


वार्षिक प्रतिवेदन
Annual Report
2006-2007

भा.कृ.अनु.प.
ICAR

केन्द्रीय अंतर्स्थलीय मात्स्यिकी अनुसंधान संस्थान
Central Inland Fisheries Research Institute
(Indian Council of Agricultural Research)
Barrackpore, Kolkata - 700120

हीरक जयन्ती वर्ष • 1947 - 2007 • CIFRI • 1947 - 2007 • DIAMOND JUBILEE YEAR




भा.कृ.अनु.प.
ICAR

ANNUAL REPORT

2006 - 2007

Central Inland Fisheries Research Institute
(Indian Council of Agricultural Research)
Barrackpore, Kolkata - 700 120

ANNUAL REPORT

2006 - 2007

ISSN 0970-6267

Edited & Compiled	:	K. K. Vass Manas Kr. Das S. K. Manna
Assistance	:	G. Pathak R. R. Mukherjee S. Sarkar, P. Dasgupta
Cover Design	:	S. Chowdhury
Hindi Translation	:	P. R. Rao
Published by	:	The Director CIFRI, Barrackpore
Printed at	:	Graphique International 12/1B, Madhab Chatterjee Lane Kolkata 700 020

- The activities and achievements reflected in this Annual Report covers the period April 2006 to March 2007 only.

- This report includes unprocessed or semiprocessed data that would form the basis of scientific papers in due course. The material contained in the report, therefore, may not be made use of without the permission of this Institute, except for quoting it as a scientific reference.

- Central Inland Fisheries Research Institute (CIFRI) Annual Report is not a priced publication. Recepients of complimentary copies are not permitted to sell the photocopies of the report in part or in full.

EXECUTIVE SUMMARY

The Central Inland Fisheries Research Institute (CIFRI) was established in March 1947 initially as a research center and later up scaled to the level of full-fledged institute. Over the years, the organization has grown and established itself as a premier institute in the field of inland fisheries in the country. The Institute is located at Barrackpore, Kolkata in the State of West Bengal. The Institute at present has sixty scientists, eighty-three technicians, seventy-one administrative staff and hundred sixty supporting personnel. The institute had a total budget of Rs. 202.06 lac for the year 2006-2007.

The Institute organized its research programmes as per the guidelines of the high level Research Advisory Committee (RAC), comprising mostly of eminent professionals from the field of fishery and aquatic ecology. The programmes were so designed that philosophy of VISION 2020 and recommendations of last QRT were kept in view, apart from directives received from the SMD and Council from time to time. The Institute also has a Management Committee guiding its activities. A number of internal committees such as Staff Research Council, Institute Joint Staff Council, Official Language Committee, Consultancy Processing Cell etc. are in place and contributed in Institute's management activities through periodic meetings and decisions taken.

Continuing our efforts, the Institute during the year focused its attention on overall performance, which involved research, transfer of technology, internal and external human resource development, public awareness programmes, establishment of linkages and institutional building activities.

The research programmes are designed with major thrust on ecosystem research involving resource base assessment, ecology, biodiversity, fish stock evaluation including yields and environment monitoring and its management. During the year the Institute worked on eleven research programmes apart from nine externally funded projects and three internationally funded ones. Salient achievement under various programme areas are highlighted as under :

Riverine Fisheries

The chemical and hydrological status of various rivers of India viz. Ganga, Ravi was evaluated for their water quality, hydrological and fisheries status. In river Ravi the main anthropogenic activity affecting its ecology is water abstraction and agricultural pollution. The invasion of *Clarias gariepinus* within Yamuna, Sutlej and Bea is a cause of concern.

In river Ganga on the basis of the rate of energy transformation by producers the river can be divided into three zones with upper zone having minimum value (529 Cal $m^{-2}day^{-1}$) and maximum in the middle zone (4942 Cal $m^{-2}day^{-1}$). On the basis of fish production potential and potential energy resource also, the Ganga can be divided into three zones, with upper zone showing minimum value (18.3 Kg $ha^{-1}yr^{-1}$ and 21,991 Kg $ha^{-1}yr^{-1}$) and middle zone showing the maximum (167.6 Kg $ha^{-1}yr^{-1}$ and 2,01,185 Kg $ha^{-1}yr^{-1}$).

In river Ganga, the fishery has shown a sharp decline as compared to 1960s. At Allahabad the yield rate has come down to 377.6 Kg km^{-1} from 935.4 Kg km^{-1} of the past with major carp declining to one fifth of the past. The major carp contribution was very low in the lower stretch except Farakka where it formed 14.1% of the total. Exotic carps, mainly *Cyprinus carpio*, were observed only in the middle stretch and its contribution was 25.5% of the total fish landing at Allahabad and 19.4% at Varanasi. *Tilapia* sp. were also observed, but only at Allahabad.

The socio-economic survey of fishermen community revealed decline in fishing in the river that has resulted in shifting of a good number of fishers towards other occupation.

Reservoir Fisheries

Investigations on the reservoirs of Karnataka, Uttar Pradesh, Himachal Pradesh and Rajasthan were conducted for developing optimum management norms for fish enhancement.

An estimated fish catch of 9881 Kg recorded at Kabini reservoir in the month of April 2006 was the highest during the period. *Oreochromis mossambicus* (33.1%) dominated the catch followed by *Cyprinus carpio* (27.8%), *Labeo bata* (12.3%), *Ompok bimaculatus* (12.3%), *Clarias gariepinus* (4.7%) and others (9.7%) which included *Notopterus notopterus*, *Mystus cavasius*, *Channa marulius*, etc. The CPUE during this month was 4.94 kg. Experimental fishing conducted with both multifilament and monofilament polyamide gill nets yielded more yield per unit area in monofilament gillnets.

In Mettur Reservoir of Tamil Nadu the total number of fish seed stocked during the period was 2500000. The share contributed by *Catla catla* was 947000 nos., *Labeo rohita* 1247000 nos. and *Cirrhina mrigala* 306000 nos. The fish yield from the reservoir was highest in July (42164.6 Kg). Major carps (18457.6 Kg) contributed maximum to the total production in that month whereas, the group-II fish comprising 0. *bimaculatus* (14608.850 Kg) also formed higher proportion in July. In December, the fish catch of all the groups declined drastically. This may be due to the increase in water level to FRL at 36.36m.

The three reservoirs of Madhya Pradesh investigated viz. Ohan, Barua and Jarmohra had average production ranging from 1.5-18 t with production rate of 2.31-26.4 Kg $ha^{-1}yr^{-1}$. The production potential of these reservoirs ranged from 80-123 Kg $ha^{-1}yr^{-1}$.

Estuarine Fisheries

Based on the salinity and distance relationship of the eastern bank, the zone of Hooghly estuarine intrusion was determined up to 25.8 km from the coastline during winter. It was effectively marked up to 22.2 km from the seashore during summer, but further extended up to a total 50.2 km during monsoon when the river discharge was maximal. Incidentally, the estuarine mixing zone represented the most productive zone where the fishing activity was consistently at a peak in winter contributing about 92 -96 % of the total estuarine production.

Winter Migratory Bagnet Fishery (WMBF) in lower estuary was estimated as 34516.8 t with an average CPUE of 45.39 Kg during November 2006 to January 2007 against 28394.2 t, 40.4 Kg respectively of the corresponding period of 2005-06 denoting a rise of 21.56 % in total catch and 12.35 % in CPUE value compared to previous year. Over the period of past seven years between 2000-2001 and 2006-2007, the total catch has increased by 42.19 %.

A positive correlation could be established between the abundance of prey species of *Acetes indicus* and the bagnet catch comprising of 90 % carnivorous species of fishes. A total of 117 fish species belonging to 19 Orders could be identified from freshwater to marine zone of the estuary. The occurrence of *Sicamugil cascasia*, a small size freshwater mullet in the Bicholighat-Barrackpore stretch, indicates persistent freshwater conditions prevailing in the region.

Floodplain Fisheries

Pen culture experiment was conducted for seed raising for stocking. The fast growth rate of *Labeo bata* (105.9%) in 30 days in the pen is a very encouraging result from a conservation angle. It could play a very vital role in replenishing the declining stock of this prized native carp of beel ecosystem by seed raising in pens.

Primary productivity study indicated that most of the *beels* of West Bengal were moderately productive. Higher rate of gross primary production (GPP, mgC $m^{-3}hr^{-1}$)

CONTENTS

PREFACE

The Central Inland Fisheries Research Institute during the year continued its research efforts to understand production functions in our inland aquatic resources viz., rivers, reservoirs, estuaries and wetlands for developing management norms. The issues related to resource assessment on GIS format including monitoring and management of fish and ecosystem health were also addressed. In order to generate required database and provide policy support the institute worked on eleven research projects covering different theme areas. The institute also took initiative to create awareness about biodiversity and ecosystem conservation among the fishers who depend upon the fishing activities along rivers and estuarine systems. Attempts were also made to demonstrate various fishery enhancement techniques to different user groups operating in wetlands.

Our co-operation with Fishery Department in the states of West Bengal, Gujarat, Karnataka, Assam, Haryana, Uttar Pradesh grew from strength to strength. The CIFRI through a Govt. of India sponsored project has been deeply involved in GIS application in fishery resource assessment with thirty-five States and Union Territories. This is one of the massive efforts in fishery resource assessment in inland fishery sector in the country. The CIFRI also participated actively in network projects with sister institutes, SAUs and other research organizations. At the international level two programmes, with the support from World Fish Centre, Penang, Malaysia, were executed satisfactorily and another programme sponsored by CP-IWMI, Colombo is being executed. Post Tsunami information was provided to authorities on mangroves by CIFRI, for inclusion in mangrove based restoration action plan for affected coastal areas. The Institute remained committed to generate internal resources and to achieve the target set by the Council and we met the target by performance of scientists and technicians. With regard to NEH activities, the Institute executed the approved work programme satisfactorily with main focus on fisheries enhancement from floodplain wetlands. As a part of our special effort on awareness, different publications were released during the year and sixteen exhibitions and farmer's day were organized.

All mandatory meetings of Research Advisory Committee, Staff Research Council, Management Committee, Institute Joint Staff Council, were held as per schedule and action were taken as per their suggestions for research and Institute management.

The scientists, technicians and administrative staff were provided adequate opportunities for professional improvement and manpower development programmes by their participation in different seminars, workshops and training programmes.

I express my sincere thanks to Dr. Mangala Rai, the Secretary, DARE & D.G., ICAR for his support and encouragement to the activites of CIFRI. I am grateful to Dr. S. Ayyappan, DDG (Fy.), ICAR for his guidance and continued support in furthering the research activities of this Institute. Time to time support provided to this institute by the fishery division of the Council, especially, Dr. V.V. Sugunan, (ADG, I. Fy.), Dr. A.D. Diwan (ADG, M. Fy.), Dr.V.R. Chitranshi, Shri Anil Agarwal, (Pr. Scientists) and Shri P.K.Bage, Under Secretary, is thankfully acknowledged.

All the achievements highlighted in this report are the outcome of sincere efforts made by all staff members of CIFRI during the year for which they deserve appreciation but there is significant scope to improve our performance. I hope that in future too they will continue to undertake the activities of this institute with renewed dedication and commitment.

This brief report of CIFRI, I am hopeful, will be useful to various persons and organizations interested in inland open-water fishery and ecosystem management for achieving sustainable fishery and biodiversity conservation. I personally seek their indulgence and response to make it more presentable and informative in years to come.

I am thankful to Dr. Manas Kumar Das, Principal Scientist, in compiling the basic draft of the document and to all other colleagues who have extended their help. Shri Rao has rendered his assistance in Hindi summary, which is duly acknowledged.

Barrackpore, Kolkata
August, 2007

K. K. Vass
Director

was observed in Media (693), Duma (563) and Mathura (547) primarily due to *Microcystis* bloom while in the rest of the wetlands, the GPP was in the range of 164 to 422.

Survey for fish species diversity in the two wetlands from Khagaria district of Bihar, Kasaraiya (40ha) which is in Gandak basin and Lakhmania (30ha) which is in Kosi river basin recorded 33 species belonging to 22 genera and 16 families from Kasaraiya wetland and 18 species belonging to 10 genera and 9 families from Lakhmania wetland. Gross primary production (GPP, $mgCm^{-3}h^{-1}$) in Lakhmania was comparatively higher ($62.50^{-3}02.09$) than Kasaraiya ($52.09^{-1}14.59$).

The germplasm survey was carried in Chandania (seasonally open) and Chamordaha (closed) wetlands in 24 Parganas (North) district of West Bengal. Fish species diversity was found to be higher in Chandania (36 species) belonging to 24 genera and 17 families. In Chamordaha 21 species were recorded under 15 genera and 10 families.

The socio-economic issues of the fishers of Bihar and West Bengal studied indicated that in Bihar the main occupation of the fishers was fisheries, while daily labour in agriculture was the secondary source of livelihood. Nearly 54% of fishers are having their own crafts, and 64% having their own gear. The average annual fishing effort was 268 days with average catch of 1.63 Kg day^{-1}. The average annual income from fisheries per fisher family was only Rs. 14679. In West Bengal the beels studied showed that the main occupation of fishers' was fisheries, while service and daily labour were the secondary sources of income. The average annual fishing effort for commercial fishing was 136 days with average catch of 4.03 Kg day^{-1}. The average annual income from fisheries per fisher family was Rs. 22781.

Biochemical composition of different trophic level organisms like macrophyte, snail, bivalve and insects were studied in beels of Assam. Organic matter and ash ratio in aquatic macrophyte species were in the range of 2.12-6.15. Crude lipid varied widely in different trophic organism (0.19-8.62 %) with highest value in insects.

Fish landing data from Uzanbazar fish assembly centre of River Brahmaputra was collected following systematic sampling design. A total of 236.5 t of fishes was estimated to have been landed during the year as compared to 225.4 t during the previous year, showing 4.3% increase in the overall catch. Miscellaneous species dominated the catch followed by major carps, minor carps, Hilsa, catfishes and feather-backs. The highest landings was recorded during post monsoon season.

Fish health & Environment

Rigorous pesticide risk assessment studies indicated presence of DDT, HCH and their metabolites in all the sampling stations of river and wetlands. Organochlorene pesticide, 4,4'-DDT, was present in concentrations higher than its permissible limits in water for aquatic life.

Application of Health Assessment Index (HAI) in fish of the stressed and non-stressed beel showed HAI as a useful index for rapid evaluation of fish health in beels. Standardization of fish gill as indicator of habitat status through comparative histological structure assessment of fish from stressed and non-stressed beels was done.

Detactable expression of metallothionein genes was observed at 10 mgl^{-1}, concentration of $CuSO_4$. It indicates effect of metal pollution on fish physiology.

The clinical profile of Indian major carps subjected to varied stressors viz. phenol, low dissolved oxygen, elevated temperature, heavy metals and its varied combinations and the diseases argulosis, dactylogyrosis, trichodiniasis were determined and can serve as guide for clinical pathological studies. Methodology for fish lysozyme estimation standardized. Serum lysozyme level of healthy *L. rohita* ranged between 7-9 μgml^{-1}.

Thirty seven species of microbial pathogens, *viz. Aeromonas hydrophilla, A.veronii* b.v. *sobria*, *Aeromonas sobria, Pseudomonas spp.*, *Vibrio* spp. were isolated, identified and maintained. A total of 14 chemicals and 9 plant extracts have been examined for antimicrobial activity against fish pathogenic *Aeromonas hydrophila*. Some have potentiality for use in controlling the aeromoniasis in fish.

Trichloroethylene (TCE) degrading microbes, *Pseudomonas* spp. and Bacillus spp. were isolated and preserved for further trials. Phenol resistant bacteria were isolated from polluted aquatic environments. The isolates were resistant up to 400-800 mgl^{-1} of phenol.

Resource Assessment

The mapping of water bodies with area above 10 ha and rivers and streams had been completed in the State of Orissa with post monsoon satellite data. Location information was also attached with each delineated water bodies in GIS platform in the map.

The correlation between different water quality parameters and digital values of different bands of remote sensing image, ratio of band and various indices like Normalised Difference Vegetation Index (NDVI), Normalised Difference Water Index (NDWI) were calculated. The correlation was found to be significant for some water quality parameters.

The data collected at various centres of the Institute from different inland water systems were scrutinized and analysed to know the catch and catch structure. The data from Ganga river system at Allahabad, from Yamuna River and West Yamuna Canal at Karnal and from Bramhaputra River at Guwahati have been stored in GIS platform.

HRD & TOT

Various extension, training and field demonstration of technologies developed by CIFRI were undertaken for the benefit of the clientele and stakeholders.

Other activities

The meeting of the various committees of the Institute viz., SRC, RAC, IMC, Official Language Committee, IJSC were held as per schedule. The respective committees discussed various agenda items and provided guidelines for the proper management and smooth functioning of the Institute and the research activities.

The CIFRI family is representative of the diverse cultures of the country and each member participated in celebration of various national days, events with genuine spirit of harmony and brotherhood.

INTRODUCTION

Brief History

Based on the recommendations of Sub-committee of the Central Government on Agriculture, Forestry and Fisheries, the Central Inland Fisheries Research Station was formally established on 17th March 1947 at Calcutta under the Ministry of Food and Agriculture, Government of India. From this modest beginning, the station expanded its activities and was elevated in 1959 to the status of an Institute (CIFRI) and moved to its own building at Barrackpore, West Bengal. Over the years, the organization has grown and established itself as a premier research institution in the field of the inland fisheries and aquatic ecology in the country. Since 1967, the Institute is under the administrative control of Indian Council of Agricultural Research (ICAR), DARE, and Govt. of India.

Initially the main objective of this Institute was to conduct investigations for a proper appraisal of all inland fishery resources of the country and to evolve suitable methods for their optimum fish production. While fulfilling the above objective, the Institute directed its research efforts towards understanding the ecology and production functions of different types of inland water bodies in the country. But investigation were also conducted to understand pond ecosystem, its bearing on fish production which eventually lead to development of farming practices to obtain high fish yield from unit of water area.

The Institute during late sixties and seventies focussed its attention on aquaculture research and development in consonance with the plan priorities of Government of India. Having achieved significant progress in fishery research and farming practices in the country, the planners between 1971-1973 approved All-India Coordinated Research Projects on "Composite Fish Culture", "Riverine Fish Seed Prospecting", "Air-breathing Fish Culture", "Ecology and Fisheries Management of Reservoirs" and "Brackish water Fish Farming". The success of combined project of "Composite Fish Culture & Fish Seed Production" initiated in 1974 was the turning point in the history of fish culture in India and provided a solid foundation for the development of freshwater aquaculture in the country. This resulted in the establishment of the Freshwater Aquaculture Research & Training Centre at Dhauli (Orissa) in 1977, which later became, Central Institute of Freshwater Aquaculture (CIFA) in 1987. Simultaneously, Central Institute of Brackishwater Aquaculture (CIBA) and National Research Centre on Coldwater Fisheries (NRCCWF) were carved out from this Institute to carry out research on brackish-water aquaculture and coldwater fisheries respectively. Thus, CIFRI gave birth to three major fisheries research institutions in the country.

As a consequence of creating specialised sectoral institutes and keeping in view the emerging issues in open-water fishery science within and outside the country, with greater emphasis on open water fisheries and aquatic resource management, the CIFRI mandate, was modified.

Mandate

In order to cater to the needs of the changing scenario, the research and developmental programmes in inland fishery sector demands reorientation of research priorities for achieving sustainable production besides conserving the precious biodiversity, the backbone of any production system. It is in this backdrop that the Institute had to shift its focus from :

- 'Production optimization' to 'Sustainable Productivity'
- 'Fish as the only benefit' to 'Ecosystem Health and Benefits'

With this shift in focus, the mandate of the institute is as under :

1. To undertake basic, strategic and applied research in inland open-water fisheries viz. rivers, reservoirs, lakes, estuaries and associated waters

2. To develop ecosystem-based technology and strategies for productivity enhancement in mandated waters

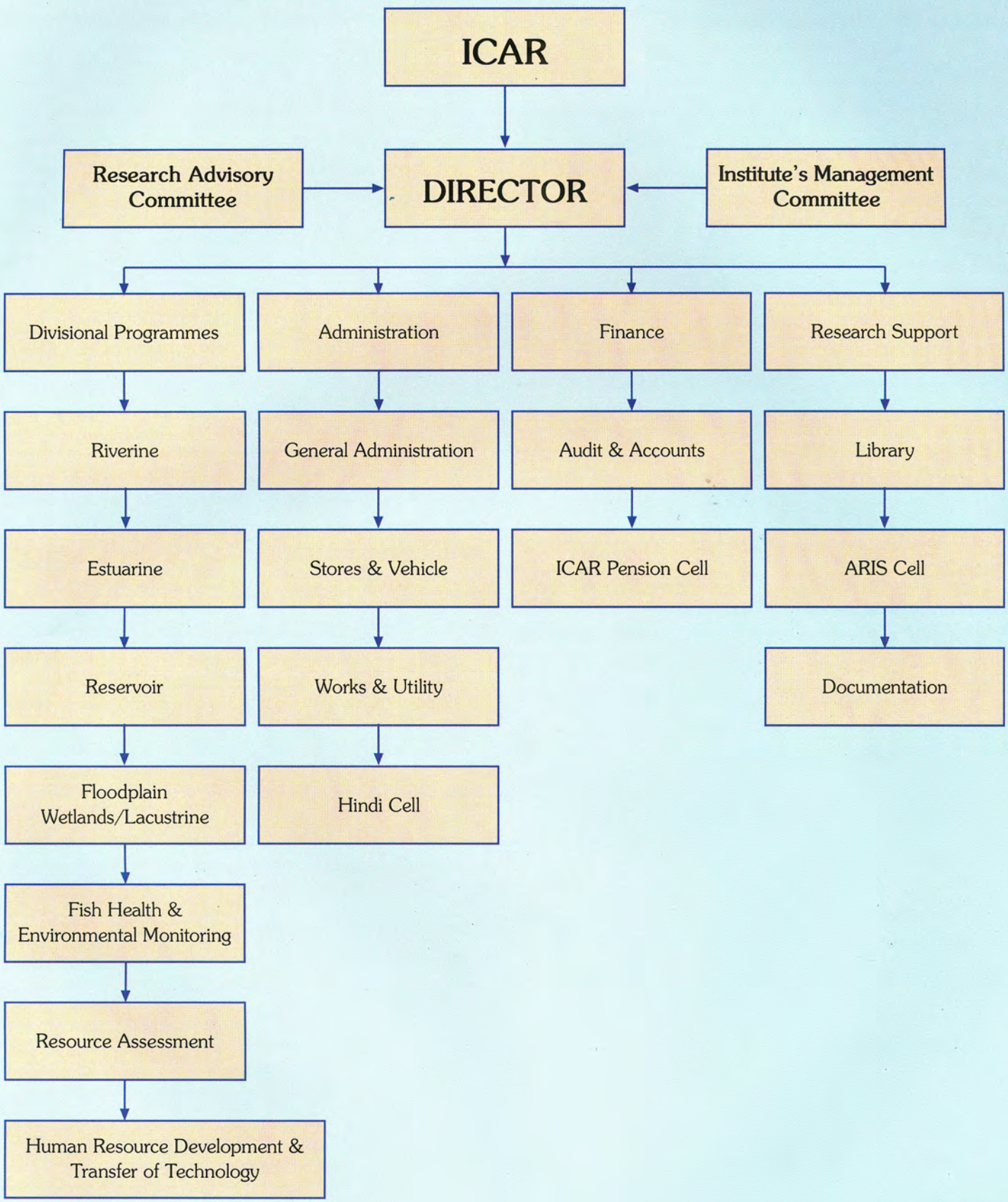
3. To monitor environmental changes, their impacts on fisheries and developing mitigation action plans in collaboration with other organizations

4. To create awareness, provide training and consultancy in inland open-waters

Organisational Structure

Till the revised divisional plan reflected in revised VISION-2025 is approved by the Council, at present the Institute is pursuing its research activities through seven main Divisions which are in turn supported by different research support services / sections. The ***Riverine Division***, with its headquarters at Allahabad, in U.P. strives to monitor and develop effective management action plan for riverine fisheries and resources of the country with adequate emphasis on the conservation of fish stocks and riverine environment. The ***Reservoir Division*** is based at Bangalore, in Karanataka. The investigations carried out in 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*** is involved in working on estuarine fishery and ecology, coastal wetlands and Sunderban mangrove ecology. ***The Fish Health and Environmental Monitoring Division*** located at Barrackpore, is working on fish health and environmental issues related to open-water fishery resources viz., rivers, wetlands, reservoirs and estuaries. It is also looking at biochemical, microbiological and biotechnological approaches for environment monitoring and management. Development of mitigation action plan for ecosystem restoration is also the responsibility of this Division. The ***Floodplain Wetlands Division*** carries out research on the wetland ecosystem production processes and fish production enhancement providing special attention to biodiversity conservation and development of environment-friendly technologies. The ***Resource Assessment Division*** is located at Barrackpore and conducts research aiming at creating a database on the fish stocks and fishery resources. The Division is geared up to develop various population models that can lead to sustainable exploitation of inland fish stocks and develop resource management database on GIS format. The ***Human Resource Development and Transfer of Technology Division*** is located at Barrackpore. The institute has aimed at manpower training and education of fisheries personnel under Human Resource Development for producing qualified persons. The Transfer of Technology wing undertakes, on regular basis, the dissemination of various technologies of inland fisheries to the fish farmers, fishermen, entrepreneurs, extension functionaries through training, demonstration, advisory service, fish farmers' day, camp discussion, film show, exhibition, etc.

The Director in Research Management Position heads the Institute. The responsibility of overall management of the Institute lies with Management Committee under the chairmanship of the Director. The Staff Research Council and the Research Advisory Committee make the specific recommendations pertaining to research and extension activities of the Institute. The Institute's research activities are organised under various research projects, which are executed from the headquarters at Barrackpore (Kolkata), and Regional Centres at Allahabad, Bangalore, Vadodara and Guwahati. The structural outline of the Institute is depicted in the Organo-gram.


ICAR
Research Advisory Committee
DIRECTOR
Institute's Management Committee
Divisional Programmes
Administration
Finance
Research Support
Riverine
General Administration
Audit & Accounts
Library
Estuarine
Stores & Vehicle
ICAR Pension Cell
ARIS Cell
Reservoir
Works & Utility
Documentation
Floodplain Wetlands/Lacustrine
Hindi Cell
Fish Health & Environmental Monitoring
Resource Assessment
Human Resource Development & Transfer of Technology

Research Support Services

Library

CIFRI Library provides services to the scientists of the Headquarters and Centres as well as to the research scholars, teachers, students and other officials from different organizations. The library added 557 books, out of which 421 books are in Hindi, 10 miscellaneous publications and 615 loose issues of journals to its collection and subscribed 18 foreign, 37 Indian and 77 e-Journals (foreign) during the year. The current total holdings of the library are 11369 books, 4300 reprints, 1252 maps and 4330 miscellaneous publications.

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. The publication of Indian Fisheries Abstracts was continued. The library has updated the Current Contents for the period Jan.–Dec. 2006. The library has exchange programmes with other National and International organizations. A budget of Rs. 8,60,863 was provided and spent during the year 2006-07 for procuring library books, journals and other reading materials. The library has also spent Rs.4.64 lakhs for upgrading information dessiminating system.

Project Monitoring and Implementation

The section monitored the progress of Research Projects of the Institute. The section processed the research papers submitted by the scientists for their publication in different journals and for presentation in Symposia/workshops/summer school, etc. Participation of scientists in seminars, symposia, conferences, etc. was also monitored by the section. The section maintains lamination, duplicating (cyclostyling), binding and photocopy facilities to cater to the needs of the Institute. Annual progress reports of all the research projects and the contribution made by individual scientists are being maintained and monitored through the Primary Project Files and Scientists' Files. Research progress is monitored through RPF I, II and III. Quarterly (QPR) and Annual Reports are some of the major responsibilities of the section. Technical briefs highlighting the progress of research under various projects are compiled and provided to the Council, Ministry of Agriculture and other agencies from time to time. Technical queries regarding the activities of the Institute from various quarters within and outside the country were attended to by the section.

Documentation Section

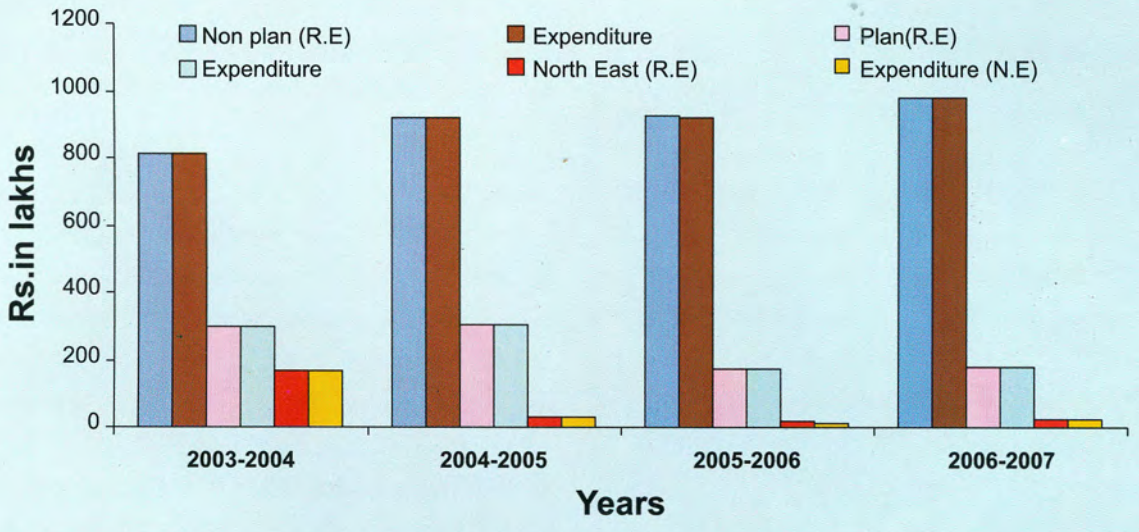
It is entrusted with the responsibity of publication of bulletin, annual report, newsletter, brochure etc. During the year this section published CIFRI annual report, two newsletters and four bulletins.

ARIS facility

The computer related facilities are provided to the scientists and other staff members of the institute by this cell. Total LAN system is in place and Internet facility has been provided to the scientists.

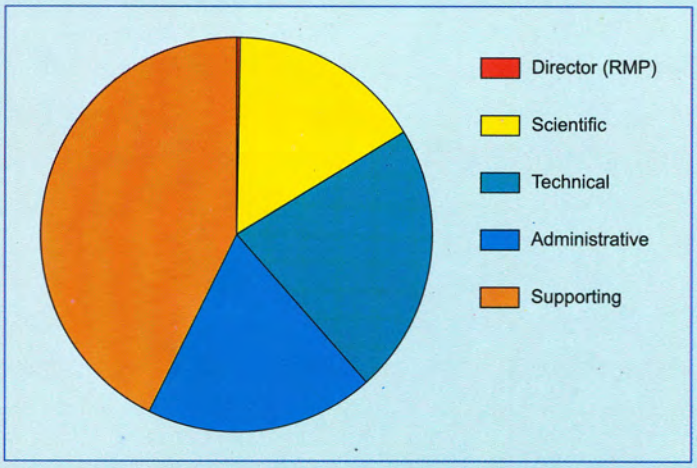
Budget Statement for 2006-07

Head of Account	Budget (R.E.) (Rs. in Lakhs)		Expenditure (Rs. in Lakhs)	
	Plan	Non plan	Plan	Non plan
Pay & allowances Including OTA	-	877.15	-	877.15
TA	4	9.4	4	9.4
Other charges including IT and HRD	151.52	73.45	141.52	73.45
Works	28.38	18	28.32	18
Others	3.16	-	3.16	-
Grand total	177.06	978	177.05	978
NE Component	25	-	24.99	



Staff Position as on March 2007

Sl. No.	Category	Sanctioned	In position
1.	Director (RMP)	1	1
2.	Scientific	98	60
3.	Technical	90	83
4.	Administrative	80	71
5.	Supporting	168	160
	Total	437	375



INSTITUTIONAL PROJECTS

RIVERINE ECOLOGY AND FISHERY

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

D. N. Mishra, Usha Moza, Sushil Kumar, Kuldeep Singh

Ecology & Fishery of river Ravi

River Ravi, one of the three eastern rivers of the Indus basin, has been evaluated for its ecology and fishery resources within plains of Punjab for an estimated length of 170 km.

Abiotic characteristics

Water : Water temperature of river Ravi within Kandi regions of Punjab showed less variation and ranged between 20-23°C, slightly higher than last year 20-22°C, but in lower plains the temperature varied from 17-30°C. River water was alkaline with pH ranging between 7.3-7.6. Dissolved oxygen content ranged between 6.6 to 7.2, B.O.D. 1.0-1.2 mgl^{-1} and C.O.D. values between 3.2-4.3 mgl^{-1} indicating no pollutional load. Total alkalinity ranges between 79.3 and 118.0 mgl^{-1} indicated it to be productive.

Gross primary production varied between 102.08 and 148.960 mgC $m^{-3}hr^{-1}$ being lowest at Derababa Nanak and highest at Kathlour and net production varied between 67.710 and 114.58 $mgCm^{-3}hr^{-1}$. The production exhibited seasonal variation all along the river, minimum during monsoon (56.25-62.50) and maximum during post-monsoon (140.62-312.50 $mgCm^{-3}hr^{-1}$). The ratio between Gross Production and Respiration varied between 2.16 and 3.1 with lowest values at below barrage and highest at Kathlour indicative of not much pollutional load.

Soil : River bed is alkaline throughout (pH7.5-7.6) having conducive available nitrogen (13.1-15.40 $mg100g^{-1}$) and phosphorus (1.26-1.6 $mg100g^{-1}$). Specific conductivity of river bed range between 159-201.3μScm^{-1} indicating that the river is not having much organic load. The conductivity was minimum at below barrage and maximum at Dharamkot Pattan: the studied lower stretch may be under the cumulative affect of tributaries, mainly Saki.

Biotic characteristics

Plankton : Plankton population is mainly formed of phyto group contributed by diatoms (66-100%) and green algae (0-34%). Zooplankton, in the form of Rotifers (11%) was present only at Kathlour. Population did not exhibit any change from last year. Absence of myxophyceae indicate clean river conducive for fishery but not for surface feeders because of the low plankton crop.

Periphyton : Periphyton concentration within Ravi was substantial, 222-608 ucm^{-2}, which is mainly due to river bed characteristics, transparent water and low water depth. The periphyton concentration unlike plankton was higher in pre-monsoon (367-767 ucm^{-2}) compared to post-monsoon (200-501 ucm^{-2}) and monsoon (134-567 ucm^{-2}). Periphyton population like plankton was dominated by diatoms (70-86%) but also had presence of blue green algae (14-20%). Common forms present were *Diatoma, Navicula* among diatoms, *Microspora, Crucigenia, Pleuroccocus* among green algae and *Oscillatoria, Microcystis* among blue green algae.

Macrobenthos : The average density ranged between 277-3207 um^{-2}, minimum at Shahpur and maximum at below barrage site. The density was high during pre-monsoon (466-3395 um^{-2}) at all stations except Kathlour. Benthic population exhibited substrate, thermal and seasonal influence. *Trichoptera, Pelecoptera* and *Ephemeroptera* nymphs were present in portion having rhithron characteristics i.e. Shahpur to Kathlour, while

Dharamkot Pattan had mainly Molluscs and Decapods. Fish fry mostly of *Chela* and *Osteobrama* sp. to the tune of 14-28% and fish fingerlings of Eel to the tune of 1.14% of total benthic population were observed at Kathlour and Dharamkot Pattan respectively during monsoon, thereby showing that this fish breeds in the river at these specific sites.

Macrophyte and associated fauna: Macrophytes *Potomogeton*, *Chara*, *Hydrilla* sp were mainly present at Kathlour during pre and post-monsoon between 800-960 gmm^{-2} (wet biomass) at below barrage 400 gmm^{-2} during post-monsoon and 50 gmm^{-2}at Dharamkot Pattan during pre-monsoon. Meiofauna density varied between 18-130 um^{-2}, being highest at Kathlour and lowest at below barrage. The epiphytic insect population like benthic population was high during pre-monsoon except at Kathlour (114 um^{-2}), and was highest during post-monsoon (232 um^{-2}).

Evaluation of Fish and Fishery of Ravi

Estimated Fish Catch (t/month): Total estimated fish catch per month for the year 2006-07 was 6.03 t distributed as 2.68 t at Pathankot, 1.33 t at Taragarh, 0.92 t at Derababa Nanak and 1.10 t at Amritsar, details of which are given below (Table 1).

Table 1 : Fish catch estimate and composition in river Ravi (2006-07)

Stn. (Apr-Jan)	Total (t/m)	Percentage composition (%)						
		IMC	Minor carp	*Tor sp.*	*Cyprinus carpio*	*S. richardsonii*	Catfish	Misc.
Pathankot	2.61	3.73	58.58	6.34	9.33	1.89	1.87	18.28
Kathlour	1.33	2.20	79.70	0.75	–	–	–	17.29
Derababa	0.92	7.61	48.91	–	3.26	–	1.09	39.13
Amritsar	1.10	–	47.28	–	–	–	7.27	45.45
Saki (Tributary)	0.80	–	56.25	–	–	–	–	43/75

Fish catch composition: Fish composition revealed that minor carps represented by *Labeo dero, Labeo dyocheilus, Cirrhina reba, Clupisoma garua* and *Labeo bata* form main stay fishery forming 59.70% of total catch. Miscellaneous group represented by Murrels, *Puntius sp., X. cancila,* eel and *N. notopterus*, form next highest group forming 26.20% of the total catch. Common carp formed third highest group yielding 4.64% of total catch. Rest of the catch was formed of IMC (3.32%), Mahseer 2.99%, large-scale catfishes 2.32% and snow trout, 0.83%.

Fish Diversity: The fish catch in studied stretch of Ravi had 31 species, out of which *Schizothorax richardsonii* was confined to Shahpur forming 1.89% of total annual catch. *Tor putitora* was present in upper Kandi area contributing 0.75-6.34%. *C. carpio* (both varieties) too were mainly confined to barrage vicinity upper Kandi area, forming 9.33% of the population. Minor carps were present throughout the stretch. Amongst miscellaneous group of fishes, eel and *Xenentodon cancila* were more prevalent in upper Kandi stretch and *Puntius*, *Notopterus* in lower stretch. *Clupisoma garua* hitherto not observed in Ravi was found at Kathlour during experimental fishing in monsoon.

Ecology and Fishery of Saki tributary

Abiotic characteristics

Water : The water temperature of Saki varied widely between 18-34°C as is the case of lower Ravi. The water was alkaline (pH 7.2-7.3), transparency 32-48 cm, D.O. 6.4-7.2 mgl^{-1}. BOD 2.7 mgl^{-1}, COD. 8.8 mgl^{-1}, total alkalinity 220-236 mgl^{-1}, chloride 20.0 mgl^{-1} and specific conductivity 499 $mScm^{-1}$ indicating polluted state of the river.

Soil : Soil is sandy loam, (60.35% sand; 25.85% silt and 13.8% clay, alkaline, pH 7.35) having moderate available nitrogen (16.52) and phosphate (1,86 $mg100g^{-1}$). The soil exhibit little variation in organic carbon (0.63-0.66%) and free calcium carbonate (4.0-4.25%). Specific conductivity range of 500 (Monsoon)-144 mmhos cm (post-monsoon) exhibit that pollution load within tributary is temporary and mostly present during monsoon because of overflow of various small drains from adjoining populated areas bringing in municipal effluents. The seasonal pollution load and moderate nutrients within the tributary soil depict that Saki does not have much pollution impact on river Ravi.

Biotic Assessment

Plankton : Saki has slightly more plankton crop (134 ul^{-1}) than river and is dominated by phytoplankton (62%). The phytoplanktons are formed by two groups diatoms (62%) and green algae (25%). Zooplankton (13%) is exclusively formed by Rotifers.

Periphyton : Periphyton concentration was high, 668 ucm^{-2}, dominated by diatoms (72%), followed by blue green algae (11%) and Desmids (10%). Green algae formed 7% of the population.

Macrobenthos : Macrobenthic population was high, average density being 2530 um^{-2} (range 1198-3862 um^{-2}) being high in post-monsoon when current is slow and transparency is high compared to monsoon.

Macrophyte associated fauna: Epiphytic population like benthic macroorganisms was high during post-monsoon (114 um^{-2}) than monsoon (90 um^{-2}). The average density was high (102 um^{-2}).

Fishery

Fish Biomass : Estimated fish catch for the year (2006-07) was 0.80 t/month, contributed mainly by minor carps (56.25%) and miscellaneous (43.75%) fishes. Miscellaneous group had dominance of Murrels, *M. tengra* and included juveniles of IMC and catfishes in post-monsoon. Presence of commercially important juvenile fishery in Saki tributary indicates that fishes from lower Ravi ascend for breeding purposes. Balanced nutrient load and good food web in the form of periphyton and benthic organism too indicate that the tributary forms rich food resource.

EVALUATION OF HABITAT DEGRADATION IN THE CONTEXT OF FISHERIES ECOLOGY IN RIVER GANGA

R.S. Panwar, H.P. Singh, D.N.Singh A.K. Laal
D. Kumar, R.N. Seth, Shree Prakash, R.K. Tyagi
V. Pathak, B.K. Singh, P.N. Jaitly, B. L. Pandey
R. S. Srivastava, K.D. Joshi, B.D. Saroj
S.K. Srivastava, J.P. Mishra, Kalpana Srivastava.

Various abiotic and biotic components of river Ganga were studied in 13 stretches between Deoprayag and Farakka.

Abiotic characteristics

Physical features : Current velocity was maximum at Deoprayag (2.8 Km hr^{-1}) and minimum at Farakka (0.78 Km hr^{-1}). Velocity was more or less similar in the stretch between Kanpur to Patna (around 1 Km hr^{-1}) and thereafter it showed a declining trend. Silt load was maximum at Kanpur and Patna (515 & 565 gm^{-3}) and minimum (130 gm^{-3}) at Farakka.

Rate of energy transformation by producers : The rate of energy transformation by producers in different stretches of Ganga was studied and the study show maximum energy fixation rate in Kanpur (5678 Cal $m^{-2}day^{-1}$) and minimum at Deoprayag (397 Cal $m^{-2}day^{-1}$). In general an increasing trend was noted from Deoprayag to Kanpur and a decline after Varanasi. On the basis of energy transformation rate the Ganga was clearly divided into three zones; upper zone (Deoprayag to Haridwar) having minimum value (529 Cal $m^{-2}day^{-1}$), middle zone having value maximum (4942 Cal $m^{-2}day^{-1}$), while lower zone (Patna to Farakka) showed values in between the two zones (1848 Cal $m^{-2}day^{-1}$). Farukhabad stretch had high rate of energy transformation (2239 Cal $m^{-2}day^{-1}$) but the values were much lower than the middle zone.

Fish production potential and potential energy : With respect to these two production parameters Ganga was again divided into three zones: upper zone having minimum values (18.3 Kg $ha^{-1}yr^{-1}$or 21,991 K cal ha^{-1} yr^{-1}) and middle zone showing maximum values (167.6 Kg $ha^{-1}yr^{-1}$or 2,01,185 Kcal ha^{-1} yr^{-1}). Lower zone showed intermediate values in both the parameters (64.0 Kg $ha^{-1}yr^{-1}$or 76,786 K cal ha^{-1} yr^{-1}). Ganga at Farukhabad showed much higher potential than upper stretch (77.5 Kg $ha^{-1}yr^{-1}$ or 93,024 K cal ha^{-1} yr^{-1}) but it was less than those in the middle zone. Studies under the project did not show any decline in potential energy resource over the years.

The accumulation of hazardous heavy metals and pesticides were much below the standard limits. The energy deposited at the bottom as organic detritus ranged between 0.18 4 x 10^4 Cal m^{-2} (Deoprayag) and 5.9 x 10^4 Cal m^{-2} (Kanpur). Several biochemical indices were developed to assess the extent of pollution and software module has been developed to store and retrieve the data.

Biotic characteristics

Fishery : Fish landings at Sadiapur and Daraganj landing centers were estimated at 86.85 and 44.44 t. The contribution of major carps and large sized catfishes was about 9% each at Sadiapur. Sadiapur landings showed an 17.0% increase as compared to the preceding year. The maximum increase was in landings of *C.mrigala* (35.1%), however, catches of *Catla catla* declined to 50% of the preceding year. Others comprising of *R. rita, C. garua, E. vacha, Chela spp., A. morar, P. coitor, A. coila* and some other smaller species also registered an increase of 25%. Among exotics catches of Tilapia increased sharply. Landings of *C. carpio* were estimated at 22.14 t and showed an increase of 11.8% over landings in the year 2005. At Daraganj the landings increased by 45.4% as compared to the landing in 2005. Major carps catch were almost double of the preceding year; landings of mrigal and catla showed a marked increase. However, the large catfishes showed a decline and landings were almost half of the preceding year.

The yield rate was computed as 377.6 kg km^{-1}, out of which the contribution of major carps and large sized catfishes was merely 10.2 and 10.5% respectively. The contribution of others and exotics were 53.8 and 25.5%. As compared to 1961-68 fish catch, the fishery has shown drastic change and decline (IMC-45.4%; large catfishes-21.5% in a total of 935.4 kg km^{-1}) in recent years.

At all centers the fishery was dominated by smaller species (42-100%). In the upper stretch (Rishikesh-Haridwar) the contribution of major carps was negligible and a good fishery of *Tor spp.* and *L. dero* was observed, specifically in the stretch below Haridwar. In middle stretch (Kannauj-Varanasi) the contribution of major carps ranged from 7.5 to 15.5% but in the lower stretch the landing of major carps was very poor excepting at Farakka (14.1%). The exotic species were mainly available in the middle stretch from Allahabad to Varanasi

with maximum availability at Allahabad (25.5%) followed by Varanasi (19.4%). The exotics were not available at Patna and below. *Tor spp.* and *L. dero* were available only in the upper stretch.

Fishery from Ganga showed sharp decline as compared to that in 1960s. At Allahabad yield came down to 381 Kg Km^{-1} from 935.4 kg km^{-1} in the past. The catches were mainly composed of smaller species (56-62%) and the contribution of major carp was very small (negligible – 15.5%). Upper stretch was dominated by *L. dero* and *Tor spp.* while middle stretch showed availability of exotic species. *C. carpio* with maximum around Allahabad.

Socio-economic analysis of fishermen community: Socio-economic survey of fishermen community were carried out in 16 villages in the upper stretch (Deoprayag to Haridwar), 12 in Bhagalpur region and 11 in the Farakka region. It was found that the meager catch per day from the river has resulted in poor monthly income, insufficient to meet fishers' food requirement. Decline in fisheries of the river has resulted in unemployment among fishers and a good proportion has shifted to other occupations.

ESTUARINE ECOLOGY AND FISHERY

STUDIES ON THE ESTUARINE ECOSYSTEMS AND SALINE WETLANDS IN RELATION TO THEIR PRODUCTION POTENTIAL

R. N. Misra, D. Nath, M. K. Mukhopadhyay
Amitabha Ghosh, J. G. Chatterjee, H.C. Karmakar
B. C. Jha, N. P. Shrivastava, K. R. Naskar
B. B. Satpathi, A. Hajra, A. Chattopadhyay
R. C. Mandi, T. Chatterjee, K. Jacquline, D. Sanfui
B. N. Das, A. Sengupta, A. K. Barui, D. Saha
A. R. Choudhury, S. Mandal, C.P. Singh
K. P. Singh, Asim Jana, S. Mondal

Hydrology and fisheries of Hooghly estuary

Delineation of mixing zone : A sea voyage was carried out in three seasons viz., monsoon, winter and summer during 2005-06 & 2006-07 on the eastern bank of Hooghly estuarine delta with the objective of delineating the zone of Hooghly estuarine intrusion (mixing zone) in to the Bay of Bengal. Considering that salinity is an ideal parameter for the purpose, subsurface water samples were collected and analysed on linear basis using the GPS at known intervals of distance starting from the coastline and proceeding farther seawards till the salinity was of the order of near-seawater value. Based on the salinity and distance relationship the zone of estuarine intrusion was determined up to 25.8 km from the coastline during winter. It was effectively marked up to 22.2 km from the sea shore during summer, but further extended up to a total 50.2 km during monsoon when the river discharge was maximal. Incidentally, the estuarine mixing zone represented the most productive zone where the fishing activity was consistently at a peak in winter contributing about 92 -96 % of the total estuarine production.

Winter Migratory Bagnet Fishery (WMBF) in Lower Estuarine Zone : Total catch of WMBF in lower estuary was estimated as 34516.8 t with an average CPUE of 45.39 kg during November, 2006 to January, 2007 against 28394.2 t, 40.4 kg respectively of the corresponding period of 2005-06 denoting a rise of 21.56 % in total catch and 12.35 % in CPUE value compared to previous year. Over the period of past seven years between 2000-2001 and 2006-2007, the total catch increased by 42.19 %.

Production fluctuation in relation to hydrology and effort patterns : Experimental fishing with bagnet and set-barrier in lower estuarine and upper fresh water tidal zone of the estuary indicated that bagnet catch comprised of 28.6 % *Pama pama* at Frazerganj-Bokkhali area, while *H. nehereus* alone contributed 45.8 % at Sagar on the other bank of the estuarine system. At Frazerganj-Bokkhali area the salinity and the transparency ranged between 13.56–29.63 ppt and 5-32 cm respectively,

while the values were between 5.8-27.1 ppt and 6.0-98.0 cm in Sagar area. A positive correlation could be established between the abundance of prey species of *Acetes indicus* and the bagnet catch comprising of 90 % carnivorous species of fishes. A total of 117 fishes belonging to 19 orders could be identified from freshwater to marine zone of the estuary. The occurrence of, *Sicamugil cascasia*, a small size freshwater mullet in the Bichalighat – Barrackpore stretch indicates persistent freshwater conditions prevailing in the region.

Mangroves and associated water resources of Sunderbans

Plankton diversity : The plankton profile at Jharkhali (high saline mangrove area) and Ichamati (low saline mangrove area, Hingalganj) were investigated in relation to quantitative abundance and qualitative texture. The phytoplankton abundance at Jharkhali ranged from 556-1025 ul^{-1}, being the highest during winter and lowest in monsoon. The Hingalganj area of Ichhamati indicated relatively low abundance of phytoplankton (239-570 ul^{-1}) as compared to Jharkhali. During the period a total of 139 (Jharkhali) and 67 (Hingalganj) species of phytoplankton were identified and photographed. The diversity of zooplankton at Jharkhali and Hingalganj was recorded as 13 and 9 species, respectively.

Macro-zoobenthic diversity : The Ichamati estuary at Hingalganj recorded the presence of 5466 um^{-2} macrobenthic organisms mostly represented by Tanaids (98 %) during the winter months. In Heronbhanga river, the density of organisms was 311 um^{-2}, represented by gastropods, e.g. *Telescopium sp.*, *Cerithedea cingulata*, *C. obtusa* and *Nerita articulata* as the dominant forms of benthic organisms. The Kumiraganda canal at Frasergunj-Bakkhali mangrove area harbored a benthic population of 296 um^{-2} comprising gastropods, crab larvae, annelids, amphipods and fish larvae.

Fish : The codlet, *Bregmaceros macclellandi* and *Labotes surinamensis* two rare species of small fish was recorded from the mangrove areas in the Heronbhanga estuary.

Mahanadi estuary

Abiotic characteristics

The Mahanadi estuarine system comprises of two important estuarine arms viz., Mahanadi main channel and Devi. The Devi estuary of Mahanadi estuarine system received additional focus for comprehensive study.

Estuarine hydrology : The estimated annual discharge in Devi was 65.66×10^9 m^3, more than 90 % of which was accounted for comparison, the Mahanadi main channel estuary had 44.8 10^9 m^3 annual discharge and drastically lower freshwater flow in summer (monthly av. discharge, 0.1884×10^9 m^3).

Water : The physical and chemical parameters indicated strong spatio-temporal variability. Low freshwater discharge in premonsoon established a clear salinity gradient of 0.6-18.0 ppt over 65 km stretch from the mouth. Monsoon turned the estuary into oligohaline (0.3 -5 ppt) but the system switched to mesohaline conditions (0.7-10.8 ppt) in winter. The external inputs due to land runoff tended to elevate NO_3-N concentrations (0.07-0.104 mgl^{-1}) at the riverine end in monsoon but the dilution effect caused a decrease (0.032-0.068 mgl^{-1}) towards the mouth region. High values of NO_3-N in post monsoon (0.14-0.28 mgl^{-1}) and in pre monsoon (0.064-0.10 mgl^{-1}) at the mid-estuary supported high productivity and also indicated a source for NO_3-N through mineralization of organic matter. This is further supported from consistently higher values of NH_4-N in post monsoon (0.04- 0.1 mgl^{-1}) and in premonsoon (0.042-0.17 mgl^{-1}), up from an average level of 0.02-0.04 mgl^{-1} in monsoon. PO_4-P concentrations marked high values in monsoon (0.078-0.122 mgl^{-1}) in the entire estuary and then leading to a gradual decrease (0.016-0.076 mgl^{-1}) in post monsoon.

Biotic characteristics

Plankton : The density of the planktonic organisms was maximum in summer (265-607 ul^{-1}) followed by winter (140-352 ul^{-1}) and monsoon season (112-240 ul^{-1}). Marine zone harboured highest population of plankton (158-607 ul^{-1}) which declined gradually in upstream brackish water (240-282 ul^{-1}) and fresh water tidal zone (112-378 ul^{-1}).

Macrozoobenthos : Between the zones studied the riverine stretch harboured highest density of the benthic organism (av. 412.5 um^{-2}) and the abundance decreased in downstream freshwater and brackish water tidal zones, while in marine zone there was again a rise in density of the benthic fauna (avg. 260.0 um^{-2}). The benthic fauna had greater dominance of gastropods (58 %).

Cast net catch from Devi estuary

The habital richness of Devi estuary

Minor carp catch from Devi estuary

Krishna estuary

The ecology, biodiversity and production potentiality of Krishna estuary revealed an alarming impact of low river flow. The seawater incursion is very high and during high tides it covers almost 90% of the tidal stretch.

Abiotic characteristics

Water quality : The regulated freshwater influx together with high seawater incursion has increased the salinity amplitude to a considerable extent (20-35 ppt) during prolonged dry season. Low catchment runoff coupled with poor river drainage has led to poor nutrient supply (avg. PO_4-P 103 μgl^{-1}, NO_3-N 143 μgl^{-1}, SiO_2-Si 5.99 mgl^{-1}) and low productivity with an average gross primary production estimated as 77.85 mgC $m^{-3}h^{-1}$.

Salinity established a strong gradient (0.14-33.6 ppt) with wide variation with season and depending on the distance from the sea mouth. For most part of the year water depth in the upper estuarine zone was low but the lower estuary was comparatively deeper with incursion from the sea. The nitrate-N concentrations ranged from 0.038-0.267 mgl^{-1} with higher concentration in the upper estuary. This indicated the impact of allochthonous recharging as an important source for N. The phosphate content varied between 0.029 and 0.365 mgl^{-1}. The upper zone was again marked for higher values similar to N. Both nitrate and phosphate contents were higher during monsoon.

Biotic characteristics

Plankton : The qualitative texture of phytoplankton spectrum revealed the presence of 93 species with greater dominance of *Bacillariophyceae* (68.23-90.08%) followed by *Dinophyceae* (18.30-22.63%), *Myxophyceae* (3.56-6.25%), *Chlorophyceae* (2.89-3.11%) and *Xanthophyceae* (1.30-1.82%). The Krishna estuary indicated insignificant variations among the biotic texture between sampling stations and seasons, barring the monsoon indicating the prevalence of homogenous ecological entity, during the larger part of the year.

Macrobenthos : The density of macrobenthic population showed wide variation from 174-9303 $nos.m^{-2}$ with an

from 0.05 - 0.062 mgl^{-1}, nitrate from 0.01-0.08 mgl^{-1} and silicate ranged from 1.7-3.8 mgl^{-1}during the period.

Primary production : Hourly integrated primary production was 97.65 mgC $m^{-2}h^{-1}$. The daily integral production was 781.2 mgC $m^{-2}d^{-1}$. Net primary production was distributed over a much narrower depth (3.0 m). The daily integral net production for the lighted period was 250 mgC $m^{-2}d^{-1}$. Gross production to community respiration ratio was 1.5, suggesting low heterotrophic activity.

Biotic characteristics

Plankton : Plankton analysis showed the dominance of phytoplankton (71.7%) over zooplankton (28.3%). Chlorophyceae (75%), Myxophyceae (14.3%), and Bacillariophyceae (10.7%), were encountered in phytoplankton. Among zooplankton, cladocerans (43.8%), copepods (39 %), rotifers (11.6%) and protozoans (5.57%) were recorded. The predominant forms encountered were *Ulothrix, Staurastrum, Microcystis, Navicula* among the phytoplankton. The dominant zooplankton forms were Calanoid copepods, *Ceriodaphnia, Diaphanosoma, Keratella.*

Periphyton : The periphyton counts ranged between 30 and 6000 nos.cm^{-2}. Bacillariophyceae was the dominant group (97.82 %) in the community and Chlorophyceae contributed only (2.18 %) of the periphytic production.

Benthos : The benthic fauna in Kabini reservoir fluctuated from 6 to 565 nos.m^{-2} Maximum abundance was noticed during October. The gastropods contribution accounted to 28.47 %, chironomus 33.76 % and other miscellaneous forms (Mayfly nymphs, Dragonfly nymphs and fish fry) contributed 37.77%.

Fish and Fishery : An estimated fish catch of 9881 kg was recorded at reservoir in the month of April 2006. 0. *mossambicus* (33.1%) dominated the catch followed by *C. carpio* (27.8%), *L. bata* (12.3%), *O. bimaculatus* (12.3%), *C. gariepinus* (4.7%) and others (9.7%) which included *N. notopterus, M cavasius, C. marulius,* etc. The CPUE during this month was 4.94 kg. In the month of July 2006, an estimated fish catch of 6546 kg was recorded at reservoir. *O. mossambicus* (56.8%) dominated the catch followed by *O. bimaculatus* (13.1%), *P. sophore* (9.5%), *M. cavasius* (9.1%), *Ambassis nama* (4.3%) and others (7.2%) which included *H. fossilis, A. ranga, Puntius ticto, L. rohita, C. reba* etc. The CPUE during this month was 2.76 kg. An estimated fish catch of 2934 kg was recorded at reservoir in the month of October 2006. *O. mossambicus* (53.3%) dominated the catch followed by *C. carpio* (36.8%), *C. calla* (3.9%), *L. rohita* (2.8%), *O. bimaculatus* (2.6%) and others species (0.6%). The CPUE during this month was 3.91 kg. In January 2007, there was an estimated fish catch of 670 kg from the reservoir with a CPUE of 1.00 kg. *O. mossambicus* (61.1%) dominated the catch followed by *L. rohita* (31.5%), *L. bata* (5.7%) and *M. cavasius* (1.2%).

Experimental gill netting at Kabini Reservoir

Experimental gillnet fishing : Was repeated jointly by CIFRI and CIFT at two sites in Kabini Reservoir in October 2006 and February 2007. *Oreochromis mossambicus* dominated the catch in experimental gill nets at Dam site and Sogahalli forming 75.3% and 72.9% respectively, followed by *Ompok bimaculatus* 24.7% and 18.6% at respective sites. At dam site 83% of the surface gill nets contained *M punctatus* and the rest consisted of *Chela laubuca* where as 75.3% of the bottom set gill nets consisted of *O. mossambicus* and the rest was constituted by *O. bimaculatus*. The entire catch in the column set gill nets were constituted by a single species *Xenentedon cancila* at Dam site. In Sogahalli 55.7% of the catch in surface gillnets were *O.mossambicus* followed by *Ompok bimaculatus* (39.3%) and *Chela laubuca* (4.9%). The column set gillnet yielded 90.9% *O. mossambicus* and the rest consisted of *Mystus punctatus* whereas the bottom set nets catch was equally represented by *Chela laubuca* and *M. punctatus*. The overall CPUE was 0.53gm^{-2}.

Ecology and Fisheries of Mettur Reservoir

Abiotic characteristics

Water quality : Water sampling was carried out in three zones viz. lentic, intermediate and lotic during the period under report. The physico-chemical characteristics of water were as follows: Temperature: 27.3 to 29.8°C, Transparency: 70 to 88 cm, pH7.9-8.4, Dissolved oxygen: lotic 8.6-9.3 mgl^{-1}, intermediate 7.6-8.3 mgl^{-1} and lentic 6.6-8.1 mgl^{-1}, Free CO2: nil, Total alkalinity : 216.0-238.0 mgl^{-1}, Carbonate alkalinity: 30.0-32.0 mgl^{-1}, Bicarbonate alkalinity: 188.0-200.0 mgl^{-1}, Hardness: 125.3-137.5 mgl^{-1}, Calcium: 28.7-32.0 mgl^{-1}, Phosphate: Traces, Silicate: 7.9 mgl^{-1}. Oxycline and thermocline were observed in all the three zones.

Primary production : The gross production was higher in lentic zone (190.5 mgC m^{-3}hr^{-1}) than lotic (140.6 mgC m^{-3}hr^{-1}) and intermediate (52.50 mgC m^{-3}hr^{-1}) zones. The net production was 162.2, 40.1 and 30.4 mgC m^{-3}hr^{-1} at lentic, lotic and intermediate zone respectively. Respiration was higher at lotic (108.5 mgC m^{-3}hr^{-1}) than lentic (30.5 mgC m^{-3}hr^{-1}) and intermediate (28.1 mgC m^{-3}hr^{-1}) zones.

Biotic characteristics

Plankton : The total plankton ranged from 100 to 1240 nos.l^{-1}. Among the plankton, the phytoplankton was dominant. Bacillariophyceae contributed maximum among phytoplankton followed by myxophyceae. *Nitzchia* sp. and *Synedra* sp were the dominant forms encountered in Bacillariophyceae during this period.

Benthic fauna : The benthic population was mainly represented by *Chaoborus* sp. in all the three zones. Among the three zones this form was maximum (1400 nos. m^{-2}) in lotic zone followed by lentic (482 nos. m^{-2}) and intermediate zones (220 nos. m^{-2}). The molluscan population was found in the lentic (310 nos.) and intermediate (240 nos.) zones.

Fish yield : The total number of fish seed stocked in Mettur reservoir during the period 2006-07 was 2500000, comprising of *C. catla* (947000 nos.), *L. rohita*, (1247000 nos.) and *C. mrigala*, (306000 nos.). The fish yield from Mettur reservoir was highest in July (42164.6 kg). Major carps (18457.6 kg) contributed maximum to the total production in that month whereas, the group II fish comprising *O. bimaculatus* (14608.850 kg) also formed higher proportion in July. In December, the fish catch of all the groups declined drastically. This may be due to the increase in water level to FRL at 36.36m. The group III consisted of all miscellaneous fishes. Tilapia alone formed group IV fishes in the catch.

Detritus food chain in carbon rich reservoir ecosystem

Gunderipallam reservoir accumulates detritus from allochthonous sources primarily from the surrounding forests. In detritus food chain greater energy is available to the terminal consumers that reflected the higher fish yield of 224.9 kg ha^{-1} from this reservoir. To study the energy flow of the detritus food chain in this reservoir, the biomasses of detritus (7.71 x 10 4 kg ha^{-1}), benthos (1306.8 kg ha^{-1}), microbes (479.6 mgl-1) and fishes (13.5 t) were quantified. Thirty seven different bacterial colonies belonging to *Serratia, Gallionella, Leptothrix*

and *Pseudomonas* and fungal colonies of *Mucor, Penicillium* and *Aspergillus* were isolated from sediment samples for mineralization of detritus.

ENVIRONMENTAL AND MANAGERIAL FACTORS OF RESERVOIRS, IMPROVEMENTS THEREIN FOR FISH PRODUCTION ENHANCEMENT

A. K. Laal, R. S. Panwar, H. P. Singh, , R. N. Seth, R. K. Tyagi,V. Pathak, B. K. Singh, P. N. Jaitly K. D. Joshi, R. S. Srivastava, S. K. Srivastava, J. P. Mishra, K. Srivastava

Three reservoirs (265-925 ha) viz. Ohan and Baura located in Chitrakoot district in U.P. and Jarmohra in Rewa district of M.P were studied during the period under report. These reservoirs are small in size, having average water spread area of 648 ha, 925 ha and 265 ha, respectively.

Abiotic characteristics

Soil : The sediment of all these reservoirs was sandy loam in nature having sand, silt and clay as 55-66.0%, 19.0-30.5% and 4.0-18.5%, respectively.

Water : Water was alkaline (pH7.6-8.4). Dissolved oxygen was moderate (5.9-8.9 mgl^{-1}) but free CO2 showed erratic behaviour. Specific conductivity (263-270 μScm^{-1}) and T.D.S. (136-143 mgl^{-1}) were higher but DO was low in Baura as compared to other reservoirs. Calcium and Magnesium contents were low. The nutrients were also low in all the reservoirs.

Biotic characteristics

Plankton : The numerical abundance of plankton in these reservoirs ranged between 109 ul^{-1} to 1183 ul^{-1} and phytoplankton population comprised 81.5-88.2 % of the total plankton. Abundance of periphytic communities ranged between 370 ucm^{-2} and 785 ucm^{-2}.

Benthos : Benthic communities in the reservoirs ranged between 330 and 858 nos. m^{-2}.

Fishery : Average annual fish production in the Ohan, Baura and Jarmohra reservoirs was 1.5, 18.0 and 7.0t, with estimated potential of 2.31, 19.46 and 26.41 kg $ha^{-1}year^{-1}$ respectively. Ohan and Baura reservoirs were leased out by the respective state fisheries departments, while fishing in the Jarmohra reservoir is conducted on royalty basis. Fish production potential in three reservoirs, namely, Ohan, Baura and Jarmohra were studied through 14C technique. These reservoirs showed a potential of 80.0, 123.2 ad 100 kg $ha^{-1}year^{-1}$, respectively, but there was gap between potential and actual yield which may be abridged by applying judicious management measures.

All these reservoirs are regularly stocked with spawn/fry/fingerlings of Indian major carps and occasionally with exotic grass and common carp (Jarmohra) and managed as culture based capture fishery resource. Practically the stocking density depends on availability of seed, but efforts are being made to stock *C. catla, L. rohita* and *C. mrigala* at a ratio of 40:30:30, respectively. The Jarmohra reservoir was stocked with 1.0-1.10 lakh fry/fingerlings of IMC. Natural recruitment of Indian major carps was noticed in Jarmohra reservoir.

FLOOD PLAIN WETLAND FISHERY

ECO-FRIENDLY MANAGEMENT NORMS FOR FISH PRODUCTION IN FLOODPLAIN WETLANDS OF INDIA

A. Mukherjee, S. R. Das, U. Bhaumik, M. Choudhury, J. G. Chatterjee, G. K. Vinci, K. Mitra, P. K. Katiha, A. Hajra, M. A. Hassan, A. K. Das, B. K. Bhattacharjee, Md. Aftabuddin, N. K. Barik, R. K. Manna, V. R. Suresh, G. Chandra, Alok Sarkar, Sukumar Saha, K. K. Sarma, A. Biswas, B. K. Biswas D. K. Biswas, S. K. Ghosh, A. Mitra, S. Saha B. Naskar, Y. Ali.

Monitoring of stock enhancement

Various beels were investigated on the ecological and fisheries aspects

Abiotic characteristics of beels

Sediment & water quality : A positive correlation was noticed between depth (m) and transparency (cm) in the beels studied, with more transparency observed

in the deeper beels viz. Kundipur (4.87 m), Duma (6.02 m) and Chamordaha (1.34 m) with Secchi depth of 240, 117 and 24 cm respectively indicating presence of extended euphotic zone. Soil was predominantly sandy, soil reaction was near neutral in most of the wetlands barring Chamordaha, Chamta, Media and Kola (pH 6.5) due to innate soil character coupled with more organic matter in soil. Organic carbon content (%) was in the range of 2.81 (Akaipur) to 5.98 (Media). Phenomenal presence of available-P (mg/100 g soil) in sediment was noticed in majority of the wetlands, like Akaipur (4.15), Sindhrani (3.5), Kundipur (3.2), Media (4.75), Chandania (3.7), Mathura (3.2), Saguna (3.04), Kola (3.0) and the lowest value was found in Chamta (0.8) due to innate soil character associated with on going agricultural activities in the catchment. Barring Chamordaha and Chamta, where total alkalinity (22 & 47 mgl^{-1}) as well as hardness (57.5 & 54 mgl^{-1}) were low, most of the beels were moderate to highly productive. Higher chloride content was noticed in Duma (168.5 mgl^{-1}) and Chandania (65 mgl^{-1}) and the range was 14.9-26.3 mgl^{-1}in rest of the beels, indicating little or no local pollution. Nitrate-N was found present in moderate to higher concentration even during December and also the phosphate-P in these wetlands. Nitrate-N (ppb) was found to a low of 240 and a high of 685 barring Saguna (48.1) and Bhomra (48.1), reflecting moderate to high productive trend in these wetlands.

Primary production : Primary productivity indicated that most of the *beels* were moderately productive. Higher rate of gross primary production (GPP, mgC $m^{-3}hr^{-1}$) was observed in Media (693), Duma (563) and Mathura (547) primarily due to *Microcystis* bloom while in the rest of the wetlands, the GPP was in the range of 164 to 422.

Development of fish yield models

Enhancement measures along with various biological, physical and chemical features were bimonthly collected from 13 wetlands to develop a fish yield predictive model using multivariate regression analysis. The various enhancement measures include stocking with bigger sized fish seed of both IMC's and exotics, removal of aquatic macrophytes, liming, sometimes resorting to feeding and even in rare case application of mahua oil cake, *in-situ* raising of seeds either through pond culture or pen rearing and so on. Vigorous stocking was done with advanced fingerlings (8 -15 cm). Stocking frequency was three times a year during pre-monsoon, monsoon and winter which started from March / April with common carp seeds except in Saguna where continuous stocking was done for 8 to 10 months. The highest catch (2067 kg ha^{-1}) was associated with the highest stocking (285 kg ha^{-1}).

A discernible negative influence of the intensity of macrophytes cover on the average plankton volume was noticeable in the wetlands studied. However, in Chamordaha, despite the absence of macrophytes, there was low plankton volume (0.53 ml) which could be attributed to high turbidity existing in this beel. The presence of *Microcystis aeruginosa* in high quantity (5267 – 5420 ml 100 l^{-1}) in Media and Mathura could be due to the nutrient loading from nearby city and also absence of macrophytes in these beels. Zooplankton outnumbered phytoplankton in all the wetlands under study.

Biology of indigenous fish species

Mystus vittatus studied selectively feed on dipteran larvae, annelid worms, crustaceans and oligochaetes. Sex ratio was 1:0.58 to 1:4. The fecundity of the fish ranged from 288(9.3cm and 8.33g) to 37632 (10.2cm and 13.7g). The fish matures at 6cm total length and breeds during May-September. Specimens of 7-8 cm size contributed maximum to the catch. Growth coefficient 'K' estimated for the fish is 1.36/year, asymptotic length L"= 11 to 15.5 cm, length at optimum yield L_{opt}= 7.8cm, total mortality rate Z= 3.56/year, natural mortality M= 2.6/year, fishing mortality F= 0.93/year and exploitation ratio E= 0.26/year. The life span (t_{max}) estimated was about 1.4 to 3.4 years and age at first maturity was 0.6 year. Recruitment of the fish occurs

twice in a year during February-March and June-August (Fig. 1). The estimated length at first capture (L_C) was 4cm and age at first capture was 0.4 year. Yield per recruit (Y/R) for the fish from the wetland would be maximum at an exploitation ratio of 0.53 (Fig. 2). Abundance of the fish in numbers varied from 0.73 to 3.67 nos. $100m^{-2}$, while the biomass was 3.53-36.38g $100m^{-2}$. Abundance in terms of numbers and biomass was lowest in June.

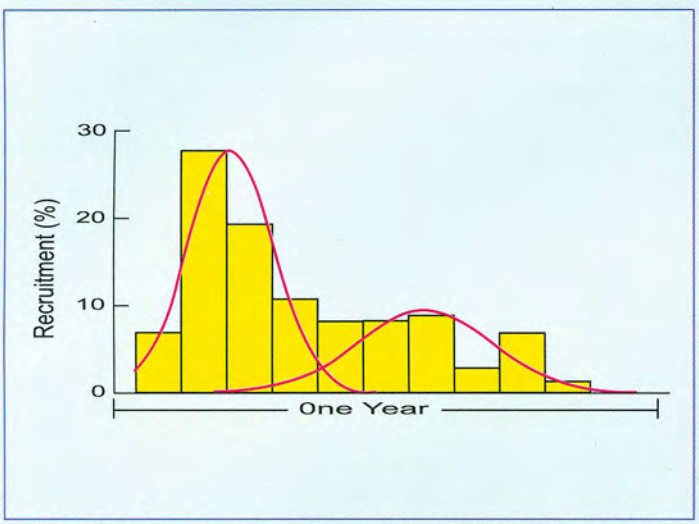


Fig. 1 : Recruitment pattern of M. vittatus *in Chandania*

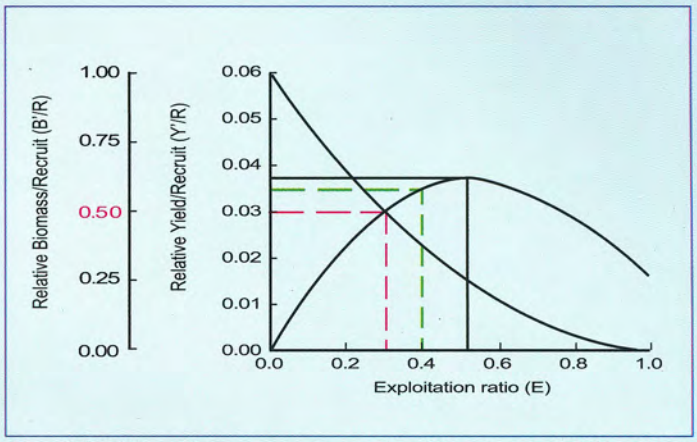


Fig. 2: Yield and biomass per recruit of M. vittatus *in Chandania*

Raising of stocking materials in pen

East Kolkata Wetlands : The 0.1 ha pen area Gompota Fishery was cordoned off using HDPE net having 3mm meshes. The pen was stocked with 3 IMC's and one minor carp at a stocking density of 5 fishes m^{-3}. The ratio of different species, *Catla catla: Labeo rohita: Cirrhinus mrigala: L.bata* maintained was 2:2:5:1. Considering the food available in the system fishes were not given any supplementary feed. The performance of various species in 60 days growth trial is depicted below (Table 2).

Table 2 : Growth performance of fishes in pen installed at Gompota, East Calcutta Wetlands, during 60 days trial

Species	Initial		Growth in 60 days		Gain in 60 days			
					Absolute		% Increase	
	Length (mm)	Weight (g)	Length (mm)	Weight (g)	Length (mm)	Weight (g)	Length (mm)	Weight (g)
Catla catla	108	11.9	121	24	13	12.1	12	102
Labeo rohita	59.17	3.08	94.5	9.75	35.33	6.67	60	216
Cirrhinus mrigala	64.40	2.47	94	7.5	29.6	4.24	46	172
L.bata	59.7	2.18	108.66	12.66	48.96	10.48	82	481

Pen culture experiment at Gomokpota Fishery in collaboration with Bidhannagar Agro & Fisheries Projects Pvt. Ltd., East Calcutta Wetlands.

A haul of fish stock from the pen at Gomokpota Fishery.

Water quality : Most of the limno-chemical parameters *viz.*, pH (7.54 - 7.73) conductance (730 - 733 µScm-1), dissolved oxygen (5.8 - 6.2 mgl^{-1}), hardness (172 - 180 mgl^{-1}), available phosphate (10 - 50 μgl^{-1}), silicate (13.4 - 14.4 mgl^{-1}) and BOD (0.4 - 7.5 mgl^{-1}) showed some what low values inside pen as compared to outside in Gompota and the difference was probably due to loading of Kolkata sewage outside the pen area of this wetland.

Pen culture experiment was initiated in Kalindi Bundh (17 ha), Bishnupur, Dist. Bankura, West Bengal. The percent increase in weight here was *Catla catla* (66.09) *Labeo rohita* (90.21*) Cirrhinus mriga*la (103.16) and *L. bata* (105.9).

Wetlands of Gandak and Kosi river basins in Bihar

Two wetlands from Khagaria district of Bihar, Kasaraiya (40ha) which is in Gandak basin and Lakhmania (30ha) which is in Kosi river basin, were selected for the study. Fishing rights of both the wetlands are with a co-operative society. The depth of the wetlands was 3.8-12.4m for Kasaraiya and 3.7-3.9m for Lakhmania.

Abiotic characteristics

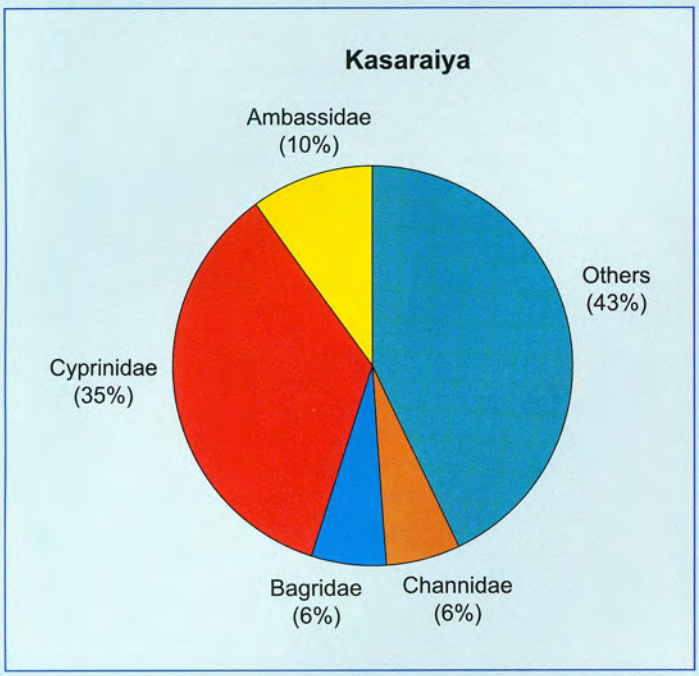
Soil : Soil was predominantly sandy and soil pH was around 7.60 in both the *beels*. Organic carbon content was very high in Lakhmania (5.1%) than Kasaraiya (3.04%). Available-P (mg $100g^{-1}$) was also in higher side in case of former wetland (12.4) than the latter (8.56) indicating higher productivity in Lakhmania.

Water : Water was moderately alkaline (pH7.8-8.0) in both the *beels*. Total alkalinity (164.5 & 127.7 mgl^{-1}) and hardness (133.6 & 111.5 mgl^{-1}) in Lakhmania and Kasaraiya respectively, reflects a moderate trend of production while Nitrate-N (μgl^{-1}) was 80-760 and trace to 570 respectively in both the two water bodies. Phosphate-P (μgl^{-1}) was trace in Lakhmania and trace to110 in Kasaraiya *beel*.

Gross primary production (GPP, mgC $m^{-3}h^{-1}$): in Lakhmania it was comparatively higher (62.50-302.09) than in Kasaraiya (52.09-114.59). Net primary production (NPP, mgC $m^{-3}h^{-1}$) also followed the same trend with higher productivity status recorded in the former.

Biotic characteristics

Fish diversity and catch : Survey for fish species diversity in the wetlands recorded 33 species belonging to 22 genera and 16 families from Kasaraiya wetland and 18 species belonging to 10 genera and 9 families from Lakhmania wetland. The percentage occurrence of fish species in various families in the wetlands is shown in Fig. 3, 4.



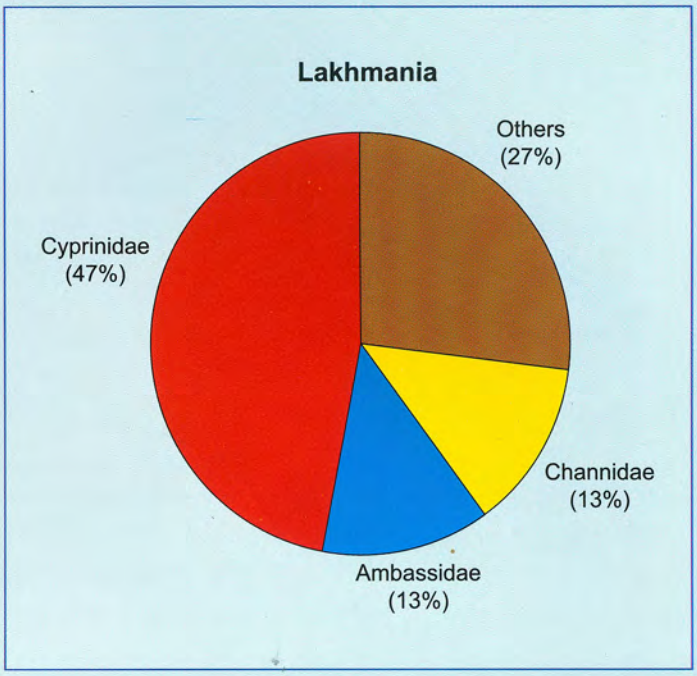


Fig. 3, 4 : Fish diversity in Kasaraiya and Lakhmania wetlands

Phytoplankton : Phytoplankton abundance exhibited variation among different stations with values ranging from 24.5 to 72.1 ul^{-1} in Kasaraiya and 35.1 to 172.5 ul^{-1} in Lakhmania. The phytoplankton abundance was higher in Lakhmania (120 ul^{-1}) than that in Kasaraiya (51.2 ul^{-1}). The wetlands are less productive with regards to plankton.

Zooplankton : Zooplankton abundance in Kasaraiya ranged from 30.5 to 59.2 ul^{-1} while that in Lakhmania was 16.6 to 92.4 ul^{-1}. The major zooplankton groups encountered in Kasaraiya were *Copepoda* (25.5-54.6 ul^{-1}), *Cladocera* (0-3.1 ul^{-1}), *Rotifera* (0-6.6 ul^{-1}) and *Protozoa* (nil) while those in Lakhmania wetland were 17.5-67.1 ul^{-1}, 0-28.8 ul^{-1}, 7.6-35.9 ul^{-1} and 0-3.2 ul^{-1} respectively.

Benthic fauna : The abundance of benthic fauna ranged form 280-1456u/l in Kasaraiya while that in Lakhmania ranged from 224 to 1358u/l. The major groups among benthos were gastropods, bivalves, oligochaetes and dipterans. Gastropods and dipterans dominated in Kasaraiya and gastropods in Lakhmania. In Kasaraiya zooplankton were represented by gastropods (70-546u/l), bivalves (0-14u/l), oligochaetes (0-308u/l) and dipterans (14-1386u/l) while representing values were in Lakhmania was 184-1344u/l, nil, 0-98u/l and 0-28u/l respectively.

Demonstration of Pen culture technology

Demonstration of fish farming in pens in West Bengal and Bihar beels were undertaken, IMC fingerlings were stocked in three mauns of Bihar namely Koithkola, Rajoura and Bahuara in Begusari at a density of 20,000 nos./ha in two mauns and 15,000 nos./ ha in one respectively whereas in West Bengal six beels were stocked with Indian Major Carp @ 15,000 nos./ha. The growth performance of fishes in mauns of Bihar is depicted in Table 3.

Table 3 : Pen culture demonstration in Bihar

STOCKING			HARVESTING							
Species	Initial length (mm)	Initial weight (gm)	Minimum length (mm)	Maximum length (mm)	Average length (mm)	Minimum length (mm)	Maximum length (mm)	Average length (mm)	Total weight (kg)	Production kg/0.1 ha/days
1. Koithkola maun : 0.1 ha										
Catla	170.2	62.5	205.3	280.5	253.4	310	625	400	145	290 kg /220 days
Rohu	200.1	66.6	232.4	300.7	270.1	250	455	350	80	
Mrigal	179.1	55.5	225.2	275.2	257.4	275	370	300	65	
2. Rajoura maun : 0.1 ha										
Catla	188.3	71.42	208.1	282.1	247.3	300	650	400	150	342 kg /219 days
Rohu	145.1	55.5	215.5	302.5	263.9	250	450	300	72	
Mrigal	159.4	66.7	222.7	312.7	269.5	200	400	275	50	
Grass Carp	252.8	142.8	305.1	325.9	317.5	400	750	600	40	
Common Carp	230.5	250.0	235.9	285.5	263.7	300	700	450	30	
3. Bahuara maun : 0.1 ha										
Catla	206.9	90.9	305.7	327.1	315.2	450	800	700	295.0	505 kg /220 days
Rohu	146.0	62.5	281.1	302.4	295.4	250	525	400	123.0	
Mrigal	134.8	55.4	262.3	305.5	287.5	250	450	350	87.0	

Socio-economics and institutional settings in beels of Bihar and West Bengal

Bihar

Occupational and economic issues : The main occupation of the fishers was fisheries, while daily labour in agriculture was the secondary source of livelihood. Nearly 54% of fishers have their own crafts, and 64% with own gear. The average annual fishing effort was 268 days with average catch of 1.63 kg day^{-1}. The average annual fisheries income per fisher family was only Rs 14679.

Production issues : Major production problems faced by the fishers in lakes were low water level and quality, weed infestation, lease period as per financial year instead of fishing year, siltation, poor storage facilities, poaching, etc.

Marketing and fishers' remuneration : The initial share of fishers was 50% of disposal price. The balance after deducting all the expenses was again distributed among fishers as profits at the end of year or at the time of some festivals.

West Bengal

In West Bengal, information on socio-economics and institutional settings was gathered from four beels during project period. The beels were Saguna, Chamordaha, Chandania/Jaleswar and Akaipur. The analysis of information revealed following observations:

Occupational and economic issues : Main occupation of fishers was fisheries, while service and daily labour were the secondary sources of income. The average annual fishing effort for commercial fishing was 136 days with average catch of 4 kg day^{-1}. The major economic problem faced by the fishers was: low employment and income level due to low fishing effort because of turn-by-turn fishing of commercial fishes. Further, it had led to low investments by the fishers in fish production activities.

Marketing and fishers' remuneration : The retail price received for the catch was around Rs 40 per kg. The fishers' share in the price was around 50%, depending upon the species and season of the year.

Wetlands of Assam

Nutrient and energy status of organism in different trophic level of beel ecosystem

Trophic level organisms were collected from Morakolong beel of Assam. Organisms include six macrophyte species of varied niche, six benthic organisms of snail and bivalve group, insects comprising *Ranatra* sp., freshwater prawn, chironomid larvae and *Eurothermis signata* and macrophte associated detritus. Biochemical nutrients like organic matter-ash ratio and crude lipid were estimated.

Organic matter and ash ratio : Aquatic macrophyte showed value in the range of 2.12-6.15 Benthic detritus showed lower value than macrophyte associated detritus. Organism under snail group showed value in the range of 0.21- 0.41 with highest in *Vivipara sp.* and lowest in *Pila sp.* Insects contain the highest value (7.34) indicating higher organic matter than mineral matter (Fig. 5).

Fig 5. Organic matter & ash ratio of organisms in different trohic level in 46, Morakolong beel

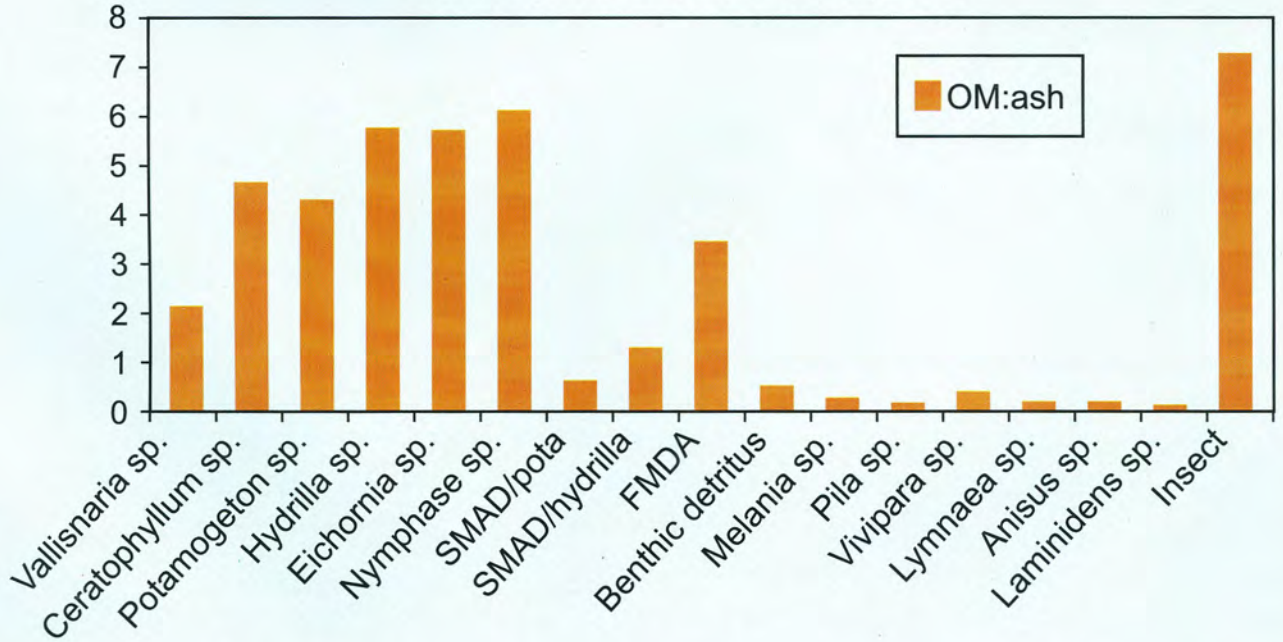
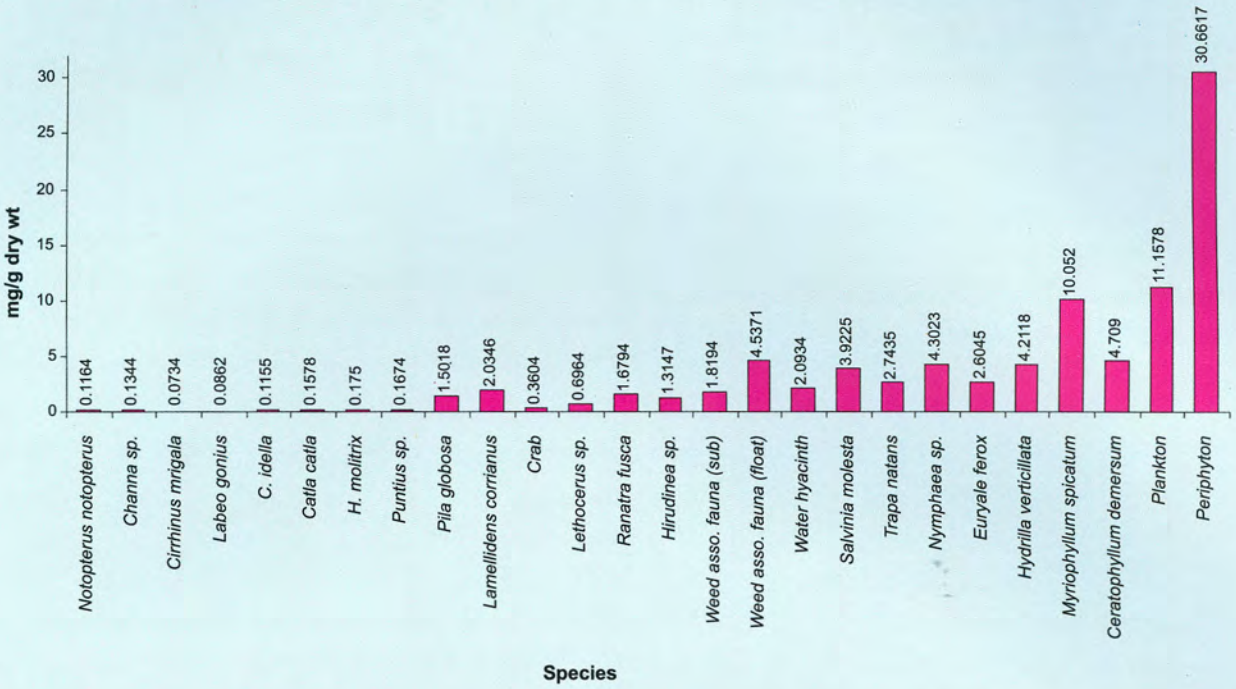


Fig. 6 Iron content (mg/g dry wt) of organisms from different trophic levels in Puthimari beel



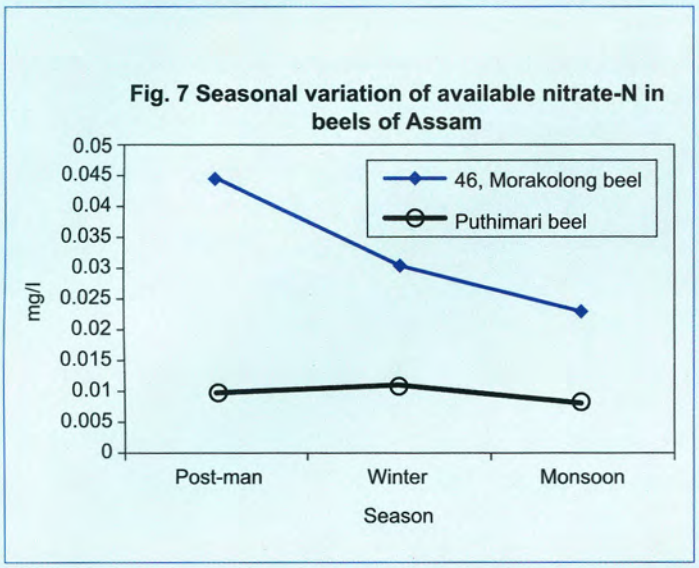
Iron content of different organisms collected from different trophic levels of Puthimari beel, Barpeta and 46, Morakolong beel, Morigaon, Assam, were examined. It varied widely (0.07-30.66mg g^{-1} dry wt.) among organisms from different trophic levels of Puthimari beel (Fig 6).

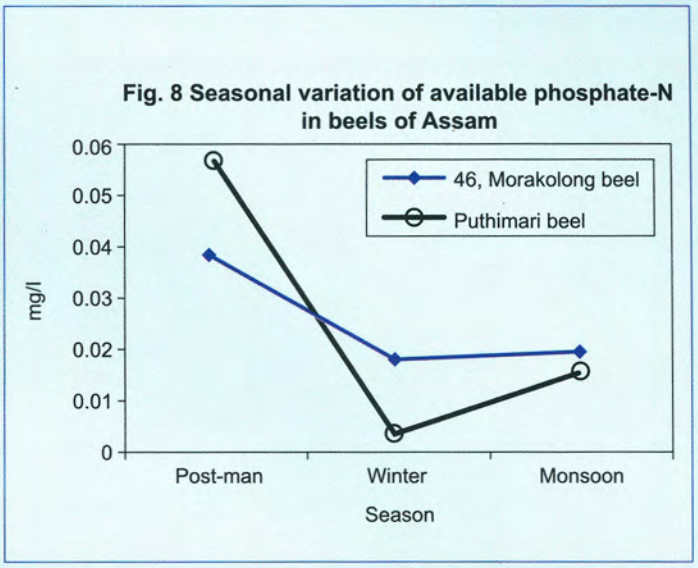
Nutrient dynamics in beel ecosystem

Dynamics of nitrate, phosphate and silicate (Fig 7, 8) : Nutrient dynamics study was conducted in monsoon in Puthimari beel, Barpeta and 46, Morakolong beel, Morigaon, Assam. Puthimari is a closed beel, whereas 46, Morakolong is a seasonally open beel and established its connectivity during monsoon sampling. Increased water level with turbid inflow caused death of submerged macrophyte infestation in 46, Morakolong beel, but, macrophyte infestation remained throughout the year in Puthimari beel. Monsoon inflow increased phosphate and silicate concentration but, decreased nitrate concentration in both the beel.

Data of a particular season is the average of nutrient concentration of six zones viz. surface and bottom of floating macrophyte zone, submerged macrophyte zone and clear zone. Impact of river connectivity is highly pronounced in silicate concentration of 46, Morakolong beel, where silicate-Si concentration varied from 1.65 in winter to 11.00 in post-monsoon. Rapid growth of submerged macrophytes during early winter helps in settling of silt thereby decreasing silicate concentration sharply in this beel. Being a closed beel, Puthimari observed less variation in silicate-Si concentration throughout the year. Both phosphate and nitrate concentration were low in both the beels and remained below 0.06 mgl^{-1} throughout the year. Rapid utilization by dense submerged macrophytes may be one of the causes for low concentration of these two primary nutrients.

Two beels namely 46, Morakolong (seasonally open) and Puthimari (closed) were selected for collection of





sediment from three zones: macrophyte clear, submerged and floating macrophyte covered for three season (post-monsoon, winter and monsoon) during 2005-06. Enzyme activity like alkaline phosphatase, acid phosphatase and dehydrogenase and physico-chemical properties of sediments were analyzed to understand the changes of enzymes activity with season, macrophyte cover and type of beel in term of river connectivity (Table 4).

Dehydrogenase : Dehydogenase activity was negatively correlated with organic carbon and total nitrogen at 10% level of significance.

Alkaline phosphatase : Alkaline phosphatase was correlated positively with organic matter, organic carbon, total nitrogen, reactive phosphorus and specific conductivity and negatively with dry matter at 1% level of significance.

Table 4 : Correlation coefficients between sediment enzymes and soil physicochemical properties (level of significance : NS, ***10%, **5%,*1%)

	Dry matter	Organic matter	Organic carbon	Total nitrogen	C : N	Reactive P	Sp conductivity	pH
Dehydrogenase	0.083	-0.278	-0.432***	-0.413***	-0.096	0.094	-	-0.364
Alkaline Phosphatase	-0.848*	0.819*	0.764*	0.779*	-0.293	0.622*	0.603*	0.035
Acid Phosphatase	-0.311	0.380***	0.324	0.331	-0.201	0.522**	0.438**	-0.122

Acid phosphatase : Acid phosphatase was correlated positively with reactive phosphorus and specific conductivity at 5% and that with organic matter at 10 % level of significance.

Fisheries of Brahmaputra river at Guwahati

Fish landing data of river Brahmaputra from Uzanbazar fish assembly centre has been collected following systematic sampling design. A total of 236.5 t of fish was estimated to have been landed during the year as compared to 225.4 t during the previous year thereby showing 4.3% increase in the overall catch. Miscellaneous species dominated the catch followed by major carps, minor carps, Hilsa, catfishes and feather-backs. The highest concentration of landings was during post monsoon season.

Development of Extension strategies for fisheries enhancements in Beels

A Success Story in Haribhanga Beel

The Haribhanga Beel is located in Nagaon district with an average effective water area of 125 ha. This beel is under the control of Assam Fisheries Development Corporation (AFDC). In 2006 the fish production of the Haribhanga beel was 1,16,800 kg with a productivity of about 935 kg ha^{-1}. Fish production and productivity of this beel in 2002 were 1,16,000 kg and 300kg $ha^{-1}year^{-1}$ respectively. Thus, in last five years, the productivity level has increased three fold. This level has been achieved with the entrepreneurial abilities of the lessee combining his goal, risk taking abilities with the scientific support of CIFRI and financial support by Assam Gramin Vikash Bank & NABARD.

EVALUATION OF ECOLOGICAL STATUS AND COMMUNITY BASED MANAGEMENT TO ENHANCE FISH PRODUCTION OF WETLANDS OF DIFFERENT RIVER BASINS

Dhirendra Kumar, H. P.Singh, Shree Prakash, K. D. Joshi, J. P. Mishra, Saket Srivastava, Kalpana Srivastava

Ramiyabehad wetland (80.0 ha) situated in Lakhimpur-Kheri district of Uttar Pradesh in Ganga river basin and Nawagaon wetland (82.12 ha) situated in Raipur district of Chhattisgarh in Mahanadi river basin were studied during the period under report.

Abiotic characteristics

Soil : The soil of Ramiyabehad is sandy in nature (sand: 70-78 %) and alkaline (pH 7.8) and was moderately productive. The water was alkaline (pH7.6), dissolved oxygen was moderate (5.43-10.56 mgl^{-1}) whereas free carbon dioxide varied from 2.5-3.0 mgl^{-1}. Bicarbonate alkalinity was moderate (156-163 mgl^{-1}) indicating that the water was productive. The soil of Nawagaon wetland was sandy loam (sand: 53-56 %) in nature showing pH value of 7.8.

Water : Water alkalinity was medium (55.0-66.0 mgl^{-1}), with pH 7.8-8.4. Dissolved oxygen was moderately high (9.8-10.19 mgl^{-1}) and free CO_2 was absent. As per alkalinity this wetland seems to be low productive.

Biotic characteristics

Plankton : Plankton in Nawagaon wetland ranged from 110-490 ul^{-1}, while in Ramiyabehad it ranged from 80-560 ul^{-1}.

Periphyton : Periphytic crystalisation was high (760-1570 ucm^{-2}) in Nawagaon while in Ramiyabehad it was moderate (380-1030 ucm^{-2}). Associated flora of Nawagaon indicated low population (895 ucm^{-2}) while

that of Ramiyabehad was high (1460 ucm^{-2}), faunal contribution was poor (1.1 %) in Nawagaon while it was slightly higher (1.67 %) in Ramiyabehad. The average biomass of macrophytes was found to range between 1.1-2.8 kg/m^2 in Nawagaon and Ramiyabehad wetlands, respectively. Nawagaon had scattered and poor presence of *Hydrilla*, while Ramiyabehad had presence of *Ceratophyllum, Hydrilla, Eichhornia* and *Sagitaria*. Phumdis (floating islands) like structures were also observed in this wetland.

Benthos : The Ramiyabehad had poor abundance of macrobenthic invertebrates (598 nos.m^{-2}) in comparison to Nawagaon wetlands (748 nos.m^{-2}). A total of 11 forms were observed from Ramiyabehad wetland while 12 from Nawagaon.

Fishery : In Nawagaon about 280.0 kg fry and fingerlings comprising *rohu* (17.50 %), *catla* (22.80 %), *mrigal* (19.52 %), *common carp* (31.26%) and *grass carp* (8.92 %) were stocked in the year 2006. No stocking is being done in Ramiyabehad as it gets autostocking during peak flood periods. As a result of dissemination of appropriate management practices there was discernible enhancement in the fish production from both the wetlands over preceding year. Fish yield of Ramiyabehad wetland was 21.0 kg ha^{-1}yr^{-1} in the year 2005-06 and 29.62 kg ha^{-1}yr^{-1} in 2006-07. Likewise fish production for the same period in Nawagaon wetland increased from 50.0 to 70.89 kg ha^{-1}yr^{-1}.

Outreach programmes : Field oriented mass awareness programmes were conducted for dissemination of suitable management techniques to the beneficiaries. An elaborate training on pen culture was imparted to senior fisheries officials of the Government of Chhattisgarh for dissemination of the technique in the state.

Ramiyabehad wetland (U. P.)

Mawagaon wetland fish catch

ENVIRONMENT AND FISH HEALTH

HOLISTIC ASSESSMENT OF HEALTH AND RELATED BIOLOGICAL ASPECTS OF FISH AND INLAND AQUATIC ECOSYSTEMS

Manas Kr. Das, P. K. Saha, K. Mitra, S. Samanta, S. S. Mishra, M. K. Bandyopadhyay, B. P. Mohanty, A. K. Das, P. Maurye, S. K. Manna, Brahmane M. P., S. Bhowmick, L. R. Mahavar, Keya Saha, H. C. Banik, S. Banerjee, Ranjana Sinha, A. Ghosh, R. Sheik

Investigations were conducted in River Churni and two beels viz. Panchita and Kalyani.

Assessment of the habitat of river Churni

Sediment Quality : The sediment of river Churni was sandy with very low content of clay fraction and moderate amount of silt. Maximum mean sand content (84%) was observed at Shivnivas site and minimum at Aranghata site which was reverse in case of silt. The sediment pH was alkaline (7.5 – 8.7). The mean conductivity values were 199, 260 and 178 $\mu S\ cm^{-1}$ for pre-monsoon, monsoon and post-monsoon seasons respectively. The mean organic carbon content varied from 0.29 % to 0.38 % at different sites.

Heavy metals : Very little difference was observed in Cu, Zn and Mn content of sediment among the five collection sites. The mean Cu, Zn and Mn values ranged between 15.7 to 33.7, 35.7 to 50.3 and 228.2 to 327.8 $mg\ kg^{-1}$ respectively.

Water quality : Wide fluctuations in transparency were noticed in the upper region of the river between Shivnibas (up to 223 cm) and Hanskhali (up to 250 cm) which gradually decreased in the lower stretch. The water was alkaline (range 7.25 – 7.86). Wide fluctuations in specific conductance was noticed in different seasons. The mean values were 203, 555 and 525 μScm^{-1} for monsoon, postmonsoon and premonsoon seasons respectively. The upper stretch of Shivnibas to Haskhali exhibited critically lower values of DO (at Shivnibas range 0.8 – 5.7 mgl^{-1}, mean 3.1 mgl^{-1}; at Haskhali range 0.4 – 5.4 mg^{l-1}, mean 3.0 mgl^{-1}). The lowering of DO was noticed relatively less critical in the stretch below Haskhali and as expected, the effect was lowest at Pairadanga (range 3.7 – 8.6 mgl^{-1}, mean 4.9 mgl^{-1}). A maximum BOD of 9.5 was noticed at Haskhali. Site wise, the mean BOD range was 1.5 – 2.7 mgl^{-1} and season wise it was 1.6 – 2.1 mgl^{-1}. The uppermost sampling site Shivnibas exhibited the highest mean BOD of 29.9 mgl^{-1} (range 6.5 – 80.0 mgl^{-1}) followed by Aranghata (range 3.5 – 108.0 mgl^{-1}, mean 27.4 mgl^{-1}). Alkalinity was in the narrow range of 80 – 104 ppm (mean 95 mgl^{-1}). Phosphate content was low and uniform at all the sampling sites (mean value range 0.08 – 0.11 mgl^{-1}. Nitrate had a mean value range 0.3 – 0.8 mgl^{-1}

Pesticide residues Water : Among the five sampling sites, highest amount of DDT was detected at Ranaghat (31 ppt) which also increased the total organochlorene pesticide residues to 80 ppt, the highest content. *Fish :* The total residue contents were found in the range of 0.59 ppb (*L. rohita*) to 76.26 ppb (*R. rita*). In general, the residue contents are found meager with respect to the permissible limits of these pesticides for human consumption.

Bioindicators for Environmental Impact Assessment

Fish community studies (IBI)

Final compilation and analysis of the data indicate that the index of biotic integrity (IBI) was significantly lower at stressed sites upstream. A scoring chart for scoring the IBI metrics of river Churni was developed from the study. The number of the native species and families, number of water column species, number of benthic species, number of intolerant species and percent individual as herbivorous decreased significantly ($P<0.01$). The percentage of tolerant species, percentage individual as omnivorous and percent individual as carnivorous increased significantly ($P<0.01$) in anthropogenically stressed sites.

Active Monitoring of fishes in River Churni

To evaluate the impact of effluents from a sugar factory on fish health, serum chemistry variables were investigated in *L. rohita* held in cage (active monitoring).

Scoring of IBI metrics developed for river Churni

Category	Metric	Traditional Scoring Criteria		
		5 (Best)	3	1 (Worst)
Taxonomic richness	1. Number of native species	> 24	12-24	<12
	2. Number of native families	>11	5-11	<5
Habitat composition	3. Number of benthic species	> 7	3-7	<3
	4. Number of water column species	> 18	8-18	<8
	5. Number of intolerant species	> 2	1-2	<1
	6. % Individuals as tolerant species	< 11	11-22	>22
Trophic composition	7. % Individuals as omnivores	< 41	41-82	>82
	8. % Individuals as herbivores	> 12	6-12	< 6
	9. % Individuals as top carnivores	> 47	23-47	< 23
Fish Health & Abundance	10. Total number of Individuals	> 1000	500-1000	< 500
	11. % Individuals as non-natives	-	-	-
	12. % Individuals with anomalies/disease	< 3	3 - 7	> 7

Serum chemistry : It indicated significant hyperglycemia, hypochloremia, enhanced cholesterol, cortisol, bilurubin and triglycerides. The levels of total bilirubin in blood from carps were significantly higher than the control fish and also fish held 90 km downstream. Plasma bilirubin was lower in fish from the less pollutant sites than in control fish and significantly higher in fish from affected site. Changed plasma bilirubin levels may therefore reflect disturbed function on many levels, e.g RBC, Hb catabolism, obstruction of bile ducts and damage of liver cells. Higher triglyceride suggests impairment of liver dynamics. Higher cortisol level indicates activation of hypothalamus pituitary axis.

Histological manifestation : The tissue manifestations of the environmental impact were observed in histological sections studied in 7 and 30 days exposed fishes. The gills of *Labeo rohita* exhibited various changes like lamellar hyperplasia, clubbing, swollen distal tip, aneurism and excessive secretion of mucus. Kidney showed shrinkage of epithelial cells in renal tubule and enlargement of glomerular cells. Liver did not exhibit any abnormality.

Fish sampling from cage

Plankton and benthos as indicators

Phytoplankton : Comparatively a higher value of Algal Pollution Index (7.0 and 10.0) and lower values (-3.0854 and –3.7388) of the Shannon-Weaver diversity index was obtained at Hanskhali and Shivnivas sampling stations respectively may be due to increase in organic pollution level at these upstream sites.

Benthos : Lower values of Shannon-Weaver diversity index were obtained at Hanskhali (-2.6811) and Shivnivas (-2.8801) sampling stations only confirming that the bottom zone of Churni river in these places are affected with pollution at low to moderate level.

Assessment of Stress proteins

Fish exposed to temperature stress (30, 32 and 34°C) showed protein bands having MW inbetween 97.4 and 68.0 KDa that may be considered as a Heat shock proteins (70 KDa), whereas, fish exposed at 25°C and 28°C shows faint bands which suggest the low expression of HSP70. Fish protein samples were analysed on narrow range and broad range IEF technique for analysis of pI (Isoelectric points) of the protein of interest. Proteins were separated and changes in isoelectric point were noticed between the 97.4 and 68.0 KDa in narrow range as well as in broad range pI.

Gene Expression

Young Labeo rohita were exposed to 3 different concentrations of copper sulfate: 1 mgl^{-1}, 5 mgl^{-1}, and 10 mgl^{-1}. Two different set of metallothionein specific gene primers were utilized for detection of the expression of two different isoforms of metallothionein genes. The control fishes did not express the metallothionein genes as indicated by absence of cDNA amplification product. Detectable gene expression of metallothionein gene was observed at the 10 mgl^{-1} concentration of copper sulphate. The appearance of metallothionein gene indicates the effect of metal pollution on fish physiology at the molecular level.

Lysozyme and protein profiling

Serum, muscle and lens proteins of freshwater catfish *Rita rita* and carp *Labeo rohita* were analysed by sodium dodecyl sulphate- polyacrylamide gel electrophoresis (SDS- PAGE). Lysozyme assay in the blood plasma/serum of these two species of fish was also standardized.

Clinical pathology of fish

L.rohita affected by Dactylogyrosis and Trichodiniasis

Morphological symptoms : Pale column of fish gills and one or two reddish spots on skin. Greater opercular movement increasing from the normal 45-60 to 120-150 times/min. Fishes cannot fully close the operculum because of swelling. Excessive secretion of mucus.

Histopathological changes : Hyperplasia and hypertrophy with fusion of lamellae. Haemorrhages in gills. Increase in the number of gill mucus cells.

Physiological alterations : Decreae in the haemoglobin, haematocrit and protein values indicating inanition in response to infection. Cholesterol levels fell indicating impaired sterol metabolism. Enhanced glucose level indicating hyperglycemic response. Pituitary interrenal axis activated as evident from enhanced cortisol levels. Enhanced creatinine levels indicate impaired kidney function. Prolactin levels increased. It stimulates mucus secretion and subsequent thickening of mucus coat thereby reducing permeability of the skin or gill epithelia.

Isolation and identification of microbial pathogens

The identified bacteria of major significance were *Aeromonas hydrophila, A. caviae, A. veronii, Photobacterium spp.*, Vibrio spp. Edwardsiella ictaluri. Among various diseases recorded, the economically important diseases were motile aeromonas septicaemia in major and minor carps, and septicaemia in catfish caused by *Edwardsiella ictaluri.*

Disease induction and Patho-physiology of Aermonas septicaemia : Clinically the disease was observed from 24 hours of infection with dropsical condition, highly congested anal opening and posterior part of the skin. The spleen was congested, liver pale and gall bladder distended. There was profuse accumulation of serous fluid in peritoneal cavity, but not in scale pockets. The blood was watery and tended not to clot. At every 2 days intervals 2 fish from each dilution were sacrificed, serum and tissues samples collected for clinical and pathological studies. Histologically, liver and kidney parenchymal cells were hypertrophied followed by necrosis. In fishes receiving higher doses of bacteria these organs were fully necrosed and lysed beyond the scope of histological examination. There was also extensive cellular infiltration. Spleen got atrophied. Characteristically, there was extensive bacterial invasion in liver.

Lysozyme estimation : Efforts were made to standardize immunological methods and study fish immunity levels. For the purpose, methodology for fish (*L. rohita*) lysozyme estimation has been standardized. Serum lysozyme level of healthy acclimatized *L. rohita* was estimated to range between 7-9 µg/ml. There was slight increase in the lysozyme level in *L. rohita* naturally infected with tail and fin rot.

Monitoring of pesticides and heavy metal

The total organochlorene pesticide residue (including HCH, DDT, endosulfan, aldrin, dieldrin, endrin, heptachlore and their metabolites) content in water and fish were evaluated in the river Roopnarayan and Farakka to Haldia stretch of the river Bhagirathi / Ganga. In river Roopnarayan, highest amount of DDT was detected at Geokhali (41.5 ppt) during monsoon sampling which also increased the total organochlorene pesticide residues to 69.6 ppt, the highest content. In the winter sample from Kolaghat, the total organochlorene pesticide residues were 61.5 ppt with DDTs content of 21.3 ppt and HCHs content of 16.9 ppt. The content of endosulfan, heptachlore, aldrin, dieldrin, endrin, and their metabolites were in very low levels except the winter sample from Kolaghat, where the aldrin group content was 21.0 ppt.

In the stretch of the river Bhagirathi / Ganga, water samples of monsoon and winter season were analysed. The highest residue of 40.1 ppt total organochlorene pesticides were detected in the monsoon sample from Baharampore with highest content of 27.0 ppt DDT and its metabolites. Highest HCHs content was 11.8 ppt in the Haldia sample of winter season.

From the river Roopnarayan, a total number of 7 fish fleshes were analysed for organochlorine pesticide residues.. The total residue contents were found in the range of 14.1 ppb (*Plotosus canius* from Geokhali sampling site) to 61.1 ppb (*Arius gagora* from Kolaghat sampling site).

From the stretch of the river Bhagirathi / Ganga, a total of 20 fish fleshes were analysed for organochlorine pesticide residues. The total residue contents were found in the range of 7.29 ppb (*A. aor* from Nabadweep sampling site) to 109.0 ppb (*R. rita* from Baharampore sampling site). The *R. rita* (101 g) from Nabadweep sampling site also found to accumulate 102.9 ppb of total organochlorine pesticide residues.

In general, the residue contents are found meager with respect to the permissible limits of these pesticides for human consumption. The metal content in fish flesh collected from the Ghantal and Geokhali sampling sites of river Roopnarayan were found low while in the other organs its accumulation was found relatively high. The metal contents in sediment samples of river Roopnarayan were below the pollution limits in most of the cases.

Surveillance of microbial diversity in selected aquatic ecosystems

During the period in report, microbiological load and diversity, physicochemical parameters and plankton,

benthos analysis of water and soil samples from selected sites of wetlands and rivers were done.

Isolation of phenol resistant & TCE degrading bacteria : About thirty two bacterial isolates were isolated in pure culture from polluted environments like river Churni, Bidyadhari, and estuarine wetlands for probable phenol degradation by enrichment technique using phenol at high concentrations. The isolates were examined for resistance to various concentrations of pure phenols. Study showed that most of the isolates were resistant to 400 ppm of phenol and few were resistant up to 800 ppm phenol under in vitro culture conditions. The isolates are further investigated for phenol degradation ability. Most the isolates could degrade 100 and 200 ppm phenol; the isolates are being further acclimated for degradation of higher doses of the phenol.

Trichloroethylene/ Trichloroethane (TCE) C_2HCl_3- used in metal degreasing in factories, textile industries, is a common contaminant in water. It is a carcinogen and affects skin, kidneys, liver causing heavy morbidity. In the present study, microbes having capacity to degrade TCE were screened and TCE degradation was detected photometrically using Fujiwara Test. Three microbes, one *Bacillus* sp. and two *Pseudomonas* spp. with significant TCE degradation activities were selected and flask culture methods indicated degradation of TCE at different time interval.

Isolation of bacterial isolates from fish : Microbiological investigation in different beels/ bheries and Bidyadhari river system indicated occurrence of skin haemorrhagic disease, ulcerative disease, swelling of abdomen and eyes. Different bacterial species like *Aeromonas hydrophilla, A.veronii b.v. sobria, A.sobria, A. enchelia, Edwardsiella, Pseudomonas* species, *Vibrio* species were isolated and identified from fish tissue samples. The pure cultures of these isolates were preserved in glycerol at -20°C for further analysis using biochemical and cultural tests.

In vitro activity of chemicals against virulent Aeromonas species : Pure chemicals, viz., Sodium sulfite, Potassium metabisulfite, Potassium permanganate, Camphor, Naphthalene and Alkyl aryl-polyoxyethylene iodine were examined for the antimicrobial property using pathogenic field strain of *A. hydrophila* and MTCC Reference strain as test organisms.. Among these, camphor, naphthalene and potassium permanganate inhibited bacterial growth, protease activity. However, these chemicals were active only at very high concentrations. Crude preparations of garlic was also re-examined for activity against pathogenic *A. hydrophila*. It inhibited bacterial growth and expression of its virulence properties. The chemicals and herbs inhibiting bacterial growth and enzymatic/toxin activities may have some potentiality for use against pathogenic *A. hydrophila* and are under further investigation.

Gene expression pattern in sediment : Methods of estimation of gene expression pattern in sediment samples to estimate the process of organic matter decomposition has been carried out. Total mRNA extraction from water and sediment was carried out using filtration methods. The mRNA was reverse transcribed and made into cDNA. This cDNA was resolved on 6% acrylamide gel to see the fragment pattern. DNA bands in the range of 300bp – 700bp were observed.

Detection of Aeromonas isolates : PCR was standardized and used for specific detection of *A.hydrophila* DNA group1, Aerolysin positive *A.hydrophila* and virulent (enterotoxigenic, hemolysin) Aeromonas spp. from samples of fish disease outbreaks and microbial samples. A number of bacterial isolates obtained from fish and preserved, were further screened to evaluate the suitability of PCR for detection of *A.hydrophila* and virulent (hemolysin positive) *Aeromonas* spp. Encouraging results were found using screening test and comparing known positive samples. The results indicated the suitability of both PCR tests for screening of samples and their field application as diagnostic tests.

FISH RESOURCE ASSESSMENT

DATABASE DEVELOPMENT IN INLAND FISHERIES THROUGH REMOTE SENSING TECHNIQUES

S. K. Mandal, R. A. Gupta, D. Nath, S. K. Sahu, D. Karunakaran, Sucheta Majumder

Evolving prediction models for resource management

The correlation between different water quality parameters and digital values of different bands of remote sensing image as well as various indices like Normalised Difference Vegetation Index (NDVI), Normalised Difference Water Index (NDWI) have been calculated for development of prediction model. Further analysis was also made with the data classified on the basis of turbidity. Analysis was performed on post monsoon physico-chemical data and DN values of RS Imageries.

The analysis revealed that total inorganic nitrogen and transparency had significant correlation with the difference index computed from infra red and near infra red bands. Total inorganic nitrogen and nitrate showed significant correlation with water index computed from near infrared and green bands. Phosphate showed significant correlation with NDVI computed from infra red and red bands.

The mapping of water bodies with area above 10 ha had been partially completed in the state of Madhya Pradesh with post monsoon data. The mapping of rivers and streams had also been completed in the same state. The total number of water bodies identified was 833 with total area 95851.0 ha. The GIS for water bodies in the Orissa state had been completed with spatial information.

Database on GIS platform for capture fisheries

Different sampling methodologies are being adopted for data collection at various centers of the Institute depending on the fishing and landing patterns. Generally multistage sampling and systematic sampling are being adopted for catch data collection. The data on catch and effort are being utilized for the development of database under the project.

The data collected at different centres from various water bodies have been compiled and stored in the database for future use.

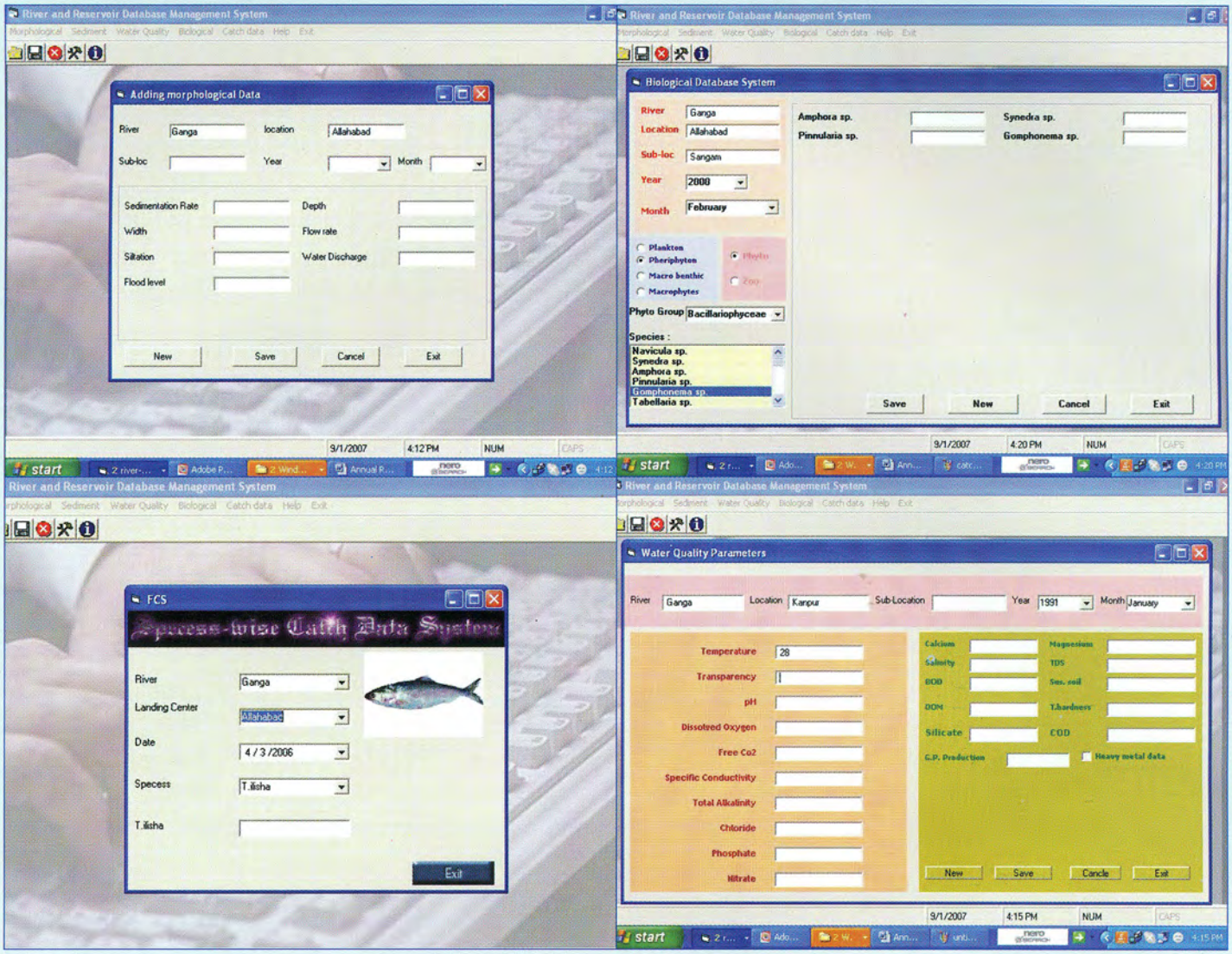
Monthly data on fish catch are recorded at Guwahati for Brahamaputra river. The species like *A. morar* and *L. dero* are the dominant species in the catch. The estimated total catch is worked out at 415.78 t at the centre.

The fish catch data for Yamuna river and West Yamuna canal are recorded at Karnal. The catch data from the Karnal centre show that *C. carpio* is the major contributor to the fishery. The estimated catch for three centres, namely, Yamunanagar, Karnal and Panipat has been worked out at 48.80 t.

The catch data are recorded from the Ganga river system at Allahabad centre. Common carp is the major contributor to the fishery during 2006. The total catch from Sadiapur has been worked out at 79.62 t and from Daragunj it has been worked out at 44.43 t.

Catch data have been utilised for the creation of Geographical Information System (GIS) for the easy storage and retrieval.

A software has been developed using Visual Basic as front-end and Microsoft Access as back-end in order to systematically store and retrieve biotic, abiotic and fish catch data of river, reservoirs and beels in structured and organized manner The software is developed very



user-friendly with menus and shortcuts, so that even novel users may be able to operate this system. It consists of broadly four modules namely Addition, Modification, Deletion and report generation to facilitate the database administrator to keep upright the databases.

User security was also imposed in the software to prevent users from inadvertently breaking an application by changing tables, queries, forms, reports, and macros on which the application depends and protect sensitive data in the database. Some windows of the modules are shown in following figures.

OTHER PROJECTS

Department of Animal Husbandry and Dairying, Ministry of Agriculture, New Delhi

- Strengthening of database and information networking for fisheries sector
- Reservoir Fisheries Development in India

ICAR Cess Fund

- National Risk Assessment Programme for Fish & fisheries products for Domestic and International market.

- Biology and Fishery of Mahseers in the Upper stretch of Cauvery.
- The Ecology and Management of Aquatic Weeds in Ganga and Brahmaputra basin with particular reference to Fisheries enhancement
- Popularisation of Organic Farming approach in Fisheries for Sustainable Development
- Database on Taxonomy and Distribution of Freshwater Fishes of India

ICAR Plan Project

- Impact, Adaptation and vulnerability of Indian agriculture to climate change – Effect of climatic change on inland fisheries.
- Mega seed project on'Production of Ornamental Fish Seed'

EXTENSION ACTIVITIES

Mass Awareness programmes

The following mass awareness campaigns were organized during the period

- Organized two Mass Awareness Campaigns to stop wanton destruction of fin and shell fish seed in the coastal belts at 10 Mile village of Sunderbans, where about 120 fishers actively participated in the Campaign on May 5, 2006 and at Koilaghat near Bokkhali where 90 fisherwomen actively participated in the awareness campaign on May 5, 2006.
- Organized one Mass Awareness Campaign in the coastal belt of Digha on June 11, 2006 towards fin fish and shell fish seed conservation where about 65 fishers participated.
- Organised a Mass Awareness Campaign on fish conservation at Chandanpidi on August 19,2006 where 150 interested fishermen were present.
- Mass awareness campaigns towards conservation of fish and environment were organised at Frazerganj Harbour, South 24 Parganas on August19 and October 12, 2006 with 150 nos fishers and 200 fishermen and fisherwomen participating.
- Organized Awareness Campaign at village Datrigram, Dist. Hooghly in West Bengal on conservation of Hilsa Seed on December 14, 2006 where more than 250 fish farmers who are involved in fishing in river were present in the campaign.
- Organized one Mass Awareness Campaign on conservation of valued fish seed at Chandil, Jharkhand, on February 6, 2007, where 150 fishers were present during the campaign.
- A Mass Awareness Campaign was organized to convince and motivate the fishers to stop wanton destruction of fish and shrimp seed at Mousumi Island, Sundarbans on 29th March, 2007 where 185 fishers were present.

National Fish Farmers' Day

- Central Inland Fisheries Research Institute and Fishing Chimes Jayasree Charitable Trust at

A fisher woman appealing for conservation of fishery

A Mass awareness campaign towards conservation of fish in coastal belts

Barrackpore jointly celebrated the National Fish Farmers' day for the year 2006 on 10 July 2006. Hon'ble Minister of Fisheries Govt. of West Bengal, Sri Kiranmay Nanda was the chief guest and Dr.

A group discussion with fishers of Jharkhand

S. Ayyappan, DDG (Fy), ICAR presided over the function. Dr. J. V. H. Dixitulu Chief Editor of Fishing Chimes welcomed the dignitaries and the august gathering.

Dr. S. Ayyappan, DDG (Fy.) in his remarks mentioned about the new initiatives taken by ICAR to strengthen the fisheries research in the country including formation of NFDB. The Hon'ble Chief Guest, Shri. Kiranmay Nanda was felicitated jointly by Fishing Chimes Jayasree Charitable Trust and CIFRI. Inaugurating the function Sri Kiranmay Nanda thanked Fishing Chimes and CIFRI for organizing this function.

Based on contributions made towards development of Inland Fisheries, CIFRI conferred Fish Farmer Award to five fish farmers of West Bengal. Sri Atul Das, Sri Sunil Biswas, Sri Indranil Banerjee, Sri Sashidulal Ghosh, Smt. Mousami Roy.

Fishing Chimes Jaysree Charitable Trust conferred Dr. Hiralal Choudhuri Gold Medal to Mr. Chintalapaati Venkata Narasimha Raju from Andhra Pradesh while Fishing Chimes Silver Jubilee Gold Medal to Mr. C. D. Sebastian for their outstanding contribution in the field of fisheries. On this occasion two books entitled " Technology of Fishing Products", authored by Dr. D. D. Nambudiri and "Fishtoons", authored by Dr. P. P. Praveen were released by Dr. S. Ayyappan,DG (Fy.), ICAR and Sri P. K. Sen, IAS, Director of Fisheries, Government of West Bengal, respectively.

Fishing Chimes Jayasree Charitable Trust also felicited Dr. S. Ayyappan, DDG (Fy.), ICAR, Dr. K.K. Vass, Director, CIFRI, Mr. P. K. Sen, IAS, Director of Fisheries Government of West Bengal, Dr. Madhumita Mukherjee, Joint Director of Fisheries Government of West Bengal, in recognition of their contribution in the field of fisheries research and development .

Dr. K. K. Vass expressed his gratitude to the Hon'ble Minister for his continued support to the activities of CIFRI and the cause of fishery in the country.

- Organised one Fish Farmers' Day at Koithkola, Begusarai district, Bihar on 26.03.2006 where about 150 fish farmers participated in the programme. The District fisheries officer, Extension functionaries of State Fisheries Department, Bihar and Mukhia of the Block were also present on the occasion.

Dr. K. K. Vass, Director, CIFRI felicitating Sri Kiranmay Nanda, Hon'ble Minister of Fisheries, Govt. of West Bengal

- Organized one PRA exercise at Gayathsul, Jharkhand on February 7 2007 where 25 villagers participated in the programme.

Participation in Exhibitions

CIFRI participated in the following exhibitions

- At Pailan Meen Bhawan, Diamond Harbour Road, Kolkata, in Workshop on "Emerging Challenges in Enhancing Sustainable Fish Production during 5 – 6 April, 2006.
- In the inauguration of National Fisheries Development Board at ANGRAU, Hyderabad on 9th September 2007.
- "18th Krishi Shilpa 'O' Banijya Mela" at Ratanpur, Dist. Purba Medinipur, West Bengal during December 9-15, 2006
- Sundarban Yuba Mela at Taldi, Canning, organized by Bahurupee Sangha, Taldi, South 24 Parganas, West Bengal during 23-31 December
- Panihati Mela during December 24, 2006 to January 01, 2007.
- Sundarban Mela at Canning Town, organized by Bandhu Mahal Canning Town, South 24 Parganas West Bengal during January 3-12, 2007 .
- Monomohan Mela & Loko Sanskrity Utsav'07 at Chota Jagulia Barasat, North 24 Parganas, West Bengal during January 6-12, .
- Prof. Satyendra Nath Bose Science & Book Fair at Barajaguli, District Nadia, West Bengal during January 6-15, 2007.
- Sanchita Shisu Kishore Utsav-O- Mela 2007 at Bawali, Budge Budge, Block II, Dist. South 24 Parganas, West Bengal during January 12-19, 2007.
- 12th Agriculture Industry Tourism & Science Festival organized by Contai Palpara Saradadevi Mahila Mondal, Baruipur, P.O. Totanala, Purba Medinipore during January 23-30, 2007.
- Krishi –O- Vigyan Mela organized by Krishi Vigayan Kendra, Kapgari, KVK West Medinipore during February 2-4, 2007.
- Kolkata Festival 2007 at Ruia, Purbapara Maidan, Titagarh, 24 Pgs (N) March 5 - 10, 2007.
- Assam Matsya Mahotsav on 6th -8th March 2007.
- "Poorvi Kshetra Kisan Mela" organized by Rajendra Agriculture University, Pusa (Samastipur), Bihar at University Campus Pusa from 9-12 March 2007 and won Second Prize.

The Institute participated in the 'Kisan Mela' organized by Indian Institute of Vegetable Research Institute, Varanasi during 27th and 28th January 07.

Dr. S. S. Baghel, Vice Chancellor, Assam Agriculture University at the CIFRI pavilion at Assam Matsya Mahotsav, 6-8 March, 2007

Empowerment training for the family members of BSF

Empowerment of fisherwomen

- Organised 13-day training programme on "Empowerment of women during September 14-26, 2006 at Kolkata Centre for the benefit of 10 women family members of BSF officials.
- Organized a 1-day training programme on "Management and conservation of fishery" at Mathurapur, South 24 Parganas on December 8, 2006 where more than 45 interested fish farmers and fisherwomen participated.

Tribal women are being trained in net making

Training / Awareness Programme / other extension activities

Trainings organised

Topic	Beneficiaries	Venue & date
Management of Pen culture	25 fishermen	Kola, Bongaon, West Bengal on 20.04.2006
Production of fish and prawn in Pens	8 officers of the Department of Fisheries, Govt. of Chattishgarh.	Barrackpore during 22-05-2006 to 26-05-2006
Floodplain Wetlands Management	Fishery officials from Govt. of West Bengal	Barrackpore during 31st May to 9th June, 2006
Training programme of DARE on Management of open water system	One Scientist of the Egyptian Agriculture Research Centre (EARC) Govt. of Egypt	Barrackpore during June 10-16 June, 2006.
Application of TNT MIPS software and GPS	Senior Research Fellows under CSS posted at Allahabad	17th June, 2006 to 22nd June, 2006
Participatory training	150 fishermen	Koithkola, Begusarai District in Bihar on July 26, 2006.
Organic Farming	35 fish farmers	Jayrambati on 29.08.2006
Pen Culture	78 fishermen and fisherwomen	Bijpur on September 8, 2006
Empowerment of women	10 women family of BSF officials	Kolkata Centre during September 14-26, 2006
Conservation of Hilsa juveniles	90 fishermen and fisherwomen	Chandanpidi and Bokkhali area on October 13, 2006
Pen culture and its utility	47 fishermen	Village Bahuara, Dist. Begusarai in Bihar on November 7th, 2006
Inland Fisheries Development	14 officers of Dept. of Fisheries, Chattisgarh.	Barrackpore, West Bengal, 8-9 November 2006.
Winter School on "Inland fisheries management using GIS tools"	17 participants	Barrackpore 14th Nov, 2006 to 4th Dec.2006.
Conservations and transportation of fin and shell fish seed	37 fishermen and fisherwomen	Singurali, Sundarbans on January 25, 2007
Training on Pen culture	State fisheries officials of Tripura	Agartala, Tripura, 5-7 February, 2007
Survey methodology for collection of statistical data and estimation of inland fish catch	Fisheries officials of the Govt. of Tripura	Agartala 8th Feb. to 10th Feb, 2007
Organic farming through learning by doing method	45 fish farmers	Suryapur, North 24 Parganas on February 17, 2007

Topic	Beneficiaries	Venue & date
Training programme on Floodplain Wetlands Management.	UG students of Cachar College, Silchar Assam (Industrial Fish & Fisheries)	NER Centre, Guwahati 20-26 February 2007
Paddy cum Fish Culture	42 fish farmers	Bhaduri Para, Kalna, Burdwan on 9th March, 2007
Hatchery Management	23 fish farmers	Kumrul, Hooghly on 12th March, 2007
"Matshya Palan Prashikshan, Bhraman evam Pradarshan"	Over 40 fish farmers (including women) from Allahabad	Bio-ved Research Society, Allahabad from 24-26 March 2007.
Training programme on Inland Fishing	20 progressive fish farmers, Guntur Dist. in Andhra Pradesh	Barrackpore March 27-30,2007.

A group discussion with the fishers for popularization of pen culture

A training programme in progress in Bihar

A training session with woman members of fisher community

Training programme on "Floodplain Wetlands Management" at NER Centre, Guwahati during 20-26 February 2007

AWARDS AND RECOGNITIONS

Biotechnology Overseas Associateship Award (BTOA) for the year 2004-05 : Awarded to Dr. B.P. Mohanty by the Department of Biotechnology (DBT), Ministry of Science & Technology, Govt. of India for undergoing specialized training on ***Proteomics (Basic Research in New Biology and Biotechnology)*** in an Overseas Laboratory.

Dr. B.K. Singh, Pr. Scientist was conferred fellowship by Bioved Research Society, Allahabad in the year 2006.

The Institute was awarded the ***Second Prize*** in "POORVI KSHETRA KISAN MELA" organized by Rajendra Agriculture University, Pusa (Samastipur), Bihar at University Campus Pusa from 9-12 March 2007.

International Projects

- World Fish Centre and CIFRI has developed collaborative project entitled "Community Rice-Fish Culture in Seasonal Floodplains"- March 2005-July 2006.
- CGIAR Challenge Programme on Water and Food (CPWF) Project on "Improved fisheries productivity and management in tropical reservoirs"(World Fish Centre, Penang, Malaysia). March 2005-Continued.
- World Fish Centre collaborative Project on Achieving greater food security and eliminating poverty by dissemination of improved carp strains of fish in India (Carp-Phase II) - March 2005-February 2007.
- Linkages have been made with National Remote Sensing Agency, Hyderabad to procure satellite maps. The help of Survey of India, Kolkata and NATMO, Salt Lake, Kolkata has been taken for using their wetland and other maps.
- The Vadodara Centre of CIFRI has developed linkages with Sardar Sarovar Narmada Nigam Limited, Gandhinagar, Department of Fisheries, Govt. of Gujrat; Gujrat Ecological Society, Vadodara and Department of Zoology, M.S.University of Borada on programmes of mutual interest.
- The Vadodara Centre of CIFRI is executing an externally funded project entitled "Fish conservational and hydro-biological perspectives of river Narmada with reference to Sardar Sarovar Project (SSP)", sponsored by Govt. of Maharastra.
- Strengthening of database and information networking for fisheries sector, Fisheries Division, Deptt.of A.H. & Dairying, Ministry of Agriculture, New Delhi, December 2003 - Continued.

PUBLICATIONS

Research papers

Brahmane, M.P., Das, M.K., Sinha, M.R., Sugunan, V.V., Mukherjee, A., Singh, S.N., Prakash, S., Maurye. P. and Hajra, A., 2006. Use of RAPD fingerprinting for delineating populations of hilsa shad *Tenualosa ilisha* (Hamilton, 1822). *Genetics and Molecular Research* **5** (4): 643-652.

Brahmane M. P. and Das, M. K., 2006. Vitellogenin gene expression as biomarker to detect endocrine disruption in *Labeo rohita* exposed to 17-β Estradiol. *Journal of Inland Fisheries Society of India* **38** (2): 92-94.

Brahmane M. P., Mitra, K., S.S. Mishra and Biswas, D., 2006. Molecular identification of *Colisa* spp. using RAPD *marker. Journal of Inland Fisheries Society of India* **38** (2): 63-66.

Das, M. K. and Samanta, S., 2006. Application of an index of biotic integrity (IBI) to fish assemblage of the tropical Hooghly estuary. *Indian Journal of Fishery* **53** (1): 47 - 57.

Ghosh, A., Karmakar, H. C., Misra, R. N., Chatterjee, T., Das, B. B. and Saha, D., 2006. Ecological conditions of freshwater and low saline sewage-fed wetlands with reference to biodiversity and aqua-crop production *Journal of Inland Fisheries Society of India* **38** (2): 20-25.

Gorai, B. K., Sugunan, V. V. and Jha, B. C., 2006. Raising of Stocking Materials of Indian Major Carps in Pen Enclosures in Selected Floodplain Wetlands, Assam, India. *Asian Fisheries Sciences* **19**: 185-197.

Joshi, K. D., 2006. Successful brood-stock rearing and captive breeding of *Schizothorax richardsonii* (Gray) at Chhirapani Farm Champawat, Uttaranchal. *Journal of Inland Fisheries Society of India* **38**(1): 64-67.

Karunakaran, D. and Mohanty, B. P., 2006. Information Technology – potential application in fisheries. *Environment and Ecology* **24** (2): 359-365.

Manna, S. K., Brahmane, M. P., Manna, C., Batabyal, K. and Das, R., 2006. Occurrence, virulence characteristics and antimicrobial resistance of *Escherichia coli* O157 in slaughtered cattle and diarrhoeic calves in West Bengal, India. *Letters in Applied Microbiology* **43**: 405-409.

Manna, S. K., M. P. Brahmane, R. Das, Chandana Manna and S. Batabyal, 2006. Detection of *Escherichia coli* O157 in foods of animal origin by culture and multiplex polymerase chain reaction. *Journal of Food Science and Technology* **43**: 77-79.

Manna, S. K., Som, A. B. and Samanta, S., 2006. Water alkaline phosphatase activity and phosphorus availability during summer in inland water bodies. *Indian Journal of Fishery* **53** (2): 167 - 173.

Manoharan, S., V.K. Murugesan and Rani Palaniswamy, 2006. Numerical abundance of benthic macroinvertebrates in selected reservoirs of Tamil Nadu, *Journal of Inland Fisheries Society of India* **38** (1): 54-59.

Mishra, S. S., Mishra, S. K. and Ramdass, P., 2006. Detection of *Vibrio cholerae* in food samples using PCR amplified DNA probe and hybridization technique, *Indian Veterinary Journal*, pp. 939-943.

Mishra, S. S., Brahmane, M. P., Maurye P., Mali, P., Dutta C. and Das, M. K., 2006. Detection of WSSV and *Vibrio parahaemolyticus* in *Peaneus monodon* (Fabricius) using DNA DOT BLOT hybridization technique. *Journal of Inland Fisheries Society of India* **38**(1): 15-22.

Mishra, S. S. and Shekhar, M. S., 2006. Surveillance and detection of white spot syndrome virus (WSSV) and Monodon baculo virus (MBV) in different prawn farms in Orissa and West Bengal using PCR technique and pathological studies. *Indian Journal of Animal Science* **76** (2): 174-181.

Mitra, K., Suresh, V. R., Vinci, G. K. and Bandyopadhyay, M. K. 2006. Captive breeding and embryonic development of a minor carp- *Puntius conchonius* (Hamilton). *Journal of Inland Fisheries Society of India* **38**(1): 77-80.

Mohanty, B. P. 2006. A p53-like protein from a freshwater mollusc *Lamellidens corrianus. Indian Journal of Biochemistry and Biophysics* **43**: 247-250.

Mohanty, B. P., Dalai, S. K. and Kar, S. K., 2006. IgG4-reactive low molecular weight antigens from *Setaria digitata* adult parasites have immunodiagnostic potential in lymphatic filariasis. *Current Science* **91** (9): 1221-1225.

Mohanty, B. P., Gupta, S. K. and Mohanty, S., 2006. Food Allergy (Hypersensitivity). *Everyman's Science* **41** (4): 234-239.

Nath. D. and Misra, R. N., 2006. Diurnal variation of physico-chemical prameters in Ichamati estuary at Hasnabad, West Bengal, India. *Journal of Inland Fisheries Society of India* **37** (2): 83-86.

Palaniswamy, R., Murugesan, V. K. and Manoharan, S., 2006. Limnology and fisheries of an upland reservoir in Nilgiris. *Journal of Inland Fisheries Society of India* **38** (1): 49-53.

Parija, S. C., Mohanty, B. P and Mohanty, S., 2006. *Helicobacter pylori*, gastritis, peptic ulcer disease and the 2005 Nobel Prize in Physiology or Medicine (*Research News). National Academy Science Letters* **29**(9&10): 333-343.

Saha, S., Das, P., Bhaumik, U., Paria, T., Qureshi, T. A. and Monahar, S., 2006. The status of fish biodiversity in North 24 Parganas district of West Bengal. *Journal of Environment & Ecology* **24S** (4):1075-1078.

Samanta, S., 2006. Organochlorine pesticide residues in fish of river Ganga in West Bengal. *Pesticide Research Journal* **18** (1): 104 - 108.

Sukumaran, P. K., Shrivastava, N. P., Singh, D. N., Rao, D.S.K. and Manoharan, S., 2006. Status of fish and fisheries of River Godavary. *Journal of Inland Fisheries Society of India* **37** (2): 15-20.

Sukumaran, P. K., 2006. Breeding habits, seasonal abundance of young and forage fishes in Markonahalli reservoir. *Environment & Ecology* **245**: 125-130.

Sukumaran, P. K., 2006. Benthic and littoral fauna of a perennial tank in Bangalore. *Environment & Ecology* **245**(2): 348-351.

Suresh, V. R., Biswas, B. K., Vinci, G. K., Mitra, K. and Mukherjee, A. 2006. Biology and fishery of barred spiny eel, *Macrognathus pancalus* Hamilton, *Acta Ichthyol. Piscat.* **36**(1): 31-37.

Mandal, D., Barat, S. and Mukhopadhyay, M. K., 2007. Toxicity of Neem Pesticides on the freshwater Loach, *Lepidocephalicthys gunta* (Ham. & Bucanan) of Darjeeling district in West Bengal. *Journal of Environmental Biology* **28** (1): 119-122.

Mitra, K., Suresh, V. R., Vinci, G. K. and Mazumdar, N. N. 2007. Food habits of the soft-fin barb, *Puntius sophore* (Ham.Buch.) in a floodplain wetland, West Bengal. *Journal of Inland Fisheries Society of India* **38**(2): 73-76.

Seminars/Symposia/Conferences papers

Bhaumik, U., Paria, T., Saha, S. K. and Mitra, A., 2006. Potential of Bamboo as the Substrate of the Growth of Pheriphyton in Pen Culture of *Macrobrachium rosenbergii,* International Policy Workshop On 'Bamboo *In :* Fisheries, Science & Society.' Department of Science & Technology Govt. of India, pp. 29-36.

Bhaumik, U., 2006. People's participation in management of open water ecosystems for sustainable development and conservation: A desired production.pp 217-226. *In :* Vass, K. K., Mitra, K., Suresh, V. R., Katiha, P. K. and Shrivastava, N. P. (eds.), *River Fisheries in India- Issues and Current Status, IFSI, Barrackpore.*

Choudhury, M. and Bhattacharjya, B. K. 2006. Fisheries resources of northeastern region off India: Management issues and strategies, pp. 184-198. *In:* Vass, K. K., Mitra, K. K., Suresh, V., Katiha, P. K. and Shrivastava, N. P. (eds.), *River Fisheries in India: Issues and Current Status*. Inland Fisheries Society of India, Barrackpore, Kolkata.

Das, M. K., 2006. Environment and its impact on inland fisheries in India. pp.250-265. In: K.K. Vass, Mitra, K., Suresh, V. R., Katiha, P.K. & Srivastava, N. P. (eds.), *River Fisheries of India Issues and current status*. Inland Fisheries Society of India, Barrackpore, Kolkata.

Mukherjee, A., Suresh, V. R. and Mitra, K. 2006. Floodplain wetlands of Ganga and Brahmaputra river systems: status and sustainable fisheries development. pp 164-183. In : Vass, K. K., Mitra, K., Suresh, V. R., Katiha, P. K. and Srivastava, N. P. (Eds), *River Fisheries in India: Issues and Current Status*. Inland Fisheries Society of India.

Mukhopadhyaya, M. K., Misra, R. N., Satpathy, B. B. and Vass, K. K., 2006. Status and problems of estuarine ecology and fisheries in India. pp.98-107. In: *River Fisheries in India - Issues and current status*. Inland Fisheries Society of India, Barrackpore, Kolkata.

Departmental Publication/ Books/Manuals/ Popular articles Book/Bulletin Chapters

Bhaumik, U. and Saha, S., 2006. Community based rice-fish farming in seasonal floodplains of West Bengal. Proceedings of state level workshop on 'Emerging challenges in enhancing sustainable fish production in West Bengal.' Organized at Department of Fisheries, Aquaculture, Aquatic Resources and Fishing Harbours, Govt. of West Bengal and Central Institute of Fisheries Education, Kolkata.

Bhaumik, U., 2006. Participatory rural appraisal and co-management in floodplain wetland. Training programme on floodplain wetlands management. Organized at CIFRI, Barrackpore, May 31-June 9, 2006; pp. 89-96.

Das, M. K., 2006. Fish Health Management. In: Sharma, R. P., Verma, S. A., Kumar, A. T., Pradhan, S., Pati, D. and Aggrawal, M. (eds.), *Handbook of Fisheries and Aquaculture*. Director of Information & Publication of Agriculture, Indian Council of Agricultural Research New Delhi. pp. 511-537.

Das, M. K., 2006. Fish health management in inland water bodies. In: Mandal, S. K. (ed.), *Course manual of Inland Fisheries Management Using GIS Tools*. Central Inland Fisheries Research Institute. Barrackpore, Kolkata. pp. 120-129.

Dutta, A, Acharjee, B. and Choudhury, M. 2006. Prospects and constraints of fish marketing in Assam. In: 'Shyamalima', Souvenir, Field Level Officers' Association, Assam State Agricultural Marketing Board, pp. 19-23.

Feroz Khan and Panikkar, P., 2006 Indian fisheries scenario - A peep into constraints/needs for its future development. *Fishing Chimes* **26**(9): 13-20.

Feroz Khan and Panikkar, P., 2006 'Conservation of fish stocks in different ecosystems' *pamphlet* in Kannada.

Jha, B. C., 2006. Bharat ki Nadiyon mein Bideshi Mool ki Matshya Prajation ka Badhta Prakop. pp. 6 -11. In: *Inland Fisheries – Major Findings*. Bulletin No.144, CIFRI, Barrackpore.

Karmakar, H. C., Misra, R. N. and Nath, D., 2006. Fisheries of Hooghly-Matlah estuary. Proc. of Nat. Seminar on Inland Fisheries Research and Development – Present Status and Future Trends., held at CIFRI, Allahabad, May 15-16, 2004 (in Hindi). Bull. No.144, CIFRI, Barrackpore. Pp. 89-94.

Katiha, P. and Bhaumik, U., 2006. Role of bamboo in culture based fisheries of inland open waters of India. International Policy Workshop On 'Bamboo in Fisheries, Science & Society' Department of Science & Technology, Govt. of India, 71-77.

Mishra, S. S., 2006. Immune mechanism in shellfish. In : Swain, P., Sahoo, P. K. and Ayyappan, S. (eds.), *Fish and Shellfish Immunology: An Introduction*. Narendra Publishing House, New Delhi, pp. 133-148.

Mishra, S. S. and Mohanty, S., 2006. Probiotics in disease Resistance. pp. 225-24. In : Swain, P., Sahoo, P. K. and Ayyappan, S. (eds.), *Fish and Shellfish Immunology: An Introduction*. Narendra Publishing House, New Delhi.

Mishra, S. S., 2006. Microbes in aquatic environments and their impact on fish and public health. pp. 154-165. In : Course Manual on "*Inland Fisheries Management using GIS tools*" winter School, Nov14-Dec. 4, 2006, CIFRI, Barrackpore.

Mukhopadhyay, M. K., 2006. Implications of Geographic Information System in fisheries research and development. pp.224-229. In: S.K. Mandal (ed.), *Course Manual on Inland Fisheries Management Using GIS Tools*. C.I.F.R.I, Barrackpore, Kolkata-120.

Pariah, T., Chakraborti, C., Neogi, A., Roy, C., Bhadra, P. P., Sahu, S. K. and Mandal, S. K., 2006. Geographical Information System (GIS) as a tool for assessment of Inland Fisheries Resources. *Fishing Chimes* **26**(5): 43-47.

Samanta S., 2006. Role of abiotic parameters in fish production. pp 171-182.In: Mandal, S. K. (ed.), Course Manual of Winter School on '*Inland Fisheries Management Using GIS Tools*'. CIFRI, Barrackpore. 14th Nov. – 4th Dec., 2006.

Samanta, S., 2006. Ganga nadi mein abased ebam rita rita machli mai HCH tatha DDT ke abasistha ka jamaha (Hindi) DDT and HCH residues in Rita rita and sediments of the river Ganga. In: Seth, R. N., Panwar, R. S., Srivastava, N. P., Joshi, K. D. and Rao, P. R. (eds.), *Antasthaliya Matshiki : Singhabalokan (Hindi) Inland Fisheries : an overview*'. CIFRI, Barrackpore. Bulletin No.144. pp 12-17.

Seth, R. N., Panwar, R. S., Srivastava, N. P., Joshi, K. D. and Rao, P. R., 2006. Antarsthaliya Matsyikee: Sinhawalokan. Proceedings of the Hindi workshop "*Antarsthaliya Matsyiki Anushandhan Evam Vikas -Vartman Awastha Tatha Bhawee Dishayen*" held at CIFRI, Allahabad on March 15-16, 2004." CIFRI Bulletin No. 144, 222 p. CIFRI, Barrackpore.

Suresh, V. R., Bhaumik, U., Kathia, P. K., Vass, K. K., Sarangi, N. and Devadasan, K. (Eds.). 2006. Fish Farming and Technologies for the Northeastern Region. *CIFRI, Special Publication*, 87p.

Das, M.K., 2007. Environment and Fish Health: A Holistic Assessment of Inland Fisheries in India. pp 137-151. In: Goswami, U. C. (ed.), *Natural and Anthropogenic Hazards on Fish & Fisheries*. Narendra Publishing House, Delhi, India.

Dutta, A, Choudhury, M. and Acharjee, B., 2007. Natural and anthropogenic hazards in cage and pen aquaculture systems in northeast India. pp. 263-270. In: U.C. Goswami (Ed.) *Natural and Anthropogenic hazards on fish and fisheries*, Narendra Publishing House, Delhi.

Samanta S., 2007. Pesticide use and its implications on the Indian aquatic ecosystems with special emphasis on fishery. pp 305-326. In: Goswami, U. C. (ed.), *Natural and Anthropogenic Hazards on Fish & Fisheries*. Narendra Publishing House, Delhi, India.

LIST OF ON-GOING PROJECTS

Title of the project	Project leader/ Project Code	Year of Start	Likely date of completion
Assessment of ecology, biodiversity and production potential of Indus river system	Shri D. N. Mishra	April 2002	March 2007
Evaluation of habitat degradation in the context of fisheries ecology in river Ganga	Dr. R.S. Panwar	April 2001	March 2007
Studies on the estuarine ecosystems and mangrove of East coast in relation to their production potentiality	Shri R.N.Mishra	April 2003	March 2007
Dynamics of biotic communities of certain estuarine systems from environmental perspectives	Dr. S. N. Singh	April 2004	March 2007
Ecology and fisheries of freshwater reservoirs	Dr. D.S. Krishna Rao	April 2002	March 2007
Exotic carps status in the reservoirs of Himachal Pradesh	Dr. V.K Sharma	April 2004	March 2007
Environmental and managerial factors of reservoirs, improvement therein for fish production enhancement	Dr. A.K.Laal	April 2005	March 2007
Development of eco-friendly management norms for enhancing fish production in floodplain wetlands of India in relation to their resource characteristics	Dr. A. Mukherjee	April 2002	March 2007
Evaluation of ecological status and community based management norms for enhancing fish production in floodplain wetlands of India in relation to their resource characteristics.	Dr. Dhirendra Kumar	April 2005	March 2007
Holistic assessment of health and related biological aspects of fish and inland aquatic ecosystems	Dr. Manas Kumar Das	April 2000	March 2007
Inventory of Resource and data base development in Inland Fisheries through Remote Sensing Techniques	Shri S. K. Mandal	April 2002	March 2007

Title	Sponsoring Organisatioon	Period
Design of fish pass facilities for the dams of Kameng Hydro Electric Project, Arunachal Pradesh	North Eastern Electric Power Corporation Ltd.	November 2004-July 2006
Fish conservational and hydrobiological perspectives of River Narmada with reference to Sardar Sarovar Project	Government of Maharashtra	2002, continuing
Feasibility Studies for Fish Production Enhancement in Selected Reservoirs of Gujarat State	The Commissionerate of Fisheries, Government of Gujarat	March 2001-2007
Establishment of population of exotic carps with special reference to common, grass and silver carp in the natural water bodies of Assam	Assam Agricultural Competitiveness Project, Guwahati	November 2006, continuing
Preparation of Monograph on the Aquatic Biodiversity of Chilika Lake	Chilika Development Authority	2005-2007

MEETINGS

- The Annual Staff Research Council Meeting of the Institute was held at Barrackpore from 16th to 20th May 2006 under the Chairmanship of Dr. K.K. Vass, Director, CIFRI. Dr. V.R. Chitranshi, ADG (Inland Fisheries), ICAR also attended the meeting. In all twelve on going projects during 2005-06 were discussed in which 52 scientists from H.Q. and different centres across the country took active part. It resulted in thorough debate and discussion on project activities of all divisions and centres. The proposed programmes for XI Plan were also discussed apart from the issues relating to Right to Information Act. Dr. V.R. Chitranshi ADG expressed his satisfaction over the presentations of project reports in the SRC and congratulated all the scientists for their active participations. The proposed activities for the year 2006-07 were approved. The issues related to administrative and financial matters were also discussed in the meeting.

- The midterm appraisal meeting of ICAR Regional Committee-II comprising the States of Assam and West Bengal was held at CIFRI, Barrackpore on 9 June 2006. Dr. S. Ayyappan, DDG (Fy) and Nodal Officer of ICAR Region-II chaired the meeting. The meeting was attended by a large number of distinguished participants, such as Vice-Chancellors and faculty members from SAUs located in the region; From ICAR Dr. Nawab Ali, DDG (Engg.) & Dr. R.C. Maheshwari, ADG (TC), ICAR attended the meeting. The Vice Chancellor BCKVV, Director, CRIJAF and other senior officers of ICAR, State officials, Govt. of West Bengal and others participated in the meeting. Dr. K.K. Vass, Director CIFRI, and Member-Secretary, ICAR Regional Committee-II extended a very warm welcome to the dignitaries and presented ATR. Dr. Ayyappan in his opening remarks explained the very purpose of convening this meeting and expressed overall satisfaction on the progress achieved so far towards the implementation of action points of the 17th meeting. At the end the Chairman stressed upon all to complete all raised action points so that at 18th meeting all work is completed.

A session of ICAR Regional Committee II in progress.

- The Second Meeting of the XIth Plan Working Group on Fisheries constituted by the Planning Commission, Govt. of India was held at Barrackpore during August 21st-22nd, 2006 under the Chairmanship of Dr. S.Ayyappan, Deputy Director General (Fy.) ICAR. Apart from Dr. V.V.Sadamate Advisor, (Agriculture) Planning Commission New Delhi, a large number of Working Group members viz, Dr.P.V.Dehadrai, former DDG (Fy) , Directors of ICAR Fishery institutes , Director General Fishery Survey of India , ICAR Governing Body member participated in the meeting, each sub-group gave a presentation. Other members who attended the meeting were representatives from State Department of Fisheries, Fish Farmer, NGOs, Cooperatives, Fishing Industry, NCDC, NABARD, MPEDA and Agri-business organizations. Shri Sudhir Barghava, Dr.A.G.Sawant and Dr.S.P.S.Brar also attended the meeting as member and provided valuable inputs. Dr. K.K.Vass, Member Secretary of the Working Group, extended a very warm

welcome to the Chairman and all the members who attended the meeting. Dr. S.Ayyappan, Chairman asked each member to respond to the presentations made by each sub-group leader for incorporation in the XI th Plan document. The two days deliberation and interaction among the members of the working group helped to formulate the recommendations for XIth Plan approach for fisheries sector in the country.

- CIFRI management committee meeting was held on 5th September 2006. Seven members attended

2nd Meeting XI Plan Working Group

it and the committee discussed ten listed agenda items. Many issues regarding institute management were discussed and decisions taken. The committee was also appraised about the over-all achievements of the institute since the last meeting. The members expressed their satisfaction and complimented the institute about the progress and timely action on many points recommended by the committee in their last meeting

- 'Hindi saptah' was celebrated at CIFRI, Barrackpore during 14-20 September 2006. During the week various competitions in Hindi on essay writing, noting and drafting, Hindi terminology, general knowledge, Hindi debate, quiz etc. were conducted. A large number of staff members participated in the competitions. Prizes were given to the winners.

Members of IMC interacting

Sri B.P.Singh Former Principal, Kendriya Vidyalaya was the Chief Guest on the occasion; he appreciated the efforts of CIFRI in promoting the use of Hindi in the institute. The Director in his remarks assured all support in making the use of Hindi at CIFRI more effective and widespread. He appreciated the efforts of Hindi Cell at CIFRI for organizing "Hindi Saptah" in a befitting manner.

- Fourth Meeting of Technical Monitoring Committee for Central Sector Scheme Sponsored by Department of Animal Husbandry Dairying and Fisheries, Govt. of India on "Strengthening

Institute celebrating Hindi Week

of database and Information Networking for Fisheries Sector" was held at CIFRI, Barrackpore

on 7-8th December, 2006. Shri .Ajay Bhattacharya, Joint Secretary, Dept of Animal Husbandry Dairying and Fisheries, Ministry of Agriculture, Govt. of India participated in the meeting. Dr. S D Sharma, Director IASRI, New Delhi & Chairman TMC conducted the two day deliberations. The officers from various Central and State Government Departments attended the meeting to review the progress of the Scheme. Shri S.K.Mandal Project in-charge & Head Resource Assessment Division from CIFRI gave a detailed progress report of the project. The committee was satisfied with the progress achieved so far and it was decided that:

All states will follow the methodology developed by CIFRI ; the software developed to be modified as per the requirement of states and their staff be provided training by CIFRI scientists ; efforts be made to develop online inland fish catch data ; for undertaking high resolution studies in different states the ministry will extend the project duration; the maritime states will adopt CMFRI methodology and they will provide training to state officials in linkage with FSI ; and states be provided with report on marine fisheries census.

- The XVIII meeting of ICAR Regional Committee-II was held during 22-23 December, 2006 at Khanapara, Guwahati, Assam. The meeting was inaugurated in the forenoon of 22.12.2006 by the Hon'ble Minister of Hill Areas Development, Animal Husbandry & Vertinery and Mines & Minerals, Govt. of Assam. The meeting deliberated upon various issues related to agriculture and allied sectors in three technical sessions. More than eighty members comprising Hon'ble Minister, Govt. of Assam, Members of the ICAR Society; Secretary, DARE & Director General, ICAR; Additional Secretary DARE & Secretary, ICAR; Secretary, Agriculture, Govt. of Assam; Ex-officio Secretary-cum Director, Agriculture, Govt. of West Bengal; Adviser (Agriculture), Planning Commission, Govt. of India; four Vice Chancellors from SAUs in the region; four DDGs & four ADGs from ICAR; Directors of ICAR Institutes in the region; State Directors of Agriculture, Animal Husbandry & Fisheries, Govt. of Assam; Heads and Officer-in Charge from the regional stations/centres of ICAR representing various commodities; representative of NABARD and others attended and participated in two days deliberations on varied agenda of agriculture and allied sectors.

The meeting of Central Sector Scheme in progress

Dr. Mangala Rai, Secretary DARE & DG, ICAR, addressing participants of the Regional Committee II Meeting

Participation of scientists in conferences, meetings, workshops, symposia etc. (India and Abroad)

Conferences

- International Conference on "The Majestic River Ganga - Health, Integrity and Management" held during November 13-15, 2006 at Patna University, Patna, Bihar, India. (U. Bhaumik, K. D. Joshi).
- 94th session of the Indian Science Congress and presented a paper entitled "Pesticide use and its implications on the Indian aquatic ecosystems with special emphasis on fishery" during January, 3 – 7, 2007 at Annamalainagar, Chidambaram (S. Samanta).
- 'P. Gogoi Assam Matsya Mahotsav' organized by Dept. of Fisheries, Govt. of Assam at Silpgram, Guwahati on March 8, 2007 (M. Choudhury B. K. Bhattacharjya V. Kolekar R.K. Manna M. Aftabuddin Ganesh Chandra A. Biswas K. K. Sarama).

Seminar

- Seminar on "Inductively Coupled Plasma Mass Spectrometry (ICP-MS) - Solutions" organized by Agilent Technologies India Pvt. Ltd. at Kolkata on 25 May, 2006. (S. Samanta).
- World Environment Day celebration Seminar organized by The Indian Science Congress Association, Kolkata on 05 June, 2006 at Kolkata, (S. Samanta).
- Seminar on "National Consultation on Water management in fisheries and Agriculture" organized jointly by Association of Aquaculturists, Inland Fisheries Society of India, CIFRI and CIFA held during 23rd- 24th June, 2006 at the National Academy of Agricultural Sciences, NASC Complex, Pusa, New Delhi (M. Feroz Khan, Preetha Panikkar, P.K. Sukumaran, K. Mitra, M.A. Hassan, A.K. Das and V.R. Suresh, S. N. Singh, U. Bhaumik, D.N. Mishra, U. Moza, A. Ghosh, R. N. Misra, H. C. Karmakar , N.P. Shrivastav, B. B. Satpathy, R.N. Seth, R.K. Tyagi, V. Pathak, K.D.Joshi, S. Samantha,B.K.Bhattacharya).
- Seminar on "Popularization of organic farming approach in fisheries for sustainable development" organized by CIFRI, Barrackpore on 12th December 2006 (M.A. Hassan, A. Mukherjee, U. Bhaumik, J.G. Chatterjee, S. K. Mandal, S. K. Sahu, S.K. Manna, D Karunakaran, S. Samanta).
- National Seminar on 'Challenging Frontiers in Applied Zoology' organized by the Zoological Society of Assam Rangia College, Kamrup, Assam August 25-26, 2006 (B. K. Bhattacharjya).
- National Symposium in Hindi on 'Bharat ke Uttar Poorvi rajyon ki Matasyaki" on December 6, 2006 and Zonal Workshop on policy Issues and HRD in Fisheries and Aquaculture for North eastern states organized by CIFE, Mumbai Guwahati on December 7-8, 2006. (M. ChoudhuryV. Kolekar M. Aftabuddin, B. K. Bhattacharjya, Ganesh Chandra, A. Biswas, K. K. Sarama, P. Gogoi).

Workshops

- Workshop on "Conservation Assessment of Fresh Water Fish for Central India" organized by NBFGR, Lucknow on 25.11.2006 at CIAE, Bhopal (K.D. Joshi).
- Workshop-cum-Training Proramme organized by NBFGR, Lucknow during 21-22 December, 2006 and acted as Co-chairperson in first Technical Session on 21st December, 2007 (H. P. Singh, and K.D. Joshi).

- Basin Level Workshop under Challenge program on Water & Food Project, entitled *"Improved fisheries productivity and management in tropical reservoirs"* on 25 Dec, 2006, at NASC Complex, PUSA, New Delhi (A.K. Das).
- Indo-Gangetic basin workshop entitled "Improved Fisheries Productivity and Management in Tropical Reservoirs" held at NASC complex on 26th December 2007 (S. N. Singh).
- Workshop on CGIAR at NASC, New Delhi held during 26-27 December, 2006 (V.K.Murugesan).
- Janpad Level Workshop on 27th Jan'07 at Andhripur, Pratapgarh (U.P.) (B.K. Singh and K.D. Joshi).
- *Rashtriya Karyashala* (Hindi workshop) on *"Matsyaki Anusandhan evam Vikaas - Dishayein aur Aayam"* organized by Inland Fisheries Society of India and CIFRI, Barrackpore during 17-18 March, 2007 (P.K. Sukumaran, Preetha Panikkar, M. Feroz Khan, A. Mukherjee, S.R. Das, G.K. Vinci, K. Mitra, M.A. Hassan, A.K. Das, V.R. Suresh and A. Hajra, U. Bhaumik, S. K. Mandal, S. K. Sahu, D Karunakaran, A. K. Das N. P. Shivastava, Jha, B. C., M. K. Mukhopadhyay, B. B. Satpathy, H. P. Singh, D. Kumar, R. N. Seth, B.K. Singh, K.D. Joshi, D. Kumar, S. Samanta).
- National Workshop on "Assessing the Impacts of Fisheries Research in India" organized by NAARM, Hyderabad. Hyderabad, April 21-22, 2006 (Ganesh Chandra).
- Workshop on "Fish Germplasm Exploration, Cataloguing and Conservation for Northeastern Region" organized by NBFGR, Lucknow at ICAR Res. Complex for NEH, Shillong.on May 5-6, 2006 (B. K. Bhattacharjya).
- Participated in the Awareness Building Workshop on National Agricultural Innovation Project (NAIP) organized by ICAR & AAU, Jorhat, at Assam Administrative Staff College, Guwahati Guwahati, September 2, 2006. V. Kolekar, Md. Aftabuddin, B. K. Bhattacharjya .

Meetings

- The State Level Monitoring Committee for Kisan Call Centre with the office of the Secretary, Department of Horticulture and Agriculture, Bangalore on 17.7.2006 (D.S. Krishna Rao).
- Meeting with the Chief Executive, National Fisheries Development Board at Bangalore on 11.11.2006 (D.S. Krishna Rao).
- Meeting with the Secretary, ICAR, New Delhi at PDBC, Bangalore on 18.11.2006 (D.S. Krishna Rao).
- Enhancement, interventions and institutional arrangements to improve productivity of indian reservoirs in Indo-Gangetic basin. 6th IWMI – Tata Annual Partners' Meet, 8 -10 March, 2007. (N. P. Shrivastava).
- Second Meeting of the Sub-committee of TMC on Catch Assessment Survey of Inland Fisheries on 13th March, 2007 at Bangalore (under Centrally Sponsored Scheme) in which Fishery Officials from five southern States participated (M. Karthikeyan).

Lectures

- Delivered a talk on Reservoir Management to Officers of Department of Fisheries (Karnataka), Fishers and NGOs during the Fish Farmers Day held on 10.07.2006 (D.S. Krishna Rao).
- Delivered a talk on Food web in aquatic system at Vijaya Composite College on 01.08.2006 (D.S. Krishna Rao).

- Delivered lecture on *"Uttar Pradesh ke Jalashayon men Mrida, Jal evam Matsyikee ka Swarup tatha Vikas kee Sambhavanayen: Ek Adhyayan"* in the Workshop cum Training Programme organized by NBFGR, Lucknow from 21-22 December, 2006 (K.D. Joshi).

Training Course

- D. Karunakaran, Scientist, attended short training course on "Watershed Based Land Use planning for Sustainable Development" at NBSS & LUP, Nagpur from 19.09.2006 to 28.09.2006.
- Sucheta Majumdar, Technical officer, attended winter school on "Inland fisheries management using GIS tools" at CIFRI Barrackpore Kolkata,during 14th Nov, 2006 to 4th Dec.2006.
- S. K. Mandal, Mr. S. K. Sahu and D Karunakaran attended third Technical Monitoring Committee meeting of CSS (Central Sector Scheme) at CIFRI on 7th and 8th Dec. 2006.
- M. K. Mukhopadhyay, N. P. Shrivastava attended Winter School on "Inland Fisheries Management Using GIS Tools." Organized by C.I.F.R.I, Barrackpore, Kolkata-120. Nov 14 – Dec. 4, 2006.
- S.S. Mishra attended DBT training programme on "Genome analysis techniques in farm animals : cloning, characterization and in vitro expression of gene and identification of genetic markers for economic traits" from Nov. 21 – Dec. 11, 2006, held at Div. of Animal Genetics, IVRI, Izatnagar, Bereilly (U.P.).
- H. P. Singh attended training programme organized by Bioved Research & Communication Cenre, Allahabad on 24.3.2007 in which Dr. Singh inaugurated the programme as Chief Guest.
- Ganesh Chandra attended the Workshop cum training programme on Methods of Impact assessment of Fisheries Research held at CMFRI, Cochin. on July 3-4, 2006.
- R. K. Manna participated in theWinter School on 'Inland fisheries management using GIS tools' organized by CIFRI, Barrackpore CIFRI, Barrackpore from November 14 to December 4, 2006.
- Md. Aftabuddin Short attended a course on Advances in Clinical Physiology organized by CAS in Veterinary Physiology, Division of Veterinary Physiology and Climatology, at IVRI, , Izatnagar from January 20 to February 9, 2007.

Exhibitions

- R. N. Seth, K.D. Joshi, J. K. Singh and Ravi Kumar Sonkar participated in Agro Tech. 2006 exhibition organized by Confederation of Indian Industry (CII) Northern Region,, Chandigarh during 1-4 December, 2006.
- R. N. Seth, S.R. Meena, J. K. Singh, and Roop Narain Singh, attended Kishan Mela organized by Indian Institute of Vegetable Research, Varanasi during 27-28th January'07.
- B.K. Singh, K.D. Joshi, J. K. Singh, and R.D. Mallah, participated in the Regional Agriculture Fair organized by Rajendra Agricultural University, Samastipur, Bihar from 9-12 March 2007 in which CIFRI won **Second Prize** and a monument.

EVENTS ORGANISED

Sundarbans Day

The 10th Sundarbans Day celebration was organized on the 3rd June, 2006 at, Kolkata office of CIFRI. Nearly sixty participants including Scientists of NBSSLUP (ER), senior officers of Botanical Survey of India, Swami Viswamayanandji, Assistant Secretary Ramakrishna Mission Ashram, Narendrapur, South 24-Parganas, Ex-Joint Director of the BSI, representatives of West Bengal Citizens' Forum, representatives from Sundarban Jana Kalyan Samiti, Apiarist, School students and other local people interested on Sunderbans biodiversity participated. The Director, CRIJAF was the guest of honour on the occasion.

National Consultation on 'Water Management in Fisheries and Aquaculture'

The Inland Fisheries Society of India, Barrackpore and the Association of Aquaculturists, Bhubaneswar, in collaboration with the Central Inland Fisheries Research Institute, Barrackpore and the Central Institute of Freshwater Aquaculture, Bhubaneswar organized a National Consultation on 'Water Management in Fisheries and Aquaculture' during the 23rd -24th June 2006 at National Academy of Agricultural Sciences, NASC Complex, New Delhi. The objective of the consultation was to plan for judicious management of open water resources for sustainable fisheries, to formulate strategies for optimal utilization of available water resources for aquaculture and integrated farming, to prioritize research needs to work out water demands in inland fisheries sector and to develop guidelines for reuse of wastewater using biological elements in managed and open water ecosystems.

Dr. S.Z. Qasim, Former Member, Planning Commission, Government of India presided over the inaugural function. Dr. Mangala Rai, the Secretary, DARE and Director General, ICAR was the chief guest at the inaugural function of the consultation. The DDG (Fy), ICAR, Dr. S. Ayyappan presented a detailed overview. A lead paper on 'Water Management Strategies' was presented by Dr. J.S. Samra, DDG (NRM), ICAR. The inaugural function was followed by Technical Sessions in which experts and resource persons from various water management organizations, fisheries and related technical institutions made detailed presentation on multiple uses of water, water budgeting , planning, policy issues, fisheries and aquaculture.A poster session of about 20 displays including institutional activities of CIFRI and CIFA as well as abstracts received from different researchers on the theme of the consultation was also organized.The plenary session was chaired by Dr. S. Ayyappan, Dr. N. Sarangi and Dr. K.K. Vass.The consultation concluded with vote of thanks proposed by Dr. J.K. Jena, Secretary, Association of Aquaculturists, Bhubaneswar.

Dr. Mangala Rai, Secretary DARE & DG, ICAR releasing Institute's publication

ICAR Inter Zonal Final Sports Meet

CIFRI organized the ICAR Inter Zonal Final Sports Meet during 27th October-2nd November 2006 at the Sport Authority of India complex, Kolkata.The sports meet was inaugurated by Sri Shyamal Sen, Hon'ble Chairman Human Rights Commission, West Bengal. Three hundred fifty participants (325men, 25 women) from 36 Institutes from Five zones (East-7, North-9, West-6, and South-7 & Central-7) participated in different events. Mr. Sailen

Manna, Ex-Olympiad gave away the prizes to the winners of different events. Sri Nirmal Nath Chief Editor (Sports) of "The Bartaman" was present as Guest of honour in the occasion. Best Institute trophy was awarded to IARI, New Delhi, and NDRI, Karnal was the runners up. CIFRI became the runners up in Table Tennis.

CIFRI contigent in the ICAR Zonal Sports

Winter School

CIFRI organized a Winter School on "Inland Fisheries Management using GIS Tools" from November 14 to December 4, 2006. The objectives of the school were : Concept of GIS and hands-on training on related hardware & software. Basics of remote sensing and image processing with training on image interpretation. Use of GIS as a tool for fisheries management.

The participants from SAUs, ICAR Institutes and research scholars attended the school.

The participants were provided both theoretical and practical training on Database, RDBMS and GIS Concept; Image processing and GIS software tools; TNT mips, Arc View, ERDAS and other related software; Role of biotic and abiotic parameters in fish production; Concept of GIS based decision support system for inland fisheries management.

Diamond jubilee celebrations

Central Inland Fisheries Research Institute (CIFRI), Barrackpore has completed 60 glorious years of dedicated service to the nation in the field of scientific research in inland fisheries with many notable achievements contributing towards Blue Revolution in the country. On this auspicious occasion, CIFRI has planned to organise several events and functions throughout the year 2007.

Hindi Workshop

The National level Hindi Workshop on 'Matsyaki Anusandhan avam Vikas – Dishayein aur Aayam' was the first major event. It was jointly organized by CIFRI and Inland Fisheries Society of India (IFSI) at Barrackpore during 17-18 March, 2007 and attended by a cross section of eminent fishery scientists, teachers and researchers from all parts of the country. At the inaugural session Prof. (Dr.) Hiralal Choudhuri, the renowned fishery scientist and the father of induced breeding carps in India was the Chief Guest; Dr. P. V. Dehadrai, Former Deputy Director General, ICAR, New Delhi presided over the function and Shri K. P. S. Kahlon, Secretary (Fisheries) Government of West Bengal was the Guest of Honour. Dr. K. K. Vass, Director, CIFRI and President, IFSI welcomed the Chief Guest, dignitaries and delegates attending the workshop. In his welcome address, Dr. Vass briefed the audience of the purpose and theme of the workshop and significant contributions of CIFRI during past 60 years. Dr. Choudhuri, the Chief Guest lighted the lamp and inaugurated the workshop. He

blessed the audiences and shared his valuable experiences, particularly on his success in induced breeding. The audience gave a standing ovation to Dr. Choudhuri for his contributions to Indian Fisheries. The dignitaries were felicitated by Dr. Vass. The eminent fishery scientists like Dr. G. P. Dubey, Dr. C.S. Singh, Dr. Amalesh Choudhury, Dr. N. C. Dutta, Dr. P. Das, Dr. B. N. Singh, Dr. V.R. Desai, Dr. V. V. Sugunan, Dr. Dilip Kumar, Dr. M. Sinha, Dr. S.C. Pathak. Dr. V. R. Chitranshi, Dr. Apurba Ghosh, Dr. T. A. Quershi, among others were present in the inaugural function.

The Chief Guest Dr. Hiralal Choudhuri released the 'Saransh' (Abstracts) of the Workshop. Four other Hindi publications of the Institute, namely, 'Kaveri Nadi – Paaryavaran avam Matsyaki'; 'Tawa Jalasaya – Paristhitiki avam Matsyaki'; 'Hugli Matlah – Jwarnadmukhi paritantra: Ek aur Adhyayan' and 'Pen mein Machhli avam Jhinga Palan' were also released on this occasion. The book 'Inland Fisheries and Aquaculture in a globalizing economy' by S. P. Malhotra and V.R.P. Sinha was also released.An exhibition, 'Matsya Pradarshini' was also organized.

Lighting of the Lamp

Dr. Hiralal Choudhuri addressing the audience

A view of the Audience

Seminar

A one-day seminar on "Popularisation of Organic Farming Approach in Fisheries for Sustainable Development" was organised on 12th December, 2006 at the Institute Headquarters Barrackpore. The Seminar was inaugurated by Prof. Chandrasekhar Chakraborty, Vice Chancellor of West Bengal University of Animal & Fishery Science, Kolkata.His Holiness Girijanandaji Maharaj, Ramakrishna Vivekenenda Mission, Barrackpore attended the inaugural function as guest of honour and in his remarks he advocated for technology support from CIFRI for efficient execution of fishery projects in their organization Seventy Scientists, Academicians, Developmental officials, Entreprenuers, Fish farmers across the state participated in the programme. The inaugural function was followed by two technical and one plenary session.

A session of the seminar in progress

(Managerial position only, from April 2006 to March 2007)

CIFRI, Barrackpore, West Bengal

- Dr. K. K.Vass, Director

Riverine Division, Allahabad, Uttar Pradesh

- Dr. H. S.Singh, Principal Scientist, Head of Division (Acting)
- Dr. R. S. Panwar, Principal Scientist upto-31.12.2007

Reservoir Division, Bangalore, Karnataka

- Dr. D. S. K.Krishna Rao, Principal Scientist, Head of Division (Acting)

Estuarine Division, Barrackpore, West Bengal

- Dr. M. K.Mukhopadhaya, Principal Scientist, Head of Division (Acting)
- Mr. R. N. Mishra, Principal Scientist upto 28.2.2007

Fish Health & Environment Division, Barrackpore, West Bengal

- Dr. Manas Kr. Das, Principal Scientist, Head of Division (Acting)

Floodplain Wetlands Division, Guwahati, Assam

- Dr. A. Mukherjee, Principal Scientist, Head of Division (Acting)

Resource Assessment Division, Barrackpore, West Bengal

- Shri S. K. Mandal ,Principal Scientist, Head of Division (Acting)
- Shri R. A. Gupta, Principal Scientist upto 30.4.2006

Human Resource Development& Transfer of Technology Division

- Dr. Utpal Bhaumik, Principal Scientist, Head of Division (Acting)

Senior Administrative Officer, CIFRI, Barrackpore

- Shri U. C. Prasad

Finance & Accounts Officer, CIFRI, Barrackpore

- Shri Z. H. Khilji

DISTINGUISHED VISITORS

The following distinguished persons visited the Institute during this period :

Sl. No.	Visitor	Institute and address/e-mail
1.	Shri A. K.Upadhyay	Additional Secretary, DARE & Secretary, ICAR.
2.	Dr. Hiralal Chowdhury	Ex-FAO Expert.
3.	Shri R. P. S. Kahlon I.A.S.	Principal Secretary, Dept. of Fisheries Govt. of West Bengal.
4.	Shri Pita Basan Das	E.C. Member of West Bengal University of Animal & Fishery Science, Kolkata.
5.	Dr. S. Ayyappan	DDG (Fy.), ICAR, New Delhi.
6.	Shri V.V. Sadamate Advisor on Agriculture	Planning Commission, Yojana Bhawan, New Delhi-110001.
7.	Dr. A. D. Diwan	ADG (M.Fy.), KAB-II, ICAR, New Delhi.
8.	Dr. Dilip Kumar	Director, CIFE, Mumbai.
9.	Dr. N. Sarangi	Director, CIFA, Bhubaneswar
10.	Dr. K. Devadasan	Director, CIFT, Cochin.
11.	Dr. P. C. Mahanta	Director, NRCCWF, Bhimtal.
12.	Dr. W. S. Lakra	Director, NBFGR, Lucknow.
13.	Dr. A.G. Ponniah	Director, CIBA, Chennai.
14.	Dr. V. S. Somvanshi	Director General, Fishery Survey of India, Mumbai.
15.	Dr. A. Sarvadeva	Director, N.C.D.C., Khel Gaon Marg, New Delhi-110016.
16.	Shri R. Srinivasan	President, Society of Aquaculture Professionals, Chennai.
17.	Shri P. K. Sen	Director of Fisheries, Govt. of West Bengal, Kolkata.
18.	Dr. S. C. Agarwal	Director of Fisheries, Govt. of Haryana, Chandigarh.
19.	Shri Harekrishna Debnath	Chairperson, National Fish Workers Forum, Kolkata.
20.	Shri S. Pathak	Deputy Director of Fisheries (Planning), Govt. of Assam, Guwahati.
21.	Dr. R. N. Das	Head, Fisheries Cell West Bengal Comprehensive Area Development Authority, Kolkata.
22.	Prof. M. K. Bhowmik	Director of Extension on Research & Farm West Bengal University of Animal and Fishery Science, Kolkata.
23.	Dr. S. P. Singh	Nodal Officer, Agriclimesh Agri-business Training Institute Varanasi.

Shri A. K. Upadhyay, Secretary ICAR releasing CIFRI News Letter.

Foreign visitor :

1. Egyptian Scientist Dr. Mohamed Nagib Bakeer visited at the Institute during June, 10-16, 2006.
2. 14 fish farmers and entrepreneurs belonging to Lekhnath Chamber of Commerce and Industry (LCCI) from Nepal Agricultural Research Council, Fisheries Research Division visited this Institute on January 3, 2007.

ANY OTHER RELEVANT INFORMATION SUCH AS SPECIAL INFRASTRUCTURAL DEVELOPMENT

Building: The Construction of Laboratory cum office building of the Reservoir Division has been completed and the staff shifted to the new premises on 1st March 2007. The Laboratory cum Office building is ready for occupation and has an area of approximately 4000 square feet spread over two floors with four Laboratories, Library Hall, Conference Hall, Museum and ARIS Cell.

Infrastructure created: A new microbiology laboratory for microbial isolation and culture processes is in the process of development.

भा.कृ.अनु.प.
ICAR

वार्षिक प्रतिवेदन

2006 - 2007

केन्द्रीय अंतर्स्थलीय मात्स्यिकी अनुसंधान संस्थान

(भारतीय कृषि अनुसंधान परिषद्)

बैरकपुर, कोलकाता 700120

प्रक्कथन

केन्द्रीय अंतर्स्थलीय मात्स्यिकी अनुसंधान संस्थान ने इस अवधि के दौरान अंतर्स्थलीय जलीय संसाधनों जैसे- नदी, जलाशय, ज्वारनदमुख, आर्द्र क्षेत्र की प्रबन्धन प्रणालियों के विकास हेतु इनकी उत्पादन प्रक्रिया को समझने की दिशा में अनुसंधान कार्य किया। इस दौरान भौगोलिक सूचना प्रणाली के अंतर्गत संसाधन मूल्यांकन तथा मत्स्य व परितंत्र के स्वास्थ्य व प्रबन्धन से संबंधित समस्याओं के समाधान का भी प्रयास किया गया। आवश्यक डाटा एकत्रित करने एवं योजनाओं के लिए सहायता प्रदान करने हेतु संस्थान ने विभिन्न मात्स्यिकी पहलूओं से संबंधित 13 अनुसंधान परियोजनाओं पर कार्य किया। संस्थान ने नदी व ज्वारनदमुखी मात्स्यिकी पर जीविका के लिए आधारित मछुआरों में जैव विविधता एवं परितंत्र के संरक्षण हेतु जागृति लाने की भी पहल की। आर्द्र क्षेत्र मात्स्यिकी से संबंधित विभिन्न लोगों में मत्स्य उत्पादन वृद्धि तकनीकों का निदर्शन भी किया।

प. बंगाल, गुजरात, कर्नाटक, असम, हरियाणा, उत्तर प्रदेश राज्य के मत्स्य विभागों के साथ संस्थान के सम्बन्धों में काफी विकास हुआ। यह संस्थान भारत सरकार द्वारा प्रायोजित एक परियोजना के तहत देश के 35 राज्यों व केन्द्र शासित प्रदेशों के मात्स्यिकी संसाधनों का मूल्यांकन भौगोलिक सूचना प्रणाली की सहायता से कर रहा है। देश के अंतर्स्थलीय मात्स्यिकी संसाधानों के मूल्यांकन की दिशा में यह एक सघन प्रयास है। संस्थान ने परिषद के अन्य संस्थानों, राज्य कृषि विश्वविद्यालयों तथा अन्य अनुसंधान संगठनों से मिलकर नेटवर्क परियोजनाओं पर भी कार्य किया। अंतरराष्ट्रीय स्तर पर वर्ल्ड फिश सेन्टर, मलेशिया की सहायता से दो कार्यक्रमों का सफल निष्पादन किया एवं CP-IWMI, कोलम्बो द्वारा प्रायोजित एक अन्य परियोजना पर कार्य कर रहा है। संस्थान द्वारा सुनामी के पश्चात प्रभावित तटीय क्षेत्रों में मैंग्रोव पर आधारित पुनरूद्धार योजनाओं हेतु सक्षम प्राधिकारियों को महत्वपूर्ण सूचनाऐं उपलब्ध कराई हैं। वित्तीय संसाधनों के अर्जन हेतु परिषद् द्वारा निर्धारित लक्ष्यों को वैज्ञानिकों एवं तकनीशियनों के सफल प्रयास द्वारा प्राप्त किया गया। संस्थान ने उत्तर पूर्वी पर्वतीय क्षेत्र में बाढ़कृत आर्द्र क्षेत्र मात्स्यिकी विकास पर पर्याप्त ध्यान देते हुए क्षेत्र के लिए अनुमोदित कार्यक्रम का सफल निष्पादन किया। जन जागृति के प्रति संस्थान के विशेष प्रयास के तहत इस वर्ष अनेक पुस्तकों का प्रकाशन तथा 16 प्रदर्शनियों एवं मत्स्य पालक दिवसों का आयोजन किया गया।

रिपोर्ट अवधि के दौरान अनुसंधान सलाहकार समिति, स्टाफ रिसर्च काउंसिल, प्रबन्धन समिति, ज्वाइंट स्टाफ काउंसिल की सभी अनिवार्य बैठकों का आयोजन किया गया एवं इन समितियों द्वारा अनुसंधान एवं प्रबन्धन हेतु दिए गए सुझावों पर कार्यवाही की गई।

संस्थान के वैज्ञानिकों, तकनीकी व प्रशासनिक कर्मचारियों को मानव संसाधन विकास के तहत विभिन्न प्रशिक्षण कार्यक्रमों, कार्यशालाओं व सेमिनारों में भाग लेने हेतु पर्याप्त अवसर दिए गए हैं।

डॉ. मंगला राय, सचिव, कृषि अनुसंधान शिक्षा विभाग एवं महानिदेशक, भारतीय कृषि अनुसंधान परिषद को

संस्थान की विभिन्न गतिविधियों में उनके सहयोग हेतु हृदय से धन्यवाद देता हूँ। मैं डॉ. एस. अय्यप्पन, उपमहानिदेशक मात्स्यिकी, भा.कृ.अनु.प. के प्रति आभारी हूँ जिन्होंने संस्थान के अनुसंधान कार्यों की प्रगति में निरन्तर सहयोग एवं दिशा निर्देश दिया है। परिषद के मात्स्यिकी प्रभाग के अधिकारीगण विशेषकर डॉ. वी. वी. सुगुणन्, सहायक महानिदेशक (अं.मा.), डॉ. ए. डी. दिवान, सहायक महानिदेशक (स.मा.), डॉ. वी. आर. चित्रांशी एवं श्री अनिल अग्रवाल, प्रधान वैज्ञानिक तथा श्री पी. के. बागे को भी धन्यवाद देता हूँ जिन्होंने समय समय पर संस्थान को सहायता प्रदान की है।

इस रिपोर्ट में दर्शायी गई सभी उपलब्धियाँ संस्थान के समस्त अधिकारियों व कर्मचारियों के सामूहिक प्रयास का परिणाम हैं जिसके लिए वे सभी बधाई के पात्र हैं, आशा करता हूँ कि वे भविष्य में भी इसी तरह सहयोग करते रहेंगे।

मैं आशा करता हूँ कि संस्थान की यह संक्षिप्त रिपोर्ट विवृत्त जल क्षेत्र मात्स्यिकी और जैव विविधता संरक्षण व सतत मात्स्यिकी हेतु परितंत्रों के प्रबन्धन में रूचि रखनेवाले सभी व्यक्तियों व संगठनों के लिए उपयोगी होगी। मैं व्यक्तिगत तौर पर उनसे आशा करता हूँ कि वे इस कार्य में सुझाव दें ताकि आनेवाले वर्षों में इसे और अधिक उपयोगी बनाया जा सके।

मैं डॉ. मानस कुमार दास, प्रधान वैज्ञानिक को धन्यवाद देता हूँ जिन्होंने इस रिपोर्ट का संकलन कर मसौदा तैयार किया। उन सभी अधिकारियों को भी धन्यवाद देता हूँ जिन्होंने इस कार्य में अपना सहयोग दिया है। इस रिपोर्ट में हिन्दी खण्ड तैयार करने वाले श्री पी. आर. राव के कार्य की भी सराहना करता हूँ।

बैरकपुर, कोलकाता
अगस्त 2007

कुलदीप कुमार वास
निदेशक

विशिष्ट सारांश

केन्द्रीय अंतर्स्थलीय मात्स्यिकी अनुसंधान संस्थान की स्थापना मार्च 1947 में एक अनुसंधान केन्द्र के रूप में हुई जो कालान्तर में एक संपूर्ण संस्थान में विकसित हुई। इन वर्षों में यह संस्थान अंतर्स्थलीय मात्स्यिकी के क्षेत्र में एक प्रमुख संस्थान के रूप में प्रतिष्ठित हुआ है। यह संस्थान पश्चिम बंगाल राज्य के कोलकाता शहर के बैरकपुर क्षेत्र में स्थित है। संस्थान में इस समय 70 वैज्ञानिक, 85 तकनीकी कर्मचारी, 73 प्रशासनिक कर्मचारी और 167 सहायक कर्मचारी कार्यरत हैं।

संस्थान ने अपने अनुसंधान कार्य को उच्चस्तरीय अनुसंधान सलाहकार समिति जिसमें मात्स्यिकी एवं जलीय पारिस्थितिकी के विशिष्ट व्यक्ति सदस्य हैं, के मार्गदर्शन के अनुसार व्यवस्थित किया। अनुसंधान कार्यक्रमों की रूपरेखा इस प्रकार तैयार की गई ताकि विजन-2020 तथा पंचवर्षीय समीक्षा दल के सुझावों का समावेश हो सके। इनके अलावा परिषद् एवं SMD से प्राप्त निर्देशों का भी अनुसंधान कार्यक्रमों में समावेश किया गया। संस्थान की गतिविधियों को दिशा निर्देश देने हेतु एक प्रबन्धन समिति भी है। इसके अलावा अनेक आंतरिक समितियाँ जैसे-स्टाफ रिसर्च काउंसिल, जाइन्ट स्टाफ काउंसिल, राजभाषा कार्यान्वयन समिति, परामर्शक सेवा कक्ष आदि का भी गठन किया गया है जो अपनी नियमित बैठकों में लिए गए निर्णयों से संस्थान के प्रबन्धन में महत्वपूर्ण योगदान देते हैं।

रिपोर्ट की अवधि के दौरान संस्थान में अनुसंधान कार्य, प्रोद्यौगिकी हस्तांतरण, मानव संसाधन विकास, जन जागृति कार्यक्रम, देशी-विदेशी संगठनों के साथ अनुसंधान सहयोग आदि पर विशेष ध्यान दिया गया।

अनुसंधान कार्यक्रमों की दिशा मुख्यत: परितंत्रों के अनुसंधान जैसे स्त्रोतों के मूल्यांकन, परियोजनाओं तथा विदेशी संस्थाओं द्वारा प्रायोजित 2 परियोजनाओं के अलावा संस्थान की 13 अनुसंधान परियोजनाओं पर भी कार्य सम्पन्न हुआ। इन अनुसंधान परियोजनाओं की महत्वपूर्ण उपलब्धियाँ निम्नलिखित हैं।

नदीय मात्स्यिकी

संस्थान ने गंगा, रावि नदियों की जलीय गुणवत्ता व अन्य जल विज्ञान संबंधी तथ्य, मात्स्यिकी स्तर आदि की जानकारी हेतु इनका अध्ययन किया। रावि नदी की पारिस्थितिकी को प्रभावित करनेवाले मुख्य कारक हैं - जल निकासी एवं कृषि प्रदूषण। यमुना, सतलज और व्यास नदी में सी. गेरीपीनस की अत्यधिक मौजूदगी चिन्ताजनक है। गंगा नदीय क्षेत्र को उत्पादकों द्वारा उर्जा रूपान्तरण दर के अनुसार तीन भागों में बाँटा जा सकता है-ऊपरी क्षेत्र जहाँ यह दर निम्नतम स्तर (529 कैल/वर्गमीटर/दिन) और मध्य क्षेत्र जहॉ यह स्तर (4942 कैल/वर्गमीटर/दिन) है।

मत्स्य उत्पादन क्षमता के अनुसार भी गंगा नदीय क्षेत्र जहाँ यह दर निम्नतम स्तर (18.3 कि.ग्रा./हे./वर्ष से 21,991 कि.ग्रा./हे./वर्ष) पर और मध्य क्षेत्र 13 (167.6 कि.ग्रा./हे./वर्ष से 2,01,185 कि.ग्रा./हे./वर्ष) है।

गंगा नदीय उपज में वर्ष 1960 की तुलना में काफी कमी आयी है। इलाहाबाद क्षेत्र से प्राप्त उपज 935.4 कि.ग्रा/वर्गकिलोमीटर से घटकर 377.6 कि.ग्रा./वर्गकिलोमीटर हो गई। मेजर कार्प मछलियाँ घटकर 1/5 रह गई हैं। नदी के निचले क्षेत्र में मेजर कार्प मछलियों का योगदान काफी कम पाया गया, केवल फरक्का क्षेत्र में इनका योगदान कुल उपज का 14.1% है।

विदेशी कार्प मछलियाँ मुख्यत: **सिप्रीनस कार्पियो** केवल मध्य क्षेत्र में ही रह गईं और इलाहाबाद क्षेत्र में इन मछलियों की कुल उपज में 25.5% तथा वारणसी में 19.4% का योगदान है । तिलापिया प्रजाति केवल इलाहाबाद क्षेत्र में ही देखी गई है ।

मछुआरों के सामाजिक व आर्थिक सर्वेक्षण से स्पष्ट होता है कि मत्स्यन कार्य में काफी कमी आयी है जिससे मछुआरे अन्य प्रकार के रोजगार की ओर जा रहे हैं।

जलाशय मात्स्यिकी

कर्नाटक, उत्तर प्रदेश, हिमाचल प्रदेश और राजस्थान के जलाशयों में मत्स्य उत्पादन बढ़ाने के लिए उपयुक्त प्रबन्धन प्रणालियों के विकास हेतु इन जलाशयों का अध्ययन किया गया।

काबिनी जलाशय से अप्रैल, 2006 के दौरान आकलित 9881 कि.ग्रा. मत्स्य उपज सर्वाधिक उपज है। इस कुल उपज में **ओ. मोजाम्बिकस** 33.1% **सिप्रीनस कार्पियो** 27.8%, **लेबियो बाटा** 12.3%, **ओम्पाक बिमाक्यूलेटस** 12.3%, 13.1% **क्लारियस गेरिपीनस** 4.7 तथा **नोटापटीरस नोटोपटीरस, मिस्टस केवासियस, चन्ना मारूलियस** व अन्य प्रजातियॉ 9.7% पाई गई हैं। इस माह के दौरान प्रति युनिट प्रयास की उपज 4.94 कि.ग्रा. रही। प्रायोगिक तौर पर मल्टीफिलामेन्ट एवं मोनोफिलामेन्ट पोलायामाइड गिल नेट द्वारा किए गए मत्स्यन कार्य से स्पष्ट हुआ है कि मोनोफिलामेन्ट द्वारा प्रति युनिट क्षेत्र से अधिक उपज प्राप्त होती है।

तमिलनाडू के मेट्टूर जलाशय में वर्ष 2006-2007 के दौरान 2500000 मत्स्य बीजों का संग्रहण किया गया। कुल मत्स्य बीजों में **सी. कतला** के 947000 बीज, **लेबियो रोहिता** के 1247000 तथा **सिरहीनस म्रिगाला** के 306000 बीज संग्रहित किए गए। मेट्टूर जलाशय से जुलाई के दौरान सबसे अधिक उपज 42164.6 कि.ग्रा. पाई गई। इस उपज में मेजर कार्य मछलियों का 18457.6 कि.ग्रा. योगदान पाया गया। कुल उपज में दूसरे वर्ग की मछलियॉ जिनमें **ओ. बिमाक्यूलेटस** आदि हैं, भी 14608.850 कि.ग्रा. पाई गई हैं। दिसम्बर माह के दौरान सभी प्रजातियों की उपज काफी घट गई है। यह कमी जल स्तर का FRL तक 36.6 मी. तक बढना भी हो सकता है।

मध्य प्रदेश के ओन, बरूवा और जारमोहरा जलाशयों में किए गए अध्ययनों से पता चला है कि इनका औसत उत्पादन 1.5 से 18 टन एवं उत्पादन दर 2.31 से 26.4 कि.ग्रा./हे./वर्ष है जब कि इन जलाशयों की उत्पादन क्षमता 80-123 कि.ग्रा./हे./वर्ष है।

ज्वारनदमुखी मात्स्यिकी

हुगली नदी के पूर्वी ज्वारनदमुखी क्षेत्र में शीतकाल के दौरान तटीय क्षेत्र से 25.8 कि.मी. तक ज्वारनदमुखी

प्रभाव आंका गया है जब कि ग्रीष्मकाल में यह दूरी 22.2 कि.मी. तक ही सीमित है परन्तु मानसून के दौरान यह प्रभाव 50.2 कि.मी. तक पाया गया।

निचले ज्वारनदमुखी क्षेत्र में विन्टर माइग्रेटरी बैगनेट फिशरी नवम्बर 2006 से जनवरी 2007 के दौरान 34516.8 टन आंका गया जो औसतन 45.39 कि.ग्रा. प्रति युनिट मत्स्यन प्रयास है। इससे पहले वर्ष इस अवधि में यह उपज 28394.3 टन औसतन 40.4 कि.ग्रा. प्रति युनिट मत्स्यन प्रयास पाया गया। इससे यह स्पष्ट होता है कि कुल उपज में 21.56 प्रतिशत की बढ़ोत्तरी तथा प्रति युनिट मत्स्य प्रयास में 12.35% की बढ़ोत्तरी हुई। पिछले 7 वर्षों में यानि 2000-2001 से 2006-2007 दौरान कुल उपज में 42.19% की बढ़ोत्तरी हुई।

आर्द्र क्षेत्र मात्स्यिकी

मत्स्य बीज उत्पादन हेतु पेन पालन प्रयोग किए गए। इन प्रयोगों से प्राप्त परिणामों में **लेबियो बाटा** प्रजाति का 30 दिनों में तेज विकास 105.9% काफी उत्साहवर्धक पाया गया। बील परितंत्रों में इस घटती प्रजाति की पुनर्स्थापना हेतु पेन में मत्स्य बीज उत्पादन महत्वपूर्ण भूमिका निभा सकता है।

प्राथमिक उत्पादकता अध्ययन से ज्ञात होता है कि पश्चिम बंगाल की अधिकतर बील मध्यम उत्पादकता वाली हैं। सकल प्राथमिक उत्पादकता (GPP, $mgC/m^3/hr$) का उच्च दर मेदिया (693), दुमा (563) और मथुरा बीलों में मुख्यत: मैक्रोसिस्टिस के कारण पाई गई जब कि अन्य बीलों में यह स्तर 164 से 422 के बीच रही। बिहार के खगारिया जिले में गंदक बेसिन में स्थित केसरिया आर्द्र क्षेत्र तथा कोशी नदीय बेसिन में स्थित लखमानिया आर्द्र क्षेत्र में जैव विविधता का अध्ययन किया गया। केसरिया आर्द्र क्षेत्र से 22 जेनेरा एवं 16 फैमिली के 33 मत्स्य प्रजातियॉ तथा लखमानिया से 10 जेनेरा एवं 9 फैमिली के 18 प्रजातियॉ पाई गईं। लखमानिया की सकल प्राथमिक उत्पादता (GPP, $mgC/m^3/hr$) (62.50-302.09) केसरिया (52.09-114.59) की तुलना में अधिक पाई गई।

प. बंगाल के उत्तर 24 परगना जिले के चन्दानिया (ऋतु विशेष में खुली) तथा चमोरदह (बंद) आर्द्र क्षेत्रों में जर्मप्लाज्म सर्वेक्षण किया गया। चन्दानिया में 24 जेनेरा एवं 17 फेमिली की 36 प्रजातियॉ और चमारदह में 15 जेनेरा एवं 10 फेमिली की 21 प्रजातियॉ पायी गयीं।

बिहार एवं प. बंगाल के मछुआरों की सामाजिक-आर्थिक स्थितियों पर किए गए अध्ययनों से स्पष्ट होता है कि बिहार के मछुआरों का प्रमुख रोजगार मत्स्यन कार्य ही है, पर खेतों में मजदूरी भी करते हैं। लगभग 54% मछुआरों के पास निजी नाव इत्यादि तथा 64% मछुआरों के पास निजी जाल आदि उपलब्ध हैं। ये मछुआरे प्रतिवर्ष औसतन 268 दिन मत्स्यन कार्य करते हैं एवं औसत उपज दर 1.63 कि.ग्रा./दिन होता है। मछुआ परिवारों की औसतन वार्षिक आय रू. 14,679 है।

प. बंगाल बीलों के अध्ययन से ज्ञात होता है कि यहॉ भी मछुआरों का मुख्य रोजगार मत्स्यन कार्य ही है परन्तु आय के अतिरिक्त साधनों के तहत वे दैनिक मजदूरी या नौकरी भी करते हैं। मत्स्यन कार्य से प्रत्येक मछुआ परिवार को औसतन वार्षिक आय रू. 22781 है।

मत्स्य अवतरण केन्द्र से ब्रह्मपुत्र नदी से प्राप्त उपज संबंधी आंकड़ों को क्रमबद्ध तरीके से एकत्रित किया गया। एक आकलन के अनुसार इस वर्ष कुल 236.5 टन मत्स्य उपज प्राप्त हुई जो पिछले वर्ष (225.4 टन) की तुलना में (4.3%) अधिक है। प्राप्त उपज में विविध प्रकार की मछलियों की अधिकता थी। इन विविध प्रकार की मछलियों के बाद का स्थान मेजर कार्प, माइनर कार्प, हिल्सा, कैटफिश और फेदरबैक प्रजातियों का रहा। अधिकतम उपज मानसून के पश्चात प्राप्त हुई।

मत्स्य स्वास्थ्य व पर्यावरण

कीटनाशकों से उत्पन्न खतरों के मूल्यांकन हेतु किए गए अध्ययनों के दौरान नदी एवं आर्द्र क्षेत्रों के समस्त केन्द्रों से प्राप्त नमूनों में DDT, HCH तथा उनके मेटाबोलाइटस् की मौजूदगी देखी गई । ऑर्गनोक्लोरीन कीटनाशक, 4, 4'-DDT आदि मान्य सीमाओं से अधिक परिमाण में पाए गए।

दबावयुक्त व दबावरहित बीलों में हेल्थ एसेसमेंट इन्डेक्स का प्रयोग इन बीलों की मछलियों के स्वास्थ्य मूल्यांकन में काफी उपयोगी पाया गया।

लेबियो रोहिता मछलियों मे vetellogenin gene expression को एक बयोमार्कर के रूप में उपयोग किया जा सकता है।

मछलियों की लाइजोजाइम आकलन पद्धति का मानकीकरण किया गया। एक स्वस्थ लेबियो रोहिता मछली में सीरम लाइजोजाइम स्तर μgml^{-1} पाया गया।

मछलियों में एरोमोनास हाइड्रोफिला रोगाणुओं के नियंत्रण हेतु 14 रसायनों एवं 9 पौधों के सार का परीक्षण किया गया जिनमें से कुछ मछलियों में एरोमोनियासिस नियंत्रण हेतु उपयोगी पाया गया।

सुक्ष्म रोगाणुकों के 37 प्रजातियों जैसे-एरोमोनास हाइड्रोफिला, ए. विरोनी बी. वी. सोबरिया, एरोमोनास सोबरिया, सूडोमोनास प्रजाति आदि का पृथकीकरण, पहचान आदि किया गया।

संसाधन मूल्यांकन

उड़ीसा राज्य में 10 हे. से अधिक क्षेत्रफल वाले जल निकायों तथा नदियों व झरनों का मानचित्रीकरण मानसून के बाद के सैटलाइट डाटा के उपयोग से पूरा कर लिया गया।

रिमोट सेंसिंग इमेज के विभिन्न बैंडों के डिजिटल वैल्यू तथा जलीय गुण्वत्ता प्राचलों का आपसी सह-संबंध बैंड़ों का अनुपात, विभिन्न सूचाकांक जैसे नॉरमालाइजड डिफरेन्स वेजीटेशन इन्डेक्स, नॉरमालाइजड डिफरेन्स वॉटर इन्डेक्स आदि का परिकलन किया गया।

संस्थान के केन्द्रों द्वारा एकत्रित विभिन्न जल निकायों से संबंधित आंकड़ों का विश्लेषण किया गया ताकि मत्स्य उपज एवं इसकी रूपरेखा को समझा जा सके। इलाहाबाद के निकट गंगा नदी से एकत्रित आंकड़े, करनाल से यमुना एवं पश्चिमी यमुना कैनल तथा गुवाहाटी में ब्रह्मपुत्र नदी से एकत्रित आंकड़ों को भौगोलिक सूचना प्रणाली के अंतर्गत संग्रहित किया गया।

अन्य गतिविधियाँ

संस्थान में स्टाफ रिसर्च काउंसिल, अनुसंधान सलाहकार समिति, प्रबन्धन समिति, हिन्दी कार्यान्वयन समिति आदि की बैठकों का आयोजन निर्धारित समय पर किया गया। इन बैठकों में संबंधित विषयों पर चर्चा की गई एवं संस्थान के अनुसंधान तथा उचित प्रबन्धन हेतु आवश्यक दिशा-निर्देश तैयार किये गए।

यह संस्थान देश के विभिन्न संस्कृतियों का प्रतिनिधित्व करता है। प्रत्येक सदस्य ने संस्थान द्वारा आयोजित विभिन्न राष्ट्रीय दिवसों व अन्य आयोजनों में बड़े उत्साह, सद्भाव एवं भाइचारे के साथ भाग लिया है।

भूमिका

संक्षिप्त इतिहास

केन्द्रीय सरकार की कृषि, वानिकी तथा मात्स्यिकी से संबंधित उप-समिति के प्रस्ताव पर 17 मार्च 1947 को भारत सरकार के खाद्य व कृषि मंत्रालय के अंतर्गत केन्द्रीय अंतर्स्थलीय मात्स्यिकी अनुसंधान केन्द्र की स्थापना कलकत्ता में हुई। एक छोटे पैमाने पर प्रारंभ किया गया यह केन्द्र अपने कार्यकलापों के बल पर वर्ष 1959 में एक पूर्ण संस्थान के रूप में परिणत हुआ तथा बैरकपुर, पश्चिम बंगाल के नवनिर्मित भवन में इसका स्थानांतरण हुआ। कालान्तर में यह संगठन समूचे राष्ट्र की अंतर्स्थलीय मात्स्यिकी एवं जलकृषि का सर्वश्रेष्ठ अनुसंधान संस्थान के रूप में प्रतिष्ठित हआ। वर्ष 1967 से यह संस्थान भारतीय कृषि अनुसंधान परिषद्, कृषि अनुसंधान एवं शिक्षा विभाग, भारत सरकार का विधिवत् सदस्य है।

प्रारम्भ में संस्थान का मुख्य उद्देश्य देश के अंतर्स्थलीय मात्स्यिकी संसाधनों का उचित मूल्यांकन तथा इनके संरक्षण व अधिकतम समुपयोजन के लिए उपयुक्त प्रणालियों का विकास करना था। इस उद्देश्य पूर्ति के लिए संस्थान ने देश में उपलब्ध सभी अंतर्स्थलीय जल संसाधनों की पारिस्थितिकी एवं इनकी उत्पादन क्षमताओं के साथ साथ तालाबों की पारिस्थितिकी एवं उत्पादन से संबंधित कृषि पद्धतियों का भी अध्ययन किया जिससे प्रति युनिट इकाई मत्स्य उत्पादन में वृद्धि की जा सके।

1960 और 1970 के दशक में संस्थान ने भारत सरकार के योजनास्वरूप जलकृषि अनुसंधान एवं विकास पर अपना ध्यान केन्द्रित करना आरम्भ किया। देश की मात्स्यिकी अनुसंधान एवं कृषि पद्धति में महत्वपूर्ण उपलब्धियों को प्राप्त करने के बाद संस्थान ने 4 अखिल भारतीय समन्वित अनुसंधान परियोजनाओं का कार्य प्रारम्भ किया। ये परियोजनायें थीं - मिश्रित मत्स्य पालन, नदीय मत्स्य बीज उत्पादन, वायु श्वासी मत्स्य पालन, जलाशयों की पारिस्थितिकी व मात्स्यिकी प्रबंधन तथा खाराजल मत्स्य पालन। वर्ष 1974 में प्रारम्भ की गई मिश्रित मत्स्य पालन व नदीय मत्स्य बीज उत्पादन नामक संयुक्त परियोजना की सफलता भारत में मत्स्य पालन के लिए एक ऐतिहासिक घटना थी जिसे देश के मीठाजल जीव पालन के विकास का आधार स्तम्भ माना जाता है। इस सफलता के परिणामस्वरूप वर्ष 1977 में धौली, उड़ीसा में केन्द्रीय मीठाजल जीवपालन अनुसंधान एवं प्रशिक्षण केन्द्र की स्थापना हुई जो वर्ष 1987 में केन्द्रीय मीठाजल जीवपालन अनुसंधान संस्थान के रूप में परिणत हुई। इसी प्रकार संस्थान ने केन्द्रीय खाराजल जीवपालन अनुसंधान संस्थान तथा राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र की स्थापना किया जिनका कार्य खाराजल जीव पालन एवं शीतजल मात्स्यिकी अनुसंधान करना था। अत: के. अं. मा. अनु. संस्थान को तीन प्रमुख अनुसंधान संस्थान प्रारम्भ करने का श्रेय प्राप्त है।

अधिदेश

विषय विशेष संस्थानों की स्थापना के उपरान्त, इस संस्थान को देश के भीतर एवं बाहर उत्पन्न विवृत्त जल क्षेत्र मात्स्यिकी के विभिन्न मुद्दों को सुलझाने तथा जलीय संसाधनों के प्रबन्धन का अधिदेश दिया गया।

बदलते परिदृश्य तथा वर्तमान अनुसंधान व विकास की आवश्यकताओं को ध्यान में रखते हुए अनुसंधान प्राथमिकताओं का पुन:संस्करण आवश्यक है ताकि मत्स्य उत्पादन सतत बनी रहे। जैव विविधता का संरक्षण अति महत्वपूर्ण है जो किसी भी उत्पादन व्यवस्था का आधार स्तम्भ है। संस्थान की अनुसंधान प्राथमिकताओं में निम्नलिखित परिवर्तन किए गए हैं -

- उत्पादन में वृद्धि से उत्पादकता को सतत बनाए रखने पर ध्यान देना
- केवल मत्स्य लाभ से परितंत्र की स्वास्थ्य व लाभ की ओर ध्यान देना

इन परिवर्तनों के कारण संस्थान का अधिदेश इस प्रकार है -

- अंतर्स्थलीय विवृत्त जल क्षेत्रों जैसे - नदी, जलाशय, झील, ज्वारनदमुख व संबद्ध जल क्षेत्रों में मौलिक, सामरिक व व्यवहारिक अनुसंधान कार्य।
- अधिदेशित जल निकायों की उत्पादकता बढ़ाने हेतु परितंत्र विशेष के लिए तकनीकों व प्रणालियों को विकसित करना।
- बदलते पर्यावरण का अनुमापन एवं मात्स्यिकी पर इसका प्रभाव तथा इसके समाधान हेतु अन्य संगठनों के सहयोग से योजनाऐं बनाना।
- अंतर्स्थलीय विवृत्त जल क्षेत्रों के प्रति जागृति पैदा करना, प्रशिक्षण व परामर्शक सेवाऐं प्रदान करना आदि।

संगठन

संस्थान द्वारा विजन - 2020 में दर्शाए गए प्रभागों का संशोधित पुनर्गठन की स्वीकृति प्राप्त होने तक संस्थान ने अपने अनुसंधान कार्य को 7 प्रभागों के अंतर्गत विभाजित किया और इन प्रभागों की सहायता हेतु कुछ अनुभागों व सेवा एककों का भी गठन किया। उत्तर प्रदेश के इलाहाबाद स्थित नदीय प्रभाग देश के नदीय संसाधनों एवं इनकी मात्स्यिकी के अनुमापन एवं उपयुक्त प्रबन्धन प्रणालियों को विकसित करने में जुटा हुआ है। इस कार्य के दौरान नदीय पर्यावरण एवं मत्स्य सम्पदा पर भी विशेष ध्यान दिया जाता है। संस्थान का जलाशय प्रभाग कर्नाटक के बैंगलोर में है और यह प्रभाग बड़े, मध्यम तथा छोटे जलाशयों की मत्स्य उपज वृद्धि हेतु प्रबन्ध प्रणालियों को विकसित करने पर कार्य कर रहा है। इन प्रभागों के अलावा अन्य सभी प्रभाग बैरकपुर स्थित हैं। इनमें ज्वारनदमुखी प्रभाग ज्वारनदमुखी मात्स्यिकी एवं पारिस्थितिकी, तटीय आर्द्र क्षेत्र एवं सुन्दरवन मैंग्रोव पर कार्य कर रहा है। मत्स्य स्वास्थ्य व पर्यावरणीय अनुमापन प्रभाग विवृत्त जल क्षेत्र जैसे - नदीय संसाधन, आर्द्र क्षेत्र, जलाशय एवं ज्वारनदमुखों के पर्यावरण एवं मत्स्य स्वास्थ्य संबंधी विभिन्न पहलुओं को सुलझाने में प्रयासरत है। यह प्रभाग पर्यावरणीय अनुमापन एवं प्रबन्धन हेतु जैव-रसायनिक, सूक्ष्मजैविकी तथा जैव-प्रोद्यौगिकी पहलूओं पर भी कार्य कर रहा है। परितंत्रों के पुनरूद्धार योजनाओं का विकास भी इस प्रभाग का दायित्व है। बाढ़कृत मैदानी आर्द्र क्षेत्र मात्स्यिकी प्रभाग आर्द्र क्षेत्रों की उत्पादन प्रक्रिया तथा मत्स्य उत्पादन में वृद्धि हेतु कार्य करता है। इस कार्य के तहत जैव विविधता संरक्षण

व पारिस्थितिक अनुकूल प्रणालियों का विकास करना है। संसाधन मूल्यांकन प्रभाग देश की मत्स्य सम्पदा व जलीय संसाधनों का डाटाबेस तैयार करने का प्रयास करता है। यह प्रभाग विभिन्न पापुलेशन मॉडलों व भौगोलिक सूचना प्रणाली के अंतर्गत संसाधन प्रबन्धन डाटाबेस का विकास कर रहा है जिससे अंतर्स्थलीय मत्स्य सम्पदा सतत प्राप्त होती रहे। संस्थान का मानव संसाधन विकास एवं प्रोद्यौगिकी हस्तांतरण प्रभाग संस्थान के अधिकारियों/कर्मचारियों के अलावा मात्स्यिकी से जुड़े अन्य संगठनों के कर्मियों को प्रशिक्षित करता है। प्रोद्यौगिकी हस्तांतरण के तहत मत्स्यपालकों, मछुआरों, उद्यमियों, विस्तार कार्यकर्त्ताओं को प्रदर्शनियों, सलाहकार सेवाऐं, मत्स्य पालक दिवस, चर्चाऐं, फिल्म शो आदि के माध्यम से अंतर्स्थलीय मात्स्यिकी से संबंधित विभिन्न तकनीकों को हस्तांतरित करता है।

संस्थान के अनुसंधान प्रबंधन में निदेशक का पद सर्वोच्च है तथा संस्थान का समस्त प्रबन्धन कार्य निदेशक की अध्यक्षता में ही सम्पन्न किया जाता है। स्टाफ रिसर्च काउंसिल तथा अनुसंधान सलाहकार समिति संस्थान के अनुसंधान व विस्तार गतिविधियों से संबंधित सुझाव प्रदान करते हैं। अनुसंधान परियोजनाओं का कार्य बैरकपुर मुख्यालय तथा केन्द्रों से निष्पादित किया जाता है।

अनुसंधान सहायक सेवाऐं

पुस्तकालय व सूचना अनुभाग

संस्थान का पुस्तकालय मुख्यालय व अनुसंधान केन्द्रों में कार्यरत वैज्ञानिकों की आवश्यकताओं के अलावा अन्य संनठनों के शोधकर्त्ताओं, अध्यापकों, विद्यार्थियों तथा अधिकारियों को भी अपनी सेवाऐं मुहैया कराता है। इस अवधि के दौरान पुस्तकालय ने अपने भंडार में 421 हिन्दी पुस्तकें तथा 10 अन्य विविध प्रकाशन, जरनलों के 615 अंक संग्रहित किये एवं 77 e-journal (foreign) व 37 भारतीय जरनलों की व्यवस्था की। इस समय पुस्तकालय में कुल 11369 पुस्तकें, 4300 पुनर्मुद्रित लेख, 1252 मानचित्र और 4330 विविध प्रकाशनों का संग्रह है।

विगत वर्षों की तरह इस वर्ष भी संस्थान के विभागीय प्रकाशनों को विभिन्न अनुसंधान संगठनों, विश्वविद्यालयों एवं किसानों को िशुल्क भेजता रहा ताकि उन्हें आधुनिक विकास की जानकारी हो । पुस्तकालय में Indian Fisheries Abstracts का प्रकाशन जारी रखा गया । वर्ष 2006-2007 दौरान पुस्तकालय हेतु रू. 8,60,863 खर्च किया गया।

परियोजना अनुमापन एवं कार्यान्वयन

यह अनुभाग संस्थान के विभिन्न अनुसंधान परियोजनाओं की प्रगति का अनुमापन एवं स्टाफ रिसर्च काउंसिल बैठकों का आयोजन करता है। सभी अनुसंधान परियोजनाओं की वार्षिक प्रगति तथा प्रत्येक वैज्ञानिक के योगदान संबंधी सूचनाओं को भी इस अनुभाग द्वारा संकलित किया जाता है। अनुसंधान प्रगति का अनुमापन आर.पी.एफ. I, II एवं III के माध्यम से किया जाता है। एक्टविटी माइलस्टोन, तिमाही और वार्षिक रिपोर्ट आदि इस अनुभाग के मुख्य दायित्वों में से एक है। समय समय पर विभिन्न अनुसंधान परियोनाओं की प्रगति को संकलित कर परिषद के मुख्यालय, कृषि मंत्रालय तथा अन्य संगठनों को भेजा जाता है। संस्थान की अनुसंधान गतिविधियों से संबंधित देश विदेश से आये प्रश्नों का उत्तर देना भी इस अनुभाग का दायित्व है।

प्रलेखन अनुभाग

इस अनुभाग को वैज्ञानिक बुलेटिन, वार्षिक रिपोर्ट, न्यूजलेटर, ब्रोचर आदि के प्रकाशन की जिम्मेदारी सौंपी गई है। इस वर्ष संस्थान का वार्षिक रिपोर्ट, 2 न्यूजलेटर एवं 4 वैज्ञानिक बुलेटिनों का प्रकाशन किया गया है।

कृषि अनुसंधान सूचना प्रणाली

इस कक्ष द्वारा वैज्ञानिकों एवं कर्मचारियों को कम्पयूटर से संबंधित सुविधाऐं प्रदान की जाती हैं। मुख्यालय में LAN System की व्यवस्था एवं वैज्ञानिको को इंटरनेट की सुविधा दी गई है।

संस्थान का बजट (वर्ष 2006-2007)

लेखा शीर्ष	संशोधित बजट (लाखों में)		खर्च	
	योजना	गैर योजना	योजना	गैर योजना
वेतन व अन्य भत्ते समयोपरि भत्ता सहित	-	877.15	-	877.15
यात्रा भत्ता	4	9.4	4	9.4
अन्य खर्च-सूचना प्रोद्यौगिकी एवं मानव संसाधन विकास सहित	151.52	73.45	141.52	73.45
वर्क्स	28.38	18	28.32	18
अन्य	3.16	-	3.16	978
कुल योग	177.06	978	177.05	978
उत्तर पूर्वी भाग	25	-	24.99	-
अधिकारी व कर्मचारियों की संख्या मार्च 2007 के दौरान				
क्रम संख्या	वर्ग		स्वीकृत पद	कार्यरत अधिकारी
1.	निदेशक (अनुसंधान प्रबन्धन पद)		1	1
2.	वैज्ञानिक		98	60
3.	तकनीकी		90	83
4.	प्रशासनिक		80	71
5.	सहायक (सपोर्टिंग स्टाफ)		168	160
6.	कुल		437	375

हीरक जयन्ती समारोह

केन्द्रीय अंतर्स्थलीय मात्स्यिकी अनुसंधान संस्थान ने राष्ट्र की सेवा एवं अंतर्स्थलीय मात्स्यिकी अनुसंधान क्षेत्र में 60 वर्ष पूरे कर लिए हैं। इस अवधि के दौरान संस्थान ने अंतर्स्थलीय मात्स्यिकी अनुसंधान क्षेत्र में अनेक उपलब्धियों को प्राप्त किया जिनका देश की नील क्रान्ति में विशेष योगदान है। इस शुभ अवसर पर संस्थान में पूरे वर्ष के दौरान अनेक कार्यक्रमों की योजना है।

कार्यशाला

संस्थान के मुख्यालय में हीरक जयन्ती कार्यक्रमों के तहत सर्वप्रथम एक राष्ट्रीय हिन्दी कार्यशाला का आयोजन बैरकपुर में 17-18 मार्च, 2007 के दौरान संस्थान एवं इन्लैंड फिशरीज सोसाइटी ऑफ इंडिया ने संयुक्त रूप से किया। कार्यशाला में देश के विभिन्न भागों से अनेक गणमान्य मत्स्य वैज्ञानिक, अध्यापकगण एवं शोधकर्त्ताओं ने भाग लिया। कार्यशाला के उद्घाटन समारोह में ख्याति प्राप्त प्रमुख मत्स्य वैज्ञानिक व भारत में प्रेरित प्रजनन के जन्मदाता प्रोफेसर डॉ. हीरालाल चौधरी मुख्य अतिथि के रूप में उपस्थित हुए। समारोह की अध्यक्षता डॉ. पी. वी. देहादराय, पूर्व उपमहानिदेशक, भारतीय कृषि अनुसंधान परिषद् ने की एवं पश्चिम बंगाल सरकार के मात्स्यिकी सचिव श्री के. पी. एस. कहलॉन समारोह में विशेष अतिथि रहे। संस्थान के निदेशक एवं इन्लैंड फिशरीज सोसाइटी ऑफ इंडिया के अध्यक्ष डॉ. कुलदीप कुमार वास ने कार्यशाला में उपस्थित सदस्यों का स्वागत करते हुए कार्यशाला के विषय एवं उद्देश्य की जानकारी दी एवं साथ ही संस्थान के 60 वर्षों की उपलब्धियों का भी उल्लेख किया। समारोह के मुख्य अतिथि डॉ. हीरालाल चौधरी जी ने दीप प्रज्जलित कर कार्यशाला का शुभारम्भ किया। उन्होंने सभा सदस्यों को आशीर्वाद दिया एवं अपने अनुभवों विशेषकर प्रेरित प्रजनन के बारे में बताया। सभा सदस्यों ने अंतर्स्थलीय मात्स्यिकी क्षेत्र में डॉ. चौधरी के विशेष योगदान के लिए उनका अभिनंदन किया। कार्यशाला के इस उद्घाटन सत्र में मात्स्यिकी क्षेत्र के प्रमुख जैसे - डॉ. जी. पी. दुबे, डॉ. वी. आर. देसाई, डॉ. वी. वी. सुगुणन्, डॉ. दिलीप कुमार, डॉ. एम. सिन्हा, डॉ. एस. सी. पाठक, डॉ. बी. एन. सिंह, डॉ. सी. एस. सिंह, डॉ. पी. दास, डॉ. वी. आर. चित्रांशी, डॉ अपूर्बा घोष, डॉ. एन. सी. दत्ता, डॉ. टी. ए. कुरेशी, डॉ. अमलेश चौधरी आदि उपस्थित हुए।

समारोह के मुख्य अतिथि डॉ. हीरालाल चौधरी जी ने कार्यशाला में प्रस्तुत लेखों के सारांश का विमोचन किया । इस समारोह में संस्थान द्वारा प्रकाशित 4 हिन्दी बुलेटिन तवा जलाशय - पारिस्थितिकी एवं मात्स्यिकी, कावेरी नदी - पर्यावरण एवं मात्स्यिकी, हुगली मातलह ज्वारनदमुखी परितंत्र - एक और अध्ययन, पेन में मछली एवं झींगा पालन का विमोचन किया गया। इस अवसर पर एस. पी. मलहोत्रा एवं वी. आर. पी. सिन्हा द्वारा लिखित Inland Fisheries and Aquaculture in a globalizing economy नामक पुस्तक का भी विमोचन किया गया। कार्यशाला के इस अवसर पर एक मत्स्य प्रदर्शनी का भी आयोजन किया गया।

सेमिनार

संस्थान के मुख्यालय बैरकपुर में 12 दिसम्बर, 2006 के दिन मात्स्यिकी के सतत विकास के लिए जैविक पालन प्रणाली को लोकप्रिय बनाना विषय पर एकदिवसीय

सेमिनार का आयोजन किया गया। सेमिनार का उद्घाटन प. बंगाल पशु एवं मत्स्य विज्ञान विश्वविद्यालय के उप कुलपति प्रो. चन्द्रशेखर चक्रवर्ती ने किया। सेमिनार के उद्घाटन सत्र में रामकृष्ण विवेकानन्द मिशन, बैरकपुर के महराज गिरिजानन्द जी ने विशेष अतिथि के रूप में भाग लिया। उन्होंने उनके संगठन में मात्स्यिकी कार्य हेतु संस्थान द्वारा की गई तकनीकी सहायता की सराहना की।

हिन्दी प्रकाशन

चन्द्रा, जी., 2006 सुन्दरवन मंगल में मात्स्यिकी - क्षमाताऐं, समस्याऐं, सम्भावनाऐं एवं चुनौतियॉ : अंतर्स्थलीय मात्स्यिकी - सिंहावलोकन, सिफरी बुलेटिन सं 144 : 70 - 83 । संपादक : आर. एन. सेठ, आर. एस. पंवार, एन. पी. श्रीवास्तव, के. डी. जोशी एवं पी. आर. राव।

दास, एम. के., 2006 अंतर्स्थलीय मात्स्यिकी एवं स्वास्थ्य प्रबन्धन - विस्तृत चर्चा : अंतर्स्थलीय मात्स्यिकी - सिंहावलोकन, सिफरी बुलेटिन सं 144 : 70 - 83। संपादक : आर. एन. सेठ, आर. एस. पंवार, एन. पी. श्रीवास्तव, के. डी. जोशी एवं पी. आर. राव।

देसाई, वी. आर., एन. पी श्रीवास्तव एवं डी. कुमार 2007 जलाशय मात्स्यिकी विकास और बाधाऐं - रविशंकर जलाशय एक अध्ययन। राष्ट्रीय कार्यशाला - मात्स्यिकी अनुसंधान एवं विकास - दिशाऐं और आयाम।

देसाई. वी. आर., सी. सेल्वाराज, डी. कुमार, एन. पी. श्रीवास्तव, बी. एल. पाण्डेय, के. के. अग्रवाल एवं के. सिंह 2007 तवा जलाशय - पारिस्थितिकी एवं मात्स्यिकी । सिफरी बुलेटिन सं. 100. 1 - 34 ।

जोशी, के. डी., 2006 पर्वतीय नदियों में मात्स्यिकी का वर्तमान स्वारूप - एक अध्ययन । अंतर्स्थलीय मात्स्यिकी - सिंहावलोकन, सिफरी बुलेटिन सं 144 : 62 - 69 । संपादक : आर. एन. सेठ, आर. एस. पंवार, एन. पी. श्रीवास्तव, के. डी. जोशी एवं पी. आर. राव।

जोशी, के. डी. 2006 घेरे में मत्स्य पालन - आवश्यक सामग्री, निर्माण तथा उचित रख रखाव। सिफरी प्रशिक्षण बुलेटिन : पेन में मत्स्य एवं झींगा पालन, पृ. 21-28।

जोशी, के. डी. और डी. कुमार, 2006, उत्तर प्रेदश के कुछ झीलों में तलछटीय जन्तु विविधता। अंतर्स्थलीय मात्स्यिकी - सिंहावलोकन, सिफरी बुलेटिन सं 144 : 143 - 147 । संपादक : आर. एन. सेठ, आर. एस. पांवार, एन. पी. श्री वास्तव, के. डी. जोशी एवं पी. आर. राव।

कुमार, डी. और के. डी. जोशी, 2007 उत्तर प्रदेश के झीलों में मात्स्यिकी का वर्तमान परिदृश्य एवं विकास की सम्भावनाऐं। राष्ट्रीय कार्यशाला - मात्स्यिकी अनुसंधान एवं विकास - दिशाऐं और आयाम ।

कुमार, डी., 2006 आर्द्रभूमि संसाधनों का मात्स्यिकीय प्रबन्धन एवं छत्तीसगढ़ में पेन या घेरे में मत्स्य/झींगा पालन की सम्भावनाऐं । सिफरी प्रशिक्षण बुलेटिन : पेन में मत्स्य एवं झींगा पालन, पृ. 6 - 10 ।

पनिक्कर, पी. और फिरोज खान, 2006 अंतर्स्थलीय मात्स्यिकी में पर्यावरणीय व्याधियॉ। मत्स्यगंधा (2005), 6 : 43 - 44 ।

वास, के. के. और श्रीवास्तव एन. पी., 2006 पूर्वोत्तर में जलाशय मात्स्यिकी एक परिदृश्य। के. म. शि. संस्थान

द्वारा आयोजित राष्ट्रीय संगोष्ठि का कार्यवृत्त पृ. 8 - 13

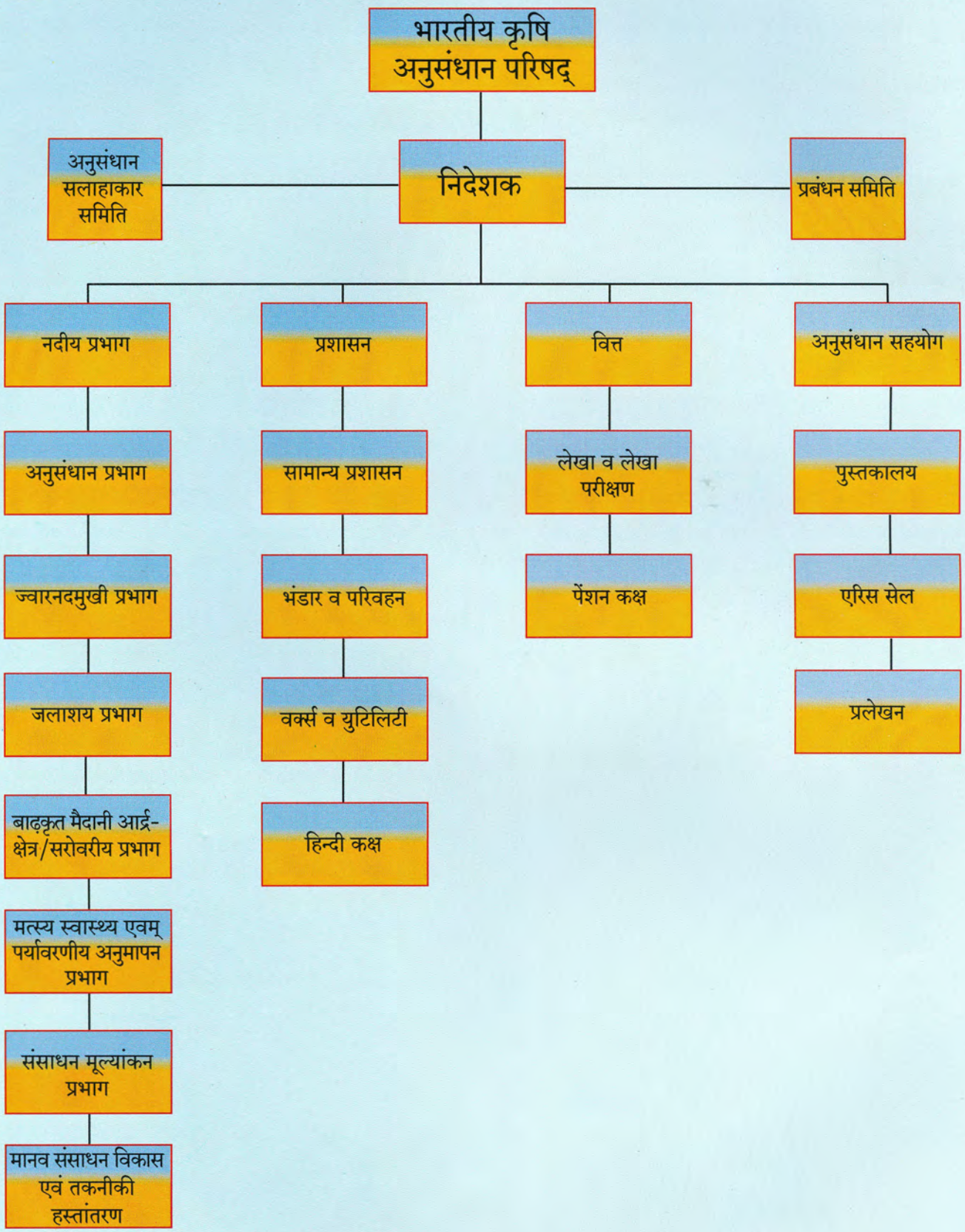
अंतर्स्थलीय मात्स्यिकी : सिंहावलोकन, सिफरी बुलेटिन संख्या 144।

तवा जलाशय-पारिस्थितिकी एवं मात्स्यिकी, सिफरी बुलेटिन संख्या 100।

हुगली मातलह ज्वारनदमुखी परितंत्र-एक और अध्ययन, सिफरी बुलेटिन संख्या 109।

पेन में मछली एवं झींगा पालन, सिफरी बुलेटिन संख्या 146।

राष्ट्रीय कार्यशाला - मात्स्यिकी अनुसंधान एवं विकास - दिशाऐं और आयाम - सारांश।


भारतीय कृषि अनुसंधान परिषद्
अनुसंधान सलाहाकार समिति
निदेशक
प्रबंधन समिति
नदीय प्रभाग
अनुसंधान प्रभाग
ज्वारनदमुखी प्रभाग
जलाशय प्रभाग
बाढ़कृत मैदानी आर्द्र-क्षेत्र/सरोवरीय प्रभाग
मत्स्य स्वास्थ्य एवम् पर्यावरणीय अनुमापन प्रभाग
संसाधन मूल्यांकन प्रभाग
मानव संसाधन विकास एवं तकनीकी हस्तांतरण
प्रशासन
सामान्य प्रशासन
भंडार व परिवहन
वर्क्स व युटिलिटी
हिन्दी कक्ष
वित्त
लेखा व लेखा परीक्षण
पेंशन कक्ष
अनुसंधान सहयोग
पुस्तकालय
एरिस सेल
प्रलेखन