1997-98
ANNUAL REPORT

CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE : BARRACKPORE

वार्षिक प्रतिवेदन
ANNUAL REPORT
1997-98

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी 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 1997 to December 1997 only. Activities and achievements for the period January 1997 to March 1997 have already been covered in the earlier published 1996-97 Annual Report of the Institute.

ISSN 0970-6267

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

1. PREFACE

The Annual Report of CIFRI for the year 1997-98 is before you. It contains comprehensive information on the results achieved by the research projects under seven divisions as well as Krishi Vigyan Kendra of the Institute.

Some of the major research thrusts of the Institute during the year has been on (i) assessment of fisheries resources and biological response to ecology of rivers Ganges, Yamuna and Godavari, the reservoirs and floodplain wetlands, (ii) monitoring of pollution and conservation aspects of river Ganges and Yamuna, and (iii) standardising the various parameters for monitoring fish and prawn health and controlling fish disease.

Keeping in view the new policy decision of ICAR, external fund for the research programmes were obtained through ad-hoc schemes supported by ICAR/NRCD etc. Consultancy assignments were taken up regularly for the purpose of resource generation. Additional resources were also generated by organising ad-hoc training programmes on various relevant topics.

The Institute continued its effort to strengthen its research activities through linkages with other national/international organizations. The transfer of technology programmes were effectively implemented.

M. Sinha
Director

2. EXECUTIVE SUMMARY

Rapid survey of ecology and fisheries of River Ganga

Sample analyses and interpretation of data collected through rapid survey by scientists of Central Inland Capture Fisheries Research Institute during 1995 to 1996 at 43 selected centres of the river Ganga, Bhagirathi and Hooghly estuarine system from Tehri to Gangetic deltaic Sunderbans for assessment of soil and water quality pertaining to hydrology, primary production and biological parameters was done during the year 1997.

The study revealed the entire river bed from Tehri to Patna to be affected by textual deformity and the stretch is blanketted by sand drifted through a number of tributaries such as Gomti, Ghagra and Gandak. The denuded catchment washings are also responsible for the deformation of the river bed. The bed texture from Tehri to Patna has been transformed into sandy soil with 79 to 99% sand and on an average 1 to 12% clay instead of being silty loam. Moreover, the stretch upto Farakka is already under threat where the sand percentage is 48 to 54%. The entire river bed soil has slightly alkaline to alkaline pH. Appreciable improvement in dissolved oxygen content of water was noticed in the middle and lower stretches of the river system as compared to earlier period. It is definitely a positive result of Ganga Action Plan. Considerable increased value of dissolved oxygen (6.0 to 8.2 mgl^{-1}) was also observed in the estuarine system. This may be due to increased influx of freshwater into the estuary after commission of Farakka barrage. The present low values of nitrate (tr. to 0.22 mgl^{-1}) in the river water as compared to earlier values indicate the improved condition of water quality as well as a lower degree of pollution. High primary productivity values inspite of sandy alkaline soil in the river may be attributed to the presence of nutrients received through allochthonous sources.

The density of plankton has decreased particularly in the upper, middle and lower stretches of the river Ganga as compared to earlier records, but the abundance of pollution indicator species such as *Ankistrodesmus, Coelastrum, Pediastrum, Scenedesmus, Actinastrum, Cymbella, Cyclotella, Fragilaria, Anabaena, Lyngbya, Merismopodia,* and *Spirulina* were less in the lotic waters of river Ganga during the present study which indicates the presence of more numbers of clean water indicator species in the phyto-plankton community. Similarly, the occurrence of pollution indicator groups of macro-

zoobenthos such as Oligochaeta, members of Ephemeroptera and Trichoptera were very negligible in the present study which also indirectly infers the improved water quality of the river system. The fisheries scenario shows that the contribution of Indian Major carps, has gone down miserably. *Catla catla* was totally absent in the middle Ganga and certain commercially important species such as *Notopterus chitala, Labeo fimbriatas, Ompak pabo, O. bimaculatus, Pangasius pangasius* and *Mystus vittatus* were either absent or very less in middle and lower stretches of the river. Proportionately, the contribution of catfish has increased in the total fish production in both middle and lower Ganga. Considerable reduction in spawning grounds as well as a lower degree of recruitment of IMC have also been observed in the middle and lower Ganga due to changes in river morphology, hydrography in terms of flow and flow rate, water abstraction for canal projects and wanton destruction of commercially important juvenile as well as adult fishes. Drastic decline in hilsa fisheries in middle and lower stretches of the Ganga after commissioning of Farakka barrage is also one of the main reasons for depletion of overall fisheries in the area. On the contrary, manifold increase in fish yield has been observed in the estuarine zone during post Farakka barrage period. Certain freshwater fish and prawn species *viz., Eutropiichthys vacha, Clupisoma garua, Rita rita, Wallago attu, Mystus seenghala, M. aor, C. catla, L. bata* and *Macrobrachium rosenbergii* have made their appearance in the entire upper estuarine zone. These species were not reported prior to pre-Farakka barrage period. The general habitat of hilsa in the estuary has improved for its migration, breeding and growth due to higher flow of freshwater in the estuary after commissioning of Farakka barrage. The average annual landing of the species which remained at 1,500 tons prior to 1975 has increased to 4,000 tons in recent years. The present study infers that though the Ganges has become more conducive for aquatic production but the average annual fish production of the upper, middle and lower stretches of the river has declined due to siltation, increased water abstractions and irrational fishing.

Rapid Survey of River Mahanadi

Scientists of CIFRI conducted a rapid survey of River Mahanadi for the first time during 1995-1996 from its origin at Pharsiya to its estuarine-mouth at Paradip to assess the status of fisheries and environment and the samples were analysed and data interpretted during 1997.

The study revealed that the drainage area of 1,41,589 sq.km is distributed mainly in Madhya Pradesh (53%) and Orissa (46.3%), leaving negligible stretches in Bihar (0.5%) and Maharashtra (0.2%). The upstream river course is split repeatedly by

boulders and sand-bars, either to end up in blind courses or to rejoin the main flow. The lower stretch exhibits scanty muddy basin and mostly sandy bed. Most of the distributaries suffer from inadequate headwater flow and become weed-chocked readily. Twelve deep-pools and nine reservoirs above Hirakud Dam provide ample shelter to the fishes and offer some scope for fishing. Such a deep-pool above Kamaldihi, serving as a fish sanctuary, is presumed to be the largest in Asia.Aided by an annual rainfall of 1000-1500 mm, the discharge rate assumes a height of 44,740 cumecs as the river descends from an altitude of 300 m to MSL during its 857 km run.

The survey revealed existence of 78, 24 and 110 fish species in the upper, middle and lower stretches respectively, indicating a rosy picture of fish biodiversity. Fish landings are at a optimal level. Average upstream catch (25-100 kg day^{-1} $centre^{-1}$) comprises mainly catfishes (40%)and minnows (35%). Catch at Sonepur (248 kg day^{-1}) is higher than the average catch of the middle stretch (36 to 122 kg day^{-1} $centre^{-1}$), because carps are the prime contributors. The fish yields of the lower zone are 50-250 kg day^{-1} $site^{-1}$ at freshwater stretch up to Mundah barrage, 400-600 kg day^{-1}in the stretch between Mundah barrage and Cuttack barrage and 10-750 kg ha^{-1} $site^{-1}$ in the estuarine stretch. Due to availability of coastal fishes in the estuarine zone the yield at Paradip touches nearly 18-32 t day^{-1} in winter months.

Biotic ecosystem of the river is moderately congenial. The plankton and benthos densities being 40-1562 u l^{-1} and 18-2117 u m^{2-1} respectively and primary productivity ranging from 185.6 to 1200.5 mg C m^{3-1} day^{-1}. Among abiotic features the ranges of water temperature, DO, pH, nitrates, phosphates, etc. are within the optimum range but the salinity in the estuary is quite low (0.036-3.64 ppt). Specific conductivities at places are quite high (>6000 μmhos).Though the neutral river bed soil favours the ecosystem, the low organic C content (0.29-0.86%) is a constraint and the high sand content (70-100%) is a hindrance to the productivity. However, the sandy river bed is supporting the growth of prawn fishery and at places the landing is dominated by ten species of prawns.

Upper Hooghly-Bhagirathi - a declining fishery

Scientists of the Institute studied a stretch of the river Hooghly-Bhagirathi to evaluate the level of habitat degradation.

The study covered a 440 km stretch of the river Hooghly-Bhagirathi extending from Barrackpore to Farakka barrage during 28.5.1997 to 5.6.1997 and a number of abiotic and biotic parameters were considered. The main findings of the survey are :

1 There was a drastic decline in water depth mainly due to soil erosion in the catchment areas. At many points, the river depth has declined to 30-40 cm which coupled with the instability in bottom sediments resulted in a decline of benthic fauna. This erratic distribution of benthic community is considered to be one of the reasons for the disappearance of many bottom feeding fish species.

2 The fish catch from the stretch of river was dominated by small sized catfishes such as *Clupisoma garua, Eutropiichthys vacha, Mystus tengra* and *Mystus cavasius,* while the presence of major carp like *C. catla, L. rohita* and *C. mrigala* was irregular.

3 Fishing methods followed by the fishermen have also undergone drastic changes. Group fishing methods by employing *Phansi jal* (gill net) and *Berjal* (encircling net) have become unremunerative and difficult to operate due to lack of adequate depth. Cast nets, scoop nets, dip nets and other devices which are operated individually by the fishermen in shallow water have taken the place of group fishing gear. Traps are also becoming very popular. Hook and line fishing is very intense in the feeder canal and Farakka barrage zones. The CPUE calculated for the traps was 4-4.5 kg $trap^{-1}$ during the off seasons and 7-10 kg $trap^{-1}$ during monsoon.

Bacterial load of river Ganga

The results of bacteriological studies during the period indicate that Rishikesh in comparison to other seven stations monitored on the river Ganga occupied 4th position in respect of total bacterial load and 5th position in respect of coliform load. Both coliform and faecal coliform counts were above the ISI limit specified for drinking waters. These results clearly show that Ganga water should not be used for drinking purposes or for any house-hold purposes directly. However, the total count per ml has not exceeded the critical limit (i.e. 10^5 per ml), therefore, fish flesh is still free from bacterial infection, and can be consumed after processing.

Winter bagnet fishery of the Hooghly estuary - an economic evaluation

Contrary to subsistence character of riverine fisheries of freshwater zone, winter migratory fishery seems to be highly remunerative activity as is revealed by fishing operations witnessed during the year 1994-95, 95-96 and 1996-97. Appropriate linkages between average CPUE and catch sound a note of caution that high levels of commercial exploitation practiced at present may not be sustainable in the long run. The entry of more fishing units lured by past trends in profitability may ultimately result in diminising returns or increasing costs.

Being an owner operator production relationship, wage paid employment is more stable in winter fishery compared to their counter parts engaged in freshwater stretch whose income is uncertain due to violent fluctuations in fish production. There has been a discernible trend towards increased employment from 4,548 fishermen in 1993-94 to 6,248 fishermen in 1996-97, the wage rate being Rs.4,517/- per fisherman for a period of three months. Winter fisheries being highly labour intensive activity wage component in recent years has been roughly 75 to 78% of total costs. With increased entry of more fishing units employment prospects may improve but much will depend upon productivity level. Further, mechanisation of this sector has so far not displaced manpower but accelerating pace of mechanisation and upgradation of gear technology may adversely affect in near future the prospects for additional employment.

River Damodar ecologically destablized

The river Damodar in the process of sharing its water with the industries and adjoining areas engulf enormous volume of effluxion produced. CIFRI study revealed that the quantum of major pollutants discharged into the river approximately amounts to 1,11,700 MLD industrial effluents, 80,000 litres domestic wastes and 10,000 tonnes of fly-ash per day. The other toxicants released per day were phenol (17 tonnes), heavy metals (Fe - 329.4 kg; Cu - 141.2 kg; Zn - 243.2 kg; Pb - 369.1 kg and Cd -166 kg), ammonia (17 tonnes) and oil and grease (6 tonnes). The indiscriminate dumping of solid wastes along the periphery of the river, physically deforming its course at a faster rate and endangering its existence, is very alarming.

Though the river discharges 5-6 lakh cusecs of water in monsoon it becomes a narrow stream in summer with a flow of less than 300 cusecs. Thus, the monsoon run off dilutes the concentration of the consumed toxicants to the non-toxic level but the malignant effects of some of the toxicants persist in the river system.

During the last 40 years, a conspicuous change has occurred in the fisheries composition of the river. From the upper and middle reaches of the river, hill stream forms (*Barilius* sp., *Nemacheilus* sp., *Clupisoma* sp., *Glyptothorax* sp., *Chela* sp., *Ambasis* sp.) and sub-mountain carp and catfishes (*L. boggut, L.dyocheilus, L. calbasu, M. seenghala, M. aor, M. cavasius, O. bimaculatus*) were recorded. From Tenughat dam upto Burdwan fishes available were *C. mrigala, L. rohita, P. sarana, C. catla, L. bata, C. reba*. Presently 56 species belonging to 21 families are registered of which 16 species representing 6 families are commercially important. Since 1957, the reservoirs were stocked with Indian major carps by Damodar Valley Corporation but the fishes failed to establish themselves in the eco-system. The fish species *viz., N. chitala, R. rita, B. bagarius, P. pangasius, S. silondia, L. boga* and *L. dero* are endangered.

The native fishes examined showed gill damages. The cellular deformities recorded cause asphyxia and disproportionate growth, finally resulting in mortality. This is confirmed by *in situ* bioassay experiment conducted in river Damodar at four representative sites *viz.* Rajarappa, Kargali, Durgapur and Burdwan with Indian major carp fingerlings in monsoon. The fishes could not survive beyond 96 hours but 50% mortality occurred after 26 hrs., 32 hrs., 27 hrs., and 72 hrs., respectively.

From the foregoing account it is evident that a gradual destabilization of the ecosystem of river Damodar is occurring .Immediate remedial measures need to be taken by planners, administrators and environmentalists to rectify the ecological imbalances caused.

Industrial effluents endangering fish life in river Hooghly

In situ bioassay experiments were conducted by subjecting Indian major carps to the mixed effluents emanating from ICI and other industries in river Hooghly at Rishra. The results showed the effluents cause 100% mortality to spawn and fry of carps within 30 to 45 minutes and 70 to 90 minutes respectively at out fall and 90 minutes and 190 to 240 minutes of exposure period below 1 km of discharge point. The river water above outfall, during low tide was proven to be safe since no mortality in exposed fish materials occurred till 300 minutes of exposure period. The toxic effect of the effluent was extended to above outfall region during high tide when 60% of the spawn and 30 to 41.2% of the fry died within 225 minutes and 105-220 minutes respectively at a distance of 200 metres from the effluent discharge point.

The water quality analysed revealed that the high specific conductance due to the high concentrations of magnesium, phosphate, nitrate, calcium, etc. coupled with comparatively low pH are detrimental to the early life stages of the fish. Further, the data indicates that the river stretch near the discharge point covering a length of 1.2 km or more remains unhealthy for the fishes throughout the year.

Fish mortality due to unionised ammonia stress

Fish mortality of *L. rohita, C. mrigala* was encountered in two water bodies SNP and KB measuring 2 ha and 6 ha respectively in north 24 Parganas, West Bengal. Investigations conducted on the causative agent revealed high levels of unionised ammonia ranging from 0.8 to 15 mgl^{-1} and low oxygen level 0.5 to 1.4 mgl^{-1} at 5 A.M. Microcystis sp. bloom was present throughout the water bodies. While the SNP received washings from prawn processing factory, KB received domestic waste from household situated around it. The physiological parameters investigated in *C. mrigala* blood from SNP where very high UIA levels persisted consistently (6-15 mgl^{-1}) showed Hb (4.5-5.0 g/100 ml), Haematocrit (28-30%), Blood clotting time (20-30 sec.), plasma chloride (87-98 mEq/l and plasma glucose (40-51 mg/100 ml). It could not give a definite indication of physiological stress, but histological examination of gills of affected fishes showed stress changes, in form of lamellar hyperplasia and fusion - a prerequisite for causing asphyxia in fishes during low oxygen levels.

Remedial measures adopted were channelizing the prawn processing factory wastes through sedimentation tanks with filters before draining into the pond.It gave good result.

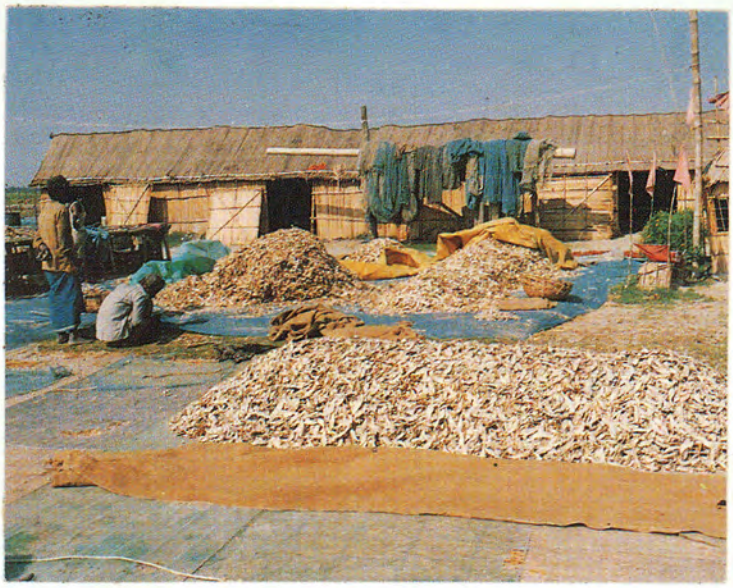
A catch of *N. chitala* from Hooghly river

A catch of different fish species from Bhagirathi river at Katowa

Weed choked Alaka distributory of river Mahanadi

Dominant prawn fishery from Nuna river at Barpal

Winter bagnet fishes being dried

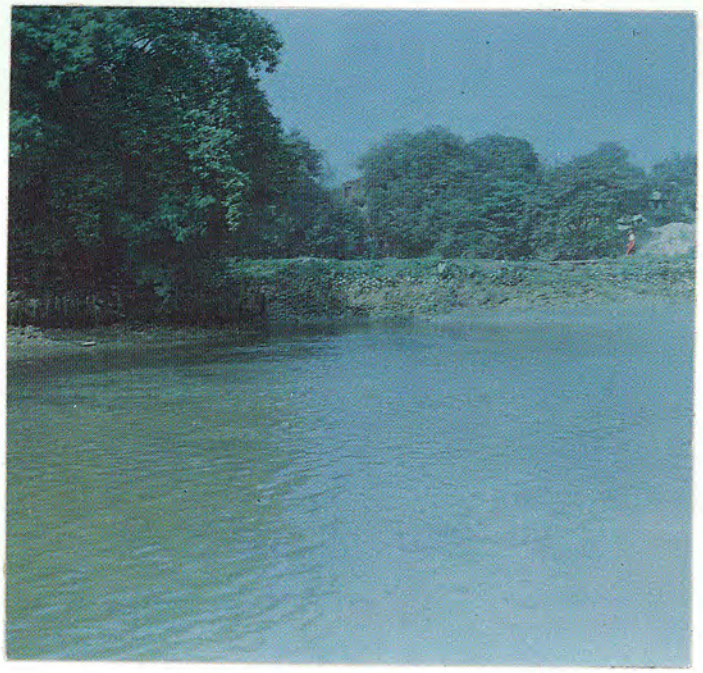


Bag nets in operation in the Hooghly-Matlah estuary

Nalkari river loaded with effluent draining river Damodar

Solid waste (coal powder) encroaching river Damodar

Industrial discharge causing fatal effect on fish life



In situ bioassay near industrial effluent discharge point in river Hooghly

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 17 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 50 years of its existence** on March 16, 1997. By the year 1959, the Station acquired its status as Central Inland Fisheries Research Institute (CIFRI) and moved to its own buildings at Barrackpore, West Bengal. Since 1967, the Institute is under the administrative fold of Indian Council of Agricultural Research (ICAR).

The main objectives of the Institute were to conduct investigations for a proper appraisal of inland fisheries resources of the country and to evolve suitable methods for their conservation and optimum utilization. While fulfilling the above objectives, the Institute directed its research efforts towards understanding the ecology and production functions of inland water bodies available in the country like the river system, lakes, ponds, tanks, reservoirs and floodplain wetlands. These studies have unravelled the complex trophic structure and functions *vis-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 (0.28 million t in 1950-51 to 2.2 million t in 1996-97) which can be mainly attributed to the above technologies.

At the beginning of Seventh Five Year Plan three Institutes (Central Institute of Freshwater Aquaculture, Central Institute of Brackishwater Aquaculture and National Research Centre on Coldwater Fisheries) were carved out from this Institute and the parent Institute was rechristened as Central Inland Capture Fisheries Research Institute with effect from 1.4.1987. Under the changed set up, the 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 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 a national data centre on inland fisheries; and

6 conduct training and provide extension/consultancy services.

Organisational set-up (chart)

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

The ***Riverine Division,*** with its headquarters at Allahabad, strives to develop systems for effective management of the vast riverine fisheries resources of the country with adequate emphasis on the conservation of riverine environment. The research

projects under the Division cover the rivers 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 Narmada Estuarine systems. The effluents from a number of industrial units, agricultural wastes, municipal wastes etc. make the Hooghly estuary one of the most polluted stretches of the Ganga river system which is being investigated by the Division. Biotic and abiotic features of estuarine tributaries and mangroves of Sunderban region are also being studied.

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

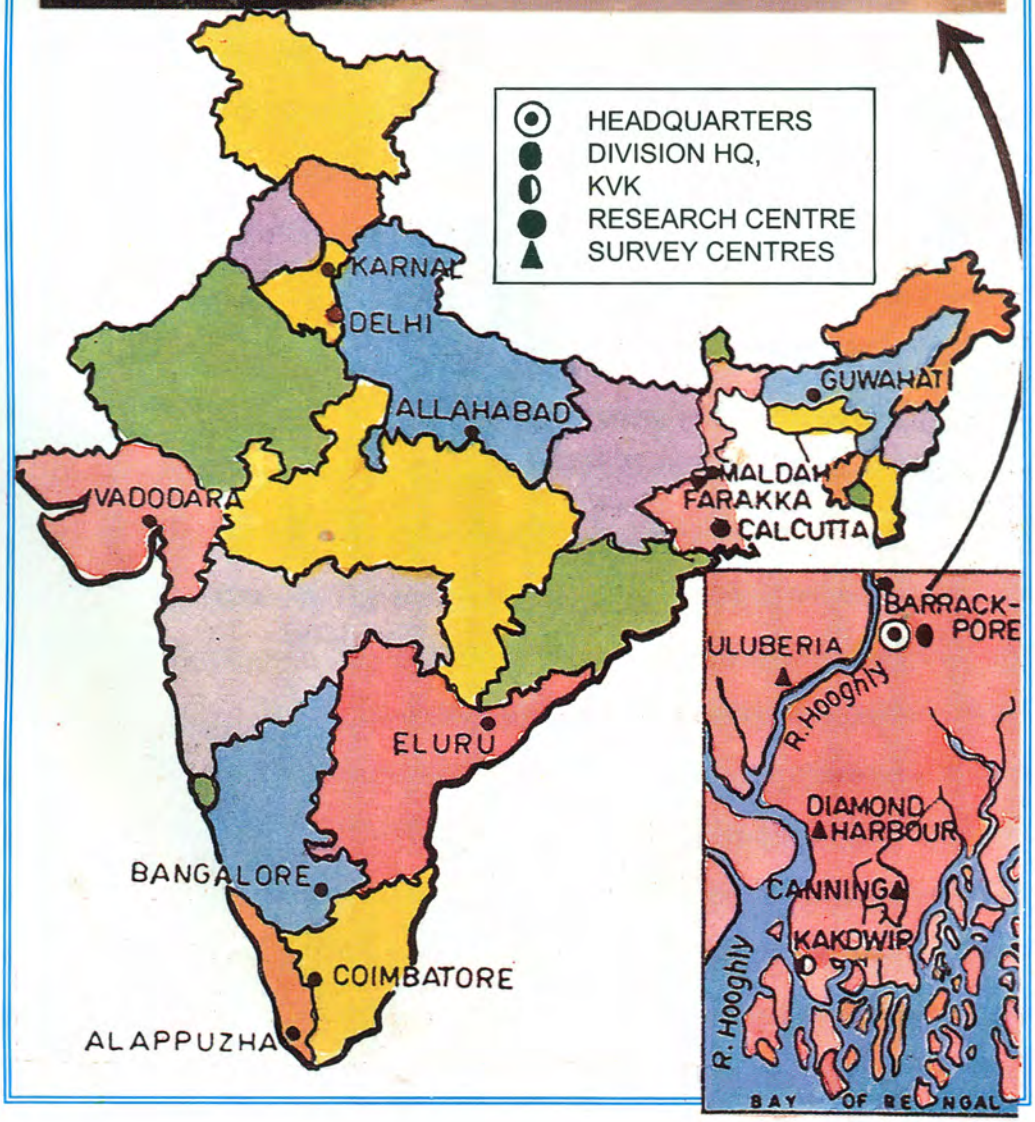
The ***Floodplain Wetlands Division*** has its headquarters at Guwahati. The ecodynamics of wetlands spread over the floodplains of Ganga-Brahmaputra basins are being studied in order to evolve management norms for their sustainable development. The wetlands associated with the floodplains of Ganga and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

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

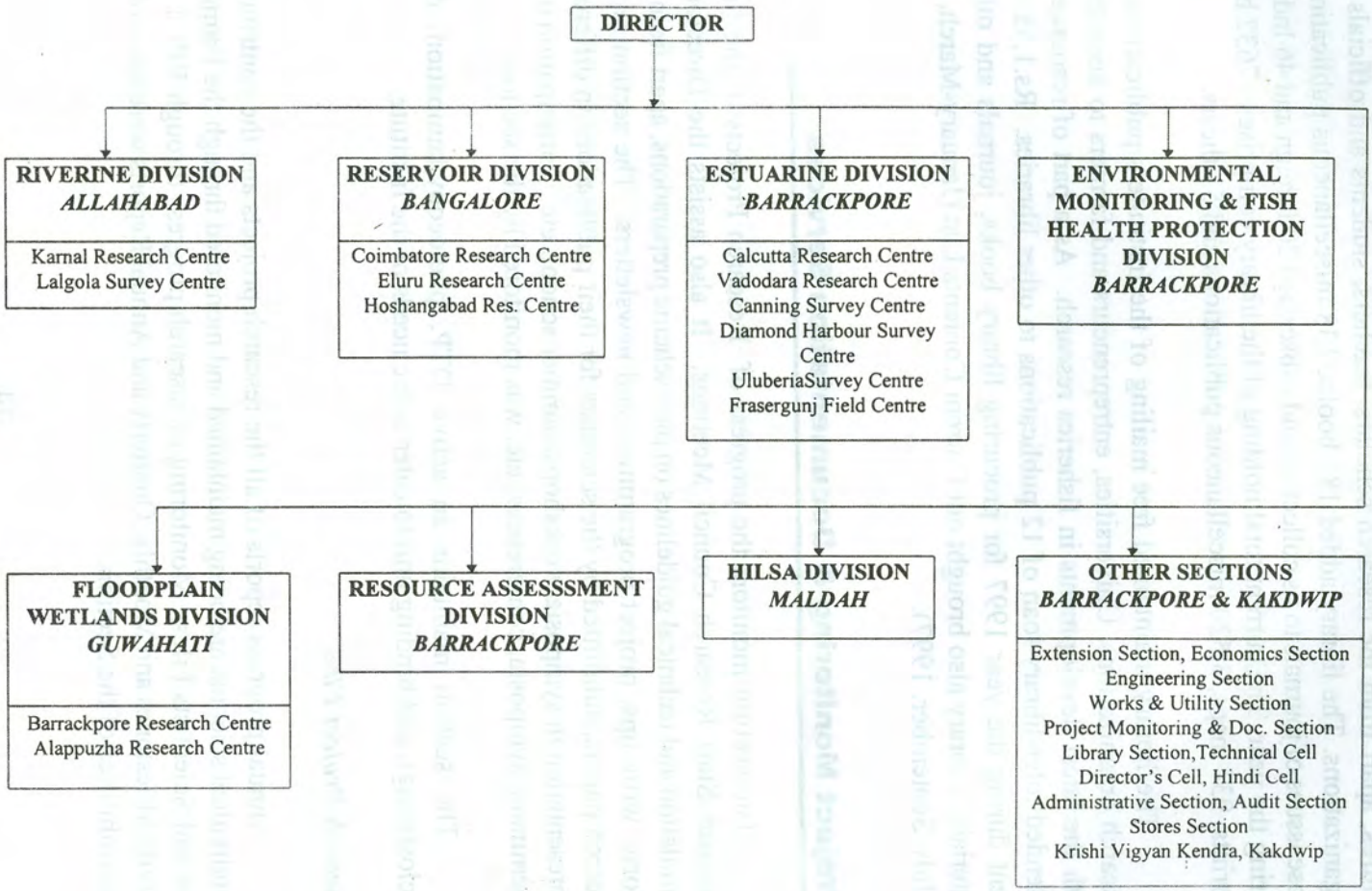
The main aim of the ***Hilsa Division***, located at Maldah, West Bengal is to carry out research on biology, life habits and behaviour of hilsa, leading to development of measures for the recovery of its fishery in the depleted stretches of the river Ganga.

The Institute's research activities have been organised under 18 research projects which are operated from the Headquarters at Barrackpore, 11 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 organisation chart.

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



ORGANIZATIONAL SET-UP OF CIFRI



Library services

CIFRI Library is providing its services to the scientists of the Headquarters and centres, apart from the research scholars, teachers, students and officials from other organizations. The library added 182 books, 138 miscellaneous publications and 550 loose issues of journals to its collection and subscribed 20 foreign and 46 Indian journals during the year. The current total holding of the library comprises : 7632 books, 4245 reprints, 937 maps, 3,520 miscellaneous publications and 51 thesis.

The library maintained free mailing of the Institute's publications to various research organizations, Universities, entrepreneurs and farmers to keep them abreast with the latest developments in fisheries research. As a part of resource sharing, it extended inter-library loan of 12 publications to other libraries. Rs.1,58,993.00 was spent during the year 1997 for procuring library books, journals and other reading materials. Library also brought out Current Contents List (January-March, April-June & July-September, 1997).

Project Monitoring & Documentation Services

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

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

Research Project Files

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

Technical Reports/queries

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

Personal Information System (PIS)

During the reported period, biodata of 75 scienists 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 April 1997 to December 1997

1 THE INLAND FISHERIES NEWS (two issues, Vol.2, No. 1 & 2)

2 Bul. No. 74 - Ecology and Fisheries of ox-bow lakes (*Maun*) of North Bihar - A threatened ecosystem
M. Sinha and B.C. Jha

3 Bull No. 75 - Fisheries Enhancement of Small Reservoirs and Floodplain Lakes in India
Edited by V.V. Sugunan and M. Sinha

4 Bull. No. 76 - Winter Migratory Bagnet Fishery of the Hooghly Estuary - An economic evaluation
S. Paul, P.M. Mitra, D.K. De, H.K. Sen, N.C. Mandal and P. Singh

5 Current Contents List (January-March, April-June & July-September, 1997.

Financial statement

The provision of funds for the financial year 1997-98 was as under :

Non-Plan	:	340.00 lakhs
Plan	:	175.00 lakhs
TOTAL	***:***	***515.00 lakhs***

Against this, the expenditure from 1st April 1997 to 31st December 1997 was as follows :

Non-Plan	:	310.27 lakhs
Plan	:	45.23 lakhs
TOTAL	***:***	***355.50 lakhs***

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 1.1.1997 to 31.12.1997)

Sl. No.	Class of Posts	Total No. of posts sanctioned	Total No. of emplo-yees in position	Total No. of Sch. Cast among them	% of total emplo-yees	Total No. of Sch. Tribe among them	% of total empl o-yees	Remarks
1.	**SCIENTIFIC POSTS**							
	Experimental Scientist	-	-	-	-	-	-	
	Scientist	76	65	3	5.25%	-	-	
	Sr.Scientist/Scientist (Sel.Grade)/Scientist (Sr.Scale)	16	1	-	-	-	-	
	Principal Scientist	8	1	-	-	-	-	
	RMP Scientist	1	1	-	-	-	-	
	TOTAL	**101**	**68**	**3**				
2.	**TECHNICAL POSTS**							
	Category - I	62	51	9	17.65%	3	5.89%	This includes 2 (two) posts under C.S.S. and 15 (fifteen) posts under KVK
	Category - II	51	48	11	22.92%	3	6.25%	
	Category - III	19	13	2	15.39%	1	7.7%	
	TOTAL	**132**	**112**	**22**		**7**		

3.	**ADMINISTRATIVE POSTS**							
	Sr. A.Os/A.Os/Accounts Officer, etc.	2	2	-	-	-	-	This includes 1 (one) Assistant, 1 (one) Stenographer and 1 (one) Jr. Clerk posts under C.S.S. and 1 (one) Asstt., 1 (one) Jr. Clerk & 1(one) Jr.Steno. under KVK
	A/A.Os/Superentendent(Accounts)/Supdt.	8	8	2	25%	1	12.5%	
	Assistant Director (O.L)	1	1	-	-	-	-	
	Assistants	23	17	6	35.3%	1	5.89%	
	Sr.Stenographer, Stenographer	5	4	2	50%	1	25%	
	Jr. Steno, Sr. Clerks/U.D.Cs	32	28	7	25%	-	-	
	Junior Clerks/Hindi/Time Keeper/Sr.Gestetner Operator	35	28	5	17.86%	-	-	
	TOTAL	**106**	**88**	**22**		**3**		
4.	**SUPPORTING STAFF**							
	Grade - I	87	81	32	39.51%	3	3.71%	This includes 1 (one) post of SSG under C.S.S. and 7 (seven) post of SSG under KVK
	Grade - II	61	60	23	38.33%	2	3.33%	
	Grade - III	36	36	14	38.89%	3	8.33%	
	Grade - IV	18	18	11	61.12%	2	11.11 %	
	TOTAL	**202**	**195**	**80**		**10**		
5.	**AUXILIARY POSTS**	10	4	2	50%	-	-	

Note : The other posts available may also please be shown in the respective class of posts mentioned above and the posts, if any, do not come under the above mentioned categories may be shown separately.

4. RESEARCH ACHIEVEMENTS

PROJECT : FC/B/10

ECODYNAMICS AND FISHERY STATUS OF UPPER STRETCHES OF RIVER YAMUNA AND ASSOCIATED CANALS

Duration : Upto March 2000

Personnel : D.N. Mishra, Usha Moza (Scientists)
C. Lakra, S.K. Srivastava, Sushil Kumar (Technicals)

Location : Karnal

Fish composition and biomass

The studied stretch of River Yamuna (RY) show dominance of miscellaneous fishery (79.78%) formed by minor carps, *Chela* sp. and advance fry and fingerlings of available species, followed by catfishes forming 11.63% of total population amongst which *W.attu* formed the bulk 69.0% followed by *M.seenghala* (4.39%). Major carps formed only 4.93% of total population. The fish catch of this stretch of river was estimated as 14.79 t during April to December 1997. Western Yamuna Canal (WYC) also showed dominance of miscellaneous fishery (48.25%) constituted mainly by minor carps, *L.bata, L.dyocheilus, L.dero, L.gonius* etc. Catfishes formed the second important group, 23.64% of population, contributing double the amount than river.

Water quality

In river Yamuna the water is alkaline throughout, pH ranged between 7.24-7.59. The salinity of river increases as water flows downwards from 47.09 (Hathnikund) to 53.07 mgl^{-1} (Panipat). The overall salinity of river shows an increase of 3-5 mgl^{-1} from last year.

The water within WYC has clear demarcation between AOF Y-nagar having clear water than rest of the canal. The configuration changes by influx of industrial waste at OF Y-nagar. But water recovers by the time it reaches Karnal and further recovery downwards is due to flushing of water from SYL-having high D.O. 9.12 ppm. The water quality of EYC do not vary much from WYC.

Primary productivity

The primary production in the river stretch showed gradual increase from 50.0 (Hathnikund) to 154.17 mgC m^{3-1} hr^{-1}(Panipat) in gross production and an increase from 29.17 to (Hathnikund) 104.17 mgC m^{3-1} hr^{-1}(Panipat) in net production.

The primary production of whole canal barring Panipat zone has reduced a lot from previous year. Range of gross primary production in 1996, 101.43 to 123 mgC m^{3-1} hr^{-1} has been reduced to 58.33 to 112.5 mgC m^{1} hr^{1} and that of net production from 81.25-64.58 (1996) to 35.0-75.0 mgC m^{3-1} hr^{-1}.

Biotic communities

Plankton : The standing crop of plankton on an average in R. Yamuna was estimated to be 258.3 ul^{-1} and was dominated by bacillariophyceae (59.7%). The composition of plankton indicated dominance of phytoplankton (93.6%).

In Eastern Yamuna canal, the plankton productivity was 250 ul^{-1} at Y-nagar which enhanced to 316.0 ul^{-1} at Panipat. The high percentage of myxophyceae (60%) may safely be regarded as bioindicator of mesoaprobic zone within river.

In western Yamuna canal (EYC) the standing crop of plankton was an average 250 u l^{-1} and was dominated by bacillariophyceae (66.6%), myxophyceae (2.8%) which shows that the water within EYC is pollution free compared to WYC.

Periphyton : Periphyton population of river was almost equal ranging from 283 u cm^{2-1} (Hathnikund to 300 u cm^{2-1} (Panipat). In WYC periphyton population increases from 266 u cm^{2-1} to 366 u cm^{2-1} barring OF Yamunagar, where population was only 183 u cm^{2-1} under the influence of industrial waste. In EYC, average periphyton population ranged from 383 to 366 u m^{-2} from Saharanpur to Shamlee.

Benthos : The average density varies between 496 (Hathnikund) to 770 u cm^{2-1} (Panipat). Benthic productivity of WYC initiates from BOF Y-nagar onwards and picks up (408-979 u cm^{2-1}) only after the flushing of canal by SYL water.

Macrovegetation : Macrovegetation production within Yamuna was only during pre-monsoon from Hathnikund to Karnal. Within WYC, macrovegetation was present only at AOF and BOF (Yamunagar) having an average biomass of 4.06 to 48 gmm^{2-1}. Eastern Yamuna canal was devoid of any vegetation.

Spatio-temporal variation in availability of spawn

Spawn prospecting investigations were undertaken this year at Mavi village in Panipat zone. The availability of spawn at this stretch is also negligible, but shows presence of 3% of major carps compared to its absence in Karnal stretch.

There is no evidence of effluent/sewage discharge into EYC- as such no stress points are demarcated.

PROJECT : FC/B/11

ENVIRONMENTAL IMPACT ASSESSMENT IN RIVERINE ECOSYSTEMS

Personnel : K.K. Vass (upto 17.11.97), M.M. Bagchi (upto 31.11.97), R.K. Das, Dr. M.K. Mukhopadhyay, K. Mitra, K. Chandra, B.C. Jha, H.P. Singh, Balbir Singh, Usha Moza, B.P. Mohanty, Sandeep Bhatia , M.A. Khan (Scientists)
S.P. Ghosh, S. Bhowmick, Keya Saha, S. Bandopadhya, K.K. Das (Technicals)

Duration : 1994-1998

Location : Barrackpore, Allahabad and Karnal

Bacterial load

The total bacterial load was maximum at Nurpur and lowest at Hrishikesh amongst the eight sampling stations. Post monsoon counts of the bacterial population was higher in comparison to pre-monsoon in most of the sampling centres.

Density of faecal coliform bacteria was highest at Patna followed by Kanpur, Dakshineswar, Hrishikesh, Nabadwip, Varanasi, Bhagalpur and Nurpur. While coliform count was in the order Patna > Kanpur > Dakshineswar > Bhagalpur > Hrishikesh > Nurpur > Nabadwip > Varanasi.

Toxicant accumulation

Water and sediments : River Ganga, at 13 selected points was monitored for heavy metal contamination of water and sediments. The quantum of dissolved metals (Zn, Cu, Cd and Pb) were in higher range of 0.220-0.485 ml l^{-1} in upper zone near Hindon/Yamuna confluence in Delhi, and at Kanpur, Allahabad and Varanasi on the main stretch of the river. In middle stretch between Patna and Farakka, contamination was comparatively less (0.14-0.25 ml l^{-1}), while in lower stretch, mainly in Hooghly estuarine zone values of metals (0.27-0.20 ml l^{-1}) gradually increased. In compliance with ambient contents, deposition of metals in sediments were also high in upper stretch (124.10-434.25 ml l^{-1}) followed by middle (104.33-276.88 ml l^{-1}) and lower (88.47-158.00 ml l^{-1}) stretch of the system.

Plankton and benthos : The detected values in different trophic levels revealed very high rate of metal accumulation in planktonic organisms at Bandel in comparison to Farakka in lower stretch. At benthic level, gastropods (*Thiara* sp.) also accumulated higher metal quantum at Bandel due to contaminated detritus used as food by these bottom dwelling organisms in the region.

Fish : The fish tissues in river Ganga showed variability in metal accumulations. The test species, mostly carnivores, accumulated highest level of Zn followed by Pb, Cd and Cu in gill, liver and kidney tissues. In *Rita rita*, the accumulated metals were in the order Kidney > Liver > Gill. Histology of gills, liver and kidney tissues of the test fish *R.rita* and *Pama pama* revealed toxic effect of accumulated metals in damaging the structures and physiological function of these vital organs. Growth pattern of the test species were also significantly affected in relation to the level of metal accumulation and resulted in extensive cellular damages in the organs.

***In situ* toxicity of industrial effluents**

In situ bioassay conducted in Hooghly river at an effluent discharge point near Rishra revealed 100% mortality of carp spawn and fry in 30 to 45 and 70 to 90 minutes respectively at outfall, and 90 minutes and 190 to 240 minutes of exposure period below 1 km of the discharge point. The river water above out fall, proved to be safe during low tide period. The toxic effect was extended to above outfall region in high tide when 60% of exposed spawn and 30 to 41.2% of fry sccumbed to the toxic effluent within 225 minutes and 105-220 minutes respectively at 200 m upstream of the discharge point.

The water quality analysed at the experimental points revealed high specific conductance due to excess magnesium, phosphate, nitrate, calcium etc. coupled with low pH which are detrimental to the early life stages of the fish. Further, the findings indicated that 1.2 km river stretch near the discharge point remaining unhealthy for tiny fishes through out the year.

Monitoring Upper Hooghly-Bhagirathi

Environmental monitoring in a 440 km stretch of river Hooghly-Bhagirathi from Barrackpore to Farakka barrage revealed the siltation effected resulting food chain destruction and shifting major fishery of carps to cat fishes and also change in fishing methods from group fishing by gill nets and encircle nets to shallow water and single man operated devices like cast nets, scoop nets, dip nets, hooks and line and traps due to unremunerative catch and lack of adequate depth of water.

Environmental impact assessment in rivers Mahi and Sabarmati

In west coast, the rivers Mahi and Sabarmati were environmentally monitored. Of these rivers, Mahi in upper zone at Vijyapur and Agarwada was recorded with high COD and affected biocommunities like declination in qualitative and quantitative abundance of plankton and benthic fauna. High density and dominance of mollusc population was indicative of high organic depositions in the river sediments at Coda, Vijyapur and Mandeswari.

River Sabarmati out of its two sampling sites showed high COD and specific conductance near Sabarmati bridge. However, the impact of environmental alterations was not significant on the biotic resources like plankton and benthic fauna.

PROJECT : FC/B/12

INVESTIGATIONS ON ECOLOGY, BIODIVERSITY AND PRODUCTION RELATIONSHIP IN YAMUNA AND GHAGRA TRIBUTARIES OF RIVER GANGA

Personnel : R.S. Panwar, V. Pathak, Balbir singh, A.K. Laal, Shree Prakash, R.N. Seth, R.K. Tyagi,B.K. Singh, R.K. Dwivedi, P.N. Jaitly, P.K. Katiha (Scientists)
R.C. Singh, N.K. Srivastava, B.D. Saroj, L.R. Mahavar, Ramji Tiwari, J.P. Mishra, Kalpana Srivastava (Technicals)

Duration : 1996-1998

Location : Allahabad

River Yamuna

Fishery : The fish landings at five centres of river Yamuna were recorded *viz.,* Kalpi, Hamirpur, Fatehpur, Khaga and Allahabad. Landings of *C.carpio* (3.03 t) and silver carp (0.48 t) were observed at all the centres on river Yamuna, excepting at Allahabad. *H. ilisha* was recorded (1.44 t) at Allahabad. In river Yamuna the major carps landings were almost uniform throughout the stretch, but selected catfish groups were more pronounced in the upper stretch. The other groups contribution was maximum at Allahabad (58.6%). As compared to corresponding period of preceding year, the landings at Allahabad showed an increase of 24.8%. Major carps were more than double of the preceding year (1.13 t). Selected catfishes and others group registered an increase of 15.0% and 17.2% respectfully but hilsa was about half of last year (2.40 t).

Water quality : There was a gradual improvement in quality of physico-chemical parameters from upper stretch (Shergarh) to lower stretch (Madauka or Arail). Water was fairly rich in respect of organic matter ranging between 0.75 to 1.5 mgl^{-1} but nitrate and phosphate were lower (0.03 to 0.07 mgl^{-1}) and (0.006 to 0.44 mgl^{-1}), respectively.

Sediment quality : Physical features of the sediment revealed the dominance of sand (77.0 to 88.5%) throughout the stretch with silt and clay particles ranging from 5.5 to 18.5% and 4.0 to 10.0% respectively.

Plankton : Plankton density ranged between 42 ul^{-1} (Hamirpur) and 249 ul^{-1} at Shergarh. Plankton population was more in lower stretch than upper.

Benthic fauna : Benthic fauna was dominated by molluscs. Seasonal fluctuations of benthic community in number and species indicated river free from pollution.

Microbes : The bacterial count ranged between $646x10^6$ (Madauka) and $13x10^6$ ml^{-1} (Shergarh).

Study of socio-economic parameters revealed that the fishermen's share in consumer rupee ranged between 60-72%.

River Ghagra

Fishery : The fish landings were recorded at four centres of river Ghagra *viz.,* Faizabad, Tanda, Barhalganj and Bilthera Rd.

The total fish landings of river Ghagra was 91.16 t out of which catfishes were more than the carps and other fishes. Catfishes were dominant at all the centres and contributed about 50% to the total. Out of the total landings of 91.16% t, catfish contribution was 47.47 t.

Water : The chemical parameters of river Ghagra showed gradual increasing trend towards down stretch. Entire stretch exhibited oligotrophic trend both in relation to chemical and biological parameters. There was gradual increase in chemical parameters from upper to lower stretch. Nitrate and phosphate were poor. Chloride was more at OF of NTPC, Tanda. Heavy metals in sediments and water were in lesser concentration except Zn which was 207.85 mgg^{-1} at Shergarh.

Sediment quality : The physical features of the sediment showed dominance of sand throughout the stretch (84.0 to 93.1%), with silt and clay ranging from 4.5 to 14.0% and 1.0 to 8.0% respectively.

Average gross production and net production in entire stretch were 511.12 and 340.45 $mgCm^{-2}$ day^{-1}. Energy transformation on an average was 5019 Cal m^2 day^1 (gross) and 3343 $Calm^{-2}$ day^1 in the entire stretch of which 66.6% was stored by producers and the rest was lost as energy for respiration.

Plankton : Plankton population was lesser than 300 ul^{-1} at all the centres except at Guptarghat and Bazitola where it was 1377 and 766 ul^{-1} respectively. Plankton population showed gradual increase towards lower stretch, except at Guptarghat which may be attributed to city sewage discharge in river. Bacillariophyceae was dominant both in phytoplankton and periphyton. Fly ash of NTPC, Tanda inhibited phytoplankton growth.

Benthic fauna : Benthic fauna comprised *Lamellidens marginalis, L.corrianus,L. bengalensis* and Chironomids. Molluscs were dominant over others.

Study of the economics of riverine fisheries and marketing operations showed that the fishermen's share in consumer rupee was 60-74%

PROJECT : FC/B/14

ECOLOGY AND EVALUATION OF PRODUCTION RELATIONSHIPS IN THE RIVER BRAHMAPUTRA WITH SPECIAL EMPHASIS ON ITS TRIBUTARIES

Personnel **:** V. Pathak, M. Choudhury, B.K. Bhattacharjee (Scientists)
Alok Sarkar (Technical)

Duration **:** 1993-2001

Location **:** Guwahati

Fish catch statistics

Estimated fish catch (kg day^{-1}) and percentage composition of various groups in the three constituents of R. Brahmaputra and 8 landing centres between Sadiya and Dhubri have been recorded. The landing from Siang, Dibang and Lohit were 182.0 kg day^{-1} , 205.0 kg day^{-1} and 150 kg day^{-1} respectively. Fishes were mainly dominated by *Tor putitora, Neolissochilus hexagonolepis, L. dero, L. dyocheilus* and *Schizothorax richardsonii* in all the three stretches (80.2 to 89.4%). Miscellaneous trace fishes represented 10.6 to 19.8% of the total catch while major carp, minor carp, catfishes etc. were completely absent.

There was considerable variation in both qualitative and quantitative composition of fishes in various stretches of R. Brahmaputra.

Sediment quality

From Central Lohit, Sadiya down upto Dhubri soil showed complete dominance of sand (76.5 to 97.0%). Bottom soil was alkaline in reaction with pH varying between 7.2 to 7.93. In the entire stretch soil was found to be poor in nutrients with available phosphorus varying between 0.4 to 1.8 mg/100 g and available nitrogen 8.42 to 21.64 mg/100 g soil. Organic carbon was poor to moderate (0.0924 to 0.815%). Among the 18 north bank tributaries the bottom soil was dominated by sand (76.5 to 97.5%). Both the available nutrients were poor in all the tributaries (available phosphate 0.28 to 2.6 mg/100 g and available nitrate 5.63 to 31.22 mg/100 g) with few exceptions. The south bank tributaries were also dominated by sand (76.5 to 97%).

Water quality

Important water quality parameters of R. Brahmaputra in different stretches; north and south bank tributaries along with its three components have beenstudied.

The three components Siang, Dibang and Lohit were characterised by rich oxygen (9.02 to 10.0 mg l^{-1}), low temperature (10.7 to 12.5 C), high transparency (128.3 to 164.0 cm) and slightly alkaline pH(7.6). The parameters like alkalinity, conductance, total dissolved solids and total hardness all were comparatively higher in Siang (62.67 mgl^{-1}, 141.3 µmhos, 71.3 mgl^{-1} and 70.8 mgl^{-1} respectively) and lower in Dibang (35.72 mgl^{-1}, 99.8 µmhos, 50.6 mgl^{-1} and 42.6 mgl^{-1} respectively). The three tributaries were poor in nutrients and rich in dissolved organic matter. Throughout the stretch from Sadiya to Dhubri R. Brahmaputra was found to be rich in oxygen (6.23 to 7.85 mgl^{-1})low in free CO_2 (0.96 to 1.44 mgl^{-1}) alkaline pH (7.25 to 7.75) rich dissolved organic matter and very poor nutrients.

The common features of both the banks were rich oxygen, low CO_2, alkaline pH (with few exceptions), high dissolved organic matter and low nutrients.

Rate of energy formation by producers

The rate of primary production was studied at 8 different centres between Sadiya and Dhubri. The average rate of energy fixation in the entire Brahmaputra stretch was

4123 cal m^{-2} day^{-1} (gross) and 2740 cal m^{-2} day^{-1} (net). Studies have shown that on average 66.4% of energy fixed by producers was actually stored by them and the rest was lost as heat of respiration.

Biotic communities

Benthos : Dominance of sand to the extent of 97.5% resulted in poor abundance of benthos at the collection site except at Neematighat Jorhat, where 96 no. m^{-2} of oligochaetes were recorded.

PROJECT : FC/A/4

ECO-DYNAMICS AND FISHERY MANAGEMENT OF BEEL ECOSYSTEMS IN WEST BENGAL

Personnel **:** V.V. Sugunan (till 31.10.97) , G.K. Vinci, Krishna Mitra, Dhirendra Kumar, M. K. Bandopadhyay, A. Hassan (Scientists)
M.P. Singh, D.K. Biswas, Subhra Saha (Technicals)

Duration **:** 1986-1999

Location **:** Barrackpore

Soil and water quality assessment

All the beels studied had acidic soil (pH 5.4-6.7) with pH values decreasing in the beels of south and north Dinajpur districts, West Bengal. Higher organic carbon with lower available nitrogen in many of the beels were indicative of slow decomposition of organic matter due to acidic conditions. However, all the beels except Bhaluka in south Dinajpur had higher values of pH in waterphase. Higher levels of nitrates and phosphates at the water phase also indicated that lakes were passing through transient phases of eutrophication. Dissolved oxygen ranging from 3.1 to 11.6 ppm at water surface pointed towards higher rate of photosynthesis. Based on the soil and water quality parameters, the beels can be rated as productive, considering the conducive temperature regime (Table 1).

Table 1 : Water quality parameters of some beels of West Bengal

Parameters	South Dinajpur		North Dinajpur		24-Pgs(N)	Nadia
	Palari	*Bhaluka*	*Nehali*	*Moranadi*	*Kola*	*Bhomra*
Transparency (cm)	6.0	6.0	9.0	14.0	70.0	100.0
Water temp. (°C)	29.2	33.0	27.5	32.0	32.0	30.5
pH	8.6	5.5	7.9	8.0	8.0	7.7
D.O. (ppm)	7.7	6.3	5.9	7.8	11.6*	3.1
Free CO_2 (ppm)	nil	10.0	3.5	1.5	0.7	8.8
Total alk. (ppm)	42.0	20.0	18.0	20.7	80.5	133.5
Nitrate N (ppm)	0.06	0.24	0.11	0.05	0.08	Tr
Phosphate P (ppm)	0.05	0.31	9.03	0.08	0.07	tr
T. hardness (ppm)	42.0	32.0	16.0	27.0	72.8	120.0
TDS (ppm)	95.0	70.0	50.0	77.5	150.0	-

* Klinograde distribution recorded

Rate of primary production through phytoplankton phase was very low in Nehali and Bhomra beels which were weed-infested. However, despite infestation of weeds to the tune of 35 to 40%, Patari beel recorded high rate of planktonic primary productivity. Patari beel has equally rich communities of plankton, benthos, macrophytes and weed associated fauna (Table 2).

Table 2 : Primary productivity and biotic communities in some beels of West Bengal

Parameters	South Dinajpur		North Dinajpur		24-Prgs(N)	Nadia
	Palari	*Bhaluka*	*Nehali*	*Moranadi*	*Kola*	*Bhomra*
Gross PP ($mgCm^{2-1}hr^{-1}$)	739.59	-	37.50	903.12	-	166.65
Net PP ($mgCm^{2-1}hr^{-1}$)	611.98	-	25.00	770.31	-	135.41
Res. ($mgO_2m^{2-1}hr^{-1}$)	153.12	56.25	15.00	159.37	-	37.50
Phytoplakton						
Total count (no. m^{3}-1)	3098	447	10439	14987	4338	3647
No. of species	9	7	11	9	22	9
Zooplankton						
Total count (no. m^{3-1})	583	104	173	631	1150	351
No. of species	6	3	6	5	8	6
Benthic fauna (no. m^{2-1})	1453	460	129	1771	-	-
Macrophytes (%)	35-40	-	90-95	clear	-	60-70
Weed assoc. fauna (no.m^{2-1})	602	-	68	-	-	1184

* After weed removal

Fishery management

Capture fishery norms were followed in the four beels of Dinajpur districts. Culture-based capture fishery is followed in Kola and Bhomra beels of 24-Parganas (N) and Nadia districts respectively. Kola beel recorded a stupendous yield rate of 5391 kg/ha at a CPUE of 63.3. Higher yield rate has also been observed in Bhomra where stocking was done effectively. Conversion of beel into aquaculture ponds has also proved to be less effective as judged by the yield rates obtained at Nehali. Capture fisheries based on natural populations alone seems to be ineffective as seen from the performance of Moranadi beel.

A socio-economic survey was initiated in the beels of West Bengal. So far, information on eight beels have been collected on structured questionnaires. Apart from the morphometric, hydrographic and other details of the beels, informations on fishing methods, catch structure, fishing effort, functioning of cooperative societies, income level of fishermen, their living conditions, etc., are being collected. The work is in progress.

Pen culture

A pen culture experiment was initiated at the Kola beel with pen area of 0.6 ha. The pen was stocked with 1100 juveniles of *Macrobrachium rosenbergii* at an average stocking size of 7.3 cm (2.8 g) during March 1997. During the 60 days of rearing period the prawns were fed with commercially available pelleted feed at the rate of 2% of body weight, the feed containing 38% protein.

At survival rate of about 70%, 763 prawns were harvested at an average harvest size of 30.97 g. However, the prawns registered a great heterogeneity in their growth rate ranging from 8-70 g in weight and 11-20 cm in size.

PROJECT : FC/A/7

ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS

Sub project : Ecology and Fisheries of Manchanbele Reservoir. (Karnataka)

Personnel : C.Selvaraj, M.Ramakrishniah, D.S.Krishna Rao, P.K.Sukumaran, M.Karthikeyan, A.K.Das (Scientists)
M.F.Rahman (Technicals).

Duration : 1996-2001

Location : Reservoir Division, Bangalore.

Physico-chemical parameters

The reservoir was thermally stratified during most part of the period with the thermocline around 5.0 m. In December the water column was in homothermal

condition due to convection cooling coupled with wind action. Thermal stratification resulted in classical changes in the vertical distribution of chemical parameters like oxygen and pH. Appreciable fall in pH was recorded from surface to bottom (8.9 at surface to 7.5 at bottom in May 97). DO recorded precipitous fall from epito hypolimnion. On most occasions hypolimnion recorded anoxic conditions (May to October). In the month of December the vertical heterogeneity in pH and oxygen was not significant. Clinograde distribution of oxygen and pH suggest the productive character of the reservoir.

Primary productivity

Gross production (C m^{2-1} h^{-1}) declined from May to September and thereafter showed an ascending trend. Least production was recorded in August (154.7 mg) and the most in December (431 mg). Maximum assimilation rate was recorded near 2 to 3 m depth and showed evidence of photo-inhibition at the surface.

Plankton

The standing crop of plankton varied from 1.24 ml (September) to 2.69 ml m^{3-1} (June). Zooplankton was predominant (68%) and was represented by *Cyclops, Diaptomus, Bosmina,Moina, Keratella and Brachionus.* Main phytoplankters were *Microcystis, Pediastrum* and *Ceratium.*

Fishery

No efforts have been made to develop the fishery in Manchanbele, though it is a new impoundment and showed productive features.

O. mossambicus, made an accidental entry into the reservoir and established itself contributing to the commercial fishery. Total catch during April to December was estimated at 19.7 t with peak catches occurring during August and September (3.3 & 3.57 t). Tilapia accounted for 99% of the catch. Stray specimens of *P. dorsalis, P. sarana, O. bimaculatus, G. giuris* and *M. vittatus* were also encountered.

Sub project	:	**Ecology and Fisheries of Tawa reservoir (Madhya Pradesh)**
Personnel	:	N.P.Shrivastava and B.L.Pandey
Duration	:	October 1993 to March 1998
Location	:	Reservoir Fisheries Research Centre of CIFRI, Hoshangabad (MP)

Physico-chemical parameters

The physico-chemical features of water and soil showed no marked difference to what has been reported in earlier years.

Fishery

Commercial fishing in Tawa reservoir resumed from 27.8.97 after the closed season. In 144 days of fishing (till end of November) 140.6 t of fish was caught from the reservoir.

C. catla (65.6%) was the most dominant species followed by *C. mrigala* (12.3%), while *L. rohita* (2.0%) and *T. tor* (1.0%) were not significant. Other species accounted for 19%. Catch was maximum in September due to increase in effort and minimum (2.0 t) in August.

Gill nets in the range 50-90 mm mesh-bar were mainly operated in the commercial fishing with greater number of 90 mm nets.

Fish fauna

13 species of fish were recorded during this period which takes the total to 42 species belonging to 10 families and 25 genera. The species are *Labeo angra* (Ham-Buch), *L. kontius* (Jerdon), *Cyprinus carpio (*Linnaeus*)*

The occurrence of silver carp, recorded for the first time in Tawa Reservoir is rather disturbing.

PROJECT : FC/A/22

TROPHIC DYNAMICS AND FISHERY MANAGEMENT OF FLOODPLAIN LAKE ECOSYSTEMS IN ASSAM.

Personnel : V.V. Sugunan, M. Choudhury, B.K. Bhattacharjya (Scientists) Aloke Sarkar (Technical)

Duration : 1994-1999

Location : Guwahati

Survey of floodplain lakes

The *beels* surveyed in 11 districts of Assam are shown in Table 1. Water quality in terms of pH, total alkalinity, dissolved solids and free CO_2 were less conducive to productivity in the beels of Barak valley. Among the Brahmaputra valley districts, ecological conditions were more favourable in Lakhimpur district, judged in terms of total alkalinity, pH, dissolved solids and free CO_2. Open beels, which generally harboured less macrophytes, were favourably disposed for energy transformation through phytoplankton.

Table 1 : *Beels* surveyed in Assam

District	Name of *beels* studied
Silchar	Ramnagar, Banskandi, Algapur
Hailakandi	Boiya
Karimganj	Sone, Sakaity, Howder
Darrang	Maihata, Gathia, Bodiashicha
Sonitpur	Dighali, Goroimari, Kharoi
Lakhimpur	Bilmukh, Morichampora
Jorhat	Goromaj, Borchala
Sibsagar	Boka, Barboka, Dikhow mornai
Dibrugarh	Longhori, Mer, Dihing era suti
Nalbari	Sotha jan, Ghogra jan, Morasaulkhowa
Barpeta	Kapla, Chotkapla, Tabha, Alpajan

Primary productivity and biotic communities

The results recorded on these parameters are depicted in Table 2. Most of the *beels* were managed on capture fishery norms by exploiting the natural fish stock, leading to low yield rates in the range of 66.67 to 638 kg ha^{-1} yr^{-1}. In the absence of any species management, these *beels* were dominated by small fishes (*Puntius* spp., *Colisa* spp., *Chanda* spp., *Mystus vittatus, Ambassis* sp., *Amblypharyngodon mola, Nandus nandus, Mastacembelus pancalus*, small prawns, *Botia* sp.), carnivorous catfishes (*Wallago attu, Ailia coila, Ompok bimaculatus*), air breathers (*H. fossilis, Channa punctatus, A. testudineus* and *N. notopterus*) and others. Boiya (Hailakandi district) and Kapla (Barpeta district) beels were the only exceptions where culture-based fishery was followed.

Table 2 : Primary productivity and some biotic communities in the *beels* surveyed in Assam

District	Primary productivity (mgC $m3^{-1}$ day^{-1})			Infestation of macrophytes (%)	Numerical abundance	
	Gross	Respi-ration	Net		Plankton (per litre)	Benthos (per m^2)
Silchar	1256.3	1170.0	281.3	Cl-70	11-58 Bc, Cp	0
Hailakandi	2409.4	468.0	2034.4	Cl	58 Bc, Ch	0
Karimganj	-	-	-	50-95,WH,V	9-99 BC, Cp	0-32 G
Darrang	1102.5	81.0	1035.0	Cl-90 WH,T	24-96 M, Bc	64-160 G
Sonitpur	2756.2	832.5	2062.5	Cl-90 T	36-414 Cp, Bc	32-320 G, O
Lakhimpur	2482.2	495.0	2070.0	25-50 H	34-140 Cp, Ch	64-416 G, B
Jorhat	-	-	-	70-80 H,WH	96-140 Bc, Cp	64-224 G, O
Sibsagar	925 1717.5	0-1110.0	0-1717.5	60-90 WH,V	20-178 Cp, Bc	0-32 G
Dibrugarh	-	-	-	50-80 N,V	9-49 Cp, Cd	0
Nalbari	-	-	-	Cl-30 WH	11-76 Ch, Cp	0-96 G,B
Barpeta	-	-	-	50-90 WH,C	24-118 Cp, M	32-196 G,B

Pen culture

An experiment on pen culture was conducted in Bagheswari beel, Kamrup district. Two pens of 0.1 ha area erected in the margin of the beel were stocked with 1100 fingerlings during 1st week of January and harvested after 129 days during mid May because of turbulent weather. The acidic water of the beel (pH 6.8-6.9 and alkalinity 14-15 mg l^{-1}) was limed @ 200 kg CaO per ha.

Species	Pen 1	Pen 2
Species stocked	*C.catla, L.rohita, C.mrigala*	*C.catla, L.rohita, C.mrigala*
Stocking number	1100	1100
Stocking density	C 30; : R 35 : M 35	C 30; : R 35 : M 35
Stocking size	C 24 g; R 21 g, M 18 g	C 24 g; R 21 g, M 18 g
Survival	30.72%	12.54%
Growth	C 52.7 g, R 38.1 g, M 21.1 g	C 31.4 g, R 26.7 g, M 20.5 g

PROJECT : FC/A/24

ASSESSMENT OF PRODUCTION POTENTIALITY OF RESERVOIRS IN TAMIL NADU

Personnel : V.K. Murugesan (Scientist), S. Manoharan (Technical)

Duration : 1996-98

Location : Coimbatore

Ecological studies

Summer sampling was carried out in Amaravathy, Palar-poranthalar, Uppar, Pilloor, Gunderipallam and Varatupallam reservoirs.

Soil quality : Soil sample from Pilloor reservoir was acidic to neutral (pH, 6.8-7.0), it was neutral in Palar-poranthalar. In other reservoirs, the soil samples were alkaline in reaction.

Water quality : The pH in the surface water (7.5 to 8.4) and the bottom water (7.2 to 8.4) were alkaline in reaction in all the reservoirs expect Pilloor which remained neutral (pH, 7.0). The dissolved oxygen content was fairly good, both in the surface (6.0-8.0 ml l^{-1}) and bottom (5.4 to 7.4 ml l^{-1}) waters excepting in the bottom layer in Pilloor (3.8 ml l^{-1}) during April. Alkalinity was mainly due to carbonates and ranged from 54.0 ml l^{-1} (Amaravathy) to 153.0 ml l^{-1} (Gunderipallam). Total dissloved solids and the specific conductivity ranged from 15.4 to 33.0 ml l^{-1} and 31.0 to 67.1 umhos cm^{l} respectively. Very small quantities of phosphates (0.057 to 0.28 ml l^{-1}) and sulphates (1.0 to 3.1 ml l^{-1}) and a fairly good amount of silicates (2.6 to 8.3 ml l^{-1}) were recorded from the reservoirs.

Plankton : The plankton population was dominated by phytoplankton (16.6 to 95.0%) in majority of the reservoirs. The zooplankton population dominated (83.4%) only in the Varatupallam reservoirs. The number of plankters varied from 1370 to 8980 per litre and the volume varied from 2.0 to 6.0 ml m^{3-1}.

Macrobenthos : *Chironomus* sp. dominated in Palar-poranthalar and Uppar. *Chaoborus* sp. dominated in Pilloor reservoir. Molluscan forms were found only in Uppar and Pilloor reservoirs.

Primary productivity : Varatupallam reservoir is the most productive one followed by Gunderipallam, Palar-poranthalar, Uppar, Thunakadavu, Peruvaripallam, Parambikulam, Pilloor and Amaravathy.

Stocking and fishing

Fishing is carried out regularly using the gillnets in Amaravathy, Palar-poranthalar, Gunderipallam, Uppar and Pillor by professional fishermen on share-crop basis. Whereas, in Parambikulam, Thunakadavu and Peruvaripallam fishing is carried out illegally by the tribal people for their subsistence. The contribution by stocked varieties in the landings were high in Palar-poranthalar, Amaravathy and Gunderipallam and by non-stocked varieties in Uppar and Pilloor.

PROJECT : FC/A/25

ECOLOGICAL INVESTIGATIONS OF SELECTED RESERVOIRS IN HARYANA, PUNJAB AND HIMACHAL PRADESH TO EVOLVE MANAGEMENT PACKAGE.

Personnel : D.K. Kaushal, V.K. Sharma (Scientists)
Sushil Kumar (Technical)

Duration : 1997-1998

Location : Karnal

Ecological investigations of seven selected reservoirs in Haryana, Punjab and Himachal Pradesh were concluded with the completion of summer campaign in May, 1997. Thereafter, ecological investigations of two reservoirs in Rajasthan were initiated in September, 1997 representing post-monsoon campaign.

The details of the nine reservoirs studied are given in Table 1.

Table 1. The details of the reservoirs surveyed

Name of the reservoir	State	District	Area (ha)
Badkhal	Haryana	Faridabad	22.8
Peacock	Haryana	Faridabad	10.8
Dholbaha	Punjab	Hoshiarpur	57.0
Janauri	Punjab	Hoshiarpur	17.0
Maili	Punjab	Hoshiarpur	46.0
Nangal	Punjab	Ropar	280.0
Chamera	Himachal Pradesh	Chamba	900.0
Sainthal	Rajasthan	Dausa	520.0
Kalakho	Rajasthan	Dausa	724.0

Limnological observations

Sainthal and Kalakho reservoirs were productive as evident from the values of calcium concentration (14.43-19.23 ml l^{-1}).

Primary productivity

The average gross organic production fluctuated between 83.9 (Chamera) and 140.4 mgC m^{2-1} hr^{-1} Peacock). Net organic production varied from 41.7 (Janauri) to 88.6 mgC m^{2-1} hr^{-1} (Peacock). Observations on the primary production in general indicated higher values of carbon production during summer months.

Aquatic biodiversity

Plankton : The density of plankton was highest (664 u l^{-1}) in Badkhal lake, Haryana while it was lowest (159 u l^{-1}) in Chamera reservoir, H.P. The average annual composition of plankton in Badkhal and Peacock lake, Haryana, indicated almost equal dominance of chlorophyceae, myxophyceae and bacillariophyceae. The dominance of rotifers ranged between 13.1 to 16.5%.

Plankton population varied from 319 u l^{-1} in Maili to 438 u/l in Dholbaha. Bacillariophyceae were dominant in all the reservoirs varying between 39.2% to 58.1%. Rotifers had their abundance in Januari (7.7%) while their lowest abundance was in Maili reservoir (2.1%). In Chamera reservoir, bacillariophyceae (56.1%) was also dominant followed by chlorophyceae (17.8%) and rotifers (12.8%).

Post-monsoon campaign of Sainthal and Kalakho reservoirs in Rajasthan revealed average abundance of 507 and 405 u l^{-1} of plankton respectively. Bacillariophyceae (27.7%) and chlorophyceae (29.2%) were equally distributed in Sainthal where as in Kalakho reservoir bacillariophyceae (37.9%) was dominant.

Periphyton : Periphytic community was dominated both qualitatively and quantitatively by bacillariophyceae in all the reservoirs.

Benthos : Benthos of Badkhal and Peacock reservoir were dominated by chironomids. Chironomids and *Chaoborus* sp. were dominant in Sainthal whereas molluscs dominated in the Kalakho reservoir.

Fishery

The details on fishery of Badkhal, Peacock, Dolbaha, Janauri, Maili, Nangal, Chamera has already been reported. *Notopterus* sp., *M.seenghala, W.attu, Mastocembelus* sp. and *Channa* sp. were the main fishes of Sainthal rservoir. The reservoir is stocked @ a minimum rate of 200 fingerlings per ha for maintenance of fish stock. Stocking of Indian major carps in Kalakho reservoir is a regular feature. Other species reported here are *M.seenghala, N.notopterus* and *L.bata.* Catfish generally dominated (upto 69%) the catch.

PROJECT : **FC/A/26**

ECOLOGY AND PRODUCTION RELATIONSHIPS IN PENINSULAR RIVER SYSTEMS

Sub project : **Investigations on ecology, biodiversity and production function in river Godavari.**

Personnel : M.Ramakrishniah, D.S.Krishna Rao, P.K.Sukumaran, N.P.Shrivastava, V.K. Murugesan, M.Karthikeyan, A.K.Das (Scientists)
Bijoy Nandan, S.Manoharan (Technicals).

Duration : 1997 to March 1998

Location : Reservoir Division, Bangalore.

Physiography of river Godavari

The total length of the river Godavari extends to over 1400 km and the catchment covers an area of 3,12,812 km^2. Major part of the river lies in the states of Maharashtra, Andhra Pradesh and Madhya Pradesh.

The river is narrow in the Maharashtra stretch and a number of pick-up weirs were constructed in this region for tapping water for irrigation. Three reservoirs exists on the main course of the river; a medium one at Nasik (Gangapur) and large one at

Paithan (Nathsagar) and Pochampad (Sriramsagar). In the lower stretch (Andhra Pradesh) two old anicuts are located, one at Dummagudem and the other 190 km down at Dhawaleswaram. Recently the Dhawaleswaram anicut has been replaced by a regulator.

For the purpose of study, the river has been divided into upper (Nasik to Nanded (Maharashtra), middle (Khandkurti to Eturunagaram, (Andhra Pradesh) and lower (Dummagudem to Yanam/ Narsapur, (Andhra Pradesh) stretches. In each stretch 8 to 9 centres were chosen for detailed sampling.

Water quality

Post monsoon sampling was conducted during November to December 1997. Water temperature varied from 23 °C at Nasik to 28 °C in lower reaches. pH was above 8.0 in middle and lower stretches and it was between 6.2 and 7.3 in the upper stretch except at Nasik. DO values were higher in the lower stretch (7.0-9.2 ml l^{-1}). Free CO_2 was recorded only in the middle stretch to a maximum of 5.0 ml/l. Total alkalinity was lowest at the source (44 ml l^{-1}) but gradually picked up with centres in the middle stretch recording the highest values (116-204 ml l^{-1}). Calcium ion was in the range 11.22 to 28.86 mg l^{-1} in upper stretch, 19.94 to 36.28 ml/l in the middle stretch and 19.24 - 25.65 ml l^{-1} in the freshwater zone of lower stretch. Magnesium was in the range 6.78 - 19.4 ml l^{-1}, 9.03-24.28 and 7.75 - 12.61 ml l^{-1} respectively in the three stretches. NO_3-N and PO_4-P were in low concentration, the former in the range 0.02 - 0.09 ml l^{-1} and the latter from 0.025 - 0.13 ml l^{-1} in the entire course of the river.

Fishery

Fishing activity in the Maharashtra stretch of the river is generally low and is mainly confined to areas around weirs and reservoirs. The fishing intensity increased from middle to lower stretch with greatest concentration in the tidal zones at Yanam and Narsapur. The main fishing craft is plank built boat. However, in middle and upper stretches thermocole rafts are used for fishing.

Seines, gillnets (with numerous variations and nomenclature) and castnets are the gears in riverine zone while in estuaries stake nets are prevalent.

The main fishing season in the river is during January to May.

The catches were poor, except in the estuarine zone. The target species appears to be the prawn which brings good returns. *C. mrigala* and *L. rohita* occurred sporadically. Long lines were observed at Rajahmundry catching *M. malcolmsonii*. In the upper stretch miscellaneous fishes formed the bulk of the catch.

PROJECT : FC/A/27

SEASONAL STUDIES ON FISHERIES RESOURCES IN RELATION TO ENVIRONMENTAL QUALITY AND PRODUCTION POTENTIAL IN SELECTED BACKWATERS.

Personnel : V.K. Unnithan (Scientist),
S. Bijoy Nandan, C.K. Vava (Technicals)

Duration : 1997-98

Location : Alappuzha

Water quality assessment

The mean pH values varied from 5.63 in Azhikode to 7.68 in Ashtamudi backwater during the monsoon whereas it varied from 5.4 in Chetuva to 8.2 in Neelaswaram backwater during the post monsoon period. There was a general reduction in pH during the post monsoon owing to less mixing coupled with the impact of retting activity at certain stations. The salinity values were mixo-haline in nature showing a range of 0.5 to 28.6 ppt during the post monsoon whereas it varied from 0.18 to 22.42 ppt during the monsoon period.

Anoxic condition was observed in station 5 and 4 (retting zones) in Ashtamudi and Kadinamkulam backwaters respectively. The monsoon period showed higher nutrient concentrations in most of the backwaters due to the inputs from the various river sources.

The study indicated that retting of coconut husk in the backwaters has been the major contributing factor to the organic pollution leading to the depletion in the faunal resources in the backwaters.

The water quality of the Achancoil, Pamba, Manimala and Meenachil rivers and the canals which drain into the Vembanad lake showed a marked deterioration with low transparency, high conductivity (917μ mhos cm^{-1}), TDS (478.0 mg l^{-1}), alkalinity (116 mg l^{-1}), hardness (137 mg l^{-1}) COD (18 mg l^{-1}), and low dissolved oxygen (0.6 - 5.6; av. 2.0 mg l^{-1})

Primary productivity

The Ashtamudi estuary showed a maximum gross productivity value (0.87g C m^{3-1} day^{-1}) during the post monsoon period whereas the Neelaswaram estuary showed a peak net productivity value of 3.3 gC m^{3-1} day^{-1}.

Community Structure and Biodiversity

Biomass : The mean seasonal biomass varied from 0.52 in Azhikode to 5.85 ml m^{3-1} in the Kadinamkulam backwater during the monsoon, whereas it varied from 0.28 in Mahe to 6.83 ml m^{3-1} in Ashtamudi estuary during the post monsoon period.

Phytoplankton : The Kadinamkulam estuary showed the maximum mean phytoplankton population during the monsoon period whereas the Chettuva estuary showed the maximum value in the post monsoon period. Desmidaceae had a higher representation in the northern backwaters (Neeleswaram to Azhikode) during the monsoon season whereas this was replaced by either Bacillariophyceae or Chlorophyceae during the post monsoon season. The southern backwaters except Ashtamudi was dominated by Bacillariophyceae during monsoon which got replaced by Myxophyceae during the post monsoon season. A total of 100 species of phytoplankton were recorded from the backwaters.

Zooplankton : The monsoon period showed the presence of 14 groups of zooplankton whereas the post monsoon showed 20 groups in the ten backwaters.

Benthos : Amphipoda, Polychaeta and Gastropoda formed the dominant groups in all the backwaters during both the seasons. The monsoon as well as post monsoon periods showed higher numerical density in the southern backwaters when compared to the northern segments. Thirteen groups formed the benthic population during the monsoon period whereas seventeen groups in the post monsoon.

Fish and fisheries

A total of 30 species of fishes, 5 species of prawns, 2 species of crabs and 2 species of bivalves were recorded during the present study.

PROJECT : BF/B/3

ECOLOGY AND PRODUCTION BIOLOGY OF HOOGHLY-MATLAH AND KULTI ESTUARINE SYSTEM

Personnel : D.K. De, D.Nath, P.M. Mitra, H.C. Karmakar, A. Hajra (Scientists)
N.C. Mondal, H.K. Sen, A.R. Paul, B.B. Das, P. Biswas, D. Sanfui, B.B. Das, Abhijita Sengupta, S. Mondal, P. Singh, A. Roychowdhury, C.P. Singh (Technicals)

Duration : 1983-98

Location : Barrackpore

Ecology

The study on ecology of the Hooghly-Matlah and Kulti estuarine system revealed that in the estuarine system, no appreciable fluctuation in the values of pH, D.O., transparency, total alkalinity and hardness was observed when compared with the respected values for the last four years.

The total plankton production for the Hooghly estuarine system was maximum at Diamond-Harbour (1542 u l^{-1}) and minimum at Barrackpore (144 u l^{-1}) during monsoon. The average density of macrozoobenthos in the estuarine system varied from 291 to 1784 u m^{2-1} and maximum density was observed during winter season. The average density of macrozoobenthic fauna was high in all the zones during all seasons excepting marine zone during winter and freshwater zone during monsoon.

Fishery

Total fish yield from the Hooghly-Matlah estuarine system and Digha centre was estimated as 14,765.1 t and 9,542.2 t respectively (total being 2,4307.3 t) during the period February to October 1997. The combined catch showed an increase of 5317.3 t (28%). The principal factor for the enhanced fish catch from the estuarine system was due to sharp increase of hilsa catch by 3296 t (64%) and some other species.

An estimated catch of 8,418.4 t of hilsa was netted out from the Hooghly estuary while at Digha landing centre it amounted to 1229.8 t during February to October 1997 compared to 5122.4 t and 1522.1 t respectively during the corresponding period of last year.

The lower estuarine zone, accounted for 95% and 91% of the total catch including and excluding the catch of Digha centre respectively. Average CPUE of 'Drift gill' net and 'Bagnet' were 0.94 kg and 3.76 kg in the upper estuary compared to 1.09 kg and 3.55 kg respectively during 1996.

Inventry of crafts and gears

A census of crafts and gears in the upper estuary was undertaken during July to October 1997. About 75% of the villages from Nabadwip to Diamond-Harbour stretch except Budge Budge to Falta were covered. Preliminary analysis of 121 common villages in the upper stretch surveyed during current year revealed all round decline of gears, boats and full time employed fishermen compared to 82-83 inventory. Dominant gears, drift-gill and bagnet decreased substantially by 40% and 62% respectively. Purse net, small seine, cast net also decreased by 57%, 68% and 42% respectively. Some selective new types of small meshed gill nets locally known as '*Tapsia*' and '*Bhola-ber*' to capture *P.paradiseus, P.pama* have been introduced which had no existence during 1982-83 inventory.

Destruction of hilsa juveniles

Wanton destruction of hilsa juveniles by indiscriminate exploitation through small meshed nets in the upper stretch of the estuary was estimated as 32.6 t during February to October 1997.

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P.monodon seed potential

The level of commercial exploitation of bagda seed from the Midnapore coast was assessed. The total arrivals of bagda *(Penaeus monodon)* seed in the markets of Digha-Sankarpur and Haldia during the period February to June 1997 was estimated as 84.654 millions. The sale price per thousand number seed varied from Rs. 120.00 to 1,000.00.

PROJECT : BF/B/9

ECOLOGY, BIODIVERSITY AND FISHERIES OF NARMADA ESTUARINE SYSTEM WITH SPECIAL REFERENCE TO THE PROPOSED IMPOUNDMENT OF RIVER NARMADA (SARDAR SAROVAR)

Personnel : S.N. Singh, V .Kolekar (Scientists)
R.C. Mandi, R.K. Sah, Ram Prasad (Technicals)

Duration : 1988 - 1998

Location : Vadodara

Ecology of the Narmada Estuarine System

Seven centres were selected by considering the topography and salinity ingress. Mahegam, Bhadbhut and Bharuch represented the estuarine extent while Jhanor and Sisodara, Poicha and Vadgam constituted the transitional and fresh- water expanse of the Narmada estuarine system respectively. The last centre, Vedgam falls under submergence area of Sardar Sarovar dam.

Biological regime

Plankton : Average planktonic biomass for the Narmada estuarine complex as a single entity varied from 44 (Vedgam) to 238 Nos.l^{-1} (Bhadbhut). Phytoplankton dominance was constituted by Bacillariophyceae (50.44 to71.62%). Zooplankton was meagerly represented.

Macrobenthos : Average macro-benthic abundance fluctuated between 402 (Sisodara) to 4699 Nos.m^{-2} (Bharuch). Oligochaeta/Polychaeta (70.33 to 98.06%) were the major groups at the estuarine and transitional zones while Diptera and Mollusca dominated the upstream freshwater zone.

Environmental monitoring

Environmental monitoring was carried out at Baijalpur receiving domestic and industrial effluents and Sakkarpura point discharging composite effluents into the estuarine zone of the system.

Higher abundance of Oligochaeta/Polychaeta reflected establishment of organic enrichment process at Baijalpur confluence site while stress condition at Sakkarpura point.

PROJECT : BF/B/10

INVESTIGATIONS ON PRODUCTION DYNAMICS OF SALINE *BHERIES* IN RELATION TO THEIR FISHERIES DEVELOPMENT

Personnel : A.K. Ghosh, P.K. Pandit, H.C. Karmakar (Scientists)
T. Chatterjee, S.K. Chatterjee, B.B. Das, L.K. Parbat, Amoy Barui, Debasis Saha (Technicals)

Duration : 1991 - 1998

Location : Calcutta

Under the project, survey was initiated to select bheries from 3 different zones at Hatgachia (freshwater), Kharibari (low saline) and Chandipur-Kumirmari (high saline). Investigations were carried out at 4 bheries in each zone to study the ecological parameters and production trend of fish and prawn (mainly *P.monodon*).

Water quality assessment

The physico-chemical characteristics of water and soil of the selected bheries were studied. The heavy metal analysed here were within the tolerance limit of the fish and prawn.

Biotic communities

Plankton : The plankton availability was recorded from traces to 4.50 cc 50 l^{-1} of water at Hatgachia; traces to 3.50 cc 50 l^{-1} of water at Kharibari and traces to 7.00 cc 50 l^{-1} of water at Chandipur-Kumirmari area. Species diversity index was found to vary from 0.70 to 3.09 in freshwater; 0.36 to 3.24 in low saline and 0.62 to 2.83 in high saline zone during the period. In the freshwater, the presence of *Spirulina* sp. indicated polluted condition of the Bhery-1 and the main forms of macrovegetation were also recorded at different zones.

Benthos : Various forms of benthic flora and fauna were recorded.

Fishery

The estimated total annual production from freshwater, low and high saline zones bheries fluctuated from 6153.8 kg ha^{-1} to 8007.0 kg ha^{-1}, 620.520 kg ha^{-1} (*P. monodon* : 231.841 kg) to 798.240 kg ha^{-1} (*P. monodon* : 171.874 kg) and 199.815 kg ha^{-1} (*P. monodon* : 128.514 kg) to 281.385 kg ha (*P. monodon*: 199.697 kg) respectively.

Fish and prawn diseases

The occurrence of isopod parasites and white spot disease in prawns were reported from low and high saline areas. Remedial measures like liming and methylene blue applications were suggested for effective results.

Socio-economic study

The study was carried out in 8 villages near the selected bheries to know the socio-economic condition of the fishermen/fisherwomen engaged in the bheries. A total of 275 individuals were selected at random. They were interviewed personally with a schedule developed for this purpose. Data is being analysed.

PROJECT : BF/B/11

INVESTIGATION ON DIAGNOSIS AND CONTROL OF FISH AND PRAWN DISEASE EPIDEMIC

Personnel **:** M.K. Das, R.K. Das, S. Bhatia (Scientists)
S.P. Ghosh, S. Bhowmick (Technicals)

Duration **:** 1992-1998

Location **:** Barrackpore

During the period under report investigations were conducted in the sites mentioned below and 600 fishes were examined for fish/prawn disease investigation. The pathogens recorded are also given below :

Site	Disease	Host	Bact. load	Causative agent
Nazat Bheri (NB)	*Vibriosis*	*P.monodon* *L.parsia*	3600 ml	*Vibrio* sp. *Patrichodina indica*
Dey Ganga				
B1 (T3)	*Vibriosis*	*P.monodon*	2750/ml	*Vibrio* sp.
B2 (AA)			2150/ml	
B3 (M3)			4330/ml	
Swarupnagar Pond (SNB)	Environ-mental	*C.catla, L.rohita, C.mrigala*	580/ml	High level unionised ammonia, plankton bloom
Kulkulia beel (KB)	Environ-mental	*C.catla, C.mrigala*	5000/ml	High level unionised ammonia, high organic load
Matigara pond (M.P) Kankinara pond (K.P) Kulia pond (Ku.P)	Investigations on the physiological parameters of blood			

Investigations were continued to determine the approximate normal ranges of the various blood parameters from clinically healthy Indian major carp *L.rohita* (100-110 g) under optimum water quality conditions. The results are tabulated below.

Site	(M.P)	(Ku.P)	(Ka. P)
Haemoglobin (g/100 ml)	4.0-6.0	7.0-8.1	7.0-8.0
Haematocrit (%)	30-34	63-81	42.8-67.0
Leucocrit (%)	-	-	-
Clotting time (sec.)	28-37	29-31	22-28.0
Plasmachloride (m Eq/l)	84.6-92.3	100	85.0-111.9
Plasma glucose (mg/100 ml)	58.4-60.7	96.8-131.4	122.5-152.5
Plasma protein (g/dl)	2.25-2.65	1.0-1.4	0.75-0.9
Plasma cholesterol (mg/100ml)	104.5-151.4	210.3-230.6	122.9-134.2

Histopathology : Gills and anterior kidney of *L.rohita* from suboptimal habitat causing stress to fish was histologically examined for stress assessment of fish.

Specific disease outbreak investigated

Fish mortality of *L.rohita, C.mrigala* and *C.catla* in two water bodies SNB and KB measuring 2 ha and 6 ha respectively in north 24 Parganas, West Bengal were observed. Investigations conducted on the causative agent revealed high levels of unionised ammonia ranging from 0.8 mgl^{-1} to 15 mgl^{-1} and low oxygen level 0.5 to 1.4 mgl^{-1} at 5 AM. Microcystis bloom was present throughout the water bodies. While SNB received washings from prawn processing factory, KB received domestic waste from household situated around it.

The physiological parameters investigated in *C.mrigala* in SNB where very high UIA levels persisted consistently (6-15 mg l^{-1}) showed Hb (4.5-5.0 g/100 ml); Haematocrit (28-30%), Blood clotting time (20-30 sec), plasma chloride (87-98 m Eq l^{-1}) and plasma glucose (40-51 mg/100 ml) could not give a definite indication of physiological stress, but histological examination of gills of affected fishes showed lamellar hyperplasia and fusion a prerequisite for causing asphyxia in fishes during low oxygen levels. Remedial measures adopted were channelizing the prawn processing factory wastes through sedimentation tanks with filters before draining into the ponds. It gave good results.

PROJECT : BF/B/12

SPATIO TEMPORAL VARIATIONS IN THE BIOTIC AND ABIOTIC FEATURES OF THE MAJOR ESTUARIES AMIDST SUNDERBAN MANGROVES

Personnel **:** P.K. Chakrabarti, A. Hajra, R.K. Das, U. Bhaumik (Scientists) N.N. Mazumder, Sukumar Saha, Arunava Mitra and C.P. Singh (Technicals)

Duration **:** 1993-1997

Location **:** Barrackpore

Research investigations were conducted in six major estuaries *viz.,* Jheela, Bidya, Matlah, Thakuran, Saptamukhi and Hooghly located within the Sunderbans.

Biotic communities

Plankton : Plankton densities recorded like previous years were more than double than those of winter months for all the estuaries in general. The spatio-temporal variations in the plankton density exhibit it to be minimum (117.2-129.8 u l^{-1}) in the Hooghly estuary during summer and maximum (793.6-822.7 u l^{-1}) in the Bidya during monsoon. Plankton density showed direct relationship with the transparency of the estuarine water.

Macrobenthos : Unlike plankton density, the concentration of macrobenthos was the highest (172.7 u m^{2-1} in the range of 68.4-172.7 u m^{2-1}) inthe estuaries with adequate headwater influx and the minimum (58.8 u m^{2-1} in the range of 58.8-137.2 u m^{2-1}) in the estuaries with scanty headwater discharge.

Nekton : During the year in various seasons, surface and sub-surface (upto 0.5 m depth) hauls of nekton by townet comprised fish and prawn seeds.

Physico-chemical parameters

Values of pH, DO, alkalinity and soluble nitrogen were at optimum level for various estuaries in different seasons. PO4-P values (0.013-0.035 mg l^{-1}) in winter and

monsoon months were conducive in all the estuaries. Notable features of these estuaries within the Sunderban mangals were :

a) Nutrient values increased during monsoon season when mangrove litter washings from the forest reached the estuarine waters.

b) CO_3 was practically absent all throughout barring Thakuran-Matlah and Bidya-Jheela systems in summer for higher rate of litter decomposition.

c) HCO_3 values increased from monsoon to summer even when nutrient values were not much.

d) Primary production was higher in estuaries with less turbidity and higher salinity.

Microbes

Microbial studies were conducted to assess the load of beneficial bacteria in the mangrove estuarine system. The trends of such bacterial count in the estuaries were similar to those observed earlier.

As usual bacterial loads were maximum in monsoon and minimum in winter, being contributed greatly by heterotrophic and aerobic N-fixing bacteria like previous year. When loads of heterotrophic bacteria and phosphate solubilizing bacteria declined towards the estuaries with inadequacy of headwater, the load of aerobic N-fixing bacteria increased inversely in all seasons.

Biochemical studies

Besides routine observations on glucose, cholesterol, urea etc. in blood and the lipid content in fishes from various estuaries, the study on hydration, condition factors and gonadosomatic indices of *S.panijus* and *L.parsia* were taken up during the period under report. These three parameters exhibited direct relationship with the quantum of headwater flow through the estuaries. The trend of GSI in both the species were identical but the condition factors (Kn) were slightly better in *S.panijus* than in*L.parsia*.

Socio-economic studies on *P.monodon* and collectors

The availability of seed of *P.monodon* has gone down in Hooghly by 14.1%, Matlah by 7.9%, Saptamukhi by 11.24%, Thakuran by 12.6%, Bidya 11.1% and Jhila by 6.5%.

PROJECT : BF/A/22

IMPACT OF FARAKKA BARRAGE ON RECRUITMENT OF HILSA

Personnel : H.P. Singh (from 18.6.97), A. Mukherjee, A. Ghosh, A. Hajra, B.P. Mohanty, A. R. Chowdhury (Scientists) K.S. Banerjee and K.P. Singh (Technicals)

Duration : 1993-1997

Location : Malda (Farakka)

General assessment of fish landing at the Farakka region

Recording of fish landing data at Farakka Fish Assembly centres with particular reference to three fishing zones *viz.,* Taltala (upstream of river Ganga, above the Farakka barrage). Beniagram (downstream of river Ganga, below the Farakka barrage) and Feeder canal (leading to river Bhagirathi) was carried out during the period under report.

Hilsa fishery at the Farakka region

The total catch of hilsa, *Tenualosa ilisha* from the Ganga River system at the Farakka region during the period under report has been estimated to the tune of 23.89 t forming 20.62% of the total fish landing from the region. Beniagram fish landing centre contributed 52.04% to the total catch of hilsa from the region followed by Feeder canal (43.34%) and Taltala (4.62%).

The present catch of hilsa has depicted a decrease by 27.85% when compared with the catch of the corresponding period of 1996.

The adult hilsa population (>200 m) of 22.64 t formed about 94.79% of the total catch of hilsa from the region. The juvenile hilsa population (upto 200 mm) of 1.24 t formed 5.21% of the total catch of hilsa from the region. The significant findings is the presence of hilsa juveniles from the Beniagram Fish landing centre contributing 9.89% to the total hilsa juveniles of the region. The catch per unit of effort has been estimated as 0.798, 0.702, 0.662, 0.341 and 0.186 kg man^{-1} hr^{-1}.

Two more fish landing centres at the upstream of river Ganga above the Farakka barrage have been considered during the period under report *viz.*, Manikchawk fish landing centre where the total estimated catch of hilsa during the period has been estimated to be of 463 kg which is about 18.6% less than that of the corresponding period of 1996.

In the other landing centre Rajnagar/Panchanandapur the CPUE varied from 0.26 to 0.76 and 0.25 to 1.64 kg/man/hr. respectively during the period under report.

The total estimated catch of hilsa during the period has been estimated to be 1088.5 kg which is more than five times compared with that of the previous year.

Drag nets and gill nets of different mesh sizes are the main gears operated and the CPUE varied from 0.01 to 0.5 and 0.02 to 0.87 kg man^{-1} hr^{-1} respectively during the period under report.

Study of biological parameters

Centre	Monsoon		Winter	
	Plankton	*Macrobenthos*	*Plankton*	*Macrobenthos*
Manikchawk	85.5 u l^{-1}	74 u m^{2-1}	205 u l^{-1}	194.44 m^{2-1}
Taltalaghat	130 u l^{-1}	55.5 u m^{2-1}	300 u l^{-1}	208.33 m^{2-1}
Beniagram	60 u l^{-1}	9 u m^{2-1}	130 u l^{-1}	83.33 m^{2-1}

Water quality

To evaluate the water quality, three centres *viz.*, Manikchawk and Taltalaghat and Beniagram were selected and samples were analysed. Water was highly turbid having low transparency (6.0-7.0 cm) in monsoon and was moderate during winter (17.0-25.0 cm). This may be due to heavy amount of silt-load during monsoon which restrict the penetration of light. Carbonate alkalinity was quite low (1.0-3.0 mgl^{-1}). Bicarbonate alkalinity was high during winter (84.0-88.0 mgl^{-1}) and low during monsoon (62.0-80.0 mgl^{-1}).

Water was moderately hard (96-120 mgl^{-1}). Chloride concentration was low (16-19.0 mgl^{-1}). Critical evaluation of data reveals that water temperature, carbonate, chloride and hardness was low whereas transparency, D.O. and bicarbonate was high in winter season.

Soil quality

Four centres *viz.*, Manikchawkghat and Taltalaghat and Feeder canal and Nimtita were selected and samples were collected. Percentage of sand was very high (90%) at Manikchawk which decreased slowly at Feeder canal (66%) and then increased at Nimtita (69.0%). Clay showed the increasing trend from Manikchawk to Nimtita. pH was towards the alkaline side (8.16-8.33) which indicate decreasing trend from Manikchawkghat to Feeder canal and then increased. Specific conductivity increased from 116.0 mmhos cm^{-1} (Manickchawkghat) to 218.0 mmhos cm^{-1} (Feeder canal) and decreased to 200 mmhos cm^{-1} at Nimtita. TDS showed the similar trend like specific conductivity. Percentage of organic matter was lowest (0.21%) at Manikchawkghat which rises slowly and reached the highest value (0.55%) at Nimtita. Soil characteristics reflect the clearcut impact of the barrage on its quality.

Critical evaluation reflect that all the metals *viz.*, Cu, Pb, Zn increased from Manikchawkghat to Feeder canal and decreased at Nimtita except Chromium which clearly indicates the impact of barrage on metal concentration.

Delineation of breeding ground of hilsa

Investigations revealed the presence of hilsa seeds during September to November at different centres in 240 km stretch between Berhampur (*c* 100 km down stream of Farakka barrage) and Bhagalpur (c 140 km upstream of Farakka barrage).

PROJECT : AN/A/16

INLAND FISHERIES RESOURCES EVALUATION THROUGH REMOTE SENSING TECHNIQUES

Personnel **:** R.A. Gupta, D. Kumar, B.C. Jha, S.K. Mandal, G.C. Laha (upto 31.8.97) (Scientists). Sucheta Mazumder, K. Jaquiline (Technicals)

Duration **:** 1995-1998

Location **:** Barrackpore

No achievements could be made under the project as the project programme could not be initiated due to inconclusive discussions made with the Ministry of Agriculture and Cooperation, Govt. of India on the modalities and other collaborative arrangements envisaged while preparation of the project. However, the project will be initiated during the first year of the IX Plan. Action is being taken to establish laboratory facilities for such studies.

5. TECHNOLOGY ASSESSED AND TRANSFERRED

Research on Extension Education

Impact of Peripatetic training : An investigation was carried out in Sunderbans to find out the changes in attitude about pig-cum-fish farming among the participants of peripatetic training and to study the relationship between the attitude of farmers and their age, education, size of land holdings, extension, contact, extension participation, social participation and mass media utility.

The study revealed, peripatetic training has resulted the participants to develop favourable attitude towards pig-cum-fish farming. As high as 82.4% of the fish farmers before training had negative attitude towards pig-cum-fish farming. This percentage was reduced to 36.2% after the training.

Extension Services

The following services were imparted through the extension activities of the Institute :

Extension activities	Beneficieries
1. Advisory service	Fish farmers, entrepreneurs, Govt. Agencies, NGOs, farmers (286 nos.)
2. Training	Extension functioneries, farmers (51 nos.)
3. Communication services through literature, video cassettes, etc.	Govt. Agencies, NGOs, entrepreneurs (78 nos.)
4. Talks	Farmers, students, trainees of State Govts. (28 nos.)
5. Exhibition	Farmers, students, trainees of State Govts. (5 nos.)
6. Mass media coverage (Doordarshan programmes)	Farmers, students, trainees of State Govts.(3 nos.)

Krishi Vigyan Kendra

The Krishi Vigyan Kendra of CIFRI established for the socio-economic upliftment of the downtrodden people of Sunderbans is working with five disciplines *viz.* Fisheries, Crop production (Agronomy), Horticulture, Animal Science and Home Science.The kendra has contributed remarkably in transferring need based, problem oriented, location specific and skill oriented training programmes both on-campus and off-campus to its clientale.

Achievement of Training Programme conducted during the year 1997

Course name	No. of courses conducted	Total number of trainees participated			
		S.C/S.T.		Others	
		Male	Female	Male	Female
Practising farmers					
Agronomy	16	123	38	197	70
Horticulture	26	82	42	180	40
Fisheries	18	90	25	157	71
Animal Science	24	83	24	142	57
Home Science	19	-	115	-	142
School dropouts/Rural youth					
Agronomy	11	70	20	70	35
Horticulture	03	20	-	44	10
Fisheries	09	74	09	46	20
Animal Science	04	20	-	-	107
Home Science	12	-	99	-	107
In service training for extension functionaries					
Agronomy	03	07	13	43	07
Fisheries	05	50	20	61	30

Impact of Training Programme

Name of specific technology/skill transferred	No. of trainees	Percentage of adoption	Income before training (Rs. per unit/ha)	Income after training (Rs. per unit/ha)
Induced breeding of Indian major carp	65	60%	-	10,000.00
Composite fish culture	220	80%	12,000.00	32,000.00
Paddy cum fish culture	55	505	4,000.00	10,000.00
Hybrid tomato cultivation	120	60%	4,500.00	9,000.00
Betelvine production technique	225	60%	5,000.00	8,000.00
Profitable mushroom production	30	40%	-	1,000.00
Freshwater prawn farming	20	60%	5,500.00	10,000.00
Pig-cum-fish farming	20	50%	5,000.00	7,000.00
Duck-cum-fish farming	30	60%	-	1,200.00
Adoption of intermittent lighting management and concrete floor rearing of poultry broiler	45	60%	-	750.00 (per 100 birds)

6. EDUCATION AND TRAINING

Training (Inland)

Dr. A.K. Das, Scientist attended the Summer School on Fisheries enhancement of small reservoirs and floodplain lakes in India conducted by CIFRI, Barrackpore from 14 July to 12 August, 1997.

Dr. R.S. Panwar, Principal Scientist participated in the course on 'Management of Agricultural Research Institutes/Stations' held at NAARM, Hyderabad from 18th August to 23rd August, 1997

Dr. S. Bijoy Nandan, T-5 received advanced training in environmental biotechnology at the National Environmental Engineering Research Institute (NEERI), Nagpur under the DST visiting fellowship programme. The fellowship was for a duration of three months from September 1 to November 30, 1997.

Dr. Sandeep Bhatia, Scientist has been nominated Foundation Course for Agricultural Research Service (FOCARS) at NAARM, Hyderabad from 3rd October 1997 to 29th January, 1998.

Mrs. Rina Naiyya, T-2, attended the course on 'Operating the software' from 17-28 November, 1997 at CALIBNET, Calcutta.

Training (Abroad)

Shri Sukumar Saha, T-5, participated in the training on 'Extension Methodology and Fishery Resources Conservation' from 24th October to 29th November 1997 at SEAFDEC, Thailand.

Short term training programme

CIFRI conducted a short term training programme on 'Statistical Methods for Fisheries Data Collection in Open Water Ecosystems' from November 17-22, 1997 for the benefit of scientific and technical personnel engaged in fisheries data collection in the country. This training was imparted to 17 participants representing various State

Group discussion with the farmers

On-campus training in progress

On-farm trials of betelvine under KVK programme

Demonstration on cabbage under Lab to Land programme

Directorates of Fisheries, Agricultural Universities and ICAR Institutes. The various topics covered during the programme included :

1 Basic Statistical Methods used in Inland Fisheries.
2 Application of sampling techniques in the estimation of inland fish catch.
3 Methodology for collection and estimation of fish statistics from reservoirs and lakes.
4 Data collection methodology for estimation of fish production from estuaries and lagoons.
5 Collection and estimation of fish catch in the state of West Bengal.

CIFRI Study Circle

Scientific lectures were arranged by the CIFRI Study Circle to commemorate the Institute's Golden Jubilee celebrations during 1997. The following distinguished scientists delivered lectures :

Prof. H.P.C. Shetty, Ex- Director of Instruction, Fisheries College, Mangalore
Prof. Giridhari Mazumder, Dept. of Zoology, Burdwan University
Mr. M.M. Bagchi, Sr. Scientist, CIFRI
Dr. B.C. Jha, Sr. Scientist, CIFRI
Mr. U. Bhaumik, Sr. Scientist, CIFRI
Mr. P.K. Chakraborti, Sr. Scientist, CIFRI
Mr. R.K. Das, Sr. Scientist, CIFRI.

Hindi Fortnight

The Institute observed the Hindi Fortnight during 15-29 September 1997. During this fortnight various competitions were conducted like essay, letter writing and drafting in Official Language at the Institute Headquarters. During this fortnight a meeting was also convened under the chairmanship of the Director, CIFRI to highlight the provision and statutory obligations of Official Lanuage Act and Official Language Rules. The Director and other senior officers of the Institute appealed to the members of staff to do their day to day official work in Hindi. The message and appeal of the Director General, ICAR, New Delhi was also read in the said meeting. Prizes were distributed by the Director to the winners.

7. AWARDS & RECOGNITIONS

☛ Dr. Maniranjan Sinha, Director, CIFRI, was honoured with the prestigious **Param Krishi Vaigyanik Award 1996-97** at the 30th Annual Session of Indian Society of Agricultural Chemists held at Sheila Dhar Institute of Soil Science (University of Allahabad) during December 18-20, 1997 besides the Fellowship of the Society. Dr. Sinha was conferred this award for his outstanding contributions in inland fisheries research in the country. The award carries a cash prize of Rs.10,000.00, a gold medal, a memento and a citation. The award is given after every four years to a distinguished scientist of international repute in Agriculture/Soils and Agricultural Chemistry/Fisheries.

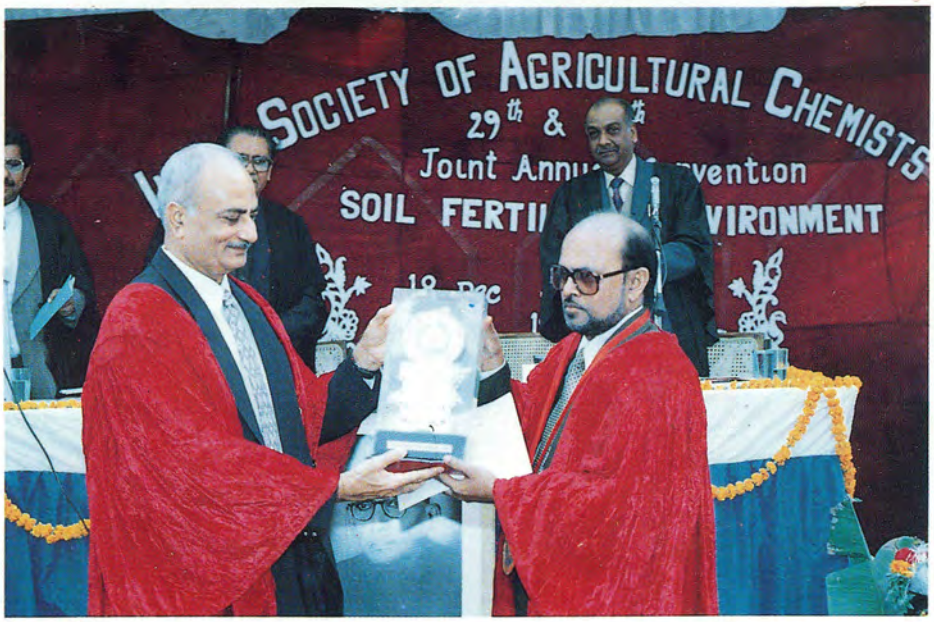
☛ Dr. K. Chandra, Senior Scientist, CIFRI has been awarded Fellowship of Indian Society of Agricultural Chemists (FISAC) at the 30th Annual Session of the Society held at Sheila Dhar Institute of Soil Science (University of Allahabad) on 18 December, 1997.

☛ Dr. V.K. Unnithan, Senior Scientist was nominated as a Member of the Coastal Zone Management Committee constituted by the Govt. of Kerala for the formulation of the policies under the CRZ regulations in the State.

☛ Mr. D.S. Krishna Rao, Senior Scientist, Reservoir Division of CIFRI, Bangalore, has been awarded the Degree of Doctor of Philosophy in November 1997 by the Bangalore University for his research thesis entitled 'Zooplankton Dynamics and Production in a Tropical Man-made Lake'.

☛ Mr. R.N. Seth, Senior Scientist was awarded degree of Doctor of Philosophy for his thesis "Fisheries Ecology and Breeding behavior of a catfish, *Aorichthys seenghala* (Sykes) with special reference to its management strategies" from Allahabad University.

Dr. Maniranjan Sinha, Director, CIFRI receiving the
Param Krishi Vaigyanik Award from D. D.G.(Soil Science), ICAR



Prof. H.P.C. Shetty delivering lecture to scientists of the Study Circle, CIFRI

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

☞ An ICAR Cess Fund Project entitled Dynamics of Tilapia populations in Peninsular Reservoirs and their possible impact on the native fish genetic resources IS under operation.

☞ An ICAR Cess Fund Project entitled "Standardization of the stress sensitive biological parameters in fish and their possible use as indicator of water quality" is being undertaken.

☞ An ICAR Cess Fund Project entitled "On farm research for development of fisheries in ox-bow lakes in Begusarai (Bihar) is being executed.

☞ The CIFRI Centre at Alappuzha collaborates with the State Government in the implementation of the Janakeeya Matsykrishi, a mass fishery programme with the public participation in Kerala.

9. AICRP/COORDINATION UNIT/NATIONAL CENTRES

Nil.

10. LIST OF PUBLICATIONS

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11. LIST OF APPROVED ONGOING PROJECTS

Project No.		Name of Project
FC/B/10	:	ECODYNAMICS AND FISHERY STATUS OF UPPER STRETCHES OF RIVER YAMUNA AND ASSOCIATED CANALS
FC/B/11	:	ENVIRONMENTAL IMPACT ASSESSMENT IN RIVERINE ECOSYSTEMS
FC/B/12	:	INVESTIGATIONS ON ECOLOGY, BIODIVERSITY AND PRODUCTION RELATIONSHIP IN YAMUNA AND GHAGRA TRIBUTARIES OF RIVER GANGA
FC/B/14	:	ECOLOGY AND EVALUATION OF PRODUCTION RELATIONSHIPS IN THE RIVER BRAHMAPUTRA WITH SPECIAL EMPHASIS ON ITS TRIBUTARIES
FC/A/4	:	ECO-DYNAMICS AND FISHERY MANAGEMENT OF BEEL ECOSYSTEMS IN WEST BENGAL
FC/A/7	:	ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS
FC/A/22	:	TROPHIC DYNAMICS AND FISHERY MANAGEMENT OF FLOODPLAIN LAKE ECOSYSTEMS IN ASSAM
FC/A/24	:	ASSESSMENT OF PRODUCTION POTENTIALITY OF RESERVOIRS IN TAMIL NADU
FC/A/25	:	ECOLOGICAL INVESTIGATIONS OF SELECTED RESERVOIRS IN HARYANA, PUNJAB AND HIMACHAL PRADESH TO EVOLVE MANAGEMENT PACKAGE
FC/A/26	:	ECOLOGY AND PRODUCTION RELATIONSHIPS IN PENINSULAR RIVER SYSTEMS
FC/A/27	:	SEASONAL STUDIES ON FISHERIES RESOURCES IN RELATION TO ENVIRONMENTAL QUALITY AND PRODUCTION POTENTIAL IN SELECTED BACKWATERS

Project No.		Name of Project
BF/B/3	:	ECOLOGY AND PRODUCTION BIOLOGY OF HOOGHLY-MATLAH AND KULTI ESTUARINE SYSTEM
BF/B/9	:	ECOLOGY, BIODIVERSITY AND FISHERIES OF NARMADA ESTUARINE SYSTEM WITH SPECIAL REFERENCE TO THE PROPOSED IMPOUNDMENT OF RIVER NARMADA (SARDAR SAROVAR)
BF/B/10	:	INVESTIGATIONS ON PRODUCTION DYNAMICS OF SALINE BHERIES IN RELATION TO THEIR FISHERIES DEVELOPMENT
BF/B/11	:	INVESTIGATION ON DIAGNOSIS AND CONTROL OF FISH AND PRAWN DISEASE EPIDEMIC
BF/B/12	:	SPATIO TEMPORAL VARIATIONS IN THE BIOTIC AND ABIOTIC FEATURES OF THE MAJOR ESTUARIES AMIDST SUNDERBAN MANGROVES
BF/A/22	:	IMPACT OF FARAKKA BARRAGE ON RECRUITMENT OF HILSA
AN/A/16	:	INLAND FISHERIES RESOURCES EVALUATION THROUGH REMOTE SENSING TECHNIQUES

12. CONSULTANCY, PATENTS, COMMERCIALISATION OF TECHNOLOGY

☞ A Consultancy Project on "A Cost Benefit Analysis of the Ganga Action Plan" sponsored by the Ministry of Environment & Forests, Govt. Of India, was carried out which relates to impact of GAP on fisheries.

☞ A Consultancy Project entitled "Likely impact on aquatic ecology in the context of Barrage construction across the river Ganga at Kanpur" awarded by the Government of Uttar Pradesh is being executed.

☞ The Riverine Division of CIFRI at Allahabad is working on a consultancy project "Likely Impact of Barrage on River Ganga at Kanpur" assigned by the Department of Irrigation, Uttar Pradesh.

☞ A consultancy project entitled "Fish conservational and hydrobiological perspectives of river Narmada with reference to Sardar Sarovar Project" sponsored by the Government of Maharashtra, Mumbai is being executed at Vadodara Research Centre of the Institute.

☞ Consultancy Project on "Environmental Impact Assessment Study on Shrimp and Fish Culture" Project in Bihar and Uttar Pradesh sponsored by the World Bank is on the anvil.

CIFRI Research Advisory Committee Meeting

The third meeting of Research Advisory Committee of the Institute was held at Barrackpore on 29 April 1997. Dr. K.V. Devaraj, Ex-VC, Agricultural University, Bangalore, Dr. M. Sinha, Director, CIFRI, Dr. M.Y. Kamal, ADG (Fy), ICAR, Prof. N.C. Dutta, Ex-Head, Dept. of Zoology, Calcutta University, Dr. Brij Gopal, JNU, New Delhi, Dr. A. Khudabuksh, Kalyani University, Dr. K.K. Vass, CIFRI, Barrackpore attended the meeting.

All the Heads of Division, project leaders and other scientists attended the meeting.

The Director apprised the RAC of the deliberation of Institute's Staff Research Council meeting which which was held on 26th & 27th April. He explained briefly about the progress achieved under various divisions. The members were also briefed by the member secretary about the action taken by the Institute on various recommendations made by RAC during their second meeting held at the Institute on July 29 & 30, 1996. Regarding the recommendation of inclusion of disciplines of Sociology and Environmental sciences among the subjects for ARS recruitment, the Chairman desired that necessary proposal with justification may be submitted to ICAR. The RAC Chairman and members desired that subsequent meetings may be held at Allahabad and Guwahati spread over for two days. After this brief discussion the action taken report on the last meeting was approved.

Following recommendations were made at the meeting and it was suggested by the members that suitable action may be taken if possible within specific time frame to implement them.

Recommendations :

1 The technology developed at the Institute level will be of no use if it is not transferred to the user properly. In this connection problems of implementation at the user departments was highlighted. To overcome this problem it was proposed that at highest level in ICAR a mechanism should be evolved to make the user departments more accountable in such programmes.

2 The proposal of the Director to consolidate the sub-centre base of the Institute, in tune with the perspective plan to provide more facilities in terms of manpower and infrastructure, at regional centres was agreed in principle by the RAC but then expressed the view that consolidation should be done after the current programmes at those centres are completed.

3 The problem of hilsa ranching was discussed in detail and it emerged that more investigations should be continued before a firm decision can be taken on the matter. However, it was decided to keep the programme of ranching of hilsa suspended for the present.

4 It was observed that more basic scientific understanding of various interactions within the system should be taken up in order to develop sound management strategy either for biological stocks within the system or conservation of system as such.

5 It was emphasised that work on ecological modelling should be initiated and analytical content in each project improved further. It was also opined that with the help of modern computer software packages, all data generated should be subjected to rigorous analysis.

6 Ecologically sensitive and protected wetlands should not be indiscriminately brought under fish culture activities. Biodiversity of our inland aquatic ecosystems need to be conserved.

Meeting of the Management Committee of CIFRI

The 20th meeting of the Management Committee of CIFRI was held at Barrackpore on 16th October, 1997. The meeting was attended by Dr. M. Sinha, Director, Mrs. Parul Devi Das, Commissioner & Secretary, Government of Assam, Dr. M.Y. Kamal, Asstt. Director General (IF), ICAR, Shri P.C. Chakraborty, Jt. Director of Fisheries, Govt. of West Bengal, Shri Susanta Halder, NGO and other members of the Institute. The proceedings of the 19th meeting of the Management Committee was confirmed and discussions were made on the other eight agenda items.

Meeting of the Joint Staff Council, CIFRI

The meeting of the I.J.S.C. of CIFRI was held on 5th April 1997 at Barrackpore. The meeting was attended by Dr. M. Sinha (Chairman) and other members. The IJSC confirmed the proceedings of its meeting held on 30th December 1996. There was discussion on the points of previous meeting and on five agenda items.

The second meeting ot the IJSC was held on 3rd December 1997 at Barrackpore. The meeting was attended by the Chairman and other members of IJSC. The meeting confirmed the proceedings of the previous meeting. Discussions were held as per agenda items.

Meeting of Social Audit Committee (Inland Aquaculture)

Two meeting of the Social Audit Committee on Inland Aquaculture, constituted by the President, ICAR, and headed by Dr. Prabin Chandra Sarma, M.P. was held at Guwahati centre of CIFRI on 12.2.1997 to 14.2.1997 and at Barrackpore on 9.5.1997. In the first meeting the development of fisheries in Assam was discussed in detail whereas in the second meeting the report of the Committee was finalized.

Meeting of Social Audit Committee (KVK)

A high-powered Social Audit Committee constituted by the ICAR consisting of the members Dr. S.N. Jha, Ex-Director, ADB, Shri Ambika Prasad, MLA, Dr. A.N. Sukhla, ADG (KVK) and Dr. S.S. Ghosh, Zonal Coordinator Zone II visited Institutes' Krishi Vigyan Kendra, Kakdwip and one of its adopted village at Mundapara on December 3, 1997. They went round the KVK and discussed with the scientists and the farmers present there. They were highly impressed by the achievements in the diffusion of technologies on betelvine, RIR chicks rearing and integrated fish farming. 80% of the population of the village are tribal.

The Research Advisory Committee Meeting of the Institute in progress

ICAR Fishery Institutes Directors Meeting at CIFRI, Barrackpore

Dr. M. Sinha, Director, CIFRI addressing the Management Committee Meeting

Members of Social Audit Committee of ICAR Institute discussing with the Director CIFRI

Staff Research Council Meeting of CIFRI

Annual Staff Research Council Meeting of the Institute was held at CIFRI Auditorium, Barrackpore on 25 and 26 April 1997 to discuss the annual reports of projects and future research plans. Dr. M. Sinha, Director, CIFRI, chaired the proceedings. Progress achieved under all the 20 current research projects of the Institute was presented at the meeting by the respectiver project leaders. The meeting also formulated the future plan of action under each project.

Dr. M. Sinha, Director, CIFRI exhorted the members to present the salient findings of their projects and outline their future course of action. Ten major recommendations were made and the time limit for their action was also fixed. The Project Programme for the year 1997-98 was finalised at the meeting in the light of the discussions and within the framework of guidelines given by the Research Advisory Committee of the Institute.

Annual Divisional Meeting of the Fisheries Research Institutes

The Annual Divisional Meeting of the Fisheries Research Institutes was held at CIFRI, Barrackpore, on 19th & 20th September, 1997. The meeting was attended by the Deputy Director General (Fisheries), Assistant Director General (Fisheries), Directors of CIFRI, CIFA, CIFE, CMFRI, NBFGR, NRCCWF and the Under Secretary (Fisheries), ICAR. The Directors of the research institutes presented the IX Plan proposal in respect of their Institutes. The financial, administrative, organizational and personnel matters were discussed in detail and approaches to be adapted for better functioning of the Institutes were critically examined.

The Chairman {DDG (FY)} highlighted that generation of funds through consultancy and contract research should be given priority by each Institute. He suggested that the pattern of developing new courses, M.F.Sc. in Aquaculture, Fishery Technology and Environment Monitoring need to be further discussed in detail and directed CIFRI and CIFT to start training programmes for the technical personnel of all Fisheries Institutes in order to upgrade their skills. He emphasised that each Institute should become a centre of excellence in their respective areas of scientific research. The meeting ended with a vote of thanks proposed by Dr. M. Sinha, Director, CIFRI, to the Chair.

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

The scientists of the Institute participated in various conferences/symposia/ seminars and meetings held during April 1997 to December 1997, 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	Paper presented	Authors/Partici-pants
Workshop on Fisheries Education held at CIFE, Bombay on 14th July 1997	-	M. Sinha
Training Workshop on Breeding and culture of freshwater prawn organised at CIFA (ICAR), Bhubaneswar, Orissa during 8-13 September 1997	Availability and identification of commercially important freshwater prawn species in eastern Indian ecosystem.	D.K. De
Society of Biosciences Environment and Health organised at Ch. Charan Singh University, Meerut, from 17-19 October 1997	Apprehensions of environmental perturbations by genetically altered fishes	P. Das & P.K. Pandit
Society of Biosciences Environment and Health organised at Ch. Charan Singh University, Meerut, from 17-19 October 1997	Benthos - the water quality indicator in River Yamuna	Usha Moza & V. Kolekar
62nd Annual Convention of ISSS, Calcutta from 18-21 October 1997	--------	K. Chandra
Seminar on Environment Protection and conservation of Nature and Natural Resources of N.E. India, Jaysagar, from 7-8 November, 1997	Conservation status of some threatened warm water fishes of Assam	B.K.Bhattacharya M. Chaudhury & Alok Sarkar

Fourth National Symposium on Fish and their environment, held at Indian Academy of Environmental Sciences, from 26-28 November, 1997	Primary productivity of two ecologically different ponds in relation to appropriate aquaculture practices	Dhirendra Kumar
-do-	Effect of industrial and sewage pollution in river Yamuna - a stretch from Delhi to Allahabad	K. Chandra, D.N. Mishra, U. Moza, V. Kolekar
-do-	Energy dynamics in the beels of West Bengal	A.K. Das
-do-	Studies on plankton communities and primary production in middle stretch of river Ganga in context of cultural eutrophication	M.A. Khan
-do-	Role of fin-clipping in fishery development in reservoirs	V.K. Murugesan, C. Selvaraj and S. Manoharan
Workshop on New Economic policy, opportunities and challenges for sustainable development of fisheries and conservation of aquatic resources, organised by National Academy of Agricultural Sciences, Bhopal, Madhya Pradesh during 15-16 December 1997	Perspective and challenges for conservation and management of riverine and reservoir fisheries and their economic considerations	M. Sinha
-do-	Plankton study of Ravishankar Sagar Reservoir (Dist. Raipur, M.P.)	N.P. Srivastava
-do-	Comparison of fish species abundance in riverine system in upper and lower stretches of Farakka barrage	B.L. Pandey

National Symposia on Soil Fertility and its Environment at Shieladhar Institute of Soil Sciences, University of Allahabad during December 18-20, 1997	Environmental perturbations and inland fisheries	M. Sinha
-do-	Soil pollution due to some toxic metals fallout from flyash of thermal power plants in Rihand Reservoir, UttarPradesh, India	K. Chandra
National Symposium on Social Sciences perspectives in Agricultural Research, Palli Siksha Bhavan, P.O. Sriniketan, 18-20 December 1997	Intended competencies for fisheries extension personnel towards inland fisheries development	U. Bhaumik, S.K. Saha
International Congress on Sustainable Development of Environment and Wildlife, organised by Centre for Environmental Management , MPISSR, Ujjain from 18-21 December 1997	Impact of environmental pollution on species diversity of macro-benthic fauna in the river Damodar	B.K. Biswas

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

Summer School 1997 on 'Fisheries Enhancement in Small Reservoirs and Floodplain Lakes'

A Summer School on Fisheries enhancement in small reservoirs and floodplain lakes was organised at CIFRI, Barrackpore from 14th July 1997 to 12 August 1997. Twentysix teachers/scientists working in Universities/Colleges/Research Institutes/State Governments from different parts of the country participated in the Summer School. The Summer School was inaugurated by Dr. M.G. Som, Vice-Chancellor, Bidhan Chandra Krishi Vishwavidyalaya.

The Summer School comprised, lectures by the Institute's scientists, guest lecturers and other experts in the subject matter, field visits, group discussions, project assignments and seminars.

Shri D.P. Yadav, Chairman, Committee on Transfer of Technology, Ministry of Agriculture, Government of India, presided over the valedictory function. Shri Yadav distributed the certificates to the participants on successful completion of the 30 days course. Mrs. Poonam Prakash of Rajendra Agricultural University was adjudged as the best participant, based on her performance in the Summer School.

Fish Farmers' Day

Four Fish Farmers' Days were organised at Mundapara, Khiristala, Patharpratima and Swarupnagar. A team of scientists of various disciplines of the Institute participated to render necessary advise and solutions of the problems of about 575 fish farmers/fishermen of the above areas.

16. DISTINGUISHED VISITORS

Union Agriculture Minister lays foundation stone for Womens' participation in fisheries development of ox-bow lakes in Begusarai, Bihar

CIFRI has started working on a new approach for developing ox-bow lakes *(maun)* through effective participation of women in fish husbandry in the marginal areas of such lakes, under an Ad-hoc Research scheme of ICAR. In its first phase 10 women of fishermen families, from the poorest lot, have been identified in collaboration with the District Administration Begusarai, Bihar for the purpose of fish- husbandry in Bishunpur *maun* near Begusarai. Each woman would be alloted one pen enclosure for doing fish culture under the guidance of CIFRI scientists. Under the scheme all the required inputs in terms of technical knowhow, pen-structure, feed, seed, etc. will be given in order to make them aware of the effectiveness and the suitability of fish-husbandry in the fisheries development of ox-bow lakes through pen culture. The venture would also open a new avenue for generating additional income for fishermen families.

The second phase of the scheme would take care of the production of quality fish seeds by establishing a hatchery complex at Jaimangalagarh, Begusarai to cater to the needs of fish farmers in general and for stocking the ox-bow lakes in particular. The work in this regard is under progress. The foundation stone for the said hatchery complex has been laid in the month of February 1997 by the Hon'ble Minister of Agriculture, Govt. of India, Shri Chaturanan Mishra in presence of Dr. R.S. Paroda, Director General and Dr. P.V. Dehadrai, Dy. Director General (Fy), ICAR. The Hon'ble Minister of Agriculture Shri Ramjeevan Singh, Govt. Of Bihar; Shri Shatrughan Prasad Singh and Shri Ramendra Kumar, Hon'ble Members of Parliament and Shri Vimal Kriti Singh, District Magistrate, Begusarai were the other dignitories who graced the occasion.

❍ A number of distinguished personalities including national leaders visited the Institute's Headquarters and its centres during 1997. This included Hon'ble Shri Gorakh Prasad Nishad, State Minister of Fisheries and Animal Husbandry, Govt. of Uttar Pradesh & Ms. Bilasibala Sahish, Deputy Minister, West Bengal.

Other distinguished visitors were :

Dr. P.V. Dehadrai, Dy. Director General (Fy), ICAR, New Delhi
Dr. M.Y. Kamal, ADG (Fy), ICAR, New Delhi
Dr. A.N. Shukla, Assistant Director General (Agril. Extension), ICAR, New Delhi
Shri Karanbir Singh, President, Bhartiya Krishak Samaj
Shri D.P. Yadav, Chairman, Committee on Transfer of Technology, Ministry of Agriculture, Government of India
Dr. M.G. Som, Vice-Chancellor, Bidhan Chandra Krishi Vishwavidyalaya
Mrs. Parul Debi Das, Commissioner & Secretary, Fisheries Department, Govt. of Assam, Dispur
Shri Abhay Rath, IAS, Principal Secretary, Fisheries & Animal Resource Development, Govt. of Orissa
Dr. K.V. Devaraj, Ex-VC, Agricultural University, Bangalore
Prof. N.C. Dutta, Ex-Head, Dept. of Zoology, Calcutta University
Dr. Brij Gopal, JNU, New Delhi
Dr. A. Khudabuksh, Kalyani University,
Dr. K. Raman, Ex-Director, CIBA, Madras
Dr. M. Peer Mohammed, Principal Scientist and Head of the Division, CMFRI, Kochi
Dr. P.M. Sherief, Asst. Professor, College of Fisheries, Kerala Agricultural University
Dr. Velayudhan, Senior Scientist, CMFRI, Kochi
Dr. K.G. Padmakumar, Asst. Professor, Regional Res. Station, Kerala Agrl. University,Kumarakom
Dr. Manorama Thampatti, Asst. Professor, Regional Res. Station, Kerala Agrl. University,Kumarakom
Md. A.H.M. Kohinoor, Scientific Officer, Bangladesh Fisheries Research Institute, Mymensingh, Bangladesh
Md. Abdul Hye, Deputy Secretary, Ministry of Fishery & Live Stock, Bangladesh
Md. Siddiqur Rahman, Director of Fisheries, Bangladesh
Md. Ali Addear, Deputy Director of Fisheries, Bangladesh
Md. Mokammel Hossain, Project Coordinator of Fisheries, Bangladesh
Dr. Nuanmane Pongthana, Fishery Officer, Cambodia
Ms. Wacheraprance Claithong, Research Officer, Thailand
Ms. Khung Kim Dinh, Research Officer, Vietnam
Md. Saleh Uddin Ahmed, Chief Scientific Officer, Bangladesh
Md. Jahirul Haque, Deputy Director, IMED, Bangladesh

Dr.Rahul Amin, Deputy Chief Planning Commission, Bangladesh
Dr. Shah Mahmood Farid, Secretary, Planning Commission, Bangladesh
Shri K.B. Choudhary, President, Kisan Samaj
Shri B.K. Hazarika, Director of Fisheries, Assam
Shri D. Nath, Managing Director, Beel Fisheries Development Corporation, Assam
Dr. S.C. Jha, Former Director, ADB
Dr. S.C. Ghosh, Zonal Coordinator, Zone-II.
Dr. S.C. Aggarwal, Joint Director of Fisheries, Haryana, Chandigarh
Sh. D.S. Bharati, Chief Executive Officer, FFDA, Karnal
Dr. M.N. Sadafel, Ex-Assistant Director General, ICAR, New Delhi
Prof. H.R. Singh, Head, Dept. of Zoology, Allahabad University, Allahabad
Prof. P.K. Mondal, Dept. of Zoology, Allahabad University, Allahabad
Prof. P.S. Rao, Dept. Of Zoology, Delhi University, Delhi
Prof. Janak Pandey, Director, G.B. Pant Institute of Social Sciences, Allahabad
Prof. A.K. Lal, G.B. Pant Institute of Social Sciences, Allahabad
Dr. Mahan Singh, Reader, Dept. of Agronomy, School of Agricultural Sciences and Rural Development, Nagaland university, Nagaland
Shri Udai Patel, Director, Special Projects, Surrey, U.K.
Dr. H.P.C. Shetty, Ex-Director of Instructions, Fisheries College, Mangalore
Mr. Hassanai Kongkeo, NACACoordinator
Dr. Dilip Kumar, Sr. Aquaculturists, NACA

Dr. D.P. Yadava, Chairman, Transfer of Technology Projects, ICAR, distributing certificate to participants of the Summer School

Fish Farmers' day in progress

Shri Chaturanan Mishra, Union Minister of Agriculture laying the foundation stone of the Hatchery Complex at Begusarai. Hon'ble M.P. of the area Shri Shatrughan Singh and Dr. R.S. Paroda, D.G., ICAR are also seen

Hon'ble Minister Shri Gorakh Prasad Nishad, Dept. of Fisheries & Animal Husbandry Govt. of Uttar Pradesh observing fish diversity in rivers

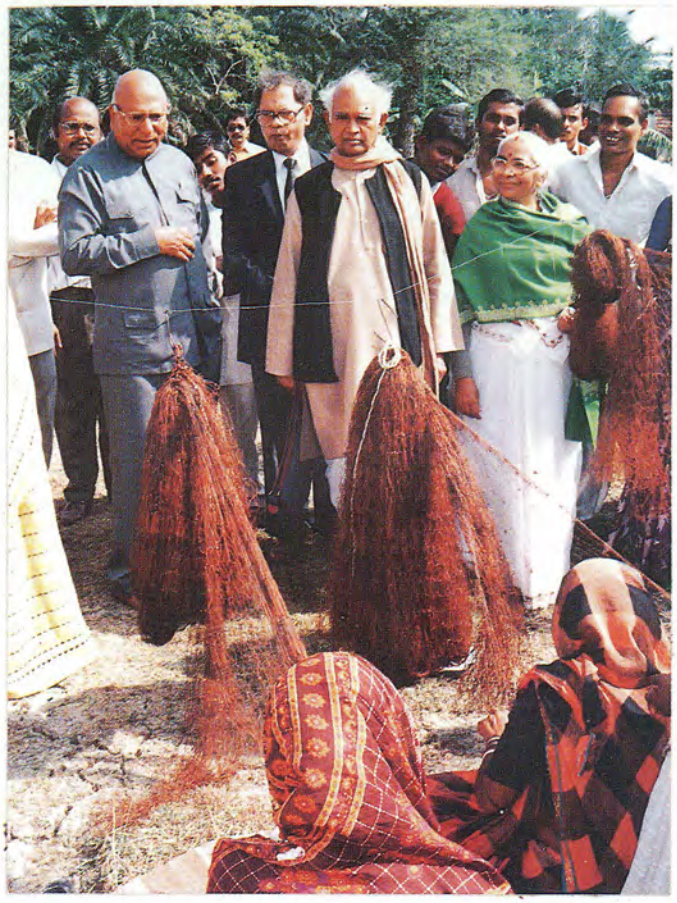
Md. Ishadul Haque, Secretary, Dept. Of Fisheries and Livestock, Bangladesh discussing with the Director, CIFRI

Bangladesh senior fisheries officers led by Mr. Syed Golam Kibria, Joint Secretary, Dept of Fisheries & Livestock gets a briefing about Institute research activities.

Mr. Hassanai Kongkeo, Coordinator and Dr. Dilip Kumar, Sr. Aquaculturists, NACA visiting Institute library

Shri Abhay Rath, IAS, Principal Secretary, Fisheries & Animal Resource Development, Govt. of Orissa going through the Institute publications

KVK Social Audit Committee members observing net weaving demonstration



Social Audit Committee members addressing the farmers adopted under KVK

17. PERSONNEL (Managerial position only)

Dr. M. Sinha, **Director,** CIFRI, Barrackpore, West Bengal

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)

Estuarine Division, Barrackpore, West Bengal

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

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

Dr. M.K. Mukhopadhyay, Senior Scientist, Head of Division (Acting)

Floodplain Wetlands Division, Guwahati, Assam

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

Resource Assessment Division, Barrackpore, West Bengal

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

Hilsa Division, Maldah, West Bengal

Dr. H.P. Singh, Principal Scientist, Head of Division (Acting)

Senior Administrative Officer, CIFRI, Barrackpore

Shri A.C. Ghosh

Finance & Accounts Officer, CIFRI, Barrackpore

Shri G.P. Sharma (upto 15.7.1997)
Shri S.K.C. Bose (from 16.7.1997)

18. ANY OTHER RELEVANT INFORMATION SUCH AS SPECIAL INFRASTRUCTURAL DEVELOPMENT

Construction of a new administrative building of the Institute, at a total cost of Rs. 111 lakhs, is nearing completion. Administrative, Audit, Engineering and Vehicle Sections in addition to the Library of the Institute are proposed to be shifted to this new building. After the above said shifting, the whole of the old building would be converted into a research complex with various laboratories for research purpose.

With a view to provide additional housing facility to the staff members, construction of 15 staff quarters have been initiated in the existing campus of the Institute. An additional piece of land measuring 6.3 acre for construction of more staff quarters have been procurred from Central Research Institute for Jute & Allied Fibres, Barrackpore.

19. *हिन्दी खण्ड (संक्षिप्त विवरण)*

वार्षिक प्रतिवेदन 1997-98

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान
(भा. कृ. अनु. प.) बैरकपुर : पश्चिम बंगाल

संक्षिप्त इतिहास

इस संस्थान की स्थापना एक अनुसंधान केन्द्र के रुप में 17 मार्च 1947 को कलकत्ता में हुई । यह केन्द्र वर्ष 1959 में केन्द्रीय अन्तर्स्थलीय मात्स्यकी अनुसंधान संस्थान का दर्जा प्राप्त कर पश्चिम बंगाल के बैरकपुर स्थित अपने निजी भवनों में स्थानांतरित हुआ । वर्ष 1967 में यह संस्थान भारतीय कृषि अनुसंधान परिषद्, नई दिल्ली का विधिवत् सदस्य बना । इस संस्थान द्वारा मात्स्यिकी अनुसंधान एवं विकास के क्षेत्र में कई मानदण्ड स्थापित किया है एवं गत वर्ष 16 मार्च 1997 को अपने स्वर्ण जयन्ती वर्ष में प्रवेश कर इस दिशा में उत्तरोतर प्रगति की ओर अग्रसर है ।

7वीं पंचवर्षीय योजना के आरम्भ में ही इस संस्थान ने तीन अन्य संस्थानों (केन्द्रीय अलवणीय जलीय कृषि संस्थान, केन्द्रीय खारा जलीय कृषि संस्थान भुवनेश्वर, चेन्नई और राष्ट्रीय शीत जल मात्स्यकी केन्द्र, भीमताल) को जन्म दिया तथा 1.4.87 से इस मूल संस्थान का पुनर्नामकरण केन्द्रीय अन्तर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान किया गया ।

अधिदेश

इस संस्थान के वर्तमान अधिदेश निम्नलिखित हैं :-

1 *10 हेक्टयर क्षेत्रफल से बड़े जलीय संसाधनों में मत्स्य संख्या गतिकी का अध्ययन*

2 *उक्त प्रकार के जलीय संसाधनों से अधिकतम मत्स्य उत्पादन प्राप्त करने हेतु प्रबन्ध प्रणालियों को विकसित करना ।*

3 *इन जलीय संसाधनों में अपकर्षण / प्रदूषण के कारण एवं उनके प्रभाव का अध्ययन कर इन जलीय संसाधनों के संरक्षण के लिए अनुसंधानात्मक कार्य करना ।*

4 *नदीय घाटी परियोजनाओं के कारण संबंधित बेसिन की मात्स्यकी पर पड़ने वाले दुष्प्रभावों का अध्ययन एवं इनकी प्रबन्धन 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 एवं विस्तार / परामर्शक सेवाएं उपलब्ध करना ।*

संगठन

उपर्युक्त अधिदेश की पूर्ति एवं देश के मात्स्यकीय विकास हेतु केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान के अनुसंधान कार्यों को मात्स्यकीय स्त्रोतों के अनुरूप सात प्रमुख प्रभागों के अन्तर्गत संगठित किया गया है ।

इस संस्थान का नदीय प्रभाग इलाहाबाद में, जलाशय प्रभाग बंगलोर में, ज्वारनदमुखी प्रभाग बैरकपुर में स्थित हैं । संस्थान के मुख्यालय बैरकपुर में ज्वारनदमुखी प्रभाग के अतिरिक्त पर्यावरणीय अनुमापन एवं मत्स्य स्वास्थ्य परिरक्षण प्रभाग, वाढ़कृत मैदानी आर्द्र क्षेत्र प्रभाग तथा मत्स्य स्त्रोत मूल्यांकन प्रभाग भी स्थित हैं । संस्थान का हिल्सा मात्स्यकी प्रभाग पश्चिम बंगाल के मालदा शहर में स्थित है ।

संस्थान का अनुसंधान कार्य कुल 20 अनुसंधान परियोजनाओं के तहत् सम्पादित किया जा रहा है जो मुख्यालय के अलावा 10 राज्यों में फैले 11 अनुसंधान एवं 6 सर्वेक्षण केन्द्र के रूप में कार्यरत हैं ।

मुख्य उपलब्धियाँ

गंगा नदी की पारिस्थितिकी एवं मात्स्यकी - एक त्वरित सर्वेक्षण

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान द्वारा वर्ष 1995 से 1996 के वीच तेहरी से गंगीय डेल्टा सुन्दरवन तक के गंगा, भागीरथी तथा हुगली ज्वारनदमुख के 43 केन्द्रों में जल-विज्ञान सम्वन्धी मृदा व जलीय गुणवत्ता एवं प्राथमिक उत्पादकता से संबंधित जैविक प्राचलों जैसे पादप प्लवक, जैव-प्लवक एवं तलीय जीव समुदाय की सघनता एवं विविधता आदि के मूल्यांकन हेतु एक विस्तृत सर्वेक्षण किया गया ।

इन अध्ययनों से ज्ञात होता है कि तेहरी से पटना तक के पूरे क्षेत्र में नदीय तल विरुपण से ही प्रभावित नहीं अपितु विभिन्न उपनदियों से प्रवाहित वालू से भी भरा पड़ा है (79-99%) । समस्त नदीय तल में यद्यपि निम्न स्तर का हाइड्रोजन ऑयन देखने को मिला है तथापि आक्सीजन की मात्रा (6.0-8.0 मी. ग्रा./ली) है जो पिछले वर्षों की अपेक्षा सन्तोषजनक है । वर्तमान में अपेक्षाकृत निम्न स्तर के नाइट्रेट की उपलब्धता से सूचित होता है कि जलीय प्रदूषण में कुछ कमी आई है । वलुई मृदा के होने पर भी प्राथमिक उत्पादकता का अपेक्षाकृत उच्च स्तर का श्रेय अपरस्थानिक स्त्रोतों से प्राप्त पोषक तत्वों को दिया जाता है ।

प्लवकों के घनत्व में स्पष्टतया कमी आई है । पादप-प्लवकों के समुदाय में प्रदूषण सूचक प्रजातियों के परिमाण में भी कमी आई है एवं स्वच्छ जल सूचक प्रजातियों में वृद्धि हुई है । इसी तरह नितल जीवजात समुदाय के प्रदूषण सूचक प्रजातियों की कमी जलीय गुणवत्ता में सुधार को दर्शाती है ।

मत्स्य सम्पदा के संदर्भ में देखा गया है कि भारतीय मेजर कार्प मछलियों की उपज में भारी कमी आई है । गंगा नदी के मध्य क्षेत्र से कतला मछली प्रायः लुप्त सी हो गई है । मध्य व निचले क्षेत्र में व्यवसायिक तौर पर महत्वपूर्ण मछलियों में भी कमी आई है लेकिन शिंगटी मछलियों की उत्पादन में वृद्धि होने के कारण कुल उत्पादन में भी वृद्धि हुई है । इस अध्ययन से यह स्पष्ट होता है कि हाल के वर्षों में यद्यपि गंगा नदी की पारिस्थितिकी, जलीय-उत्पादन हेतु अधिक अनुकूल बनी है किन्तु इसके ऊपरी, मध्य एवं निचले क्षेत्रों में बढ़ते हुए गद जल अवरोध एवं असंतुलित मत्स्यन कार्य के कारण औसत वार्षिक मत्स्य उत्पादन में गिरावट आयी है ।

महानदी का त्वरित सर्वेक्षण

संस्थान के वैज्ञानिकों ने पहली बार वर्ष 1995-96 के दौरान महानदी का, उसके उद्गम से पाराद्वीप के निकट स्थित ज्वारनदमुख तक के क्षेत्र का सर्वेक्षण किया ताकि इस नदी की मात्स्यकी तथा जलीय पर्यावरण का मूल्यांकन हो सके ।

अध्ययन से यह ज्ञात होता है कि इस नदी का आवाह क्षेत्र जो मुख्यतः मध्य प्रदेश (53%) और उड़ीसा (46.3%) में फैला हुआ है अत्यधिक बालु का प्रवाह करता है फलस्वरुप नदी का ऊपरी तथा निचली क्षेत्र काफी वलुई वाला है । इसके सहायक नदियों के जल प्रवाह में कमी आयी है एवं परिणामस्वरुप धीरे धीरे जलीय पौधों के जमाव में वृद्धि हो रही है ।

मात्स्यकी के अध्ययन से स्पष्ट होता है कि इस नदी के ऊपरी, मध्य व निचले क्षेत्र में क्रमशः 78, 24 और 110 मत्स्य प्रजातियाँ उपलब्ध हैं जो उच्च मत्स्य जैव-विविधता को दर्शाती हैं । मत्स्य उत्पादन लगभग अधिकतम सीमा पर पहुँच चुका है । वैसे नदी का कुछेक क्षेत्र वलुई होने के कारण झींगा मात्स्यकी हेतु अनुकूल स्थिति को दर्शाता है ।

ऊपरी हुगली भागरथी में मात्स्यकी का ह्रास

संस्थान के वैज्ञानिकों द्वारा हुगली भागरथी नदी के कुछ क्षेत्र का विस्तृत सर्वेक्षण किया गया ताकि इसके वर्तमान में मत्स्य आवासीय स्तर का मूल्यांकन किया जा सके । यह अध्ययन बैरकपुर से फरक्का बाँध तक के 440 कि. मी. क्षेत्र में किया गया, जिसमें अनेक जैविक तथा जीवोतर प्राचलों पर विशेष ध्यान दिया गया । इस अध्ययन से प्राप्त परिणामों के मुख्य अंश निम्नलिखित हैं:-

1) मृदा के अपरदन के कारण जल की गहराई में कमी ।
2) प्राप्त मत्स्य उपज में छोटे तथा शिंगटी मछलियों की अधिकता साथ ही मेजर कार्प मछलियों की उपज में कमी ।
3) जल की गहराई में आयी कमी के कारण मछुआरों द्वारा उपयोग किए जानेवाले मत्स्यन संभारों जैसे जाल आदि में विशेष परिवर्तन ।

गंगा नदीय जल में जीवाणुओं के परिमाण का मूल्यांकन

गंगा नदी के जल में किए गए जीवाणु अध्ययन से ज्ञात होता है कि इस जल का उपयोग पीने या किसी अन्य घरेलू कार्य के लिए नहीं किया जाना चाहिए । गंगा नदी के सात केन्द्रों से एकत्रित आंकड़ों से स्पष्ट होता है कि ऋषिकेश का जीवाणु के दृष्टिकोण से स्थान चौथा है । वैसे आम तौर पर इसे स्वच्छ माना जाता है । *कोलीफार्म* तथा *फीकल कोलीफार्म* का स्तर आइ. एस, आई. स्तर से अधिक है, किन्तु इन क्षेत्रों से प्राप्त मत्स्य मांस इस जीवाणुओं के प्रभाव से मुक्त हैं एवं मानव उपभोजन के लिए उपयुक्त है ।

हुगली ज्वारनदमुख में शीत कालीन बैगनेट मात्स्यकी - एक आर्थिक मूल्यांकन

अलवणीय जल क्षेत्रों में नदीय मात्स्यकी कार्यो की तुलना में शीतकालीन प्रवासी मात्स्यकी कार्य अधिक लाभदायक है । वर्ष 1994-95, 95-96 और 1996-97 में हुए मात्स्यकी कार्यों द्वारा इस विषय की पुष्टि होती है । व्यवसायिक तौर पर मत्स्यन कार्य का स्तर यदि इसी प्रकार रहा तो इसके दीर्घकालीन परिणाम प्रतिकूल होंगे ।

इस मत्स्यन कार्य के दौरान मछुआरों को जो मजदूरी लगभग 4517/- प्रति व्यक्ति प्रति तीन माह की अवधि में, मिलती है यह अन्य मत्स्यन कार्यों में प्राप्त मजदूरी से अधिक है । वर्ष 1993-94 के दौरान इस कार्य में कार्यरत मछुआरों की संख्या 4,548 थी जो बढ़कर वर्ष 1996-97 के दौरान 6,248 तक पहुँच गई है । इस क्षेत्र का मशीनीकरण से अब तक तो मजदूरी की संख्या में कमी नहीं आ पाई है किन्तु बढ़ती हुई मशीनीकरण एवं उन्नत मत्स्यन संभार भविष्य में अतिरिक्त रोजगार को प्रभावित कर सकते हैं ।

दामोदर नदी पारिस्थितिक अस्थिरता की ओर

दामोदर नदी में प्रवाहित औद्योगिक बहिस्त्राव के कारण इसमें काफी मात्रा में प्रदूषकों का प्रवेश हो चुका है । इस संस्थान द्वारा किये गए अध्ययनों से ज्ञात होता है कि इस नदीय क्षेत्र में प्रति दिन 1,11,700 MLD औद्योगिक बहि:स्त्राव 80,000 लीटर घरेलू अपरद्द तथा 10,000 टन कलई क्षार प्रवाहित होता है, जिसके अलावा फेनोल (7 टन), भारी धातु अमोनिया (17 टन), तेल, ग्रीज आदि भी प्रवाहित किये जाते हें । इस परिपेक्ष में इसकी अस्थिरता की आशंका बन गयी है ।

पिछले 40 वर्षों में इस नदी की मत्स्य सम्पदा की संरचना में विशेष परिवर्तन हुआ है । इस समय इस नदी में 56 मत्स्य प्रजातियाँ उपलब्ध हैं जिनमें 16 प्रजातियाँ व्यवसायिक तौर पर महत्वपूर्ण हैं, लेकिन उत्पादन में उल्लेखनीय ह्रास हुआ है ।

हुगली नदी की मात्स्यकी पर औद्योगिक बहि:स्त्राव का दुष्प्रभाव

रिसड़ा के निकट हुगली नदी में प्रवाहित औद्योगिक बहि:स्त्राव का भारतीय मेजर कार्प मछलियों पर संभावित प्रभाव के मूल्यांकन हेतु संस्थान द्वारा किए गए जैव-आमापन परीक्षणों से ज्ञात होता है कि इस बहि:स्त्राव के दुष्प्रभाव से 30 से 45 मिन्टों में ही कार्प के जीरे तथा 70 से 90 मिन्टों में पोना की मृत्यु हो जाती है । इसका प्रतिकूल प्रभाव 1 कि. मी. के परिधि तक देखा गया है एवं मत्स्य बीज के विभिन्न स्तर पर इसका घातक प्रभाव होता है - जीरा की मृत्यु 90 मी. में एवं पोना की 190-240 मी. में ।

जल की गुणवत्ता के विश्लेषणों से पता चला है कि मैगनिशियम, फॉसफेट, नॉइट्रेट, कैलशियम आदि की अत्यधिक परिमाण एवं कम पी. एच. स्तर मत्स्य वीजों के लिए घातक है । इस क्षेत्र का लगभग 1.2 कि. मी. मत्स्य स्वास्थ्य के लिए बिल्कुल ही प्रतिकूल है ।

अनायनित अमोनिया के प्रभाव से मछलियों की मृत्यु

पश्चिम बंगाल राज्य के उत्तर 24 परगना जिले के दो तालाबों, एस-1 व एस-2, जिनका क्षेत्रफल क्रमश: 2 व 6 हे. है, *एल. रोहिता* एवं *सी. म्रिगला* मछलियों की मृत्यु होता देखा गया है । मृत्यु के कारण पर अन्वेषणों से ज्ञात होता है कि इन जल निकायों में अनायनित अमोनिया का स्तर 0.8 से 15 मि. ग्रा. प्रति लीटर तथा ऑक्सीजन का स्तर 0.5 से 1.4 मि. ग्रा. प्रति लीटर था । इन जल निकायों के एस-1 में झींगा संसाधन संयत्र से अपरद्द तथा एस-2 जल निकाय में घरेलू अपरद्द प्रवाहित किया जाता है ।

इसके निवारण के लिए झींगा संसाधन संयत्र से जलनिकाय में प्रवाहित किए जाने वाले अपरद्द का पहले संसाधित करना आवश्यक है । अन्यथा मृत्यु दर बढ़ोतरी होने की सम्भावना है ।

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