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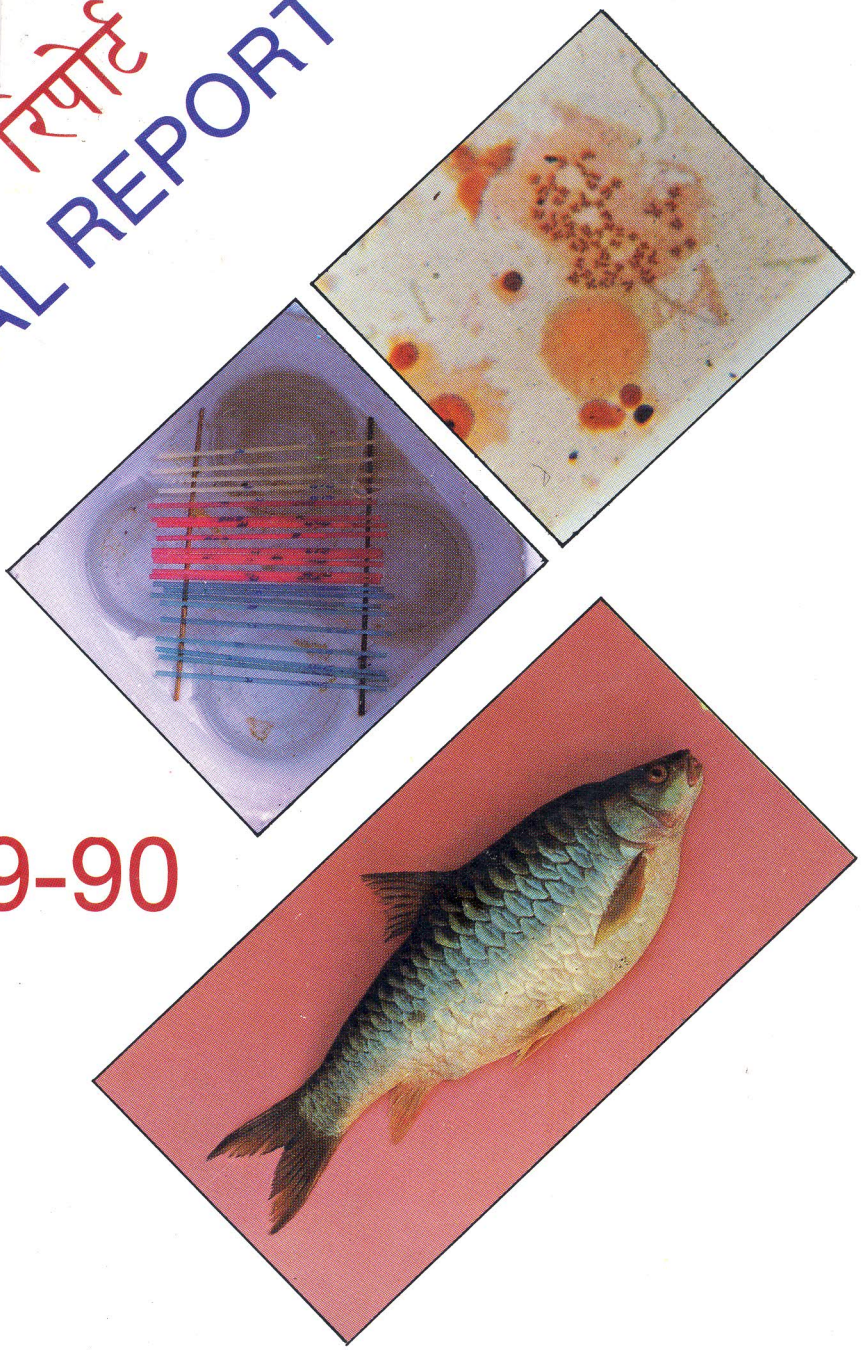
ANNUAL REPORT



1989-90

NATIONAL BUREAU OF FISH GENETIC RESOURCES
ALLAHABAD

Credits

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Cover Photos:

* *Silver stained Chromosomes of Mystus vittatus.*
* *Freezing of straws with milt over liquid nitrogen.*
* *The endangered MAHSEER, Tor tor*

CONTENTS

1. INTRODUCTION

1.1 BRIEF HISTORY

In view of national programmes for improvement and expansion of both inland and marine fisheries of the country, it has been recognised that enhancement of fish production alone is not enough and conservation of the diversity of the natural fish populations is a necessary prerequisite. Appreciating this, the Government of India approved establishment of the Bureau at the end of the Sixth Five Year Plan.

The National Bureau of Fish Genetic Resources was finally sanctioned in December 1983 under the Indian Council of Agricultural Research with its headquarters at Allahabad in Uttar Pradesh.

1.2 MANDATE

The mandate of the Bureau includes collection, classification and evaluation of information on fish genetic resources of the country, cataloguing of genotypes, maintenance and preservation of fish genetic materials, introduction of exotic species in Indian waters and conservation of endangered species.
(1) Collection and classification of information regarding the fish genetic resources of the country, (2) Maintenance and preservation of fish genetic resources, (3) Introduction of new species and (4) Conservation of endangered species.

1.3 ORGANISATION

The organisational set up of the Bureau was structured for meeting the above objectives. Four centres have been approved in order to take up work on different resources. These are (i) Freshwater resource centre, located at the headquarters of the Bureau at Allahabad for freshwater fisheries resources (ii) Brackishwater resource centre will be located at the headquarters of the new Institute, Central Institute of Brackishwater Aquaculture and will work on brackishwater fisheries resources (iii) Marine resource centre will work on marine fisheries resources and will be located at the Central Marine Fisheries Research Institute at Cochin (iv) Coldwater resource centre will work on coldwater fisheries resources and will be located at the heaquarters of the new organisation, National Research Centre for Coldwater Fisheries.

The following subject matter Divisions have been set up at the headquarters of the Bureau at Allahabad.

i) Division of Fish Cytogenetics
ii) Division of Fish Biochemical Genetics
iii) Division of Fish Biology
iv) Division of Fish Conservation and Management.

1.4 STAFF POSITION

The overall staff position, as on 31 March, 1990 is given below:

Staff position as on 31 March, 1990

Sl. No.	Category of Posts	Posts sanctioned (No.)	Posts created (No.)	Staff in position	Posts vacant
1	2	3	4	5	6
1.	Scientific	27	16	9*	7
2.	Technical	35	18	15	3
3.	Administrative	15	9	9	—
4.	Auxiliary	2	1	1	—
5.	Supporting	29	13	10	3
	Total	108	57	44	13

* Includes one scientist who is on deputation and also the Director.

1.5 FINANCE

Allocation of fund and expenditure incurred during the year 1989-1990

Plan/Non-Plan	Allocation (Rs. in lakhs)	Expenditure (Rs. in lakhs)
Plan	**53.00**	**52.50**
Non-Plan	**6.20**	**6.20**
Total	**59.20**	**58.70**

2. RESEARCH ACHIEVEMENTS

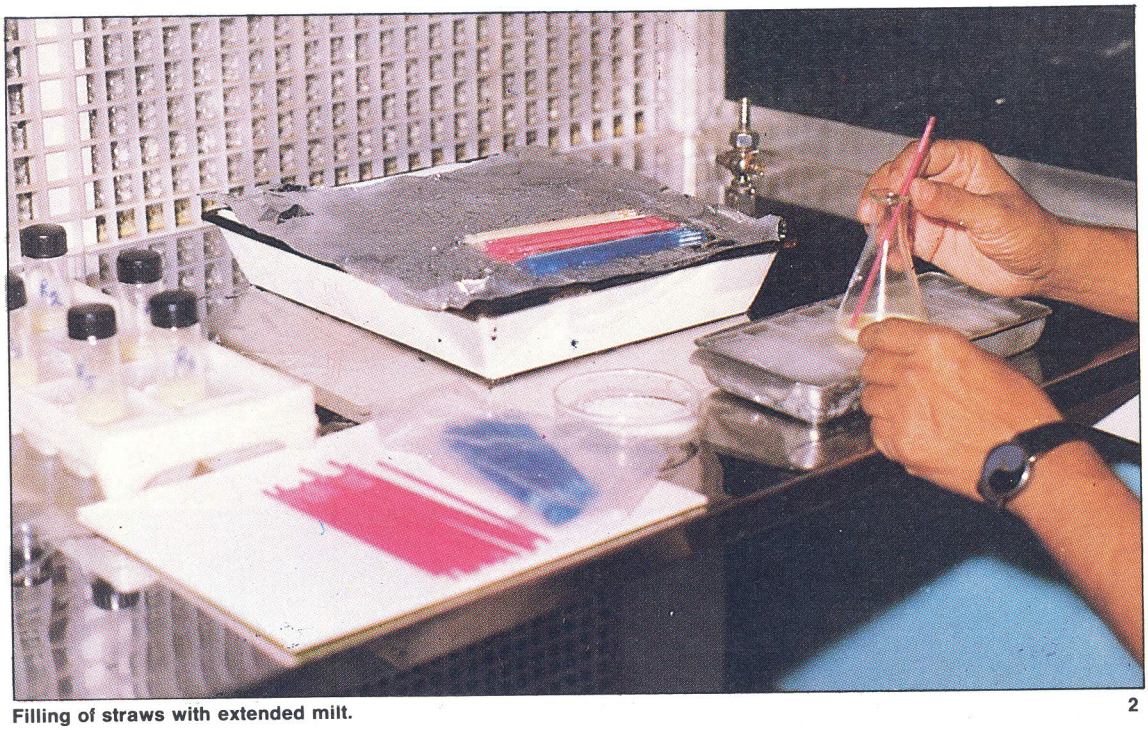
Laboratory setup for freezing and cryopreservation of fish milt. 1

2.1 CP.1. CRYOPRESERVATION OF FISH SPERMATOZOA

L.B. Singh, A.G. Ponniah, P.C. Mahanta, P.K. Sahoo and A. Barat

Main objectives of the project are (i) To develop suitable techniques for cryopreservation of Indian fish spermatozoa, (ii) to facilitate selective breeding and hybridisation programmes, and (iii) to establish a cryogenic gene bank.

During the period under report, investigation on the cryopreservation of spermatozoa of two species *Cyprinus carpio* and *Labeo rohita* were carried out (Fig.1). Three different extenders—I—IA and II were tested all having 10% glycerol as cryoprotectant.



Filling of straws with extended milt. 2

Cyprinus carpio

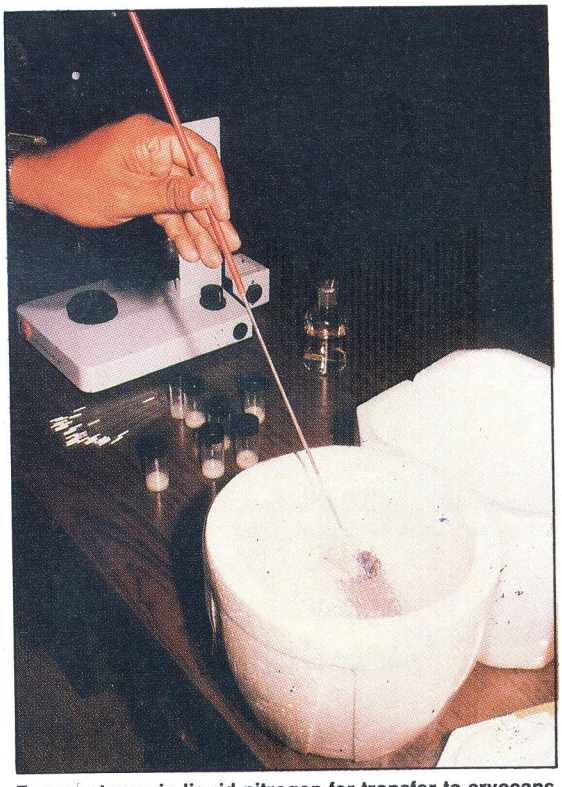
Collection of milt of *C. carpio* was carried out in April 1989 at the State Fisheries Farm and brought to the laboratory in cold condition and cryopreserved (Fig.2&3). All the three different extenders as above were tested. Short term cryopreservation was possible for a period of 72 hours. Long term cryopreservation was also tested using straws with the three extenders. The sperm were found to be motile upto 140 days. In performance (motility), there was not much difference between extenders I and IA while extender II was slightly better. In fertility trials, no hatching was observed both in eggs mixed with cryopreserved sperm and fresh (control) milt indicating that possibly the eggs were not in optimum state for fertility trials.

In March 1990 fresh milt were collected and preserved with extenders II and IIA using DMSO and glycerol as the cryoprotectant. The experiment is in progress.

Labeo rohita

In July 1989 milt collection was made from catla and rohu. More than 80% motility was observed in milt cryopreserved for more than 24 hours. Due to a leakage in the can the samples were unfortunately lost thereafter.

3



Frozen straws in liquid nitrogen for transfer to cryocans.

In August 1989 another collection of milt was carried out and rohu milt were cryopreserved using extenders IA and II with 10% glycerol as the cryoprotectant. Motile sperm (60 to 80%) were observed till 233 days of storage (end of March '90). The experiment is in progress and fertility trials will be undertaken in the monsoon season.

2.2 FB—1. CATALOGUING OF EXPLOITED AND ENDANGERED SPECIES IN NATURAL HABITATS OF DIFFERENT DRAINAGE SYSTEMS IN INDIA.

P.C. Mahanta, L.B. Singh, D. Kapoor, S.P. Singh and A.K. Singh

The main objectives of the study are (i) to collect information on population structure of economic importance in freshwater stretches of Ganga river system, (ii) to study the present abundance of various economic species in the system in relation to their past availability and (iii) cataloguing of fish germplasm resources including endangered, threatened and rare fishes.

During the period under report, the following progress was made on the project.

A computer readable proforma for collection of data for cataloguing of fish genetic resources of the country was prepared.

The compilation so far, yielded a list of 1479 species inhabiting in different ecosystems as below.

Ecosystem	No. of species	Percentage
Upland Coldwaters	67	4.53
Warmwaters of plains	450	30.43
Brackishwater of maritime regions	135	9.12
Marine	827	55.92

Out of these 396 species were listed as commercially important. The collection of further detailed information is in progress. The data collected was stored in a computer readable format. Further various institutions, universities, governmental and non-governmental agencies were contacted in this regard.

Population structure of economically important species in the Ganga river system and nearby water bodies were determined. The study revealed the decline of fish catch in general and carps in particular in the middle and lower stretches of Ganga river system. This confirms the observations of other agencies particularly of CICFRI.

Information on the status of fishery of the endangered mahseer (*Tor* species) is also being particularly collected/compiled. Preliminary information on the status on mahseer fishery of the North and

A view of MAHSEER (*Tor putitora*) in Bhimtal lake, Nainital. 4

North Eastern regions viz., Assam, Meghalaya, U.P. Hills and Himachal Pradesh was collected and compiled. In Himachal Pradesh, there was a decline of mahseer fishery from 8.9% of the total landing of Govindsagar reservoir in 1984-85 to 4.1% in 1988-89. In Bhimtal lake of U.P. Mahseer formed 50% of the total catch in 1989-90 as compared to 83% in 1979-80. Collection of further information on mahseer fishery through field surveys is in progress to develop strategies for its conservation (Fig.4).

USE OF COMPUTER

One PC XT was installed in September 1989 at the Bureau. It is being used for scientific calculations & storage of information as under.

(A) Information on the following categories of fisheries were catalogued and stored on computer hard disk for retrieval and future use.
   i) 400 marine fish species.
   ii) 84 freshwater fish species of Allahabad district.
   iii) 44 fish species reported as endangered, threatened and rare.
   iv) 81 fish species found in Varanasi district.

(B) Detailed information of 18 species which are highly commercially important were also stored in computer hard disk for easy retrieval and use.

2.3 SR—1. SEX-REVERSAL FOR PRODUCTION OF MONOSEX INDIVIDUALS

P. Das, W.S. Lakra and A.K. Singh

The objective of the study is to standardise the method of production of monosex population of exotic species by feeding sex steroids in diet.

Experiments were conducted to increase the percentage of monosex male production in *Oreochromis mossambicus* through the oral administration of 17 alpha-methyl-testosterone. A production of 84 percent male population had already been achieved. Various doses of steroid hormones, duration of feeding etc. are being tried to get 100 percent monosex production of male since this sex grows faster and bigger than the other sex. Monosex culture also would restrict breeding, thereby not allowing the individual size to go down. Monosex exotic fishes can be considered for introduction in selected natural waters like small reservoirs and beels for development of fisheries without running the risk of ecological disaster.

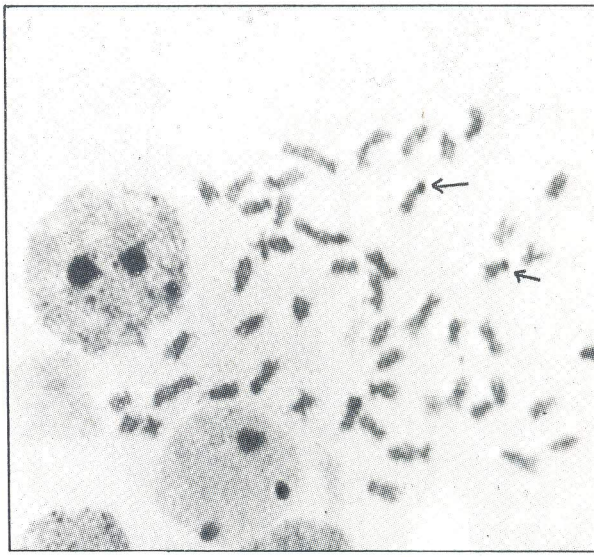
2.4 CG-1. CYTOGENETIC EVALUATION OF ECONOMICALLY IMPORTANT SPECIES FOR CONSERVATION AND UPGRADATION (REVISED)

W.S. Lakra, G. John, D. Kapoor, L.B. Singh and A. Barat

Objectives of the study are (i) to cytogenetically test and assess the intra-population genetic variation of the gene pools of carp population in the Ganga and Cauvery systems, (ii) to identify cytogenetic polymorphic markers that can be used to identify inter-population genetic variations and (iii) to calculate the genetic distance between the fishes of the different drainage systems.

Comparative studies have been made on the chromosome of Indian major carps i.e. catla, rohu and mrigal in relation to the application of banding techniques. G. banding is a specialised staining technique that can be used for identifying individual chromosomes and also intraspecific variation. Despite uniformity in chromosome number and morphology in a species, there may be variations in the banding patterns. NOR patterns are localised on certain chromosome pairs and the pattern is somewhat species specific. Examining NOR for possible intraspecific variations is necessary. The diploid number (2n) 50 has been confirmed in all the above species as reported earlier.

The terminal position of the Nucleous Organiser Regions (NOR) was located on the chromosomes of *Catla catla, Labeo rohita* and *Cirrhinus mrigala* for



NOR-in Chromosomes of *Labeo rohita*

the first time in India using the silver staining technique of Howell & Black (1980).

Attempts have also been made for C-banding using the technique of Sumner *et al.* (1971). Some positive indications have been noticed and the efforts are being continued to get consistent C-bands in the Indian major carps. Positive G-bands have also been obtained in *Catla catla.*

Besides, in vivo chromosomal preparation techniques have been refined for better metaphase spreads by necessary modifications in the standard procedures.

2.5 BG—1. GENETIC VARIATIONS IN MORPHOLOGICALLY DISTINCT/GEOGRAPHICALLY ISOLATED POPULATION (REVISED)

A.G. Ponniah, P.C. Mahanta, D. Kapoor, W.S. Lakra, P.K. Sahoo, A. Barat and A.K. Singh.

Main objective of the study is to ascertain the degree of genetic differentiation between three morphotypes of Rihand catla and to compare it with the catla of the Ganga river system.

Three different morphotypes of *Catla catla* were collected from the Rihand reservoir and were preserved for study of its morphomeristic variations. The three intra-variable populations of catla were found to be identifiable by short, medium and long pectorals and their girth measurements. The morphomeristic measurements confirmed the three morphotypes.

During the period under report studies were carried out to determine whether the three catla morphotypes are genetically distinct.

Preliminary trials were carried out using the Gangetic catla to test whether the tissue preserved in liquid notrogen can be used for biochemical genetic studies. The results indicate that there was no loss of activity nor change in isozyme pattern with long storage for isozymes Phosphoglucomutase, Isocitrate dehydrogenase, Aspartate amino transferase, Glucose-6-phosphate dehydrogenase, Maleic enzyme and Malate dehydrogenase.

Two field collection trips were undertaken in May 1989 and February 1990 to Rihand Reservoir. The fishes available were large varying from 11-27 kg and thus, the same could not be carried to the laboratory at Allahabad. Therefore, for cytogenetic investigations, temporary laboratory facilities were established in the state fisheries office.

Live specimens could not be collected from the local catch since they were gill netted. Arrangements were made for experimental fishing when the scientists and technicians themselves went with the fisherman in their boat. During the first trip only 2 specimens of the medium morphotypes were collected. During the second trip four specimens could be collected one each of long and short and two of medium morphotypes. Besides cytogenetic investigations, muscle and liver samples were collected, preserved in liquid nitrogen and transported to the laboratery at Allahabad.

In the laboratory, biochemical genetic investigations were carried out to determine whether the isozyme patterns differed between the different morphotypes. The absence of variations in band patterns indicated that there were no genetic differences in the limited samples available. The slides prepared at Rihand were screened for chromosomes. Due to the large size of fishes (11 kg) available for cytogenetic investigations the frequency of metaphase spreads were low. Further investigations for NOR failed to indicate differences between morphotypes. However, the studies are being continued.

2.6 BG-1. BIOCHEMICAL GENETIC EVALUATION OF ECONOMICALLY IMPORTANT SPECIES FOR GENETIC CONSERVATION AND UPGRADATION

A.G. Ponniah and P.K. Sahoo.

The objective of the programme is (a) to draw up biochemical genetic protocols that can be extended to other fishes and prawns (b) to identify biochemical genetic markers for delineating genetically distinct stocks/strains of fishes and (c) to determine if the Ganga and Cauvery populations form distinct genetic strains.

During the period, studies were conducted under the following programmes :-

i) Standardisation of electrophoretic conditions of selected isozymes.
ii) Determining the tissue specific expression of these enzymes and to determine the genetic basis of electrophoretic band patterns observed.
iii) To draw the comparative biochemical genetic profile for these enzymes in the three major carps.

1. Standardisation of eletrophoretic conditions

Initial screening was carried out with 14 enzymes namely—(1) Lactate dehydrogenase (LDH) (2) Alcohol

dehydrogenase (ADH) (3) Aldehyde dehydrogenase (AHD) (4) Xanthine dehydrogenase (XDH) (5) Glycerol-3-phosphate dehydrogenase (G3PDH) (6) Glutamate dehydrogenase (GLUDH) (7) Sorbital dehydrogenase (SORD) (8) Glucose-6-phosphate isomerase (GPI) (9) Phosphoglucomutase (PGM) (10) Isocitrate dehydrogenase (IDHP) (11) Glucose-6-Phosphate dehydrogenase (G6PDH) (12) Asparatate amino transferase (AAT) (13) Malate dehydrogenase (MDH) (14) Maleic enzyme (ME). Six buffer systems were tested to determine the optimum buffer. Besides the buffer systems, optimum electrophoretic conditions were determined with regard to sample homogenising buffers, current, enzyme stabilizers and staining procedures.

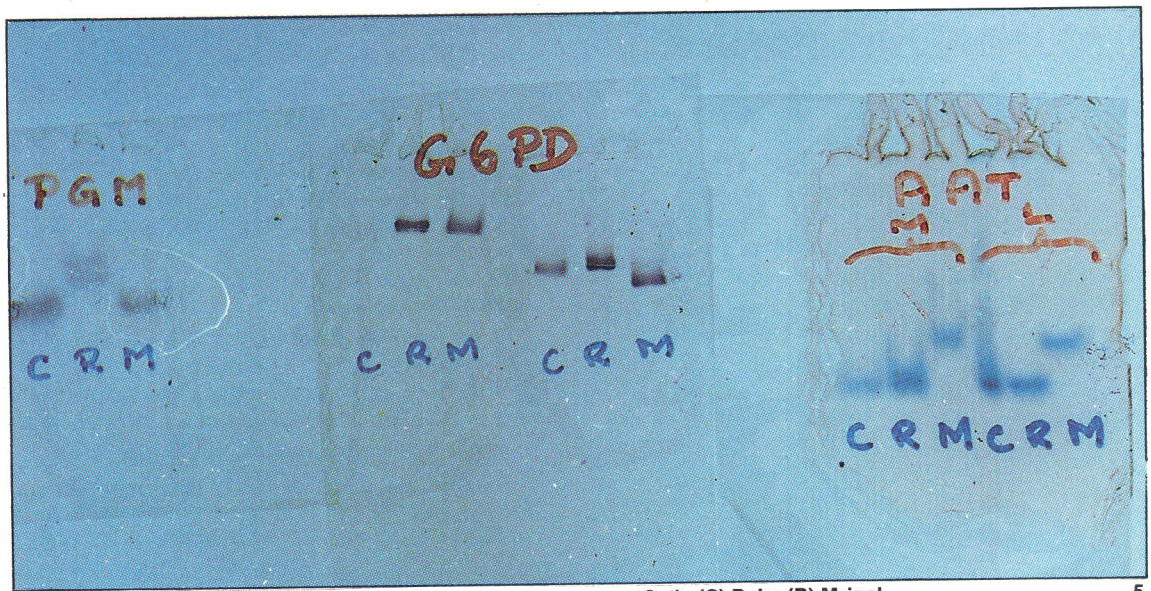
It was found that due to higher activity of lactic dehydrogenase and alcohol dehydrogenase the other dehydrogenase band patterns were not distinct necessitating the application of different inhibitor treatments. Partial standardisation of the first eight of fourteen listed enzymes was possible. For the next six enzymes (PGM, IDHP, G6PDH, AAT, ME and MDH) complete standardisation was possible. For these six enzymes tissue specific pattern were studied in the three major carps.

11. Tissue specificity and genetic basis of enzyme expression

Only one locus which is equally expressed in muscle and liver could be resolved for PGM in all the three major carps. In liver one band, the product of a single locus was observed for IDHP. The activity of G6PDH was strong in liver and much reduced in muscle. In both tissues the enzyme is encoded by a single loci. In both tissues AAT was resolved as a single locus in the three major carps. The presence of 2 loci for ME was indicated by the 2 banded structure of ME isozymes in liver. The genetic basis of the MDH bands could not be fully interpreted. A conservative estimate would be that there are only 2 loci present for MDH and the different band patterns in muscle and liver is due to the differential expression of the heteropolymers in both the tissues.

111. Comparative biochemical genetic profile of major carps

For PGM, IDHP, ME-B, MDH-A, MDH-B all the three major carps *Catla catla, Labeo rohita* and *Cirrhinus mrigala* exhibit a more or less identical band pattern. Though the differences in mobility between the three species was little for G6PD, it was consistently expressed indicating that the most common allele in the 3 species is different. The mobility of AAT isozymes in mrigala was slower than that of catla and rohu (Fig.5). For ME the faster loci (ME-B) had the same mobility. ME-A exhibited differences between the three species. For IDHP and PGM the presence of polymorphism was also indicated.



Comparative biochemical genetic profile of the three major carps; Catla (C) Rohu (R) Mrigal (M) for the isozyme phosphoglucomatase (PGM), glucose-6- phosphate dehydroyenase (G6PD), asparatate amino transferase (AAT) in muscle (m) and liver (l) tissues. 5

3. COLLABORATION

3.1 National

1. Central Inland Capture Fisheries Research Institute Barrackpore, West Bengal.
2. Central Institute of Brackishwater Aquaculture, Madras, Tamil Nadu.
3. Central Marine Fisheries Research Institute, Cochin, Kerala.
4. Department of Zoology, University of Allahabad, Allahabad, U.P.
5. Department of Zoology, Kurukshetra University, Kurukshetra, Haryana
6. Department of Zoology, University of Kalyani, Kalyani, W.B.
7. School of Life Sciences, North Eastern Hill University, Shillong, Meghalaya.
8. Department of Zoology, University of Calcutta, Calcutta, West Bengal.
9. National Academy of Sciences, India, Allahabad, U.P.
10. Zoological Survey of India, Madras, Tamil Nadu.

3.2 International

1. Fish & Agriculture Research Station, Agriculture-Research Organisation, Door, Hof Hacarmal, Israel.
2. Institute of Aquaculture, Stirling, Scotland, U.K.
3. Savannah River Ecology Lab., University of Georgia, Drawer E, Aiken SC 29802, USA.

4. MANPOWER DEVELOPMENT

4.1 Scientific and Technical

The following personnel received training in their respective fields.

—**Dr. W.S. Lakra,** Scientist (Sr. Scale) underwent training on fish cytogenetics at Department of Zoology, Kurukshetra University, Kurukshetra from May 1 to 31, 1989.

—**Shri S.P. Singh,** Scientist, underwent the short term IInd Refresher Course in Statistics for Agricultural Scientists conducted at Indian Agricultural Statistics Research Institute, New Delhi from October 3 to December 30, 1989.

—**Dr. W.S. Lakra,** Scientist (Sr. Scale) underwent training on "Characterisation of farm livestock genetic resources by cytogenetic techniques" from October 16 to 20, 1989 at the National Bureau of Animal Genetic Resources & National Institute of Animal Genetics, Karnal.

—**Dr. W.S. Lakra,** Scientist (Sr. Scale) underwent training on "Cytogenetics of crustaceans and molluscs" at the National Institute of Oceanography, Dona Paula, Goa from January 14 to 21, 1990.

—**Dr. W.S. Lakra,** Scientist (Sr. Scale) underwent training on "Sex control in Tilapia and Common Carp" at College of Fisheries, Mangalore from January 24 to 28, 1990.

—**Dr. A.G. Ponniah,** Scientist (Sel. Grade) attended the DBT sponsored Workshop cum Training organised by the National Institute of Immunology, New Delhi during March 5 to 19, 1990 on "Gene cloning and transfer of gene constructs in fish embryos".

—**Dr. W.S. Lakra,** Scientist (Sr. Scale) attended the DBT sponsored Workshop cum Training organised by the National Institute of Immunology, New Delhi during March 5 to 19, 1990 on "Gene cloning and transfer of gene constructs in fish embryos".

—**Dr. G. John,** Scientist (Sel. Grade) attended the DBT sponsored training programme on "Gene and Chromosome Manipulation" held at the Madurai Kamaraj University, Madurai from March 20 to April 3, 1990.

—**Shri Ved Prakash,** Library Attendant (T-1) appeared and qualified in the Library Science Certificate Examination 1989 in IInd Division from the Library Science Training Centre, Allahabad conducted by Library Association U.P.

4.2 HONOURS & AWARDS

—**Dr. P. Das,** Director was nominated as member of National Organising Committee of the National Symposium on the Conservation and Sustainable Management of India's Genetic Estate held during 3-4 November, 1989 in New Delhi, Organised by World Wide Fund for Nature-India.

—**Dr. P. Das,** Director has been nominated as the member of the Steering Committee on Biological Diversity, WWF-India.

—**Dr. P. Das,** Director has been nominated as the Associate Editor of the Journal of Nature Conservation, published by Nature Conservators, Muzaffarnagar, U.P.

5. TRANSFER OF TECHNOLOGY

5.1 ADVISORY SERVICES

Fish farmers as well as other persons interested in fisheries frequently visited the Bureau for getting technical know how on aquacultural aspects. Necessary advice on various aspects of both fin and shell fish culture were rendered. Technical advice was also offered to interested persons during the visit of the scientists to villages. The broad aspects included composite fish culture, induced breeding, remedial measures for fish diseases, renovation and construction of ponds.

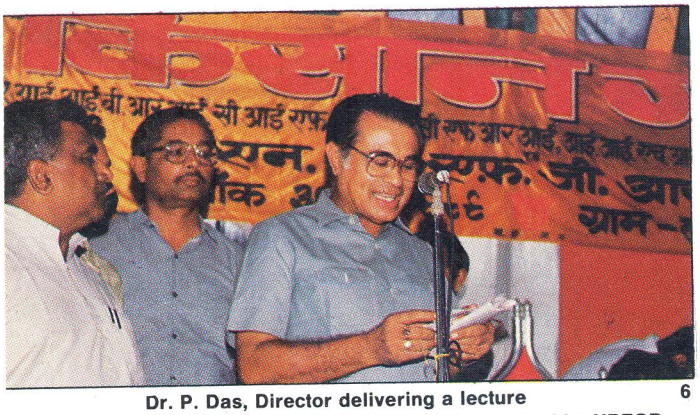
5.2 FIELD DEMONSTRATION OF COMPOSITE FISH CULTURE

In order to arrange demonstrations on composite fish culture techniques, two ponds were taken up in Fatehpur. The various aspects of the technology were demonstrated step by step to the Fish Farmers and other interested persons.

The Union Minister of State (DARE), Hon'ble Shri H.K. Shastri inaugurated one of the demonstration centres of the NBFGR for composite fish culture at Ladigaon.

5.3 EXHIBITIONS AND KISAN GOSTHI

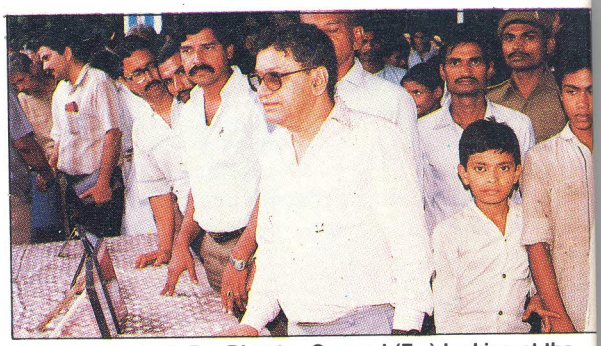
In addition to the field demonstration, a big 'Kisan Gosthi' was organized on 30.9.89 at village Ladigaon



Dr. P. Das, Director delivering a lecture during Kisan Gosthi at Fatehpur organised by NBFGR.

6

in Fatehpur (Fig.6.7). In addition to the Bureau, IARI, IVRI, CARI, NCRO, CIFE, CICFRI also participated. More than 700 farmers participated. An exhibition depicting the scientific methods of fish culture was also organised. The main programme of the 'Gosthi' was lectures/talks followed by discussions on improved methods of fish culture including various problems of fish culture particularly fish diseases and proper curative measures.



Dr. P.V. Dehadrai, Dy. Director General (Fy.) looking at the exhibition organised by NBFGR at Ladigoan, Fatehpur.

Dr. P. Das, Director was the main speaker at the massive Kisan Gosthi at the ICAR pavilion 'Nehru Kisan Mela' at Allahabad on 11-19 November 1989. He spoke on the modern Aquaculture and their

Dr. P. Das, Director delivering a lecture during Kisan Gosthi Nehru Kisan Mela, Allahabad.

economics (Fig. 8). This was followed by a lively discussion on the matter in which all other senior scientists of NBFGR and CICFR Centre, Allahabad participated.

5.4 OTHER ACTIVITIES

An extension booklet on scientific methods of composite fish culture in Hindi was prepared and distributed among the fish farmers.

Radio talks on various aspects of fish culture were delivered, by experts of the Bureau, as under :

Fingerlings stocking in ponds by Dr. P. Das

Supplementary feeding of fishes—Mr. D. Kapoor

Breeding of common carps—Mr. D. Kapoor

Fish diseases and their control—Dr. A.K. Singh.

Scientists of the Bureau visited the State Fisheries Corporation Fish Farm for rendering technical and scientific suggestions on mollusc control which was a severe problem there. Short term experiments were also conducted on mollusc control.

6. LIBRARY AND DOCUMENTATION SERVICE

6.1 LIBRARY HOLDINGS

The NBFGR Library acquired 173 latest books, 90 reprints and photocopies of scientific papers, 88 miscellaneous publications and subscribed to 26 foreign and 27 Indian journals. In addition, the library acquired 32 foreign and 31 Indian journals in exchange/as gratis. The library, in March 1990, had a total holding of 689 books, 133 reprints & photocopies, 261 miscellaneous publications and 10 maps. The total expenditure incurred by the library during the year was Rs.2,89,000.00.

6.2 EXCHANGE SERVICES

The library maintained exchange relationship with 60 leading National and International Research Institutes/ Information Centres.

The library maintained free mailing of Bureau's Annual Report and other publications to various research organisations, universities, agencies, entrepreneurs and fish farmers. It also extended its service to the scientific personnel of research organisations, university, research scholars, students and individuals through inter-library loan services and reading room facilities.

6.3 REPROGRAPHY SERVICES

The section maintained active reprography services by producing departmental publications and supplying required photocopies to the scientists of the Bureau as well as of other research institutes and universities free of cost.

The section also maintained a cyclostyling (duplicating) machine to serve the various units of the Bureau.

6.4 TECHNICAL REPORTS

Twenty technical reports on the progress of research activities and administrative activities of the Bureau were compiled and sent to ICAR. Twenty-one review and research papers of the scientists were communicated to various journals and symposia/seminars/conferences for publication and presentation. Twenty two technical queries regarding the activities of the Bureau from various quarters of the country and abroad were attended to by the section.

6.5 INFORMATION SERVICES

The section contacted WWF-International world Conservation Centre and International Union for Conservation of Nature and Natural Resources and procured publications on resource conservation for sharing information by the Scientists. It also took Institutional Membership of WWF-India for information retrieval.

Contents list (quarterly) were provided to the Scientists to keep them aware with the latest references. The book entitled "Fish Genetics in India", ed. by P. Das and A.G. Jhingran containing the papers presented at the Symposium on Conservation and Management of Fish Genetic Resources of India, held on 11-13 April 1986 at the Bureau was published in 1989. This book includes review papers, articles and experience papers written by leading researchers in the field. This is the first Indian book on fish genetics.

6.6 PUBLICATIONS

The following publications were brought out by the Bureau during the year:

—Book entitled "Fish Genetics in India" ed. by P. Das and A.G. Jhingran, printed by M/S Today & Tomorrows Publishers, New Delhi, 226p.

—Annual Report 1988-89.

—Research Project programme 1989.

—Activity Milestone 1989-90.

—Report for the Committee of the Directions on 20 February 1989.

—Report for the In House Review Committee of the ICAR, 28-30 March, 1989.

—Fish seed production in India—P. Das & S.P. Ayyar (paper presented at the SAARC Workshop held at Fish Res. Inst., Mymensing, Bangladesh, 11-12 June 1989).

—"Aadhunik Matsya Palan" (Pamphlet in Hindi).

—A discussion paper on "Introduction of Exotic Aquatic Species" for the meeting of the Committee on Introduction of Exotic Aquatic Species, 22nd and 23rd February held at CICFRI, Barrackpore, W.B.

—Base paper submitted for the meeting of the Committee of Directions at NBFGR on 28 February, 1990.

—Memorandum submitted to the Quinquennial Review Team of the NBFGR for the period 1983-1988.

7. CONFERENCES AND SYMPOSIA ETC.

7.1 Participation

The Scientists and Technicians of the Bureau participated in various Conferences/Symposia/Meetings as detailed below:

Sl. No.	Conferences/Symposia/ Seminar/Workshops	Organised by	Title of the paper presented with Authorship	Name of the Participants
1.	Second Asian Fisheries Forum, Tokyo, Japan, 18-21 April, 1989.	Asian Fisheries Society, Manila, Philippines.	Conservation of fish germplasm resources in India—P. Das.	—
2.	SAARC Workshop on Fish Seed Production, 11-12 June, 1989.	SAARC Secretariat Kathmandu—held at Fisheries Research Institute, Mymensing, Bangladesh.	Fish seed production in India—P. Das & S.P. Ayyar.	Dr. P. Das
3.	Symposium on Environmental Protection—a Movement, 18-19 July, 1989.	Nature Conservators, C/o Deptt. of Zoology, D.A.V. College, Muzaffarnagar, U.P.	Management of natural aquasystems for fish germplasms conservation—P. Das.	—
4.	9th National Conference of Agricultural Research Statisticians of the ICAR Institutes, 19-21 July, 1989.	Indian Agricultural Statistics Research Institute (ICAR), New Delhi—held at Tamil Nadu Agricultural Univ., Coimbatore.	—	Sri S.P. Singh
5.	National Symposium on Environmental Management Strategies for Pathogenesis in Parasitic Diseases, 13-15 Oct., 1989.	University of Allahabad, Allahabad.	Genetic approach in developing disease resistant fish varieties—P. Das.	Dr. P. Das
6.	Symposium on Development Without Destruction, 17-20 Oct., 1989.	Deptt. of Botany, University of Kashmir & Nature Conservators, Muzaffarnagar, U.P.—held at Srinagar.	Genetic variability maintenance of fish gene pools—a national responsibility—Dr. P. Das	Dr. P. Das
7.	Symposium on Advances in Limnology and Conservation of Endangered Fish Species, 23-25 Oct., 1989.	Society of Biosciences, Muzaffarnagar & Deptt. of Zoology, held at Garhwal University, Srinagar—Garhwal.	Conservation genetics of endangered fish population in India—P. Das.	Dr. P. Das
8.	—do—	—do—	The biology and conservation of Decean Mahseer *Tor khudree* (Sykes)—W.S. Lakra & P. Das.	—
9.	National Symposium on Conservation and Sustainable Management on India's Genetic Estate, 3-4 November, 1989.	World Wide Fund for Nature, India, New Delhi.	Fish genetic resource conservation in India—P. Das.	Drs. P. Das, A.G. Ponniah, G. John, Mr. D. Kapoor & Dr. W.S. Larka

10.	Symposium on Cultural and Natural Sites along the Ganga: Our Unique National Heritage, 5 November, 1989.	National Academy of Sciences, India, Allahabad—held at Allahabad.	—	Dr. P. Das & Mrs. S. Das
11.	National Symposium on Forty Years of Freshwater Aquaculture in India, 7—9 November, 1989.	Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar.	Olfaction in the Indian major carps and its possible applicability in aquaculture.—W.S. Lakra.	—
12.	National Seminar on Fisheries Education in India, 23 & 24 Dec., 1989.	Central Institute of Fisheries Education, Bombay.	—	Dr. P. Das
13.	National Workshop on Reservoir Fisheries, 3-4 Jan., 1990.	Asian Fisheries Society (Indian Branch) & Central Inland Capture Fisheries Research Institute—held at Barrackpore, W.B.	Exotic germplasm in reservoirs—P. Das.	Dr. P. Das
14.	77th Indian Science Congress, Cochin, 4-9 Feb., 1990.	Indian Science Congress Association, Calcutta—held at University of Science & Technology, Cochin.	Fish germplasm conservation: Our national obligation—P. Das.	Dr. P. Das
15.	—do—	—do—	Role of biochemical genetic studies in the Conservation of fish genetic resources—A.G. Ponniah.	Dr. A.G. Ponniah
16.	National Workshop on Ulcerative Disease Syndrome in Fish, 6-7 March, 1990.	Directorate of Fisheries, Govt. of West Bengal & Ministry of Agriculture, New Delhi—held in Calcutta.	Some observations on epizootic ulcerative syndrome in fishes around, Allahabad—P. Das, V.K. Johri, A. Mishra & D. Kapoor.	Dr. P. Das
17.	Workshop on Cloing and Transfer of Gene Constructs—in Fish Embryos, 6-20 March, 1990.	National Institute of Immunology, New Delhi.	—	Dr. A.G. Ponniah & Dr. W.S. Lakra
18.	UGC Seminar on Woman & Development: Some perspectives, 23-25 March, 1990.	Faculty of Arts, Univ. of Allahabad.	—	Mrs. S. Das

7.2 IMPORTANT MEETINGS

The following meetings were organised by the Bureau during April, 1989 to March 1990.

** Meeting of the Committee for Introduction of Exotic Fish Germplasm which was held on 23 February 1990, at CICFRI, Barrackpore. It was attended by Drs. P. Das and G. John.

** Meeting of the Committee of Directions of the Bureau was held on 28 February 1990 under the chairmanship of Dr. V.G. Jhingran, Padmashree. Other members were Dr. A.G.K. Menon, Emeritus Scientist at the Zoological Survey of India, Madras and Dr. P. Das, Member Secretary of the Committee and the Director of the Bureau.

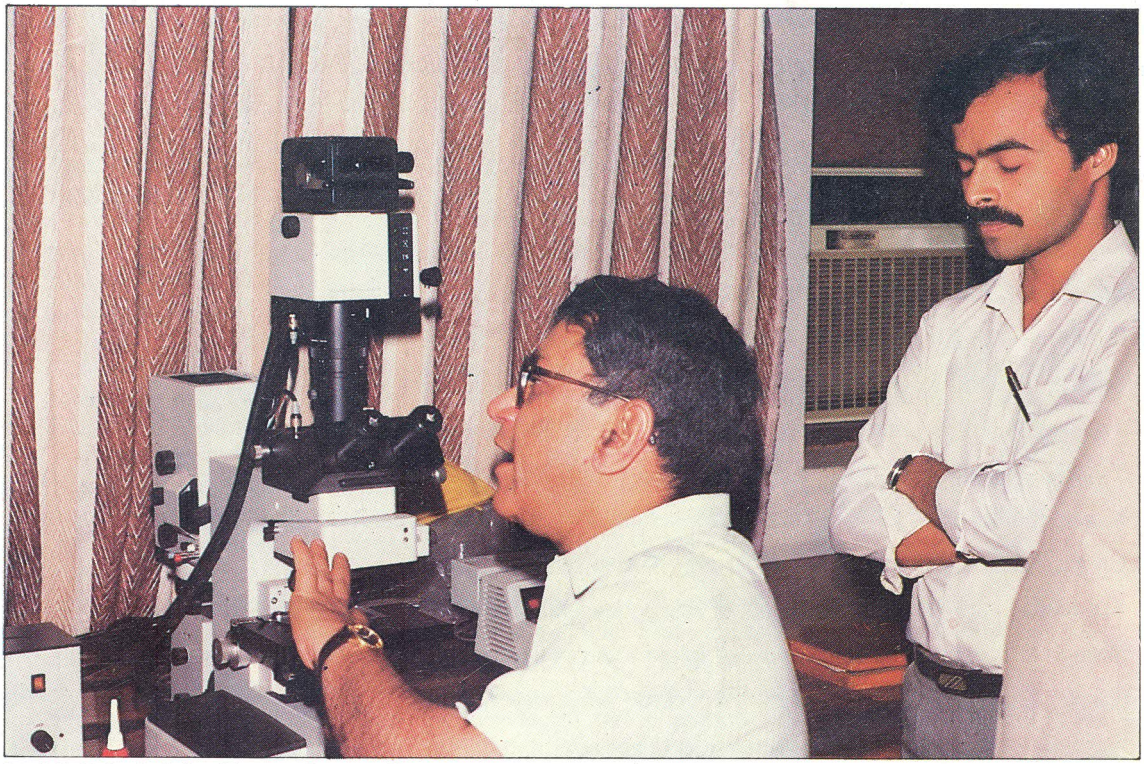
** Annual Staff Research Council meeting was held on 20 April 1990 during which the progress on last year's projects were discussed and new projects approved.

8. VISITORS

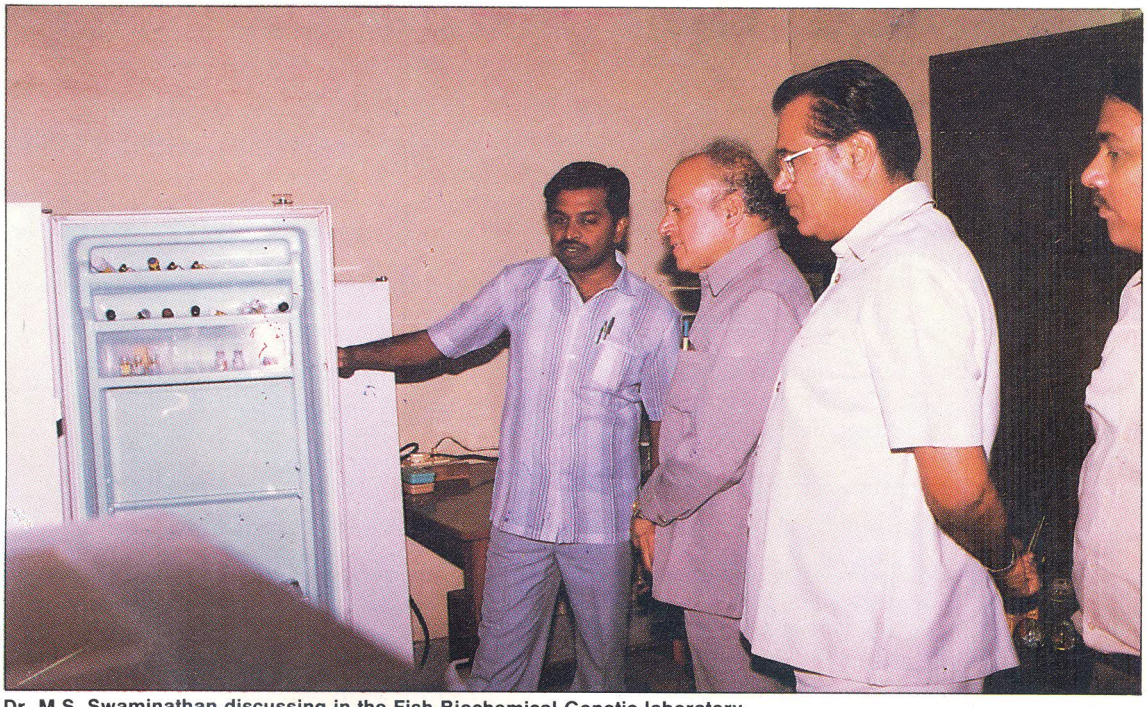
A good number of distinguished personalities and National leaders visited this Bureau during 1989-90. They included Hon'ble Union Minister of State for Agricultural Research & Education, Govt. Of India, Shri Hari Krishna Shastri and Ex-Director General, ICAR & IRRI and Hony. Director, Centre for Research on Sustainable Agricultural & Rural Development Dr. M.S. Swaminathan. The following is the list of other distinguished visitors: (Fig.9-12)

Dr. M.S. Swaminathan observing, histological slide of diseased fish in Fish Biology laboratory. 9

Dr. M.S. Swaminathan in the NBFGR library. 10



Dr. P.V. Dehadrai, Dy. Director General (Fy.) discussing fish chromosome banding in Fish Cytogenetics laboratory. 11



Dr. M.S. Swaminathan discussing in the Fish Biochemical Genetic laboratory. 12

Dehadrai, P.V. (Dr.), Deputy Director General (Fisheries), Indian Council of Agricultural Research, New Delhi.

Srivastava, G.C. (Dr., IAS) Secretary, Indian Council of Agricultural Research, New Delhi.

Guha, Amala (Dr.), U. Comn. Health Centre, Connecticut, USA.

Jhingran, V.G. (Dr.), Ex-Director of CICFRI, Ex-Fisheries Expert of FAO, World Bank of Asian Dev. Bank & Fisheries consultant, Dehradun.

Kumar, Krishan (Mr.), Director (P&I), ICAR Bhavan, New Delhi.

Sinha, V.R.P. (Dr.), Director, Central Institute of Fisheries Education, Bombay.

Srivastava, C.B.L. (Dr.), Head, Deptt. of Zoology, University of Allahabad, Allahabad.

Srivastava, U.S. (Dr.), Emeritus Scientist, National Academy of Sciences, India, Allahabad.

Swarup, K. (Dr.), Emeritus Scientist, National Academy of Sciences, India, Allahabad.

Tahiliani, N.D. (Dr.), Head of Deptt. of Surgery, M.L.N. Medical College, Allahabad.

Tripathi, Y.R. (Dr.), Ex-Director of Fisheries, Govt. of U.P., Lucknow.

Menon, A.G.K. (Dr.), Ex-Joint Director & Emeritus Scientist, Zoological Survey of India, Madras.

Grewal, S.S. (Dr.), Reader, Deptt. of Zoology, Punjab University, Patiala.

Raj, Samuel Paul (Dr.), Reader, School of Energy, Madurai Kamaraj University, Madurai.

Rastogi, M.L. (Mr.), Principal, Centre for Inland Fisheries Operatives Trg., Chinhat, Lucknow.

Shanker, Uma (Mr.), Under Secretary (P&I), ICAR, KAB, New Delhi.

Singh, S.N. (Mr.), Chief General Manager, State Fish, Dev. Corpn., Lucknow.

9. SCIENTIFIC PUBLICATIONS

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Conservation genetics of endangered fish populations in India. *In* National Symposium on Advances in Limnology and Conservation of Endangered Fish Species, Oct. 23-25, 1989, Souvenir & Abstracts of Papers, Deptt. of Zoology, H.N.B. Garhwal Univ., Srinagar-Garhwal, p. 27.

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Role of biochemical genetic studies in the conservation of fish genetic resources. Proc. Seventy Seventh Session of the Indian Science Congress, Cochin, 1990. Part IV: Advance notes on Symp. & discussions, Section of Zoology, Entomology & Fisheries, p. 66.

10.1. LIST OF PERSONNEL

DR. P. DAS, DIRECTOR

SCIENTIFIC

1.	Dr. L.B. Singh	— Principal Scientist
2.	Dr. M. Sinha	— Principal Scientist (on deputation to NEC, Shillong)
3.	Dr. A.G. Ponniah	— Scientist (Sel. Grade)
4.	Dr. G. John	— Scientist (Sel. Grade)
5.	Shri D. Kapoor	— Scientist (Sel. Grade)
6.	Shri P.C. Mahanta	— Scientist (Sr. Scale)
7.	Dr. W.S. Lakra	— Scientist (Sr. Scale)
8.	Shri S.P. Singh	— Scientist

TECHNICAL

1.	Dr. A.K. Singh	— Asstt. Farm Manager, T-6
2.	Smt. Sukla Das	— Librarian, T-5
3.	Shri A.K. Mishra	— Electrical Foreman, T-4
4.	Dr. A. Barat	— Senior Laboratory Technician (Cytogenetics), T-4
5.	Shri Babu Ram	— Farm Engineering Asstt., T-4
6.	Dr. (Mrs.) P.K. Sahoo	— Senior Laboratory Technician (Biochemical genetics),T-4
7.	Shri Rajesh Dayal	— Field Surveyor, T-4
8.	Shri S.M. Srivastava	— Field Surveyor, T-4
9.	Shri Rabindra Singh Patiyal	— Farm Assistant, T-4
10.	Shri P. Chithamparam	— Library Assistant, T-11-3
11.	Shri Raj Kumar Sukla	— Sample Sorter, T-1
13.	Shri Bhola Nath Pathak	— Gestetner Operator, T-1
14.	Shri Ved Prakash	— Library Attendant, T-1
15.	Shri Rama Shankar Sah	— Dark Room Assistant, T-1

ADMINISTRATIVE

1.	Sri R.C. Srivastava	— Assistant Finance & Accounts Officer
2.	Sri A. Sah	— Superintendent
3.	Sri R.C.P. Sinha	— Stenographer
4.	Sri K.P. Nath	— Assistant
5.	Sri A.K. Srivastava	— Senior Clerk
6.	Sri Panchoo Lal	— Senior Clerk
7.	Sri Mohan Tiwari	— Junior Clerk
8.	Smt. Chandra Tiwari	— Junior Clerk
9.	Sri Navin Kumar	— Junior Clerk

AUXILIARY

1.	Sri Samarjit Singh	— Driver

SUPPORTING

1.	Sri Sree Ram	— Fieldman, SSG-III
2.	Sri Madan Lal	— Fisherman, SSG-I
3.	Sri Raj Bahadur	— Laboratory Attendant, SSG-I
4.	Sri Swapan Debnath	— Laboratory Attendant, SSG-I
5.	Sri K.K. Singh	— Fieldman, SSG-I
6.	Sri Ram Baran	— Fisherman, SSG-I
7.	Sri Laxchaman Prasad	— Fisherman, SSG-I
8.	Sri Dukhi Shyam Deo	— Fisherman, SSG-I
9.	Sri Indrajit Singh	— Messenger, SSG-I
10.	Sri Anil Kumar	— Safaiwala, SSG-I

10.2. APPOINTMENTS

Sl. No.	Name	Designation	Date of appointment
	Scientific		
1.	Dr. George John	Scientist (Sel. grade)	31.7.1989
	Technical		
1.	Dr. A.K. Singh	Assistant Farm Manager, T-6	9.6.1989
2.	Sri Rajesh Dayal	Field Surveyer, T-4	3.2.1990
3.	Sri S.M. Srivastava	Field Surveyer, T-4	6.2.1990
4.	Sri Rabindra Singh Patiyal	Farm Assistant, T-4	15.2.1990
	Supporting		
1.	Sri Dukhi Shyam Deo	Fisherman, SSG-I	22.9.1989
2.	Sri Anil Kumar	Safaiwala, SSG-I	19.12.1989
3.	Sri Indrajit Singh	Messenger, SSG-I	14.2.1990

10.3. TRANSFER/DEPUTATION

Sl. No.	Name	Posts	Date of joining	Date of relieving	Transferred from	Transferred to
1.	Sri S.P. Singh	Scientist	3.4.1989		JARI Barrackpore	NBFGR Allahabad.

APPENDIX-1

Statement showing the total number of employees and member of the Scheduled Castes and Scheduled Tribes amongst them as on 31.3.90

Group/Class	Total No. of employees	Scheduled Castes	Percentage of S.C.	Scheduled Tribes	Percentage of S.T.
1	2	3	4	5	6
GROUP 'A' (Class-1)					
1. Director	1	—	—	—	—
2. Principal Scientist	2*	—	—	—	—
3. Scientist (Sel. Grade)	3	—	—	—	—
4. Scientist (Sr. Scale)	2	—	—	—	—
5. Scientist	1	—	—	—	—
6. Assistant Farm Manager, T-6	1	—	—	—	—
Group 'B' (Class-II)					
1. Asstt. Fianance & Accounts Officer	1	—	—	—	—
2. Librarian, T-5 (Technical Officer)	1	—	—	—	—
3. Superintendent	1	—	—	1	100%
* One on deputation to NEC Shillong.					
Group 'C' (Class-III)					
1. Technical T-4	7	1	14.3%	1	14.3%
2. Technical T-II-3	1	—	—	—	—
3. Technical T-1	5	2	40%	1	20%
4. Stenographer	1	—	—	—	—
5. Assistant	1	—	—	—	—
6. Senior Clerk	2	1	50%	—	—
7. Junior Clerk	3	1	33.3%	—	—
8. Driver	1	—	—	—	—
Group 'D' (Class-IV)					
1. Fisherman	4	—	—	1	25%
2. Lab. Attendant	2	—	—	—	—
3. Fieldman	2	1	50%	—	—
4. Messenger	1	—	—	—	—
5. Safaiwala	1	1	100%	—	—

Appendix-II : *Organisational Chart*