

वार्षिक प्रतिवेदन
ANNUAL REPORT

२०००-२००१



राष्ट्रीय शीतजल मात्स्यकी अनुसंधान केन्द्र
(भारतीय कृषि अनुसंधान परिषद)
भीमताल-२६३ १३६, जनपद-नैनीताल, (उत्तरांचल)

NATIONAL RESEARCH CENTRE ON COLDWATER FISHERIES
(Indian Council of Agricultural Research)
BHIMTAL - 263136, District-NAINITAL, (UTTARANCHAL)



वार्षिक प्रतिवेदन ANNUAL REPORT

2000-2001



राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र
(भारतीय कृषि अनुसंधान परिषद्)
भीमताल – 263 136, जिला नैनीताल,
उत्तरांचल

NATIONAL RESEARCH CENTRE ON COLDWATER FISHERIES
(*Indian Council of Agricultural Research*)
Bhimtal – 263 136, Distt. Nainital,
Uttaranchal

NRCCWF Annual Report 2000 – 2001

Compiling & Editing

Kuldeep K.Vass

C.B.Joshi

Computer Composing

Susheela Tewari

Computer Designing

A.K.Nayak

Hindi Summary

C.B.Joshi

Amit Joshi

Published by

Dr. K.K. Vass

Director, NRCCWF

Printed at

Yugantar Prakashan Pvt. Ltd.

WH-23, Mayapuri Industrial Area Phase-I, New Delhi – 110 064

Phone: 5135949, 5139018.

- The activities and achievements reflected in this report covers the period from April 2000 to March 2001.
- The material in this report contains the semi-processed and analyzed data of different projects, which will form the basis for the publications of the Centre. Therefore, material may not be used for any publication without written permission of the Centre.
- NRCCWF Annual Report is not a priced publication. Recipients of complimentary copies should use it for scientific purposes only.

CONTENTS

| | |
|---|----|
| 1. Preface | 5 |
| 2. Executive Summary | 7 |
| 3. Introduction | 11 |
| 4. Research Achievements | 17 |
| 5. Technology Assessed and Transferred | 36 |
| 6. Education and Training | 42 |
| 7. Awards and Recognitions | 43 |
| 8. Linkage and Collaborations | 44 |
| 9. Publications | 47 |
| 10. List of On-going Projects | 52 |
| 11. Consultancy | 53 |
| 12. RAC, MC, SRC, QRT Meetings | 54 |
| 13. Participation in conferences, seminars, meetings and workshops | 65 |
| 14. Workshops, Seminars organized | 68 |
| 15. Distinguished Visitors | 72 |
| 16. Personnel | 74 |
| 17. Other relevant information such as special infrastructural development | 76 |
| 18. Hindi Summary | 79 |

1. PREFACE

National Research Centre on Coldwater Fisheries, Bhimtal, the nodal facility of the Indian Council of Agricultural Research for Coldwater Fisheries has been contributing to research in this sector for last thirteen years. The Centre's efforts in research, transfer of technology and out-reach received keen attention during the year 2000–2001, along with emphasis on infrastructure development which was accorded highest priority.

The year 2000-2001 will be remembered in the history of NRCCWF for some important events that occurred during the year. The first event was organization of a Workshop on Hill Fisheries Development in Hindi on September 7, 2000 at Bhimtal, which was inaugurated by Prof. Rajput, Vice-Chancellor of Kumaon University. The second most important event was the Foundation Stone Unveiling Ceremony of NRCCWF Lab-Cum-Office Complex held on March 12, 2001. The Chief guest and guests of honour for this function were Dr. Debendra Pradhan Ji, MOS, DARE (ICAR), Govt. of India; Shri Banshidhar Bhagat Ji, Agriculture Minister, Govt. of Uttaranchal; and Shri Suresh Arya Ji, MOS, Surface Transport, Govt. of Uttaranchal, apart from other dignitaries.

The Centre during the year worked on five ongoing research programmes and sixth on information technology was initiated which helped to create computer awareness among all the members of staff. The major contribution of this programme has been launch of Web page for the NRCCWF, improving e-mail and Internet facility at the Centre. The research programmes were focussed on Ecosystems studies, Aquaculture Systems Research, Technology Dissemination and Out-reach. Among the ecosystem studies the significant aspect was to pinpoint the causes responsible for winter fish kill in Nainital lake. The mahseer seed production activity continued for ranching in Kumaon lakes. The efforts by the Centre in rainbow trout farming at our Chirapani farm, inspite of prevailing warmer water temperature, were successful and first sale was open to public in February 2001. This opens up immense possibility for trout farming in Kumaon hills.

Improving the out-reach of the Centre, apart from organizing various exhibitions, farmers training and awareness programmes, the participation in two major events viz., Millennium International Angling Festival, and Himalayan Adventure & Tourism Mart 2000 have special significance. Both these programmes are linked with sport fishery activity, which has tremendous scope in the country to promote angling tourism. The NRCCWF wanted to project this potential of Coldwater Fishery by this initiative.

The scientists, technical and administrative staff were provided adequate opportunities for professional participation and manpower development programmes. The Centre also created critical infrastructural facilities at Mahseer hatchery Bhimtal and Experimental farm at Champawat, which has greatly facilitated our farm activity. The library services were improved by installation of CD-ROM facility.

During the year the review of NRCCWF's research achievements for the period between 1994-1998 was completed by the Quinquennial Review Team constituted by the Council for this purpose under the Chairmanship of Dr. M.Y.Kamal, Vice-Chancellor, Sheri-Kashmir University of Agricultural Science & Technology, Srinagar.

I hope that aquatic ecologists and fishery personnel from hill states will find the information presented in the report useful and informative. Any valuable suggestions and comments from the readers are most welcome; this will enable the Centre to improve our annual report presentation.

I would like to express my sincere thanks to Dr.R.S. Paroda, the former Secretary DARE, Govt. of India and Director General, ICAR for his support and encouragement extended to NRCCWF. I am grateful to Dr.K.Gopakumar, DDG (Fisheries) ICAR for his guidance and support in expanding the activities of the Centre. Time to time support extended to the research and related activities of the NRCCWF by Dr.B.N.Singh, the Asst. Director General (I.Fy) is thankfully acknowledged. I wish to put on record the co-operation extended by Shri S.K. Maheshwari, IAS, the former District Magistrate Champawat, in all the developmental and extension programmes of NRCCWF under operation in the district.

All the members of NRCCWF staff worked in the spirit of unity, integrity and commitment to achieve the overall progress highlighted in this report. I am sure that with establishment of lab-cum-office complex by next year, the Centre's research activities will reach new milestones with dedicated efforts of all members of NRCCWF family.

I am thankful to Dr.C.B.Joshi, Principal Scientist for his sincere efforts to compile the basic draft report and to other colleagues who have all contributed to this effort. Shri Amit Joshi has helped in Hindi translation of the summary report and its computer script. The help rendered by Shri A.K.Nayak, Scientist and Smt. Susheela Tewari, Steno, in computer processing is thankfully acknowledged.

Bhimtal (Nainital)
1 September, 2001



(K. K. VASS)
DIRECTOR

2. EXECUTIVE SUMMARY

The National Research Centre on Coldwater Fisheries (NRCCWF) was established by Indian Council of Agricultural Research (ICAR) in September, 1987. The Centre is located at Bhimtal (District Nainital) in the State of Uttaranchal. The Centre at present has ten scientists, eleven technicians and twenty two other staff. It had a total budget of Rs. 208.00 Lakhs for the year 2000-2001.

The Centre is guided in its policies by a high level Research Advisory Committee (RAC) comprising mostly of eminent professionals outside the system. The Centre also has a Management Committee. A number of internal committees, such as Staff Research Council, Official Language Committee, Consultancy Processing Cell, Institute Joint Council etc. are in place for decentralized management.

Research programmes are underway in each major thrust areas viz; Openwater Fisheries, Aquaculture and Transfer of Technology. This section summarizes the salient findings of on-going studies.

The first programme of the centre was openwater fisheries in which Himalayan lakes and riverine systems were main focus. Accordingly a study was undertaken to survey the high mountain lakes in the Garhwal region of Central Himalayas, which are very important from the biodiversity angle. Mostly the systems are in the oligotrophic state but some enrichment is also evident due to higher chloride level. Under the same programme investigation was also initiated to understand the mechanism behind recurring winter fish kill reported from Nainital lake in Kumaon region. The study revealed certain disturbing water quality changes that have taken place in the lake environment through the years and significant manifestation of which is critically low levels of oxygen in surface waters recorded in winter. This unusual phenomenon has triggered many physiological changes in the lake environment resulting in regular stress to fish population and subsequent mortality. The lake is subjected to intense biotic pressure and consequent nutrient loading resulting in anoxic conditions in a large volume of lake water with very little water exchange. During monsoon due to defective outlet mechanism of lake only surface water column gets replenished while the deeper waters hardly get time to renew quickly. Thus detritus remains undisturbed and undergoes partial bio-degradation under anaerobic conditions. Consequently toxic substances, such as ammonia and hydrogen sulphide are produced resulting in fish mortality from time to time, particularly during winter. The local environmental group has initiated some of the restorative measures with total support from the district administration. But the restoration of this lake needs a comprehensive action plan involving scientists, engineering experts, administrative people, local stakeholders and financial support.

In the field of riverine ecology, the centre mounted a detailed resource assessment of the hill streams in Garhwal Himalayas which are both snow-fed and spring-fed with rocky bottom at upper reaches and laden with silt, sand and mud in lower reaches. A total of seven (7) streams were surveyed during the period. These systems are generally devoid of any macro vegetation excepting a few patches of algal mass on the sides in gentle flowing stretches. These streams hold a rich and diverse fish fauna of coldwater species dominated by snow-trouts (60-95%). The share of Mahseer in the total fishery was observed to range between 2-10%. A total of 38 fish species have been recorded from various streams and their tributaries.

The second thrust area addressed by the Centre was aquaculture of both indigenous and exotic fish species. Fulfilling the objective of Mahseer (*Tor putitora*) conservation, the centre continued its efforts to produce the seed of this important indigenous species at the flow-through hatchery by artificial fecundation. The seed produced was stocked in different Kumaon lakes for replenishing their stocks. Trials were also initiated to assess the performance of Mahseer when stocked in ponds alongwith other exotic carps viz; silver, grass and common carp for developing a composite fish culture technology, based on a mix of exotic and indigenous species suitable for hills.

Similarly, addressing the issue of exotic species based aquaculture, the centre during the year focused on the up-scaling of carp based technology by working out a combination to achieve higher growth rates and test the technology under different pond types. Further, research was initiated to work out the problem of brood stock maturation of silver and grass carp at high altitudes, through hormonal treatment to stocks because low water temperature has been observed to be a constraint in maturation process. The seed production activity of common carp was continued and supplied to farmers in Champawat district. Among the most important exotic species, the successful rearing of rainbow trout *Oncorhynchus mykiss* upto table size at Chirapani experimental farm of the centre was a major achievement. The institute's formulated feed for this fish was manufactured on pilot scale at CIFA feed plant, which has given good results with trout stocks in the farm. The first ever sale of trout to local people in February 2001 was formally opened by the District Magistrate, this is a significant contribution of NRCCWF towards fishery development in Kumaon region. The Centre's effort in developing balanced diet for indigenous species viz; mahseer and snow-trout was continued by experimenting different feeding trials. Two test diets, NRCCWF I and II formulated by the institute were experimented upon with *Tor putitora* and *Schizothorax richardsonii* as test species. It was found that diet II resulted in higher net weight gain, specific growth rate at lower stocking density. But comparing the survival of stocks between two test diets, the diet I recorded less mortality during feeding trials. Both the test fishes responded on similar lines with regard to feeding trials.

The third programme area of the Centre was to transfer the technology developed by the institute to the user groups. In this activity the centre has been able to make a dent through demonstrations and following other extension methodologies. This has helped to create awareness among local farmers about the benefits of aquaculture in hills and the viability of exotic carp based technology developed by the centre.

Realizing the potential of fish culture in generating additional income, the technology evolved by the Institute on exotic carp farming was passed on to the local farmers and about 24 fish ponds of various farmers were adopted to test the technology on pilot scale in Kumaon Himalayas. By application of standardized management practices the results obtained so far are quite encouraging and an average fish production of 3500 kg ha⁻¹yr⁻¹ was achieved. The transfer of this technology on farming of exotic carps in the small holdings like irrigation tanks and other similar water bodies can be popularized in the hill areas to motivate more and more people to adopt the technology evolved by the Centre and generate additional income.

The NATP project being executed at NRCCWF with three Co-operating Centres continued to function as per schedule. Under the project ecological database was generated and Mahseer fishery potential in different rivers systems *viz*; Beas, Saryu, (W) Ramganga, Ganges and Chenab was assessed.

The Information Technology received due importance in the programme activity of the centre. Keeping pace with this frontier area, the ARIS Cell of the centre developed a Website. The website contains detailed information about the centre's mandate, research programmes, technologies evolved, research support services and future thrust areas. The efforts to update the website by incorporating additional information on coldwater fish & fisheries are being continued.

In order to improve the visibility of the centre, we participated and organized various exhibitions and farmer oriented programmes at district and block level. Number of publications both in English and Hindi were released for the benefit of farmers, students, researchers and other workers interested in Hill Aquatic Resource Management.

Under Human Resource Development activities, scientists of the Institute were deputed for various training programmes to upgrade their knowledge on the different fisheries aspects. Most of the Scientists of the Institute participated in seminars, symposia, workshops and conferences organized by different scientific agencies and presented their findings. Two technicians were deputed for advance training in soil and water analysis methodology at CICFRI, Barrackpore.

The scheduled meetings of all committees *viz*; Research Advisory, Staff Research Council, official language, Institute Joint Staff Council and Management were held and various decisions were taken for smooth management of the centre and research.

One of the important task completed during the year was the review of NRCCWF by the QRT under the chairmanship of Dr. M.Y. Kamal, Vice Chancellor, S.K. University of Agricultural Sciences & Technology, Srinagar (J&K State). All the visits and discussions on research activities were completed. The team has already prepared draft report with recommendations for final discussion with the members of Management Committee.

Implementing the constitutional mandate, the centre is encouraging the members of staff to use more and more Hindi. Apart from its routine use, the centre organized a scientific workshop "*Parvatiya shetron mein matsya anusandhan evam vikas*" in Hindi on September 7, 2000 at Bhimtal, which was inaugurated by the Vice Chancellor, Kumaon University, Nainital Prof. B.S. Rajput. The function was also attended by the Chairperson, District Board, Nainital Mrs. Beena Arya; General Manager, Kumaon Mandal Vikas Nigam Limited, Shri U.D. Chaube; Joint Director, IVRI, Mukteshwar Dr.P.C. Harbola; Prof. Sarvesh Kumar, Head, Department of Zoology, Kumaon University, Nainital. Many technical papers and popular articles written in Hindi were presented in the workshop. The Technical paper adjudged best was presented with a suitable award.

The most memorable event of NRCCWF during the year was organizing a "**Foundation Stone Unveiling Function**" of the NRCCWF Lab-cum-Office complex at Bhimtal. Initiating the construction of institute's own complex after a wait of 14 long years was the most significant event for NRCCWF family. This ceremony was attended by many dignitaries, the chief guest and guests of honour were Dr. Debendra Pradhan, Minister of State for AHD/DARE (ICAR), Government of India; Shri Banshidhar Bhagat, Minister of Agriculture, Government of Uttaranchal; Shri Suresh Arya, Minister of State for Transport, Government of Uttaranchal; Dr. K. Gopakumar, Deputy Director General(Fisheries), ICAR. The function was held on March 12, 2001, this becomes the second most important day for the centre after the foundation day.

The NRCCWF family is representative of the diverse cultures of the country, and each member participated in celebration of various national days, events of national and international importance and all the major festivities with a genuine spirit of communal and cultural harmony.

3. INTRODUCTION

Establishment and Growth

The National Research Centre on Coldwater Fisheries (NRCCWF) was established by Indian Council of Agricultural Research (ICAR) on September 24, 1987. to strengthen fishery research in Coldwater sector, spread over Himalayan region. Presently the Centre is operating from rented buildings at Bhimtal, the approved Headquarters, located in the newly created state of Uttaranchal. The NRCCWF has one field centre in Champawat district of Kumaon, Uttaranchal which is in operation since 1992.

Mandate

The NRCCWF is mandated to:

- Evaluate and assess the coldwater fishery resources in upland regions
- Develop strategies for their conservation and management
- Conduct research leading to development of suitable technology for farming of indigenous and exotic fish species in uplands
- Study the impact of environmental changes on the aquatic bio-diversity in upland openwaters
- Undertake transfer of technology through training, education and extension programmes
- Consultancy services in different areas like coldwater fisheries development, aquatic ecology and environmental impact assessment

Location

The headquarter of Centre is located at Bhimtal situated at an altitude of 1470 masl (district Nainital) in the newly created State of Uttaranchal. It is about 25 km away from famous tourist place of Nainital. The nearest rail head is Kathgodam, which is about 280 km from Delhi. The Centre has an experimental field station at Champawat about 150 km from Bhimtal.

Faculty

The Centre has at present eleven scientists. This includes the Director, five Principal Scientists (two as per sanctioned cadre and three from career advancement),

one Senior Scientist, and four Scientists. Nearly 50% of sanctioned scientists posts are under recruitment process.

Management

A high-powered Research Advisory Committee (RAC) comprising mostly of eminent professionals outside the system guides the Centre in its research policies. The research planning, thrust areas, new initiatives, and evaluation of progress is being monitored and guided by the RAC.

The Centre is supervised by the Management Committee (MC) headed by the Director, as constituted and mandated by the Council. A number of internal committees, such as Staff Research Council, Official Language Committee, Institute joint staff council, are in place for decentralized management. The IJSC promotes healthy interaction and proper work environment. All the internal committees with various wings of the Centre such as administration, finance and store work and function together for the growth of the Institute.

Organogram

The organogram of the Centre is given in Figure 1.

Research Support Facilities

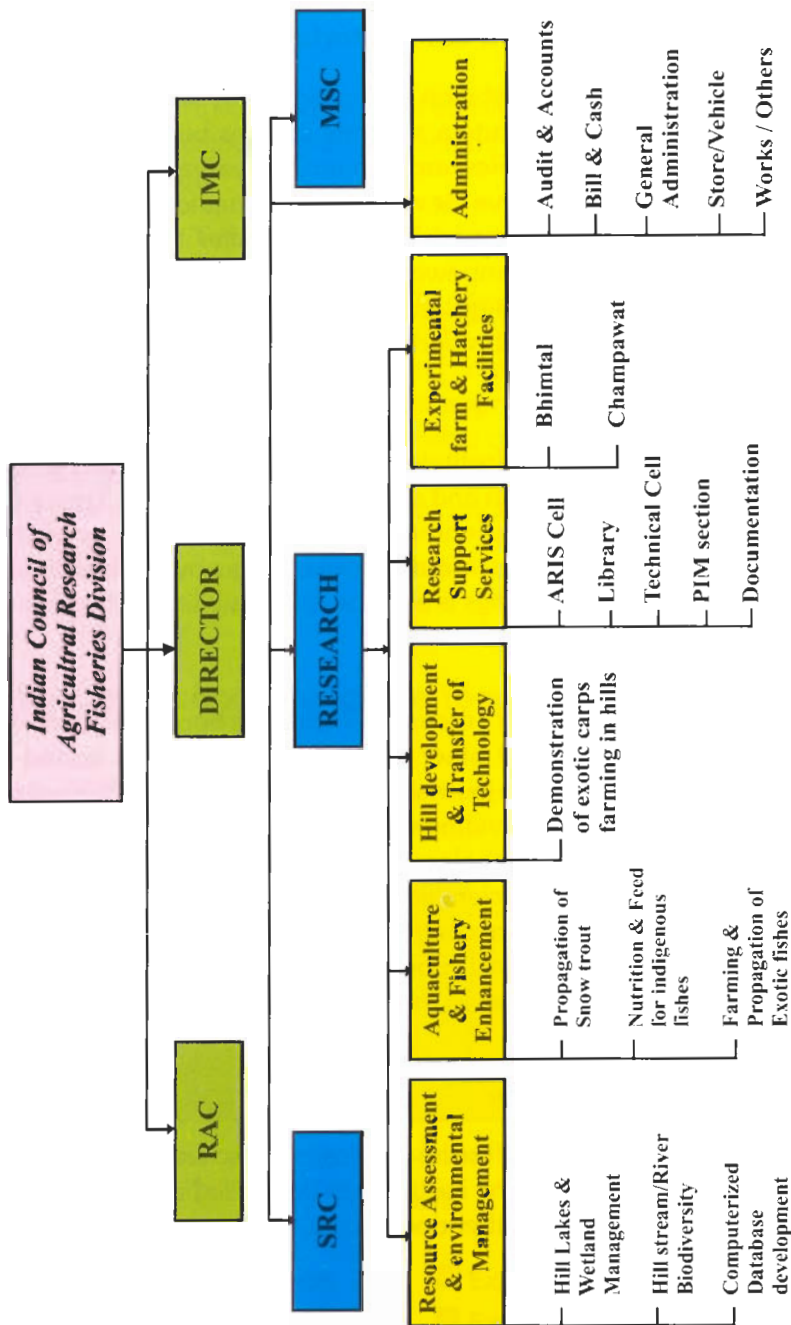
Infrastructure:

Building and Farm

Besides three separate rented buildings at Bhimtal for operating our activities, a pilot scale Mahseer seed production unit is also in operation at Bhimtal. By the side of Centre's flow-through hatchery complex, a farm laboratory has also been recently set up in order to provide back up facilities to seed production activity of the centre. However, this facility is presently located on the piece of land belonging to the State Fisheries Department. The Centre has an experimental fish farm facility at Chirapani in Champawat district, Uttaranchal state with hatchery, cemented raceways for nursery and brood stock rearing. A few circular iron tanks are also available for conducting yard trials on various culture aspects of indigenous and exotic fish species. During the year the Centre has made a significant head way to create own building facilities at Bhimtal, by awarding construction of NRCCWF- Lab-cum-Office Complex Phase-I to CPWD in the month of March 2000.

NATIONAL RESEARCH CENTRE ON COLDWATER FISHERIES

ORGANOGRAM



Support Services:

Project Implementation & Monitoring Cell

To monitor the implementation and progress of research project programmes being conducted by the Institute a separate cell has been created, which annually organizes the meeting of Staff Research Council to evaluate the progress made in each project and accordingly approve the work programmes for the current year. The fresh/new proposals are also approved by the SRC after thorough evaluation of the objectives, practical utility, manpower support and financial involvement. The cell is also responsible for maintaining records of project reports through RPF system, besides compilation of annual report and newsletter of the Institute.

Technical Cell

The Technical Cell of the Institute is entrusted with the responsibilities of dealing with all technical matters within and outside the ICAR system. Training programmes, deputations, participation of scientists in seminars, symposia, workshops, meetings etc. organizing of conferences are also looked after by the section. Besides HRD activities, holding RAC meetings is also the responsibility of this section

Library section

The library during the year procured 47 scientific books, 19 journals both Foreign and Indian, apart from 2220 other documents. The library added in the current holdings 1110 books, 28 Indian journals, 1148 foreign journals, 7615 other publications. The library of NRCCWF is providing services to the scientists and other staff members of the Institute apart from scholars, researchers, students and others from local organizations interested in scientific literature on coldwater fisheries and allied subjects. The library section continues its efforts in collection, processing and disseminating scientific/technical information to the potential users. The library is now providing the CD ROM facilities to the scientists on various fields of aquaculture and applied fisheries.

Documentation section

The section mainly looks after the publication of scientific bulletins, brochures and pamphlets. During the year the section has processed and published one bulletin, fifteen pamphlets and three other documents.

ARIS Cell

This cell is providing the computer related facilities to the scientists and other staff of the Institute. To convert the data generated by the scientists into usable information is also the responsibility of ARIS Cell. The cell is also organizing the basic and advance

computer-training programme for the in-house staff. This cell is also providing the Internet facility.

Extension wing

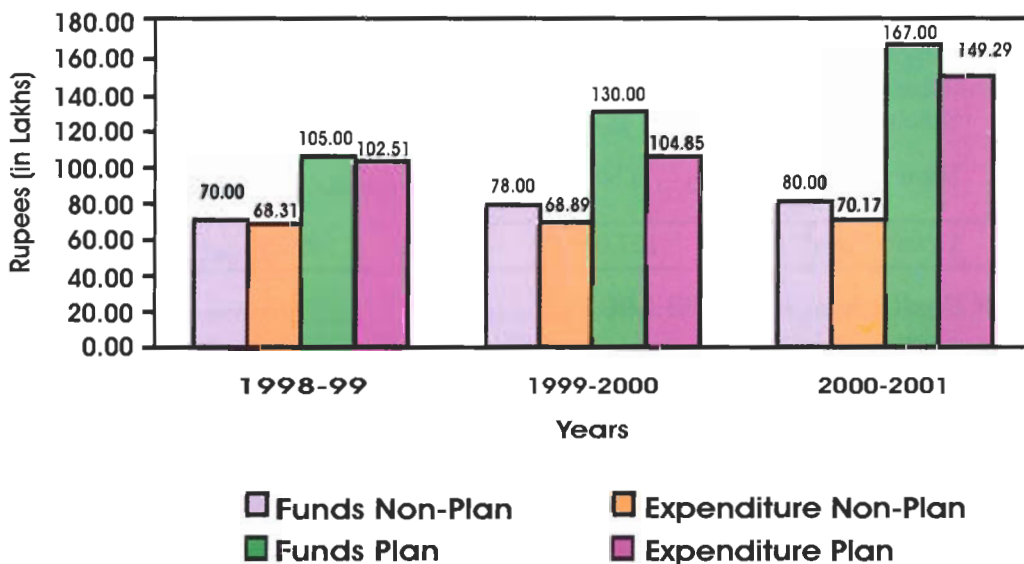
The extension activities of the Institute such as transfer of technology programmes, organizing the exhibitions, training programmes and other activities related to farmers are looked after by this section.

National Agricultural Technology Project

Under Hill and Mountainous Agro-ecosystem, a prestigious National Agricultural Technology Project on Aquaculture Management in Coldwaters is under operation at the Institute as a lead centre covering the Kumaon Himalayan region for assessing the Mahseer fishery potentials. Implementation of the approved technical programme of the project and monitoring the progress made by other cooperating centres in different Himalayan regions is the responsibility of the lead centre. The progress of the work under the project was satisfactory during the year under report.

Financial Statement

Budget/Expenditure for the Year 1998-99 to 2000-01



Abstract**(Rupees in Lakhs)**

| Year | Funds Non-Plan | Expenditure Non-Plan | Funds Plan | Expenditure Plan |
|-----------|----------------|----------------------|------------|------------------|
| 1998-1999 | 70.00 | 68.31 | 105.00 | 102.51 |
| 1999-2000 | 78.00 | 68.89 | 130.00 | 104.85 |
| 2000-2001 | 80.00 | 70.17 | 167.00 | 149.29 |

Budget Statement for the year 2000-2001

| Code | Head of Account | Budget (R.E.) | | Expenditure | |
|--------------------|---|---------------|----------|-------------|----------|
| | | Plan | Non-Plan | Plan | Non-Plan |
| 02 | Pay & Allowance | - | 65.50 | - | 56.72 |
| 06 | Overtime Allowance | - | - | - | - |
| 10 | T. A. | 2.50 | 1.00 | 1.55 | 0.90 |
| 15 | Other Charges including equipments | 30.00 | 9.64 | 27.58 | 8.93 |
| 20 | Works & Land | 133.50 | 3.36 | 119.67 | 3.36 |
| 25 | Other items Fellowship/Scholarship/Awards | 0.50 | 0.50 | 0.49 | 0.26 |
| | Information Technology | 0.50 | - | - | - |
| Grand Total | | 167.00 | 80.00 | 149.29 | 70.17 |

Staff Position as on 31.03.2001

| Sl. No. | Category | Post Sanctioned | In Position |
|---------|----------------|-----------------|-------------|
| 1. | Director (R&M) | 01 | 01 |
| 2. | Scientific | 20 | 11 |
| 3. | Technical | 14 | 11 |
| 4. | Administrative | 14 | 09 |
| 5. | Supporting | 18 | 14 |
| Total: | | 67 | 46 |

4. RESEARCH ACHIEVEMENTS

Research achievements during the year under the major programme areas of NRCCWF are given below.

THE ECOSYSTEM IMPERATIVE

An outstanding feature of the National Research Centre's research on biodiversity and conservation is the focus on ecosystem. While it may be a truism to state that conservation of threatened species, whether mahseer or snow-trout in a lake or riverine stretches, has to be understood within an ecosystem perspective, the implication is that conservation of ecosystem structure and integrity is paramount. The answers to such questions as why Mahseer/Snow-trout are declining, or what are the minimum fishery enhancement plans or what are impacts of anthropogenic factors on lake fishery, are increasingly being sought using quantitative ecosystem analysis. And threatened species are not the only focal points of ecosystem analysis, if fisheries are to provide sustainable yields, the ecosystem – based management is essential.

Structure and Production Functions in Lakes/Wetlands

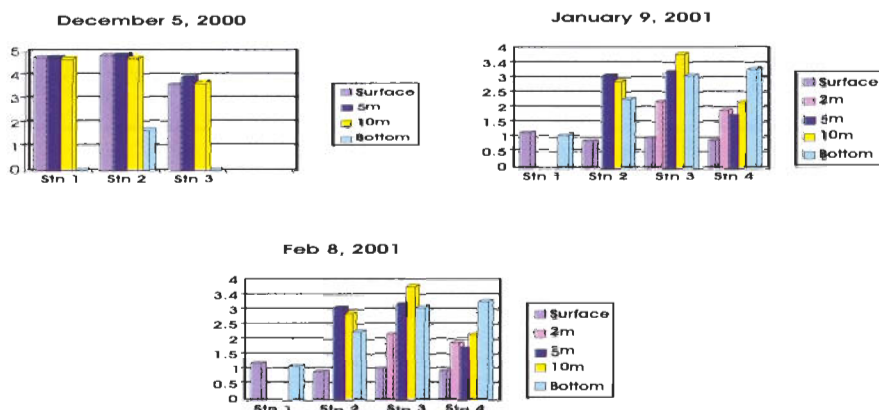
K.K. Vass, H.S. Raina and C.B. Joshi

A detailed investigation was carried out in Kumaon lakes viz; Nainital, Bhimtal, Naukuchiatal, Sattal, Garurtal, Shyاملatal situated in the altitudinal range of 1200-1900 m asl, while in the Garhwal region, a rapid survey was conducted on the lakes in Chamoli district located in the altitudinal range of above 2000 m asl.

Physico-Chemical Characteristics

Kumaon lakes

The morphometric data of Kumaon lakes revealed that Naukuchiatal Lake is the deepest with a depth of 38m. The water of these lakes is generally clear with maximum transparency of 2.5m in Garurtal followed by 2.0m in Bhimtal. However, the secchi transparency in other lakes is very low and ranged between 0.42 – 0.85 m being lowest recorded in Shyاملatal Lake in winter periods. The average water temperature varied between 11.0 – 26.5°C except in Nainital where it drops to 5.0°C in winters. Overall thermal status of these lakes is categorized as warm-monomictic. Majority of lakes stratify during spring and mix freely in winter.



Temperature and oxygen profile in Nainital lake

The water quality in these lakes is generally alkaline in nature except for a brief period during summer months when bottom waters reflects slightly acidic pH values ranging from 6.4-6.8, particularly in Naukuchiatal lake. However, surface pH in all Kumaon lakes remained above 7.0. The dissolved oxygen data indicated that surface water of Kumaon lakes is usually well oxygenated except for Nainital. During the winter of 2000-2001 the depth wise oxygen profile in Nainital, Naukuchiatal and Bhimtal did not follow the expected relationship with temperature profile, this behaviour needs to be further investigated. Temperature and dissolved oxygen profiles recorded in three typical Kumaon lakes during the investigation period is depicted in table below:

Table 1. Comparative temperature & oxygen profile in Lakes.

| Parameters | LAKES | | | | | | | | |
|--------------------------------|----------|---------------|-----|--------------|--------------|------|---------|---------------|------|
| | Nainital | | | Naukuchiatal | | | Bhimtal | | |
| | Nov. | Dec. | Jan | Nov. | Dec. | Jan | Nov. | Dec. | Jan. |
| Water Temperature (°C) | | | | | | | | | |
| Surface | 15.0 | 11.5 | 7.0 | 17.5 | 14.5 | 12.0 | 15.0 | 16.0 | 12.5 |
| 5 m depth | 13.5 | 10.0 | 8.0 | 16.5 | 14.5 | 12.0 | 13.5 | 14.5 | 11.5 |
| 10 m depth | 12.5 | 10.0 | 8.0 | 14.0 | 13.0 | 11.5 | 13.7 | 14.0 | 10.0 |
| Bottom | 10.0 | 09.0 (22m) | 8.0 | 13.5 | 2.5 (38m) | 11.0 | 12.5 | 13.5 (21m) | 9.0 |
| Dissolved Oxygen (mg/l) | | | | | | | | | |
| Surface | 5.2 | 4.7 | 1.0 | 6.5 | 5.5 | 2.5 | 7.4 | 7.9 | 10.2 |
| 5 m depth | 4.5 | 4.8 | 1.9 | 6.0 | 6.2 | 2.2 | 7.6 | 8.0 | 10.0 |
| 10 m depth | 4.0 | 4.7 | 2.2 | 2.4 | 6.2 | 4.1 | 8.4 | 10.2 | 8.2 |
| Bottom | 0.9 | nil | 2.5 | 2.6 | 4.1 | 3.8 | 4.3 | 4.5 | 6.5 |

Primary production

The production profile of these lakes during the study period reflected moderate to high production. But the food chain mechanism and other chemical factors perhaps do not permit this energy to translate into fish biomass, which require further in depth analysis of various interactions. The estimates of primary production are tabulated hereunder:

Table 2. Average primary production profile

| Lake(s) | Primary Production (mg cm ⁻³ hr ⁻¹) | | |
|--------------|--|-----------|-----------|
| | Surface | Centre | Bottom |
| Nainital | 25.0-82.0 | 20.5-67.0 | 10.0-35.0 |
| Naukuchiatal | 29.0-85.0 | 29.0-87.0 | 11.0-51.0 |
| Bhimtal | 40.0-65.0 | 33.0-43.0 | 27.0-37.5 |
| Shyاملatal | 29.37 | | 18.50 |
| Deoria Tal | 15.6-39.8 | | |

Biological status

Plankton population in Kumaon lakes exhibited a tropical seasonality almost similar to sub-temperate situation, yet the species diversity and particularly limnetic species composition reflected the characteristics of sub-tropical/tropical waters. The phytoplankton population was normally dominated by Chlorophyceae followed by Bacillariophyceae, Dinophyceae and Cyanophyceae. In Nainital lake it was dominated by green algae and in Bhimtal lake by diatoms throughout the year. The zooplankton population of these lakes was mainly dominated by rotifera, copepoda and cladocera. The population in Shyاملatal Lake was significantly high as compared to other lakes, recording a density above 250 units/l, dominated by *Asplanchna pridonta*, *Notholca acuminata*, *Keratella cochlearis*, *Daphnia longispina* and species of *Mesocyclops* and *Eucyclops*. Among the zoobenthic organisms, dipteran and ephemeropteran larvae were dominant in all the lakes. However, in Nainital and Naukuchiatal lakes, low oxygen and pollution tolerant organisms like *Tubifex* and *Chironomus* dominated the macrobenthic fauna.

Fish & Fishery

Based on the experimental fishing with standard gill nets and data collected from the anglers revealed that golden mahseer *Tor putitora* was the main dominant species in all the lakes except Nainital lake. However, the introduced Chinese carps and Indian major carps were also recorded in Bhimtal, Sattal, Nainital and Naukuchiatal lakes and contributed to the overall fish production in these systems. There is no

commercial or organized fishing in these lakes except angling carried out by the local residents around the lakes. The Bhimtal and Sattal contribute maximum towards fish production in this region. On an average these two lakes produce fish biomass in the range of 5.0-8.0 kg/ha/yr.

In order to estimate natural growth of Mahseer in lakes during October 2000, a riverine stock of golden mahseer, having a size of 45-130 mm in length and 4-7 g were stocked in Garurtal lake after tagging by fin clipping. Their growth pattern will be observed in subsequent years.



A high mountain lake in Garhwal Himalaya - the Hemkund Sahib

Garhwal Lakes

A high altitude lake Deoria Tal located at an elevation of 2250 m.asl in Garhwal region of Uttaranchal was surveyed during winter. The lake appears to be typical oligotrophic with minimum water temperature of 5.5 °C, pH 7.6, and secchi transparency as high as 4.0 m .The dissolved oxygen at surface ranged between 6.82-7.4 mg/l. Total alkalinity ranged between 10-20 mg/l; specific conductivity 24.0-25.0 mmhos (at 25 °C), while the gross primary production at surface was estimated at 15.62 mg C m³ h⁻¹. The lake has moderate phytoplankton and zooplankton population. There is no record of natural fish population in this system except that lake has recently been stocked with the seed of *Tor putitora* and *Cyprinus carpio*, both are reported to be performing well.

Riverine Ecology and Bio-diversity

H.S. Raina, Shyam Sunder and A.K. Singh

A survey was conducted for resource assessment and aquatic biodiversity evaluation of various river systems and their main tributaries in Garhwal Himalayas. In all 14 sampling sites located at different tributaries of Ganga river system were studied. The major tributaries investigated were Bhagirathi (Bhilangna); Alakananda (Pinder, Mandakini, Nandakini); Yamuna; Song and significant observations with regard to their bio-diversity and fish production at various stretches were recorded.

General Ecology

These rivers/streams located in Garhwal Himalayas are typical mountain river systems having glacial or spring origin. The substrata of these rivers at upper reaches contain either boulders, stones mixed with pebbles, gravel and sand, while at lower reaches it is mixed with mud and sand. The flow of these rivers range between 0.9-5.6 m/sec with maximum flow at higher reaches. The catchments of these tributaries are predominantly forest, grassland and agricultural land with low population density, thus still free from major nutrient influx or industrial waste. The thermal regime remains between 9.0-21.5 °C. Normally low temperature was recorded in upper reaches of the main rivers that too only in winters. Water quality of these systems usually remain alkaline (pH above 7.5) and highly oxygenated (dissolved oxygen above 8.5 mg/l) with total Alkalinity ranging between 42 mg/l (Mandakini river) to 112 mg/l (Bhagirathi river).

Biological Profile

In these streams, epiphytes and phytoplankton represented a large population of primary producers, which serve as food for zoo benthos and herbivore fishes. The phytoplankton population was mainly dominated by Bacillariophyceae (above 80%), followed by Chlorophyceae and Desmidiaceae with their density ranging between 150-550 units/l. The zooplankton population was fairly low in these systems ranging between 15-35 units/l. The benthic population in Garhwal rivers both qualitatively and quantitatively reflects high productive potential in terms of its diversity and density. The benthic density varied between 25-510 ind./sq.m (0.500- 25.500 g/sq.m as wet biomass). The benthic population was dominated by Ephmeroptera (2.8-65.5 %) followed by Trichoptera (4.5- 45.0 %), Coleoptera (1.5-17.5%) and Odonata (nil-5.0%). The dominant forms recorded were *Heptagenia*, *Baetis*, *Rithrogena*, *Epeorus*, *Iron* (Ephmeroptera); *Perla* and *Nemoura* (Plecoptera); *Psephenus*, *Elmis* and *Gyrinus* (Coleoptera); *Leptocella*, *Philopotamus*, *Rhycophila* (Trichoptera) and *Chironomus*, *Simulium*, *Atherix* (Diptera) and *Gomphus*, *Enallagma* (Odonata).



Fish sampling using cast net in a hill stream in Garhwal

Fish Diversity

Based on the experimental fishing using cast nets in different rivers/streams and field observations in the local market revealed that the fish catch per unit effort ranged between 125-425g. The total fish catches were dominated by *Schizothorax richardsonii* to the tune of 60.0-95% in majority of rivers. The other important species contributing to catches was *Tor putitora* with 2.0-10.0% in total catch. Apart from these species, brown trout (*Salmo trutta fario*) was also recorded in lesser magnitude in the river Bhagirathi, Birehi and Pinder. The other fish bio-diversity elements were *Labeo dero*, *Garra gotyla*, *Barilius bola*, *B. bendelisis*, *Glyptothorax sp.* and *Neomachelius sp.* The upper reaches of these rivers supported fewer species due to high altitude, steep stream gradient, cold temperature and marked water flow variations. A total of 38 fish species have been recorded from the Garhwal region. Majority of the fishes are caught individually by local fishermen in the rivers and streams and do not form the fisheries of commercial catch. The average catch per person with their conventional gears range from 500 –1500g per day. The local market and village shops act their sale centers, which normally fetches them a price of Rs.60-80 per kg.

Table 3. Physico-chemical characteristics of various tributaries of Ganga River System (Garhwal Himalayas in Uttaranchal).

| Characteristics | Alaknanda | Bhilangana | Bhagirathi | Birehi | Garurganga | Mandakini | Nandakini | Pinder |
|-------------------------------|-----------|------------|------------|-----------|------------|-----------|-----------|-----------|
| Water temp. (°C) | 12.0-18.5 | 10.5-19.0 | 12.0-17.5 | 9-15.0 | 9.6-12.7 | 8.5-16.7 | 10.0-15.0 | 9-18 |
| Water flow (m/sec.) | 1.0-1.35 | 0.85-1.20 | 0.90-1.82 | 1.0-1.6 | 0.90-1.48 | 0.60-1.34 | 0.50-1.46 | 0.7-1.4 |
| pH | 7.2-7.8 | 7.4-7.8 | 7.4-8.0 | 7.4-7.8 | 7.4-7.9 | 7.4-7.8 | 7.2-7.8 | 7.4-8.0 |
| Dissolved Oxygen (mg/l) | 10.0-11.6 | 10.0-11.0 | 9.4-10.6 | 8.5-10.5 | 9.6-10.7 | 8.6-10.7 | 10.0-11.0 | 8.5-10.2 |
| Free CO ₂ (mg/l) | - | - | 0.1-1.2 | 0-0.6 | - | 0.0-0.8 | - | 0.0-1.0 |
| Alkalinity (mg/l) | 45.0-56 | 74-86 | 40-110 | 32-56 | 34-36 | 30-42 | 86-90 | 66-86 |
| Chlorides (mg/l) | 10.0-22.4 | 16.0- | 10.4-12.5 | 11.0-20.0 | 8.0-12.0 | 15.0-22.0 | 9.6-11.2 | 20.0-27.0 |
| Hardness (mg/l) | 36.0 | 22.0 | 46.0 | 45-52 | 43-57 | 45-48 | 60-65 | 35-44 |
| Calcium (mg/l) | 6.2-8.0 | 8.0-9.5 | 10.0-12.0 | 8.0-10.0 | 22.5-30.0 | 8.0-9.5 | 26.0-22.0 | 9.0-11.6 |
| Magnesium (mg/l) | 3.0-3.8 | 0.5-1.0 | 1.0-5.0 | 1.5-6.5 | 1.0-4.0 | 2.0-4.0 | 2.5-3.0 | 4.0-5.8 |
| D.O.M (mg/l) | 1.0-1.8 | 0.5-1.0 | 0.5-1.2 | 1.2-2.0 | 0.5-1.0 | 1.0-2.5 | 10-14 | 2.0-3.2 |
| Conductivity (µmhos at 25 °C) | 150-167 | 75-100 | 145-172 | 150-294 | 250-370 | 98-125 | 75-110 | 75-86 |
| TDS (mg/l) | 75-82 | 36-50 | 73-86 | 75-145 | 125-185 | 49-62 | 37-55 | 37-43 |

Table 4. Major fish species in different rivers of Garhwal region

| Stream/river | Pre-dominant fish species | |
|--------------|---|---|
| | Main | Others |
| Alaknanda | <i>Schizothorax richardsonii</i> (90.0-95.0%) <i>Tor putitora</i> (2.5-7.5%) | <i>Barilius bendelisis</i> , <i>Garra gotyla</i> (below 2.0%) |
| Bhagirathi | <i>Schizothorax richardsonii</i> (95.0-97.0%) <i>Tor putitora</i> (1.0-2.5%) | <i>Labeo dero</i> , <i>L. dyocheilus</i> , <i>Garra gotyla</i> , <i>Glyptothorax</i> <i>brevipinnis</i> |
| Birehi | <i>Schizothorax richardsonii</i> (above 80.0%) <i>Salmo trutta fario</i> (below 1.0%) | <i>Neomacheilus corica</i> , <i>N. montanus</i> (1.0-2.0%), <i>Barilius</i> <i>bola</i> |
| Mandakini | <i>Schizothorax richardsonii</i> (90.0-95.0%) <i>Tor putitora</i> (2.5-5.0%) <i>Salmo trutta fario</i> (below 1.0%) | <i>Neomacheilus multifasciatus</i> |
| Nandakini | <i>Schizothorax richardsonii</i> (80.0-85.0%) <i>Tor putitora</i> (3.0-5.0%) <i>Salmo trutta fario</i> (below 1.0%) | <i>Neomacheilus montanus</i> |
| Pinder | <i>Schizothorax richardsonii</i> (60.0-65.0%) <i>Tor putitora</i> (1.0-2.0%) | <i>Glyptothorax brevipinnis</i> (1.0-2.0%) <i>Barilius bendelisis</i> , <i>Barilius bola</i> , <i>Garra gotyla</i> |
| Dholiganga | <i>Schizothorax richardsonii</i> (above 60.0%) | <i>Neomacheilus montanus</i> , <i>Barilius</i> <i>bola</i> , <i>Garra gotyla</i> |

THE FARMING SYSTEM APPROACH

The most significant feature of inland fisheries sector in the country during last five decades has been increased production to 2.8 million tones of which nearly 70% is contributed by the farming systems. This major achievement in warm water sector was result of sustained research on farming system involving controlled breeding, feed & management, coupled with faster growing species both indigenous and exotic. In comparison, the coldwater sector started late in farming activity and was constraint by small resource base, limited choice of species, lack of technology and support. Further, due to agro-climate conditions prevailing in Himalayan region the biological productivity is low in these systems. However, the NRCCWF having realized the sensitivity of Himalayan aquatic resources, potential for sustainable use of fish as a candidate for

economic diversification for local community initiated technology development for hill aquaculture involving important indigenous and exotic species suitable to hill environment. This aquaculture would also help to restore the declining population of important indigenous fish species.

Feed Development for Indigenous Upland Fishes

Madan Mohan

During the period under report, the feeding experiments were conducted on golden mahseer, *Tor putitora* and snow trout, *Schizothorax richardsonii* at the experimental hatchery, Bhimtal. Test fishes i.e. juveniles of *Tor putitora* and *Schizothorax richardsonii* collected from the Kosi river, were acclimatized under hatchery conditions before the onset of various experiments. Except for amino acid analysis of the two test diets, which was carried out at Defence Agricultural Research Laboratory (DRDO), Govt. of India, Pithoragarh, Uttaranchal, all other analysis was carried out at NRCCWF.

Comparison of two test diets (NRCCWF I & II)

Preparation of experimental diets:

In order to improve upon our already tried NRCCWF-I test diets, 50% casein was replaced by good quality fishmeal and the feed was named as NRCCWF-II. The proximate chemical composition of the two experimental diets revealed decrease of crude protein by 6% in NRCCWF - II as compared to NRCCWF - I diet, though casein in the diet was replaced upto 50%.

Table 5. Proximate composition of test diets

| Composition (%) | NRCCWF I | NRCCWF II |
|-----------------|----------|-----------|
| Crude protein | 51.50 | 45.35 |
| Crude fat | 14.80 | 16.00 |
| Crude fibre | 4.20 | 6.50 |
| NFE | 21.10 | 22.65 |
| Total ash | 8.00 | 9.50 |

Trials with Golden Mahseer:

The test fish, *Tor putitora* were stocked at three different stocking biomass viz; 0.15g/l, 0.20g/l and 0.25g/l and stocks were fed with two experimental feeds i.e. NRC-CWF-I and NRC-CWF-II at the feeding rate of 5% of body weight per day for 105 days. The initial length of the test fish ranged from 51mm to 69 mm and initial weight ranged between 0.88-2.08 g in different biomass. Among the two test diets, fishes fed with NRC-CWF-II diet recorded higher net weight gain, percentage weight gain and specific growth rate after three and half months of rearing period. However, better survival of stocks was recorded with trials on NRCCWF I diet.

Among the three stocking biomasses, net weight gain, percentage weight gain and specific growth rate was higher in NRCCWF-II diet at lower biomass level but better survival was recorded in all biomass levels. But survival was better with NRCCWF-I diet at all biomass levels.

Table 6. Growth performance of Mahseer fed with NRCCWF- I and NRCCWF - II diets at Bhimtal

| Parameters | NRCCWF I | NRCCWF II |
|------------------------------|-----------------|------------------|
| Duration of study (days) | 105 | 105 |
| Initial length (mm) | 57.33 | 58.00 |
| Final length (mm) | 68.40 | 71.50 |
| Initial weight (g) | 1.30 | 1.33 |
| Final weight (g) | 2.46 | 2.78 |
| Net weight gain (g) | 1.16 | 1.45 |
| Specific growth rate (% day) | 0.26 | 0.30 |
| Survival (%) | 82.61 | 75.55 |

The proximate chemical composition of mahseer at the onset and termination of feeding and rearing experiments revealed that moisture in the fish came down from 77.71% in initial stages to 71.44% with NRCCWF-I diet and 72.87% with NRCCWF-II diet. On the other hand, the amount of crude protein increased from initial level of 13.87% (wet basis) to 18.63% with NRCCWF-I diet and 17.42% in NRCCWF-II diet fed fishes. The increase in fat content and glycogen was substantial with both the diets but NRCCWF-II performed marginally better. The total ash increased considerably from 3.76% initially to 4.59% with NRCCWF-I diet and remained almost same with NRCCWF-II diet at 3.88%.

Table 7. Water quality for (Mahseer) feeding trials.

| Parameter | Value |
|---|-----------|
| Temperature (°C) | 16-24 |
| pH | 7.2-7.8 |
| Dissolve oxygen (mg ^l ⁻¹) | 7.0-8.4 |
| Free carbondioxide (mg ^l ⁻¹) | 2.6-3.0 |
| Total alkalinity (mg ^l ⁻¹) | 80.2-91.0 |
| Flow rate (lm ⁻¹) | 0.46-1.20 |

Trials with Snow Trout

The test fish *Schizothorax richardsonii* were stocked at three different stocking densities viz; 50 fish/100 l; 100 fish/100 l and 150 fish/100 l and were fed with two test diets at the feeding rate of 5% of body weight per day for 90 days. Among the two test diets, fishes fed with NRCCWF-II diet showed higher weight gain, percentage weight gain and specific growth rate but survival of fish was better with NRCCWF-I diet.

At all the three stocking densities, net weight gain, percentage weight gain and specific growth rate was higher with NRCCWF-II diet. Percentage weight gain, specific growth rate was highest at lowest density. But again survival of fish was better with NRCCWF-I diet.

Table 8. Growth performance of *S. richardsonii* fed with NRCCWF - I and NRCCWF - II diets at Bhimtal

| Parameters | NRCCWF I | NRCCWF II |
|------------------------------|----------|-----------|
| Duration of study (days) | 90 | 90 |
| Initial length (mm) | 36.00 | 38.00 |
| Final length (mm) | 42.25 | 43.25 |
| Initial weight (g) | 0.21 | 0.22 |
| Final weight (g) | 0.58 | 0.64 |
| Net weight gain (g) | 0.37 | 0.44 |
| Specific growth rate (% day) | 0.49 | 0.52 |
| Survival (%) | 78.00 | 71.00 |

The proximate chemical composition of snow trout at the onset and termination of feeding and rearing experiments revealed that moisture in the fish came down from 83.10% in initial stages to 80.00% with NRCCWF-I diet and 79.60% with NRCCWF-II diet. On the other hand, the amount of crude protein increased from initial level of 68.80% (dry basis) to 71.60% with NRCCWF-I diet and 70.50% in NRCCWF-II diet fed fishes. But the fat content in three samples remained almost same.

Table 9. Water Quality for (Snow trout) feeding trials

| Parameter | Value |
|---|-----------|
| Temperature(°C) | 7.0-15.5 |
| pH | 7.1-7.4 |
| Dissolved oxygen (mg ^l ⁻¹) | 8.0-9.6 |
| Free carbon dioxide(mg ^l ⁻¹) | 2.0-2.80 |
| Total alkalinity(mg ^l ⁻¹) | 112-117 |
| Flow rate (lm ⁻¹) | 0.62-1.25 |

Amino acid composition of diets:

The qualitative amino acid analysis of diets was carried out by Biochemistry Lab of DARL (DRDO) using Thin Layer Chromatography method and comparing with standard amino acids. These preliminary qualitative studies revealed that in NRCCWF I diet, 16 amino acids and two unknown derivatives were present. Out of ten essential amino acids, only 7 are present in this diet whereas arginine, histidine and tryptophan appear to be absent. In the modified diet NRCCWF II in which 50% casein was replaced by fishmeal, out of 20 amino acids, 17 have been recorded. Out of ten essential amino acids, 8 are present whereas histidine and threonine appears to be absent.

Induced Spawning & Ovarian Development in Exotic Carps

B.C. Tyagi and K.D. Joshi

The newly developed “mixed carp farming technology” making use of three exotic Chinese carps namely silver, common and grass carp with the provisions of feed and fertilizers has proved its efficiency in coldwaters also. Common carp has not registered any operational problems in production of its seed. But the two other carps i.e. silver and grass carps have not matured even at the age of 5 years at Chirapani

farm. Low temperature of water (6-26°C) for most of the time and long spell of cold season (November to March when temperature remains mostly between 4-16°C) are the possible reasons for it. As a result the non-availability of their seed synchronizing with growing period in hills, becomes a big constraint in the development of aquaculture. To tackle this problem through manipulating the environment, feed and use of sex hormones to induce ovarian development etc., a research programme was initiated in March 2000.

The fish stock of three exotic carps was segregated age-wise and reared in cemented raceways of 150 m² with a depth of 0.8-0.9 m. the fishes were fed daily @ 1% of their body weight on supplementary feed consisting of roasted soya dust 30% + rice polish 30% +wheatbran 10% and oil cake 20% and fish meal 10%. Feed was supplemented with 'vitamin premix'. Grass carp was fed on terrestrial weeds mainly consisting of dub grass. Except lime treatment to ponds (@ 150 kg/ha/yr in 10 days frequency, no fertilizers were used. The rearing details and water quality are given in Table 10 and 11.

Table 10. Rearing of brood stock

| Pond No. | Species | Number | Age (Yr.) | Av. wt. (kg) | Range of wt.(kg) | Total biomass/ ha |
|----------|-------------|--------|-----------|--------------|------------------|-------------------|
| RP-4 | Grass carp | 22 | 5+ | 2.1 | 1.5-3.0 | 4586 |
| | Silver carp | 09 | 5+ | 1.4 | 1.0-1.5 | |
| | Common carp | 10 | 3+ | 1.0 | 0.6-1.2 | |
| RP-2 | Grass carp | 72 | 4+ | 0.7 | 0.3-1.5 | 6293 |
| | Silver carp | 60 | 3+ | 0.6 | 0.4-0.7 | |
| | Common carp | 20 | 2+ | 0.4 | 0.3-0.8 | |
| RP-4 | Grass carp | 110 | 3+ | 0.35 | 0.2-0.5 | 6233 |
| | Silver carp | 200 | 3+ | 0.20 | 0.10-0.3 | |
| | Common carp | 100 | 4+ | 0.20 | 0.10-0.4 | |

Table 11. Water quality (pooled value) during the year

| Parameters | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------|-------------|---------------|---------------|
| Water temp. (°C) | 14.5- 18.0 | 18.6- 22.8 | 26.5- 27.5 | 26.7- 27.4 | 26.0- 22.7 | 20.2- 21.2 | 12.0- 18.0 | 12.0- 14.0 | 5.6- 8.6 | 5.3- 7.4 | 10.5- 12.2 | 12.5- 15.8 |
| Sun shine (hrs/day) | 10 | 11 | 11.2 | 9.8 | 10 | 9.6 | 8.5 | 9.0 | 10.5 | 9.1 | 10.4 | 10.2 |
| Dissolved oxygen(mg/l) | 10.8 | 10.4 | 9.8 | 8.4 | 9.2 | 8.6 | 10.6 | 8.0 | 10.6 | 10.4 | 8.5 | 8.5 |
| pH | 8.3 | 8.4 | 8.5 | 8.4 | 8.6 | 8.8 | 8.8 | 8.4 | 7.8 | 8.0 | 8.4 | 8.6 |
| Alkalinity (mg/l) | 34 | 42 | 56 | 38 | 22 | 49 | 40 | 28 | 22 | 27 | 30 | 32 |

The increase in weight of fish at different water temperature was recorded at 18.6-27.4°C during summer months (May to September), nil growth at 12.0-18.0°C during October to November and March to April. In winter months between December to February (5.3-15.8°C) loss of weight was noticed. The water temperature and high stocking density @4586-6293 kg/ha seems to be one of the responsible factors for delayed maturity in exotic carps. The proposed programme to reduce the density to 1.0-1.5 t/ha and use of sex hormones (17 α methyltesteron (T) + Damperidon + LHRH-A, had some execution constraints during the period under report . Selected grass carps and silver carps of 5+ year age were injected with PG extract in combination with Ovaprime @ 2 mg/kg at 20 days interval from April onwards to achieve maturity.

THE TECHNOLOGY DISSEMINATION

The research institutes apart conducting research and generating technology in their labs and farms have the social obligation to see that benefits of their work are passed on to the farming community. In comparison to warm water sector the concept of fish farming in hills is by and large non-existent. The NRCCWF has strived hard to put across the message regarding potential of aquaculture in generating additional income to local farmers. The farmers get convinced of any technology through demonstration. The institute has been vigorously involving itself in demonstration of farming system technology developed so far, to the local farmers and other clients. This initiative has paid dividends, now more and more farmers are evincing keen interest in this activity.



Demonstration netting in a TOT pond at Ghorakhal(Nainital)

Demonstration of Exotic Carp Farming

B.C. Tyagi, K.D. Joshi & Smt. S. Kapila (upto 23.9.2000)

In all, 24 demonstrations on mixed carp farming under TOT programme could be carried out during the period under report in Pati and Bhimtal block area of Kumaon hills (800-1640 m asl). As a result of demonstrations, 4 new clients joined the programme but similar number of clients in Bhimtal due to financial reasons did not involve themselves seriously in this activity. The fish production ranged between 1330-5987 kg/ha/yr (Av. 3590 kg/ha/yr). The fish production was higher in the ponds fertilized regularly and fishes were fed on feed of good quality at higher rate. The use of local feed and kitchen wastes as fish feed also achieved fish production of 3071 kg/ha/yr. The conventional feed like RP+OC @ 1% and 2% registered a fish production of 2371 and 4235 kg/ha/yr, respectively. The summarized results are given in Table 12.

Table 12. Fish production in ponds under TOT programme

| Particulars | Bhimtal block | Pati block |
|---|---------------|------------|
| 1. No. of ponds | 10 | 14 |
| 2. Altitude (m asl) | 800-1400 | 1400-1640 |
| 3. Range of fish production(kg/ha/yr) | 1330-4242 | 1335-5987 |
| 4. Average production (kg/ha/yr) | 3206 | 3865 |
| 5. Production in completely harvested ponds(kg/ha/yr) (9 No.) | 3435 | 4023 |
| 6. Estimated production (kg/ha/yr) (13 No.) | 2861 | 3822 |

Further, analysis of the data generated through the demonstration programme revealed that higher density (4-5 fish/m²) resulted in higher biomass but fish do not attain marketable size (400 g) in one season (March to October) while stocking @ 2-3 fish/m² with 3 exotic carps and rearing them between March/April to October with the provision of supplementary feed @ 2-3% plus aquatic weeds can easily give fish

production > 2000 kg/ha/yr. Based on the performance of each species it is advisable to stock grass carp at higher percentage and exclude the snow-trout but include rohu and Mahseer at lower altitude (Table 13)

Table 13. Performance of various species in mixed farming at different stocking densities

| Species | Density (No./m ²) | Growth/ Month (g) | Contribution in Production (%) | Rank |
|-------------|-------------------------------|-------------------|--------------------------------|------|
| Common carp | 1.0-2.0 | 7.4-15.3 | 23.3-46.3 | 2 |
| Silver carp | 0.6-2.0 | 4.2-23.7 | 11.1-32.4 | 3 |
| Grass carp | 0.4-2.9 | 11.1-26.1 | 17.6-66.0 | 1 |
| Mahseer | 0.1-1.2 | 5.1-6.6 | 4.0-18.0 | 5 |
| Rohu | 0.0-0.3 | 18.0 | 8.9 | 4 |
| Snow-trout | 0.1 | 3.3 | 0.10 | 6 |

The trials on rearing of Indian major carp, rohu (*Labeo rohita*) and golden mahseer (*Tor putitora*) indicated some hope to become candidate species in mixed farming in the upland ponds and need further trials, the production of snow-trout (*Schizothorax richardsonii*), however, was very insignificant in such type of culture system.

Fish farmers of the area where demonstrations are in progress are keen to adopt mixed carp farming but lack required financial support. The attitude of farmers to seek more and more financial help from implementing/other agencies as subsidy for developing fish culture is becoming counter productive to growth of aquaculture activity. Lack of knowledge among the farmers to make use of fish culture as an integral part of agriculture and water management is another constraint, which NRCCWF is addressing through training programmes. The greater involvement of concerned state departments and NGOs seems important for aquaculture promotion in hills.

THE INFORMATION TECHNOLOGY

The computer application has revolutionized modern science and technology through the use of information technology. Accordingly computerization at NRCCWF was taken up on priority. It involved providing minimum required hardware & software, making the staff computer literate and also formulating the coldwater fisheries data on the computerized database format. The Institute is providing computers to scientists/officers for their works. The institute has also ARIS Cell well equipped with Pentium computer and printing facilities.

Manpower and Database development through Computer Application

A. K. Nayak and K.K. Vass

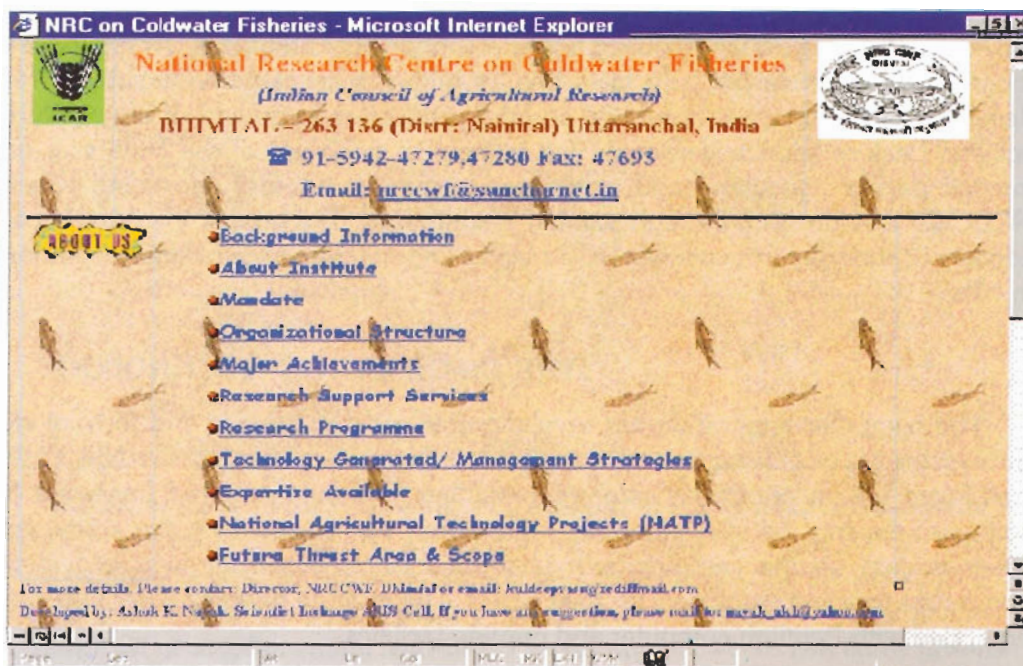
Computer training Facility:

During the year, in-house training programme on “**Computer Fundamental with Microsoft Word**” was organized by ARIS Cell for the member of staffs, which was quite useful. The in-house training was imparted to 7 Scientific, 8 Technical and 9 Administrative staff of this Institute at Bhimtal and its research Unit at Champawat. Now all the scientist and other staff of the Institute are using the computer for their official work.

WebPage Design:

The ARIS Cell also developed material for NRCCWF Website. The site contains information about coldwater resources, a detailed history of the institute with photographs of the new complex, experimental fish farm/hatchery. The mandate of the institute with organizational structure and manpower is also reflected. It also contains major achievements of the Centre on exotic trout, carps, indigenous snow-trout, golden mahseer, ecosystem studies, and a brief about technology generated/management strategies developed.

The site also contains information about available research supports services. The information about ongoing research programmes, the expertise available with the centre on major thrust areas, NATP programme is also reflected in the site.



(Home page of NRCCWF)

The NRCCWF website finds place in the Indian Council of Agricultural Research (ICAR) website: <http://www.nic.in/icar>.

This website was formally opened by Dr. K. Gopakumar, Deputy Director General (Fy), ICAR on March 12, 2001 on the occasion of Foundation Stone Laying Ceremony of this Institute. The website was visited by Dr. Debendra Pradhan, Hon'ble Minister of State for Agriculture, DARE (ICAR)/AHD, New Delhi who was the chief guest at the function.

The website is being upgraded by including additional information generated on coldwater fish and fisheries. It will be helpful to users in having first hand knowledge about the coldwater fishery resources.

5. TECHNOLOGY ASSESSED & TRANSFERRED

FARM ACTIVITIES

Seed production of golden Mahseer

In order to refine breeding and seed production of *Tor putitora* this programme was continued as hatchery activity at Bhimtal during 2000-2001. In all 21 brooders of golden mahseer in the size range of 390-540 mm in total length and 600-1600 g in weight yielded 95640 ripe eggs and were fertilized with the milt stripped from the oozing male fishes ranging 330-425 mm in total length and 400-600 g in weight. The rates of fertilization varied between 78.2-93.5% with total number of fertilized eggs as 80877. The hatching rate was 78.2-92.4% and cumulative survival from the fertilized eggs to swim-up fry recorded was 72.3-89.4%. A total of 65080 swim-up fry were produced in the hatchery during the breeding season, which were further reared and stocked in different water bodies. Under the rehabilitation programme 50,000 fry were stocked in Sattal lake and 5000 fry in Garurtal lake. The remaining fry were released in the earthen ponds at hatchery site for experimental purposes.

Rainbow trout farming

In order to propagate exotic trout in comparatively warmer environment conditions prevailing in mid-Himalayan region, the methodologies suitable to the local conditions are being developed at Institute's Chirapani Fish Farm in Champawat district of Kumaon. The initial stock of eyed-eggs of rainbow trout (*Oncorhynchus mykiss*) was transported from a hatchery in Himachal Pradesh. With the application of suitable methodologies on rearing the eyed-eggs, fry, growing of yearlings, adult and proper feeding on the artificial diet evolved by the Institute, the exotic trout is now within the reach of the common people at Champawat. For the first time the trout was sold by the Institute from the month of February 2001 onwards to public at Champawat. The Institute has successfully developed the technique for raising trout to table size. It will be helpful in promoting its culture in other remote areas and generate additional income to the local people in Kumaon region of Uttaranchal.

EVENTS

Millennium International Angling Festival

The Centre participated in an International Mahseer Angling Festival organized by Kumaon Mandal Vikas Nigam Limited, Nainital at Pancheshwar on the river Kali during April 2000. Apart from reputed Indian anglers, many international anglers also

participated. Dr. Shyam Sunder, Dr.B.C. Tyagi and Dr.K.D. Joshi, Scientists from this Centre interacted with the participating anglers and local dignitaries present on the occasion.



Angling for Mahseer in river Kali at Pancheshwar(Champawat)



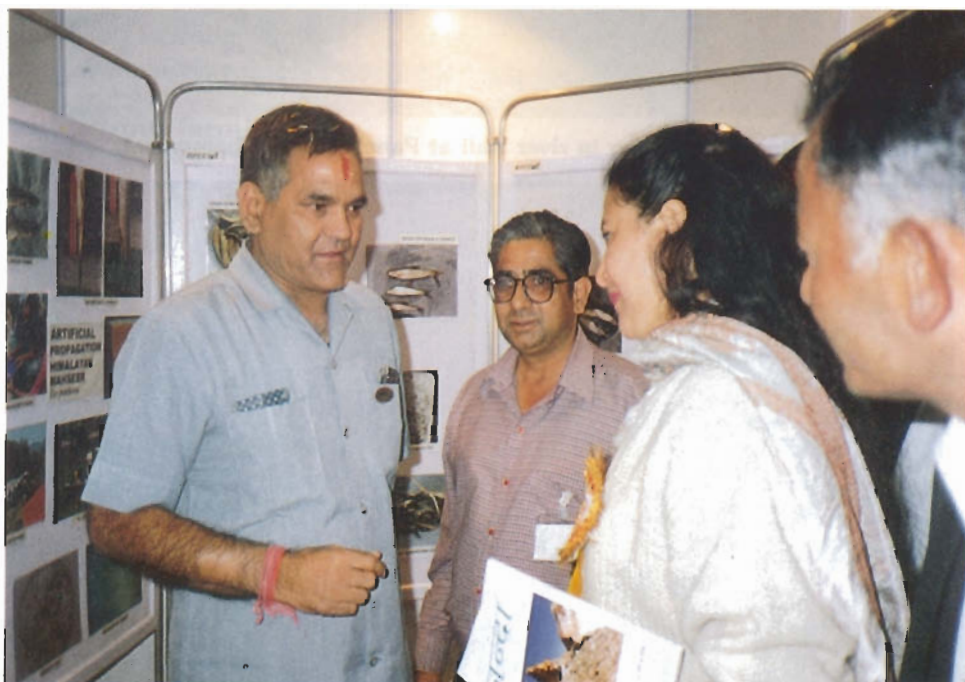
Participants of International Mahseer Angling Competition

The Centre organized an exhibition at the site (Pancheshwar) depicting the efforts of NRCCWF in artificial propagation and conservation of golden mahseer. The pamphlets/brochures and other published material on different aspects of coldwater fisheries developed by the Centre was distributed to the participants.

The international group apart from angling in and around Pancheshwar, went down the river by rafting in order to hook Mahseer and 60 mahseers were caught in the size range of 2-20 kg. About 40 anglers fished in a stretch of 70 km between Pancheshwar and Boom. The observation of various anglers revealed that the water conditions of river Kali are very good for development of mahseer as sport activity.

Himalayan Adventure & Tourism Mart 2000

The Centre organized an exhibition depicting various research and development activities of the Institute in Himalayan Adventure and Tourism Mart 2000 organized by Kumaon Mandal Vikas Nigam Limited under the aegis of Ministry of Tourism, Government of India; U.P. Tourism; Garhwal Mandal Vikas Nigam Limited and Uttaranchal Tourism from October 10-12 2000 at Nainital.



Hon'ble Minister and Commissioner Kumaon at NRCCWF's exhibition stall

Fisheries Science Congress

The Centre participated in the First Indian Fisheries Science Congress and installed an exhibition which was held at Chandigarh from September 21 to 23, 2000.

In the exhibits, the activities of the Institute were depicted through the charts and posters. The Institute's publications were also displayed at the stall.



The Director delivering a special lecture



DDG (Fisheries) visiting NRCCWF's exhibition stall

Trout Sale

For the first time, the sale of exotic rainbow trout (*Oncorhynchus mykiss*) grown in NRCCWF's experimental fish farm at Chirapani was formally opened for local public by Shri S.K. Maheshwari, IAS, District Magistrate, Champawat. Apart from other dignitaries of Champawat, NRCCWF scientists Dr.H.S. Raina, Dr.C.B. Joshi and Dr.K.D. Joshi were present on the occasion. The chief guest appreciated the efforts made by NRCCWF for developing the trout fisheries in the district and expressed hope that local people will take up its farming.



**Inauguration of trout sale by District Magistrate, Champawat
Shri S .K. Maheshwari at Chirapani farm**

Media interactions

Dr. Shyam Sunder, Principal Scientist highlighted the management and rehabilitation initiatives taken by NRCCWF to conserve the declining stocks of golden Mahseer in Himalayan region. This talk was telecast under the programme "EARTH MATTERS" by Doordarshan channel.

Dr. A.K. Singh delivered a radio talk on coldwater fisheries – developmental aspects from Akashvani Almora, which was broadcasted in the programme "Inse Miliye".

A visiting team of All India Radio, Akashvani Kendra, Almora recorded the talks of NRCCWF Scientists Dr.C.B. Joshi, Dr. Shyam Sunder, Dr.B.C. Tyagi and Dr.A.K.

Singh and Shri R.S. Halder, T-5 on different aspects of coldwater fisheries, which was broadcasted from All India Radio, Almora on 15.2.2001.

The activities of NRCCWF and contribution in fishery development in hill regions was highlighted by different Newspapers of Hindi and English viz. "Amar Ujala", "Dainik Jagaran from time to time.

6. EDUCATION & TRAINING

Training

- 18 farmers including two extension officials from Pithoragarh district visited the Institute's experimental fish farm at Chirapani in Champawat district on February 17, 2001 and were apprised with the various activities on fish culture at the farm site.
- Shri Ashok Kumar Nayak, Scientist attended a training programme on "Building MIS using Visual Basic & MS-ACCESS at IASRI, New Delhi on July 10-22 2000.
- Shri A.K. Nayak, Scientist was deputed for the foundation course at NAARM, Hyderabad from 25th August to 22nd December 2000.
- Dr.K.D. Joshi, Scientist was deputed to attend a training programme on "Aquaculture Development" sponsored by Republic of Israel at CIFA, Bhubaneshwar from 10-22nd September 2000.
- Dr.A.K. Singh, Senior Scientist was deputed to NAARM, Hyderabad from November 6-16 2000 to undertake training on "GIS Applications in Agriculture"
- Shri R.S. Haldar, T-5 and Shri T.M. Sharma, T-1 were deputed to CICFRI, Barrackpore during January 5-12 2001 for undergoing training on "Modern Methodologies in Water & Water Quality Analysis".



DM, Champawat handing over certificates to successful trainees at Champawat farm

7. AWARDS & RECOGNITION

- The Society of Nature Conservators,, Muzaffarnagar conferred a fellowship to Dr.K.D. Joshi, Scientist during “National Symposium on Sustainable Development and Conservation of Coldwater Fish Genetic Resources” on June 7-8 2000 at HPKVV, Palampur.
- Fellowship of ISEP Society, Gorakhpur was conferred to Dr.A.K. Singh, Sr.Scientist during August 2000 at the National Conference on Sustainable Rural Development for his contributions made in the field of Fish Conservation Biology.
- Dr.Madan Mohan, Principal Scientist was conferred honorary fellowship by the Society of Biosciences, Muzaffarnagar at the inauguration of National Symposium on “Role of Biosciences in New Millennium” during November 25-26 2000 at Ambedkar University, Agra (UP)
- Dr.A.K. Singh, Sr.Scientist won an award in a poster presentation competition organized by CIFE Mumbai during August 10-11 2000 at CIFE, Lucknow.
- The Society of Biosciences awarded fellowship to Dr.K.K. Vass, Director.
- The G.B. Pant University of Agriculture & Technology, Pantnagar while recognizing the contribution of Dr. Vass to the fishery science presented a recognition award to him at a function in November 2000.

8. LINKAGES & COLLABORATION

Linkages in North-East

The Centre held its second meeting of Quinquennial Review Team at Itanagar (Arunachal Pradesh) during June 19-20 2000. It helped to assess the R&D needs in the North-East on coldwater fisheries sector. Presiding over the inaugural function of the meeting, the Honourable Home & Fisheries Minister of Arunachal Pradesh Shri Kameng Dolo said that fisheries has good potential in the state if sincere and concrete efforts are made for the development of coldwater fisheries both in openwaters as well as in aquaculture sector. He impressed upon the visiting team to formulate suitable strategies so that the people in the state could be benefited and boost their economy by fish farming. He desired to collaborate with ICAR through NRCCWF by setting up a field centre in the State. The interactive meeting of QR team members with the fish culturists of Arunachal Pradesh and visit to various fishery development sites in Itanagar and Ziro, provided an opportunity to assess the potential prospects of coldwater fisheries in the state. It is felt that R&D support from NRCCWF and financial support will go a long way in producing more fish in the states, which will help in economic development of farmers and at the same time contribute to sustainable food security. In this direction NRCCWF through ICAR system has prepared a programme in collaboration with fisheries department of Arunachal Pradesh for establishing Mahseer hatchery.



Hon'ble Minister of Home & Fisheries, Government of Arunachal Pradesh addressing an interactive meeting of QRT members, NRCCWF scientists & State Government officers at Itanagar



Members of QRT, NRCCWF scientists and Arunachal Fishery Officers at the interactive meeting

State Agriculture Universities

A project on “Aquaculture in Coldwaters – Evaluation of Mahseer fishery potentials and its farming feasibility for conservation in Himalayan region” funded by the World Bank under NATP has been approved by Council with NRCCWF as a lead centre. The project programme on the evaluation of Mahseer fishery potential in the different Himalayan zones i.e. Kumaon, Garhwal, Himachal Pradesh and Jammu & Kashmir Himalayas will have an integrated approach to generate reliable database on its status. The participating institutions – G.B. Pant University of Agriculture & Technology, Pantnagar (Uttaranchal); Himachal Pradesh Krishi Vishwavidyalaya, Palampur (H.P.); and S.K. University of Agricultural Sciences & Technology, J&K State have the responsibilities to enumerate the data on ecology and fishery of various Mahseer waters in the respective regions. In addition, the culture technology will be evolved in each of the Himalayan region for conservation of this prized germplasm and to rejuvenate Mahseer fishery in the depleted waters in Himalayas.



Students and staff from universities being explained the activities of NRCCWF

Sister Institutes and outside ICAR

- The Institute has developed linkage with State Fisheries Departments of U.P., Himachal Pradesh and Uttaranchal in various research and development programmes.
- The NRCCWF has already established linkages with CIFA, Bhubaneshwar; NBGFR, Lucknow; G.B.P.U.A.T., Pantnagar and DRDO, Pithoragarh in connection with various fisheries activities including fish feeds, nutrition, cryopreservation and fish conservation programmes, fish seed and other development initiatives in the hills.
- The Institute has strong linkages with Sainik School, Ghorakhal; District Development Department, Champawat; Village Panchayats in Pati & Bhimtal block with regard to transfer of technology programme for aquaculture in hills.
- The NRCCWF established a linkage with CSWCR&TI, Dehradun with regard to use of watershed programmes in development of coldwater fisheries.

9. PUBLICATIONS

Full papers :

Santanu Ghosh, G.N. Chattopadhyay and K.K. Vass. 2000. Environmental Impact Assessment of Lower Ganga System. **Environment & Ecology**. 18(1): 126-129.

Santanu Ghosh, A.K. Das and K.K. Vass. 2000. DDT, HCH and Endosulfan residues in the lower stretch of river Ganga. **GEOBIOS** 27 : 161 - 164

Book chapters :

Vass, K.K. 2000. Coldwater Fisheries Research in India., pp 114-123. In **Fifty Years of Fisheries Research in India**. (Eds.K.Gopakumar,B.N. Singh & V.R.Chitranshi) Indian Council of Agricultural Research, New Delhi. 270 p.

Vass, K.K. 2000. Strategy for Hill Fisheries Development and Aquatic Resource Management. pp 190-204. In **Fifty Years of Fisheries Research in India**(Eds.K.Gopakumar,B.N.Singh & V.R.Chitranshi).Indian Council of Agricultural Research, New Delhi. 270 p.

Vass, K.K. 2000. Problems and Prospects of Coldwater Fisheries Development. **SOUVENIR**. National Symp. Fish Health Management and Sustainable Aquaculture. G.B. Pant University of Agriculture & Tech.,Pantnagar.39-49 pp.

Vass, K.K. 2000. Biological monitoring tools for Inland Fisheries Resources. Environment Impact Assessment of Inland Waters for Sustainable Fisheries Management and conservation of Biodiversity. (Eds. M. Sinha, B.C. Jha & M.A. Khan). CICFRI Publication, Barrackpore. pp. 87-94.

Vass, K.K. 2001. Indian Coldwater Fisheries – technology support. **SOUVENIR**. Fishery. Technologies & their commercialization. Indian Fisheries Association & CIFE, Mumbai. pp. 61-66.

Sanchita Saha Bhowmik, Rima Gupta, H.C. Joshi and K.K. Vass. 2001. Heavy Metal Accumulation in soft tissues and hard parts of *Rita rita* from the industrially polluted zone of Hooghly estuary. 240 p. (Ed. R.K. Trivedy). ABD Publishers, Jaipur (Rajasthan) India. 157-166 pp.

Seminar/Symposia/Workshops :

Vass, K.K. and H.S. Raina. 2000 b. Prospects and Problems of Angling Tourism with regard to Golden Mahseer (*Tor putitora*) in India. National Workshop "**Biodiversity & Conservation with regard to threatened fish Mahseer**". M.P. Council of Science & Technology, Bhopal. 10-12.

Joshi C.B. 2000. Strategies for rehabilitation of Mahseer in Himalayan uplands. National workshop "**Biodiversity & Conservation with regard to threatened fish Mahseer**". M.P. Council of Science & Technology, Bhopal..

Sunder S. & Raina H.S. 2000. Mahseer fishery in Central Himalaya – A review National workshop on **Biodiversity & conservation with regard to threatened fish Mahseer**. M.P. Council of Science. & Technology., Bhopal. Abst. No. 5

Joshi C.B. & Sunder S. 2000. Status of Mahseer fishery in U.P. Himalayas. National Symposium on **Sustainable Development & Conservation of Coldwater Fish Genetic Resources**. HPKVV, Palampur. Abst. No. 42.

Joshi K.D., Joshi, C.B. & Sunder S. 2000. Ecology & fishery of river Ladhiya in U.P. hills. National **Symposium on Sustainable Development and Conservation of Coldwater Fish Genetic Resources**. Palampur. Abst. 65.

Sunder S. & Joshi C.B. 2000. State-of-art of threatened fishes of Himalayan uplands and strategies for their conservation. National. **Symposium on Sustainable Development & Conservation of Coldwater Fish Genetic Resources**. Palampur. Abst. No. 43.

Tyagi B.C. & Kapila S. 2000. Observations on growth, survival and contribution of Himalayan Mahseer, *Tor putitora* (Ham.) in mixed Chinese carp culture system being adopted in Kumaon Himalayas. Ibid., Palampur (H.P.). Abst. No. 45.

Joshi K.D. 2000. Status of *Schizothorax richardsonii* (Gray) in some lotic systems in Kumaon hills. Ibid. Abst. No. 66.

Joshi, C.B. & Sunder S. 2000. Fishery potentials in Kumaon river systems. National **Symposium on fish health management & sustainable aquaculture**. GBPUAT, Pantnagar. Abst. No. 3.

Joshi K.D. 2000. Prospects of fisheries development in Uttaranchal. National **Symposium on fish health management and sustainable aquaculture**. GBPUAT, Pantnagar. Abst.No. 5.

Kapila R., Kapila S. and Basade Y. 2000. Seasonal profile and serological parameters in coldwater fish, *Schizothorax richardsonii*. Ibid. 7.

Madan Mohan, Agarwal V.P. & Sehgal K.L. 2000. Physico-chemical characteristics of river Gaula in Kumaon Himalaya. Ibid. Abst. No. 71.

Singh A.K. & Ponniah A.G. 2000. Risk analysis of exotic magur (*C. gariepinus*) and big head (*A. nobilis*) culture in India. Ibid., Abst. No. 23.

Tyagi B.C. 2000. Incidences of fish mortality in ponds at high altitudes in Kumaon Himalayas. Ibid.,

Sunder S. 2000. Artificial diets for coldwater fishes. Indian Science Congress. New Delhi.

Madan Mohan, Agarwal V.P. & Sehgal K.L. 2000. Phytoplankton dynamics in river Gaula – Kumaon Himalayas. **National symposium on Role of Biosciences in New Millennium**. Agra. Abst. No. 18.

Sunder S., Vass K.K., Joshi C.B. & Joshi K.D. 2000. Snow-trout potentials in Kumaon Himalayas. **First Indian Fisheries Science Congress**. Chandigarh. Abst. No. 29.

Joshi K.D. 2000. Artificial fecundation and rearing of *Schizothorax richardsonii* (Gray) under farm conditions in Central Himalaya. **Ibid.**, Abst. 30.

Singh A.K. & Misra A. 2000. Indiscriminate spread and culture of hybrid big head, *Aristichthys nobilis* in Uttar Pradesh. **National conference on sustainable rural development. Gorakhpur**.

Singh A.K. & Misra A. 2000. Performance of big head carp *Aristichthys nobilis* in rural aquaculture. **Ibid.**, . Gorakhpur.

Singh A.K. 2000. Sex control and reproductive management in coldwater fishes. **Proc. Acad. Eviro. Biol.** Vol. 9 (Suppl.). P. 51.

Singh A.K. 2001. Sex control in fishes. Indian Agricultural Scientists & Fisheries Congress. Allahabad. P. 63.

Hindi Publications :

Joshi C.B. 2000. Mahseer machhaliyon ka palan poshan. Workshop (Hindi) on Parvatiya kshetron mein matsya anusandhan evam vikas. NRCCWF, Bhimtal. Abst. No. 24.

Joshi K.D. 2000. Parvatiya kshetron ke liye tri-stariya matsya palan. Workshop (Hindi) on Parvatiya kshetron mein matsya anusandhan evam vikas. NRCCWF Bhimtal. Abst.22.

Madan Mohan 2000. Sheetjal matsyaki Krishi vikas evam sambhavanaye. Hindi workshop on Parvatiya kshetron mein matsya anusandhan evam vikas, NRCCWF Bhimtal. Abst. No. 10.

Madan Mohan 2000. Sheetjal machhliyon ki ahar avashyaktayen. Ibid. Abst. No. 11.

Madan Mohan 2000. Parvatiya desi matsya prajatiyon ki jal Krishi mein ahar ka mahatva. National workshop on Adhunik jal kheti. Bhubaneshwar. Abst. No. 8.

Sunder S. 2000. Sheetjal matsyaki per avkranti ka prabhav. Workshop (Hindi) on parvatiya kshetron mein matsya anusandhan evam vikas. NRCCWF Bhimtal: 27.

Singh A.K. 2000. Bharat mein videshi machhaliyon ka matsya palan mein samavesh. National Conference on "Matsya evam parivesh". CIFE Lucknow. P. 59.

Singh A.K., Mishra A., Pande A.K., Pande S.C. and Raman R.P. 2000. Matsya palan ke vikas mein jaiv praudhyogiki neelitima, CIFA Bhubaneshwar. P. 1-7.

Singh A.K. & Pande A.K. 2000. Jaliya jaiv vividhata evam unke satat vikas ke liye sanrakshan evam samvardhan ki avashyakata. National workshop on Adhunik jal kheti. CIFA, Bhubaneshwar. P. 37-38.

Singh A.K. 2000. Parvatiya kshetron ki matsya sampada evam unka vikas. Ibid. p. 81.

Tyagi B.C. 2000. Parvatiya kshetron main misrit matsya Palan ke naye ayam. Workshop (Hindi) on parvatiya kshetron mein matsya anusandhan evam vikas. NRCCWF Bhimtal Abst. No.20

Departmental Bulletins / Pamphlets :

Tyagi B.C. 2000. NRCCWF Extension Services. NRCCWF Publ. No. 5.

Vass K.K. & Singh A.K. 2001. NRCCWF – An Introduction. NRCCWF (Bilingual) Bulletin No. 5.

Joshi C.B. 2000. Kritrim andjananshala mein Mahseer matsya beej utpadan. NRCCWF Publ. No. 10.

Tyagi B.C. 2000. Rashtriya sheetjal matsyaki anusandhan kendra – prasar sevayen. NRCCWF Publ. No. 12.

Sunder S. 2000. Coldwater fish diets. NRCCWF Publ. No. 15.

Sunder S. 2000. Snow-trout fishery in Himalaya. NRCCWF. Publ. No. 18.

10. LIST OF ON GOING PROJECTS

| Title of the Project | Project Leader & Associates | Year of Start | Likely year of termination |
|---|--|---------------|----------------------------|
| Ecological modeling & Fishery enhancement in lakes/wetlands in Himalayan/sub-Himalayan region | Dr.K.K.Vass Dr.H.S.Raina Dr.C.B.Joshi | 1998 | 2003 |
| Establishment of baseline information with respect to aquatic resource assessment and bio-diversity with application of GIS | Dr.H.S. Raina Dr.Shyam Sunder Dr.A.K.Singh | 1998 | 2003 |
| Nutrition and feed development for upland fishes with focus on indigenous species | Dr.Madan Mohan | 1998 | 2003 |
| Studies on induced ovarian development, maturation and spawning of grass carp (<i>Ctenopharyngodon idella</i>) and silver carp (<i>Hypophthalmichthys molitrix</i>) in coldwaters | Dr.B.C.Tyagi Dr.K.D. Joshi | 2000 | 2003 |
| Technology dissemination to the clients through pilot scale testing and demonstration programmes | Dr.B.C.Tyagi Dr.K.D. Joshi | 1998 | 2001 |
| Computer application in coldwater fisheries resource assessment & management | Shri A.K.Nayak Dr.K.K. Vass | 2000 | 2003 |

11. CONSULTANCY, PATENTS, COMMERCIALIZATION OF TECHNOLOGY

The Centre's research programmes and outreach activities are expanding to meet the increasing demand of the sector. The Centre is evolving multiple mechanisms to exploit the existing complementary linkages with national R&D organizations for providing technology back up in the hill fisheries development. The Centre is at the advanced stage of negotiations of consultancy with Tehri Power Corporation as per the Council's guidelines and specifically designed to complement the ongoing and emerging thrusts and supplement the budgetary resources of the Centre.

12. RAC, MC, SRC, QRT MEETINGS

Research Advisory Committee (RAC)

The composition of Research Advisory Committee of the Centre w.e.f. April 1998 is as follows:

| | | |
|---------------------|--|------------------|
| Dr. V.R.P.Sinha | Ex-Director, CIFE, Mumbai. | Chairman |
| Dr.S.P. Ayyar | Ex – Director CICFRI, Barrackpore | Member |
| Dr.M. Shahul Hameed | Director School of Industrial Fisheries Cochin University of Science & Technology, Cochin | Member |
| Prof.S.K. Garg | CCS Agricultural University Hisar, Haryana | Member |
| Prof. K. Chatterjee | North-Eastern Hill University Shillong. | Member |
| Dr.B.N. Singh | Asstt.Director General (IF), ICAR HQ, New Delhi. | Member |
| Dr.K.K.Vass | Director, NRCCWF, Bhimtal. | |
| Dr.H.S. Raina | Principal Scientist NRCCWF, Bhimtal | Member Secretary |

Research Advisory Committee meeting (27 – 29 September 2000)

This annual meeting of the Committee was held under the chairmanship of Dr.S.P. Ayyar, Ex-Director, CICFRI as per ICAR directive because the regular Chairman Dr.Sinha was out of country on some assignment so could not participate in the meeting. The meeting was held both at Bhimtal and Champawat. The major observations of the RAC members are as follows:



Institute's Research Advisory Committee in a session



The Chairman RAC releasing NRCCWF's publications



RAC members releasing hatchery produced Mahseer seed into nursery ponds

The Centre should collect more information on types and size of nets/gears normally used by the local fishermen in highland rivers to catch specific species. Further, the Centre in collaboration with CIFT should also design some special gear to increase fish catch in torrential waters of the Himalayan regions.

Committee appreciated the work done on rainbow trout at Chirapani Experimental Fish Farm. It was recommended that in order to meet the growing demand for trout feed, the Centre should explore possibilities to establish a feed mill at the farm. This will significantly help in expanding trout culture programme in the region.

The committee observed that the exotic carp based aquaculture technology developed and tested by the Centre in Kumaon region should also be tried in other parts of Uttaranchal in order to have wider comparative database.

The committee strongly observed that NRCCWF should be provided with the scientists as per their cadre strength so that research on aquaculture, openwater fisheries and hill aquatic resource management could be executed more effectively as per the mandate.

Management Committee (MC)

The sixth meeting of Institute Management Committee was held on July 1, 2000 at Bhimtal under the chairmanship of the Director, NRCCWF and various agenda items were discussed and decisions taken for smooth working of the Institute. The following members attended the meeting.

| | | |
|----------------------|--|------------------|
| Dr.K.K. Vass | Director NRCCWF, Bhimtal | Chairman |
| Dr.V.V. Sugunan | Principal Scientist CICFRI, Barrackpore | Member |
| Dr.D. Kapoor | Senior Scientist NBFGR, Lucknow | Member |
| Dr. Shyam Sunder | Senior Scientist NRCCWF, Bhimtal | Member |
| Dr.H.S. Raina | Principal Scientist NRCCWF, Bhimtal | Member Secretary |
| Shri Prakash Chandra | AF&AO NRCCWF, Bhimtal | Special Invitee |



Management Committee in session

Staff Research Council (SRC) Meeting

The annual meet of Staff Research Council (SRC) of the Institute was held between May 22 to 24, 2000 at Bhimtal under the chairmanship of the Director, NRCCWF, Bhimtal. Apart from the scientific staff of the Institute Dr. V.R. Chitranshi, Senior Scientist (IFy) ICAR, New Delhi representing SMD ICAR HQ also attended the meeting. The progress made under each of the research project was reviewed critically. In case of Lake project it was decided that problem of winter fish kill will be investigated in detail both in Naukuchiatal and Nainital. Under the same programme Garurtal will be stocked with tagged mahseer fingerlings to assess growth performance. In case of river biodiversity programme it was observed that Garhwal region should be investigated. Assessing the progress of nutrition programme it was recommended that NRCCWF-I feed should be modified to achieve better results and trials made in earthen ponds. For exotic carp based aquaculture project it was observed that attempts should be made to induce breed silver and grass carp at Chirapani farm. It was observed that transfer of technology programme on exotic carp culture has shown good performance but there is need to evaluate the growth performance of indigenous species along with these exotic under local pond conditions, this aspects needs to be looked into. With the joining of a scientist (Computer Applications) at the Centre, a new project on development of computerized database on coldwater fisheries was proposed which was approved after thorough discussions. During this meeting some administrative and financial matters were also discussed.

Quinquennial Review Team (QRT) Meetings

The Quinquennial Review Team constituted by the ICAR to assess the research and other achievements of the Institute for the period 1994-98 met on the following dates under the Chairmanship of Dr. M.Y. Kamal, Vice Chancellor, S.K. University & Agricultural Sciences & Technology, Srinagar (J&K State),

| Meeting | Date | Venue |
|---------|---------------------|-----------------------------|
| First | April 18-19, 2000 | NRCCWF, Bhimtal |
| Second | June 19-20, 2000 | Itanagar, Arunachal Pradesh |
| Third | October 16-18, 2000 | NRCCWF, Champawat |
| Fourth | March 19-21, 2001 | NRCCWF, Bhimtal |

In the first meeting held at Bhimtal the committee evaluated the progress and achievement made by the Centre under various project programmes in operation between 1994-98. The team was presented with a detailed document prepared earlier by the Centre, highlighting the achievements and constraints. The Director presented

before the committee the overview of research achievements and future projections of coldwater sector in the country. The team interacted with all the scientists, critically evaluated their work, listened to the presentations made by each Project Leader. The Committee paid visit to aquaculture demonstration sites around Bhimtal/Bhowali adopted under TOT programme of NRCCWF. The team members also discussed various administrative and financial issues with the concerned staff and also saw the existing facilities of the Centre at Bhimtal. The team undertook their evaluation as per the terms of reference approved by Council.

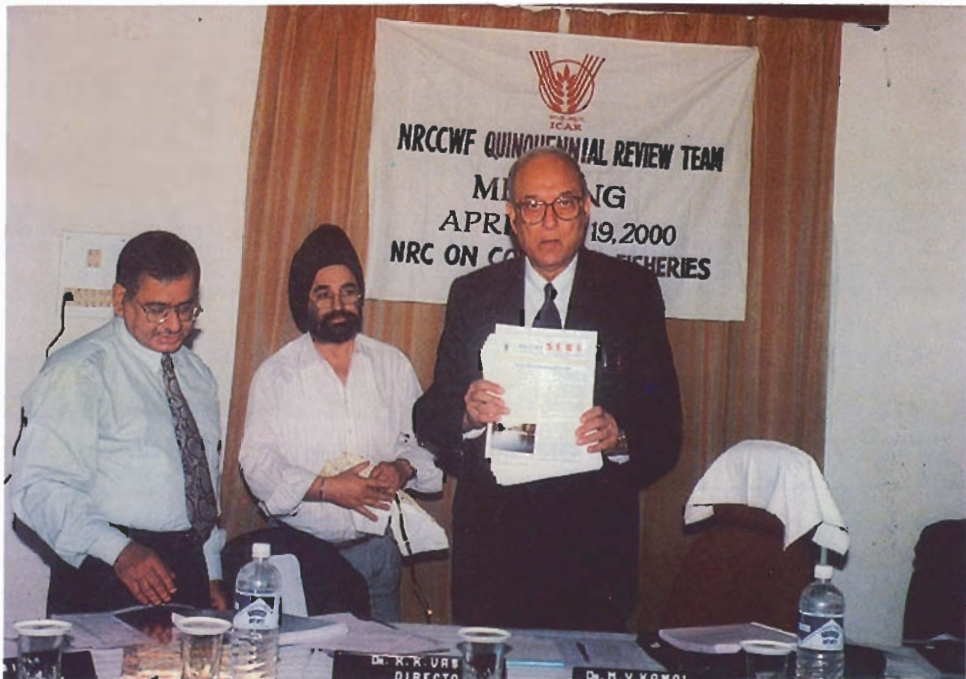


The first QRT meeting in session

The second meeting was held at Itanagar, Arunachal Pradesh in collaboration with the State Govt. and local Fisheries Department. This visit helped the members and the Chairman to assess the R&D requirements in Coldwater Fisheries in this important region of North-east. Among the North-eastern States the Arunachal Pradesh has the maximum resources and potential for development of Coldwater Fisheries. Since the Govt. of India attaches great importance to the development of North-eastern region, the visit of this high powered committee to this region was timely. The team apart from visits to potential sites, had meetings with various high ranking State Officers and a special meeting with the Chief Minister and the Minister of Home & Fisheries, Govt-of Arunachal Pradesh. In these meetings various initiatives that ICAR/NRCCWF can take to extend R&D support to Arunachal Fisheries Department were discussed.

During third meeting the team paid a visit to the Centre's Experimental Farm at Chirapani, in the district of Champawat. They saw the activities regarding aquaculture being carried out at the farm and appreciated the efforts made by the Centre in developing rainbow trout culture for the first time in Kumaon region of Uttaranchal State.

The team saw the facilities at the farm and field office of the Champawat centre, they also evaluated the progress of work made by the scientist posted there. An interaction meeting with the members of staff posted at Champawat was held by the team. The team visited the demonstration ponds of farmers in the district adopted by the Centre under transfer of technology programme. The team was also accompanied by Shri S.K.Maheshwari, IAS, the DM, Champawat during their visit to farmers ponds and observed the enthusiasm of local farmers to take up farming of exotic carps under the technical supervision of NRCCWF. On this occasion the Chairman, DM and other Members released fish seed, produced at NECCWF farm, into the farmers ponds.



The Chairman QRT releasing the Institute's publications



QRT members on a visit to Mahseer hatchery



Chairman QRT and a member examining rainbow trout stocks at Chirapani farm



QRT members discussing draft final report at a special Management Committee meeting

The following members of the team attended different meetings and evaluated the work of NRCCWF.

| | | |
|------------------------|---|------------------|
| Dr.M.Y. Kamal | Vice Chancellor SKUAST, Srinagar (J&K) | Chairman |
| Prof.(Dr) C.S. Singh | Ex-Dean College of Fishery Sciences GBPUAT, Pantnagar | Member |
| Prof.(Dr.) D.P. Zutshi | Ex-Director CORD Kashmir University, Srinagar | Member |
| Shri K.K. Choudhary | Director (Fisheries) Government of Arunachal Pradesh | Member |
| Prof.(Dr.) H.R. Singh | Dean, Faculty of Science & Head, Department of Zoology, Allahabad University, Allahabad | Member |
| Dr.H.S. Raina | Principal Scientist NRCCWF, Bhimtal | Member Secretary |

The fourth meeting was held at Bhimtal in which the draft final report was discussed in detail, which was based on the technical proceedings of previous meetings/field, visits, individual comments/observations of each member and the technical inputs from each team member. For making the report comprehensive the Chairman also solicited the opinion from different Heads of organizations/ departments in the Hill States who have a stake in Coldwater Fisheries Development and need R&D support. During this meeting broad framework of recommendations were also finalized. Apart from this important business of the Committee the members took time to interact with all members of staff to know their problems and difficulties so that important ones could be incorporated in the recommendations.

Other Committees:

Official Language Committee

| | |
|-------------------|---------------------------|
| Dr. K. K. Vass | Chairman |
| Dr. C.B. Joshi | Member Secretary |
| Shri R.L. Raina | Member |
| Shri Manni Lal | Member |
| Shri Baldev Singh | Member |
| Shri Amit Joshi | Member & Hindi Translator |

Terms of Reference

- To monitor the progress of work done in official language from time to time.
- To organize *Raj Bhasha* activities as intimated by the Council from time to time.

During the year regular quarterly meetings of the committee were held and the decisions taken were communicated to Council from time to time. The committee took initiative to organize various programmes i.e. Hindi Workshop, Hindi Quiz, Hindi Essay competition to celebrate the Golden Jubilee Year of *Raj Bhasha*.

Institute Joint Staff Council

| Official Side | Staff Side |
|---------------------------------------|--|
| Dr.K.K.Vass, Director & Chairman | Shri Harish Ram, Asstt. & Member CJSC |
| Dr. Madan Mohan, Principal Scientist | Shri T.M. Sharma, T-2, Member |
| Dr.Shyam Sunder, Senior Scientist | Shri Baldev Singh, T-3, Member |
| Dr.A.K. Singh, Senior Scientist | Shri J.C. Bhandari, LDC, Secretary SS |
| Dr. K.D. Joshi, Scientist | Shri Ravinder Kumar, SSG-III, Member |
| Shri Prakash Chandra , AE&AO | Shri Hansa S. Bhandari, SSG-II, Member |
| Shri R.L.Raina , AAO/Member Secretary | |

During the year the Institute's Joint Staff Council meeting was held twice on 28.8.2000 and 6.12.2000 to sort out the various problems of the staff of the Institute. Both the meetings were held under the chairmanship of the Director.

Sports Meet

As an extra curricular activity the staff of the institute took active part in various sports meets' organized locally at Bhimtal. The team took part in a cricket league match organized at Bhimtal.

13. PARTICIPATION IN CONFERENCES, SEMINARS, MEETINGS & WORKSHOPS

Conferences/Meetings/Symposia /Seminars/Workshops

Participants

National symposium on "Sustainable development and Conservation of coldwater fish genetic resources"
June 7-8, 2000 at HPKVV, Palampur

Dr.C.B. Joshi
Dr.Shyam Sunder
Dr. K.D. Joshi

Young Scientist Congress at M.P. Council of Science & Technology, Bhopal, July 29-30, 2000

Dr.K.K. Vass

Hindi workshop on "Matsya aur Parivesh"
August 10-11, 2000 at CIFE Chinhat Centre, Lucknow

Dr. Madan Mohan
Dr.A.K. Singh

Summer Institute on "Biological Monitoring Tools for Inland Fisheries Resources"
August 11-14, 2000 at CIFRI, Barrackpore

Dr. K.K. Vass

National Conference on "Sustainable rural development"
August 28-30, 2000 at IESP, Gorakhpur, U.P.

Dr.A.K. Singh

First India Fisheries Science Congress
September 21-23, 2000 at Punjab University, Chandigarh

Dr.K.K. Vass
Dr.Shyam Sunder

Brainstorming Session on HRD in Fishery Sector at CIFE, Mumbai, October 20-21, 2000

Dr.K.K. Vass

National Symposium on "Fish health management and Sustainable aquaculture"
November 1-2, 2000 at GBPUAT, Pantnagar

Dr.K.K. Vass
Dr.Madan Mohan
Dr.C.B. Joshi
Dr.Shyam Sunder
Dr.B.C. Tyagi
Dr.A.K. Singh
Dr.K.D. Joshi

National Symposium on "Role of Biosciences in New Millennium"
November 25-26, 2000 at Ambedkar University, Agra (UP)

Dr.Madan Mohan

Third all India scientists and farmers congress
February 3-5, 2001 at Allahabad

Dr.A.K. Singh

National symposium on Ecology VISION 2020 at
Jawaharlal Nehru University, New Delhi
March 16-17, 2001

Dr.K.K. Vass

Meetings

Board meeting at ASRB, New Delhi
March 16, 2000

Dr. K.K. Vass

QRT meeting at Itanagar, Arunachal Pradesh
June 19 & 20, 2000

Dr. K.K. Vass

Board meeting at ASRB, New Delhi
June 30, 2000

Dr.K.K. Vass

Board meeting at ASRB, New Delhi
July 17, 2000

Dr.K.K. Vass

Project Screening Committee & Scientific Panel of Fisheries
Division at ICAR HQ
August 16-18, 2000

Dr.K.K. Vass

Meeting to discuss the prospects of designing, construction
& installation of cages in openwater bodies at ICAR, SMD
August 21, 2000

Dr.K.K. Vass

Fisheries Divisional Meeting at ICAR HQ
August 22, 2000

Dr.K.K. Vass

NACA Task Force Meeting at ICAR HQ
August 23, 2000

Dr.K.K. Vass

QRT meeting at Champawat
October 16 & 17, 2000

Dr.K.K. Vass

Directors' conference
October 12-13,2000

Dr.K.K. Vass

Meeting on hill fisheries development in North-Eastern
Region at Krishi Bhavan,New Delhi

Dr.K.K. Vass

December 7, 2000

Meeting of the National Committee on Introduction of Exotic Aquatic Species in Indian Waters at Krishi Bhavan, New Delhi
January 22, 2001

Dr.K.K. Vass

Fisheries Divisional Meeting at NBFGR, Lucknow
January 31st February 1st, 2001

Dr.K.K. Vass

Meeting in connection with fisheries development in North-Eastern & hilly regions at Krishi Bhavan, New Delhi

Dr.K.K. Vass

Board meeting at ASRB, New Delhi
March 9, 2001

Dr.K.K. Vass

14. WORKSHOP & FARMER'S EVENTS ORGANIZED

Hindi Workshop

The Institute organized a Workshop in Hindi on September 7, 2000. The topic for the workshop was “पर्वतीय क्षेत्रों में मत्स्य अनुसंधान एवं विकास”. The objective of the workshop was to make local masses aware about the scientific findings, and the technologies developed in the field of coldwater fisheries by the Institute in Hindi. This awareness in their own language will help the farmers to understand better the potential of fisheries in hills which indirectly results in income generation to these people. The representatives who attended the workshop were from various institutions, government and non-governmental organizations, college and school teachers, researchers, local panchayat representatives and people from farming community.



Inaugural session of Hindi Workshop organized by NRCCWF

Prof. B.S. Rajput, Hon'ble Vice Chancellor, Kumaon University, Nainital inaugurated the workshop. In his inaugural address Prof. Rajput stressed upon the need for the use of Hindi in the scientific institutions and briefed how the local people

can be benefited when our research findings are passed on to them in their own simple language. Among the distinguished invitees, Shri U.D. Chaube, General Manager, Kumaon Mandal Vikas Nigam Limited, Nainital; Smt. Beena Arya, Chairperson, District Board, Nainital and Dr.P.C. Harbola, Joint Director, IVRI, Mukteshwar also spoke on the use of Hindi and its need for implementation in research organizations. All appreciated the NRCCWF for taking this initiative in this remote area of Bhimtal.

In all 30 papers were presented in the workshop in three technical sessions. The fourth was the plenary session in which ten recommendations were made by the panel, which were approved after thorough discussion. The best paper presentation adjudged by the judges (Prof. Sarvesh Kumar, Kumaon University, Dr. C.B.Joshi, NRCCWF) in the workshop was suitably awarded. Two special lectures were also delivered one by Dr. P.C. Harbola, Joint Director, IVRI and another by Dr. Ajay Singh Rawat, Kumaon University, Nainital.

The Director of the Institute highlighted in brief the contributions made by the NRCCWF in promoting Hindi as an official language as well as its use in scientific matters through publication of scientific information in Hindi. On this occasion, the prizes were given to the best three essays written by the Institute's staff in the essay competition during Hindi week on the topic "*Rashtrabhasha ki samsya aur samadhan*". Six publications of the Institute written in Hindi were also released on this occasion by the honourable guests and distributed among the participants.

Farmers' Day/Kisan Mela

The Institute jointly with the "Paryavaran Sanrakshan Samiti (NGO) Pati organized a mega event – Fish Farmers' Day on October 16, 2000 at Toti – a remote village in Pati block of Champawat district. The function was inaugurated by Dr.M.Y. Kamal, Vice Chancellor, SKUAST, Srtnagar (J&K) and Shri S.K. Maheshwari, IAS, District Magistrate Champawat; Dr.C.S. Singh, Former Dean, GBPUAT, Pantnagar were among the distinguished guests present on the occasion. In the gathering of 150 farmers and villagers, two fish farmers were selected and honoured for higher fish production in their ponds. On the occasion Dr. K.K. Vass, Director of the Institute highlighted the activities of NRCCWF while the scientists of the Institute Dr.H.S. Raina, Dr.B.C. Tyagi and Dr. K.D.Joshi briefed about various research and extension activities of the Institute.

Dr.B.C. Tyagi, Senior Scientist of the Institute participated in Kisan Mela at Bichkhali, Nainital on 10.3.2001 organized by IVRI Mukteshwar and Chirag (NGO) and interacted with officials and farmers. He apprised them with the initiatives of NRCCWF for the development of coldwater fisheries in the Kumaon uplands.

The Institute participated in Kisan Mela organized by VPKAS, Almora on March 21, 2001. The NRCCWF staff displayed various research and development activities

of the Institute through charts & posters. Honourable Minister of Agriculture, Uttaranchal State Shri Banshidhar Bhagat inaugurated the Kisan Mela and paid visit to NRCCWF stall. He appreciated the efforts made the institute for the development of fisheries in the region.



Fish Farmer Day celebration, present on the occasion are Vice Chancellor, S.K.U.A.S.T., Srinagar (J&K State) & DM, Champawat



Vice Chancellor, SKUAST Dr. Kamal releasing fish seed in to farmer's pond



Local visitors at NRCCWF exhibition stall at Almora

15. DISTINGUISHED VISITORS

Following distinguished dignitaries visited the Institute during the year 2000-2001.

- Shri A.R. Malik, Chief Development Officer, Champawat
- Prof. S.K. Garg, Department of Zoology, CCS Haryana Agriculture University, Hisar, Haryana
- Prof. K. Chatterjee, Department of Zoology, School of Life Sciences, North Eastern Hill University, Shillong
- Dr. M. Shahul Hameed, Director, School of Industrial Fisheries, Cochin University of Science & Technology, Cochin
- Dr. S.P. Ayyar, Ex-Director, CICFRI, Barrackpore
- Dr. B.N. Singh, Asstt. Director General (IF), ICAR, New Delhi
- Dr. M.Y. Kamal, Vice Chancellor, S.K. University of Agricultural Sciences & Technology, Srinagar, J&K State
- Dr. C.S. Singh, Ex-Dean, College of Fishery Sciences, G.B. Pant University of Agriculture & Technology, Pantnagar
- Dr. M. Sinha, Director, CICFRI, Barrackpore
- Dr. V.N. Kapoor, Executive Fellow, Department of Zoology, Allahabad University, Allahabad
- Shri S.K. Maheshwari, IAS, District Magistrate, Champawat
- Shri Y. Sheshu Kumar, IFS, Division Forest Officer, Pithoragarh
- Shri P.S. Sanga, Deputy S.P. Champawat



Commissioner Kumaon, DM Champawat and other officials at NRCCWF exhibition stall Champawat



DM Champawat and others on a visit to Chirapani fish farm, Champawat

16. PERSONNEL AS ON MARCH 31, 2001

SCIENTIFIC

1. Dr. K.K. Vass, Director
2. Dr.Madan Mohan, Principal Scientist
3. Dr.H.B. Singh, Principal Scientist
4. Dr.C.B. Joshi, Senior Scientist
5. Dr.Shyam Sunder, Senior Scientist
6. Dr.B.C. Tyagi, Senior Scientist
7. Dr.A.K. Singh, Senior Scientist (w.e.f. 1.8.2000)
8. Shri Rajeev Kapila, Scientist (on study leave w.e.f.7.1.1999)
9. Smt. Suman Kapila, Scientist (transferred to NDRI, Kamal on 23.10.2000)
10. Dr.S.K. Bhanja, Scientist (transferred to CARI, Izatnagar on 6.4.2000)
11. Dr.K.D. Joshi, Scientist
12. Miss Yasmeen Basade, Scientist (on study leave w.e.f. 22.9.1999)
13. Shri Ashok Kumar Nayak, Scientist

ADMINISTRATIVE

1. Shri Prakash Chandra, AF&AO
2. Shri R.L. Raina, AAO
3. Shri Harish Ram, Asstt.
4. Shri Manni Lal, Asstt.
5. Smt. Susheela Tewari, Stenographer
6. Smt. Khilawati Rawat, Senior Clerk
7. Shri P.C. Tewari, Junior Clerk
8. Shri Pratap Singh, Junior Clerk
9. Shri J.C. Bhandari, Junior Clerk

TECHNICAL

1. Shri R.S. Haldar, T-5
2. Shri Amit Kumar Joshi, T-3 (Hindi Translator)
3. Shri Baldev Singh, T-3
4. Shri Santosh Kumar, T-2
5. Shri Ravinder Kumar, T-2
6. Shri Gopal, T-1
7. Shri R.K. Arya, T-1
8. Shri Hansa Dutt, T-1
9. Shri T.M. Sharma, T-1
10. Shri Bakshi Ram, Driver (T-1)
11. Shri Bhagwan Singh, Driver (T-1)

SUPPORTING

1. Shri Japhu Ram, SS Gr IV
2. Shri Sant Ram, SS Gr IV
3. Shri Ravinder Kumar, SS Gr III
4. Shri Om Raj, SS Gr III
5. Shri H.S. Chauhan, SS Gr III (promoted from Gr II to III post on 1.11.2000)
6. Shri H.S. Bhandari, SS Gr II
7. Shri Dharam Singh, SS Gr I
8. Shri Sunder Lal, SS Gr I
9. Shri H.C. Bhakt, SS Gr I (Died on 5.11.2000)
10. Shri Manoj Kumar, SS Gr I
11. Shri Pooran Chandra, SS Gr I
12. Shri Kuldeep Kumar, SS Gr I
13. Shri Bhola Dutt, SS Gr I
14. Shri Chandra Shekhar, SS Gr I
15. Shri Prakash Akela, SS Gr I

17. SPECIAL INFRASTRUCTURAL DEVELOPMENT

The Centre attached greatest priority to create infrastructural facilities at Bhimtal, in this direction all out effort was made at all levels and CPWD initiated the process of construction of NRCCWF Lab-cum-Office Complex at Bhimtal in December 2000 when "Bhumi-Pujan" was performed. Subsequently on March 12, 2001 the foundation stone of the complex was unveiled by the Hon'ble MOS, ADH/DARE, ICAR, Dr. Debendra Pradhan Ji after performing the Puja. This important function was also attended by Shri Banshidhar Bhagat Ji, the Hon'ble Minister of Agriculture, Govt. of Uttaranchal; Shri Suresh Arya Ji, Hon'ble Minister of State, Transport & Tourism, Govt. of Uttaranchal; Dr. K. Gopakumar, Deputy Director General (Fisheries) ICAR Hq.; other senior officers of the State Administration and local dignitaries of Bhimtal/ Gorakhal/Bhowali/Nainital/Champawat. On this occasion special publications brought out by NRCCWF and Web-page of the centre were released by various dignitaries. The exhibition depicting the research achievements of NRCCWF put up on this occasion was opened by Madam MOS, ADH/DARE.



**Hon'ble MOS, DARE&AHD; Hon'ble Agriculture Minister, Uttaranchal;
Hon'ble MOS Transport' Uttaranchal and DDG (Fisheries) ICAR
at Foundation Stone Ceremony**



Hon'ble MOS' DARE&AHD Dr. Debendra Pradhan along with the distinguished guests unveiling the foundation stone



The Director NRCCWF explaining the activities through posters to Hon 'ble MOS, Dr. Pradhan

To ensure uninterrupted construction of complex necessary funds were released to CPWD. Similarly action was taken to create necessary additional facilities at Chirapani Experimental farm for efficient working and making available more tank/pond facilities to carry out desired aquaculture experiments. Accordingly five work items were awarded to CPWD to be executed at Champawat. The existing facilities at Mahseer hatchery were also improved by establishing one Limnology laboratory which was inaugurated by the members of QRT during their visit to Bhimtal in March 2001. To keep pace with information technology, additional computer facilities were created, further faster E-mail and Internet service was put in place.