## वार्षिक प्रतिवेदन Annual Report 2005 - 06



केन्द्रीय अंनर्स्थलीय मात्स्यकी अनुसंधान संस्थान (भारतीय कृषि अनुसंधान परिषद्) बैरकपुर, कोलकाता – 700 120

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



# **ANNUAL REPORT** 2005 - 2006



## **Central Inland Fisheries Research Institute**

(Indian Council of Agricultural Research) Barrackpore, Kolkata - 700 120



## **ANNUAL REPORT** 2005 - 2006

#### ISSN 0970-6267

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Published by	:	The Director CIFRI, Barrackpore
Printed at	:	Graphique International 12/1-B Madhab Chatterjee Lane
		Kolkata - 700 020

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## PREFACE

The Central Inland Fisheries Research Institute during the year continued its research to promote the understanding of production functions in our inland aquatic resources viz., rivers, reservoirs, estuaries, wetlands apart from addressing the issues related with resource assessment on GIS format including monitoring and management of fish and ecosystem health. In order to generate required database and provide policy support the institute worked on twelve 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 State 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 institute has also been involved with network projects with sister institutes, SAU's and other research organizations. At the international level two programmes one on reservoir fisheries and another on economic evaluation of improved strain of Labeo rohita in three states, in collaboration with CIFA and with the financial support from World Fish



Centre Penang, Malaysia, were executed satisfactorily. The progress under the projects has been appreciated at international review meetings. Significant information was provided to authorities on mangroves by CIFRI, for inclusion in mangrove based post-Tsunami restoration action plan for affected coastal areas. The institute remained committed to generate internal resources and the target set by council was achieved by overall 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. The CIFRI successfully coordinated setting up of "Pond to Plate" exhibition stall at ICAR pavilion at NE AGRI-EXPO-2006 during March 27-30, 2006 at Dimapur, Nagaland. 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.

The most important event of this year was inspection visit of Hon'ble Minister of Agriculture and Consumer Affairs, Food and Public Distribution, Government of India Shri Sharad Pawar Ji to CIFRI on 19th October, 2005. The Hon'ble Minister was accompanied by the Secretary DARE and DG, ICAR Dr. Mangala Rai and several other senior officers. The Hon'ble Minister evinced keen interest in



the achievement of CIFRI.

Chitranshi (ADG, I Fy); Dr. A.D. Diwan (ADG, M Fy), Shri Anil Agarwal (Pr. Scientist) and Shri A.S. Bhatia, Ex-Under Secretary and Shri Bage



the present Under Secretary in Fishery division is thankfully acknowledged.

All the achievements highlighted in this report are the outcome of the sincere efforts made by all members of staff 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 undertake the activities of this

All mandatory meetings of Research Advisory Committee, Staff Research Council, Management Committee, Institute Joint Staff Council, and Raj Bhasha committee were held as per schedule and actions 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 council especially Dr.V.R. 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, is duly acknowledged.

Barrackpore, Kolkata

August, 2006

K. K.Vass Director

## **EXCUTIVE 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 seventy scientists, eighty-five technicians, seventy-three administrative staff and hundred sixty-seven supporting personnel. The institute had a total budget of Rs.12 crores for the year 2005-2006.

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 the philosophy of VISION 2020 and recommendations of last QRT were kept in view, apart from directives received from SMD and Council from time to time. The institute also has a Management Committee guiding the 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, e c o l o g y , biodiversity, fish



#### **Riverine Fisheries**

The chemical and hydrological status of various rivers of India viz. Ganga, Ravi were evaluated for their water quality, hydrological and fisheries status. Accumulation of HCH and DDT pesticides in sediment was maximum at Farakka (68.0 ngg<sup>-1</sup>). An overall decline was observed in the fish landings at Sadiapur and Daraganj estimated at 74 t and 30 t with major carp and large catfishes contributing around 10 %. In river Ravi the main anthropogenic activity affecting it is water abstraction and pollution from agricultural practices close to catchment. Total estimated biomass was 4.4 t per month distributed as 1.6 t at Pathankot, 0.98 t at Kathlour, 0.38 t at Derababa Nanak and 1.42 t per month at Amritsar. The invasion of C. gariepinus within Yamuna, Sutlej and Beas is a cause of concern.

#### **Reservoir Fisheries**

Investigations on the reservoirs of Karnataka, Uttar Pradesh, Himachal Pradesh and Rajasthan were conducted for developing system specific management norms for fish yield enhancement. In all the reservoirs various aspects of ecology and fisheries were evaluated to develop the appropriate action plan. Observations in Pong Reservoir in Himachal Pradesh reveals



that the catch of exotic carp is independent of

its stocking. There is need to control the catfish population which is spreading at the cost of Indian Major Carps and exotic carps.

#### **Estuarine Fisheries**

The winter migratory bag net catch in lower Hooghly estuary was estimated at 28394.2 t during November, 2005- January 2006 with an average CPUE of 40.4 kg. This exhibits a decrease in catch by 1352.4t (4.6%) and increase of av. CPUE by 0.8 kg (2%) compared to the corresponding period last year which stood at 29746.6 t with an average CPUE of 39.6 kg. About 90 species of fish and prawn were encountered in the commercial fish landings. The annual fish production from the estuary was estimated at 110.08 t. Mullets contributed maximum at the rate of 18.2 % followed by prawns 14.2%, Bombayduck 10.9% and other groups sharing 6.3 - 8.0% of the total production. About 40 fish species belonging to 26 families and 36 genera were recorded from the Krishna estuary. The fish fauna was dominated by the estuarine and marine species. A total fish production of 540 t (=90 kg ha<sup>-1</sup>) was reported for the year 2005-06.

#### **Floodplain Fisheries**

Cage culture trials in floating cages of 27 m<sup>3</sup> size with *Catla catla*, *Labeo rohita*, *Labeo bata* and *Cirrhinus mrigala* fingerlings in size range of 0.09 to 1.03 g at a stocking density @ 10-20 lakh ha<sup>-1</sup> were conducted for 60-90 days. The fishes attained average size 10 g, 20 g, 11g, and 17g, respectively. Data of 118 beels from 23 districts of Assam was analysed and a model formula for calculation of optimum lease rates of the beels was developed. The formula derived is based on the principle that 15 % of the economic rent should be the optimum lease rate.

#### **Fish Health & Environment**

Bioindicators developed at biochemical, physiological and community levels were used holistically to assess environmental status of river Churni. The studies indicated that the number of the native species, families, column species, benthic species, number of intolerant species and percent herbivores decreased significantly (P<0.01). The index of biotic integrity (IBI) was significantly lower at stressed upstream sites. Monitoring of pesticides in river Ganga showed 4,4'-DDTs was present in concentrations higher than its permissible limits of EPA (USA) at all the sampling sites.

The experiments conducted on evaluation of chemicals for their pathogens inhibition properties revealed that copper sulphate, sodium nitrite, formalin, hydrogen peroxide, camphor and garlic inhibited growth of pathogenic field strain of *A. hydrophila* protease activity and aerolysin toxin expression.

#### **Resource** assessment

Digital base map has been prepared for twenty-five districts of Orissa. The mapping of water bodies with area above 10 ha has been completed for the Rajasthan state using post monsoon data. The rivers and streams have also been mapped in the state.

A centralized database has been developed at the institute on fish catch data collected from different inland ecosystems under different projects. The



data has been collected from Hooghly-Matlah estuary at Barrackpore, from Yamuna River and West Yamuna canal at Karnal and from Brahmaputra river at Guwahati.

#### **Other activities**

The meeting of the various committees of the Institute viz., SRC, RAC, Management Committee, 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.





#### **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 17 March 1947 in 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 a unit water area.

The Institute during late sixties and seventies focused 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 four All-India Coordinated Research Projects, one each on "Composite Fish Culture","Riverine Fish Seed Prospecting", "Air-breathing Fish Culture" and "Ecology and Fisheries Management of Reservoirs" and "Brackish Water Fish Farming". The success story of "Composite Fish Culture and Fish Seed Production" project 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, the CIFRI mandate was modified with greater emphasis on open water fisheries and aquatic resource management.

#### Mandate

In the light of changing scenario and to cater to the existing R&D needs of the sector, the Institute's research focus has shifted to:



## Sustainable Productivity and Ecsystem health and benefits

With this shift in focus, the revised mandate for CIFRI as proposed in revised VISION-2020 document of the institute, is as follows:

- Generate scientific database on fish and fisheries of Inland open-waters viz. rivers, estuaries including lagoons, reservoirs and wetlands
- Developing ecosystem based management strategies for sustainable fishery enhancement in reservoirs and wetlands
- Monitoring ecosystem changes and their impacts on fisheries and developing mitigation plans.
- Providing policy support for responsible fisheries and conservation of inland aquatic ecosy+stems

#### **Organisational structure**

Presently 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 Karnataka. 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 (Kolkata)-based Estuarine Division is involved in working on estuarine fishery and ecology, coastal wetlands and Sunderban mangrove

#### ecology. The Fish Health and Environment

**Division**, 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.



Hon'ble Union Agriculture Minister visits Bio-Technology laboratory

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 (Kolkata) and conducts research aiming at creating a database on the fishstocks 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.





Hon'ble Union Agriculture Minister visits GIS laboratory

The Human Resource Development and Transfer of Technology Division is located at Barrackpore (Kolkata). 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



Director CIFRI addresses fish farmers



Demonstration of penculture technique to farmers of Uttar Pradesh

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.



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## **ORGANOGRAM OF CIFRI**





#### **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 811 books, out of which 678 books are in Hindi, 50 miscellaneous publications and 675 loose issues of journals to its collection and subscribed 17 foreign, 37 Indian and 77 e-Journals (foreign) during the year. The current total holdings of the library are 10812 books, 4296 reprints, 1252 maps and 4321 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 Library has exchange programmes with other National and International organizations. A budget of Rs. 17.55 lakh was provided and spent during the year 2005-06 for procuring library books, journals and other reading materials. The publication of Indian Fisheries Abstracts was continued. Library has updated the Current Contents for the period Jan. - Dec. 2005.

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. Research progress is monitored through RPF I, II and III. 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.

It is entrusted with the responsibility 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' section monitored the progress of Research Projects of the Institute. The section processed the research papers submitted by the scientists for their publications in different journals and for presentation symposia/ in



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 scientists at main building.



### Budget Statement for the year 2005 –2006

(Rs in lakhs)

Head of Account	Budge	t (R.E.)	Expenditure			
ficula officeounic	Plan	Non plan	Plan	Non plan		
Pay & allowances including OTA	-	799.55	-	792.54		
T.A	4.98	9.40	4.98	9.40		
Other charges including I.T and H.R.D	137.09	97.00	136.73	95.99		
Works	28.93	20.05	28.93	19.64		
Others	-	1.00	1 -	0.92		
Grand total	171.00	927.00	170.64	918.49		
N.E component	15.00	-	12.91	-		





North East budget and expenditure



	Staff position as o	n March 31, 2006	
Serial No.	Category	Sanctioned	In position
1.	Director (RMP)	01	01
2.	Scientific	98	70*
3.	Technical	90	85
4.	Administrative	80	73
5.	Supporting	168	167
	Total	437	396

\*Including four (4) Technical Personnel of KVK adjusted against scientific post

2



#### Staff position as on March 31, 2006



## RESEARCH ACHIEVEMENTS

R e s e a r c h achievements during the year

2005-2006 under major programmes areas at CIFRI are given hereunder:

#### 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 and Fishery of the River Ravi**

River Ravi the third important tributary of Punjab component of Indus river system has a total length of 720 km, draining 370 km of Indian territory, out of which 200 km in within Himachal Pradesh and 170 km within Punjab, where it forms the potamon zone and is exploited for its fishery resources.

#### Anthropogenic activity

Main anthropogenic activity impacting Ravi river within India is large scale water abstraction and pollution from agricultural activities to some extent. The leaching of fertilizer and pesticide washings directly into river is the main source of effluents, as agricultural fields are situated along its banks. The river is not subjected to industrial and municipal runoffs, as its drainage area has a few industries, mainly at Gurdaspur (1 Distillery and 1 Paper Board) and main cities are located 20-30 km away from its banks.

#### Water quality

The Ravi river water within Punjab depicts average temperature range between 20.5-25.3°C, the upper Shahpur stretch, can be delineated into cool water zone, since the stretch records temperature range between 20-22°C during peak summer. The lower stretch exhibit wide seasonal variation in thermal regime between 18 to 32°C. The river water was alkaline throughout its course with pH range of 7.3-7.4. Water contains sufficient dissolved oxygen (7.8-8.3 mg 1<sup>-1</sup>), low B.O.D. and C.O.D. values with chloride content (11.5-15 mg 1<sup>-1</sup>) and specific conductivity (162.5-241.0 µmhos cm<sup>-1</sup>) indicating low nutrient load. Total alkalinity range of 76-101.5 mg 1<sup>-1</sup> indicates its productive nature.

Range of silicate  $(5.2-6.0 \text{ mg } l^{-1})$  calcium  $(25.3-36.5 \text{ mg } l^{-1})$  and magnesium  $(12.6-15.9 \text{ mg } l^{-1})$  were moderate in the river water.

Gross primary production as mg C m<sup>-3</sup> hr<sup>-1</sup> was high (156.25-250) during pre-monsoon, moderate (93.75-140.62) during monsoon and (93.75-187.5) post-monsoon and low (78.12-109.375) during winter.

#### Sediment quality

Soil texture in upper zone of the river upto Kathlour was sandy having 61 to 71.3% sand, 20.9 to 27.7% silt and 7.8 to 11.3% clay. At lower zone (Dharmkot Pattan) the river bed was loamy sand having 51.5% sand, 31.5% silt and 17.0% clay, reaction was alkaline with pH (7.3-7.4), available nitrogen (13.3-20.4 mg 100g<sup>-1</sup>), available phosphorus (0.4-0.6mg100g<sup>-1</sup>), specific conductivity (220-360.3  $\mu$ mhos cm<sup>-1</sup>).

#### **Biological features**

*Plankton:* Average plankton density in the river was 50-128 u l<sup>-1</sup>. The density was comparatively

higher in post-monsoon  $(77-134 \text{ u } \text{l}^{-1})$  than pre-monsoon  $(67-120 \text{ u } \text{l}^{-1})$  and monsoon  $(33-67 \text{ u } \text{l}^{-1})$ .

Plankton population was dominated by diatoms (48-70%), followed by green algae (17-33%). Zooplanktons mainly represented by Rotifers are present in middle segment only forming 13-18% of total population.

**Periphyton:** The average periphyton concentration ranged 374-635 u cm<sup>-2</sup>; it was maximum in winter 467-1100 u cm<sup>-2</sup>, and minimum in monsoon 167-367 u cm<sup>-2</sup> dominated by diatoms 68-77% with blue greens recorded in the range of 12-17%.

*Macrobenthos:* The average macrobenthic density ranged between 790-5310 u m<sup>-2</sup> and was minimum at Dharamkot Pattan and maximum at Kathlour. The density was high during post-monsoon, 1497-5310 u m<sup>-2</sup> and minimum during monsoon 67-1863 u m<sup>-2</sup>.

*Macrophyte:* Macrophytes were mainly present at Kathlour (0.8 kg m<sup>-2</sup> wet biomass) and at Modhopur (nil-0.2 kg m<sup>-2</sup>) during pre-monsoon.

Macrophyte associated fauna: Meiofauna density varied between 27-180 u m<sup>-2</sup>, highest at Kathlour and lowest at below barrage. The associated fauna like all biotic organisms was more during post-monsoon (12 to528 u m<sup>-2</sup>) minimum during monsoon (nil-24 u m<sup>-2</sup>). During winter Shahpur stretch had substantial population (144 u m<sup>-2</sup>) whereas it was low (nil-44 u m<sup>-2</sup>) in lower stretch.

#### Fisheries

*Estimated Fish catch* : Total estimated fish biomass was 4.40 t month<sup>-1</sup> distributed as 1.62 at Pathankot, 0.98 at Kathlour, 0.38 at Derababa Nanak and 1.42 t month<sup>-1</sup> at Amritsar. Catch estimated at Pathankot centre during



post-monsoon include the surplus catch from Kathlour and at Amritsar from Saki drain, respectively.

Seasonal catch estimate revealed poor fish produce during pre-monsoon, 1.06 t month<sup>-1</sup> compared to post-monsoon, 6.05 t month<sup>-1</sup> and winter 3.16 t month<sup>-1</sup>

Fish catch composition: Fish composition revealed that the minor carps, represented by L. dero, C. reba, L. dyocheilus and L. bata form major fishery of the river contributing 55.68% to the total catch. The miscellaneous group represented mainly by Murrels, *Puntius* sp., X. cancilla, etc. was next higher group forming 22.05% followed by C. carpio (12.05%) while IMC constituted only 2.50% of total population.

Large size catfishes formed only 1.59% of total population present either at Pathankot and Amritsar, and mainly contributed by *W. attu* during post-monsoon. While *T. putitora* representing 4.31% and *S. richardsonni* 1.82% of the total population, were recorded mainly in Pathankot region.

#### 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.P.
Mohanty, B.D. Saroj, S.K. Srivastava, J.P.
Mishra, Kalpana Srivastava.



About 2000 km stretch of the river Ganga, from

Deoprayag to Farakka, was investigated at 13 predetermined sampling centers using standard methodologies.

#### Water and Sediment Quality

Current velocity was maximum at Deoprayag (2.85 km hr<sup>-1</sup>) and minimum at Farakka (0.68 km hr<sup>-1</sup>) while silt load was maximum at Patna (608.6 g m<sup>-3</sup>). The discharge of water in Ganga has shown considerable decline over the years with tremendous increase in siltation rate.

Sediment between Deoprayag and Farakka were dominated by sand (56.0 to 99%) with silt and clay showing considerable increase at the down stream (Bhagalpur to Farakka). The sediment chemistry was alkaline pH (7.2 to 7.9) poor available nutrients (N – 3.8 to 8.0 and P – 0.8 to 2.2 mg 100g<sup>-1</sup>) and poor organic carbon (0.012 to 0.23%).

The water quality of Ganga revealed that it was rich in oxygen (6.2 to 9.2 mg  $\Gamma^1$ ), with alkaline pH (8.0 to 8.2), poor nutrients (NO3-N 0.01 to 0.06 mg  $\Gamma^1$  & PO4 – P nil to 0.05 mg  $\Gamma^1$ ) and high dissolved organic matter (0.89 to 2.55 mg  $\Gamma^1$ ).

On the basis of water quality parameters, viz. alkalinity, conductance, dissolved solids, hardness and chloride, the river Ganga appears to be divided into three zones, upper zone (Deoprayag to Haridwar) recording minimum concentration of above parameters (70.3 mg l<sup>-1</sup>, 184.5  $\mu$ mhos, 92.4 mg l<sup>-1</sup>, 66.4 mg l<sup>-1</sup> and 14.2 mg l<sup>-1</sup>); middle zone (Kannauj to Varanasi) having maximum values (150.2 mg l<sup>-1</sup>, 456  $\mu$ mhos, 227 mg l<sup>-1</sup>, 158.7 mg l<sup>-1</sup> and 30.8 mg l<sup>-1</sup>) and Lower Zone (Patna to Farakka) having values in between the two (107.5 mg l<sup>-1</sup>, 244.7  $\mu$ mhos, 122.9 mg l<sup>-1</sup>, 130.6 mg l<sup>-1</sup> and 18.3 mg l<sup>-1</sup>).

Based on the rate of energy transformation and potential energy resource the river Ganga can be divided into three zones, upper zone having minimum values (1453 cal m<sup>-2</sup> d<sup>-1</sup> & 60, 360 Kcal ha<sup>-1</sup>) middle zone maximum (5064 cal m<sup>-2</sup> d<sup>-1</sup> & 2,09, 520 Kcal ha<sup>-1</sup>) and lower zone values in between (2404 cal m<sup>-2</sup> d<sup>-1</sup> & 99, 840 Kcal ha<sup>-1</sup>). The energy deposited as organic detritus was maximum at Kanpur (8.4x104 cal m<sup>-2</sup>) and minimum at Deoprayag (0.18x10<sup>4</sup> cal m<sup>-2</sup>).

#### Pesticides and heavy metals

Accumulation of pesticides in sediment was maximum at Farakka (68.0 ng g<sup>-1</sup>) and minimum at Deoprayag (5.4 ng g<sup>-1</sup>) however, in molluscan samples the contamination was more between Kanpur to Varanasi (12 to 16.8 ppb), HCH & DDT were the main component.

Accumulation of Cu, Pb, and Zn in sediment were minimum at Deoprayag (0.6, 4.8 and 8.4  $\mu$ g g<sup>-1</sup>) and maximum at Allahabad (18.6, 40.6 and 76.8  $\mu$ g g<sup>-1</sup>). Similar pattern was observed in water phase also. The metals levels were found to be maximum in the molluscan samples from Kanpur (0.84, 2.98 and 10.8 ppm). Cr was detected only at Kanpur and Cd levels recorded levels remained invariably low.

#### **Biological features**

**Plankton** Numerical abundance of plankton ranged between 58 to 285 u 1<sup>-1</sup> between Deoprayag to Kanpur and 188 to 496 u 1<sup>-1</sup> between Allahabad and Farakka. Phytoplankton



remained the dominant component with numerical superiority of diatoms in the upper stretches and chlorophyceae in the lower stretches.

*Periphyton* population was maximum at Varanasi (2686 u cm<sup>-2</sup>) and minimum at Deoprayag (410 u cm<sup>-2</sup>), diatom being the most dominant component.

**Benthos** The qualitative and quantitative picture of benthos varied in three zones of Ganga river, the upper zone being poor in population with dominance of insects, middle zone with maximum abundance dominated by chironomids, and the lower zone dominated by molluscs and having moderate abundance.

#### Fishery

At Kanpur a total of 2200 ml spawn and at Varanasi a total of was 712 ml of spawn could be collected with a qualitative index of Indian Major carp being (18.5 to 44.5%).

Fish landing at Sadiapur and Daraganj were estimated at 74.25 t and 30.0 t; with major carps and large catfishes contributing around 10% each. An overall decline in catches was recorded at both centres as compared to preceding year.

#### **ESTUARINE ECOLOGY AND FISHERY**

#### STUDIES ON THE ESTUARINE ECOSYSTEMS AND MANGROVE OF EAST COAST IN RELATION TO THEIR PRODUCTION POTENTIAL

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Amitabha Ghosh, J. G. Chatterjee, H. C.
Karmakar, B. C. Jha, N. P. Srivastava,
K.R.Naskar, B. B. Satpathi, A.Hajra, 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.

Investigations were conducted on the production

fluctuations in relation to hydrobiology in Hooghly Estuarine system.

#### **Biological status**

#### Winter Migratory Bagnet Fishery

The winter migratory bag net catch in lower Hooghly estuary was estimated at 28394.2 t during November, 2005- January, 2006 with an average CPUE of 40.4 kg. This exhibits a decrease in catch by 1352.4 t (4.6%) and increase in average CPUE by 0.8 kg (2%) compared to the corresponding period last year that was 29746.6 t with an average CPUE of 39.6 kg. The dominant species contributing to winter migratory bag net fishery in order of abundance were Harpodon nehereus (30.9%), Setipinna sp. (17.7%), Trichiurus sp. (9.0%), Pama pama (8.9%), Coilia sp.(8.9%), Prawns (3.4%), Mackerel (2.9%), Pompus argenteus (0.9%) etc. These species alone accounted for about 82.2% of the total landings of winter migratory bag net fishery. During 2005-06 fishing effort (702903 net-tides) was also 6.4% less compared to fishing effort during last winter (750880 net-tides) which is encouraging for the fishery. But the effort level is still 67.6 % higher than permissible maximum effort, fMSY (419287 net-tides) (worked out using Fox model, last year) indicating over exploitation.



transitional and high

saline zones of

Fish diversity study recorded eighty five summer, which extended further up to 52 km during monsoon with increase in freshwater discharge. This indicates that the estuarine mixing zone with the seas, where the fishing activity is

Pama

Pama 9%

Coilia

sp.9%

species of fish belonging to 13 orders and more than 30 families from freshwater,

consistently at a peak in winter, contributes about 90% to the total estuarine SPECIES COMPOSITION OF WINTER MIGRATORY production. No



clear relationship however, could be established between river Setipinna sp. 18% discharge, pollution load, salinity and fish catch.

#### Water quality

#### Table 1 Water quality variations in the marine zone of Hooghly estuary

Parameters	(225 kn	Frazerganj n from Barra	ckpore)	(230 kr	Kalisthan n from Barra	ckpore)	Sagar (7 Sites) (185 km from Barrackpore)		
	November	December	January	November	December	January	November	December	January
Salinity (ppt)	15.01- 16.64	20.06- 23.856	24.76	13.57- 16.64	20.246- 21.87	29.63	5.806- 20.25	6.00-7.6	17.36- 20.25
Dissolved Oxygen (mg <sup>-1</sup> )	6.40-7.20	7.27.4	7.6	5.60-7.20	7.2-7.2	7.2	6.4-7.28	15.20- 27.10	7.6-8.0
Nitrate-N (mg <sup>-1</sup> )	0.104- 0.112	0.072- 0.104	0.076	0.096- 0.108	0.14- 0.176	0.104	0.100- 0.352	0.052- 0.124	0.056- 0.108
Phosphate-P (mg <sup>-1</sup> )	0.062- 0.073	0.036- 0.045	0.065	0.070- 0.073	0.038- 0.047	0.0375	0.040- 0.134	0.026- 0.060	0.045- 0.065
Gross Primary productivity (mg Cm <sup>-3</sup> h <sup>-1</sup> )	166.67- 230.00	125.0- 166.67	166.67	58.34- 166.67	125.0- 166.67	166.67	20.83- 83.34	37.5- 83.33	83.33- 125.0

H.nehereus

30%

18

#### Mangrove

Studies on the recruitment of fishes in the mangrove associated areas (Jharkhali and Bokkhali) indicated the presence of seeds of Liza parsia, Therapon jarbua, Pama pama, Harpodon neherius, Setipinna taty, glass eels, much higher at the seaward site as indicated by

lower  $NO_3$ -N : tot.-N at 0.1). The nitrifying activity on organic N inputs from mangrove was apparently slow. The PO4-P concentrations was two times higher at Bakkhali than at Jharkhali which

larvae of Engrauliidae, other Gobidae, Sciaenidae etc., besides larvae of the coveted *P. monodon* and other penaeid prawns and hermit crab.

The physico-chemical attributes and nutrient distribution in the mangrove fringed macrotidal region of

Hooghly estuary at Jharkhali and Bakkhali indicated that dissolved oxygen was above saturation level and average salinity was 17 ppt at both Jharkhali and Bakkhali. Total-N concentrations in water peaked downstream at Bakkhali, showing N enrichment by 3 times. The proportion of organic N (of tot.-N) in water was



Mangroves of Sunderbans, West Bengal

accounted for a molar N : P ratio of 2.55 and 10.22 respectively. The soil nutrient status indicated that downstream and upstream sites are equally productive in terms of available –N, available –P. The C/N ratio did not vary to a great extent

(~ 90) implying that the rate of mineralisation of organic matter is similar, though not very efficient. The leaves of *Excoecaria* and *Avicennia* species of mangrove were analysed and found to contain 73.2 % and 60.8 %, 19.2 % and 18.0 %, 8.6 % and 9.0 %, and 17.1 % and 22.4 % of moisture, protein, fat and ash, respectively.

#### Water quality

Table 2 Water and soil quality variations in mangrove covered Hooghly estuary and associated wetlands

Parameters	Upstream site-	Downstream site-	Mangrove
(Values in range)	Jharkhali	Bakkhali	Wetlands
Water Salinity (ppt)	10.68 – 20.61	17.04 – 17.04	9.96 – 19.70
Dissolved $O_2 (mg l^{-1})$	5.20 - 6.40	7.40 - 8.00	6.00 - 8.40
Total-N (mg $l^{-1}$ )	0.284-0.436	1.037-1.150	0.276-0.462
Nitrate (mg $l^{-1}$ )	0.132 - 0.204	0.084 - 0.10	0.156 - 0.192
Phosphate $(mg 1^{-1})$	0.028 - 0.04	0.09 - 0.12	0.018 - 0.034
Gross Primary productivity (mg C m <sup>-3</sup> h <sup>-1</sup> )	83.33-83.33	125.00-125.0	187.50 - 187.50
Soil Available –N (mg 100g <sup>-1</sup> ) soil)	14.00-14.00	. 11.20-11.20	19.60-22.40
Available –P (mg 100g <sup>-1</sup> soil)	0.123-0.123	0.117-0.117	0.089-0.117



#### Mahanadi estuary

#### Water quality

The salinity gradient was prominent only during premonsoon (7-31 ppt) covering brackishwater tidal zone (BWTZ) and marine zone (MARZ). During turbulent monsoon significant variation in suspended matter from river end to the estuary mouth is recorded. The highest Tot.-N concentrations were consistent in the monsoon throughout the estuarine stretch. The sustained modest level of  $NH_4$ -N with a summer peak suggested the importance of nutrient cycling. The soil quality showed that the available N was consistently high in all sites. Available P in soil shot up to the highest level in post monsoon period compared to other seasons and the FWAZ was comparatively poorer in P. The gross productivity ranged from 43.33 – 166.67 mg C m<sup>-3</sup> h<sup>-1</sup> with an annual average between 104.15 mg C m<sup>-3</sup> h<sup>-1</sup> and 131.94 mg C m<sup>-3</sup> h<sup>-1</sup> for the four zones of the estuary.



Restricted freshwater discharge affects post-monsoon hydromorphometry of Mahanadi estuary

 Table
 3 Spatio-temporal variation of water and soil quality parameters in Mahanadi estuary during 2005-06

Parameters	Fres	hwater	zone	Freshwater tidal zone			Brackishwater tidal			Marine zone		
	(Val	ues in 1	range)	(Values in range)			zone(Values in range)			(Values in range)		
3	Pre-	Monsoon	Post-	Pre-	Monsoon	Post-	Pre-	Monsoon	Post-	Pre-	Monsoon	Post-
1	monsoon		monsoon	monsoon		monsoon	monsoon		monsoon	monsoon		monsoon
Water						11 m					-	
Salinity	0.065-	0.044-	0.0437-	0.08-	0.04-	0.044-	7.03-	0.04-	0.076-	16.99-	0.199-	5.44-
(ppt)	0.08	0.051	0.055	0.082	0.044	0.071	7.61	0.044	1.231	31.61	1.228	10.96
Dissolved O <sub>2</sub>	6.0-	4.8-	7.2-	6.4-	6.0-	7.2-	4.8-	5.6-	7.6-	4.8-	4.8-	6.8-
(mg1 <sup>-1</sup> )	7.2	6.0	84	6.8	6.0	8.0	6.8	6.0	8.8	5.6	5.6	9.2
Total-N	0.415-	0.89-	0.568-	0.370-	0.70-	0.47-	0.149-	0.99	0.580-	0.555-	0.80	0.622-
(mg1 <sup>-1</sup> )	0.453	0.94	0.655	0.381	0.84	0.52	0.250	0.103	0.465	0.680	0.82	0.504
NH <sub>4</sub> -N	0.176-	0.35-	0.285-	0.146-	0.29	0.335-	0.017-	0.31-	0.084-	0.175-	0.27	0.104-
(mg1 <sup>-1</sup> )	0.191	0.35	0.250	0.152	0.33	0.35	0.012	0.35	0.067	0.179	0.31	0.091
Nitrate	0.05-	0.41-	0.07-	0.06-	0.18-	0.05-	0.075-	0.14-	0.08-	0.018-	0.4-	0.09-
(mg1 <sup>-1</sup> )	0.062	0.688	0.224	0.65	0.416	0.18	0.082	0.85	0.196	0.023	0.56	0.116
Phosphate (	0.01-	0.212-	0.025-	0.025	0.320-	0.0275-	0.143-	0.312-	0.033-	0.213-	0.264-	0.075-
(mg1 <sup>-1</sup> )	0.035	0.380	0.173	0.048	0.384	0.166	0.151	0.412	0.220	0.453	0.596	1.463
Gross Primary	83.33-	41.67-	125.0-	83.33-	83.33-	83.33-	83.33-	83.33-	83.33-	83.33-	83.33-	166.67
productivity	125.00	125.00	125.0	166.67	83.33	125.0	166.67	125.00	125.00	166.67	125.00	166.67
$(\mathrm{mg}\mathrm{Cm}^{-3}\mathrm{hr}^{-1})$												
Soil												•
Available -N	19.6-	1.12-	5.60-	19.04-	0.56-	4.30-	18.46-	12.32-	6.30-	19.12-	0.56-	4.80-
(mg 100g <sup>-1</sup> )	20.16	3.36	7.00	19.10	8.40	4.30	19.32	13.44	7.70	20.10	10.64	6.30
Available -P	0.76-	1.22-	1.143-	1.08-	1.20-	2.47-	1.56-	1.02-	1.13-	1.32-	1.28-	1.14-
(mg 100g <sup>-1</sup> )	1.12	1.65	1.277	1.48	1.33	2.03	1.68	1.54	1.18	2.87	3.68	1.42



#### **Biological status**

Plankton comprised 38 genera of phytoplankton and 17 genera of zooplankton. The macrobenthic fauna was sustained by 11 genera of molluscs, 3 genera of annelids, insect larvae and some crustaceans.

A total of 90 species of fish and prawn were encountered in the commercial fish landings. The annual fish production from the estuary was estimated at 110.08 t. Mullets contributed maximum at the rate of 18.2 % followed by prawns 14.2%, Bombayduck 10.9% and other groups sharing 6.3 - 8.0% of the total production. Breeding and recruitment of major carps was low in the freshwater zone. Early recruitees were comparatively more in the brackishwater zone being the natural breeding and rearing ground for the resident and migrant population of fishes and prawns. The post larvae of *P. monodon* were available almost round the year. Juveniles of *T. ilisha* were recorded during the post monsoon season but the relative numerical abundance was low in the total catch.

#### Krishna Estuary

**Chemical status :** Freshwater zone was not recorded at Krishna estuary. Gradient and marine zones were found during monsoon and postmonsoon periods only with hyper saline condition during summer. Gross primary production in mg C m<sup>-1</sup> hr<sup>-1</sup> was maximum during post monsoon (Av. 78.7) followed by pre-monsoon (78.0) while it was slightly low during monsoon (78.86).

Parameters	Pre-monsoon	Monsoon	Post-monsoon
Water			
D.O. (ppm)	6.0-7.1	6.5-7.3	6.6-8.4
PH	7.4-7.6	7.4-7.8	8.0-8.5
Sp. cond. (mScm <sup>-1</sup> )	11.15-20.15	0.08-10.32	1.07-19.41
Total alkalinity (ppm)	120-172	92-118	112-166
Salinity (ppt)	19.88-35.59	1.83-19.88	2.10-29.60
PO4 (ppm)	0.02-0.10	0.12-0.19	0.07-0.17
NO3 (ppm)	0.01-0.03	0.14-0.45	0.06-0.16
Silicate (ppm)	0.7-10.8	9.16-1.11	2.9-8.7
Soil :		Carlo and the second second	State of the second second
PH	7.25-7.56	7.00-7.65	7.1-7.8
Total N (%)	0.01-0.20	0.01-0.05	0.02-0.04
Avail. N (mg 100g <sup>-1</sup> )	6.0-14.56	5.00-17.36	7.28-15.68
Avail. P2O5 (mg 100g <sup>-1</sup> )	2.48-5.76	0.38-5.94	1.76-6.24
Organic carbon (%)	0.09-0.27	0.12-0.54	0.24-0.63
			and the second second second second
Primary production	74.17-91.67	50.00-104.17	62.08-104.17

Table 4 Physico-chemical features of water and soil and primary production of Krishna estuary



#### **Biological status**

Fishery: 40 fish species belonging to 26 families and 36 genera were recorded from the Krishna estuary. The fish fauna was dominated by the estuarine and marine species. A total fish production of 540 t (=90 kg ha<sup>-1</sup>) was recorded for the year 2005-06. The total fishing effort and CPUE were estimated as 36,000 boat-tide; 13.6 kg boat<sup>-1</sup> tide<sup>-1</sup> in post- monsoon and 3750 boat-tide; 1.74 kg boat<sup>-1</sup> tide<sup>-1</sup> in pre-monsoon respectively. The breeding and recruitment of commercially important species are taking place in the estuary. Higher abundance of spawn was observed in the upper zone (75-85 nos. net<sup>-1</sup>hr<sup>-1</sup>) as compared to the lower zone of the estuary (3-8 nos.net<sup>-1</sup>hr<sup>-1</sup>) during monsoon. **Benthos:** The population showed seasonal

variation in Krishna estuary. The density of macro-benthos was low (1027 nos m<sup>-2</sup>). The concentration was more in the gradient and upper zones (67%) than the marine zone (33%).

#### DYNAMICS OF BIOTIC COMMUNITIES OF CERTAIN ESTUARINE SYSTEMS F R O M E N V I R O N M E N T A L PERSPECTIVES

S.N. Singh, V. Kolekar, R.K. Sah, T.K. Halder

#### **Ecology of Mahi Estuarine System**

Abiotic and biotic parameters were evaluated at six sites in the estuary having different salinity



#### Water Quality

The water temperature varied from 18.5 to 37.0°C. The transparency level was least in monsoon and fluctuated between 6.0 to 88.0 cm. Owing to comparatively high tidal oscillation, the lower estuarine

site viz., Dhuvaran recorded lowest transparency regime. The average pH of water was alkaline and the values ranged from 7.83 to 8.16. The dissolved oxygen level varied from 7.14 to 9.26 mg  $1^{-1}$ , salinity was high at lower estuarine sites as compared to upper and it varied from 0.084 to 36.0 g  $1^{-1}$ . Other parameters viz., specific



**Fish catch of Krishna Estuary** 

**Plankton:** The mean abundance of total plankton collected in three seasons viz., pre-monsoon (494 nos  $1^{-1}$ ), monsoon (236 nos  $1^{-1}$ ) and post- monsoon (318) from Krishna estuary was compared statistically and found that mean abundance during pre-monsoon was significantly (p<0.01) higher than post-monsoon and monsoon.



c onductance(0.54 - 10.84 mS  $cm^{-1}$ ), total

dissolved solids  $(0.352 - 7.046 \text{ g l}^{-1})$  and total alkalinity (98.0 to 180.0 mg l<sup>-1</sup>) were high at Dhuvaran being the lower estuarine site.

Based on the average availability of phosphate, which varied from 0.057 to 0.08 mg  $1^{-1}$ , the estuaries may be categorized as poor to fairly productive. However, nitrate (0.49–0.65 mg  $1^{-1}$ ) and silicate (4.93 to 10.37 mg  $1^{-1}$ ) discerned more or less identical trend of distribution.

#### **Sediment Quality**

The sediment reaction was alkaline and pH varied from 6.73 to 7.69. The lower estuarine site, viz. Dhuvaran experienced high specific conductance  $(0.31 - 2.82 \text{ m S cm}^{-1})$  as compared to upper sites  $(0.03-0.59 \text{ m S cm}^{-1})$ . There was little variation  $(5.62 \text{ to } 7.28 \text{ mg}100\text{g}^{-1})$  in average content of available nitrogen. The available phosphorus fluctuated between 0.146 to 1.0 mg l<sup>-1</sup>. The average content of organic carbon and free CaCO<sub>3</sub> were 0.32 to 0.42% and 7.17 to 8.42% respectively. The soil texture

was predominantly sandy.

#### Plankton

Dhuvaran, the lower estuarine site, recorded an average planktonic abundance of 99 u  $1^{-1}$ Phytoplankton constituted (80.81 %) followed by zooplankton (16.16%). Gambhira, centre had average netplankton abundance of 168 nos.1<sup>-1</sup>. Phytoplankton contributed (91.66%) and zooplankton contribution was (7.74%).

In Sindhrot, centre average net-plankton abundance was 309 nos. 1<sup>-1</sup> Phytoplankton (92.23%) was the major component followed by the zooplankton (7.77%). Vasad, site recorded an aver age plankton population of 346 nos1<sup>-1</sup> with Phytoplankton contribution of (97.12%) and zooplankton (2.60%). Bhadarva site had high average plankton abundance of 531 nos.1<sup>-1</sup> with contribution of phytoplankton (96.61%) and zooplankton (3.20%). Sevalia, representing the freshwater site, recorded highest plankton abundance of 787nos.1<sup>-1</sup>. Phytoplankton (98.22%)contributing bulk and the zooplankton population being (1.65%).

Sites	Dhu	varan	Gam	nbhira	Sind	dhrot	Va	isad	Bha	darva	Sev	alia
Planktonic groups	Av.	%	Av	%	Av.	%	Av.	%	Av.	%	Av	%
Myxophyceae	3	3.03	10	5.95	68	22.0	132	38.15	39	7.34	78	9.91
Bacillariophyceae	69	69.70	123	73.21	199	64.40	187	54.05	441	83.05	666	84.63
Chlorophyceae	8	8.08	21	12.50	18	5.82	17	4.92	33	6.22	29	3.68
Phytoplankton	80	80.81	154	91.66	285	92.23	336	97.12	513	96.61	773	98.22
Protozoa	6	6.06	2	1.19	2	0.65	2	0.58	3	0.56	2	0.25
Rotifera	3	3.03	4	2.38	8	2.59	2	0.58	4	0.75	6	0.76
Cladocera	-		-		1	0.32	1	0.28	1	0.19	-	
Ostracoda	-	-		-	-	an sea	11:4	-	1	0.19	-	-
Copepoda	7	7.07	7	4.17	13	4.21	4	1.16	8	1.51	5	0.64
Zooplankton	16	16.16	13	7.74	24	7.77	9	2.69	17	3.20	13	1.65
Un-identified organism	3	3.03	1	0.60	-	-	1	0.28	1	0.19	1	0.13
Total plankton	99	100.0	168	100.0	309	100.0	346	100.0	531	100.0	787	100.0



#### **Macro-benthos**

Dhuvaran, harboured poor average macro-benthic population of 120 nos.m<sup>-2</sup>, Gambhira site recorded average macro-benthic abundance of 236 nos.m<sup>-2</sup>.Sindhrot site contained an average macro-benthic population of 472 nos.m<sup>-2</sup> Vasad site harboured higher macro-benthos abundance of 984 nos. m<sup>-2</sup>. Bhadarva site recorded average macro-bentic population of 679 nos.m<sup>-2</sup>. Sevalia site representing fresh water extent experienced an average macro-benthic abundance of 996 nos.m<sup>-2</sup>.

#### **Organic Production**

The gross production rate for Mahi estuarine system varied from 25.0 to 375 .0 mg C m<sup>-3</sup> hr<sup>-1</sup> and the net production rate varied from 16.67 to 208.33 mg C m<sup>-3</sup> hr<sup>-1</sup>. Based on the average production rate, the producers retained energy varying from 54.02 to 61.11 % and this reflected congenial environmental status of Mahi estuarine system.

#### **RESERVOIR FISHERY**

#### ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS

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#### Kabini reservoir

#### **Chemical Status**

Water quality: Water temperature fluctuated from 22.5 to  $26.0^{\circ}$  C, pH from 8.5 to 9.0and specific conductance from 59 to 87(mS cm<sup>-1</sup>) and transparency from 0.9 to 1.5 m. The dissolved oxygen values ranged from 5.2 to 7.0 mg 1<sup>-1</sup>. The gross primary production varied from 78.13 to 89.3 mg C m<sup>-3</sup> hr<sup>-1</sup> and the net primary

production from 60.94 to 68.14 mg C m<sup>-3</sup> hr<sup>-1</sup>.

Phosphate values ranged from 0.04 to 0.62 mg  $1^{-1}$ , nitrate from 0.02 to 0.175 mg  $1^{-1}$  and silicate showed values with an overall range from 4.3 to 6.36 mg  $1^{-1}$ 

#### **Biological status**

The phytoplankton population showed the chlorophyceae to record the highest density both at lentic (82%) and lotic (93%) stations.



Phytoplankton composition in Kabini

Among zooplankton, cladocerans (37.7%) dominated the lentic station followed by copepoda (26.4%) while copepoda (68%) dominated the lotic station. The Cladocerans were prominent in September and June. The periphyton counts ranged between 450 and 1650 u cm-2. The contribution of chlorophyceae (*Spirogyra sp. and Ulothrix* sp.) to total was very meager (2.18%) while Bacillariophyceae was dominant group with (97.82%) in the total community diversity.



Zooplankton composition in Kabini



### fishing gear used was gill net made up of monofilament polyethylene. Oreochromis mossambicus dominated the landings forming 42.1 % in June 2005, 49.6 % in January 2006 and 36 % in March 2006 whereas C. carpio was the dominant species in September 2005 forming 81.4%.

#### Fish yield and biodiversity

The maximum fish catch and catch per unit effort was 9.2 tonnes and 5.11 kg, respectively in September and a minimum of 6.4 tonnes and 4.23 kg, respectively being recorded in March. The

Species	June	2005	Sept	Sept 2005		ry 2006	March 2006	
	Catch (kg)	(%)	Catch (kg)	(%)	Catch (kg)	(%)	Catch (kg)	(%)
C. carpio	300	5.0	7492	81.4	790	15.3	-	
O. mossambicus	2550	42.1	1426	15.5	2558	49.6	2288	36.0
O. bimaculatus	2295	37.9	45	0.5	1395	27.0	938	14.8
M. cavasius	480	7.9	90	1.0	91	1.8	338	5.3
L. rohita	105	1.7			-			4.4
L. bata	143	2.4	-		122	2.4	1688	26.6
N. notopterus			135	1.5	43	0.8		
Chela spp.			9	0.1				
C. marulius					64	1.2		
Puntius dorsalis	4				-		13	0.2
Hyporamphus limbatus							56	0.9
C. gariepinus	-				-		1031	16.2
Miscellaneous	180	3.0	-		97	1.9		
Total (kg)	6053	100	9197	100	5160	100	6352	100
Effort (No. of units)		1860		1800		1550		1500
CPUE (kg)		3.25		5.11		3.33		4.23

#### Table 6 Estimated fish catch (kg) at Kabini Reservoir



#### Survey of other reservoirs

The post monsoon survey of 10 reservoirs of different agro climatic conditions in Karnataka viz. Kanva (440 ha), Votehole (690 ha), Boranakanive (1330 ha), Gayatri (780 ha), Jambadahalla (3890 ha), Shantisagar (2488 ha), Anjanapur (698 ha), Tunga (1228 ha), Varahi (2560 ha) and Chakra (1228 ha) was conducted during the month of December 2005.

#### Water quality

The water temperature varied from  $23.1 - 25.2^{\circ}$ C. pH was neutral in Tunga, Varahi, Chakra and Votehole (7.0 - 7.2) and alkaline in Jambadahalla, Boranakanive and Gayatri (8.2 - 8.3). Transparency was low in Boranakanive, Shantisagar and Gajanur (0.5 - 0.8 m), medium in Jambadahalla, Anjanapura, Voteholle (1.0–1.3m) and high in Varahi, Chakra and Gayatri (3.0 -3.2m). Nitrate was recorded in traces in all the reservoirs whereas phosphate varied from a low of 1.38 µg l<sup>-1</sup> in Anjanapura to 1.68 µg l<sup>-1</sup> in Kanva, Jambadahalla and Tunga reservoir. The silicate content recorded was lowest in Varahi (5.4 mg l<sup>-1</sup>) and highest in Shantisagar (12.8 mg  $l^{-1}$ ). Based on the limnological characteristics, Kanva and Boranakanive could be considered as productive, Chakra and Shantisagar as low productive and the other reservoirs as medium productive.

#### **Primary production**

Mean GPP with standard deviation (mean  $\pm$ sd) for all the reservoirs was  $1.8\pm 0.7$  g C m<sup>-2</sup> d<sup>-1</sup>. Kanva recorded highest GPP of 3.1 g C m<sup>-2</sup> d<sup>-1</sup>. Relatively low values were recorded in Anjanapura, Shantisagar, Gayathri and Chakra (1.0 – 1.1 g C m<sup>-2</sup> d<sup>-1</sup>). The higher productivity of Kanva is due to allochthnous

nutrients from the catchment areas rich in agricultural farming and human settlement.

#### **Biotic communities**

The percentage composition of phytoplankton and zooplankton determined for the different reservoirs are shown below. Zooplankton population  $(300 \text{ No.1}^{-1})$  was higher compared to phytoplankton  $(128 \text{ u } 1^{-1})$  in Kanva. The total plankton was highest in Jambadahalla (906 u 1-1) followed by Varahi  $(824 \text{ u } 1^{-1})$ .



#### Fishery

The commercial catches of all the reservoirs with the exception of Kanva and Boranakanive are dominated by the native carps, catfishes, murrels and other species, viz. *C. reba*, *O. bimaculatus*, *M. cavasius*, *N. notopterus*, *Mastacembelus* sp. and *Channa* sp., besides the exotic tilapia in a few reservoirs. The share of tilapia is significant in Jambadahalla (45.8%), Shantisagar (56.2%) and Gayatri (48.7%).

#### **Fish Biodiversity**

In Votehole reservoir, *Rasabora daniconius* dominated the littoral fish community forming 60.8 % followed by *O. mossambicus* (23.2 %) and *Puntius ticto* (13.6 %). Among other



miscellaneous catch *Glossogobius giuris* formed a

meagre 0.8 %. The freshwater prawn *Macrobrachium idella* was also present to the tune of 1.8 % in the catch.

At Boranakanive, *Gambusia affinis* was the most dominant species constituting 93 % of the littoral community followed by *M. idella* (4%). *Glossogobius giuris*, *Rasabora daniconius* and *Hyporamphus limbatus* were also present in minute quantities among miscellaneous fish landings.

Puntius sophore and Osteobrama vigorssi were dominant at Anjanapura reservoir forming 23 % each. O. bimaculatus, M. cavasius, Notopterus notopterus, Xenentedon cancilla and Cirrhinus reba constituted 12 % each among the landings in this reservoir.

The weed fish *Chanda nama* was dominant in Jambadahalla reservoir constituting 60 % of the total fish collected from the littoral zone. This was followed by *Garra gotylla* and *P.sophore* each forming 20 % of the total fishes.

#### Ecology and Fisheries of Mettur Reservoir in Tamil Nadu

#### Water quality

Mettur reservoir was surveyed for monsoon sampling in three zones viz. lentic, intermediate and lotic. The average values of the physicochemical characteristics of water were: Water temperature –  $32.0^{\circ}$  C; Transparency – 73.3 cm; pH-7.85 units; Dissolved oxygen : lotic - 9.0 mg l<sup>-1</sup>; intermediate -13.3 mg l<sup>-1</sup>; lentic -9.04 mg l<sup>-1</sup>; Free CO2 – nil ; Total alkalinity – 89.3 mg l<sup>-1</sup>; Carbonate alkalinity – 18.0 mg l<sup>-1</sup> ; Bicarbonate alkalinity – 71.3 mg l<sup>-1</sup> ; Hardness – 121.3 mg l<sup>-1</sup> ; Calcium -25.7 mg  $l^{-1}$ ; Phosphate - 0.129 mg  $l^{-1}$ ; Nitrate - 0.084 mg  $l^{-1}$ ; and Silicate -7.0 mg  $l^{-1}$ .

#### **Primary production**

The gross primary production was higher in intermediate zone (296.8 mg C m<sup>-3</sup> hr<sup>-1</sup>) than lentic (156.3 mg C m<sup>-3</sup> hr<sup>-1</sup>) and lotic(250.0 mg C m<sup>-3</sup> hr<sup>-1</sup>) zone. The net production was 187.5, 250.0 and 62.5 mg C m<sup>-3</sup> hr<sup>-1</sup> at lotic, intermediate and lentic zone respectively. Respiration was higher at lentic (112.5 mg C m<sup>-3</sup> hr<sup>-1</sup>) than lotic (75.0 mg C m<sup>-3</sup> hr<sup>-1</sup>) and intermediate (56.2 mg C m<sup>-3</sup> hr<sup>-1</sup>) zones.

#### **Biotic communities**

**Plankton** In general the plankton population was very low in this reservoir. The total plankton ranged from 1816 to 4526 u 1<sup>-1</sup>. Among the plankton the phytoplankton was dominant. Bacillariophyceae contributed maximum among phytoplankton followed by myxophyceae. *Nitzchia* sp. *Synedra* sp and *Cyclotella* sp were the dominant forms encountered in bacillariophyceae. Species of *Microcystis*, *Spirulina*, and *Nostoc* shared the maximum proportion of the myxophyceae family. The zooplankton was mainly contributed by copepods.

**Benthic fauna** The benthic population was represented by *Chironomus* species alone. The population ranged from 27 to 392 nos m<sup>-2</sup>. The maximum population was encountered in the intermediate zone.

#### **Fish yield**

During April to December 2005 the total number of fish seed stocked in Mettur reservoir was 2164000. In which share of *C. catla* was 559000 Nos., *L. rohita*, 1201200 Nos. and *C. mrigala*, 404400 Nos. The fish yield from Mettur reservoir



was highest in July (29882.45 kg) in which major carps (14314.0 kg) contributed maximum to the total production, whereas, catfishes (6367.45 kg) weighing more than 500 g formed higher proportion in August. In September, the fish catch of all the groups declined drastically. This may be attributed to the increase in water level to 36.36 m, the FRL. During the month of October, the fish landings were poor comprising mainly *P. sarana*, *M. aor*, *M. cavasius* and *O. mossambicus*. The lowest fish catch of 7898 kg was recorded during September.

#### Gunderipallam reservoir

#### Soil and water quality

The pH range of the soil was 5.92 and 6.31 between July and August. Available Nitrogen was estimated at 20.8 and 21.8 mg 100g<sup>-1</sup> of soil during the same period.

The physico-chemical characteristics of the water registered average water temperature of -28.1° C; pH -6.7; Dissolved oxygen – 8.0 mg  $1^{-1}$ ; Total alkalinity -125.1 mg  $1^{-1}$ ; Carbonate alkalinity – 12.5 mg  $1^{-1}$ ; Bicarbonate alkalinity -112.6 mg  $1^{-1}$ Hardness -156.8 mg  $1^{-1}$ ; Calcium-24.6 mg $1^{-1}$ ; Magnesium – 25.8 mg $1^{-1}$ ; Phosphate-0.083 mg  $1^{-1}$ ; Nitrate -0.171 mg  $1^{-1}$ ; Silicate - 4.24 mg  $1^{-1}$ .

The maximum gross and net production was recorded in June (593.75 and 500 mg C m<sup>-3</sup> hr<sup>-1</sup>).

#### **Biotic communities**

The plankton analysis revealed that during all the months, phytoplankton numerically dominated over the zooplankton. A wide fluctuation in the abundance of phytoplankton was observed during June, a maximum of 17883 u  $1^{-1}$  was encountered which gradually decreased to 268 u  $1^{-1}$  in

December. The Bacillariophyceae was contributed

by *Nitzschia* sp and *Synedra* sp. and Myxophyceae by *Microcystis* sp. The zooplankton populations represented by rotifers, copepods and cladocerans.

The benthic population was chiefly represented by *Chironomus* sp, *Chaoborus* sp and Molluscs. *Chironomus* sp were observed only during July and August and their count was meager. 14 nos m<sup>-2</sup> and 29.0 nos m<sup>-2</sup>, respectively During June, only *Chaoborus* sp. was present throughout the study period except November. Molluscs were present during certain months ranging from 9.0 nos m<sup>-2</sup> to 72 nos m<sup>-2</sup>. The average benthic population was the highest during August (443.0 nos m<sup>-2</sup>) and the lowest during June and December (43 nos m<sup>-2</sup>).

#### ENVIRONMENTAL AND MANAGERIAL FACTORS OF RESERVOIRS IMPROVEMENT THEREIN FOR FISH PRODUCTION ENHANCEMENT

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Three medium size reservoirs viz. Barua, Ohan in district of Chitrakoot (U.P.) and Jarmohra in district of Rewa (M.P.) were selected for the study.

#### Water quality

These reservoirs recorded moderate values of DO (8.03-9.6 mg  $1^{-1}$ ). Water was alkaline (pH 7.5). The highest alkalinity (138.0 mg  $1^{-1}$ ) was estimated in Barua reservoir, where as other two reservoirs registered lower value (936-38 mg  $1^{-1}$ ). The chloride (13.5-18.0 mg  $1^{-1}$ ),



Sp. conductance  $(66-74 \mu mhos cm^{-1})$ , hardness

(60.0 mg  $1^{-1}$ ) and dissolved organic matter (0.63-0.67 mg  $1^{-1}$ ) were low in Ohan and Jarmohara, respectively, where as higher values for these factors were recorded in Barua reservoir.

#### **Biological status**

#### Plankton

Plankton density was 50 u l<sup>-1</sup> in July and 100 u l<sup>-1</sup> in December 2005. Phytoplankton contributed more than 90% in Ohan reservoir. In Barua reservoir plankton density was 210 u/l in July and 296 u/l in December with phytoplankton contributing more than 86%. In Jarmohra reservoir the plankton density was 100 u/l in July and 300 u/l in December with phytoplankton contributing more than 84 %.

#### Periphyton

Periphytic population was 190 u cm<sup>-2</sup> in July and 710 u cm<sup>-2</sup> in December in Ohan reservoir. In Barua reservoir periphytic population was 440 u cm<sup>-2</sup> in July and 1040 u cm<sup>-2</sup> in December. In Jarmohra periphytic population was 390 u cm<sup>-2</sup> in July and 800 u cm<sup>-2</sup> in December. Interesting feature of periphytic community was that more green algae taxa were recorded in comparison to diatoms.

#### Macrobenthos

Benthic population was 132 u m<sup>-2</sup> in July and 576 u m<sup>-2</sup> in December in Ohan reservoir. Benthic population was 308 u m<sup>-2</sup> in July and 576 u m<sup>-2</sup> in December. In Barua and in Jarmohra reservoir benthic population was 1980 u m<sup>-2</sup> in July and 2500 u m<sup>-2</sup> in December.

#### EXOTIC CARPS STATUS IN HIMACHAL PRADESH RESERVOIRS

#### V.K. Sharma, Sushil Kumar, Kuldeep Singh

Seasonal campaigns in the three zones of the Pong reservoir of Himachal Pradesh pertaining to chemical characteristics of water and fish samples, catch composition and exotic carp status was conducted during 2005-06.

#### Water quality

During pre-monsoon season water temperature ranged between 23-25 (mean 24°C) with transparency in the range of 215-235 (250 cm), pH being near alkaline with range of 7.2-7.3. Dissolved oxygen varied from 8.0-8.6 (average 8.3 mg  $1^{-1}$ ) during pre-monsoon. Total alkalinity 72-80 (average 76 mg  $1^{-1}$ ). Specific conductivity during pre-monsoon period ranged between 186-198 (average 192 µmhos cm<sup>-1</sup>).

During post-monsoon period the water temperature ranged between  $25-33^{\circ}$ C (average  $29.3^{\circ}$ C), transparency range was 42-195 cm (average 101.7 cm), pH being 7.3-7.4 (average 7.4), dissolved oxygen was in range of 9.2-9.6 (average 8.0 mg 1<sup>-1</sup>), total alkalinity range was 78-86 (average 81.3 mg 1<sup>-1</sup>). The specific conductivity during post-monsoon season in the three zones of the reservoir was in the range of 196-212.0 (average 204 µmhos cm<sup>-1</sup>).

During winter season the water temperature dropped to 14-17 (15. 7°C), with increase in transparency 126-215 (average 175 cm). pH being 7.2-7.3 (average 7.3). Dissolved oxygen ranged between 9.2-10 (average 9.6 mg 1<sup>-1</sup>), total alkalinity range being 80-90 mg 1<sup>-1</sup>. The specific conductivity was in the range of 186-198 (average 191.3  $\mu$ mhos cm<sup>-1</sup>).

#### Fishery status

Exotic carps sttus: The exotic carp status in the commercial catches of Pong reservoir during the period April, 2005 to March, 2006 indicated that during the month of April, 2005 the catch of Indian major carps formed 8.63% (1224.74 kg) as compared to 5.35% exotic carps (759.2 kg) and 5.04% Tor putitora (714.9 kg). The main exotic carp observed in the reservoir is Cyprinus carpio only. The catfish mainly A. seenghala dominated the fisheries catch of Pong with 80.77% of total fish catch of the reservoir (11464.3 kg). Zonewise maximum exotic carps were recorded from Dehra (Lotic zone) with 487.6 kg. Catfish is distributed all over the reservoir with dominance in Nandpur, Nagrota Suriyan, Guglara and Katiyar landing centers. During May, 2005 the catch of exotic carp came down to 1.66% of total (526.5 kg) with its presence in lotic zone only (429.2 kg). The catfish formed 87.40% and IMC 3.71% of total catch. A total of 4542.7 kg of exotic carp was caught (1.23%) from the reservoir with maximum 3168.4 kg from Dehra zone only followed by 346.0 kg from Dadasiba, 203.8 kg Jambal and 206.5 kg Haripur\_ The catch of catfish during the period is 305589.0 kg (83.20%) of total with IMC 27837.7 kg (7.58%) and Tor putitora 27718.5 kg (7.55%).

The centre wise fish landings was Katiyar (15.90%) and Nagrota Suriyan (15.82%) the most productive zones of the reservoir followed by Dehra 9.84%. While analyzing the month-wise catches it was noticed that maximum fish 16.23% on left bank and 13.88% on right bank, were landed immediately after the closed season, which is bound to impact the productivity of reservoir, and present production is 24.49 kg ha<sup>-1</sup> for the period (April, 05 to March, 06)

#### FLOOD PLAIN WETLAND FISHERY

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

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

#### West Bengal Beels

Limnological investigations in 13 selected wetlands spread over Nadia and 24 Parganas (N) districts of West Bengal, viz., Media (Konkana baor), Chandania, Duma, Akaipur, Chomordaha, Beledanga, Champta, Kundipur, Kola, Sindhrani, Bhomra, Saguna and Mathura were undertaken during the period.

#### **Raising of stocking materials**

Batteries of eight floating cages in the size of 6 X 3 X 1.5 m each, were installed at Chandania beel (24 Pgs. N district) and cage of 3 X1X1.5 m size at Suguna beel (Nadia district) of West Bengal. These cages were stocked with early fingerlings of *Catla catla*, *Labeo rohita*, *Labeo bata* and *Cirrhinus mrigala*.

Growth performances of different species reared in cages in Chandania beel (July to October, 2005) and Saguna beel (September to November, 2005) are depicted below



Species	Catla	catla	Labeo	rohita	Labeo bata		Cirrhinus	mrigala
Stocking density	100 m <sup>-2</sup>	200 m <sup>-2</sup>						
Initial stocking size	20.96mm	0.109g	20.0mm	0.094g	24.4mm	0.178g	21.24mm	0.096g
Harvested Length (mm)	55.89	78.17	92.3	86.5	83.2	76.9	89	96
Weight (g)	2.7	6.4	14.4	9.8	6.5	4.9	10.02	11.4
Gain in wt (g)	2.59	6.29	9.71	6.32	4.7	11.3		
Recovery in %	16.6	15.1	35.7	30	100	82.9	79.1	40.2
Total fish stocked (g)	196.2	392.4	169.2	338.4	193.6	640.8	172.8	604.8
Total fish harvested	810	3488	9273.6	10584	11700	14627	14278.5	16530

#### Table 7 Growth performance of fishes stocked in cages in Chandania beel

Recovery: 81.3 kg/144m<sup>3</sup> /90 days

Table 8 Growth performance of fishes stocked in cages in Sug	ina beel
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Species	Catla catla		Labeo rohita		Labeo bata		Cirrhinus mrigala	
Stocking density	50 m <sup>-2</sup>	100 m <sup>-2</sup>						
Initial stocking size	44.4mm	1.2g	25.0mm	0.17g	41.2mm	0.72g	48.1mm	1.28g
Harvested Length (mm)	86.92	87.8	122.7	122.5	103.4	97.75	136.55	118.71
Weight (g)	9.37	10.1	21.11	20.71	10.7	10.56	25.25	17.22
Gain in wt (g)	8.17	8.9	20.93	20.54	9.98	9.84	23.97	15.94
Recovery in %	96	54.7	37.3	29.3	98.7	79.3	62	53.7
Total fish stocked (g)	180	360	25.5	51	108	216	192	384
Total fish harvested	1349.3	1656.4	1128.2	1822.5	1583.6	2513.3	2348.3	2772.4

Recovery: 15 kg/24 m<sup>3</sup>/ in 90 days

In the experiments *Catla catla* showed a good growth and recovery at lower stocking density (Suguna beel) while the same was reversed at higher stocking density (Chandania beel). *Labeo bata* growth performance was very good.


#### **Biology of indigenous fishes**

*Macrognathus pancalus* Biological studies on the species indicate that this fish feeds mainly on insect larvae. Fecundity ranged from 205 (178mm and 22.13g) to 4115 (170 mm and 30.31g) and attained sexual maturity at 91-101mm (males) and 102-112mm (females) in total length. Breeds during February to September.

*Macrognathus aral* selectively feed on Annelid worms. The fecundity of the fish ranged from 21(64 mm and 2.65 g) to 16867 (90 mm and 8.98 g). 50% of the females matured at 130-145mm length and males at 146-161mm.

*Puntius ticto* 50% of the female reach the maturity at 40-45mm total length. The fecundity of the fish ranged from 27 (L.49mm and Wt.1.72 g) to 4572 (L 52mm and 2.397g wt.). The average relative gut length calculated to be 1.7 showing that the fish is an omnivore.

*Puntius conchonius* 50% of the female reach the maturity at 61-65mm total length. The fecundity of the fish ranged from 558 (L.63mm and Wt.3.799 g) to 11045 (L 79mm and 8.893g wt.). It is an omnivore.

#### Macrophytes response to stress

Experiment was conducted to study the potential of *Eichhornia* in removing toxic metal Copper at 5, 10 and 15 ppm doses. A concentration of 250-650 ppm in shoot and 5,500-8,600 ppm in root (dry weight basis) was recorded in respect of copper accumulation in *Eichhornia*. Higher concentration (5-15 ppm) led to higher accumulation in both the roots and shoots. The blank (weed) recorded 15 and 42 ppm of copper for the shoot and root.

The experiment revealed the ability of *Eichhornia crassipes* to remove the toxic metal copper from water.

The enzyme response of the macrophytes in

the beel was also investigated. The activity of phosphatase was recorded to be higher in roots maintained in clear tap water (28 units min<sup>-1</sup>mg<sup>-1</sup> protein enzyme), compared to that of the activity of the root of the plant maintained in beel water (13.5 units min<sup>-1</sup>mg<sup>-1</sup> protein enzyme). It was thus observed that the enzyme activity remained depressed in beel water, the decrease being around 48 percent, sufficient to disturb the physiological processes of the plant by the toxicants in ambient water.

# **Bihar wetlands**

## Soil and Water quality-

Two beels viz., Marda and Kurnama in Bihar were sampled. Mechanical analysis of soil revealed that soil was predominantly sandy in both the beels with sand content around 80% in Marda an 84% in Kurnama. Less clay content was noticed in Kurnama (3.79%) compared to Marda (7.35%). Soil reaction was alkaline with soil pH 7.80 in both the beels. Organic carbon content was moderately higher in Marda (1.8%) as compared to Kurnama (1.29). C/N ratio, an indicator of productivity was in the range 24.3 and 17.1 in the beels reflecting moderate rate of mineralization of soil organic matter. Available phosphorus (mg 100g<sup>-1</sup>), though a limiting factor of production was found to the tune of 1.05 and 1.99 while, available nitrogen (mg 100g<sup>-1</sup>) was observed to the extent of 25.5 in Marda and 30.6 in Kurnama, indicating moderate trend of production. Free CaCO<sub>3</sub> was present at 3.9 and 5.0% in Marda and Kurnama respectively. Water was moderately alkaline (pH: 7.6-7.7) in both the beels. Amongst dissolved gases, free CO<sub>2</sub> content was in the range 3-6 mg 1<sup>-1</sup> in Marda year round while in Kurnama,



it was almost negligible and in post monsoon it

was 6.0 mg l<sup>-1</sup>. Total alkalinity (178 & 233 mg l<sup>-1</sup>) and hardness (97 & 128 mg l<sup>-1</sup>) were moderate reflecting a medium trend of production. Nitrate-N ( $\mu$ g l<sup>-1</sup>) was recorded as trace to 30 and 20-680 in Marda and Kurnama respectively. While phosphate-P ( $\mu$ g l<sup>-1</sup>) in Marda was trace to 290 and in Kurnama it was 10-130 with more concentration observed during post monsoon season. Silicate-Si (mg l<sup>-1</sup>) was moderate (8.6 & 6.5) in Marda and Kurnama.

### **Fish and fisheries**

During experimental fishing using a drag net a total of 22 species from Marda, and only14 species from Kurnama was recorded. Natural fishery was dominated, in order of abundance, by varieties of *Puntius* spp., small prawns, *Mystus* spp., *Chela labuca*, *C. punctatus*, *C. striatus*, *C. marulius*,

continued for 45-50 days. In spite of

sufficient stocking in these water bodies, the

yield remained low and varied between

*Chanda ranga*, *Nandus nandus*, *N.chitala*, *M. armatus* and *Xenentodon cancilla*. The cooperative societies regularly stock these beels with fish seeds. In Kurnama the seed comprised both IMCs and exotic carps, particularly *Ctenopharyngodon idella*, *Aristichthys nobilis* and *Cyprinus carpio*. The stocking density ranged from 2000-3000 nos ha<sup>-1</sup>. In Kurnama major harvesting operation was during summer (April-May) and

250-500 kg ha<sup>-1</sup>.

Pen culture

Demonstration on Fish Farming in pens having area of 0.01 ha each was organised in six beels located at Jaleswar, Mustafapur, Kujerbagi, Chumurdah, Kanchrapara and Kola of North 24 Parganas district of West Bengal.

In the experiments, fingerlings of catla, rohu and mrigal were stocked at a density of 15,000 nos ha-1 and at a ratio of 40:30:30 weighing 65.79 g, 23.0-29.0 g and 22.0-25.0 g, respectively. The fishes were fed with pelleted feed containing 30% protein @ 2% of their body weight. The growth of the fishes recorded during harvesting varied between catla 322.26 - 414.37 g, rohu 196 - 280 g and mrigal 88.33 - 117.21 g depicting productions at 366 kg, 357 kg, 260 kg, 283 kg and 343 kg in 4 months from the pen beels of Jaleswar, Mustafapur, Kujerbagi, Chumurdah, Kanchrapara and Kola respectively.



Pen culture in Bijpur, West Bengal

#### Assam

*Monitoring of stock enhancement:* Monitoring of stock enhancement practices followed in



Puthimari Bagheswari, Rongai, Kumri, Kalidanga, Nandini, Tariachora, Motiarkuti and Jogra beels of lower Assam revealed that all the beels were regularly stocked except in Bagheswari and Rongai beels. No definite species ratio was followed and stocking density varied widely (1400 to 12500 per ha) in the selected beels. The study showed that culture-based fisheries was practiced in Puthimari beel, where an estimated 85% of total fish yield came from stocked fishes alone. Approximate rate of recapture of stocked fishes in this closed beel was 50-60%.

Cage culture: Nine polyethylene net cages (size of each cage 4 x 4 x 1.5 m) were installed at Bagheswari beel (Kamrup district, Assam). These were stocked with Labeo rohita, Cirrhinus mrigala, Hypopthalmichthys molitrix and Labeo gonius at stocking densities of 8 nos m<sup>-3</sup> and fed with supplementary feed @ 5% body wt. The experiment showed that carry-over carp fingerlings (10.5-12.9 cm TL) could be reared during the winter months (December, 2005 to February, 2006). Relative growth rates were the highest in the minor carp, Labeo gonius (114.1%) followed by silver carp (112.7%) indicating that these two species performed relatively better during colder months. Rohu had moderate growth rates (82.8%) whereas mrigal showed the poorest



Cage culture in beel in Assam

growth (52.9%). Low water temperature

(19.7-25.0°C) and intense growth of *Microcystis* sp. (5485 u  $1^{-1}$ ) might have adversely affected the growth of stocked fishes.

Food chain: Organic matter and ash ratio was lowest in case of molluscs (0.8) and highest in case of water beetle (36.31). Fishes observed to contain higher crude protein (79.4-87.5 %) than all other trophic organisms. Giant water beetle was observed to have very high lipid level (27.95%) as compared to other organisms. Phosphorous content of detritus associated with floating macrophyte is higher than macrophyte itself. Bivalve observed to accumulate higher copper content than macrophytes signifying its possible use as biomarker. Calculated energy value of different organisms at various trophic levels showed that lipid contributed maximum to the total energy. Their highest levels were recorded in water beetle (2211 KJ 100g<sup>-1</sup>).

Ecology and fisheries of river Brahmaputra

Fisheries A total of 225.4 t of fishes were estimated to land at Uzanbazar fish landing centre during the year as compared to 381.2 t during the corresponding period of the previous year thereby showing 40% decline in the overall catch. Miscellaneous species viz., Gadusia chapra, Cirrhinus reba, Notopterus chitala, Aspidoparia morar etc. (68.61%) dominated the catch.

*Water quality:* Water pH in most of the months varied between 7.4-7.8. Transparency, sp. conductivity, total alkalinity and hardness observed to increase steadily from monsoon to winter months. Nutrients varied widely over the months. Soil organic carbon was observed to increase from



monsoon to winter months. Gross primary

productions were low  $(7.8-48.6 \text{ mg C m}-3 \text{ h}^{-1})$  due to poor plankton concentration.

**Communication and information flow in beels:** Data collected for communication and information flow in beels suggests that interpersonal channel like progressive fishers and scientists are still important to the fishers because the development and spread of mass media and ICT in Assam is still in its infancy. Distance from towns and access to interpersonal channels significantly influenced access to extension services, especially in rural areas. In areas of greater access of communication and information, fishers were more likely to proactively seek extension advice.

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

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In Ganga river basin one wetland Ramiyabehad in U.P (80.0 ha) was selected, while in Mahanadi river basin in Chhattisgarh, Nawagaon wetland (82.0 ha) was identified for investigation.

#### Soil and Water quality

The soil composition of Ramiyabehad was sandyloam in nature and with alkaline (pH 7.6) indicating moderate productive nature. The water too was alkaline (pH 7.4-7.5) with moderate dissolved oxygen (5.29-8.23 mg l-1) and total alkalinity (136-141 mg l-1), indicating the water to be of productive nature. The soil of Nawagaon wetland was laterite showing pH value of 7.7, being moderately productive. The alkalinity in water was medium (55.0-70.0 mg l-1), pH range 7.5-7.8, and moderate dissolved oxygen (8.03-8.96 mg l-1) reflects low to moderate productive nature of the wetland.

# **Biotic communities**

Plankton in Nawagaon wetland ranged from 120-191 u l<sup>-1</sup>, while in Ramiyabehad the range was from 300-590 u<sup>11</sup>. Periphyton was poor (100 u cm<sup>-2</sup>) in Nawagaon while it was high in Ramiyabehad (590-2670 u cm<sup>-2</sup>). Associated flora of Nawagaon indicated low population (540 u cm<sup>-2</sup>) while in Ramiyabehad it was high (1970 u cm<sup>-2</sup>), faunal contribution was nil in Nawagaon while it was 2.09 % in Ramiyabehad. Biomass of macrophytes of these wetlands ranged between 2.02-2.5 kg m<sup>-2</sup>. Nawagaon wetland was dominated by Potamogeton (100 %) and Ramiyabehad with Hydrilla (70 %) and Najas (10 %). The Ramiyabehad (U.P.) was poor in abundance of macrobenthic invertebrates (389 nos m<sup>-2</sup>) in comparison of Nawagaon (C.G.) wetland (908 nos m<sup>-2</sup>). A total of 11 forms were observed from both the wetlands in which maximum diversity (7 species) was encountered in Nawagaon.

## Fishery

Nawagaon wetland is being mainly stocked with IMC fingerlings in the month of June and July while exotic species (Grass carp, Silver carp, Common carp and Big head) are also stocked in small quantities. Ramiyabehad wetland is auto stocked during peak flood periods only.

Fish catch composition during August 2005-January 2006 (Ramiyabehad) comprised L. *rohita* (59.7 %), *W. attu* (10.9 %), murrels and



minnows (29.4 %). Estimated annual fish production was 21.0 kg ha<sup>-1</sup> in Ramiyabehad wetland. Harvested species of Nawagaon wetland during the period represented *C. catla*, *L. rohita*, *C. mrigala*, *W. attu*, *M. vittatus*, *C. nama* and *Puntius* sps. etc. and the estimated fish production was 50.0 kg ha<sup>-1</sup>.

# Sediment

*Churni* All the s e d i m e n t

parameters of Churni river exhibited insignificant difference among the sampling sites. Maximum mean sand (84%) was observed at Shivnivas site



Fishing in Nawagoan wetland, Chattisgarh

# FISH HEALTH AND ENVIRONMENT

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

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During the period River Churni and two fresh water wetlands viz., Panchita and Kalyani beel were investigated for assessing the environment and fishery status. and minimum at Aranghata site, which was reverse in case of silt. The sediment pH was alkaline (7.5-8.7) with average values ranging between 8.1 and 8.2. Fluctuation in specific conductance was noticed in different seasons. The mean values were 199, 260 and 178  $\mu$ S cm<sup>-1</sup> for premonsoon, monsoon and post monsoon seasons, respectively. Sediment of all the sites had very low organic carbon. The mean organic carbon content

varied from 0.29 % to 0.38 % at different 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<sup>-1</sup> respectively.

Beels Sediment of Panchita beel and Kalyani beel were sandy in nature and slightly alkaline in reaction (pH 7.2–7.4). Panchita beel exhibited higher specific conductance (1214 – 2360 iS cm<sup>-1</sup>) and organic carbon (3.23 – 4.43 %) compared to Kalyani beel (conductance 13110–1380 iS cm-1 and organic carbon 1.2–1.7%). Heavy metals in the sediments of the water bodies were found in the range of Cu: 6.0 – 56.3 mg kg<sup>-1</sup>; Pb: 6.2–32.1 mg kg<sup>-1</sup>; Zn: 38.9–141.9 mg kg<sup>-1</sup> and Cd: below detection limit.



Water

Churni The level of dissolved oxygen at the upstream

sampling sites were Shivnibas (0.8 - 5.7 ppm)and Haskhali (0.4 - 5.4 ppm) with lowest average (2.95-3.10 ppm). The values improved in the downstream (average 3.5-4.9 ppm). The transparency, specific conductance, free CO<sub>2</sub>, DO, alkalinity, hardness and phosphate-P exhibited significant variations due to monsoon inflow variability.

*Beels* The physico chemical properties of water of Panchita beel were in the favorable range except low amount of nutrients viz., phosphate (traces to 0.02 ppm) and nitrate (traces). Kalyani beel is a stressed ecosystem with low transparency (14–25 cm), high specific conductance (770–1983 mS cm<sup>-1</sup>), low dissolved oxygen (lower value 3.2 ppm), high COD (up to 52 ppm), high carbonate and bicarbonate alkalinity (up to 76 and 524 ppm respectively), high phosphate (up to 0.5 ppm) and unionized ammonia (0.24–0.27 ppm) during post and pre-monsoon months.

## **Pesticide status**

Highest residue (0.064 ppb) was detected at Saguna beel. It is observed that 4,4'-DDT is present

in concentrations higher than its permissible limits at all the sites.

Highest residue of (285.87 ppb) was detected in *C. mrigala* (348 g) of Saguna beel. In general, the residue contents were within the permissible limits of these pesticides for human consumption.

# **Trace metal status**

The 5 sampling sites of river Churni exhibited no difference among them in trace metal concentration in water. The seasonal variability was however, prominent in case of Cd and Pb and wide variability noticed with Zn. In case of Cd and Pb the monsoon samples had significantly higher content over pre- and post-monsoon samples (Tamhane T2 test p values 0.016-0.017 for Cd and 0.00-0.011 for Pb). Average Zn content was highest during premonsoon (66  $\mu$ g 1<sup>-1</sup>) with respect to 39 and 21µg l<sup>-1</sup>contents during monsoon and postmonsoon seasons respectively (F = 3.207, p 0.053). The levels of Cu, Zn, Cd and Pb in the flesh of L. rohita, C. mrigala, M. aor and W. attu were in the range of Tr. to 1.9, Tr. to 6.6, Tr. to 0.2 and Tr. to 1.9 mgkg<sup>-1</sup> wet weight fish with the mean values of 0.45, 3.3, 0.03, and 0.56 mg kg<sup>-1</sup> respectively, which are below the permissible limit for human consumption

 Table 9 Organochlorine pesticide residue content (ppb) in fish of the river Churni and beels of West Bengal

Site	Species	Weight	DDTs	HCHs	Endosulfans	Heptachlors	Aldrins	Total Organochlorine
Aranghata	L. rohita	261 g	5.84	0.89	0.32	0.04	0.43	7.52
Ranaghat	C. mrigala	180 g	17.19	1.67	1.34	0.12	1.11	21.43
Ranaghat	L. calbasu	32-70 g	9.46	1.55	1.08	0.36	0.80	13.25
Panchita	L. rohita	80-115 g	4.19	1.70	0.23	0.16	0.38	6.66

Maximum accumulation of metals was observed in liver followed by kidney and then gill.

# **Bioindicator studies**

#### Fish community studies (IBI)

The index of biotic integrity (IBI) was applied in 110 km of river Churni at 5 sites. Seven new metrics viz., native species richness, native family richness, benthic species richness, water column species richness, % non-native individuals, % tolerant individuals and % herbivorous individuals were added retaining five original metrics. 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). Whereas the percentage of tolerant species, percentage individual as omnivorous and percent individual as carnivorous increased significantly (P<0.01) in anthropogenically stressed sites S1 and S2. The index of biotic integrity (IBI) is significantly lower at stressed sites upstream. Based on the scoring of IBI only 3 or 60% of the sample sites supported fishery in acceptable condition. A scoring chart for scoring the IBI metrics of River Churni was developed from the study.

### **Monitoring in cages**

The blood physiology and tissue changes were investigated in *L. rohita* kept in cages and compared with the control. Physiological alteration recorded were hypochloremia elevated levels of creatinine, bilirubin and cortisol. Histological alterations indicated lamellar hyperplasia, clubbing, swollen distal tip, aneurism and secretion of mucous cells of primary gill filament. Occasional shrinkage of epithelial cells in renal tubule and enlargement of glomerular cells were also observed in kidney however, liver did not show any



abnormality. This showed that fishes were suffering from stress due to the deficiency of oxygen, which is a common feature of this stretch of the river Churni.



Monitoring fish health in cages in River Churni

# Application of Health Assessment Index (HAI) in beels

The rapid health assessment index (HAI) was applied to assess the general health status of fish population (*L. rohita*) of Panchita beel and Kalyani beel as compared to the healthy fishes (control) from optimum habitat.

The HAI for Panchita and Kalyani beel were 29.3 and 37.5 respectively as compared to the optimum ecosystem (17.3). The sub optimal water quality of Kalyani beel reflected by low dissolved oxygen (3.2-5.1), high COD (upto 52 ppm) and high-unionized ammonia (0.24-0.27 ppm) created stress to fish as reflected in higher HAI. Anomalies in the three index variable viz., liver, fin and gill were mainly responsible for the higher HAI values.

# Plankton and benthos as indicator in Churni River

Based on the estimated Palmer's Algal Genera Pollution Index values (3.0 to 14.0) and



the Shannon-Weaver diversity index values

( $\hat{H}$  -2.9439 to-3.7388) of phytoplankton of different sampling stations, the surface and column layer of the water body can be considered as slightly organically polluted. The  $\hat{H}$  values of zooplankton at Hanskhali (-1.5507) have indicated moderate level of water pollution and in Shivnivas (-2.2805) it was at slight level. Mostly  $\beta$ - mesosaprobic conditions of the bottom zones were recorded in 80% of the sampling stations. Based on the saprobic condition as well as the obtained Shannon-Weaver diversity index values ( $\hat{H}$ :-2.6811 and -2.880), the bottom zones of Hanskhali and Shivnivas sampling station was found to be low to moderately polluted.

#### Assessment of stress protein level in fish

The protein samples prepared from experimental fishes *L. rohita* were first analysed by SDS-PAGE. The gel were analysed on gel-doc and images showed that the liver, kidney and brains had a wide variation in protein pattern whereas muscles, gills and blood cells were not properly separated on the gel. Fish samples from temperature stress (30, 32 and 34 °C) shows protein bands in between the 97.4 and 68.0 KDa that may be considered as a Heat shock proteins (70 KDa) whereas 25 and 28°C shows faint bands which suggest the low expression of HSP70.

All the tissue proteins were also checked on 2D gel electrophoresis technique. This time the tube gels (first dimension) were run with narrow range (pH-4-6 and 5-7) and as usual broad range (3-10) for better resolution of proteins.

# Gene Expression studies in fish exposed to aquatic pollution

Labeo rohita male fishes were exposed to 17-â Estradiol at a concentration of 80 µgL-1 dissolved in DMSO for 48 hours at room temperature. The study demonstrated the use of PCR based method for bioassessment of the effect of Estradiol on Labeo rohita males. The appearance of the vitellogenin induced by the presence of estradiol in male rohu was detected at the transcriptional level. The 190 bp region of the vitellogenin gene is expressed in the individuals, which were exposed to 17-â Estradiol and is not expressed in those fishes, which were not treated with 17-â Estradiol. Thus the vitellogenin gene expression in males fishes exposed to estradiol indicate the endocrine disrupting effect on the Indian major carp Labeo rohita and can be used in bioassesment of aquatic pollution.

## Disease induction and Patho-physiological study

*Edwardsiella ictaluri* strains were examined for in vivo pathogenicity in *Labeo rohita* under laboratory condition.

A. hydrophila, isolated from severely affected IMC from Pancheeta beel repeatedly tested pathogenic in *L. rohita* under laboratory condition. Different dilutions of bacteria, with counts ranging from  $12 \times 103$  to  $12 \times 108$  CFU, were intraperitoneally injected into *L. rohita*. 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.



	C/48	4/48	C/96	4/96	C/10	4/10
Triglyceride (mg dl <sup>-1</sup> )	76.2	75.6	90	106.2	97.5	140
Chloride (m Eq 1 <sup>-1</sup> )	100.6	81.6	93.8	71.4	90.2	70.3
Bilirubin (mg dl <sup>-1</sup> )	1.6	2.2	2	4.5	2.2	4.8
Glucose (mg dl <sup>-1</sup> )	39.6	48	40.2	58.6	52.6	68.3
Cortisol (ng l <sup>-1</sup> )	110	130	130	160	125	195

Table 10 Clinical profile after disease induction

Clinically hypochloremia is evident with enhanced levels of bilirubin, glucose and cortisol observed upto the 10th days.

# Temperature and DO stress in fish

Fishes were subjected to stress of high temperature (36°C) and low dissolved oxygen (4ppm)

Enhanced cortisol (100-140 ng ml<sup>-1</sup>) and blood glucose (104.2-181.7 mg dl<sup>-1</sup>) with increase in haemoglobin and haematocrit. Normally compensatory responses initiated after 72 hrs but because of  $O_2$  stress, HPI remains activated and it is reflected by high cortisol values. This will have an immunosuppressive response effect in the fishes.

# Pesticides and heavy metal assessment

Sampling was conducted from the Farakka to Haldia stretch of river Ganga with sampling sites at Farakka, Berhampore, Nabadwip, Barrackpore and Haldia. Samples were also collected from Ghantal, Kolaghat and Geokhali on river Roopnarayan.

The Farakka to Haldia stretch of river Ganga had all its physico-chemical parameters in the desirable levels. Water pH was alkaline (7.0 to 8.4), with good DO (4.6 to 9.3), low BOD (0 to 6 ppm). Organic carbon content was poor in Bhagirathi (0.03-0.16 %) compared to Roopnarayan (average 0.12-0.26 %).

The total organochlorene pesticide residue (including HCH, DDT, endosulfan, aldrin, dieldrin, endrin, heptachlore and their metabolites) content in water and fish were evaluated. The data generated are presented below. In water, the 4,4'-DDTs were the pollutants present in concentrations higher than its permissible limits of EPA (USA) at all the sampling sites to disturb the aquatic life process.



Table 11 Organochlorine pesticide residue content (ppt) in water

	DDTs	HCHs	Endosulfans	Heptachlors	Aldrins	Total OC pesticides
Farakka	18.05	9	0.07	0.44	0	27.56
Baharampore	13.75	10.66	9.19	0.4	0.01	34.01
Nabadweep	7.82	7.91	5.61	0.5	0	21.84
Barrackpore	9.95	7.14	1.45	0	0.38	18.92
Haldia (1)	12.41	4.07	1.5	0.27	0.36	18.61
Haldia (2)	8.76	3.88	3.64	0.12	1.29	17.69
Ghantal (1)	15.12	8.59	5.7	0	1.79	31.2
Ghantal (2)	6.47	3.09	0.89	0	1.32	11.77
Kolaghat (1)	21.33	16.85	2.32	0.01	21.03	61.54
Kolaghat (2)	7.67	3.22	0.86	0	0.19	11.94
Geokhali (1)	11.2	8.57	1.68	0.25	0.14	21.84
Geokhali (2)	7.18	4.18	0.91	0.12	0.19	12.58

The organochlorine pesticide residue contents in fish flesh showed the highest residue of 59.3 ppb in *A. aor* (500 g) of Farakka sampling site. In general, the residue contents were found meager with respect to the permissible limits of these pesticides for human consumption.

# **Microbiological studies**

Microbiological analysis of soil/water/fish samples from six sites for the following parameters was done. The APC of bacteria in river Churni ranged between 6-21 x 104 CFU ml<sup>-1</sup> water and 335-1098 x 105 CFU gm<sup>-1</sup> in dry sediment.



**Table 12** Estimation of different microbial load in water/soil/fishsamples collected from different aquatic ecosystems.

Sampling Site	Sample	ТРС	TVC	Total Aeromonas	Total coli/EC	Salmonella
Panchita	Water	3.4x10 <sup>3</sup>	Nil	3.4x10 <sup>2</sup>	+	Nil
Beel	Soil	1.03x10 <sup>6</sup>	Nil	5.1x10 <sup>2</sup>	+	Nil
	Fish	2.8x10 <sup>5</sup>	Nil	0.9x10 <sup>1</sup>	+	Nil
Kole	Soil	1.I8x 10 <sup>6</sup>	Nil	3x10 <sup>3</sup>	+	Nil
Beel	Water	1.08x10 <sup>4</sup>	Nil	Nil	+	Nil
Kulti	Water	8.6x 10 <sup>4</sup>	Nil	Nil	1.22x 10 <sup>4</sup>	Nil
Gate	Soil	2.6x 10 <sup>6</sup>	Nil	1.9x 10 <sup>3</sup>	6.7x10 <sup>3</sup>	Nil
Kulti wetland	Fish	9.2x10 <sup>4</sup>	2.66x10 <sup>3</sup>	2.5xI0 <sup>3</sup>	4.1xI0 <sup>3</sup>	Nil
4No.	Soil	2.8x 10 <sup>5</sup>	2.8x 10 <sup>3</sup>	6.3x 10 <sup>3</sup>	6.4x10 <sup>3</sup>	Nil
Bhery	Water	1.72x 10 <sup>5</sup>	$1.3 \times 10^3$	4.4x10 <sup>3</sup>	2.04x10 <sup>4</sup>	Nil
	Fish	1.75x10 <sup>5</sup>	2.75x10 <sup>3</sup>	7.1x10 <sup>3</sup>	5.4x10 <sup>3</sup>	Nil
Kulia Beel	Soil	7.8x10 <sup>5</sup>	1.4x 102	Nil	6.5x 10 <sup>3</sup>	Nil
	Water	3.72x10 <sup>3</sup>	1.7x10 <sup>2</sup>	Nil	1.35x10 <sup>2</sup>	Nil
	Fish	4.9x10 <sup>7</sup>	$2.52 \times 10^4$	Nil	1.74x10 <sup>4</sup>	Nil
Churni River	Soil	4.4x 10 <sup>6</sup>	3x10 <sup>1</sup>	2.08x10 <sup>3</sup>	Nil	Nil
	Water	2.1x10 <sup>2</sup>	Nil	1.I4x10 <sup>2</sup>		Nil

Study of sediment dehydrogenase activity The dehydrogenase activity was much higher in sediment from Kulia and Kalyani beels as compared to those from Kole, Kulti and Panchita beels. In river Churni, the sediment dehydrogenase activity was exceptionally high. The enzyme activity was related to allochthonus organic matter input. **Isolation of Aeromonas spp. from fish** 50 fish samples were screened from 6 beels and 2 bheries. A total number of 57 *Aeromonas* spp. were isolated. The pure cultures of these isolates were preserved in glycerol at -20DC for further analysis using biochemical and cultural tests.



Testing of chemicals for in vitro activity

#### against virulent Aeromonas species

Out of 9 chemicals, tested for the antimicrobial property using pathogenic field strain of *A*, *hydrophila* and MTCC reference strain as test organisms. Copper sulphate, sodium nitrite, formalin, hydrogen peroxide and camphor inhibited bacterial growth, protease activity and aerolysin toxin expression. Among herbal preparations only garlic inhibited bacterial growth and expression of virulence properties of *A*. *hydrophila*.

### Detection of Aeromonas isolates using PCR

PCR was standardized and used for specific detection of A. hydrophila DNA group 1, Aerolysin positive A. hydrophila and virulent (enterotoxigenic, hemolysin) Aeromonas spp. from samples of fish disease outbreaks and microbial samples.

A number of bacterial samples 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.



Screening of smaples from fish for detection of Aeromonas spp.

Trichloro Ethylene Degradation using Microbe Trichloroethylene/Trichloroethane (TCE). It is a common contaminant in water sites located near to metal factories/ industries. Thus its removal from the aquatic system assumes significance. In the present study, methods were standardized for detection of suitable microbes having capacity to degrade TCE and detected photometrically using Fujiwara Test.

#### FISH RESOURCE ASSESSMENT

# DATABASE DEVELOPMENT IN INLAND FISHERIES THROUGH REMOTE SENSING TECHNIQUES

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#### **Evolving prediction models**

Digital base maps for twenty five districts of Orissa have been prepared. Observations on water quality and soil characteristics were taken from twenty four selected water bodies during premonsoon in the state of Orissa.

The correlation between different water quality parameters and digital values of different bands of remote sensing image as well as various indices like Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI) have been calculated for development of prediction model. The following observation was made on the different correlation. Correlation coefficients of water quality parameters and DN value are shown in table 13.



- Transparency showed significant correlation with Near Infra Red (NIR) band, red band, green band and Normalized Difference Water Index (NDWI).
- Specific conductivity showed significant correlation with Normalized Difference Vegetation Index (NDVI) and NDWI.
- Total alkalinity showed significant correlation with NIR and NDVI.
- Total dissolved solid (TDS) showed significant correlation with NDVI only.
- Sulphate showed high correlation with NIR band, red band, green band and NDWI.
- Silicate showed high correlation with red band and green band.

Hardness showed significant

correlation with NIR band, green band, NDVI and NDWI.

Ca showed significant correlation with NIR band, NDVI and NDWI. Mg showed significant correlation with green band and NDWI

The mapping of water bodies with area above 10 ha had been completed in the Rajasthan state with post monsoon data. The mapping of rivers and streams has also been completed in the same state. The GIS for water bodies in the Rajasthan state has been completed with spatial information. The total number of water bodies identified was 807.

Table	<b>13</b> Correlation	coefficients	for different	parameters	with va	irious	bands
	(Total no of	f water bodie	es 24)				

Sl. No	Parameters	Correlation with Infreared band	Correlation with Near Infreared band	Correlation with Red band	Correlation with Green band	Correlation with NDVI (Near Infreared-Red)/ (Near Infrared + Red)	Correlationwith NDWI (Infrared Near Infrared) /(Infrared + Near Infrared)
1	Transparency	-0.272	-0.603**	-0.602**	-0.501*	-0.102	-0.501*
2	DO	0.103	0.304	0.297	0.399	0.006	0.242
3	PH	0.091	-0.045	-0.216	-0.179	0.204	-0.150
4	Sp.	-0.101	-0.372	-0.167	-0.387	-0.418*	-0.446*
	Conductivity	Sec. Sec.					
5	TDS	-0.091	-0.364	-0.167	-0.167	-0.401	-0.439*
6	Total alkanity	-0.268	-0.455*	-0.079	-0.296	-0.608**	-0.385
7	Free CO <sub>2</sub>	-0.145	-0.049	0.133	0.099	-0.263	0.028
8	Chloronity	-0.311	-0.054	0.115	0.061	-0.199	0.225
9	Salinity	-0.311	-0.054	0.115	0.062	-0.199	0.225
10	Tot. nitrate	-0.050	0.120	-0.093	-0.092	0.432*	0.289
11	NO <sub>3</sub>	-0.083	0.074	-0.036	0.001	0.271	0.240
12	PO <sub>4</sub>	-0.137	-0.006	-0.053	0.018	-0.016	0.054
13	Sulphate	0.375	0.763**	0.787**	0.718**	0.009	0.542**
14	Silicate	0.091	0.194	0.409*	0.449*	-0.330	0.083
15	Hardness	-0.094	-0.456*	-0.268	-0.416*	-0.503**	-0.570**
16	Ca	-0.141	-0.415*	-0.154	-0.318	-0.474*	-0.477*
17	Mg	0.299	-0.226	-0.078	-0.444*	-0.274	-0.553**
18	Gross P.P.	0.263	0.154	0.124	0.126	-0.063	-0.136
19	Net P.P	0.052	0.048	-0.161	-0.118	0.171	-0.037
20	Respiration	0.270	0.135	0.381	0.324	-0.315	0.387

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



## **Database development on GIS platform**

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.

Monthly data on fish catch are recorded at Guwahati for Brahamaputra river. The species like *A. moror*, *L. bata* and *A. coila*. are the dominant species in the catch.

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 catch data are recorded from the Ganga river system at Allahabad centre. Common carp is the major contributor to the fishery during 2005.

Recently catch data have been received from Vadodara centre for Mahi River collected from five center namely Gambhira, Sindhrot, Juna Badalpur, Bhadarva and Vasad. The catch data show that cast net, gill net and hook & lines are operated in the river system. Freshwater as well as estuarine species are landed in these centers.

Catch data have been utilised for the creation of Geographical Information System (GIS) for the easy storage and retrieval. Some modules of existing river and reservoirs data base management software which was developed using Fox-pro were converted to Visual Basic platform with MS-Access as back end.



# **OTHER PROJECTS**

Name of the Project	Sponsors
Strengthening of database and information networking for fisheries sector	Fisheries Division, Department of Animal Husbandry and Dairying, Ministry of Agriculture, New Delhi
Reservoir Fisheries Development in India	Fisheries Division, Department of Animal Husbandry and Dairying, Ministry of Agriculture, New Delhi
National Risk Assessment Programme for Fish & fisheries products for Domestic and International market.	ICAR Cess Fund
Biology and Fishery of Mahseer in the Upper stretch of Cauvery.	ICAR Cess Fund
The Ecology and Management of Aquatic Weeds in Ganga and Brahmaputra basin with particular reference to Fisheries enhancement	ICAR Cess Fund
Popularisation of Organic Farming approach in Fisheries for Sustainable Development	ICAR Cess Fund
Database on Taxonomy and Distribution of Freshwater Fishes of India	ICAR Cess Fund
Impact, Adaptation and vulnerability of Indian agriculture to climate change – Effect of climatic change on inland fisheries.	ICAR Plan Project



# TECHNOLOGY ASSESSED AND TRANSFERRED

# EXTENSION ACTIVITIES

Various activities

relevant to development of human resource and transfer of technology, were undertaken for the benefit of the clientele and stakeholders.

# **Advisory services**

A total of 245 fish farmers/fishermen owning 289 ponds/beels and 16 bheries, 12 entrepreneurs, 50 extension functionaries/clientele were provided with solutions to their respective problems when they called on at Institute headquarters or over telephone or through letters or through farm visit.

# **Mass Awareness**

The following mass awareness programme were organised during the period.

- On fish conservation during April 12, 2005 at Kolaghat, where more than 200 fishermen participated and on May 03, 2005 at Tribeni where 120 fishermen participated.
- A group discussion on April 20, 2005 at Kujerbagi, a Tribal village for development of beel fishery where 80 Tribal fishermen participated in the discussion
- On fish conservation in the estuarine belt of Sunderbans, West Bengal during 30<sup>th</sup> -31<sup>st</sup> August, 2005 and 1<sup>st</sup> September and 30.11.05 to 1.12.05
   where 795 fishermen were present



Mass awareness camp for fish conservation

- A group discussion was organized at Frazerganj on 19.10.2005 to strengthen empowerment of fisher women folk for their livelihood
- On Conservation of finfish and shellfish seed at Gadiara on 27.02.2006 and Digha on 30.12.2005 where 450 nos. interested fishermen/fisherwomen/seed collectors were present.



Mass awareness camp at Gadiara West Bengal

Participatory Rural Appraisal (PRA) exercises were organized during August and December 2005 to study the socio-economic status and identify the problems of the fishers operating in jheels of Begusari District, Bihar. Over 100 fishers attended the programme at each beel. The state government officials also participated actively in programme at all the jheels. The programme was very popular and got wide coverage in local newspaper. After analyses of the data necessary solutions to solve their problems were rendered towards fisheries development in the respective mauns.



PRA at Begusarai, Bihar

# Exhibition

The Institute participated in the following exhibitions

Exhibition at Barrackpore, organized jointly by Inland Fisheries Society of India and Central Inland Fisheries Research Institute during 16-17 April, 005.



D.G. ICAR visiting CIFRI, exhibition stall

In the exhibition organised in connection with 7th Indian Fisheries Forum at Bangalore during November 8-11, 2005.



Honble, Chief Minister, Karnataka visiting CIFRI stall at UAS Bangalore

In the exhibition arranged by Indian Society of Fisheries Professionals at Ludhiana during December, 21-22, 2005.



CIFRI, Exhibition Stall at PAU, Ludhiana

- In the exhibition at Basanti, South 24 Parganas organized by Sundarban Krishi Mela & Loko Sanaskirti Utsab, 2005 during 20.12.05 to 29.12.05 with poster and charts etc.
- In an exhibition at Taldi, South 24 parganas organized by Bharupee Sangha, during 22.12.05 to 31.12.05.
- In an exhibition organized by Sarada Devi Mahila Mondal, Baruipara, East Medinipore during January 23-30, 2006.
- In an exhibition organised in connection with Indian Science Congress in Hyderabad during January 3-7, 2006.
- In exhibition at BCKV Mohanpur, Kalyani during January 30- February 2, 2006.



CIFRI Stall in the exhibition at BCKV, Mohanpur, West Bengal



In an exhibition on State level Seminar on extension methodology and farmers' meet for sustainable aquaculture at State Fisheries Training Center Kulia, Kalyani during 27<sup>th</sup> and 28<sup>th</sup> March, 2006.

CIFRI displayed their exhibits in the the Fisheries Division 'Pond to Plate' stall at ICAR pavilion set up for the Northeast Agri Expo, 2006 at Dimapur, Nagaland during March 29-31, 2006.

#### **Empowerment of fisherwomen**

Organized four training programmes of suitable technologies for fisher women folk. The folk were trained in making net. Six training courses for women on net making were organized at Namkhana, Devnivas, Kujerbagi, Kakdwip, Bhubanagar and Mundapara.





North East Agri Expo 2006, Dimapur, Nagaland

# EDUCATION AND TRAINING

# **Education and Training**



Topic	Participants .	Place
Management of Pen Culture	30 fishermen	Chumurdah, West Bengal 18.05.2005
Management of Pen Culture	50 fishermen	Mustafapur, 24-Parganas (N) 20.6.2005
Strengthening of database and information networking in fisheries sector (CSS)	Arunachal Pradesh State Fisheries Officials	Itanagar, Arunachal Pradesh 25-27 July, 2005
Summer School on 'Management Issues in Fisheries and Biodiversity of Estuarine and Associated Ecosystems	Fisheries officers, fisheries educationists and researchers	CIFRI, Barrackpore; 21 July- 11 August, 2005
Strengthening of database and information networking in fisheries sector (CSS)	Mizoram State Fisheries Officials	Aizwal, Mizoram 28-31 August, 2005
Pen culture in floodplain wetlands	30 Fish farmers	Hekera, Kamrup, Assam 26-28 October, 2005
Cage culture in floodplain wetlands	35 Fish farmers and beel lessee	Puthimari beel, Sarbhog, Barpeta, Assam 24th November, 2005
Sampling Methodology	Fish farmers	Bangalore, Karnataka, 24-25 November, 2005
Management of Wetlands	62 fishermen	Panchita, Bongaon, 24 Parganas (N), 28.11.2005
Training on Wetland Management under Skill Development Programme	Fishermen of Cooperative Society	Bhomra, Nadia, West Bengal; 20-22 December, 2005
Training on Wetland Management under Skill Development Programme	Fishermen	Haldia, West Bengal; 23-25 December, 2005



Topic	Participants	Place
Fish Farming in Pen	63 fishermen	Begusarai, Bihar, 28.12.2005
Reservoir Management	Fishermen	Bangalore, Karnataka during
(Manchanbele)		29-30 December 2005
Strengthening of database	Arunachal Pradesh and	Guwahati, Assam 5-7 January, 2006
and information networking	Assam State Fisheries	
in fisheries sector (CSS)	Officials	
Use and Application of	State Govt. officials from	CIFRI, Barrackpore, 5-7 January, 2006
Catch Assessment Survey	Orissa, Bihar and	A CONTRACTOR OF
Software	West Bengal	
Peripatetic Training on	30 fishermen	Latehar, Jharkhand 16-25
Inland Fisheries		January, 2006
Development		
Strengthening of database	Manipur State Fisheries	Guwahati, Assam 17-19 January, 2006
and information networking	Officials	A STATE OF A STATE OF A STATE
in fisheries sector (CSS)		
Strengthening of database	Nagaland and Mizoram	Guwahati, Assam21-23 January, 2006
and information networking	State Fisheries Officials	
in fisheries sector (CSS)		
Floodplain Wetland	15 students and teachers	NER Centre, Guwahati, Assam,
Management	of a college of Barak valley,	06-11 February, 2006
	Assam	
Reservoir Ecology and	State officials	Bangalore, Karnataka during
Fishery enhancement		7-10 February 2006
techniques		
Pen culture in	20 Fish farmers	Puthimari, Goalpara, Assam
floodplain wetlands		17-19 February, 2006
Training on Diversification	47 fishermen and State	Bijpur, 24-Parganas (N), West Bengal,
Fish Farming in Beel	Government officials	21.02.2006
Training on Jheel Matsyiki	20 fishermen	Raebareli, U.P., 2-4 March, 2006
Prabandhan		

		and the second
Topic	Participants	Place
Training on Jheel Matsyiki	20 fishermen	Lakhimpur-Kheri, U.P.,
Prabandhan		9-11 March, 2006
Conservation of fish stock	Fish farmers	Markonahalli, Bangalore, 10.3.2006
in different ecosystems		State States and States
Cage Culture.	Fishermen	Bangalore, Karnataka
(Manchanbele)		17-18 March 2006.
GIS Application in Inland	State Govt. officials,	CIFRI, Barrackpore;
Fisheries	University teachers and	21-30 March, 2006
	scholars	
Conservation of fish stock	Fish farmers	Krishnarajasagar, Mysore,
in different ecosystems		23.3.2006
Cage Culture	Fishermen	Bangalore, 24-25 March 2006
(Hessarghatta).		
Training on Fish Farming in	60 fishermen	Rajaura, Begusarai, Bihar, 27.3.2006
Pen		

# Training abroad

Aquaculture	Dr.Biswajit Dash,T-4	Nigbo University, China from
		1.9.04 to 15.5.05



Inaugural Session of the Summer School 21st July-10th August, 2005



Mass awareness on fish conservation at K R reservoir, Karnataka



Training on Jheel Matsyiki Prabandhan in Uttar Pradesh



Demostration cum Training on Cage Culture at Bangalore



Cage Culture training in Puthimara Beel, Assam



Training on Inland Fisheries at Jharkhand

# AWARDS AND RECOGNITIONS



Best Athelete award winner M. Roy



Dr. K.K.Vass has been elected a Fellow of the

National Academy of Agricultural Sciences on 1st January 2005. Dr. M.S. Swaminathan, the President of Academy, awarded the Fellowship to Dr. Vass during the Annual Day Celebration of Academy held at NASC complex, New Delhi on June 05, 2005.

Shri M. Roy bagged the Best Athlete Award at the ICAR eastern Zonal Sports Meet held at SAI Complex, Salt Lake, Kolkata.

CIFRI was selected as "The Best Exhibitor Of Gourami Variety" in the Aqua Show 2006 Competition held at, Kaloor, Kochi, Kerala during 2-7 February 2006

Dr. B.K.Singh, have been conferred Fellowship Award of the Bioved Research Society, Allahabad for the year 2006.



Dr. K. K. Vass, Director CIFRI being conferred Fellowship of NAAS by Dr. M. S. Swaminathan



# LINKAGES AND COLLABORATIONS

# **Collaboration with CGIAR**

The Consultative Group on International Agricultural Research (CGIAR) under its Challenge Programme on Water and Food (CPWF) has approved a mega project "Improved fisheries productivity and management in tropical reservoirs" to CIFRI, Barrackpore through global competitive bid for research grant schemes. The interdisciplinary project has an overall aim of increasing the productivity of water and providing sustainable livelihoods to rural poor through improved fisheries management in tropical reservoirs. Dr. S. Ayyappan, DDG (Fy), ICAR, New Delhi is the project leader with CIFRI Barrackpore as the lead centre. The other international partners in the project are: Lake Nasser Development Authority, Aswan, Egypt; National Institute Of Oceanography and Fisheries, Cairo, Egypt; Water Research Institute, Achimota. Ghana; Department of Fisheries and Marine Biology, University of Bergen, Norway and World Fish Center, Penang,

Malaysia. A team of CIFRI scientists are involved in the project. The Letter of Agreement has already been signed between CPWF and ICAR for implementation of the project. The work programme is being implemented as per schedule. The project is expected to provide a momentum to development of reservoir fisheries in India.

- CGIAR Challenge Programme on Water and Food (CPWF) project "Community-based fish culture in seasonally flooded rice fields in India" (World Fish Center, Penang, Malaysia)
- Achieving greater food security and eliminating poverty by dissemination of improved CARP strains to fish farmers in India (World Fish Centre, Penang, Malaysia)
- 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.

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- Rajasthan ke Chaynit Jalashayo ki Paristhithiki ewam Matsyaki. Bulletin No.138. Central Inland Fisheries Research Institure, Barrackpore (2005).
- Haryana ke Choti Jalashayo ka Paristhithiki par Adharit Matsya Prabandhan. Bulletin No.136 Central Inland Fisheries Research Institure, Barrackpore (2005).
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# LIST ON-GOING PROJECTS

		ser i mes i contra	
Title of the project	Project leader	Year of Start	Likely date of completion
Assessment of ecology, biodiversity and production potential of Indus river system	Mr. D.N Mishra	April 2002	March 2005
Evaluation of habitat degradation in the context of fisheries ecology in river Ganga	Dr. R.S. Panwar	April 2001	March 2006
Studies on the estuarine ecosystems and mangrove of East in relation to their production potentiality	Mr. R.N.Mishra	April 2003	March 2008
Dynamics of biotic communities of certain estuarine systems from environmental perspectives	Dr. S. N. Singh	April 2004	March 2006
Ecology and fisheries of freshwater reservoirs	Dr. D.S. Krishna Rao	April 2002	March 2007
Ecology and fisheries of small reservoirs of Rajasthan	Dr. V.K Sharma	April 2002	March 2006
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 2008
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 in of India in relation to their resource characteristics.	Dr. Dhirendra Kumar	April 2005	March 2008
Holistic assessment of health and related biological aspects of fish and inland aquatic ecosystems	Dr. Manas Kumar Das	April 2000	March 2008
Inventory of resource and database development in inland fisheries through Remote Sensing Techniques	Mr. R.A. Gupta	April 2002	March 2007



# CONSULTANCIES

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, continuing
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	March2001, continuing

# MEETINGS

# Interaction of fishery scientists from other ICAR institutes

A meeting of Fisheries scientists working in other divisions of ICAR was held under the Chairmanship of Dr. S. Ayyappan DDG (Fy) on 9th April, at CIFRI, Barrackpore to discuss and know the research activities that the scientists are carrying out in their respective institutes. Fourteen fisheries scientists from seven ICAR research Institutes viz., ICAR Research Complex for NEH Region, Barapani; ICAR Research Complex, Goa; Central Agricultural Research Institute, Port Blair; ICAR Research Complex for Eastern Region, Patna; Central Soil and Water Conservation Research and Training Institute, Dehradun and Indian Veterinary Research Institute, Izatnagar participated in the meetings. The



meeting provided an opportunity to assess the strength and weakness of each.. Definite recommendations and action points for implementation was decided. The CIFRI has been made the nodal institute to co-ordinate the activities.





Meeting of fishery scientists of other institutes 10<sup>th</sup> August, 2005

#### **Staff Research Council**

The Annual Staff Research Council meeting of the Institute was held between 18 to 20 April 2005 at CIFRI, Barrackpore. Dr. K K Vass, Director chaired the meeting and Dr. V.R.Chitranshi ADG (Fy) represented the Fisheries Division, The progress of work of all the research projects for the year 2004-05 of the Institute was presented by respective project leaders. After critical review and elaborate deliberations the project programmes for 2005-2006 were approved. Apart from projects the respective scientists also discussed the administrative and financial issues with the representatives from institute administration and finance. The

Staff Research Council meeting 18-20 April, 2005

# **RCM II**

The XVIIth Meeting of the ICAR Regional Committee No. II was held on 24-25 June, 2005 at CIFRI, Barrackpore under the Chairmanship of Dr. Mangala Rai, Secretary, DARE & Director General of ICAR.A host of dignitaries viz, one Minister each from the States of West Bengal and Assam, Members of ICAR GB and Society, Vice Chancellors of SAUs, DDGs and ADGs from ICAR, Directors of ICAR Institutes, State officials and Scientist-in-charge of ICAR stations located in the region attended the meeting. Sri Anisur Rahman, Hon'ble Minister of Animal Resource Development, Govt. of West Bengal was the Chief Guest and Sri Gobind Ch. Langthasa, Hon'ble Minister of Veterinary, Govt. of Assam was the Guest of Honour. Sri Mehboob Zaidhi, Member of Parliament (LS) and Member, G.B (ICAR)



and Sri Harishankar Prasad, Member

ICAR society also graced the occasion. After the formal inaugural function the Chairman, Dr.Mangala Rai, reviewed the progress of work of the region under each crop/commodity/discipline from entire ICAR system and invited responses and interaction from SAUs and State Departments on the issues related to agriculture development, research, extension and education. The meeting ended with the formulation of recommendations and action points for implementation during the next two years. It concluded with the vote of thanks proposed by the member secretary Dr. K. K. Vass, Director, CIFRI.

### **Management** Committee

The Institute Management Committee meeting was held at Barrackpore on 22.8.2005 under the Chairmanship of Dr. K.K. Vass, Director, CIFRI. The committee discussed the action taken on the previous meeting and new agenda items were discussed in detail and approved according to the importance of the items. The following members of the committee attended the meeting. Dr.V.R.Chitranshi, ADG (Fy), Dean, Faculty of Fisheries, Kolkata, West Bengal. Shri Shiv Kumar Saini, Shri Rajiv Singh, Dr. H.C. Joshi, Pr. Scientist, IARI, New Delhi, Dr. R.K. Jana, Pr. Scientist, CIFA, Bhubaneshwar, Dr. P. Ravichandran, Acting Director, CIBA, Chennai, FAO, CRIJAF, Barrackpore, FAO, CIFRI, Barrackpore and SAO, CIFRI, Barrackpore.



ICAR Regional Committee No. 11, XVII<sup>th</sup> Meeting at CIFRI on 24-25 June. 2005



Management Committee Meeting 22August, 2005



# Joint Staff Council (LJSC)

The Staff Council Meeting was held on 21.9.2005. The members of constituted IJSC body which functioned during 2005-2006 is given here under

Official side		Staff side	
Director	: Chairman	Shri Umesh Chaudhary, SSG-II : Secretary, IJSC	
Dr.M.K.Mukhopadhyay Pr.Scientist	: Member	Shri H.C.Banik, T-5 : Member & Member, CJSC	
Dr.B.B. Satpathy. Sr. Scientist	: Member	Shri Kantesh Prasad Singh, T-3 : Member	
Shri D. Karunakaran Scientist	: Member	Shri Shyamal Baran Roy, Asstt. : Member	
Shri U.C.Prasad ,SAO	: Member	Shri P. Muraleedharan, Sr. Clerk: Member	
Shri Z.H.Khilji, FAO	: Member	Shri A.L. Yadav, SSG-IV : Member	
Shri A.B. Biswas, Asst. Admn. Office	: Member-Secretary		

# **Research Advisory Committee**

The Research Advisory Committee of the Institute met at Barrackpore on 24-25 February, 2006 under the chairmanship of Dr. K.V. Devaraj, Former V.C., University of Agricultural Sciences, Bangalore. The following members constitute the committee Dr. B.N.Singh, Ex-DDG (Fy), Dr. V.R. Desai, Ex-Director CIFRI, Prof. B.B. Jana, Kalyani University, Dr. Amalesh Chowdhury and Dr.P.S. Roy, Dean, Indian Institute of Remote Sensing, Dehradun.All Heads of Divisions and Scientists of the Institute participated in the deliberations. The committee expressed the view that future work programmes should incorporate the suggestions offered by the members on each project in the meeting while finalizing future programmes.



Research Advisory Committee Meeting 24-25 February, 2006



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

Participant(s)	Name of Seminar/Symposia/Workshop etc. and organiser	Venue and Date
M. Choudhury,	National Seminar on 'Management	CIFRI, Barrackpore
R. K. Manna,	Challenges in Fisheries of Rivers	April 16-17, 2005
B. K. Bhattacharya,	and Associated Ecosystems: Issues	
Ganesh Chandra,	and Strategies' organized by IFSI	
N. K. Barik, M.P. Brahmane,	and CIFRI, Kolkata	
B.C. Jha, M.K. Bandhopadhyay,		
A.K. Das, D.K. Kaushal,		
H.P. Singh, D. Nath,		
K.D. Joshi, U. Moza,		
R. Palaniswamy, H.C. Karmakar,		
S.K. Mandal, A. Hajra, S.K. Sahu,		
S.N. Singh, A.K. Laal,		
P.N. Jaitley, V.K. Sharma,		
V. Pathak, D.N. Mishra,		
V.K. Murugeshan, B.K. Singh,	a state of the second second second second	
R.N. Seth, P. Maurya, K.R. Naskar,		
M.A. Hassan, D.N. Singh,		
R.S. Panwar, P.K. Saha,		
S.K. Manna, D.S.K. Rao,		
J.G. Chatterjee, S. Samanta,		
M.K. Das, A. Ghosh, V.R. Suresh,	and the second	
S.S. Mishra, B.P Mohanty,		
M.K. Mukhopadhyay, P.K. Katiha,		
A. Mukherjee, U. Bhaumik,		
R.N. Mishra, N.P. Srivastava,		
R.A. Gupta, B.B. Sathapathy,		
K. Mitra		
K.D. Joshi	National Symposium on	NBFGR, Lucknow;
	Re-assessment of Fish Genetic	26-27 April, 2005
	Resources in India and Need to	
	Evolve Suitable Methodology for	
	Conservation	
	(NBFGR and AFS, Indian Branch)	

\*
Participant(s)	Name of Seminar/Symposia/Workshop etc. and organiser	Venue and Date	
D.N. Mishra	3 <sup>rd</sup> Congress on Extension and Education	Karnal; 27 <sup>th</sup> April, 2005	
M. Choudhury, B.K. Bhattacharya	Seminar on 'Environmental degradation of beels of North Kamrup'' organized by Dr. Ambedkar Mission, Assam	Guwahati; April 29-30, 2005	
K.D.Joshi	21 days Summer School on "Advances in Agricultural Research Project Management".	NAARM, Hyderabad 05-25 May 2005	
Utpal Bhaumik	Workshop of CGIAR on Community based Rice-Fish Farming in Indo Gangetic basin at World Fish Centre	Penang, Malaysia; 7-10 June, 2005	
P.K. Katiha	Workshop for Production of a Book on Water use and Productivity	London, U.K., 20-21 June, 2005	
B. K. Bhattacharjya A.K. Das	Summer School of the ICAR on "Management issues in fisheries and biodiversity of estuarine and associated ecosystems"	CIFRI, Barrackpore July 21 to August 10, 2005.	
D. Kumar	Workshop organized by State Fisheries Deptt., U.P.	Lucknow; 25 <sup>th</sup> July, 2005	
S.K. Mandal	Material Testing Workshop on Stock Assessment Tools and Capacity Building	DFID, Kolkata; 8-12 August, 2005	
D.N. Mishra	Workshop on All India Coordinated Research Project in Agroforestry	CSSRI, Karnal; 20-22 August, 2005	
H.C. Karmakar	Workshop on Community- based Management of Rice-Fish Farming under World Fish Centre	based CIFRI, Barrackpore; <sup>7</sup> arming 27 <sup>th</sup> August, 2005	
V.R. Suresh	National Conference on IPR and Management of Agricultural Research	NASC, Pusa, New Delhi; 27-29 August, 2005	



Participant(s)	Name of Seminar/Symposia/Workshop etc. and organiser	Venue and Date	
D.N. Mishra	RCM Meeting of Zone-VI	CSSRI, Karnal; 2-3 September, 2005	
M.K. Das and P. Maurya	Second Annual workshop on the project 'Impact Adaptation and Vulnerability of Indian Agriculture to Global Climate Change'	CPCRI, Kasargod, 22-24 Sept., 2005	
S.K. Mandal & S.K. Sahu	3 <sup>rd</sup> Technical Committee Meeting of CSS	Chandigarh; 26 <sup>th</sup> September, 2005	
D. Kumar	Symposium on Excitement of Science	NASI; Allahabad; 6-7 October, 2005	
A.K. Das, K.D. Joshi	Workshop on Disaster Management in Fisheries and Aquaculture	NIDM, New Delhi; 6-7 October, 2005	
D. Kumar	Platinum Jubilee Celebration of NASI held at M.N.I.T.,	Allahabad 6 <sup>th</sup> October 2005.	
D. Kumar	Symposium on "Exitement of Science" held at NASI, Allahabad.	Allahabad October 6 & 7, 2005	
M. Choudhury B. K. Bhattacharjya Ganesh Chandra A. Biswas K. K. Sarma	Pen culture in beels at Livestock Research Station, Assam Agricultural University, Assam	Mandira, Kamrup, Assam October 26-28, 2005	
K. K. Vass	7 <sup>th</sup> Indian Fisheries Forum	Bangalore, 8-11 November, 2005	
P.K. Sukumaran, M. Feroz Khan, P. Panikkar Sukumar Saha	Seminar on 7 <sup>th</sup> Indian Fisheries Forum	Bangalore; 8-11 November, 2005	
K. K. Vass	Participated in the Meeting of the Director of Fishery InstitutesBangalo Novem		
M. Choudhury, B.K. Bhattacharya	Seminar on 'Ornamental fish culture and trade" organized by Goalpara College, Assam	Goalpara, Assam November 11-12, 2005	

Participant(s)	Name of Seminar/Symposia/Workshop etc. and organiser	Venue and Date
R. K. Manna B. K. Bhattacharjya	Field training on Cage culture under NE component organised by NERC,	Puthimari beel, Sarbhog, Assam
A. Biswas K. K. Sarma D.N. Mishra, Usha Moza	CIFRI National Workshop on Culture of Catfishes and Murrels	24 November, 2005 ARTI, Hisar, Haryana; 25-26 November, 2005
R.N.Seth	National Workshop on Culture of cat fishes and murrels and delivered invited lecture on 'Bionomics of culturable cat fishes of India'	ARTI, Hissar (Haryana), 25-26 November, 2005
K.K. Vass	Meeting with the Directors of Fisheries for discussion on dwilding of fish stocks in river Yamuna-Haryana State	Chandigarh 26 <sup>th</sup> Nov. to 1 <sup>st</sup> Dec., 2005
Usha Moza	Director's Meeting on Conservation of Fisheries in River Yamuna	Chandigarh; 28-30 November, 2005
B. K. Bhattacharjya	Training programme for progressive fish farmers (under AACP) organized by the Directorate of Fisheries, Govt. of Assam	SIRD, Kahikuchi, Guwahati 29th November, 2005
A. Biswas	Training programme for progressive fish farmers (under AACP) organized by the Directorate of Fisheries, Govt. of Assam	SIRD, Kahikuchi, Guwahati 30th November, 2005
R. K. Manna, B. K. Bhattacharya	Training programme for progressive fish farmers (under AACP) organized by the Directorate of Fisheries, Govt. of Assam	SIRD, Kahikuchi, Guwahati 1 <sup>st</sup> December, 2005
M. Feroz Khan, M. Kartikeyan, P. Panikkar	Training programme on SPSS Software	Bangalore 2 <sup>nd</sup> December, 2005



Participant(s)	Name of Seminar/Symposia/Workshop etc. and organiser	Venue and Date	
K. K. Vass	Participated in the International Water Conference	NASC Complex, DPS Marg, New Delhi 5-11 December, 2005	
S.N. Singh	Participated in an Interactive Meeting convened by the Conservator of Forests, Sardar Sarovar Narmada Nigam Ltd.	Gandhinagar; 6th December, 2005	
M. Choudhury	NBFGR Review Meeting at NRC Mithun, Medziphema, Nagaland	Medziphema, Nagaland December 6-7, 2005	
D.N. Mishra, Usha Moza	Workshop on Strategies for Restoration of River Yamuna Floodplain	CSSRI, Karnal; 7 <sup>th</sup> December, 2005	
A. Biswas	Training programme for existing hatchery owners, hapa breeders & seed growers organized by the Directorate of Fisheries, Govt. of Assam	SIRD, Kahikuchi, Guwahati 4 <sup>th</sup> December, 2005	
R. K. Manna, M. Aftabuddin	Training programme for existing hatchery owners, hapa breeders & seed growers organized by the Directorate of Fisheries, Govt. of Assam	SIRD, Kahikuchi, Guwahati 15 <sup>th</sup> December, 2005	
K.D. Joshi	Mandaliya Matsya palan Karyashala organized by State Fisheries, U.P.	Allahabad; 15 <sup>th</sup> December, 2005	
K. K. Vass	Participated XXXV Academic Council Meeting of CIFE.	CIFE, Mumbai 16 <sup>th</sup> December, 2005	



Participant(s)	Name of Seminar/Symposia/Workshop etc. and organiser	Venue and Date	
D.N. Singh, Usha Moza	Fisheries and Aquaculture in Indus	PAU, Ludhiana;	
	River Regions, Conservation,	21-22 December,	
	Management and Development of	2005	
	Indigenous Fish Fauna		
D.S.K. Rao	RCM VIII	Chennai;	
		23-24 December, 2005	
S.Samanta	Seminar on 'Recent development	Chromspec	
	on chromatography instruments'	Technologies and	
		Agilent Technologies,	
		7.12.05, Kolkata, WB.	
R.S.Panwar, D. Kumar,	Attended a Sangosthi on Intellectual	Bioved Research	
B.K.Singh and K.D. Joshi	Property Rights (IPR) held	Society, Allahabad	
		10 <sup>th</sup> January 2006	
D. Kumar	Participated and delivered talk on	Bioved Society,	
	Conservation on Fisheries Resources	Allahabad;	
	in Sangosthi on IPR	10 <sup>th</sup> January, 2006	
B.K.Singh, D. Kumar	Participated in deliberation in	Faizabad, U.P.	
	"Brain-storming session" at	18 <sup>th</sup> January 2006	
	Narendra Deo University of		
	Agriculture and Technology,		
V.R. Suresh	Meeting on Assessment of Fish	NBFGR,	
B.K. Bhattacharjya	Biodiversity in India Lucknow;		
		27-28 January, 2006	
R.K.Tyagi	Participated in brainstorming session	NBFGR, Lucknow	
	on "Fish germplasm exploration,	27-28 January, 2006	
	cataloguing and conservation :		
	a collaborative effort of		
	ICAR Fisheries Institutes".		
A.K. Das	Training programme on Disaster	NIDM, New Delhi;	
K.D. Joshi	Management in Fisheries and	30 <sup>th</sup> January-	
	Aquaculture	3 <sup>rd</sup> February, 2006	



Participant(s)	Name of Seminar/Symposia/Workshop etc. Venue and D and organiser		
D. Karunakaran	Training programme on Development of Portal using LAMP Technology	IASRI (ICAR), New Delhi; 1-21 February, 2006	
Dr. R.N.Seth	National Seminar on Impact of pollutants on fishes and other aquatic life	Jamshedpur Co-operative College, Jamshedpur 5-6th February, 2006.	
M. Choudhury R. K. Manna M. Aftabuddin B. K. Bhattacharjya Ganesh Chandra A. Biswas	Training programme on 'Fisheries management of floodplain wetlands (beels) of Assam'organised by NERC, CIFRI, Guwahati	NER centre of CIFRI, Guwahati. 06-11 February, 2006	
M. Choudhury B. K. Bhattacharjya K. K. Sarma	Training on Pen culture in beels	Puthimari, Goalpara, Assam 17-19 February, 2006	
R.N.Seth, and Dr. B.K.Singh,	Participated in the 8th Indian Agricultural Scientists and Farmers Congress,	Banaras Hindu Univerity, Varanasi 21-22 February 2006	
M.K.Das, P.K.Saha, M.K. Mukhopadhyay, K.Katiha, S.K.Manna, M.P.Brahmane, P.Maurya	Workshop on Impact, Adaptation and Vulnerability of Fisheries and Livestock to Climate Change	CIFRI, Kolkata; 4 <sup>th</sup> March, 2006	
D. Kumar	28 <sup>th</sup> Meeting of Management Committee of CIBA	Chennai; 9 <sup>th</sup> March, 2006	
B. K. Bhattacharjya	MPEDA sponsored Two-day workshop on 'Prospect of ornamental fish culture in Meghalaya" organized by the Directorate of Fisheries, Govt. of Meghalaya	Shillong 16-17 March, 2006	

Participant(s)	Name of Seminar/Symposia/Workshop etc. and organiser	Venue and Date	
Sukumar Saha, A. Mitra	Exhibition-cum-Seminar	Science City, Salt Lake, Kolkata; 17-18 March, 2006	
A.K. Das, Usha Moza R.S.Panwar	National Convention on Knowledge Driven Agricultural Development: Management Change	IARI, Pusa, New Delhi; 24-26 March, 2006	
Utpal Bhaumik	Seminar on Extention Methodology and Farmers Meet for Sustainable Aquaculture, MPEDA, Kolkata	Kulia, Kalyani; 27-28 March, 2006	
K.D. Joshi	Seminar on Biodiversity of Uttaranchal state, Gurukul Kangri University and delivered guest lecture	Haridwar, Uttaranchal; 27-28 March, 2006	
R.S.Panwar and Dr. A.K.Laal	Attended Meeting of Management Committee of NRCCWF.	Bhimtal 28th March 2006	



# **EVENTS ORGANISED**

#### NATIONAL SEMINAR

The Institute in collaboration with Inland Fisheries Society of India organized a National Seminar On "Management Challenges in Fisheries of Rivers and Associated Ecosystems: Issues and Strategies" at Barrackpore, Kolkata on April 16-17, 2005. Dr. Mangala Rai, the Secretary DARE, Govt. of India and Director General, ICAR inaugurated the seminar. The seminar was attended by 250 delegates involved in open-water fishery management from different parts of the country. The Society organized a Memorial lecture during the seminar to honour late Dr. T.V.R Pillay, a great promoter of aquaculture at global level, which was delivered by Prof. M.N. Kutty. On this occasion Dr. Mangala Rai released six publications, three in Hindi and three in English apart from the Seminar Souvenir.



Inaugural session of the National Seminar

**Independence Day** was celebrated with solomneity at the headquarter. The Director unfurled the National flag.



Independence Day celebration at CIFRI

Republic Day was celebrated with usual enthusiasm.

#### Summer School

Summer School of 21day duration on 'Management Issues in Fisheries and Biodiversity of Estuarine and associated Ecosystems' was organised at Barrackpore from 21st July, 2005 to 10th August. 25 participants from 7 states took part. The participants were trained in modern tools and exposed to skill development and use of new concepts in estuarine ecology and associated ecosystem management.

#### Workshops

A workshop on 'Community-based Management of Rice-fish Farming with Adaptive Learning Approach' was organized at CIFRI, Barrackpore on 27 August, 2005. The Workshop on the collaborative project between World Fish Center-Central Inland Fisheries Research Institute on "Communitybased fish culture in seasonally flooded rice fields in India" was attended and chaired by Dr. S.Ayyappan, DDG (Fy), ICAR. Dr. Robert Arthur, from MARG, London, presented the findings of the adaptive learning approach (ALA) in rice-fish farming. Shri N.K. Saha and Dr. S. Bardhan Roy, Department of Agricultural (DoF), Government of West Bengal,

Dr. Utpal Bhaumik, Principal Investigator of the project from CIFRI, and Dr. P.K. Pandit, Coordinator presented their findings. Dr.K.K.Vass, Director, CIFRI summarized the proceedings. The recommendations were discussed in the house for approval. About 50 scientists, farmers and officers from the various departments attended the workshop.



Workshop on community based management of Rice-Fish farming in progress

The thematic workshop on 'Impact, Adaptation and Vulnerability of Fisheries and Livestock to Climate Change' under the ICAR funded project entitled 'Impact Adaptation & Vulnerability of Indian Agriculture to Global Climate Change was



held on 4th March, 2006 at CIFRI. The workshop was chaired by Dr.S.Ayyappan, DDG (Fy) with the presence of Dr. P.K. Aggarwal, Coordinator of the project and Dr. K.K. Vass. The principal investigator and coinvestigators from participating organizations NDRI, Karnal, CMFRI, Kochi, NDUAT, Faizabad and CIFRI presented their findings. After intensive discussion recommendations were formulated for future work.



Workshop on 'Impact, Adaptation and Vulnerability of Fisheries and Livestock to Climate change, 4th March, 2006

#### **ICAR Eastern Zonal Sports Meet**

The ICAR zonal sports meet Zone III was organized by CIFRI at Sports Authority of India complex, Kolkata during 15-19February 2006. Ten ICAR institutes participated in different events at Sports Meet. The CIFRI contingent put up a sterling performance and Shri M. Roy bagged the Best Athlete Award at the Meet. Mr Mewalaal



Ex-Olympiad gave away the prizes to the

winners of different events.



ICAR Eastern Zonal Sports Meet organised by CIFRI

#### **Hindi Week**

Hindi week was observed during the period from 14<sup>th</sup> September to 20<sup>th</sup> September, 2005. During this week many Hindi competitions were conducted. A large number of staff members participated in these competitions. A function was conducted on 20th September, 2005 to conclude the week long celebrations. Dr. Suraj Bahadur Thapa, Professor, Surendra Nath College, Barrackpore was the Chief Guest in the function. Prizes for best performances in Hindi competitions were given away by the Guest of Honour, Smt. Girija Vass.

#### Shri Sharad Pawar Ji Union Minister of Agriculture visits CIFRI

Honorable Union Minister of Agriculture and Consumer Affairs, Food and Public Distribution Government of India and President of ICAR, Shri Sharad Pawar Ji had a joint inspection visit of CIFRI and CRIJAF at Barrackpore on 19th October, 2005. Shri Pawar was received at CIFRI by the Secretary DARE and the D.G. ICAR Dr. Mangala Rai; DDG (Fy) Dr. S. Ayyappan; Directors of CIFRI and CRIJAF, Dr. K.K. Vass and Dr. H.S.Sen, respectively.

Shri Pawar inspected the exhibition set up on this occasion by CIFRI and CRIJAF, depicting the achievements in inland fisheries and jute sector. He also visited the Aquarium house and laboratories of CIFRI, where honorable Minister was apprised by the scientists about the current research work carried out by them in different emerging areas of inland fisheries. The DG, ICAR also interacted with the scientists and visited the various laboratories of CIFRI. The Honorable Minister also presided over an interaction meeting in which apart from scientists from both institutes, representatives of fishers, farmers, farmwomen and entrepreneurs of fishery and jute sector were present. To start with Dr. Mangala Rai, DG, ICAR while extending a warm welcome to the Hon'ble Minister and all the participants to this interaction meeting, informed the Honorable Minister, about the history and the importance of research work carried out by CIFRI & CRIJAF. Dr. Vass and Dr. Sen, the respective directors of CIFRI and CRIJAF, presented a brief overview of each sector before the Honorable Minister and the gathering. In this meeting representatives of each sector flagged certain issues before the Honorable Minister, the secretary DARE assured that appropriate action

will be taken to address them after appropriate examination.

The Honorable Minister addressed the gathering and said that he was happy to know the achievement of both the institutes but due to paucity of time this inspection visit was brief. He expressed that in future he will find time to have a longer interaction with scientist of each institute. He advised the scientists to work hard to provide solutions to the farmers' problems in both the sectors. At the end of meeting Dr. Ayyappan DDG (Fisheries) proposed a vote of thanks.



Visit of Hon'ble Union Minister of Agriculture and Consumer Affairs, Food and Public distribution to CIFRI on 19th October, 2005

#### **Fish Farmers Day**

- Northeastern Regional Centre of CIFRI organized the National Fish Farmers Day in Guwahati on July 10, 2005. On this occasion about 200 fish farmers/fishermen of Kamrup district, Naogaon, Morigaon, Barpeta of Assam interacted with the scientist of the regional centre. On this occasion five enterprising fishermen were felicitated with 'Fish Farmer Award 2005'.
  - Organised one Fish Farmers' Day at Koithkola at Bihar on 26.03.2006 about 150 fish farmers participated in the programme. The officials of State Fisheries Department, Government of Bihar and members of the local Government bodies were also participated in the programme.



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Fish Farmers Day at Guwahati, Assam on 10th July, 2005



## PERSONNEL

Managerial position only, from March 2005 to April 2006

**CIFRI, Barrackpore, West Bengal** Dr. K. K.Vass, Director

**Riverine Division, Allahabad, Uttar Pradesh** Dr. R.S. Panwar, Principal Scientist, Head of Division (Acting)

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

**Estuarine Division, Barrackpore, West Bengal** Mr.R.N.Mishra , Principal Scientist, Head of Division (Acting)

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

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



Shri Anisur Rahman, Hon'ble Minister for Animal Resources, Govt of West B engal.

Shri Mehboob Zaidhi Hon'ble M.P. and GB Member, ICAR

Shri Gobind Ch. Langthasa Hon'ble Minister of Veterinary, Govt. of Assam

**Dr. Mangala Rai** Secretary DARE, GOI and DG, ICAR.

Dr. Dipak Bagchi V.C. BCKKV, West Bengal.

Dr.R.C. Baghail V.C., AAU, Guwahati

**Dr. Mrinal K.Mazumdar** V.C., Uttar Bangha Agricultural University, Cooch Bihar

**Dr.A.K.Bandyopadhyay** V.C., West Bengal University of Animal and Fishery Sciences

Dr. Mark Prein Senior Scientist, World Fish Centre, Pennang.

Dr. Madan Dey Regional Director, World Fish Centre, Pennang **Dr. Robert Arthur** Scientist, MRAG, London.

Dr. Chris Bene Senior Scientist, World Fish Centre, Cario

Mr. Marco Blixt IWMI, Colombo

**Dr. S. Ayyappan,** DDG (Fy) ICAR

Dr. J.S.Samra DDG (NRM) ICAR

Dr. V.K Taneja DDG (AS) ICAR

Dr. P. Das DDG (AE) ICAR

Dr. Nawab Ali DDG (Engg) ICAR

Dr. P.V. Dehadrai Ex. DDG (Fy), ICAR

Dr. S.D. Tripathi Ex. Director, CIFE

**Prof. H.P.C. Shetty** *Ex. Director of Instruction, Fisheries College, Mangalore* 

Mrs. Sarojini Pillai Ex-Scientist, CIFRI



**Dr. M.Y. Kamal** *Ex-V.C., Sher-E-Kashmir Agricultural University, Srinagar* 

Shri Hari Shanker Prasad a progressive farmer & Member ICAR Society.

Dr. R.C. Maheswari ADG (Te) ICAR

Dr. Khokar ADG (PIM) ICAR

Dr. S.N. Pandey ADG (Hort) ICAR

Dr. N.B. Singh ADG (Crops) & Agriculture Commissioner, GOI Dr. H.S. Sen Director, CRIJAF, West Bengal.

**Dr. S.K. Bhattacharya** *Director, NIRJAFT, Kolkata* 

**Dr. S.K. Biswas** Director, Jute Development Corporation, Kolkata

**Sri R.P.S Kahlon** *The Secretary, Department of Fisheries, Govt. of West Bengal.* 

Sri S.K. Das Zonal Coordinator, ICAR, Kolkata.

**Dr. Nicos Perez** Coordinator, World Fish Centre, Penang, Malaysia.

#### ANY OTHER RELEVANT INFORMATION SUCH AS SPECIAL INFRASTRUCTURAL DEVELOPMENT

The work on new laboratory building for our Reservoir Division at Bangalore has registered 70% physical progress.



# वार्षिक प्रतिवेदन 2005 - 2006



केन्द्रीय अंनर्स्थलीय मात्स्यकी अनुसंधान संस्थान (भारतीय कृषि अनुसंधान परिषद्) बैरकपुर, कोलकाता - 700120

# आमुख



योजना के लिये आवश्यक सूचनाओं

को उपलब्ध कराया । संस्थान ने परिषद् द्वारा निर्धारित आंतरिक वित्तीय संसाधानों की प्राप्ति के लक्ष्य को वैज्ञानिकों एवं तकनीकी कर्मचारियों के अथक प्रयास से प्राप्त किया। उत्तर-पूर्वी पर्वतीय क्षेत्र के कार्य - कलापों की दिशा में संस्थान ने स्वीकृत कार्यक्रम को कार्यान्वित किया जिसमें बाढ़कृत आर्द्रक्षेत्रों की मात्स्यिकी पर विशेष ध्यान दिया गया। मात्स्यिकी क्षेत्र में जागरूकता उत्पन्न करने हेतु संस्थान के विशेष प्रयासों के अंतर्गत विभिन्न प्रकार के मात्स्यिकी संबंधित साहित्य का प्रकाशन, 16 प्रदर्शनियों एवं मत्स्य पालक दिवसों का आयोजन किया गया ।

संस्थान के सभी आवश्यक बैठकें जैसे अनुसंधान सलाहकार समिति, स्टाफ रिसर्च काउंसिल, प्रबंधन समिति, संस्थान का संयुक्त कर्मचारी परिषद् का पूर्व निर्धारित समय पर आयोजन किया गया एवं इनके सुझावों को अनुसंधान एवं संस्थान प्रबंधन में कार्यान्वित किया गया।

संस्थान के वैज्ञानिकों, तकनीकी व प्रशासनिक अधिकारियों एवं कर्मचारियों को विभिन्न संगोष्ठियों, कार्यशालाओं एवं प्रशिक्षण कार्यक्रमों में भाग लेने के पर्याप्त अवसर प्रदान किये गये।

मैं, डॉ॰ मंगला रॉय, सचिव, कृषि अनुसंधान एवं शिक्षा विभाग तथा महानिदेशक, भारतीय कृषि अनुसंधान परिषद, नई दिल्ली के प्रति कृतज्ञ हूँ जिन्होने संस्थान के कार्यकलापों में आवश्यक सहायता एवं प्रोत्साहन दिया । मै, डॉ॰ एस. अय्यप्पन, उप-महानिदेशक (मात्स्यिकी), भारतीय कृषि अनुसंधान परिषद के प्रति भी आभारी हूँ जिन्होने संस्थान के अनुसंधान कार्यो में निरंतर दिशा-निर्देश एवं सहायता प्रदान

केन्द्रीय अंतर्स्थलीय मात्स्यकी अनुसंधान संस्थान ने इस वर्ष भी अपने अनुसंधान कार्य को अंतर्स्थलीय जलीय संसाधनों जैसे नदी, जलाशय, ज्वारनदमुख, आर्द्र क्षेत्रों की उत्पादन क्षमताओं को उजागर करने की दिशा में कार्य किया है । इसके अलावा संस्थान ने भौगोलिक सूचना प्रणाली की सहायता से जलीय संसाधनों के मूल्यांकन, मत्स्य प्रबंधन तथा परितंत्रों की स्वच्छता संबंधित विभिन्न पहलुओं का समाधान करने का भी प्रयास किया । जलीय संसाधनों से संबंधित आवश्यक डेटाबेस तैयार करने एवं नीतिगत सहायता के विकास के लिये संस्थान ने १३ अनुसंधान परियोजनाओं पर भी कार्य किया । नदी व ज्वारनदमुखों पर आधारित मछुआरों में जैव-विविधता तथा जलीय परितंत्रों के संरक्षण के प्रति जागरूकता पैदा करने का भी प्रयास किया गया । आर्द्रक्षेत्रों में कार्यरत विभिन्न समूह के लोगों के लिये मत्स्य उत्पादन में वृद्धि के अनेक तकनीकों का निरूपण भी किया गया ।

देश के विभिन्न राज्य सरकारो जैसे - प० बंगाल, गुजरात, कर्नाटक, असम, हरियाणा एवं उत्तर प्रदेश के मत्स्य विभागों के आपसी सहयोग में काफी प्रगति हुई है । भारत सरकार द्वारा प्रदत्त एक परियोजना के तहत संस्थान देश के 35 राज्यों एवं केन्द्र शासित प्रदेशों के जलीय संसाधानों का भौगोलिक सूचना प्रणाली तकनीक के प्रयोग से मूल्यांकन करने की दिशा में कार्य कर रहा है । देश के जलीय संसाधनों के मूल्यांकन की दिशा में यह एक ठोस कार्य है । संस्थान ने भारतीय कृषि अनुसंधान परिषद् के अन्य संस्थानों, राज्य कृषि विश्वविद्यालयों तथा विभिन्न अनुसंधान संगठनों से मिलकर अनेक नेटवर्क परियोजनाओं में भी कार्यरत है । अंतर्राष्ट्रीय स्तर पर संस्थान ने वर्ल्ड फिश सेन्टर, पेनांग के सहयोग से दो परियोजनाओं को सफलतापूर्वक सम्पन्न किया । सुनामी त्रासदी के संदर्भ में संस्थान ने प्रभावित तटीय क्षेत्रों में मैंग्रोव आधारित पुनरुद्धार



किया । परिषद के मात्स्यिकी प्रभाग के

अधिकारियों विशेषकर डॉ॰ वी. आर. चित्रांशी, सहायक -महानिदेशक (अंतर्स्थलीय माल्स्यिकी), डॉ॰ ए. डी. दीवान, सहायक - महानिदेशक (समुद्रीय माल्स्यिकी), श्री अनिल अग्रवाल, प्रधान वैज्ञानिक तथा श्री ए. एस. भाटिया, अवर सचिव को भी धन्यवाद देता हूँ जो समय - समय पर अपना सहयोग एवं सहायता प्रदान करते रहे हैं ।

इस रिपोर्ट में उल्लेखित सभी उपलब्धियाँ संस्थान के समस्त अधिकारियों एवं कर्मचारियों के सामूहिक प्रयास का परिणाम है जिसके लिये वे बधाई के पात्र हैं । हमें आशा है कि भविष्य में वे अपने कार्य निष्पादन में निखार लाने हेतु और भी बेहतर प्रयास करेंगें ।

मैं आशा करता हूँ कि यह रिपोर्ट विभिन्न लोगों एवं संगठनों के लिये उपयोगी सिद्ध होगा जिन्हें विवृत जल क्षेत्र मात्स्यिकी एवं परितंत्रों के प्रबंधन में रूचि है तथा जिससे उपयुक्त मत्स्य उत्पादन एवं जैव - विविधता का संरक्षण किया जा सके । मैं व्यक्तिगत रूप से उनके विचार जानने के लिये इच्छुक हूँ जिससे आने वाले वर्षों में इसे और भी सूचनाप्रद बनांया जा सके ।

मैं डॉ॰ मानस कुमार दास, प्रधान वैज्ञानिक को धन्यवाद देता हूँ जिन्होने इस रिपोर्ट के मसौदे का संकलन किया है साथ ही उन सभी अधिकारियों एवं कर्मचारियों का भी धन्यवाद देता हूँ जिन्होने इस कार्य में सहायता दिया है । श्री पी. आर. राव सहायक निदेशक (राजभाषा) को भी धन्यवाद देता हूँ जिन्होने इस इस रिपोर्ट का संक्षिप्त विवरण हिन्दी में तैयार किया है ।

कुत्रीप वास

कुलदीप कुमार वास निदेशक

बैरकपुर, कोलकाता अगस्त, 2006

# विशिष्ट सारांश



परियोजनाओं की महत्वपूर्ण उपलब्धियाँ निम्नलिखित हैं -

#### नदीय मात्रियकी

संस्थान ने देश के विभिन्न नदियों जैसे गंगा, रावी आदि की जलीय गुणवत्ता, जल विज्ञान एवं मात्स्यिकी की स्थिति का अध्ययन किया । फरका में तलछटों में एच.सी.एच. कीटनाशकों का जमाव अधिकतम 68.0 पाया गया । सदियापुर और दारागंज मत्स्ययन केन्द्रों से प्राप्त मत्स्य उपज कमश: 74 और 34 टन के आंकलन से ज्ञात होता है कि उपज में कमी आई है जिसमें मेजर कार्प और शिंगटी मछलियों का योगदान मात्र 10% है । रावी नदी जल निकासी एवं कृषि प्रदूषण से प्रभावित है । इससे प्राप्त कुल जैविक उपज 4.4 टन/मीटर जिसमें पठानकोट से 1.6 टन, कथलौर से 0.98 टन, डेराबाबा नानक से 0.38 टन और अमृतसर से 1.42 टन प्राप्त हुआ है । यमुना सतलज तथा व्यास नदियों में सी. ग्रिपिनस की मौजूदगी चिन्ताजनक है ।

#### जलाशय मात्रियकी

कर्नाटक, उत्तर प्रदेश, हिमाचल प्रेदश और राजस्थान के जलाशयों का अध्ययन किया गया ताकि इनमें मात्स्यिकी के विकास हेतु आवश्यक प्रबंधन प्रणालियों का विकास किया जा सके । सभी जलाशयों की पारिस्थितिकी और मात्स्यिकी स्तर के विभिन्न पहलुओं का मूल्यांकन किया गया जिससे सही संस्तुतियाँ दी जा सकें ।

हिमाचल प्रदेश के पांग जलाशय से प्राप्त उपज से ज्ञात होता है कि विदेशी कार्प मछलियों की उपज बीज संग्रहण के अनुरूप नही है । शिंगटी मछलियों के विकास पर नियंत्रण करना आवश्यक है जो कि भारतीय व विदेशी कार्प मछलियों का स्थान ले रही हैं ।

#### ज्वारनदमुखी मात्रियकी

नवम्बर, 2005 से जनवरी 2006 के दौरान हुगली की निचली ज्वारनदमुख की शीतकालीन बैगनेट उपज के आंकलन सें 28394.2 टन की कमी एवं उपज प्रति इकाई प्रयास में 0.8

केन्द्रीय अंतर्स्थलीय मात्स्यकी अनुसंधान संस्थान की स्थापना मार्च 1947 में एक अनुसंधान केन्द्र के रुप में हुई जो कालान्तर में एक संपूर्ण संस्थान में विकसित हुई । इन वर्षों में यह संस्थान अंतर्स्थलीय मात्स्यकी के क्षेत्र में एक प्रमुख संस्थान के रूप में स्थापित हुआ है । यह संस्थान पश्चिम बंगाल राज्य के कोलकाता शहर के निकट बैरकपुर में स्थित है । इस संस्थान में इस समय 70 वैज्ञानिक, 85 प्रशासनिक कर्मचारी एवं 167 सहायक वर्ग के कर्मचारी कार्यरत हैं । वित्तीय वर्ष 2005-06 के दौरान इस संस्थान का कुल बजट 12.00 करोड़ रुपये था ।

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

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

अनुसंधान कार्यक्रमों की दिशा मुख्यतः परितंत्रों के अनुसंधान जैसे:- स्रोतों का मूल्यांकन, पारिस्थितिकी, जैव-विविधता, मत्स्य मूल्यांकन, उपज तथा पर्यावरणीय अनुमापन एवं प्रबन्धन की ओर था । इस अवधि के दौरान संस्थान ने बाहरी संगठनों द्वारा प्रायोजित 8 परियोजनाओं तथा विदेशी संस्थाओं द्वारा प्रायोजित 2 परियोजनाओं के अलावा संस्थान के 12 अनुसंधान परियोजनाओं पर भी कार्य सम्पन्न किया । इन अनुसंधान



कि.ग्रा (2%) की वृद्धि देखी गई । पिछले वर्ष यह उपज 29746.6

टन एवं प्रति इकाई प्रयास में 39.6 कि.ग्रा थी ।

व्यावसायिक मत्स्ययन कार्य में कुल 90 मत्स्य व झींगा प्रजातियाँ पाई गई। ज्वारनदमुख का कुल वार्षिक मत्स्य उपज 110.08 मेट्रिक टक आंका गया। उपज में मुलेट 18.2%, झींगे 10.9% तथा अन्य वर्ग 6.3 - 8.0% देखा गया।

कृष्णा ज्वारनदमुख से कुल 40 मत्स्य प्रजातियाँ पाई गई जो 26 फेमिली और 36 जेनेरा से संबंधिन है । मत्स्य प्रजातियों में ज्वारनदमुख एवं समुद्री प्रजातियों का बाहुल्य है । वर्ष 2005-06 के दौरान कुल मत्स्य उत्पादन 540 टन अर्थात् 90 कि.ग्रा प्रति हे आंका गया ।

#### बाढ़कृत मैदानी आर्द्र क्षेत्र मात्स्यिकी

कतला, रोहू बाटा और मृगल के 0.09 से 1.03 ग्रा॰ के भार वाले अंगुलिकाओं को 27 मीटर आमाप के तैरने वाले पिंजरों में 10 से 20 लाख प्रति है॰ की दर से संग्रहित कर 60-90 दिनों तक पालने पर इनका शारीरिक वजन क्रमश: 10, 20, 11 और 17 ग्रा॰ हो गया है ।

असम के 23 जिलों के 118 बीलों से आंकड़ों को प्राप्त कर उनका विश्लेषण किया गया तथा बीलों के इष्टतम लीज दर के अनुमापन के लिये फार्मूला तैयार किया गया जिसके अनुसार इष्टतम लीज दर आर्थिक किराये का 15 प्रतिशत होना चाहिये ।

#### मत्स्य स्वास्थ्य एवं पर्यावरण

जैव सूचकों को जैव-रासायनिक, भौतिकी एवं सामुदायिक स्तर पर प्रयोग करके चूर्णी नदी के पर्यावरणीय स्तर को मापा गया । अध्ययन से देखा गया कि कुछ देशी प्रजातियों, जल कालुम प्रजातियों, नीतलस्थ प्रजातियों तथा शाकाहारी प्रजातियों के संख्या में कमी आई है । जैव इंटीग्रीटी सूचक का ऊपरी स्तर पर अभाव देखा गया । इस सूचक के अनुसार केवल 3 या 60 प्रतिशत प्रतिचयन स्थलों पर ही मात्स्यिकी संभव है ।

गंगा नदी के कीटनाशको के अध्ययन से यह पता चला कि सभी प्रतिचयन स्थलों में डी. डी. टी. का जमाव 4.4' तक है जो संयुक्त राष्ट्र अमेरिका द्वारा निर्धारित ई.पी.ए. स्तर से कहीं अधिक है । एरोमोनास हाइड्रोफिला के अध्ययन से देखा गया कि कॉपर सल्फेट, सोडियम नाइट्रेट, फोरमालिन, हाइड्रोजन पेरोक्साइड, कर्पूर आदि इस प्रजाति पर प्रतिकूल प्रभाव डालते हैं जिससे उनके रोग निरोध क्षमता में कमी आती है ।

#### संसाधन मूल्यांकन

उड़ीसा के 25 जिलों के लिये डिजिटल आधारित मानचित्र तैयार किया गया है । राजस्थान के 10 हे. क्षेत्र से अधिक जल निकायों के मैंपिंग का कार्य मानसून पश्चात् प्राप्त आंकड़ों से किया गया तथा साथ ही नदियों एवं झरनों के मैपिंग का कार्य को भी पूरा किया गया ।

विभिन्न अंतर्स्थलीय जल संसाधनों से संस्थान के विभिन्न केन्द्रों द्वारा मत्स्य आंकड़ों को प्राप्त कर डेटाबेस तैयार किया गया है जैसे बैरकपुर में हुगली-मातलाह ज्वारनदमुख, करनाल में यमुना व पश्चिमी यमुना नदी तथा गुवाहाटी का ब्रहमपुत्र नदी ।

#### अन्य कार्यकलाप

संस्थान की विभिन्न समितियों जैसे - स्टाफ रिसर्च काउंसिल, अनुसंधान सलाहकार समिति प्रबंधन समिति, राजभाषा कार्यान्वयन समिति तथा संस्थान का संयुक्त कर्मचारी परिषद की बैठकों को नियमित रूप से सम्पन्न किया गया । इन समितियों ने विभिन्न मुद्दों पर विचार - विमर्श कर संस्थान के प्रबंधन व अनुसंधान कार्य को सुचारू रूप चलाने के लिये आवश्यक दिशा-निर्देश प्रदान किया ।

यह संस्थान देश की विविध संस्कृतियों का मिला - जुला रूप हे जिसके सदस्य विभिन्न प्रांतों से हैं तथा विभिन्न राष्ट्रीय कार्यक्रमों व दिवस में सकिय रूप से भाग लेकर राष्ट्रीय एकता व भाइचारे का संदेश देते हैं ।



किया । देश के मात्स्यकी अनुसंधान एवं कृषि पद्धति में

महत्वपूर्ण उपलब्धियों को प्राप्त करने के बाद संस्थान ने चार अखिल भारतीय समन्वित अनुसंधान परियोजनाओं का कार्य प्रारंभ किया । ये परियोजनाएँ थीं - मिश्रित मत्स्य पालन व नदीय मत्स्य बीज उत्पादन, वायू-श्वासी मत्स्य पालन, अलवणीय जलाशयों की पारिस्थितिकी तथा लवणीय जल मत्स्य पालन । "मिश्रित मत्स्य पालन व नदीय मत्स्य बीज उत्पादन" नामक संयुक्त परियोजना जो 1974 में प्रारंभ हुई थी, की सफलता भारत के मत्स्य पालन के लिये एक ऐतिहासिक घटना थी जिसे देश के मीठाजल जीव पालन के विकास के आधार - स्तंभ के रूप में स्थापित किया जाता है । परिणामस्वरूप, 1977 मे धौली, उडीसा में मीठाजल जीव पालन अनुसंधान एवं प्रशिक्षण केन्द्र की शुरूआत हुई जो 1987 में केन्द्रीय मीठाजल जीव पालन अनुसंधान संस्थान के नाम से प्रसिद्ध हुआ । इसी प्रकार इसी संस्थान ने केन्द्रीय खाराजल जीव पालन अनुसंधान संस्थान तथा राष्ट्रीय शीतजल मात्स्यकी अनुसंधान केन्द्र को प्रारंभ किया जिनका कार्य खाराजल जीव पालन एवं शीतजल मात्स्यकी से संबंधित अनुसंधान कार्य था । अत: के.अं.मा.अनु.सं को तीन प्रमुख अनुसंधान संस्थानों को प्रारंभ करने का श्रेय प्राप्त है ।

विशेष सेक्टर संस्थानों के निर्माण, देश के बाहर व भीतर विवृत जल मात्स्यकी से संबंधित मुद्दों का जन्म एवं इसकी बढ़ती लोकप्रियता तथा जलकृषि संसाधनों के प्रबंधन को ध्यान में रखते हुए संस्थान के अधिदेशों में संशोधन किया गया ।

#### अधिदेश

बदलते परिदृश्यों तथा वर्तमान अनुसंधान और विकास की आवश्यकताओं को ध्यान में रखते हुए प्रबंधन हेतु अनुसंधानात्मक प्राथमिकताओं का पुन:संस्करण आवश्यक है जिससे दीर्घकाल तक मत्स्य उत्पादन हो सके । साथ ही जैव-विविधता, जो किसी भी उत्पादन व्यवस्था का आधार-

# भूमिका

### संक्षिप्त इतिहास

केन्द्रीय सरकार के कृषि, वानिकी तथा मात्स्यकी से संबंधित उप-समिति के प्रस्ताव पर 17 मार्च 1947 को भारत सरकार के खाद्य व कृषि मंत्रालय के अंतर्गत केन्द्रीय अंतर्स्थलीय मात्स्यकी 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 संस्थान के रूप में परिणत हुआ तथा बैरकपुर, पश्चिम बंगाल के नवनिर्मित भवन में इसका स्थानांतरण हुआ । कालान्तर में यह संगठन समूचे राष्ट्र के अंतर्स्थलीय मात्स्यकी एवं जलकृषि पारिस्थितिकी का सर्वश्रेष्ठ अनुसंधान के रूप में प्रतिष्ठित हुआ । वर्ष 1967 से यह संस्थान भारतीय कृषि अनुसंधान परिषद्, कृषि अनुसंधान एवं शिक्षा विभाग, भारत सरकार का विधिवत् सदस्य है ।

प्रारंभ में संस्थान का मुख्य उद्देश्य देश के अंतर्स्थलीय मात्स्यकी संसाधनों का उचित मूल्यांकन एवं इनके संरक्षण तथा अधिकतम समुपयोजन के लिये उपयुक्त प्रणालियों का विकास था। इन उद्देश्यों की पूर्ति के लिये संस्थान ने देश में उपलब्ध सभी अंतर्स्थलीय जल संसाधनों के पारिस्थितिकी एवं उनके उत्पादन क्षमताओं का अध्ययन किया । साथ ही तालाबों की पारिस्थितिकी एवं उत्पादन से संबंधित कृषि पद्धतियों का भी अध्ययन किया गया जिससे प्रति इकाई मत्स्य उत्पादन में वृद्धि की जा सके ।

1960 और 1970 के दशक में भारत सरकार के योजनास्वरूप जलकृषि अनुसंधान एवं विकास पर अपना ध्यान केन्द्रित करना आरंभ किया । देश के मात्स्यकी अनुसंधान एवं कृषि पद्धति में महत्वपूर्ण उपलब्धियों को प्राप्त करने के बाद संस्थान ने चार अखिल भारतीय समन्वित अनुसंधान परियोजनाओं का कार्य प्रारंभ किया । ये परियोजनाएँ थीं - मिश्रित मत्स्य पालन व नदीय मत्स्य बीज उत्पादन, वायु-श्वासी मत्स्य पालन, अलवणीय जलाशयों की पारिस्थितिकी तथा लवणीय जल मत्स्य पालन । "मिश्रित मत्स्य पालन व नदीय मत्स्य बीज उत्पादन" नामक संयुक्त परियोजना जो 1960 और 1970 के दशक में भारत सरकार के योजनास्वरूप जलकृषि अनुसंधान एवं विकास पर अपना ध्यान केन्द्रित करना आरंभ

बैरकपुर स्थित ज्वारनदमुखी प्रभाग इस समय ज्वारनदमुख परितंत्र के मात्स्यकी एवं पारिस्थितिकी, तटीय आर्द्रक्षेत्र एवं सुन्दरवन मैंग्रोव के पारिस्थितिकी पर कार्य कर रहा है।

बैरकपुर स्थित पर्यावरणीय अनुमापन एवम् मत्स्य स्वास्थ्य प्रभाग को अधिदेश दिया गया है कि नदीय, जलाशय एवम् ज्वारनदमुखी परितंत्रों में मानवीकृंत परिवर्तनों का अनुमापन करे, एवम् उपयुक्त सुधारात्मक उपायों को विकसित करें । प्राकृतिक स्रोतों से प्राप्त सूचनाओं के निर्धारण के लिए प्रयोगशाला स्थितियों में भी अन्वेषण कार्य किया जा रहा है । प्रभाग द्वारा किए गए अध्ययनों से मत्स्य निवास स्थान की विभिन्नता जैव-विविधता तथा ज्ञात सूचकों के माध्यम से दुष्प्रभाव का शिनाख्त करना, नियंत्रित स्थितियों में विषैले पदार्थों को परखना, जलीय पर्यावरण में कार्वनिक पदार्थों के परिमाण के लिए सूक्ष्म जैविकी का अध्ययन और मत्स्य रोगों की पहचान तथा इनके उपचार से संबंधित मौलिक सूचानायें भी सम्मिलित हैं । इस प्रभाग को जलीय परितंत्रों के सुधार के लिए एक कार्य योजना तैयार करने का दायित्व भी सौंपा गया है ।

बाढ़कृत मैदानी आर्द्र-क्षेत्र प्रभाग का मुख्यालय बैरकपुर में स्थित है । इस प्रभाग के अन्तर्गत गंगा तथा ब्रह्मपुत्र वेसिन के आर्द्र-क्षेत्रों की पारिस्थितिक गतिकी का अध्ययन किया जा रहा है, ताकि इनके विकास के लिए उपयुक्त प्रणालियों को विकसित किया जा सके । यह प्रभाग पारिस्थितिक परितंत्रों की प्रक्रिया एवम् इनकी मत्स्य उत्पादन क्षमता का अध्ययन करता है, जिससे इनकी जैव-विविधता को नुकसान पहँचाए विना पर्यावरण के अनुकूल तकनीकी प्रणालियों को विकसित किया जा सके ।

संसाधन मूल्यांकन प्रभाग बैरकपुर में है और इस प्रभाग का लक्ष्य मत्स्य सम्पदा और मात्स्यिकीय स्त्रोतों में उपलब्ध मछलियों की संख्या निर्धारण कार्य का दायित्व सौंपा गया है ताकि इन अन्तर्स्थलीय मत्स्य स्त्रोतों का वैज्ञानिक समुपयोजन किया जा सके। यह प्रभाग रिमोट सेंसिंग प्रणाली पर संसाधन तकनीक का विकास करता है।

स्तंभ है का संरक्षण भी आवश्यक है । अत: संस्थान के अनुसंधान

कार्य की प्राथमिकताओं में परिवर्तन किया गया है। परिवर्तित प्राथमिकताएँ निम्नलिखित हैं -

- अंतर्स्थलीय विवृत जल क्षेत्र नदी, ज्वारनदमुख जिसमें लैगून, जलाशय एवं आर्द्रक्षेत्र भी सम्मिलित हैं, के मत्स्य व मात्स्यकी पर वैज्ञानिक डटाबेस तैयार करना।
- जलाशय एवं आर्द्रक्षेत्र में दीर्घकालिक मात्स्यकी के लिये पारिस्थितिकी पर आधारित प्रबंधन प्रणाली का विकास।
- मात्स्यकी पर बदलते पारिस्थितिकी के प्रभाव का मूल्यांकन तथा उसे कम करने के लिये योजनाएँ बनाना ।
- अंतर्स्थलीय जलीय परितंत्रों का संरक्षण एवं इनकी मात्स्यकी के लिये उपयुक्त योजनाएँ उपलब्ध कराना ।

#### संगठन

पुन:संशोधित विजन - 2020 जिसे परिषद् द्वारा अनुमोदित किया गया है के अनुसार उपयुक्त अधिदेश की पूर्ति एवम् देश की मात्स्यिकी विकास हेतु केन्द्रीय अन्तर्स्थलीय मात्स्यिकी अनुसंधान संस्थान के अनुसंधान कार्यों को प्रमुख मात्स्यिकीय स्रोतों के अनुरूप सात प्रभागों के अन्तर्गत संगठित किया गया है ।

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

बंगलोर स्थित जलाशय प्रभाग के केन्द्र तामिलनाडु, आंध्रप्रदेश एवम् मध्यप्रदेश राज्यों में हैं । इस प्रभाग की कार्य दिशा छोटे तथा बड़े जलाशयों में मत्स्य उत्पादन की वृद्धि हेतु प्रबंधन प्रणालियों की विकसित करने की ओर है ।



A.



संस्थान के अनुसंधान प्रबंधन में निदेशक का पद सर्वोच्च होता है

तथा समस्त प्रबंधन कार्य निदेशक की अध्यक्षता में ही सम्पन्न किया जाता है । स्टाफ रिसर्च काउंसिल तथा रिसर्च एडबायजरी कमिटि संस्थान के अनुसंधान व विस्तार कार्यकलापों से संबंधित सुझाव प्रदान करते हैं । संस्थान के अनुसंधान कार्य विभिन्न परियोजनाओं के द्वारा सम्पन्न किये जाते हैं जिनका निष्पादन बैरकपुर मुख्यालय तथा संस्थान के आंचलिक केन्द्रों जैसे इलाहाबाद, बैंगलोर, वदोदरा एवं गुवाहाटी से किया जाता है । संस्थान की संरचनात्मक ढाँचे को निम्नलिखित रूप में दिखाया गया है ।

#### पुस्तकालय सेवाएँ

संस्थान का मुख्यालय बैरकपुर स्थित केन्द्रीय पुस्तकालय में संस्थान तथा केन्द्रों के बैज्ञानिकों, शोधकर्ताओं, शिक्षकों तथा दूसरे संगठनों के अधिकारियों के लिए सेवाएँ उपलब्ध हैं । इस रिपोर्ट की अवधि के दौरान पुस्तकालय में 811 पुस्तकें, जिनमें 678 हिन्दी में हैं 50 विविध प्रकाशन तथा 675 अबद्ध प्रकाशनों को सम्मिलित किया गया तथा 17 विदेशी एवं 37 भारतीय जरनल तथा 77 विदेशी इंटरनेट जरनलों के लिये शुल्क जमा किया गया । पुस्तकालय में कुल 10182 पुस्तकें, 4296 पुनर्मुद्रित लेख, 1252 मानचित्र तथा 4321 विविध प्रकाशन के भंडार उपलब्ध हैं ।

पुस्तकालय मात्स्यकी अनुसंधान क्षेत्र में हुए सामयिक विषयों से संबंधित प्रकाशनों को विभिन्न अनुसंधान संगठनों, विश्वविद्यालयों, उद्यमियों तथा कृषकों को अवगत कराने के लिए नि:शुल्क भेजती है । इसी कार्यक्रम के अंतर्गत संस्थान ने दूसरे राष्ट्रीय व अन्तर्राष्ट्रीय संगठनों से भी संबंध स्थापित किया है । वर्ष 2000-05 के दौरान पुस्तकों व अन्य पठन सामग्री पर 17,55,000.00 रू. खर्च हुए हैं । पुस्तकालय द्वारा इंडियन फिशरीज एब्सट्रैक्ट का भी प्रकाशन किया जाता है । जनवरी-दिसंबर 2005 को करेंट कन्टेन्ट्स का भी प्रकाशन किया गया।

## परियोजना अनुमापन एवं कार्यान्वयन

यह अनुभाग संस्थान के विभिन्न अनुसंधान परियोजनाओं की प्रगति का अनुमापन एवं स्टाफ रिसर्च काउंसिल की बैठकों का आयोजन करता है। विभिन्न जरनलों में प्रकाशन हेतु तथा किसी संगोष्ठी/कार्यशाला/ग्रीष्मकालीन कार्यशाला में प्रस्तुति हेतु संस्थान के वैज्ञानिकों द्वारा निर्माण किये गये लेखों के संसोधन देता है तथा साथ ही किसी संगोष्ठी या कार्यशाला या सम्मेलन में वैज्ञानिकों के भागीदारी को निश्चित करता है । इसके अलावा संस्थान के लैमिनेशन, साइक्लोस्टाइलिंग, जिल्दसाजी तथा फोटीप्रति जैसे कार्य भी इस अनुभाग किये जाते हैं । यह अनुभाग सभी अनुसंधान परियोजनाओं की वार्षिक रिपोर्ट, विवरण, बुलेटिन, परियोजना रिपोर्ट तथा न्युजलेटर के प्रकाशन के साथ-साथ संस्थान के नीति निर्माण और तकनीकी मागदर्शन बनाने मे सहयोग करता है । अनुसंधान प्रगति का अनुमापन आर.पी.एफ. I, II एवं III के माध्यम से किया जाता है। एक्अविटी माइलस्टोन, तिमाही एवं वार्षिक रिपोर्ट आदि इस अनुभागों के मुख्य दायित्वों में से हैं। समय-समय पर विभिन्न अनुसंधान परियोजनाओं की प्रगति को संकलित कर परिषद् के मुख्यालय, कृषि मंत्रालय तथा अन्य संगठनों को भेजा जाता है। संस्थान के अनुसंधान कार्यकलापों के संबंध में देश-विदेश से आये प्रश्नों का उत्तर देना भी इस अनुभाग के दायित्वों में से एक है।

#### प्रलेखन सेवाएँ

यह अनुभाग रिपोर्ट, विवरण, बुलेटिन, परियोजना रिपोर्ट तथा न्युजेलेटर के प्रकाशन में सहायता करता है । वर्ष 2005-06 के दौरान इस अनुभाग के द्वारा संस्थान का वार्षिक प्रतिवेदन, 2 न्युजलेटर एवं 4 बुलेटिन का संकलन किया गया है ।

#### एरिस सेल

इस कक्ष द्वारा वैज्ञानिकों एवं अन्य अधिकारियों तथा कर्मचारियों को कम्प्युटर की सुविधाएँ उपलब्ध कराई जाती हैं । संस्थान में पूरी तरह लोकल एरिया नेटवर्क स्थापित किया गया है । मुख्य भवन में वैज्ञानिकों को इंटरनेट का सुविधा भी उपलब्ध कराई गई है ।



#### मुख्य घटनायें / समारोह

#### राष्ट्रीय संगोष्ठी

केन्द्रीय अंतर्स्थलीय मात्स्यकी अनुसंधान संस्थान तथा भारतीय अंतर्स्थलीय मात्स्यकी समिति द्वारा संयुक्त रूप से "नदियों एवं सहयोगी परितंत्रों की मात्स्यकी प्रबंधन चुनौतियों - मुद्दे व रणनीतियाँ" पर अप्रैल 16-17, 2005 को बैरकपुर में एक राष्ट्रीय संगोष्ठी का आयोजन किया गया । डॉ॰ मंगला रॉय, सचिव, कृषि अनुसंधान एवं शिक्षा विभाग, भारत सरकार तथा महानिदेशक, भारतीय कृषि अनुसंधान परिषद, नई दिल्ली ने इस संगोष्ठी का उद्घाटन किया । इस संगोष्ठी में 250 विशिष्ट व्यक्तियों ने भाग लिया जो विवृत जल मात्स्यिकी प्रबंधन से जूड़े हुये है । समिति ने संगोष्ठी के दौरान स्वर्गीय डॉ टी. वी. आर. पिल्ले, जिन्होने जलकृषि को विश्वव्यापी तौर पर प्रचलित किया के सम्मान में एक स्मारक व्याख्यान का आयोजन किया गया जिसे प्रो. एम. एन. कुट्टी ने प्रस्तुत किया । इस समारोह में डॉ॰ मंगला रॉय द्वारा छ: प्रकाशनों, जिसमें से तीन हिन्दी व तीन अंग्रेजी में थे का विमोजन किया गया ।

#### स्वाधीनता दिवस व गणतंत्र दिवस

संस्थान में स्वाधीनता दिवस व गणतंत्र दिवस पूरे हर्षोल्लास के साथ मनाया गया । संस्थान के निदेशक ने झंडोत्तोलन किया ।

#### ग्रीष्मकालीन प्रशिक्षण सत्र

संस्थान में 21 जुलाई से 10 अगस्त 2005 के दौरान 21 दिनों के ग्रीष्मकालीन प्रशिक्षण सत्र का आयोजन किया गया



जिसका विषय था -"ज्वारनदमुख व संबद्ध परितंत्रों की जैव-

विविधता और मात्स्यिकी में प्रबंधन मुद्दे"। इस कार्यशाला में 7 राज्यों के 25 प्रशिक्षणार्थियों ने भाग लिया। इसमें प्रशिक्षणार्थियों को ज्वारनदमुख पारिस्थितिकी व संबद्ध पारिस्थितिकी के प्रबंधन में आधुनिक तकनीकों एवं नई विचारों पर प्रशिक्षण दिया गया।

#### कार्यशाला

संस्थान एवं वर्लड फिश सेन्टर के आपसी सहयोग से प्रायोजित परियोजना कम्युनिटी वेस्ड फिश कल्चर इन फिश कल्चर इन सीजनली फूलडेड राइस फील्ड्स इन इण्डिया के अंतर्गत कम्युनिटी बेस्ड मैनजमेंट ऑफ राइस - फिश फार्मिंग विथ एडेप्टिव लर्निंग एप्रोच नामक कार्यशाला बैरकपुर में दिनांक 27 आगस्त, 2006 को आयोजित की गई । इस कार्यशाला की अध्यक्षता डॉ॰ एस. अय्यप्पन, उप-महानिदेशक (मात्स्यिकी), भारतीय कृषि अनुसंधान परिषद ने की । परियोजना के मुख्य अन्वेषक डॉ॰ रार्बट आर्थर चावल व मत्स्य खेती से संबंधित पहलुओं को प्रस्तुत किया । पश्चिम बंगाल के कृषि विभाग के अधिकारी श्री एन. के. साहा एवं एस. बर्धन राय ने राज्य के वर्षा ऋतु में गहरे जल वाले परितंत्रों में चावल व मत्स्य पालन से संबंधित पहलुओं पर प्रकाश डाला ।



संस्थान में परियोजना के प्रमुख डॉ॰ उत्पल मौमिक तथा डॉ॰ पी. के. पंडित ने अपने अनुसंधान से संबंधित सूचनाओं को प्रस्तुत किया, । संस्थान के निदेशक डॉ॰ के. के. वास ने



कार्य शाला के कार्यवाही का संक्षेपण किया । तत्पश्चात्

संस्तुतियों पर अनुमोदन के लिये विचार-विमर्श किया गया । कार्यशाला में विभिन्न विभागों से 50 वैज्ञानिको, कृषकों एवं अधिकारियों ने भाग लिया ।



भा. कृ. प. द्वारा प्रायोजित परियोजना इम्पैक्ट एडैप्टेशन एण्ड बल्नरेबिलिटी ऑफ इंडियन एग्रीकल्चर टू ग्लोबल क्लाइमेट चेंज पर संस्थान में मार्च 4, 2006 को एक थिमैटिक कार्यशाला का आयोजन किया गया । इस कार्यशाला की अध्यक्षता डॉ॰ एस. अय्यप्पन, उप-महानिदेशक (मात्स्यिकी), भारतीय कृषि अनुसंधान परिषद ने की जिसमें परियोजना समन्वयक डॉ॰ पी. के. अग्रवाल एवं संस्थान के निदेशक डा॰ के. के. वास भी उपस्थित थे । परियोजना के दूसरे भागेदारी संगठनों जैसे एन. डी. आर. आई., करनाल, सी. एम. एफ. आर. आई. कोचीन, एन.डी. यू. ए. टी., फैजाबाद, एवं के. अं. मा. अनु. सं., बैरकपुर के मुख्य अन्वेषक एवं सह-अन्वेषकों ने अपने-अपने अनुसंधान से संबंधित सूचनाओं को प्रस्तुत किया। एक गहन विचार-विमर्श के बाद भावी योजनाओं के लिये संस्तुतियों को तैयार किया गया।

#### खेल-कूद

संस्थान द्वारा आई.सी.ए.आर. जोनल स्पार्टस मीट जोन III का भारतीय खेल प्राधिकरण, कोलकाता के प्रांगण में फरवरी 15-19, 2006 के दौ रान आयोजन किया गया । इसमें 10 संस्थानों ने भाग लिया । इस स्पार्टस मीट में संस्थान का प्रदर्शन बहुत ही उत्कृष्ठ था तथा श्री मानवेन्द्र रॉय को बेस्ट एथेलीट अवार्ड से



सम्मानित किया गया । खिलाड़ियों को पुरस्कार पूर्व-ओलिम्पिक पुरस्कार विजेता श्री मेवालाल के हाथों से प्रदान किया गया ।

#### हिन्दी सप्ताह

संस्थान में दिनांक 14-20 सितम्बर 2005 के दौरान हिन्दी सप्ताह का आयोजन किया गया । इसके अंतर्गत अनेक प्रतियोगितायें जैसे हिन्दी निबंध लेखन, पत्र व टिप्पणी लेखन, शब्दावली आदि ओयोजित की गई जिसमें संस्थान के अधिकारियों एवं कर्मचारियों ने भाग लिया । समापन समारोह के मुख्य अतिथि सुरेन्द्रनाथ महाविद्यालय, बैरकपुर के प्रोफेसर डॉ॰ सुरज बहादुर थापा थे तथा प्रतियोगिताओं में उत्कृष्ठ प्रदर्शन के लिये पुरस्कार समारोह की गेस्ट ऑफ ऑनर श्रीमती गिरिजा वास के द्वारा प्रदान किया गया ।





एवं पटसन क्षेत्र के कृषकों व उद्यमियों की

एक बैठक का भी आयोजन किया गया जिसमें विचारों का पारस्परिक आदान-प्रदान किया गया । बैठक के प्रारंभ में डॉ० मंगला रॉय, महानिदेशक, भारतीय कृषि अनुसंधान परिषद ने माननीय मंत्री जी का स्वागत करते हुये दोनों संस्थानों के अनुसंधान कार्य के महत्व की जानकारी दी तथा डॉ० के. के. वास एवं डॉ० एच. एस. सेन ने अपने-अपने संस्थान के अनुसंधान संबंधी उपलब्धियों पर प्रकाश डाला । इस चर्चा में मत्स्य व पटसन दोनो क्षेत्रों के प्रतिनिधियों ने मंत्री महोदय के समक्ष कुछ समस्याओं को रखा जिस पर महानिदेशक ने विचार करने का आश्वासन दिया ।

माननीय मंत्री ने सभा को संबोधित करते हुये दोनों संस्थानों की उपलब्धियों पर प्रसन्नता व्यक्त की तथा यहा भी कहा कि समयाभाव के कारण उनका यह संदर्शन कम समय के लिये था पर भविष्य में वह अवश्य ही दोनों संस्थानों के वैज्ञानिकों से लम्बी वार्ता के लिये समय निकालने का प्रयास करेगें।

> उन्होनें सभी वैज्ञानिकों को यह सलाह दिया कि वे कृषकों के समस्यायों के समाधान हेतु प्रयास करें । अन्त में डॉ० एस. अय्यप्पन, उप - महानिदे श क (मात्स्यिकी) ने धन्यवाद ज्ञापन प्रस्तुत किया।

### माननीय केन्द्रीय कृषि मंत्री नी शरद पवार जी का संस्थान में आगमन

माननीय केन्द्रीय मंत्री, कृषि व उपभोक्ता मामले, खाद्य और सार्वजनिक वितरण एवं अध्यक्ष, भारतीय कृषि अनुसंधान परिषद श्री शरद पवार जी ने दिनांक 19, अक्टूबर 2005 को इस संस्थान एवं केन्द्रीय पटसन एवं संबद्ध रेशा अनुसंधान संस्थान, बैरकपूर का संयुक्त रूप से संदर्शन किया । डॉ० मंगला रॉय, महानिदेशक, भारतीय कृषि अनुसंधान परिषद, नई दिल्ली, डॉ० एस. अय्यप्पन, उप-महनिदेशक (मात्स्यिकी) तथा दोनों संस्थानों के निदेशक डॉ० के.के. वास एवं डॉ० एच. एस. सेन क्रमश: ने माननीय मंत्री का स्वागत किया ।

मंत्री महोदय ने दोनों संस्थानों के उपलब्धियों को दर्शाने संबंधी लगी हुई प्रदर्शनी तथा संस्थान के विभिन्न प्रयोगशालाओं एवं एकेरियम का भी संदर्शन किया जहाँ उन्हें वर्तमान में अंतर्स्थलीय मात्स्यिकी में चल रहे अनुसंधान कार्यों की जानकारी दी गई । मंत्री महोदय के साथ दोनों संस्थानों के वैज्ञानिकों, मत्स्य





सस्थान के उत्तर-पूर्वी क्षेत्रीय केन्द्र, गुवाहाटी द्वारा राष्ट्रीय मत्स्य पालक दिवस का

आयोजन गुवाहाटी में 10 जुलाई, 2005 को किया गया । इस अवसर पर असम के कामरूप, नवगॉव, मोरीगॉव तथा बारपेटा

जिलों के लगभग 200 मत्स्य पालकों एवं गुवाहाटी केन्द्र के वैज्ञानिकों के साथ आयोजित बैठक में विचारों का आदान-प्रदान किया गया तथा मत्स्य पालन से जुड़ित 5 उद्यमियों को "मत्स्य पालक पुरस्कार 2005" से पुरस्कृत किया गया ।

विहार के कोइथकोला में 26 मार्च 2006 को मत्स्य पालक दिवस का आयोजन किया गया जिसमें 150 मत्स्य पालकों ने भाग लिया । इस समारोह में बिहार



राज्य सरकार के अधिकारी एवं स्थानीय निकायों के सदस्यों ने भाग लिया।





# वर्तमान में चल रही परियोजनायें

परियोजना शीर्ष	परियोजना प्रमुख का नाम	प्रारंभ वर्ष	समापन का संभावित वर्ष
सिन्धु नदी की पारिस्थितिकी, जैव विविधता एव उत्पादन क्षमता का आंकलन	श्री डी. एन. मिश्रा	अप्रैल, 2002	मार्च, 2005
गंगा नदी पारिस्थितिकी में मत्स्य पर्यावरणीय परिपक्ष्य में ज्वारनदमुखीय पारिस्थितिकी एवं मैंग्रोव का उनके उत्पादन क्ष्मता के संबंध में अध्ययन	डा॰ आर. एस. पंवार डॉ॰ आर. एन. मिश्रा	अप्रैल, 2001 अप्रैल, 2003	मार्च, 2006 मार्च, 2008
पर्यावरणीय परिपेक्ष्य में कुछ चयनित ज्वारनदमुखीय जैव समुदायों की गतिकी	डॉ॰ एस. एन. सिंह	अप्रैल, 2004	मार्च, 2006
मीठाजल वाले जलाशयों की पारिस्थितिकी एवं मात्स्यिकी	डॉ॰ डी. एस. कृष्णा राव	अप्रैल, 2002	मार्च, 2007
राजस्थान के छोटे जलाशयों की पारिस्थितिकी एवं मात्स्यिकी	डॉ॰ वी. के. शर्मा	अप्रैल, 2002	मार्च, 2006
हिमाचल प्रदेश के जलाशयों में विदेशी कार्य मछलियों का स्तर	डॉ॰ वी. के. शर्मा	अप्रैल, 2004	मार्च, 2007
जलाशयों के मत्स्य उत्पादन संवर्धन के लिये जिम्मेदार पयावरणीय व प्रबंधन कारक	डॉ॰ ए. के. लाल	अप्रैल, 2005	मार्च, 2008
भारत के आर्द्रक्षेत्रों के संसाधन विशेषताओं के संबंध में मत्स्य उत्पादन संवर्धन हेतु पर्यावरण उन्मुख प्रबंधन तरीकों का विकास	डॉ० ए. मुखर्जी	अप्रैल, 2002	मार्च, 2007
भारत के आर्द्रक्षेत्रों के संसाधन विशेषताओं के संबंध में मत्स्य उत्पादन संवर्धन हेतु पारिस्थितिकी एवं समुदाय उन्मुख प्रवंधन तरीकों के स्तर का मुल्यांकन	डॉ० धीरेन्द्र कुमार	अप्रैल, 2005	मार्च, 2008
मत्स्य व जलीय जीवों के स्वास्थ्य व संबंधित जैविक कारकों का पूर्णत: आंकलन	डॉ० मानस कुमार दास	अप्रैल, 2000	मार्च, 2008
रिमोट सेंसिंग तकनीकों द्वारा अंतर्स्थलीय मात्स्यिकी के संसाधन का सूचीकरण और डेटाबेस का विकास	डॉ॰ आर. ए. गुप्ता	अप्रैल, 2002	मार्च, 2007



#### विशिष्ट अतिथिगण

- वर्ष 2005-06 के दौरान संस्थान के मुख्यालय एवं अनुसंधान केन्द्रों का संदर्शन निम्नलिखित विशिष्ट अतिथियों ने किया ।
- श्री अनीस उर रहमान, माननीय मंत्री, पशु संसाधन, पश्चिम बंगाल।
- श्री मेहबूब जैदी, माननीय लोक सभा सदस्य एवं सदस्य, शाषी निकाय, भारतीय कृषि अनुसंधान परिषद, नई दिल्ली ।
- श्री गोविन्द चन्द्र लंग्थासा, माननीय मंत्री, प्राणी विज्ञान, असम ।
- डॉ॰ मंगला रॉय, सचिव, कृषि अनुसंधान एवं शिक्षा विभाग, भारत सरकार तथा महानिदेशक, भारतीय कृषि अनुसंधान परिषद, नई दिल्ली।
- डॉ॰ दीपक बागची, कुलपति, बिधान चन्द्र कृषि विश्वविद्यालय, पश्चिम बंगाल ।
- डॉ॰ आर. सी. बागची, कुलपति, असम कृषि विश्वविद्यालय, गुवाहाटी ।
- डॉ॰ मृणाल के. मजुमदार, कुलपति, उत्तर बंग कृषि विश्वविद्यालय, कूच विहार ।
- डॉ॰ ए. के. बन्दोपाध्याय, कुलपति, पश्चिम बंगाल प्राणी व मात्स्यिकी विज्ञान विश्वद्यिालय ।
- डॉ॰ मार्क प्रेन, परियोजना प्रमुख, वर्लड फिश सेन्टर, पेनांग ।
- डॉ॰ मदन दे, निदेशक, वर्लड फिश सेन्टर, पेनांग ।
- डॉ॰ राबर्ट आर्थर, वैज्ञानिक, एम. आर. ए. जी., लंदन ।
- डॉ॰ क्रिस बेन, बर्लड फिश सेन्टर, कैरो।
- डाँ० मार्को ब्लिंक्स, आई. डबलु. एम. आई. कोलम्बो ।
- डॉ॰ एस. अय्यप्पन उप-महानिदेशक (मात्स्यिकी) भारतीय कृषि अनुसंधान परिषद ।
- डॉ॰ सामरा, उप-महानिदेशक (प्राकृतिक संसाधन प्रबंधन) भारतीय कृषि अनुसंधान परिषद ।
- डॉ॰ तनेजा, उप-महानिदेशक (कृषि सांख्यिकी) भारतीय कृषि अनुसंधान परिषद।
- डॉ॰ पी. दास, उप-महानिदेशक (कृषि अभियांत्रिकी) भारतीय कृषि अनुसंधान परिषद ।
- डॉ॰ नवाब अली, उप-महानिदेशक (अभियांत्रिकी) भारतीय कृषि अनुसंधान परिषद ।

- डॉ॰ कात्याल, उप-महानिदेशक (शिक्षा) भारतीय कृषि अनुसंधान परिषद ।
- डॉ॰ पी. वी. देहादराय, पूर्व उप-महानिदेशक (मात्स्यिकी) भारतीय कृषि अनुसंधान परिषद ।
- डॉ॰ एस. डी. त्रिपाठी, पूर्व निदेशक, केन्द्रीय मात्स्यिकी शिक्षा संस्थान, मुम्बई ।
- डॉ॰ एस. डी. त्रिपाठी, पूर्व निदेशक, केन्द्रीय मात्स्यिकी शिक्षा संस्थान ।
- प्रो॰ एच. पी. सी. शेट्टी, पूर्व निदेशक, मैंगलोर मात्स्यिकी कॉलेज, मैंगलोर ।
- श्रीमती सरोजनी पिल्ले, पूर्व वैज्ञानिक, के. अं. मा. अनु. सं. ।
- डॉ॰ एम. वाई. कमाल, पूर्व कुलपति, शेरे कश्मीर कृषि विश्वविद्यालय, श्रीनगर।
- श्री हरिशंकर प्रसाद, प्रगतिशील कृषक व सदस्य, भा. कृ. अनु. प. समिति ।
- डॉ॰ आर. सी. माहेश्वरी, सहायक महानिदेशक (शिक्षा), भारतीय कृषि अनुसंधान परिषद।
- डॉ॰ खोखर, सहायक महानिदेशक (पी. आई. एम.), भारतीय कृषि अनुसंधान परिषद ।
- डॉ॰ एस. एन. पाण्डेय, सहायक महानिदेशक (बागबानी), भारतीय कृषि अनुसंदान परिषद।
- डॉ॰ एन. बी. सिंह, सहायक महानिदेशक (फसल), भारतीय कृषि अनुसंधान परिषद।
- डॉ॰ एच. एस. सेन, निदेशक, केन्द्रीय पटसन एवं संबद्ध रेशा अनुसंधान संस्थान, बैरकपुर ।
- डॉ॰ एस. के. भट्टाचार्य, निदेशक राष्ट्रीय पटसनव संवद्ध रेशा प्रौधोगिकी अनुसंदान संस्थान, कोलकाता।
- डॉ॰ एस. के. बिस्वास, निदेशक, पटसन विकास अधिकरण, कोलकाता।
- श्री आर. पी. एस. कहलों, सचिव, मात्स्यिकी विभाग, पश्चिम बंगाल।
- श्री एस. के. दास, क्षेत्रीय समन्वयक, भारतीय कृषि अनुसंधान परिषद, कोलकाता ।
- डॉ॰ निकोस पेरेज, समन्वयक, वर्लड फिश सेन्टर, पेनांग, मलेशिया।