishes, 16.62 t; hilsa, 20.78 t and miscellaneous fishes, 61.84 t. Among major carps *C. catla* was the dominant species followed *by L. rohita.,*

River Tons

Sediment and water quality

The sediment was alkaline in reaction in all the stretches with pH ranging from 7.5 to 7.95. Free calcium carbonate and specific conductance were comparatively higher in the tributary (6.37 to 8.12% and 250 to 290 µmhos respectively) than Ganga (4.62% and 120 µmhos respectively). The impact of tributary on the sediment quality of Ganga was clear in respect of physical parameters, specially at the confluence zone.

The water quality parameters *viz.* alkalinity, conductance, dissolved solids, calcium, magnesium and hardness showed considerable variation in different stretches of the tributary .The impact of the tributary on Ganga was clear at the confluence point where the values of the above parameters dropped considerably but the impact was minimized below the confluence point. Although dissolved organic carbon was high in the entire stretch but nitrate and phosphate values were low.

Primary productivity

The rate of carbon production showed considerable impact at the confluence point. Both gross and net productivity was comparatively higher in Ganga (489.7 and 321.6 $mgC/m^2/d$ or 4809 and 3158 $Cal/m^2/d$ than the tributary (355.7 and 221.0 $mgC/m^2/d$ or 3493 and 2190 $Cal/m^2/d$) before their confluence. At the confluence point due to the impact of tributary Ganga showed considerable drop in the production rate but the impact was minimized below confluence zone where the rates became higher and closer to the original river.

Biotic communities

Plankton : At above confluence zone of Tons at Sirsa the plankton abundance was estimated to be 92 u/l whereas in Ganga (above confluence) the abundance was 392 u/l. At confluence and below confluence the plankton count was found to be 365 and 135 u/l, respectively. Thus, a clear cut sign of decline in plankton abundance in Ganga is visible at confluence.

Periphyton : Periphytic community of Tons was studied from upstream Maihar, Etma, Teonthar and the confluence point at Sirsa where it meets the Ganga. The composition of different groups in the entire stretch revealed that the diatoms were maximum and was followed by Chlorophyceae, Myxophyceae and desmids. Minimum periphytic population was recorded at the confluence point during all the seasons.

Macrobenthos : The average benthos density of River Tons at different centres ranged between 418 and 903 cc/m^2, mainly constituted by molluscan population. The stretch of River Ganga before confluence with Tons was represented by better benthos density (Av. 639 cc/m^2) as compared to the adjoining stretch of River Tons at Sirsa (Av. 418 cc/m^2). Minimum values for macrobenthic invertebrates were noticed at outfall region (Av. 254 cc/m^2) which increased to an average of 445 cc/m^2 below outfall region.

Spawn availability : Investigation on availability of spawn was carried out round-the-clock from 16.7.2000 to 18.8.2000. During the period, three floods were observed. Only two spurts of spawn was recorded when 297 ml spawn was collected. The spawn analysis yielded 13.8% desirable spawn and 86.2% undesirabale spawn. Analysis of fry reared in plastic pool revealed 7.2% *L. rohita*, 6.5 % *C. mrigala*, 0.7% *L. calbasu*, 28.8% minor carps and 56.8% others.

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, UshaMoza
Technical :
C. Lakra, Kuldeep Singh

Duration *:* June 1999-March 2001

Location *:* Karnal

Sampling of River Sutlej was done in its upper-most stretches at Slapper, Kanjali and down stream after Harike barrage.

Characterisation of effluent load : The water effluents within the 3 main channels showed slightly acidic nature. The dissolved oxygen between 2.6 to 4.8 mg/l and with critical values (2.61 mg/l) in Chittibein.

The soil characteristics of the 3 nallas showed that the channel bed of Budda Nalla entering Sutlej at Ludhiana was acidic (pH 5.30), with specific conductance of 1628 µmhos/cm. The characterisation of effluent load within the channels do not vary much.

Estimation of fish biomass

Fish catch along Sutlej was estimated from 4 landing centres on monthly basis. The fishing within this river is being done mainly from post-monsoon to pre-monsoon. Monsoon season between July-August are observed as closed months.

Percentage composition of various groups along the Sutlej

Station	Total landing t/month	IMC (%)	Minor carps (%)	Cat fishes (%)	*Cyprinus carpio* (%)	Misc. (%)
Roopnagar	2.51	7.17	74.90	5.2	5.2	5.2
Ludhiana	2.12	33.49	18.39	18.86	5.6	23.58
Sultanpur	12.89	12.95	28.47	11.24	7.44	39.87
Harike	10.40	26.63	11.63	23.65	8.94	29.13

Exotic fishery of *C. carpio* (both *C. carpio communis* and *C. carpio specularis*) were observed throughout the stretch.

The dominant species at various centres were *L. dero* 28%, *L. dyocheilus* 20% at Roopnagar; C. *mrigala* 16%, *L. rohita* 16% and *M. seenghala 14%* at Ludhiana; *L. gonius* 10%, *R. rita* 17% at Sultanpur and *R. rita* 17%, *M. seenghala* 12%; *W. attu* 10% at Harike.

River Sutlej

Water and soil quality : The Sutlej river water at Slapper had temperature of 18 °C. The river in the middle stretch did not differ much up to (above outfall) Ludhiana, having pH between 7.2 to 7.8 and dissolved oxygen between 9.0 to 9.8 mg/l. The effluents caused decrease in pH to 6.92, D.O. between 4.0 to 6.0 mg/l and increased specific conductance from 302-697 µmohos/cm at discharge points (outfall-below outfall). The effect persists up to the tail end of Sutlej. The water characteristics of river Beas show this river to be comparatively in a healthier condition than Sutlej.

Soil of river Sutlej is alkaline in nature throughout its course from Slapper (7.8) to the tail end (7.83). The soil characteristics of the tail end of river Beas show it to be

alkaline in nature having less of sand (60.6%) and more of silt (27.7%) and clay (11.8%). Nutrient characteristics showed the availability of nutrients for production is less in Beas than Sutlej.

Primary productivity : The gross primary production values at non discharge points ranged between 119.79 to 194.0 mg C/m^2/hr. The carbon production diminished slightly at below outfall sites under the influence of effluents except at below outfall Ludhiana, where it enhanced to 201.13 mg C/m^2/hr.

Biotic Communities

Plankton : The maximum plankton density was present at above outfall stations in the range of 233 to 283 u/l, barring Slapper (1174 u/l) and below barrange station (217 u/l). This may be due to high content of sand in river bed at these two sites being 86.6 and 74.2% respectively. The minimum plankton density was observed at outfall stations in the range of 67-100 u/l. The lowest being at outfall Ludhiana.

Plankton composition showed complete dominance of Bacillariophyceae (100%) at Slapper, thereby indicating the stretch to have clean environment. At inlet sites (OF) main plankton group present was Myxophyceae (80-100%) showing the instant impact of effluents. Tail end of river Beas showed highest plankton density of 400 u/l having 66% phytoplankton and 33% zooplankton.

Periphyton : The total periphyton density showed low values at Slapper 234 u/cm^2, with the highest periphyton density 417 u/cm^2 at tail end of the river.

Macrobenthos : Macrobenthic density within Sutlej as a whole was poor and the density showed relationship with the magnitude of effluent influx.

Macrophytes associated fauna : Macrophyte associated fauna was maximum at outfall site of Gidderpindi 42 no./m^2 followed by the end point of Sutlej within Harike and minimum 2-5 no./m^2 at sities not influenced directly by effluents.

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. Nath, P.M. Mitra, Amitabha Ghosh, H.C. Karmakar, R.N. Misra, B.C. Jha, P.K. Katiha, D. Kumar
Technical :
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Duration : May 1998-March 2003

Location : Barrackpore and Calcutta

Sub-project : 1 Investigations on the fisheries of Hooghly Estuarine System

Estimation of catch statistics of theHooghly estuarine system and Digha centre

As estimated catch of 44601.4 tonnes (t) was netted out from the Hooghly estuary and the catch at Digha landing centre amounted to 28774.9 t (combined catch being 73376.3 t) during the period February 2000 to January 2001. The fall in catch from winter migratory bagnet fishery by 4142.6 t is compensated by increased catch of *Tenualosa ilisha* (hilsa) by 4403.3 t from Hooghly estuary. The lower estuarine zone, accounted major share 95.8 and 97.4% of the total catch excluding and including Digha centre respectively.

Estimation of Winter Migratory Bagnet Fishery (WMBF) in lower estuary

The estimated catch of WMBF in lower estuary ammounted to 24274.8 t during November 2000 to January 2001 accounting 54.4% of the total catch of Hooghly estuary with an average overall catch per unit efforts (CPUE) of 64.85 kg. The sharp decline in CPUE may be ascribed to 26% increase in effort (in terms of concentrations of nets) as compared to last winter causing overfishing.

Hilsa netted out of Hooghly waters during February 2000 to January 2001 was the highest ever recorded so far. An estimated catch of 9780.8 t (22% of total catch) of hilsa was brought to shore from the Hooghly estuary while at Digha centre it amounted to 6024.8 t. The sharp increase in hilsa catch was also reflected in CPUE.

Estimation of prawn seed resources in the estuarine system showed the seed availability of *Penaeus monodon* in Hooghly estuary ranged from 95 nos/net/day (April, 2000) to 584 nos/net/day (October, 2000) and their availability gradually decreased to 222 nos./net/day by February, 2000. Almost similar trend of availability was observed in Saptamukhi and Matlah estuaries too for tiger shrimps:

Sociological investigations of the prawn and fish seed collectors in Sunderban region showed the sex ratio 54% females and 46% males. Family size of most of seed collectors varied between 3-5 followed by2-3 and 5-7 members. Their (91%) primary occupation was seed collection. Most of them collect seed during day time throughout the year. Maximum (52%) collection is made during 1st to 5th day of lunar period. Maximum period of collection (60%) was 3 to 4 hours per day. Mostly (70%) tiger shrimp seed was collected in earthen *hundi*. Most of the collectors (80%) destroy other seeds retaining only *P. monodon* seed during collection. Because of the awareness campaign of CIFRI, 20% of respondents released back the seeds of other species to river instead of destroying them.

Biotic communities

Plankton : Plankton population by and large showed the dominance of zooplankton over phytoplankton. Diatoms and *Cyclops* or its nauplii were the dominant forms.

Benthos : The community size of benthic macro-invertebrates ranged between 3814 u/m^2 and 10083 u/m^2, being the highest in summer and lowest in winter. The molluscan population was the major constituent of the macro-benthic community of the system.

Physico-chemical characteristics and primary production of important distributaries of Hooghly estuary for the period April 2000 to March 2001

PARAMETERS	KAKDWIP (HOOGHLY)	BHAGATPUR (SAPTAMU-KHI)	MOIPEETH (THAKURAN)	HALDIA (HALDI)	HASNABAD (ICHAMATI)	DHAMAKHALI (BIDYA)	JHAR-KHALI (MATLA)
WATER TEMP. (^{0} C)	13.7-29.7 (24.4)	15.8-30.1 (25.0)	16.2-28.9 (24.7)	16.5-29.2 (25.0)	16-31.4 (25.6)	14.3-31.4 (25.3)	13.9-30.4 (25.6)
TRANSPARENCY (cm)	20-22.0 (21.0)	22.5-35 (28.0)	24.5-39 (31.0)	19-21.5 (20.0)	19-22.2 (20.7)	18-23 (19.3)	21-25.5 (23.6)
DISSOLVED OXYGEN (mg/l)	6.2-6.96 (6.63)	6.0-7.3 (6.7)	5.6-7.5 (6.6)	6.4-7.3 (6.8)	6.3-6.8 (6.5)	6.1-6.8 (6.5)	5.9-7.1 (6.4)
pH	7.9-8.15 (8.06)	8.0-8.17 (8.1)	7.9-8.2 (8.1)	7.9-8.1 (8.0)	8.0-8.15 (8.1)	7.95-8.2 (8.06)	8.0-8.2 (8.1)
TOTAL ALKALINITY (mg/l)	88-144 (117.5)	96-126 (112.5)	100-128 (113)	100-148 (115)	108-170 (126.5)	104-132 (114.5)	94-124 (105)
FREE CARBON DIOXIDE (mg/l)	4.2-5.2 (4.7)	3.8-5.2 (4.5)	4.0-5.6 (4.9)	3.6-4.2 (4.0)	3.8-8.0 (5.9)	2.2-5.0 (3.5)	3-5.2 (3.9)
SALINITY (g/l)	1.8-13.6 (7.65)	18.4-23.3 (19.3)	16.1-23.9 (20.4)	2.4-11.2 (6.6)	1.8-5.1 (3.7)	0.5-23.8 (14.8)	24.8-27.0 (26.1)
NITRATE (mg/l)	0.04-0.3 (0.190	0.09-0.43 (0.27)	0.11-0.57 (0.28)	0.07-0.24 (0.16)	0.05-0.26 (0.17)	0.09-0.33 (0.21)	0.04-0.61 (0,.33)
PHOSPHORUS (mg/l)	0.048-0.12 (0.08)	0.03-0.11 (0.09)	0.04-0.16 (0.09)	0.04-0.11 (0.07)	0.05-0.19 (0.10)	0.05-0.08 (0.07)	0.03-0.12 (0.07)
SULPHATE (mg/l)	56.7-213.3 (149)	122-255 (216.60	123-298 (229)	112-228 (159)	10.7-163 (98)	39-220 (147)	126.7-246 (213)
SILICATE (mg/l)	5.0-12.3 (7.6)	3.7-8.0 (5.6)	3.5-5.1 (4.30	6.0-10.3 (8.0)	4.2-8.7 (6.0)	3.7-7.2 (5.95)	3.2-5.2 (4.0)
CALCIUM (mg/l)	56-184.4 (130.2)	192-289 (240)	224-272.5 (250.4)	64-200 (124)	56-208 (960	48-224 (146)	256.5-304.6 (276.6)
MAGNESIUM (mg/l)	86-585.4 (372)	244-1027 (515)	441-1132 (786)	129-432 (292)	62-643 (272)	187-777 (422)	484-1137 (825)

SPECIFIC CONDUCTIVITY (millimhos/cm)	1.2-17.7 (10.8)	9.2-26.2 (20.2)	15.5-29.0 (23.4)	2.2-15.1 (10.7)	0.4-19.9 (10.7)	1.2-23.0 (15.7)	16.4-29.5 (24.1)
TOTAL NITROGEN (mg/l)	0.76-0.85 (0.82)	0.39-1.34 (0.75)	0.34-1.59 (0.78)	0.32-1.06 (0.570	0.12-1.0 (0.46)	0.41-0.73 (0.61)	0.51-2.4 (1.15)
HARDNESS (mg/l)	500-2900 (18750	150-5000 (3475)	2400-5400 (3900)	700-2200 (15250	400-3200 (1375)	900-3800 (2125)	2700-5500 (4131)
GROSS PRIMARY PRODUCTIVITY ($mgC/M^3/hr$)	62.5-70.8 (66.7)	45.8-70.8 (60.4)	37.5-110.4 (72.4)	45.8-83.3 (67.70	50-70.8 (58.30	37.5-70.8 (54.2)	50-87.5 (62.5)
NET PRIMARY PRODUCTIVITY ($mgC/M^3/hr$)	29.2-50 (38.6)	20.8-50.0 (36.50	25-93.8 (45.8)	29.1-58.3 (45.8)	25-45.8 (37.2)	20.8-45.8 (33.3)	25-54.2 (37.5)
RESPIRATION ($mgC/M^3/hr$)	25-40 (33.7)	25-30 (29.0)	15-35 (26.2)	20-30 (26.2)	20-30 (25.0)	20-30 (25.0)	20-40 (30)

The physico-chemical conditions of the distributaries in general were very conducive for aquatic life.

The soil reaction was alkaline (pH 8.41-9.31) which was, in general conducive for fish health. The bottom soils of the distributaries were moderately rich in organic carbon (0.39-0.83%), total nitrogen (0.035-0.067%), available phosphorus (2.24-7.84%). Soil texture was silty clay loam, which was conducive for retention of nutrients in the soil. The C : N ratio was also conducive for fish species.

Sub-Project : 2 Ecological changes in the estuarine wetland impoundments and its effect on production potential

Water and soil parameters of selected wetlands

Low saline wetlands (Machhibhanga)

Water : The mean water salinity was 1.477 ppt. The mean value of ammonia was 2.21 mg/l to 3.0 mg/l. The mean value of primary production was 195.47 mg $C/m^3/hr$.

Plankton : The average plankton concentration in the low saline wetlands was observed to be around 130 u/l.

Macro-zoobenthos : The macro-zoobenthos in the low saline zone was found to be represented by annelids, tanaids, amphipods, mysids, prawn larvae, insect larvae and molluscs.

Medium Saline Wetlands (Harishpur)

Water : The annual mean of salinity was observed to be 2.98 ppt. The primary production ranged from 103 mg $C/m^3/hr$ to 209 mg $C/m^3/hr$. Phosphate and nitrates had mean values of 0.13 mg/l and 1.77 mg/l respectively.

Plankton **:** The mean value of plankton concentration in Harishpur (164.7 u/l wetlands increased more than two folds.

Macro-zoobenthos **:** The macro-zoobenthos in the medium saline zone was found to be represented mainly be gastropods, tanaids, amphipods, mysids and prawn larvae.

High Saline Wetlands (Sarberia)

Water **:** The mean salinity was 13.51 ppt. The average primary production was 190.04 mg $C/m^3/hr$. PO_4P and NO_3N was 0.10 and 1.29 mg/l respectively.

Plankton **:** In Sarberia wetlands the phytoplankton had slight edge over the zooplankters compared to last year when zooplankters had overall dominance over phytoplankters.

Macro-zoobenthos **:** The macro-zoobenthos in the high saline wetlands were found to be represented mainly by tanaids (60.10%), gastropods (18.25%), amphipods (14.18%) and annelids (1.45%).

Soil quality **:** The bottom soil in all the wetlands of different saline zones had alkaline pH, the mean values being 8.34, 8.32 and 7.94 in low, medium and high saline zones respectively. Electrical conductivity was highest in the high saline zone (2.1 m mhos/cm) followed by medium (1.45 m mhos/cm) and low saline (1.23 m mhos/cm) respectively.

The average organic carbon percentage of soil in the three zones was around 0.8, 0.6 and 1.25 respectively.

The pH of the river bed soil in all the three zones studied were alkaline. The organic carbon percentage was found to be the highest in the branch of river Vidya (at Machhibhanga) followed by river Baniboala (high saline) and river Ichhamati (medium saline).

River Vidya, Ichhamati and Baniboala

Water quality **:** The salinity of the rivers in the low, medium and high saline zones ranged as 0.39-4.19 ppt, trace to 13.79 ppt and 2.02-24.10 ppt respectively.

The primary production was observed to be highest in the low saline zone being 165 mg $C/m^3/hr$ on an average followed by high saline river Baniboala 126.48 mg $C/m^3/hr$ and medium saline 92.73 mg $C/m^3/hr$. The pH of the river water was alkaline.

Plankton **:** In the river Vidya zooplankters were found to have an overall dominance over phytoplankton. The average concentration was recorded to be 63.64 u/l.

In the river Ichhamati (medium saline) phytoplankton dominated over zooplankton, the respective contributions (average) being 56.80 and 43.20%.

In the river Baniboala (Sarberia-high saline) the average plankton concentration was recorded 121 u/l with phytoplankton contributing 71.86% and zooplankton 28.14%.

Assessment of production : Estimated yields from two wetlands in low saline zone were 675.438 kg/ha (*P. monodon* 291.518 kg/ha), and 540.434 kg/ha (*P. monodon* 224.343 kg/ha). The average production was 607.936 kg/ha (*P. monodon* 257.930 kg/ha).

Medium saline wetlands produced 337.6 kg/ha (*P. monodon* 90.029 kg/ha) and 368.330 kg/ha (*P. monodon* 63.330 kg/ha), average production being 352.965 kg/ha (*P. monodon* 76.679 kg/ha).

Estimated yields in two high saline wetlands were 387 kg/ha (*P. monodon* 102.56 kg/ha) and 414.607 kg/ha (*P. monodon* 165.107 kg/ha), the average production being 400.803 kg/ha (*P. monodon* 133.833 kg/ha).

Thus, average yield in low saline zone was 72% higher than medium saline zone and 51.7% higher than high saline zone.

Socio-economic studies of estuarine wetlands

On the basis of survey conducted for *bheries* in low, medium and high saline zones, schedules were prepared to gather information on socio-economic conditions of the fishers.

The wage rate of permanently engaged fishers varied from Rs.1400 to Rs.2000 per month. In some of the bheries they also got 1% share in sale proceeds. The casual labour (fisher) engaged for fish harvesting received remuneration as fixed royalty, depending upon quantum of catch or daily wages.

PROJECT : ES/B/2

ECO-STATUS OF SELECTED WEST COAST ESTUARIES OF INDIA

Sub-Projects : 1 **Development of a model for assessing salinity intrusion in Narmada estuarine system *vis-a-vis* freshwater inflow dynamics for forecasting salinity relevant changes in the fishery spectrum.**

2 **Eco-status of Mandovi-Zuari estuarine complex and other estuaries of west coast.**

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

Personnel : *Scientific* :
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Technical :
R.C. Mandi, R.K. Sah, Subrato Das, T.K. Halder

Duration : Apri11998-March 2003

Location : Vadodara (Gujarat)

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

Data on the cross-sectional area, freshwater inflow and morphometric features of the downstream of Sardar Sarovar dam have been made available to C-MMACS, Bangalore, the collaborating agency.

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

The fish landing data revealed the occurrence of young ones of *T. ilisha* varying from 73.0 to 93.0 mm in length and 3.16 to 5.58 g in weight. The specimens encountered during the month of November 2000 varied in length from 142.0 to 210.0 mm and 24.43 to 83.75 g in weight. This corroborated last year's inference that an endemic population of this fish species thrives in Ukai reservoir, a freshwater lacustrine system.

Water Quality

The water reaction was by and large alkaline and the pH varied from 6.98 to 8.29.

Mandovi estuarine system had slightly higher dissolved oxygen content (5.2 to 7.6 mg/l) as compared to Zuari (4.8 to 6.4 mg/l).

The total alkalinity was higher (46.0 to 116.0 mg/l) in Mandovi and (44.0 to 110.0 mg/l) in Zuari as compared to the upper expanse (24.0 to 64.0 mg/l) in Mandovi and (26.0 to 56.0 mg/l) in Zuari estuarine system.

Phosphate content of Mandovi estuarine system varied from traces to 0.008 mg/l while the same fluctuated between traces to 0.0120 mg/l in Zuari estuarine system. The nitrate content of Zuari (av. 0.115 to 0.153 mg/l) had slight edge over Mandovi (av. 0.109

to 0.141 mg/l). Level of these two nutrient indicated poor status. The silicate content varied from 0.24 to 2.34 and 0.36 to 2.14 mg/l in Mandovi and Zuari estuarine system respectively.

Sediments Quality

The soil reaction was towards alkaline side and this varied from 7.51 to 7.72 in Mandovi and 7.17 to 7.93 in Cumbarjua – Zuari estuarine system. The lower estuarine sites were associated with higher conductance (5.32 to 29.47 m mhos/cm in Mandovi and 6.96 to 19.93 m mhos/cm in Zuari estuarine system) as compared to upper expense (0.30 to 16.42 m mhos/cm in Mandovi and 1.16 to 16.37 m mhos/cm in Zuari). The organic carbon and total nitrogen were by and large evenly distributed (Organic Carbon – av, 2.36 to 3.31%; Total Nitrogen – av. 0.34 to 0.47%). Free Calcium Carbonate did not show any definite trend but was higher at Banastari site (av. 5.75%) representing the Cumbarjua canal. The available phosphorus exhibited spatial variations as this was higher at lower estuarine sites (av. 0.91 mg/100 g in Mandovi and av. 1.04 mg/100 g in Zuari) in comparison to upper expanse (0.53 mg/100 g in Mandovi and 0.76 mg/100 g in Zuari). The qualitative texture of the sediments of Mandovi was more sandy (70.0 to 91.0%) as compared to Zuari (69.0 to 84.50%) estuarine system.

Primary productivity

Higher gross production was recorded in Cumbarjua canal (93.75 to 187.0 mg $C/m^3/hr$) and Zuari estuarine system (62.50 to 208.33 mg $C/m^3/hr$). The observations revealed that the producers retained energy varying from 56.06 to 83.72% for other consumers.

Biotic communities

The average planktonic abundance of Mandovi-Cumbarjua-Zuari estuarine complex varied from 55 (Shiroda) to 285 nos/l (Cortalim). Phytoplankton ranged from 58.93 to 68.47%. Bacillariophyceae dominated followed by Myxophyceae and Chlorophyceae. The zooplankton (30.18 to 39.28%) was mainly comprised of Copepoda, Rotifera and Protozoa.

Macro benthos : The average macro benthic abundance ranged from 716 (Candola) to 1835 nos/m (Panaji) in Mandovi estuarine system while the same varied from 994 (Shiroda) to 1378 nos/m (Cortalim) in Zuari estuarine system. Polychaeta (51.81 to 96.37%) was the most prevailing macro faunal element; and Malacostraca and Mollusca were the groups of secondary importance.

PROJECT : ES/B/3

STUDIES ON HILSA FISHERIES IN THE STRETCH BETWEEN FARAKKA AND SAGAR ISLAND

Personnel **:** *Scientific :*
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Technical :
S.P. Ghosh, K.P. Singh

Duration : April, 2000-March, 2003

Location : Barrackpore/Malda

General Assessment of fish landing at the Farakka region

The total fish landings from the Farakka region, above and below Farakka barrage, has been estimated to the tune of 141.66 t. Taltala contributed 48.94% to the total fish landing of the region followed by Beniagram (26.02%) and Feeder Canal (25.04%).

Miscellaneous varieties of fish formed the bulk (44.40%) of the total fish landing of the region followed by catfishes (24.04%), Indian major carps (15.49%), prawns (4.30%), hilsa, *Tenualosa ilisha* (4.42%), featherbacks (3.89%) and murrels (2.46%).

Fish landing at the Farakka region

Feeder Canal fish landing centre : It contributed 25.04% to the total fish landing of the Farakka region during the period under report. Miscellaneous varieties of fishes formed the bulk of the catch of the centre (41.54%) followed by catfishes (25.26%), Indian major carps (20.43%), prawns (5.62%), hilsa, *Tenualosa ilisha* (4.46%) and featherbacks (2.68%).

Beniagram fish landing centre : The centre contributed 26.02% to the total fish landing of the Farakka region. Miscellaneous fishes formed the bulk of the catch, contributed about 32.26% to the total catch of this centre followed by catfishes (29.80%), Indian major carps (15.48%), prawns (6.50%) and featherbacks (3.2%). Hilsa contributed 12.70%.

Taltala fish landing centre : The centre contributed 48.94% to the total fish landing of the region. Major catch of the centre was dominated by the miscellaneous fishes (52.32%) followed by catfishes (20.34%), Indian major carps (12.97%), murrels (5.02%), featherbacks (4.87%) and prawns (4.48%). Hilsa catch was not recorded during the year.

Hilsa fishery at the Farakka region

The total catch of hilsa, *Tenualosa ilisha* from the Ganga River System at Farakka region during the period under report has been estimated to the tune of 6.27 t forming 4.42% of the total fish landing from the region. Beniagram fish landing centre contributed 74.75% to the total catch of hilsa from the region followed by Feeder canal (25.25%) and Taltala drew blank during the year.

Manickchawk fish landing centre : The centre is about 35 km above Farakka barrage and the total fish landing from the centre during the period under report has been estimated to the tune of 52.16 t. Miscellaneous fishes formed the bulk (80.61%) of the total fish landing during the period under report. The other major contributions were from catfishes (15.41%), Indian major carps (2.83%), featherbacks (0.59%), murrels (0.27%), hilsa, *Tenualosa ilisha* contributed only 0.29%. The total estimated catch of hilsa during the period has been estimated to be 153.5 kg.

Rajnagar fish landing centre : The centre is about 10 km above the Farakka barrage and the total fish landing from the centre during the period under report has been estimated to the tune of 38.77 t. Miscellaneous fishes formed the bulk (61.93%) of the total fish landing followed by catfishes (34.28%), Indian major carps (2.55%), featherbacks (1.03%), *Tenualosa ilisha* contributed 0.05% of the total catch. The total catch of hilsa during the period has been estimated to be19 kg solely represented by the size group of 101-2000 mm.

Behrampore fish landing centre : The total estimated landing was recorded to the tune of 8.19 t. Miscellaneous fishes dominated the catch (36.92%) followed by catfishes (26.29%), prawn (13.13%), hilsa (9.60%), carps (8.11%), featherbacks (3.81%) and murrels (2.14%).

The total estimated catch of hilsa during the period was 786.6 kg contributing 9.6% of total catch which was represented by adults only.

Nabadweep fish landing centre : The total landing was 23.709 t. At this centre also miscellaneous fishes formed the bulk (42.13%) of the total catch which was followed by catfishes(29.41%), prawn (12.34%), carps (7.04%), featherbacks (5.01%) and murrels (2.14%). Hilsa contributed only 1.93% to the total catch.

Analysis of water and soil

Physico-chemical characteristics of water of river Ganga during 2000-2001

PARAMETERS	MANICKCHAKGHAT			TALTALAGHAT			BENIAGRAM		
	Summer	Monsoon	Winter	Summer	Monsoon	Winter	Summer	Monsoon	Winter
Air temperature °C	34.0	31.5	25.0	30.8	30.5	26.8	30.0	29.8	26.5
Water temperature °C	30.0	28.5	23.5	28.2	27.8	25.3	28.5	28.0	25.5
Transperency (Cm)	15.0	8.0	80.0	17.0	7.0	80.0	16.0	9.0	78.0
Free CO_2 (mg/l)	3.0	2.0	Nil	3.0	2.0	Nil	2.0	1.0	Nil
Carbonate (mg/l)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	2.0
Bicarbonate (mg/l)	64.0	68.0	90.0	66.0	72.0	92.0	68.0	78.0	98.0
D.O. (mg/l)	6.8	6.76	11.2	6.88	6.76	10.8	7.2	6.8	11.6
Hardness (mg/l)	110.0	104.0	86.0	104.0	108.0	88.0	100.0	107.0	88.0
Chloride (mg/l)	22.0	26.0	33.0	30.0	28.0	30.0	26.0	29.0	28.0

PROJECT : RS/A/1

ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS

Sub Project :

1(a) **Ecology and fisheries management of Hemavathi reservoir (Karnataka)**

(b) **Ecology and fisheries of Manchanbele reservoir (Karnataka)**

2 **Ecology and fisheries management in a small reservoir in Tamil Nadu**

3 **Ecological investigations in selected reservoirs in Madhya Pradesh**

4 **Ecological investigations in selected reservoirs in Rajasthan**

5 **Monitoring of fish catch and effort in selected reservoirs of Andhra Pradesh**

Personnel : *Scientific :*
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Technical :
S. Manoharan, C. Lakra, P.S.C. Bose

Duration :

Sub-project 1 (a)	July 1996-March 2001
Sub-project 1 (b)	July 2000-March 2003
Sub-project 2	April 2000-March 2002
Sub-project 3	April 2000-March 2001

	Sub-project 4	April 2000-March 2001
	Sub-project 5	July 1998 - March 2001

Location : Bangalore, Coimbatore, Hoshangabad, Karnal, Eluru

Sub Project : 1(a) **Ecology and fisheries management of Hemavathi reservoir (Karnataka)**

Sediment and water quality

Sediment was sandy-clay in nature comprising 75-80% sand. Silt deposits were observed along the river course. Soil was acidic (pH 5.11 – 6.04). Organic carbon content (1.16-1.62%) was fairly rich and the same was reflected in higher C/N ratio (22-28) due to low decomposition rate of bottom organic matter.

Nitrate nitrogen was in the range of 5-61 mg/l in surface waters while in column water it fluctuated from 30-200 mg/l. Available phosphate was meagre in surface waters while in column water it ranged between 10 and 15 mg/l. Low level was due to acidic bottom. Silicate silicon was in the range of 0.40-3.50 mg/l.

Primary production

Gross primary production (GP) was in the range of 150-300 mg $C/m^2/hr$ during September and March respectively while the net production (NP) ranged from 60-205 mg $C/m^2/hr$. Gross production to community respiration (CR) i.e. P : R showed wide fluctuations (1.52-4.80).

Biotic communities

Plankton : Phytoplankton dominated (70.66%) over zooplankton (29.34%). Dominant forms among phytoplankton were *Microcystis* and *Hormidium*. *Microcystis* along contributed 52.83% of the total plankton population. *Cyclops, Diaptomus, Moina* and *Brachionus* were uniformly distributed during the period of study.

Periphyton : Periphyton population fluctuated between 475 u/cm^2 and 555 u/cm^2. Bacillariophyceae dominated (95.19%) in collection followed by Desmidiaceae (2.26%), Myxophyceae (1.55%) and Chlorophyceae (1%). High silica content (2.4 mg/l) during December favoured the growth of diatoms as silica is required for their wall formation.

Benthos : Benthic community was recorded to be nil during January and March while maximum was recorded in November (410 nos/m^2). Gastropods (78.98%) dominated over other forms like bivalves (12.74%), chironomids (1.27%) and worms (7.0%).

Fish and fisheries

An estimated fish catch of 23.16 t was recorded from Hemavathy reservoir during the period under report. Of the total catch *C. carpio* accounted for 31% followed by *L. rohita* (26%), *O. bimaculatus* (21%), *M. cavasius* (8%), *C. mrigala* (2%) and other species (12%).

Sub-project 1(b) Ecology and fisheries of Manchanbele reservoir (Karnataka)

An estimated fish catch of 10.2 t was recorded at the reservoir. There has been a small decrease (3.1%) in the estimated fish catch during 2000-2001 as compared to 1999-2000. Catch per unit effort (CPUE) during the period 2000-2001 was 7.6 kg which was higher than the previous year's CPUE of 5.2 kg. The average annual catch for the year 2000-2001 was estimated at 44.1 kg/ha as against the last year's estimate of 45.5 kg/ha. *O. mossambicus* catch during the current year was 9.03 t which formed 88.3% of the total catch. Miscellaneous fishes (*O. bimaculatus, C. marulius*) accounted for 1.2 t (11.7%). The length range of tilapia in commercial catches was 12-24 cm with the modal size around 16-18 cm.

Sub-project 2 Ecology and fisheries management in a small reservoir in Tamil Nadu

Odathurai reservoir was choosen for the detailed studies on the ecology and fisheries management including pen culture during 2000-2002.

Soil and water quality

The pH was near neutral (7.16%). The organic carbon content was in the high productive range of 1.51%. However, the available nitrogen (18.64 mg 100 g) and available phosphorus (0.86 mg/100 g) indicated poor status of these essential nutrients.

The water temperature showed a narrow variation ranging from 25.2 to 29.3 °C. The total alkalinity mainly due to bicarbonates was in the productive range (107.0 to 127.3 mg/l). The high TDS (324.8 to 333.7 mg/l), the high specific conductivity (490-530 µmhos/cm) and the high hardness (192.9 to 210.3 mg/l) indicated high productive nature of the impoundment. The average value for the phosphate and nitrate contents of water was 0.091 mg/l and 0.691 mg/l respectively. Higher values were recorded in the bottom layer compared to middle and surface layers. The silicate content was ranging from 8.1 to 15.3 mg/l.

Primary production

The average gross carbon production was 109.4, 101.6 and 117.2 mgC/m^3/hr at surface layer, 1 m and 2 m depths respectively. Similarly, the net production in these

three layers was 67.7, 70.3 and 62.5 mgC/m^3/hr. The community respiration was higher at surface layer (101.6 mgC/m^3/hr) than that of 1 m (88.5 mgC/m^3/hr) and 2 m (49.5 mgC/m^3/hr).

Biotic communities

Plankton : The plankton was dominated by phytoplankton, the zooplankton forming negligible quantity. The phytoplankton was more (71781 units/l) in the surface layer than in the bottom layer (47932 units/l). In contrast to phytoplankton, the zooplankton count was more in the bottom (424 u/l) than that of the surface (209 u/l).

Macrobenthos : The macrobenthic organisms of the impoundment were dominated by chironomids (49%), Chaoborous (29.6%) and Oligocheates (21.4%).

Fisheries

It was stocked with the seeds of Catla (31.7%), rohu (27.7%), mrigal (27%) and mirror carp (13.7%) at a combined stocking rate of 2000 nos./ha. A total of 14.05 t of fish, consisting of 47% stocked varieties and 53% non stocked varieties was harvested from the water body. Among the stocked varieties, the contribution due to catla (2.87%), rohu (3.48%) and mrigal (4.74%) was meagre. However, the performance of mirror carp was fairly good with a contribution of 35.74%. he yield rate was 187.3 kg/ha.

Sub-project 3 Ecological investigations in selected reservoirs in Madhya Pradesh

Ecological investigations were carried out in two reservoirs, a medium (Kolar) and a small (Kerwa) in Madhya Pradesh.

Kolar reservoir

Kolar is a major irrigation cum water supply project situated on the basin of Narmada and River Kolar, tributary of Narmada with catchment area of 508 sq.km and water spread at FRL 2380 (ha).

Soil and water quality

In sediment the organic carbon ranged from 0.135-0.270%, free $CaCO_3$ (7.50%), available P (0.08-1.60 mg/100 g), available N (5.04-13.16 mg/100 g), pH (7.4-7.6) and Sp. Cond. (259-280 µmhos). The range of abiotic parameters were pH ranged (8.4-9.4), Sp. Cond. (210-311 µmhos), Dissolved organic matter (1.725-1.950 mg/l), Phosphate (0.004-0.006 mg/l), Silicate (3.6-4.4 mg/l) and Chloride (3.0-4.0 mg/l).

Primary productivity

Primary production of Kolar reservoir was estimated GPP (78.125 to 93.750 $mgC/m^3/hr$), NPP (46.870-62.500 $mgC/m^3/hr$), and Respiration (18.750-56.250 $mgC/m^3/hr$).

Biotic communities

Plankton : Plankton of Kolar reservoir varied from 0.21 to 0.70 ml/m^3 (0.42 ml/m^3). Phytoplankton (51.5%) was represented by Bacillariophyceae (25.7%), Chlorophyceae (20.9%), Myxophyceae (4.9%) and zooplankton (48.5%) by copepods (31.4%), cladocerans (15.7%), rotifers (1.4%) in the order of importance.

Macrobenthos : Macrobenthic population of Kolar ranged from 259 to 1739 nos/m^2.

Periphyton : Periphyton varied from 0.01 to 0.15 ml/cm^2 with an average 0.1 ml/cm^2 (19-1605 u/cm^2; av. 668 u/cm^2). Diatoms (67.7%) were the most important followed by green algae (30.5%) and desmids (1.8%).

Fishery

The fish yield of Kolar varied from 0.8 t (0.4 kg/ha) in 1989-90 to 67.14 t (34.8 kg/ha) in 1998-99 showing an increasing trend. Major carps (65-84%) with dominance of *C. catla* (21-69%) were most important with *L. rohita* (7-12%), *C. mrigala* (6-28%) and mahseer (1-3%).

The commercial fishing of Kolar started from 1st September 2000 on contract basis giving the fishing rights to a cooperative society. Gill nets (plastic and nylon twines) 50-140 mm bar were generally used in the commercial fishing. The catch per unit of effort (CPUE) varied from 10.0 to 12.3 kg during 1995-2000.

Stocking

Kolar reservoir was being stocked regularly with fingerlings (3-4 lakh/year) @ 158-218 nos/ha with greater emphasis on catla (49%) followed by rohu (33%) and mrigal (18%). During September-December 2000, about 10 lakh fingerlings (50-70 mm) with catla (60%), rohu (20%) and mrigal (20%) were stocked in Kolar. A target of 15 lakh seed stocking was reported for 2000-2001.

Kerwa Reservoir

Kerwa an irrigation project created to harnesses the water of Kerwa river a tributary of river Betwa by construction of dam in Tehsil Huzur with a catchment area of 64.5 sq.km with water spread area 482 ha at FTL.

Soil and water quality

In sediment the range of various parameters were organic carbon (0.390-0.600%), available P (0.06-1.20 mg/100 g), available N (6.44-6.72 mg/100 g), and pH (7.6-7.7).

The water pH ranged from 9.0-9.4, Sp. Cond. 176-186 (µmhos/cm), TDS (88.93 mg/l), DO (9.6 mg/l), CO_3 (12.0 mg/l), HCO_3 (84-100 mg/l), Total alkalinity (96-112 mg/l), Dissolved organic matter (1.95-2.10 mg/l), Phosphate (0.006-0.008 mg/l), Silicate (3.0-3.6 mg/l), and Chloride (2.0-3.0 mg/l).

Primary productivity

Primary production of Kerwa reservoir showed GPP ranged from 291.660-312.500 mgC/m^3/hr, NPP (166.660-171.875 mgC/m^3/hr), and respiration (150.00-168.750 mgC/m^3/hr) respectively.

Biotic communities

Plankton : Plankton of Kerwa reservoir varied from 0.35 to 0.70 ml/m^3, average being 0.53 ml/m^3 (113-521 u/l; av. 317 u/l) with dominance of phytoplankton (86.8%) contributed by Bacillariophyceae (42.8%), Chlorophyceae (39.5%) and Myxophyceae (4.5%). Zooplankton (13.2%) was represented by cladocerans (9.4%) and copepods (3.8%) only.

Macrobenthos : Macrobenthic population of Kerwa varied from 435 to 1826 nos/m^2.

Periphyton : Periphyton of Kerwa ranged from 0.025 to 0.10 ml/cm^2 (0.06 ml/cm^2).

Fish yield

Fish yield of Kerwa ranged from 0.5 to 25.0 t (1.4-72.0 kg/ha) during 1988-1999. The catch per unit of effort (CPUE) of Kerwa ranged from 10.7-14.4 kg. The reservoir has been declared as a sanctuary for 5 years and it is being stocked with mahseer seed only. The seed of *Tor khudree* brought from Tata Electric Companies, Lonavala, was stocked in this reservoir. It was reported that this fish is breeding in Kerwa and its growth is also good indicating the suitability of the ecosystem for this species.

Sub-project 4 Ecological investigations in selected reservoirs in Rajasthan

Ecological investigations (rapid survey) of five reservoirs in Southern Rajasthan namely Khari, Kothari, Orai, Udaisagar and Som Kamla Amba were conducted

during the year 2000-2001. The distinct characteristics of these reservoirs are summarized below :

Location and morphometry : Khari (773 ha) is located across the river Khari at Dhantra village in the district of Bhilwara, while Kothari (785 ha), on the river Kothari in the district of Bhilwara, Orai (640 ha) on the river Orai and Udaisagar (440 ha) on the river Bhendach in the districts of Chittorgarh and Udaipur respectively. These reservoirs are located on the Banas river system. Som Kamla Amba (3618 ha) is located across the river Som in the district of Dungarpur and lies in the Mahi river system. All the reservoirs were constructed mainly for imigration and are surrounded by the hills of Aravali ranges.

Limnology and productivity : Marginal areas of Khari, Kothari, Orai and Som Kamla Amba reservoirs were found to have good growth of aquatic vegetation. Basin soil of the reservoirs were generally sandy loam and alkaline, pH being 7.2 in Orai and 7.6 in Kothari. Soil was deficient in organic carbon in Khari and Kothari and was rich in other reservoirs. The low phosphorus concentration in the soil reflects rapid assimilation of available phosphorus in the biota. Electric conductance fluctuated between 301.0 (Khari) and 938 µmhos/cm (Udaisagar).

The water of Khari reservoir imparted a greenish tinge. The transparency ranged from 44.0 cm in post-monsoon to 64.0 cm in winter. Surface water temperature varied between 15.5 in winter and 30.0 °C in post monsoon. Assessment of the productivity based on total alkalinity (130.7 mg/l) was indicative of productive water body. In Kothari reservoir the surface water temperature varied between 16 and 28 °C. The total alkalinity (102.7 mg/l) was conducive to fish productivity.

In Orai reservoir the water temperature was lowest in winter (16 °C) and was maximum in summer (28 °C). The average alkalinity values of 95.3 mg/l and calcium concentration of 30.3 mg/l indicated higher productivity of the water body.

In Udaisagar reservoir the water temperature was lowest 16 in winter and was highest in summer (25.5 °C). The alkaline pH of 7.75 is favourable for fish growth.

Som Kamla Amba reservoir surface temperature varied between 17 and 28 °C. Assessment of the productivity based on the total alkalinity (122 mg/l) reflected the water body to be fairly productive.

The average gross production ranged between 121.37 (Kothari) and 171.84 $mgC/m^2/hr$ (Khari). Net production varied from 72.92 (Kothari) to 109.39 $mgC/m^2/hr$ (Udaisagar). The energy assimilation efficiency was quite high (60 to 64) in all the reservoirs. The production potential thus varied from 350 in Kothari to 500 kg/ha in Khari and Udaisagar reservoir.

Biotic Community

Plankton : The density of plankton was lowest in Kothari (1732 u/l) while it was highest in Khari (3691 u/I).

Periphyton : Periphytic community were dominated both qualitatively and quantitatively by Bacillariophyceae in all the reservoirs. The density of periphytic population was high in Som Kamla Amba (2102 u/cm^2) while it was low in Khari reservoir (1843 u/cm^2).

Macrobenthos : The standing crop of macrobenthos in Khari reservoir was estimated as 783 u/cm^2. In Kothari reservoir, chironomids formed 56% of the macrofauna. The standing crop was of the order of 983 u/cm^2. Udaisagar has a rich criop of macrobenthos (2625 u/cm^2). Chironomids dominated the fauna (83.8%), followed by *Chaoborus* (9.5%), molluscs (4.8%) and nymphs (1.9%) while in Som Kamla Amba reservoir the density was 1483 u/cm^2 with chironomids constituting 42.7%.

Macrovegetation : Aquatic weeds (*Hydrilla, Potamogeton, Vallisneria*) were distributed at 0.08 in Orai to 0.83 kg/m^2 wet wt. In Khari reservoirs respectively.

Catch statistics

The fish yield kg/ha for the year 1999-2000 was high in Udaisagar (172.3) followed by Orai (66.1), Kothari (45.2) and Som Kamla Amba (23.0). Indian major carps contributed 18.0% in Udaisagar to 55.4 in Orai, Minor carps dominated in Udaisagar forming 70.2% of the total catch.

During the period April to December 2000, the total catch varied from 5.44 t in Kothari to 31.6 t in Som Kamla Amba reservoir. The fish yield (Kg/ha) declined in all the reservoir except in Orai wherein it increased by 9% compared to the landings of preceding year. Indian major carps contributed 51.0% (Kothari) to 61.9% (Khari). Besides Indian major carps, *L. gonius, L. bata, B. bola, P. sarana, W. attu* and *M. seenghala* were the common species reported in Khari reservoir. *C. catla, L. rohita, L. calbasu, C. mrigala, W. attu, M. seenghala, L. gonius, P. sarana, N. notopterus, N. Chitala, C. reba, T. tor, E. vacha, M. armatus* and *R. cotio* were the species thriving in the Orai reservoir. The common species reported from the Som Kamla Amba reservoir were *C. catla, L. rohita, C. mrigala, W. attu, M. seenghala* and *L. gonius*.

Sub-project 5 Monitoring of fish catch and effort in selected reservoirs of Andhra Pradesh

The introduction of major carps in the Yerrakalva reservoir has changed the productivity and fishery of the reservoir. The contribution of major carps increased from 36 to 60%. *C. catla* increased by 30% and *L. rohita* by 25%. There are clear signs of successful breeding and recruitment of major carps, a rare occurrence in small and medium reservoirs.

PROJECT : RS/A/2

STUDIES ON ECOLOGY AND FISHERIES OF RESERVOIRS OF EASTERN UTTAR PRADESH

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

Duration **:** May 1999-March 2002

Location **:** Allahabad

Sediment and water quality

The sediment quality showed dominance of sand (84%) at Musakhar reservoir as compared to other reservoirs. At Sirsi reservoir, the percentage of sand was 56%, silt (28%) and clay (16%). Physico-chemical composition of sediment indicated slightly acidic (6.2%) to alkaline (7.5) in reaction with low (0.28%) to high (1.056%) content of organic carbon. Available nitrogen ranged from 11.4 to 18.5 mg/100 g, showing moderate values but was poor in available phosphate (0.8 to 1.3 mg/100 g). Both free $CaCo_3$ (3.75%) and specific conductance (280.0 µmhos/cm were comparatively higher at Latif Shah than lower Khajuri being (0.75% and 55.6 µmhos/cm) respectively.

The pH of water was 7.5 to 8.6 with high content of D.O. (7.0-10.6 mg/l was absent in most of the reservoirs except Musakhar. The range of some water quality parameters in these reservoirs were Total alkalinity (45-119 mg/l), hardness (40.70 mg/l), Sp. Conductance (91.6-210.0 µmhos/cm), dissolved organic matter (0.14-1.5 mg/l) and calcium (14.4-19.4 mg/l).

Biotic communities

Lower Khajuri

Plankton population ranged from 672 u/l (winter) to 768 u/l (summer) with an average of 723 u/l. Over all plankton communities of reservoirs indicated better productive feature. Periphytic community at Lower Khajuri revealed that the maximum assemblage was recorded during summer 151 u/cm^2 and minimum during monsoon.

Macrobenthic community ranged between 176 nos/m^2 (winter) to 528 nos/m^2 (summer). The molluscan population dominant chironomids in all the seasons.

Sirisi

Plankton population ranged from 132 u/l (winter) to 588 u/l (monsoon), with an average of 365 u/l. Phytoplankton percentage was more than 80% of the total plankton. The periphytic density recorded at Sirisi was the lowest 1565 u/cm^2 amongst all the reservoirs studied. The benthic population ranged between 264 u/cm^2 (summer) to 1056 u/cm^2 (monsoon). The average value was 645 u/cm^2.

Musakhar

Total plankton population ranged from 264 u/l (winter) and 480 u/l (summer). The average plankton population was 301 u/l seem to be mesoproductive reservoir. Periphytic density was 1680 u/cm^2. Diatoms were the dominant forms followed by desmids, Chlorophyceae and Myxophyceae.

Lartif Shah

Total plankton population ranged from 144 u/l (monsoon) to 808 u/l (summer), the average plankton population was 3366 u/l. Periphytic assemblage recorded at Latif Shah was 2730 u/cm^2 and maximum density was during summer 2100 u/cm^2. The benthic community comprised *B. bengalensis* (76.5%) followed by Chironomids sp. (17.7%) and Oligochaeta (5%).

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 :*
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Technical :
Alok Sarkar, B.K. Biswas, K.K. Sarma, M.P. Singh, D.K. Biswas, S. Saha

Duration : April 1999-March 2002

Location : Guwahati, Assam
Barrackpore, West Bengal

Sub-Project 1 - Assam Centre

Development of appropriate model for culture based fishery of beel ecosystem.

Studies were conducted in Samaguri beel.

Stocking and harvesting details

Species	Stocking			Harvesting		
	Period	No.	Average size	Period	No.	Size (g)
C. catla	August-September 1999	12000	20cm(15g)	February-March 2000	6600	500
L. rohita		10000	15cm (10g)		4200	450
C. mrigala		8000	15cm (8g)		2700	410
C. catla	November	9000	30cm(20g)	January	3800	1350
L.rohita	December	6000	25cm(15g)	February	3000	1300
C. mrigala	2000	3000	20cm(13g)	2001	1600	1050

Total fish yield of the beel have been estimated at 60,350 kg including 10,710 kg of stocked carps. An increase of 3.2% in the total yield over previous year has been observed. The culture based fishery thus contributed 18% of total fish yield and together with the wild carps it formed 39%. The wild varieties of fishes constituted *W. attu* (9%), *C. reba* (4.5%), *L. gonius* (3.5%), *L. bata* (4%), *N. chitala* (6.5%), *N. notopterus* (5%), Live fishes (6%) and miscellaneous (22%).

Studies on ornamental fishes

Breeding of *C. fasciata* and *C. lalia* in captive condition were standardized and experiments were conducted to test various ingredients helping in the colour retention of ornamental fishes.

Biochemical composition of fishes

Proximate composition of fishes from beel ecosystem was estimated.

Proximate composition of fishes (%, dry weight basis)

Fish Species	Moisture	Ash	Crude Protein	Lipid	Ca	Mg	Phosphorus
L. rohita	82.82	3.8	73.0	6.9	0.4	0.18	0.335
L. calbasu	82.17	5.4	72.2	7.45	0.3	0.12	0.385
L. gonius	79.48	7.7	79.7	6.8	0.88	0.4	0.173
C. catla	82.03	6.25	76.75	7.0	0.5	0.31	0.282
C. mrigala	82.96	5.5	74.05	7.5	0.3	0.18	0.385
C. reba	83.55	6.35	85.4	5.0	0.27	0.16	0.665
W. attu	79.62	7.1	74.7	5.9	1.1	0.83	0.075

Studies on detritus dynamics in beel

Macrophyte biomass

Mean monthly density (dry wt. basis) of 2275 g/m^2 with a peak of 4538 g/m^2 during July. A spatial variation is also noticeable. Though only 15% of water surface is covered by floating variety, their contribution to total biomass is more than 50 %.

Detrital load

Attempts have been made to quantify detritus available in suspended form using a detrital trap hanged in the water column. The results are tabulated below.

Periodic Detritus deposition rate

Time	Rate (g/m^2/d)	Org. matter (%)
November-January (60days)	5.36	15.77
January- March (60days)	2.15	26.55

Litter bag study of detritus formation

Of the two macrophytes *viz. Ceratophyllum* and *Eichhornia* in the beel ecosystem, the rate of detritus formation found to be very high (62.5 %) in the first 10 days in case of *Ceratophyllum* and during 58 days more than 85% of the macrophyte was converted to detritus.

Population structure of detrital processor

Dead organic matter in aquatic ecosystem is being acted upon by various organisms like animals, saprophytes and bacteria ultimately converting to finer fractions. A study has been conducted to identify the macro organisms involved in the process and their density in relation to stages of detrital processing using *Eichhornia* and *Ceratophyllum* as substrate. The study reveals that in case of *Eichhornia,* population of detrital processors

increases with period and reached a peak density during 35th day and plateaued with further increase of duration.

Soil sediment enzymes

Dehydrogenase activity was estimated in beel sediment to see their possible seasonal variation. It has been observed that the dehydrogenase activity was higher (8.464-11.257 µg formazan formed / g dry sediment /hr.) during post monsoon months (Sept.-Nov.) than that of winter months (December- February).

Fisheries and Ecological survey of beels in Manipur

Soil and water quality

Soil quality of Loktak and Takmu lakes

Parameters	Loktak	Takmu
Sand (%)	80-90 (85)	86-90 (88)
Silt (%)	6-14 (10)	4-10 (7)
Clay (%)	4-6 (5)	4-6 (5)
PH	4.3-5.1 (4.7)	4.4-5.0 (4.7)
Org. C (%)	3.6-3.94 (3.47)	3.7-3.96 (3.83)
Total – N (%)	0.721-0.785 (0.753)	0.672-0.792 (0.732)
C/N	5 :1	5.5 :1 – 5.0 :1
Available- N (mg/kg)	380-400 (390)	390-410 (400)
Available- P (mg/kg)	34-40	35-37 (36)
Total –P (%)	0.007 (37)	0.006
Total –K (%)	0.477	0.519
Total – Fe (mg/kg)	4720	6560
Total – Mn (mg/kg)	180	190
Total –Zn (mg/kg)	170	180
Total – Cu (mg/kg)	48	52
Total – Pb (mg/kg)	Tr.	1.9
Total –Cd (mg/kg)	Tr.	0.7
Total – Cr (mg/kg)	Tr	Tr.

Water quality of Loktak and Takmu lake

Parameters	Loktak	Takmu
Water Temp. ^{0}C	7.8-18.0	7.8-18.0
pH	6.8-7.0	6.8-7.2
Diss. oxygen (mg/l)	4.8-5.2	5.2-5.4
Free CO_2 (mg/l)	9.6-11.4	7.5-9.5
Total alkalinity (mg/l)	34.0-35.0	39.0-43.0
Hardness (mg/l)	40.0-43.0	45.0-49.0
Sp. conductivity (µmhos/cm)	65.0-70.0	70.0-75.0

Calcium (mg/l)	4.0-7.0	4.0-7.5
Magnesium (mg)/l	5.0-7.5	5.0-9.0
Total disv. solids (mg/l)	29.5-34.0	26.8-32.6
Chloride (mg/l)	20.0-25.0	20.0-26.0
Silicate (mg/l)	1.0-3.0	1.0-3.5
Iron (mg/l)	0.06-0.25	0.06-0.30
PO_4 –P (mg/l)	Tr-0.008	Tr-0.006
NO_3 – N (mg/l)	0.03-0.04	0.05-0.08
Disv. Org. C (mg/l)	1.2-3.0	1.1-2.8
Net P. Productivity (mg C/m^2/day)	150	137

Biotic communities

Plankton : Plankton samples were collected from subsurface water of both the lakes. Very poor average count 61 u/l was recorded from both the lakes. Absence of zooplankton in Takmu was a noticeable feature and in Loktak *Cladocerans* were the lone representatives of zooplankton.

Macrophytes : The various species of macrophyte recorded were *Salvinia, Pistia, Alternnethra* and *Ludwigia, Hydrilla, Najas* and *Ceratophyllum, Nymphea, Nymphoides* and *Scirpus.*

Fish and Fisheries

Common carp formed one of the major fisheries of these lakes. Indian major carp contributed marginally to the total catch. Air breathing fishes like *Anabas* sp., the four species of *Channa*, *Clarias* sp. and *Heteropneustes* sp.formed an important fishery of the lakes. Sun dried fishes contributed substantially to the local fish trade.

Sub-project 2 - West Bengal Centre

Development of appropriate population model for the culture-based fisheries in beel ecosystem

Data collection for construction of models for culture-based fisheries in beels was continued. Observations were made on (i) size of stocking, (ii) stocking density, from Panchita and Bhomra beels of West Bengal. The trend of catch was the same as in the previous year of study.

Identification and cataloguing of potential ornamental fish species

Ambassis nama, A. ranga, Colisa fasciata, C. chuna, Puntius sophore, P. ticto, Rasbora daniconius, Aplocheilus panchax, Badis badis were collected as species of potential ornamental value. The following species from South Bengal beels were identified as possible candidates for development as ornamental fishes (i) *Barbus gelius,* (ii) *Barbus conchonius*, and (iii) *Mastacembelus pancalus*. An attempt was made to breed the species *Colisa lalia* in captivity.

Biology of indigenous fish species of *beel* ecosystem

Monthly samples of *Gudusia chapra* from Panchita and Garapota *beel*s were collected. More than 500 specimens have been collected during the reporting period. Total lengths were noted for length frequency studies, which ranged from 60 to 205 mm in Panchita *beel* and 96-130 mm in Garapota *beel.*

Study of detritus dynamics

Macrophyte dynamics of closed beel (Bhomra)

About 70-80% of the *beel* was choked with submerged macrophytes. *Hydrilla*, *Ceratophyllum,* and *Najas* throughout the year, while *Potamogeton crispus* appeared during winter season. By the end of the season, *Eichhornia* spread vigorously almost all over the surface with mixed stand of *Pistia* and *Azolla*.

Estimation of rate of deposition and quantification of detritus loading was studied in (i) water phase by trap method and (ii) soil phase by core sample method. In water phase, deposition of detritus ranged from 27.56 g/m^2/d to 33.00 g/m^2/d.

In the soil phase, the detritus load was fractionated into different size groups *i. e.* > 1000μ, > 500μ and > 250μ and < 250 μ and organic matter estimated. The highest percentage of organic matter (31.05%) was recorded with the fraction above 1000 μ. Detritus formation from macrophyte was studied using litter bag (size 24x14 cm of 1 mm mesh size nylon net). Decomposition of submerged macrophyte was at higher rate as compared to floating *Eichhornia.* More than 50% of submerged variety (*Hydrilla verticillata*, *Ceratophyllum demersum*, *Najas* sp., *Potamogeton crispus*) were decomposed within 1st week and up to 99% with in 6th week duration while *Eichhornia* only 24% was decomposed during 1st week and 87% up to 6th week during the experimental period (Feb-April).

Primary productivity

Rate of Primary Production in Bhomra beel

Parameter	Macrophyte phase	Plankton phase
Gross Production mgC/m^3/hr	677.72	83.34
Net Production mgC/m^3/hr	73.55	41.67
Respiration mgC/m^3/hr	725.00	38.75

Yield potential attributable to plankton and macrophytes routes

	Estimated Total carbon fixed (t/ha)	Fish yield potential (kg/ha)
Plankton chain	7.5	75
Macrophyte chain	11812.9	11813
Total	-	11888

Fisheries and ecological survey of Oxbow lakes in Bihar

Phytoplankton and zooplankton counts (units/l) in selected ox-bow-lakes of Bihar

OXBOW LAKES	Phytoplankton		Zooplankton	
	Range	Average	Range	Average
SIRSA	1 - 1896	31	1 - 142	4
MAJHORIA	4 - 7015	401	1 - 147	20
AMUA	1 - 219	41	1 - 28	10
LALSARAIYA	1 - 228	49	1 - 121	25

Species diversity indices of phytoplankton of the selected oxbow lakes in Bihar

OXBOW LAKES	Total no. of species (S)	Total no. of individuals (N)	Conc. of dominance (C)	Variety index (D)	Shannon-Weaver diversity (H)	Evenness index (J)
SIRSA	29	914	0.131	31.424	3.521	8.000
MAJHORIA	19	7614	0.849	15.407	0.639	1.661
AMUA	19	773	0.191	20.704	2.933	3.374
LALSARAIA	16	790	0.172	17.200	3.226	8.900

Macrophytes and associated fauna

More than 60% of the lake (under study) was infested with submerged weeds and 10% of littoral area with emergent vegetation, mainly *Scirpus* sp. and *Phragmites karka*.

Benthos

Benthic fauna of the oxbow lakes under study were represented mainly by insects, molluscs, oligochaetes and ostracods. The total number of benthic organisms varied from 42 nos/m^2 (Lalsaraia, summer) to 1113 nos/m^2 Majhoria, summer).

Fish and fisheries

The common fishing gear used were gill nets of 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 season of fishing was the same as that of last year *viz.*, winter (December-February). The three Indian major carps are being stocked regularly, in addition to the three exotic species *viz., Ctenopharyngodon idella, Cyrinus carpio* and *Aristichthys nobilis*. Among the non stocked fishes, *W. attu, H. fossilis, Channa striatus, C. marulius, Notopterus notopterus, Anabas testudineus, Colisa fasciatus, Amblypharyngodon mola, G. chapra, Puntius spp* and small prawns are the major fisheries.

PROJECT : FW/A/5

FISH PRODUCTION DYNAMICS OF FLOODPLAIN WETLANDS OF UTTAR PRADESH

Personnel : *Scientific :*
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Technical :
L.R. Mahavar, B.D. Saroj, Ramji Tiwari, J.P. Mishra, Saket Srivastava, Kalpana Srivastava

Duration : May 1999-March 2002

Location : Allahabad, Uttar Pradesh

Description of beels studied

District	Name	Area (ha)	River Basin
Sidhartnagar	Bansideh Tal Bhagmoa Tal	29 45	Rapti
Basti	Chandu Tal Sikanderpur	230 200	Ghagra
Azamgarh	Salona Tal Gambhir ban	33	Tons
Mau	Tal Ratoi Devashi deval	800 100	Ghagra

Soil and water quality

Sediment showed dominance of sand (75.75-96.75%) and was neutral to alkaline in reaction (pH 7.1-7.68) with the exception of Deveshi deval (pH 6.55), free calcium carbonate and conductance were comparatively higher in Tal Ratoi (14.31% and 972 µmohs) and minimum in Devsi deval (1.06% and 97.5 µmohs). Organic carbon, available nitrogen and phosphorus were quite high in all the beels (1.06-3.93%, 23.56-56.5 and 1.06 to 4.44 mg/100 g) respectively.

Water quality parameters like alkalinity, conductance, dissolved solids, calcium, magnesium and hardness showed considerable variations in different beels being maximum in Tal Ratoi where the values were 1.96 mg/l, 480 µmohs/cm, 240 mg/l, 22 mg/l, 21.6 mg/l and 145 mg/l respectively and minimum in Devasi deval with the values being 56.2 mg/l, 121 µmohs/cm, 60 mg/l, 10.7 mg/l, 7.2 mg/l and 56.9 mg/l respectively. Dissolved organic matter was rich in all the beels (1.8-3.69 mg/l) but both phosphate and nitrate were poor (0.04-1.82 and 0.0065-0.135 mg/l respectively). The low nutrient in water phase may be accounted to the large amount of nutrients being used by macrophytes and removed from circulation for a longer period.

Biotic communities

Plankton : The total phytoplankton in the beels under study ranged from 163 to 1092 u/l. Numerical abundance of zooplankton was in the range of 373 to 798 u/l excepting in Salona and Ratoi tal where the dominance of phytoplankton was observed. 73 species of phytoplankton and 26 species of zooplankton were recorded from different beels.

Associated microflora and fauna : The abundance of associated microfauna and microflora was in the range of 270 u/g (Bhagnaia tal) to 832 u/g (Devasi deval) and 2010 u/g (Tal Ratoi) to 13275 u/g (Devashi deval), respectively.

Macrophytes : In all 20 aquatic weeds were recorded in all the beels. Beels were mostly choked with floating (*Eichhornia, Marsilea* and *Nymphae*) and submerged vegetation (*Nijas, Sagittaria, Hydrilla, Potamogeton, Vallisneria, Scirpus, Nilella* and *Nais*). Infestation percentage in the various beels ranged between 20-80.

Periphyton : Higher abundance of periphyton was recorded in Devashi Deval (5200 u/cm^2). Diatoms (62.9%), green algae (8.2%), blue-green algae (12.5%), desmids (11.2%), rotifers (3.1%), crustaceans (0.6%), protozoans (1.0%) and ostracods (0.5%) constituted the periphytic fauna in all the beels.

Macrobenthos : Benthic communities ranged between 275 to 660 nos/m^2 mainly dominated by molluscs (62.5-100%).

Rate of energy fixation and fish production potential

The gross and net energy fixation rates (both phytoplankton and macrophytes) ranged from 26170-63879 cal/m^2/d and 18795-44985 cal/m^2/d being maximum in Tal Ratoi and minimum in Sikanderpur. Out of the total energy fixed by producers almost 65-95% was contributed by macrophytes and the rest 5-35% by phytoplankton. All the beels were rich in detritus energy (21.79 x 10.4-79.6 x 10.4 cal/m^2) and based on the energy flow studies the fish production potential (kg/ha/yr) was estimated as 965 kg/ha in Chandu Tal, 651 kg/ha in Sikanderpur, 760 kg/ha in Bansidah, 1012 kg/ha in Bhagnia tal, 858 kg/ha in Gambhir ban, 663 kg/ha in Tal Slona, 767 kg/ha in Devashi deval and 1557 kg/ha in Tal Ratoi. Against this potential the actual fish production from these beels was in the range of 142-245 kg/ha/yr thus only 15.5 to 26.8% is actually harvested from these water bodies.

Socio-Economic study

The average catch of fishermen was found to be 2.0 t/yr ranging between 1.0-3.5 t/yr. The gross return thus calculated was Rs.80,000.00 per year based on the prevailing prices in the market. The net return computed to be Rs.60,000.00 per year.

Fishery

As per the available information the estimated catch ranged from 152 to 245 kg/ha/yr mainly represented by Indian major carps (40%), minnows (27%), catfishes (16%), minor carps (9%), and murrels (8%). Amongst IMC, *L. rohita* was dominant followed by *C. mrigala* and *C. catla.*

PROJECT : FW/A/6

FISHERY AND BIOLOGY OF SELECTED PRAWN SPECIES IN KAYAMKULAM BACKWATER

Personnel : *Scientific :*
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Technical :
C.K. Vava

Duration : April 2000-March 2002

Location : Alappuzha

During the year, three commercially important prawns *viz., Penaeus indicus, Metapenaeus dobsoni* and *M. monoceros* along with other minor prawns and fishes collected from the Kayamkulam backwater were investigated for their biology, fishery and population characteristics. Nine major landing centres targetting these species were surveyed during the year. The total landing estimated for the 11 months of the survey (May-2000 to March 2001) worked out to be 205.26 t for the *Penaeus indicus,* 712.33 t for *Metapenaeus dobsoni,* 98.06 t for *M. monoceros,* 20.49 t for other prawns and for the fishes 1344.65 t. Exorbitant quantity of the very young prawns landed through the seine nets is not included in this landings. The CPUE in respect of each gear and Centre-wise was also estimated.

Based on an eleven months survey (May 2000-March 2001), the percentage contribution by these three species along with other prawns and fishes to the total landings was 8.62%, 4.12%, 29.92% and 0.86% and 56.48% respectively. The species were subjected to both "recruitment over-fishing" and "growth-overfishing". The indiscriminate fishery has been mainly due to the use of the fine mesh seine nets and the gill nets. About 58% of the landings of these species were fished by these two gears. Strict regulation of the exploitation is suggested by enhancing the mesh size of the seine nets and restricting the number of the gill nets and seine nets.

Pollution study

As per the project programme, a study was undertaken to know the impact of effluent on aquatic life from thermal plant near Kayamkulam. Bi-monthly collections were made in four selected centres *viz.* above outfall (AOF 1 and AOF 2), one centre at the discharge point (OF), and other two centres below the outfall (BOF 1 and BOF 2).

Not much difference in surface water temperature was noticed (29.6 to 30.4 °C). Low salinity was observed in all the stations (11.03 to 12.88 ‰) due to freshwater inflow. Hydrogen sulphide ranged from 0.8 to 3.8 mg/l, BOD from 4.13 to 6.13 mg/l, and COD from 42.5 to 58.5 mg/l. The COD values during November and March were quite high possibly due to the release of effluents during these periods. Level of nitrogen raged from 0.231 to 0.296 mg/l, phosphate 0.04 to 0.06 mg/l and silicate 6.07 to 7.5 mg/l respectively.

The plankton concentration was quantitatively poor. This may due to tidal effect as most of the plankters drifted away from the water body along with the tidal current. Bacillariophyceae was the dominant from among phytoplankton and copepods among zooplankton.

The benthic fauna composed of polychaetes, isopods, amphipods, oligochaetes, molluscs (gastropods and bivalves), *Chironomus* larvae, and miscellaneous forms.

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 Aquatic environment

Personnel **:** *Scientific :*
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Duration **:** April 1998-March 2003

Location **:** Barrackpore, Allahabad, Karnal

Studies were undertaken at the upper stretches of river Ganga (Rishikesh) and Yamuna (Dakpathar) at (mid stream of river Ganga) Varanasi, Patna and Bhagalpur and on river Tapti (Bhusawal to Surat stretch), river Sutlej (Slappar to Ropar stretch), rivers Mandovi and Zuari (Goa), and rivers Hooghly and Haldi at Haldia Industrial stretch.

Chemical studies

Most of the physico-chemical parameters did not show any alarming trend but higher levels of metals were indicated at some outfall stretch. of the rivers. Zinc concentration at Patna and Bhagalpur outfall recorded 259 mg/l and 360.5 mg/l respectively. Lead was also recorded 80.6 ppm at Bhagalpur on river Ganga. The metal contents in Sutlej river at Ludhiana stretch indicated Copper (206.5 mg/l) and higher levels of Zinc (1158.8 mg/l). The metal content especially Iron and Lead recorded towards higher side at Panaji (Goa) during pre monsoon observation, the values being 0.307 and 0.136 mg/l respectively. The sediment of Mandovi estuary indicated very higher value (2,665.3 mg/l) during summer observations. At Haldia Industrial stretch, higher values of copper was recorded (40.5 mg/l). The metal bio-accumulation was towards higher side in the larger size groups of fishes.

Biotic community

The Patna stretch was dominated by Bacillariophyceae and rotifers which indicated occurrence of mild pollution in the river Ganga. This was also supported by presence of macrobenthic organisms *viz., Chironomid* larvae and absence of *Tubifex.* The Shannon-

Weaver index $(\bar{H})$ ranged from 0.8707 to 1.739. The macrobenthic fauna at Kakrapar outfall of river Tapti (Gujarat), indicated severe organic pollution, *Tubifex tubifex* constituted 88.83% percent of the population.

Biology of commercial fishes *viz. M. aor, M. seenghala, R. rita* and *L. calbasu* was undertaken at Patna and Bhagalpur stretch of the Ganga. *R. rita* was found to subsist predominantly on insects (90.00%) and fish (10%), while *M. seenghala* fed on insects (42.85%) and fishes in equal proportion besides small prawn *M. lamereii. M. aor* chiefly subsisted on fish and insects in equal proportion (50% each).

At Bhagalpur stretch of River Ganga, *M. seenghala* was observed to feed on prawns (80%) and fish (20%). Unlike, Patna, where insects formed bulk of the diet *M. aor* consumed fish (97.5%) and insects (2.5%). *R. rita* predominantly fed on insects (90%) followed by fish (10%), unlike Patna molluscs were missing from fish diet.

The value of K for all the fishes studied were observed to be between 0.5 and 1.0 at both the centers.

At Darapur, a total of 47 ml of spawn having dominant composition of minor carps followed by miscellaneous fishes *(M. armatus, G. giuris)* and fresh water prawn *(M. lamerrei)* were collected. Major carps were conspicuous by their absence.

Histological manifestation of toxicants accumulation in test fish was also undertaken. Biopsy of gill, liver, kidney of different fishes *viz., Gagata* species, *Mystus* species, *P. pama* indicated moderate stressed impact in all tissues. However, the intensity of damage was more in respiratory and excretory organs.

Bio-assay

Bio-assay experiments were also undertaken in the field at Patikhali outfall canal of Haldia Industrial stretch on river Hooghly. The impact of combined waste on juveniles of *Liza* species indicated 70% exposed fry died within 90-125 minutes at above, below and outfall zones during summer and winter.

The brain acetyl cholinesterase enzyme activity remained high among fishes (55.5-70.0 micromhos/mg protein/ha) in the reference zone of both Yamuna and Ganga while it remained depressed (38.0 to 48.5) in fishes at Haldia-Hooghly confluence at Haldia Industrial stretch.

PROJECT : EM/B/2

AETIOLOGY AND PATHOPHYSIOLOGY OF ENVIRONMENTAL STRESS AND DISEASES IN FISH/PRAWN AND THEIR CONTROL

Personnel **:** *Scientific* :
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Technical :
S. Bhowmick

Duration **:** April 1998-March 2003

Location **:** Barrackpore

During the period under report disease investigations were conducted in the water areas tabulated below :

Site	Habibpur (P1)	Gobardhanpur pond, Deganga (P2)	Meenakshi Gheri Nezat (P3)	Naihati (P4)
Water quality				
pH	8.1	8.3	8.7	8.5
Alkalinity (mg/l)	180-195	155.2	158	210
Hardness (mg/l)	272-320	120	243	200
UIA (mg/l)	Nil-0.1	0.63	0.2	0.3
DO (mg/l)	6.5-9.0	8-9.3	7.2-8.5	5.7
Salinity (ppt)	-	0.1%	0.7%	-
Bacterial load (per ml)		8500	12000	13000
Fish/prawn species affected	*L. rohita* *C. mrigala* *C. catla*	*L. rohita*	*P. monodon*	*L. rohita* *C. mcigala*
Pathogens isolated and identified	*Argulus* sp. *Thelophamellus catlae* *Tripartiella bulbosa*	*T. caudatus* *T. rohitae* *Yersinia ruckeri*	*Vibrio* sp.	*Argulus* sp.

Experiments on stress diagnosis in fish

Experiments were conducted on *R. rita* acclimated in the laboratory to determine and evaluate the response of some stress sensitive haematological parameters to (i) sublethal heat stress and (ii) low and high pH.

Sublethal heat stress

The sublethal temperature rise of 7 °C stressed the homeostatic mechanism of *R. rita* as was evident by hyperchlorestorelomia, hyperglycemia and pituitary activation reflected by interrenal ascorbic acid depletion and cortisol elevation. However within 72 hours there was recovery of the parameters to their normal levels.

pH stress

At pH 5.5 as well as 9.0 the elevation of cortisol was suppressed. The leucocrit percentage was higher in fishes at both the extreme pH conditions indicating stress. The hepatosomatic index value of fishes decreased at 72 hours and continued further for both the pH as fishes took less amount of food. Lipid metabolism was much more affected at pH 5.5 than 9.0. The hyperglycemic response was more pronounced at pH 5.5. In these experiments control pH was 7.8 ± 0.1.

A quantitative health assessment index for rapid evaluation of fish condition in the field was tried to evaluate the general health status of fish populations in river Hooghly from two sites one non-polluted and other relatively polluted.

Health assessment index (HAI) values for *R. rita* from Hooghly river (Samudragarh & Panihati)

Hooghly River (downstream)	HAI	SD	Coefficient of variance
Samudragarh, km 275 (Reference site)	26.5	32.97	124.41
Panihati, km180 (Contaminated site)	61.5	26.01	42.29

During the period specific aspects investigated were (i) Mortality of carp spawn, (ii) Vibriosis in *P. monodon,* (iii) Ulceration and gill rot in major carps.

Aetiological study : 16 bacterial and 2 fungal colonies were isolated and cultured from diseased fishes. Among these 4 bacterial isolates were tested for pathogenicity by intra peritoneal route and two were found to reproduce the disease with similar clinical

symptom in *L. rohita.* These two have been tentatively identified as *Yersinia ruckeri* by a series of biochemical tests.

Histopathological studies : Histopathological examination in ulcer affected fishes revealed necrotic changes in both anterior and posterior kidney. It showed hyperplasia and necrosis of the distal lammelar cells. 20 permanent slides have been prepared and 30 permanent slides of the various parasites isolated have been prepared.

PROJECT : BT/B/1

GENETIC CHARACTERIZATION AND MIGRATION RELATED BIOCHEMICAL CHANGES OF INDIAN SHAD, *TENUALOSA ILISHA*

Personnel : *Scientific* :
M. Sinha, A. Mukherjee, Shree Prakash, S.N. Singh, A. Hajra, M.P Brahmne, P. Maurye

Duration : April 2000-March 2005

Location : Barrackpore, Maldah, Allahabad, Vadodara

Migration related biochemical changes in *Tenualosa ilisha* were investigated on the test fish in the Hooghly-Ganga stretch between Sagar islands and Farakka. Also, for comparative studies, samples were drawn from estuarine continental shelf at Digha, Bay of Bengal. The details are given in Table.

With respect to genetic characterization of the Indian shad, *Tenualosa ilisha,* standard molecular biology technique like the Random Amplified Polymorphic DNA *(RAPD)* is being taken up for the investigations. Infrastructural facilities have been created and samples procured from proposed locations, have been stored. The studies are in progress.

Table. Physiological changes in *Tenualosa ilisha* during spawning migration in the river stretch between Sagar Island and Farakka in monsoon season, 2000

Parmeters	Digha (Est. continental shelf) Bay of Bengal	Hooghly-Bhaghirathi sampling points						Farakka	
		Sagar Island	Kakdwip	Diamond Harbour	Budge Budge	Kuntighat	Nabadwip	Feeder canal	Down stream Ganga
Water salinity (ppt)	21.69	20.78	3.18	0.07	0.06	0.04	0.04	0.03	0.03
Air temperature (°C)	29.5	31.0	30.8	31.0	30.9	26.0	25.5	31.5	30.0
Water temperature (°C)	28.2	30.0	28.9	28.0	28.8	24.2	24.2	29.6	28.4
(Group)									
Mean body weight (kg)	1.050	1.033	1.258	1.260	1.358	1.275	1.325	1.450	1.454
length (mm)	394	391	416	390	424	409	418	429	427
Sample size	(M) 4	4	6	6	0	2	2	6	6
	(F) 8	8	6	6	12	10	10	6	6
Mean Gonad weight	(F) 26.25	37.5	55.0	76.0	116.0	29.0	105.0	75.0	100.0
	(M) 5	2.5	1.0	3.0	-	1.0	1.0	1.0	1.0
Hydration level (%)	(M) 62.0	66.0	68.0	68.0	68.5	68.0	68.0	68.5	68.8
	(F) 62.0	65.5	67.0	67.5	67.5	67.9	67.5	68.2	68.9
Blood glucose (mg/100 ml)	(M) 50.0	50.5	52.0	53.5	55.0	51.0	53.0	55.0	56.5
	(F) 48.0	49.0	50.0	53.0	55.0	50.0	52.0	54.0	56.0
Liver glycogen (mg/g wet tissue)	(M) 18.0	16.0	15.8	15.5	12.0	13.0	10.5	9.5	9.0
	(F) 17.0	16.0	15.0	15.5	15.0	12.0	10.5	10.0	10.0
Muscle glycogen (mg/g wet tissue)	(M) 1.6	1.4	1.2	1.2	1.0	1.0	0.7	0.65	0.60
	(F) 1.5	1.4	1.1	1.1	1.0	1.0	0.8	0.75	0.60
Blood serum protein (g/100 ml)	(M) 4.2	4.7	4.9	4.3	4.5	4.2	4.7	4.80	4.70
	(F) 4.3	4.7	4.8	4.0	4.3	4.0	4.5	4.20	4.40
Muscle protein (mg/g wet tissue)	(M) 175	168	160	152	140	138	130	120	110
	(F) 170	165	150	150	135	135	125	120	100
Muscle total lipid (triglycerides) (mg/g wet tissue)	(M) 135	125	125	110	105	100	90	90	80
	(F) 130	115	110	100	85	85	67	65	60
RM/WM storage ratio	1.80	1.70	1.8	1.75	1.70	1.85	1.80	1.60	1.60
Gonadal lipid									
(% wet tissue)	10.0	10.5	11.0	12.0	13.0	13.0	13.5	13.5	13.5
Testis ovary	15.0	15.2	15.8	15.8	17.0	17.5	18.0	19.0	19.5

PROJECT : BT/B/2

DEVELOPMENT OF IMMUNOLOGICAL AND MOLECULAR TECHNIQUES FOR RAPID DIAGNOSIS OF BACTERIAL AND VIRAL DISEASES OF FISH AND SHELLFISH

Personnel : *Scientific :*
S.S. Mishra, S.K. Manna, A. Hajra, P. Maurye, M.P. Brahmne

Duration : April 2000-March 2005

Location : Barrackpore

Pathogenicity study of bacterial isolate

A pathogenic bacterium belonging to *Yersinia* sp. was isolated. Pathogenic trials of this isolate was carried out by intra-peritoneal (i.p.) inoculation of dilutions of bacterial culture in *Labeo rohita.* The bacterial isolate was found to be pathogenic and induced hemorrahages and caused mortality in *L. rohita.* From this bacteria, bacterial antigen was prepared using standard method. This purified bacterial antigen of *Yersinia* sp. was used for raising hyperimmune serum in rabbits. The antibody titer was tested by agglutination test.

Agglutination test : Agglutination test for detection of bacteria was used by employing known standard hyperimmune serum i.e. *Aeromonas hydrophila* antiserum and *Yersinia* sp. antiserum.

Dot immunoassay : Dot immunoassay was used for detection of *A. hydrophila* isolates using specific *A. hydrophila* antiserum.

SDS –PAGE : Polyacrylamide gel electrophoresis (PAGE) using Sodium dodecyl sulphate (SDS) detergent was used for analysing whole cell bacterial proteins.

Standardization of PCR : Different bacterial isolates and samples as above have been kept for analysis using PCR technique. Primers sequence specific for following pathogens have been collected and synthesized (by Bangalore Genei) *viz.* (i) *Vibrio parahaemolyticus, (ii) Vibrio cholerae, (iii) Aeromonas hydrphilla, (iv)* White spot syndrome virus (WSSV), (v) Monodon baculovirus (MBV).

PROJECT : RA/A/1

INLAND FISHERIES RESOURCE EVALUATION THROUGH REMOTE SENSING TECHNIQUES

Personnel **:** *Scientific* :
R.A. Gupta, D. Kumar, D. Nath, S.K. Mandal, Debabrata Das, S.K. Sahu
Technical :
S. Majumder, K. Jacquiline, A. Sengupta

Duration **:** April 1995-March,2002

Location **:** Barrackpore

Satellite data were procured from National Remote Sensing Agency, Hyderabad. The imagery received were analysed and the maximum and minimum values of intensity for red, green, blue and near infra red bands were measured. Attempt was made to correlate them with the water quality parameters such as transparency, dissolved oxygen. pH, specific conductivity, total dissolved. Solids, total alkalinity, free CO_2, chlorinity. salinity, NO_3, total nitrogen, PO_4, silicate, hardness, Ca, Mg, primary productivity (gross and net), respiration from selected water bodies in West Bengal during pre and post monsoon period. The results are presented in the Table. The significant relationship was found in case of water temperature, PO_4, NO_3, total nitrogen, silicate, gross primary production and respiration. It was obvious that electro magnetic radiation (EMR), the basis of satellite image, increase with the rise in temperature and the correlation was positive and significant.

Table Correlation coefficients for different parameters with various bands

Parameters	Correlation with red band		Correlation with blue band		Correlation with green band		Correlation with near infrared band		Multiple correlation coefficient
	max.	min.	max.	min.	max.	min.	max.	min.	
1.Water temp.	0.490**	0.723**	0.661**	-0.375*	0.869**	-0.342*	0.663**	-0.169	0.8217**
2.Transp.	-0.262	-0.173	0.061	-0.109	0.002	-0.162	-0.071	-0.005	0.3309 NS
3.D.O.	-0.081	0.009	0.032	-0.054	0.153	-0.153	0.194	-0.153	0.3656 NS
4.pH	-0.343*	-0.166	-0.011	-0.142	-0.039	0.364*	-0.143	-0.142	0.5637 **
5.Sp.cond.	-0.164	0.029	0.218	-0.125	0.106	-0.339*	-0.115	0.238	0.1095 NS
6.Total alk.	-0.270	-0.272	-0.094	-0.006	-0.220	0.004	-0.218	-0.19	0.1922 NS
7.Free CO2	-0.11	-0.194	-0.259	-0.386*	-0.198	-0.041	-0.090	0.153	0.1318 NS
8.Chlorinity	0.075	0.250	0.298	-0.132	0.364*	-0.111	0.132	-0.056	0.3894 NS
9.Salinity	0.153	0.313	0.468**	-0.132	0.415*	-0.111	0.172	-0.056	0.4152 *
10.PO4	0.149	0.385*	0.469**	0.569**	0.460**	0.647**	0.258	-0.608**	0.2589 NS
11.NO3	0.567**	0.612**	0.708**	0.647**	0.698**	0.603**	0.478**	0.563**	0..6475**
12.Total N	0.259	0.310	0.470**	0.325*	0.312	0.380*	0.101	0.218	0.5465**
12.Silicate	-0.317	-0.380*	-0.462**	-0.241	-0.389*	-0.024	-0.389*	-0.206	0.3525 NS
13.Hardness	0.079	0.225	0.458**	0.358*	0.375*	0.122	0.150	-0.009	0.2780 NS
14.Ca	0.187	0.371*	0.575**	0.343*	0.518**	0.138	0.216	-0.014	0.4178*
15.Mg	0.006	0.023	0.091	0.080	0.043	0.080	0.016	-0.001	0.0291 NS
16.Gross p. p.	0.121	0.292	0.340 *	0.466**	0.501**	0.650**	0.372*	0.270	0.6112**
17.Net p.p.	0.038	0.145	0.215	0.377*	0.286	0.848**	0.213	0.287	0.3813 NS
18.Respiration	0.207	0.420**	0.420**	0.455**	0.664**	0.355*	0.491**	-0.012	0.7757 **

**-Significant at 1% level, *-Significant at 5% level and NS-Not significant.

GIS was created on the basis of data collected from the field of the above mentioned two districts. The satellite imagery of the West Bengal was used to sketch the vector maps of water bodies. The data structure of GIS included 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) and respiration.

PROJECT : RA/A/2

ASSESSMENT OF FISH CATCH AND CATCH STRUCTURE FROM DIFFERENT INLAND OPEN WATER SYSTEMS IN INDIA

Personnel **:** *Scientific* :
S.K. Mandal, Debabrata Das, S.K. Sahu
Technical :
S. Majumder, K. Jacquiline, N.C. Mandal, H.K. Sen, Ramji Tewari, J.P. Misra, Alok Sarkar, M.F. Rahman, R.C. Mandi, C. Lakra, H.C. Banik, C.K. Vava

Duration **:** April 1999- March, 2004

Location **:** Barrackpore

The data on various inland water systems were collected at different centres of the Institute. These data have been utilized to create a database for future use. As the fishing activities vary from one system to the other, different sampling methodologies were adopted for data collection.

Stratified multistage sampling was followed for data collection from Hooghly-Matlah estuarine system. Monthly catch estimates were worked out species-wise and gear-wise. The maximum catch was recorded in the month of November. This is due to winter migratory fishery in the lower Sunderban region. During 2000-2001 the catch of *Tenualosa ilisha* was maximum in the estuary. *Harphodon neherius, Pama pama, Trichurus* and *Setipinna* species were also significant contributors to the fishery .The bagnet catch was the highest in the estuary and was followed by drift net catch. GIS had been created on the database of Hooghly estuary .

Only one centre at Sadiapur was selected for recording catch from the Ganga river system at Allahabad. Systematic sampling was followed for selection of sampling days in a month. A catch of only 56 t of fish and prawn was recorded for the centre during the year.

Among the species landed *C. garua* dominated the catch followed by *Mystus aor, Rita rita* and *E. vacha.* The catch from the river was high during July and November.

The catch from Yamuna river and West Yamuna canal near Kamal in Haryana was not of a high order. However, catch data was collected at selected places to know the trend of catch and catch structure. The centres were Panipat, Yamuna Nagar and Karnal. The catch at Panipat was higher than the other two centres. Among the species *Labeo bata* was dominant at Yamuna Nagar, *Cyprinus carpio* at Karnal and Panipat. The catch from Yamuna river canal was dominated by *C.carpio.*

One centre was selected for recording the catch from the river Bramhaputra at Guwahati. Systematic sampling was followed for the selection of days in a month. Complete record of catch was taken from Uzanbazar where most of the catch was disposed. The data revealed that the catch during September-October was high compared to other months. *L. dero* was the dominant species followed by *C. reba, A. morar, L. bata* and *L. calbasu.*

The catch from Narmada river was recorded from four markets and six landing centres. The catch structure showed *Tenualosa ilisha* to be the dominant species followed by *Macrobrachium rosenbergii, Mystus seenghala* and *Liza parsia.*

PROJECT : EX/A/1

DEMONSTRATION OF PEN CULTURE TECHNOLOGY

Personnel **:** *Scientific* :
M.K. Mukhopadhyay, D. Nath
Technical :
Sukumar Saha, A. Mitra

Duration **:** July 1999-June,2001

Location **:** Barrackpore

Demonstration on pen culture was undertaken at Suguna and Amda *beels* in Nadia District of West Bengal.

Amda *beel*

Monoculture of *M. rosenbergii*

In monoculture system prawn grew to an average size of 138.6 mm/35.7 g and 148.2 mm/57.05 g from the initial size of 100 mm/6gm at a stocking density of 21,000 nos/ha. Feeding with molluscan meat was continued at the rate of 10% of the body weight. A production of 588 kg/ha prawn was obtained in 95 days of operation.

Carp culture

In mixed culture system with Indian and exotic carps *L. rohita* grew from 14.2 mm/65g to 105 mm/140g; *C. mrigala* from 180 mm/60 g to 225 mm/92 g; Grass carp 168 mm/40 g to 240 mm/650g within 95 days rearing period at a stocking density of 5,000 nos/ha. The fishes were fed with conventional feed mix of rice bran and mustard oilcake at the ratio of 2% of body weight and grass carp was fed with the macrovegetation present in the *beel.* A production of 1108.4 kg/ha of carp was obtained in 95 days of culture operation.

Suguna *beel*

Monoculture of *M.rosenbergii*

Gaint freshwater prawn attained an average size of 134.6 mm/38.4 g to 145,02 mm/49.3g in 92 days from initial size of 120 mm/6.5 g at a stocking density of 25,000/ha stocking density. Supplementary feeding with pelleted feed was done @ 4% of body weight. A production of 483.8 kg/ha of prawn was harvested in 92 days of culture.

5 TECHNOLOGY ASSESSED AND TRANSFERRED

Extension activities

KRISHI VIGYAN KENDRA

Krishi Vigyan Kendra, Kakdwip

Krishi Vigyan Kendra of CIFRI, Kakdwip has been launched with its specific objectives based on prescribed mandate. Conducted on-farm testing entitled "Testing of Integrated Rice-cum-fish culture technique to increase production and productivity", during Kharif 2000 and resulted excess return of Rs.79,620.00 from this integration. Other experiments entitled "Increasing productivity of green-gram by *Rhizobium inoculation*, adopting new varieties PDM-54 and K-851 in farmer's field. The front-line demonstrations of Kharif rice resulted maximum yield of variety MTU-7029 (50 qtl/ha) followed by CR 1017 (49.25 qtl/ha), IET 5656 (48.75 qtl/ha), NC 492 (41.25 qtl/ha) and Dudheswar 40.50 qtl/ha at a uniform NPK dose of 60:30 : 30 kg/ha in coastal saline zone (Table).

Table Results of testing of integrated rice-cum-fish culture techniques to increase production and productivity

Sl.No.	Varieties	Production Rice	Fish & Prawn (Qtl/ha)	Cost of production (Rs/ha)	Return from Rice & Fish (Rs/ha)	Profit from Rice-cum-fish & prawn (Rs./ha)
1	IET-5656	48.75	22.90	1,46,250.00	2,25,000.00	78,750.00
2	NC-492	42.00	23.00	1,26,000.00	2,17,200.00	91,200.00
3	MTU-7029	51.00	22.00	1,53,000.00	2,17,200.00	64,200.00
4	CR-1017	50.00	24.90	1,50,000.00	2,34,000.00	84,000.00
Average performance		47.94	23.20	1,43,810.00	2,23,430.00	79,620.00

Under FLD on oilseeds and pulses, mustard variety RW-351, sesamum variety Imp. Sel. 5 and green gram variety PDM-54 has been advocated by involving 75, 35, 20 farmers demonstrator with approved recommendation, resulted 54.54%,54.86%,37.06% respectively (Table) increased yield over farmers' practice. During this period under report 5 disciplines *viz.* Fishery, Agronomy, Horticulture, Animal Science and Home Science conducted 23, 18, 18, 12, 26 under off-campus and training for extension functionaries (Table) and 5, 5, 4, 3, 3 under on-campus vocational training were conducted by involving 2189 and 200 (Table) beneficiaries to update their knowledge and skill in adopting technologies. A massive extension programme has been launched with the cooperation from scientists and technologists of the Kendra to increase production and productivity of the Coastal Saline Zone of West Bengal.

Technology Assessed and Transferred

During the period under report five number of. technologies had been transferred after assessment through Front line demonstration programme and on- farm testing. The details of achievements are cited below :

Table. Details of results obtained under FLD programme

Sl. No	Crop	No. of demonstrations	Name of varieties	Duration (days)	Grain/seed character	Gram yield (qtl/ha)	NPK (kg/ha) applied	Percent increase in yield
1	Kharif rice	4	Swarna (IET-5656	142	Bold, coarse	48.75	60:30:30	59.84
2	Kharif rice	4	Swarna Mashuri (MTU-7029)	142	Bold, fine	50.00	60:30:30	63.93
3	Kharif rice	4	Dharitri (CR-1017)	158	Bold, coarse	49.25	60:30:30	61.47
4	Kharif rice	4	Sabita (NC-492)	157	Long, fine	41.25	60:30:30	35.24
5	Kharif rice	4	Dudheswar	145	Bold, fine	30.50	60:30:30	Control
6	Mustard	75	Bhagirathi (RW-351)	110	Small, fine	10.20	80:40:40	54.54
7	Sesamum	35	Improved Selection-5 (Rama)	85	Small, fine	-	40:20:20	-
8	Green gram	20	PDM-54	80	Medium, Coarse, Bold	-	20:40:40	-

Table. Technology Assessment and Transfer

Sl. No	Name of technology assessed/trans-ferred	No. of farmers demons-trated	Area under demons-tration (ha)	Adoption		Diffusion No. of farmers	Prpdictopm		% increase over farmer's practice (%)
				No. of farmers	%		Farmers practice (qtl/ha)	Techno-logical interven-tion (qtl/ha)	
1	Freshwater Scampi farming	10	1.5	4	40	5	3.0	4.20	40
2	Polyculture of fin fish & shell fish	10	1.5	4	40	6	2.5	4.10	64
3	Paddy-cum-fish farming	10	1.5	5	50	6	P-30.60 F-8.65	47.94 23.25	56.66 168.78
4	Duck-cum-fish farming	10	1.5	3	30	12	E-120 F-12.0	E-200 F-24.0	66.66 100
5	HYV Kharif rice production	20	5.0	20	100	28	30.50	47.31	55.11

P – paddy, F – fish & prawn, E – eggs/bird/year, Q – quintal, ha – hectare, % - percentage

Table. Training programme : On-Campus (April 2000 - March 2001)

Description	No. of course	No. of participants			Scheduled Caste			Scheduled Tribe			Others		
		M	F	Total	M	F	Total	M	F	Total	M	F	Total
Fishery	5	30	20	50	17	13	30	-	-	-	13	7	20
Agronomy	5	30	20	50	15	10	25	-	-	-	15	10	25
Horticulture	4	40	-	40	19	-	19	2	-	2	19	-	19
Animal Science	3	20	10	30	5	2	7	10	-	10	5	8	13
Home Science	3	-	30	30	-	10	10	-	5	5	-	15	15
Total	**20**	**120**	**80**	**200**	**56**	**35**	**91**	**12**	**5**	**17**	**52**	**40**	**92**
A) Practising Farmer													
Fishery	2	10	10	20	4	6	10	-	-	-	6	4	10
Agronomy	2	20	-	20	10	-	10	-	-	-	10	-	10
Horticulture	2	20	-	20	9	-	9	-	-	-	11	-	11
Animal Science	2	20	-	20	5	-	5	10	-	10	5	-	5
Home Science	1	-	10	10	-	5	5	-	-	-	-	5	5
Total	**9**	**70**	**20**	**90**	**28**	**11**	**39**	**10**	**-**	**10**	**32**	**9**	**41**
B) Rural Youth													
Fishery	3	20	10	30	13	7	20	-	-	-	7	3	10
Agronomy	3	10	20	30	5	10	15	-	-	-	5	10	15
Horticulture	2	20	-	20	10	-	10	2	-	2	8	-	8
Animal Science	1	-	10	10	-	2	2	-	-	-	-	8	8
Home Science	2	-	20	20	-	5	5	-	5	5	-	10	10
Total	**11**	**50**	**60**	**110**	**28**	**24**	**52**	**2**	**5**	**7**	**20**	**31**	**51**

Table. Training Programme : Off-Campus (April 2000 - March 2001)

Description	No. of course	No. of participants			Scheduled Caste			Scheduled Tribe			Others		
		M	F	Total	M	F	Total	M	F	Total	M	F	Total
Fishery	23	417	163	580	166	60	226	30	6	36	221	97	318
Agronomy	18	200	180	380	55	65	120	60	40	100	85	75	160
Horticulture	18	255	160	415	117	83	200	23	12	35	115	65	180
Animal Science	12	160	-	217	33	17	50	-	-	-	127	40	167
Home Science	26	-	597	597	-	202	202	-	-	-	-	395	395
Total	**97**	**1032**	**1157**	**2189**	**371**	**427**	**798**	**113**	**58**	**171**	**548**	**672**	**1220**
A) Practising Farmer													
Fishery	12	216	94	310	77	33	110	16	4	20	123	57	180
Agronomy	7	85	65	150	15	25	40	30	10	40	40	30	70
Horticulture	11	166	108	274	74	61	135	19	9	28	73	38	111

Animal Science	7	110	42	152	20	12	32	-	-	-	90	30	120
Home Science	13	-	298	298	-	98	98	-	-	-	-	200	200
Total	**50**	**577**	**607**	**1184**	**186**	**229**	**415**	**65**	**23**	**88**	**326**	**355**	**681**
B) Rural Youth													
Fishery	10	186	68	255	85	27	112	14	2	16	87	40	127
Agronomy	9	85	85	170	30	30	60	20	20	40	35	35	70
Horticulture	6	83	48	131	40	20	60	4	3	7	39	25	64
Animal Science	4	40	15	55	10	5	15	-	-	-	30	10	40
Home Science	12	-	289	289	-	102	102	-	-	-	-	187	187
Total	**41**	**394**	**506**	**900**	**165**	**184**	**349**	**38**	**25**	**63**	**191**	**297**	**488**
C) Extension functionaries													
Fishery	1	15	-	15	4	-	4	-	-	-	11	-	11
Agronomy	2	30	30	60	10	10	20	10	10	20	10	10	20
Horticulture	1	6	4	10	3	2	5	-	-	-	3	2	5
Animal Science	1	10	-	10	3	-	3	-	-	-	7	-	7
Home Science	1	-	10	10	-	2	2	-	-	-	-	8	8
Total	**6**	**61**	**44**	**105**	**20**	**14**	**34**	**10**	**10**	**20**	**31**	**20**	**51**

Individuals who called on office

A total 304 clientele owning 346 ponds, 12 bheries, 2 jheels, 11 entrepreneurs, 22 extension functionaries of State fisheries departments and 8 officers of State development departments/NGOs called on office during the period.

Exhibition

The Institute participated in 2 exhibitions with charts and posters to depict works and achievements:

The Institute participated in the exhibition organised at the time of First Indian Fisheries Congress during 21-23 September 2000 in Chandigarh.

The Institute participated in the Netaji Subhash Mela at Purulia during January 17-24, 2001 organised by Govt. of West Bengal.

Mass awareness campaigns:

Two campaigns were organised in coastal districts of West Bengal for mass awareness towards conversation of fish/prawn seed. A huge mass especially fish seed collectors of the area were educated to stop destruction of fish/shell fish seed. Proper linkage was established with the local Panchyat bodies to monitor the same. Leaflets were distributed to the mass for strengthening the approach.

6 EDUCATION AND TRAINING

Training on Computer Application

A six day training programme was organised by the Institute from 24-29 July, 2000. The course was organised on the request of Indian Science Congress Association, Calcutta and attended by seven participants of the Association. The training was imparted on computer O/S concepts, concepts of information technologies, internet and networking and library information system.

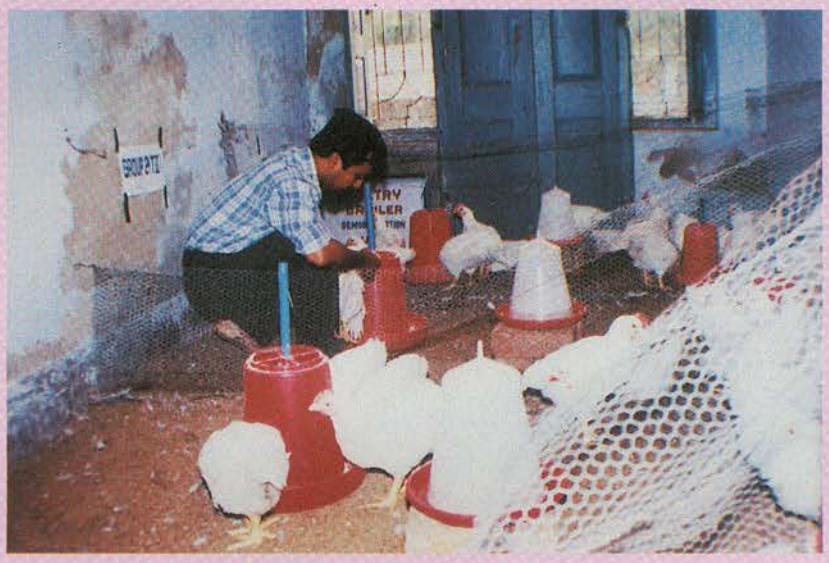
Training Programme on Beel Fisheries in Assam

The Central Inland Capture Fisheries Research Institute (CIFRI) conducted a training programme on Development and Management of Floodplain Wetland *(beel)* Fisheries of Assam at its Northeastern Regional Centre at Guwahati from September 4 to 11, 2000. The training was meant for the *beel* managers of the Assam Fisheries Development Corporation (AFCC). The eight-day long training was inaugurated by Dr. S.C. Pathak, Chief General Manager, National Bank for Agriculture and Rural Development (NABARD), Guwahati.

Mr. Arun Kumar, Commissioner and Secretary Fisheries, Govt. of Assam presided and Mr. S. Nath, Managing Director, AFDC and Dr. U.C. Goswami, Professor & Head, Dept. ofZoology, Guwahati University were the guests of honour. Mr. A.K. Phukan, Director of Fisheries, Assam distributed the certificates at the end of the training programme.

Training programme on Sewage-fed Wetland Fisheries

The Calcutta Research Centre in collaboration with the 24-Parganas Fish Producers Association organised a two-day training programme on different aspects of sewage-fed fisheries with particular reference to the sewage-fed fisheries in the outskirts of the Calcutta City, during 29-30 September, 2000. The trainees, representing different sewage fed wetlands were imparted theoretical and practical training.



Krishi Vigyan Kendra, Kakdwip
Demonstration on poultry farming

Krishi Vigyan Kendra, Kakdwip
Farmer's field visit of KVK scientists

Scientific Advisory Committee meeting of KVK, Kakdwip

On-campus training on net weaving for farm women

CIFRI Pavalion in the Netaji Subhash Mela at Purulia

Training on Pen Culture of fish and prawn

A 5-day training on Pen culture of fish and prawn, sponsored by the Directorate of Extension, Ministry of Agriculture, Govt. of India, New Delhi was organised at the Institute during December 11-15, 2000 for the extension functionaries of West Bengal. The extension functionaries of Department of fisheries, Govt. of West Bengal and technical officers of Krishi Vigyan Kendra participated in the training.

- 10 day training course was organised for fish famers of Madhubani, Bihar during May 22-31, 2000. Eighty farmers participated.
- A 10 day National training course on Management of small reservoirs sponsored by Directorate of Extension, Govt. of India was organised by the Institute during February 12 to 21,2001. Deputy Director of Fisheries from various states attended the course.
- On job training programme for the course on Industrial Fisheries was imparted to 84 students of Ganga Singh College, Bihar, Sitananda College and Ramnagar College in West Bengal during March to May 2001.

Man Power Development

- Dr. V. V. Sugunan, Principal Scientist, represented India to participate in the Workshop to produce a resource book on "Utilizing different Aquatic Environments for Small Scale Aquaculture organised by the International Institute of Rural Reconstruction (IIRR), Cavite, Philippines from 18-28 September, 2000.

- Sarvasri Ganesh Chandra, R.K. Manna, Ritish Saha and Sanjeev Kr. Sahu, Scientists, were deputed for 71 st FOCARS Programme for the ARS Scientist probationers conducted by NAARM, Rajendranagar, Hyderabad, from 25th August - 22nd December 2000. Another batch consisting Sarvasri Nagesh Kumar Barik and D. Karunakaran, Scientists have been deputed to attend 72nd FOCARS Programme for the ARS Scientist probationers during the period from 1st December 2000 to 31st March 2001 conducted by NAARM, Hyderabad.

- Dr. D. Kumar, Senior Scientist attended training course on "Agricultural Research Prioritization techniques" conducted at NAARM, Hyderabad from 21st August to 26th Augast, 2000 under NATP programme of ICAR.

7 AWARDS AND RECOGNITIONS

- Dr. R.S. Panwar, Principal Scientist was awarded Fellowship of Indian Society of Agricultural Chemists, Sheila Dhar Institute of Soil Science, University of Allahabd.

➢ Dr. A.K. Laal and Dr. Shree Prakash, Senior Scientists were awarded fellowship by the Bioved Reseafch Society, Allahabad.

➢ Dr. Kalpana Srivastava, Technical Officer was awarded Young Scientist Award by the Bioved Research Society, Allahabad.

➢ Ms. Sukla Das, Technical Officer was awarded the Best Technical Personnel Award by the International Society of Environmental Protection (ISEP) Science Academy, Gorakhpur .

➢ Dr. P.K. Sukumaran, Senior Scientist performed as a member of the Scientific Advisory Committee, Regional Station of the Kerala Agriculture University, Kumarakom, Kottayam.

➢ Sri P. Muraleedharan, LDC of the Institute received Best Men Athelete Award winning two individual Gold Medals and three Silver in the ICAR Zonal Sports Meet held at CARI, Izatnagar, Bariely. He also received the Best Men Athelete title winning two Gold and a Bronze at the Inter Zonal Meet held at CIFE, Mumbai.

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

Consultancy projects

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

The Floodplain Wetlands Division is a collaborating Centre for the NATP Project, Germplasm inventory and gene banking of freshwater fishes run by the Natlonal 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.

Dignitories of the inaugural session of the training programme on beel fisheries

Interaction with participants of the training programme on sewage fed wetland

A workshop session in progress

Participants in group discussion

Trainees learning by doing

Shri P. Muraleedharan receiving the best athelete award in the sport meet

The Commissionerate of Fisheries, Government of Gujarat, Gandhinagar has identified a sponsored project on "Feasibility Studies for Fish Production Enhancement in Selected Reservoirs of Gujarat State" is being executed at Vadodara centre of the Institute.

Linkages have been made with National Remote Sensing Agency, Hyderabad to procure satellite maps. The help of the Institute of Wetland Management and Ecological Design, Kolkata and NATMO, Salt Lake, Kolkata has been taken for using their wetland and other maps.

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

10 LIST OF PUBLICATIONS

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

Project No.	Name of Project
RI/A/I	ECOLOGY AND PRODUCTION RELATIONSHIPS IN PENINSULAR RIVER SYSTEMS
RI/B/I	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
ES/B/3	STUDIES ON HILSA FISHERIES IN THE STRETCH BETWEEN FARAKKA AND SAGAR ISLAND
RS/A/I	ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS
RS/A/2	STUDIES ON ECOLOGY AND FISHERIES OF RESERVOIRS OF EASTERN UTTAR PRADESH
FW/A/3	ECOLOGY, FISHERY BIOLOGY AND FISH PRODUCTION DYNAMICS OF FLOODPLAIN WETLANDS IN INDIA
FW/A/5	FISH PRODUCTION DYNAMICS OF FLOODPLAIN WETLANDS OF UTTAR PRADESH
FW/A/6	FISHERY AND BIOLOGY OF SELECTED PRAWN SPECIES IN KAYAMKULAM BACKWATER
EM/B/1	ASSESSMENT OF ENVIRONMENTAL IMPACT ON BIOTIC COMMUNITY IN RIVERS AND ASSOCIATED ECOSYSTEMS
EM/B/2	AETIOLOGY, PATHOPHYSIOLOGY OF ENVIRONMENTAL STRESS AND DISEASES IN FISH/PRAWN AND THEIR CONTROL
BT/B/1	GENETIC CHARACTERIZATION AND MIGRATION RELATED BIOCHEMICAL CHANGES OF INDIAN SHAD, *TENUALOSA ILISHA*
BT/B/2	DEVELOPMENT OF IMMUNOLOGICAL AND MOLECULAR TECHNIQUES FOR RAPID DIAGNOSIS OF BACTERIAL AND VIRAL DISEASES OF FISH AND SHELLFISH
RA/A/1	INLAND FISHERIES RESOURCE EVALUATION THROUGH REMOTE SENSING TECHNIQUES
RA/A/2	ASSESSMENT OF FISH CATCH AND CATCH STRUCTURE FROM DIFFERENT INLAND OPEN WATER SYSTEMS IN INDIA
EX/A/I	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 Uttar Pradesh	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 Maharashtra	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 the World 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

Annual Staff Research Council Meeting

The Annual Staff Research Council Meeting of the Institute was held on 13-14 May, 2000. Welcoming Dr. B.N. Singh, ADG (Fy), ICAR, Dr. M. Sinha, Director, CIFRI

hoped that his presence would be valuable for constructive evaluation of the research projects. The Project leaders presented the progress achieved under all the seventeen research projects. After extensive deliberation future project work for 2000-2001 was decided.

Management Committee Meeting

The Research Advisory Committee meeting of the Institute was held at CIFRI, Barrackpor on 12th May, 2000 under the Chairmanship of Prof. H.P.C. Shetty and attended by the by the members *viz,* Dr. P. Das, Dr. J.R.B. Alfred, Dr. V.C. George, Mr. Susanta Halder, Mr. B.K. Mondal and Dr. M. Sinha. After discussion on the Action Taken Report of the last meeting, the Heads of Divisions presented the progress and achievements under various projects. After elaborate deliberations on individual projects recommendations for future research programmes were formulated.

Quinquinneal Review Team evaluates research progress of CIFRI

The QRT reviewed the project of Vadodara. centre on July 6, 2000 and the various projects under the Fish Health and Environment, Estuarine and Resource Assessment Division at Barrackpore on September 11-16, 2000. The final draft of the report was submitted to the Institute Management Committee meeting held on December 23, 2000. Suggestions made by Institute Management Committeee were incorporated in the report which is now in final stage of submission to ICAR.

Management Committee Meeting

The Institute Managment Committee meeting was held on 23rd December, 2000 was attended by Dr. B.N. Singh, ADG (F), ICAR and Dr. K.V. Devaraj, Chairman, QRT in addition to other members of the Committee.

The QRT Report was tabled by the Chairman which was discussed in detail by the Institute Management Committee along with other agenda items for onward transmission to ICAR.

Joint Staff Council Meeting

The Joint Staff Council meeting of CIFRI was held on 26th December 2000 at Barrackpore under the Chairmanship of Dr. M. Sinha, Director. The members (official side as well as the staff side) attended the meeting and deliberated on the agenda.

Scientists participating in the deliberation during SRC

RAC meeting in progress

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

The scientists and technicians of the Institute participated in various conferences/symposia/seminars/workshops and meetings held during April 2000 to March 2001, 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 AP Cess Fund project on 'Techno-Socio-Economic Status of Fisheries of River Ganga' held at CIFRI, Allahabad on 6 April 2000	-	M. Sinha
Seminar on 'Environment and Agrobased activities' organised by Institution of Public Health Engineers, India and Institute of Agriculture, Visva Bharati, Sriniketan during 22-23 April 2000	Preliminary study on Environmental impact assessment of the Hooghly estuary at Haldia	M.K. Mukhopadhyay, K. Chandra, S. Samanta, K. Mitra, S. Manna & S. Bandopadhyay
-do-	Mass awarness – the striking prong to abate pollution in aquatic eco-systems	Utpal Bhaumik & S.K. Saha
State Level Workshop on 'Oilseeds and Pluses' and Finalisation of Revised Action Plan 2000-2001 of KVK, Kakdwip, held at BCKVV, Kalyani, during 16-17 May 2000	-	R.L. Sagar
Workshop on 'Bridging gaps for attaining self sufficiency in inland fish production at dawn of the new millennium' held at Bangla Academy, Kolkata on 22nd June 2000	Delivered Key-note Address	M. Sinha
-do-	-	D. Kumar
Workshop on 'Satellite Data Products and Services' held at ATIM, Salt Lake, Kolkata, organised jointly bty NDC, NRSA, DOS, Govt. of India and State Remote Sensing Centre, Dept. of Science & Technology and NES, Govt. of West Bengal on 28th July 2000	-	S.K. Mandal
State Level Workshop for KVKs of West Bengal, A & N Islands to review progress of work from November 1999 to July 2000, held at BCKVV, Kalyani, on 19th August 2000	-	R.L. Sagar

National Conference on 'Sustainable Development' organised by Paryavaran Awoure Swasthya Prabandh Santhan and ISEP Science Academy, Gorakhpur, during 28-30 August 2000	Abundance of water quality composition of periphyton communities in some full streams of Arunachal Pradesh	S.D. Gurumayum, P. Daimari and M. Choudhury
National Symposium on 'Bhartiya Jal-Krishi abong Tatbartiya Kshetra' organised and held at CIFE, Mumbai on 7 September 2000	Delivered lecture	M. Sinha
Workshop on 'Utilizing different aquatic environments for small scale aquaculture', Cavite, Philippines, 18-28 September, 2000	Delivered lecture on – 1. Culture based fisheries in India 2. Integrated development of wetlands in India	V.V. Sugunan
First Indian Fisheries Science Congress, organised by Indian Society of Fisheries Professionals, Mumbai, at Punjab University, Chandigarh, from 21-23 September, 2000	Status and FutureStrategies for Development of Fisheries of Inland Open Waters in India	M. Sinha
-do-	Optimal input use plan for reservoir fisheries in Himachal Pradesh	P.K. Katiha, Y.S. Negi & S.C. Tewari
-do-	Observations on resting sites of *A. seenghala* (Sykes) in riverine habitrat	R.N. Seth
-do-	On the rate of deposition of periphyton in flooding water	Sree Prakash
-do-	Present senario of riverine fishing methods with special response to large sized catfishes *Aorichthys* spp.	R.N. Seth & P.K. Katiha
-do-	Impact of tributary Sone on the water quality and production dynamics of river Ganga	R.S. Panwar, V. Pathak, L.R. Mahvar & J.P. Mishra
-do-	Post impoundment changes in Bias river after Pong Dam emergence	V.K. Sharma
-do-	Evaluation of fish biomass and community structure in thecontext of environmental modifications in upper stretches of river Yamuna	Usha Moza & D.N. Mishra
-do-	Limnology and productivity of Badkhal lake, Haryana	D.K. Kaushal & V.K. Sharma
-do-	Considerations for doubling fish production and dessired extension approaches	Utpal Bhaumik, S.K. Saha & A. Migtra

First Indian Fisheries Science Congress, organised by Indian Society of Fisheries Professionals, Mumbai, at Punjab University, Chandigarh, from 21-23 September, 2000	-	Balbir Singh, A.K. Laal, B.K. Singh
Regional Seminar on 'Recent trend in zoology' held at NEH University, Shillong on 14th September 2000	Studies on plankton in relation to physico-chemical qualities of rivers in Meghalaya	S.D. Gorumayum, P. Daimari, B.S. Goswami, Alok Sarkar & M. Choudhury
State Level Workshop cum Training Programme on Oilseeds & Pulses 2000-2001, held at BCKVV, Mohanpur on 28 September 2000	-	P.K. Dhara
International Symposium on 'Information Technology, People's Development and culture', organised by Indian Academy of Soil Sciences at Allahabad during October 17-21, 2000	Database needs for informatics for sustainable inland fisheries development	R.A. Gupta & S.K. Mondal
National Symposium on 'Management of Inland Aquatic Resources – a Fisheries Perspective' organised and held at GB Pant University of Agriculture & Technology, Pant Nagar, U.P., during 1-2 November 2000	Management of inland aquatic resources – a fisheries perspective	M. Sinha
National Seminar on 'Conservation of Biodiversity and Coastal aquaculture', Department of Marine Biology, Karnataka University, Karwar, during 6-8 November 2000	Informatics on fish disease and its diagnoses	D. Das & R.A. Gupta
-do-	Informatiics on fish pathogens	Debabrata Das
Symposium of National Academy of Sciences India, held at Allahabad during 3-6 November 2000	Spatio-temporal distribution of plankton in relation to physico-chemical features in a peninsular lake	D.N. Singh & A.K. Das
-do-	Anthropogenic influence on river Ghagra	A.K. Laal
-do-	On certain aspects of breeding behaviour of a large catfish *Aroichthys seenghala* (Sykes) with special reference to its aquaculture management	R.N. Seth
National Workshop on 'Sustainable fisheries in India', organised at National Academy of Agricultural Sciences at Chennai during November 2000	Sustainable capture and culture-based fisheries in freshwaters of India	V.V. Sugunan & M. Sinha

Annual Zonal Workshop for KVKs, held at R.K.M. Ashram, Narendrapur, South 24 Parganas, during 2-4 December 2000	-	R.L. Sagar
International Conference on 'Statistics, Combinatories and related areas' and the seventh International Conference of the form for interdisciplinary Mathematics, organised by Department of Mathematics, Indian Institute of Technology, Bombay during 19-21 December 2000	Exact dominance of Stein rule estimator over feasible generalized least squaries estimator	R.K. Tyagi & Aroop Chaturvedi
National workshop 'Adhunik Jal Kheti' held at CIFA, Bhubaneswar, during 12-13 December 2000	Tegra Machli ki utpadan ki sambhavana	R.N. Seth
Scientist Advisory Committee meeting of KVK of CIFRI, Kakdwip, held at Kakdwip, on 27 December 2000	-	R.L. Sagar, J.G. Chatterjee, A.K. Chottopadhyay, S.K. Sadhukhan, M. Sen (Miss), C.N. Mukherjee, P.K. Dhara
88th Indian Science Congress held at Delhi during 3-7 January 2001	Length-weight relationship and relative condition index of *Notopterus notopterus* (Pallas) of Tilaiya Reservoir, Bihar	M.a. Khan
-do-	Investigations on the ecology of saline wetlands and assessment of aqua-crop productions from such water bodies	A.K. Ghosh, AmitabhaGhosh, H.C. Karmakar & R.N. Mishra
-do-	Fish productivity of two ecologically different ponds with reference to crops and air-breathing fishes	Dhirendra Kumar
-do-	-	A.K. Ghosh
National Symposium on 'Fishery Technologies and their Commercialization' organised and held at CIFE, Mumbai, during 11-12 January 2001	Inland Capture Fishery – The Future Strategies	M. Sinha
60th Annual Conference of Indian Society of Agricultural Economics, held at Institute for Studies in Population, Agriculture and Rural Change, University of Kalyani, during 22-24 January 2001	The impact of Contractual arrangements for land and labour in riverine fisheries in India	P.K. Katiha & M. Sinha

Workshop on Fisheries Management in the Lentic Water System : Stocking of Reservoirs with Fish Seed held at CIFRI, Barrackpore during 29-31 January 2001	Delivered lecture on Fisheries Statistics in Reservoir Fisheries with special emphasis on sampling techniques	S.K. Mandal
-do-		U. Bhaumik, Sukumar Saha, Debabrata Das & S.K. Sahu
-do-	Delivered lecture on Standard methods of biological examination of plankton and benthos	D. Kumar
National Symposium on the Environment and its Management in Allahabad : An Overview, organised by Botany Department, CMP Degree College, Allahabad from February 18-19, 2001	The sources of water pollution and environment management system in India	P.K. Katiha & R.N. Seth
-do-		R.S. Panwar, R.N. Seth & V. Pathak
3rd Indian Agricultural Scientist and Farmer's Congress, Bioved Research & Communication Centre, Allahabad during 3-5 February, 2001	Seed production of Ganga river prawn *Macrobrachium gangeticum* using indigenous materials	Shree Prakash
-do-	Macrophytic association of flora and fauna in ox-bow lake (Beels)	Shree Prakash
-do-	-	R.S. Panwar, A.K. Laal, R.N. Seth & Kalpana Srivastava
Workshop on 'Biological Database through Oracle' held at Bio-Informatids Centre, Bose Institute, Calcutta during February 28 to 2 March, 2001	-	Debabrata Das & Sucheta Majumdar
National Seminar on Recent advances in Life Science, Manipur University, Imphal during 2-3 March, 2001	Seasonal variation in the abundance and composition of plankton of Imphal-Manipur River	S. D. Gurumayum, P. Daimari & M. Choudhury
National Seminar on 'Fish Health and Management' sponsored by UGC and held at L.N. Mithila University, Darbhanga, Bihar, during 25-26 March, 2001	-	M. Sinha

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

Summer School on "Environmental Impact Assessment of Inland Waters for Sustainable Fisheries Management and Conservation of Biodiversity"

A Summer School on ***'Environmental Impact Assessment of Inland Waters for Sustainable Fisheries Management and Conservation of Biodiversity'*** was held from 25 July to 14 August, 2000 at CIFRI, Barrackpore. Altogether, 25 participants belonging to various Universities, Agricultural Universities, ICAR Institute and State Fisheries Departments participated in the Summer School. A number of topics of varied fisheries interest including biodiversity and environment impact assessment were covered. The lectures were delivered by renowned specialists drawn from the Institute and from outside as guest lecturers. Practical classes, project work, quiz test and field trips were also arranged to update, improve and sharpen the knowledge of the participants. Mr. Naresh Chaturvedi, Secretary Fisheries, Govt. of West Bengal chaired the inaugural function. Dr. K.K. Vass, Director, NRC for Cold Water Fisheries distributed the certificates to participants in the Veledictory function.

Workshop

A workshop on ***'Fisheries Management in the lentic water system : stocking of reservoirs with fish seed'*** was organised under NATP during January 27-31, 2001. Fifty scientists from various Agricultural Universities attended.

Fish farmer's day

Fish farmer's day (8) were organised where 834 numbers fish farmers/fishermen and interested persons participated.

16 DISTINGUISHED VISITORS

Shri Hukumdeo Narayan Yadav, Union Minister of State for Agriculture inaugurates the Paryavaran Bhavan of CIFRI, Barrackpore

The Hon'ble Union Minister of State for Agriculture, Shri Hukumdeo Narayan Yadav inaugurated the Paryavaran Bhavan of CIFRI, Barrackpore on 2nd April 2000. He visited the laboratories and evinced keen interest in the research work being conducted by scientists. While addressing the gathering of fishery scientists and administrators the minister opined that science and technology are weapons to fight poverty, backwardness and ignorance. The projects undertaken by the research establishments should have direct

Inaugural session of the Summer School

Dr. K.K. Vass, Director, NRC, releasing the course material of the Summer School

NACA experts interacting with Director, CIFRI

Director, CIFRI highlights Institute's achievements to Media men

Dr. R.S. Paroda, DG, ICAR & Secretary, DARE visits Institute's laboratory

Hon'ble minister inaugurating the Paryavaran Bhavan of the Institute

Director, CIFRI briefing the Hon'ble members of Parlimentary Standing Committee on Agriculture

bearing on the socio-economic upliftment of Indian rural masses. He acclaimed the Institute's contribution in transforming the inland fisheries in the country from subsistence level to a viable profession.

The minister was earlier apprised of the major activities and achievements of the Institute and its organizagtional management by the Director of the Institute, Dr. M. Sinha.

Dr. R.S. Paroda, Director General, ICAR visits CIFRI

Dr. R.S. Paroda, Director General, ICAR paid a visit to CIFRI, headquarters, Barrackpore. Dr. M. Sinha, Director, CIFRI apprised him of the activities of the Institute.Dr. Paroda visited all the laboratories and discussed with scientists regarding their research work. He was pleased to see the various facilities developed for conducting research and hoped the CIFRI will continue making significant contribution towards inland capture fisheries in India.

Media Men visits CIFRI

A media team consisting of the correspondents from Business Standard, UNI, Hindustan, PTI, The Hindustan Times, Times of India, Navbharat Times, Univarta, accompanied by the CPRO, ICAR visited the Institute on 8 May, 2000. They were apprised of the various research activities and the organizational network of CIFRI by the Director, Dr. M. Sinha. Later on, the team visited the various laboratories and discussed the work programme with scientists to get a first hand knowledge of the research work and achievements in inland fisheries. All were impressed by the research work being done and the human resource management systems being employed in the Institute.

Honourable Members of Parliament visit CIFRI

The study group of the Parliamentary Standing Committee on Agriculture consisting of 21 Members of Parliament and 3 officers of the Lok Sabha Secretariat visited CIFRI on 16 June, 2000. The committee's visit was for discussing the activities, financial resources, achievements of the Institute and other problems if any. The members were accorded a warm welcome on their arrival in the Institute by the Director, Scientists and staff members of CIFRI. Dr. M. Sinha, Director presented the research activities and achievements of the Institute before the members which was followed by a lively interaction session chaired by the Chairman of the team, Hon'ble Shri S.S. Palanimanickam. All the queries of the Hon'ble members were answered by the Director to their satisfaction. Later on the members visited the laboratories and had discussion with the scientists. The Hon'ble members evinced keen interest in the research work and its management in the Institute and were impressed by the achievements of CIFRI.

Other distinguished visitors were :

Mr. S.S. Palanimanickam, Chairman, Standing Committee on Agriculture
Dr. Sena S. De Silva, Deakin University, Victoria, Australia
Prof. M.N. Kutty, Task Force Member, NACA, Bangkok
Dr. Dilip Kumar, NACA, Bangkok

Ms Nita Chowdhury, IAS, Joint Secretrary (Fisheries), Government of India
Prof. Dinesh Marothia, Ex-Chairman (CACP), Govt. of India & Prof. & Head (DANRE), Raipur
Dr. A.G. Sawant, Member, ASRB, New Delhi
Dr. D.N. Borthakur, Member, Governing Body, ICAR
Mr. Tridib Ranjan Mitra, Zoological Survey of India
Mr. Sunder Lal Bahuguna, Environmentalist
Dr. S. Ayyapan, Director, CIFE, Bombay
Prof. K. Swarup, National Academy of Science
Dr. Prakash Nautiyal, Reader, Dept. of Zoology, Garhwal University
Prof. D.N. Saxena, Head, Dept. of Zoology, Jivaji University, Gwealior
Dr. A. Abidi, Member, ASRB, New Delhi
Dr. C. Saha, Act. Director, CIFA, Kausalyaganga, Bhubaneswar
Dr. M.M. Verma, Director, Sheila Dhar research Institute of Soil Science, Allahabad
Dr. N.A. Vhora, IAS, Commissioner of Fisheries, Govt. of Gujarat, Gandhinagar
Dr. Amitava Ghosh, Deputy Project Director (T&I), DRD Cell, Govt. of West Bengal, South 24 Parganas
Dr. M. Misra, Joint Director, Dept. of Extension, Ministry of Agriculture, Govt. of India, New Delhi
Dr. S.K. Waghmare, Principal, Extension Education Institute, Govt. of India

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. M. 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)

Fish Health & Environment 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)

Senior Administrative Officer, CIFRI, Barrackpore

Shri D. Moitra

Finance & Accounts Officer, CIFRI, Barrackpore

Shri V.S. Subramanian

18 ANY OTHER RELEVANT INFORMATION SUCH AS SPECIAL INFRASTRUCTURAL DEVELOPMENT

A new Office-cum-Laboratory building is being developed at Guwahati for housing the Northeastern Regional Centre of the Institute. The 16,400 sq ft ready made building complex was purchased from the HOUSEFED, a State owned undertaking. This new premises is located near Janata Bhavan, the Assam State Secretariate.

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद्)
बैरकपुर : पश्चिम बंगाल

1. प्रस्तावना

संस्थान के वार्षिक रिपोर्ट 2000-2001 में विभिन्न अनुसंधान परियोजनाओं की उपलब्धियों तथा अन्य कार्यकलापों का व्यापक चित्रण है ।

इस अवधि के दौरान संस्थान ने निम्नलिखित क्षेत्रों में उल्लेखनीय कार्य किया है:-

i) गंगा, यमुना तथा कावेरी नदियों, जलाशयों, आर्द्र क्षेत्रों की मात्स्यिकी स्त्रोतों एवं उत्पादन क्षमताओं का आंकलन ।
ii) हुगली, नर्मदा तथा अन्य ज्वारनदमुखों की पारिस्थितिकी तथा मात्स्यकी का मूल्यांकन ।
iii) गंगा एवं यमुना के पर्यावरण एवं मात्स्यकी स्तर का अनुमापन ।
iv) हिल्सा मछलियों की अनुवांशिकी का अध्ययन ।
v) मछलियों एवं झींगों के स्वास्थ्य अनुमापन एवं मत्स्य रोगों के प्रादुर्भाव के नियंत्रण हेतु विभिन्न प्राचलों का मानकीकरण ।

आर्थिक संसाधनों के विकास के लिए संस्थान ने परामर्शक सेवाओं का कार्य जारी रखा तथा विशिष्ट विषयों पर प्रशिक्षण कार्यक्रमों द्वारा भी आर्थिक संसाधनों में वृद्धि की । इनके अलावा तदर्थ योजनाओं के तहत परिषद एवं अन्य संगठनों से भी आर्थिक संसाधनों को प्राप्त किया ।

संस्थान ने अनेक राष्ट्रीय व अंतर्राष्ट्रीय संगठनों से संबंध बनाकर अपने अनुसंधान कार्य को और भी अधिक सुदृढ़ बनाया है । विकसित की गई तकनीकी प्रणालियों को सफलतापूर्वक हस्तांतरित भी किया गया ।

निदेशक

2. महत्वपूर्ण उपलब्धियाँ

1. गंगा के दो उपनदियों जैसे, सोन तथा टोन्स, की पारिस्थितकी, जैव-विविधता एवं उत्पादन क्षमताओं के अध्ययन से ज्ञात होता है कि जैविक तथा अजैविक प्राचलों में काफी भिन्नता है । गंगा नदी में सोन एवम् टोन्स की तुलना में *कॉपर, क्रोमियम* तथा *जिंक* की मात्रा अधिक है । उपनदियों की तुलना में मुख्य नदी गंगा में प्राथमिक कार्बन उत्पादन का दर भी अधिक है ।

2. दक्षिण राजस्थान के पाँच जलाशयों में पारिस्थितकी अध्ययन कार्य सम्पन्न किया गया । ये उथले जलाशय है जिनका जल क्षारीय है । इन जलाशयों में मत्स्य उपज दर 23.0 से 172 कि.ग्रा. प्रति हेक्टर है, जिसमें भारतीय मूल मेजर एवम् मैनर कार्प मछलियों की बहुलता है । इन जलाशयों की उत्पादन क्षमता कोठारी (350) के खारी एवम् उदयसागर में (500 कि.ग्रा. प्रति हेक्टर) पाया गया अतः इन्हें उच्च उत्पादकता वाले जलाशयों के वर्ग में रखा जा सकता है । कोठारी में भारतीय मेजर कार्प मछलियों की अंगुलिकाओं को 150 प्रति हेक्टर तथा खारी एवम् उदयसागर में 1500 प्रति हेक्टर की दर से संग्रहित करने का सुझाव दिया गया है ।

3. बील जलक्षेत्रों में स्थापित *पेन* में *एम.* रोजनवर्गी का 92-95 दिनों तक पालन किया गया है । इस पालन हेतु 21000 से 25000 बीज प्रति हेक्टर के दर से संग्रहित किया गया, पालन अवधि में इन झींगों का अमाप एवम् वजन 135 मि.मी./38 ग्रा. से 148 मि.ग्रा./57 ग्रा. प्राप्त हुआ है ।

4. हुगली नदी में स्थित मत्स्य प्रजातियों की सामान्य स्वास्थ्य के मूल्यांकन हेतु प्रदूषित एवम् अप्रदूषित प्रक्षेत्रों में स्वास्थ्य मूल्यांकन सूचकांक पद्धति को सफलतापूर्वक अपनाया गया है । रीता (रीता-रीता) नामक मछलियों में प्रदूषित क्षेत्रों में यह सूचकांक (HAI) 61.5 तथा अप्रदूषित क्षेत्रों में 26.5 पाया गया ।

5. पश्चिम बंगाल के विभिन्न जिलों के जल निकायों की क्षेत्रफल तथा आकार के आकलन हेतु उपग्रह से प्राप्त (IRS-IC/ID) के USS-III चित्रों का विश्लेषण किया गया । जल निकायों का तापमान, पी.एच., क्षरीयता, नाइट्रेट, कुल नाइट्रोजन, कैल्शियम, जी.पी.पी. तथा श्वास प्रक्रिया का भी विश्लेषण किया गया । परिणामों से ज्ञात होता है कि उपग्रह से प्राप्त इन जल निकायों के चित्रों के गुणों/लक्षणों से उक्त प्राचलों का आकलन किया जा सकता है । प्रक्षेत्र से एकत्रित आंकड़ों के आधार पर भौगोलिक सूचना तंत्र (GIS) की तैयारी की गई है ।

6. संस्थान के विभिन्न केन्द्रों द्वारा भिन्न-भिन्न प्रकार के जलीय परितंत्रों से एकत्रित मत्स्य उपज के आंकड़ों द्वारा एक डाटा बेस विकसित किया गया है ।

7. उत्तर-पूर्वी राज्यों एवम् पश्चिम बंगाल क्षेत्र में संभावित रंगीन मछलियों (ऑर्नामेंटल फिश स्पीजीज) की पहचान कर उन्हें सूचीबद्ध किया गया है । इन ऑर्नामेंटल मत्स्य प्रजातियों की प्रजनन प्रक्रिया को मानक बनाया जा रहा है ।

8. केरल राज्य के कायमकुलम पश्चजल क्षेत्रों में झींगों की जैविकी तथा मात्स्यकी का अध्ययन किया गया । कुल मत्स्य उत्पादन में *पिनियस इंडिकस, मेटापिनियस* दोबसोनी तथा *एम. मोनोसीरस* मछलियों का उल्लेखनीय योगदान (830.88 टन) है ।

9. इस रिपोर्ट अवधि के दौरान हुगली नदी से प्राप्त हिल्सा मछलियों की उपज (9780.8 टन) अब तक के लिए सर्वाधिक है । हिल्सा मछली का योगदान हुगली ज्वारनदमुख की कुल मत्स्य उत्पादन का 48% भाग तथा हुगली ज्वारनदमुख एवम् दीघा से प्राप्त कुल मत्स्य उत्पादन का 32% भाग ।

3. परिचय

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 2.2 लाख टन (1950-51) से बढ़कर 28 लाख टन (1999-2000) ।

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।

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 ।

हिल्सा मछलियों की जैविकी, स्वभाव तथा आचरण आदि पर भी अनुसंधान कार्य करना है जिससे गंगा नदीय क्षेत्र से कम हुई इन मछलियों की पुनर्स्थापना के उपाय किए जा सके । इनकी अनुवांशिकी का भी अध्ययन किया जा रहा है ताकि इनकी संख्या का आकलन किया जा सके ।

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 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 ।

संस्थान का अनुसंधान कार्य कुल 18 अनुसंधान परियोजनाओं में विभाजित किया गया है । इन अनुसंधान परियोजनाओं का कार्य मुख्यालय के अलावा 10 राज्यों में फैले संस्थान के 12 अनुसंधान एवम् 5 सर्वेक्षण केन्द्र तथा एक कृषि विज्ञान केन्द्र से किया जा रहा है ।

अधिदेश

केन्द्रीय अन्तर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान का अधिदेश निम्नलिखित है :

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 प्रणलियों 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 अनुसंधानात्मक कार्य करना ।

4. नदीय परियोजनाओं के कारण संबंधित बेसिन की मात्स्यकी पर पड़ने वाले दुष्प्रभावों का अध्ययन के लिए प्रणालियों को विकसित करना ।

5. अन्तर्स्थलीय मात्स्यकी से संबंधित आंकड़ों के संदर्भ में राष्ट्रीय केन्द्र के रूप में कार्य करना,

6. प्रशिक्षण कार्यक्रमों का आयोजन, परामर्शक सेवाएँ उपलब्ध कराना आदि ।

पुस्तकालय सेवाएँ

संस्थान का पुस्तकालय मुख्यालय एवम् अनुसंधान केन्द्रों में कार्यरत वैज्ञानिक की आवश्यकताओं के अलावा अन्य संगठनों के शोधकर्ताओं, अध्यापकों, विद्यार्थियों तथा अधिकारियों को भी अपनी सेवाएँ मुहैया कराती है । इस रिपोर्ट की अवधि के दौरान पुस्तकालय ने अपने भंडार में 217 पुस्तकें, 149 विविध प्रकाशनों तथा जरनलों के 660 अंक संग्रहित किया तथा 19 विदेशी एवम् 60 भारतीय जरनलों के लिए शुल्क जमा दिया । इस समय पुस्तकालय में कुल 8493 पुस्तकें, 4265 पुनर्मुद्रित लेख, 945 मानचित्र, 3946 विविध प्रकाशन तथा 53 शोध प्रबन्धों का भंडार है ।

इस वर्ष पुस्तकों व अन्य पठन सामग्री हेतु 14,93,699/- रूपए खर्च हुए हैं । पुस्तकालय द्वारा इंडियन फिशरीज एब्सट्रैक्ट तथा करेंट कंटेंट्स भी प्रकाशित किया गया है ।

परियोजना अनुमापन व प्रलेखन सेवाएँ

यह अनुभाग संस्थान के विभिन्न अनुसंधान परियोजनाओं का अनुमापन तथा स्टाफ रिसर्च कांउसिल की बैठकों का आयोजन करता है । विभिन्न प्रकार के रिपोर्ट, लेख, बुलेटिन,

परियोजना कार्यक्रमों के प्रकाशन के अलावा यह अनुभाग निदेशक महोदय को अनुसंधान योजनाओं के निर्धारण में सहायता प्रदान करता है । वैज्ञानिकों द्वारा लिखे गए लेखों को विभिन्न देशी-विदेशी जरनलों में प्रकाशित करवाने या किसी सेमीनार, वर्कशाप आदि में प्रस्तुत करने के लिए आवश्यक प्रक्रिया इसी अनुभाग से होती है ।

अनुसंधान कार्य से संबंधित तकनीकी प्रगति रिपोर्ट इस अनुभाग द्वारा परिषद के मुख्यालय, कृषि मंत्रालय तथा अन्य अभिकरणों को भेजा जाता है । देश, विदेश से भेजे गए अनेक तकनीकी प्रश्नों का समाधान भी इसी अनुभाग द्वारा प्रस्तुत किया जाता है ।

प्रकाशन

अवधि के दौरान संस्थान द्वारा निम्नलिखित विभागीय प्रकाशनों को प्रकाशित किया गया हैं ।

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2. इनलैंड फिशरीज न्यूज (खण्ड 5, सं.1, जनवरी 2000 से जून 2000)
3. इनलैंड फिशरीज न्यूज (खण्ड 5, सं. 2, जुलाई 2000 से दिसम्बर 2000)
4. अंतःस्थलीय मात्स्यकीय (खण्ड 4, संख्या 2/3, जुलाई 1999 से जून 2000 हिन्दी)
5. बुलेटिन संख्या 97 : Ecology and production dynamics of river Brahmaputra with specialemphasis on its tributaries
6. बुलेटिन संख्या 98 : Success stories of fisheries management in small reservoirs
7. बुलेटिन संख्या 98 (हिन्दी) छोटा जलाशय के मात्स्यिकी प्रबंधन में संस्थान उपलब्धियाँ- एक झलक
8. बुलेटिन संख्या 99 : CIFRI's environment impactassessment (EIA) technology-finding users
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10. बुलेटिन संख्या 100 : Ecology and Fisheries of Tawa Reservoir (Hoshangabad, M. P.)
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12. बुलेटिन संख्या 102 : River Godavari - Environment Fishery
13. बुलेटिन संख्या 103 : Ecology and Fisheries of *beels* in West Bengal

14. बुलेटिन संख्या 104 : Ecology and Fisheries of *beels* in Assam
15. बुलेटिन संख्या 105 : Training on Pen Culture of Fish Prawn (December, 11-15, 2000)
16. बुलेटिन संख्या 106 : Management of Fisheries in Small Reservoir
17. करन्ट कन्टेनट्स (जनवरी-मार्च, अप्रैल-जून, जूलाई-सितम्बर तथा अक्तूबर से दिसम्बर 2000)
18. इन्डियन फिशरीज एब्सट्रेक्ट - संख्या 33 (4) 1999 तथा 34 (1-2) 2000

वित्तीय विवरण
(रुपये लाख में)

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