वार्षिक प्रतिवेदन
ANNUAL REPORT

1999 - 2000

राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र

वार्षिक प्रतिवेदन
ANNUAL REPORT
1999-2000

राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र
(भारतीय कृषि अनुसंधान परिषद्)
भीमताल - २६३ १३६, नैनीताल
उत्तर प्रदेश

Compiling & editing	Kuldeep K. Vass C.B. Joshi
Computer composing	A.K. Nayak Susheela Tewari
Hindi summary	C.B. Joshi Amit Kumar Joshi
Published by	Director NRCCWF Bhimtal
Printed at	Yugantar Prakashan Pvt. Ltd. WH-23, Mayapuri Industrial Area Phase I, New Delhi - 110 064 Ph. 5135949, 5139018

- The activities and achievements reflected in this Annual Report covers the period from April 1999 to March 2000.

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

CONTENTS

PREFACE

I am pleased to present the Annual Report 1999-2000 of NRCCWF as a detailed record of the progress registered by the Institute during the year in the areas of Cold-water Fisheries Research, Hill aquatic resource management, Extension and Nation building activities.

The year 1999-2000 will be remembered in the history of NRCCWF as it witnessed some memorable events during the year. One of the events was co-hosting of an International Conference on "Tropical Aquatic Ecosystems : Health, Management and Conservation" during October, 1999. This conference drew wide response from overseas participants. The second event was, convening a "Brain Storming Session" to discuss the problems and formulate an action plan for Cold-water Fishery development in the country.

Regarding research, the institute during the year worked on six ongoing research programmes apart from initiating the activities under a NATP project for which this institute is a nodal centre. The research programmes focussed on resource assessment in central Himalayan region, seed production, aquaculture activities of both indigenous and exotic fish species, nutrition, biochemistry and feed development for cold-water fish species. Further, relevant data base was generated for formulation of fishery enhancement action plan for Himalayan wetlands.

Major highlight of NRCCWF's extension accomplishments during the year was its active participation in various national level exhibitions viz., "AQUARESOURCES", "AQUAFAIR", and FISHINNIUM-2000" organised, respectively at Nainital, (U.P.).; Barrackpore, (West Bengal) and Bhubeneshwar, (Orissa). The dignitaries who visited these exhibitions, appreciated the contribution made by NRCCWF towards Cold-water Fisheries Research, Extension and Hill Aquatic Resource Management in the country. The other important extension activities like farmers training, advisory service, awareness programmes etc. continued to benefit a large section of fisher-folks and departmental officials in hills. For local awareness, the institute organised number of exhibitions and

in ICAR sports by our members of staff was given adequate support, it helped in personality development of our family.

As far infrastructure development for the institute is concerned, the year marked a special significance, as work for the construction of Phase-I of NRCCWF complex was awarded to CPWD. It is hoped that NRCCWF family will have its own complex in near future and long standing aspiration of the institute will be fulfilled.

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

I would like to express my sincere thanks to Dr. R.S. Paroda, Secretary DARE, Govt. of India & Director General ICAR for his support and encouragement to the activities of NRCCWF. I am extremely grateful to Dr. K. Gopakumar, DDG (Fisheries) ICAR for his guidance and support for promoting the activities of this institute.

The credit for the overall progress of NRCCWF during the year is due to all its members who worked in the spirit of unity, integrity, honesty and commitment. With continued co-operation, dedication and contribution of all the members of NRCCWF family, I am sure, the Institute will find a prominent place among the fisheries institutes in the country and outside, in near future.

I take this opportunity to thank Dr. C.B. Joshi, Senior Scientist for his sincere efforts to compile basic draft of the report and Mrs. Susheela Tewari for computer composing.

NRCCWF
Bhimtal, (Nainital) U.P.
July, 2000

K.K. Vass
Director

EXECUTIVE SUMMARY

The NRC on Coldwater Fisheries is the only national facility in the country where research investigations are undertaken both on capture and culture aspects with a focus on exotic and indigenous coldwater fish species. Since its inception, NRCCWF inspite of limited scientific and technical manpower and meager facilities, has made significant contribution for proper appraisal of coldwater fishery resources and evolved suitable technologies to propagate important coldwater fish species in hills. The institute has been pursuing the mandated activities and striving hard to provide necessary research support to coldwater fisheries sector in the country. Continuing our efforts, the institute during the year focussed its attention on overall performance which involved research, transfer of technology, human resource development, visibility & public awareness programmes, establishment of linkages and institutional building activities.

Regarding research, the institute during the year worked on six ongoing research programmes apart from initiating the activities under NATP project for which this institute is a nodal centre. The research programmes focussed on resource assessment in central Himalayan region, seed production, aquaculture activities of both indigenous and exotic fish species, nutrition, biochemistry and feed development of coldwater fish species. Further, relevant data base was generated for formulation of fishery enhancement action plan for Himalayan wetlands.

Fish Biodiversity in Central Himalayan river systems

The drainage system of Kumaon and Gharwal hills in Central Himalayas comprise mainly the Kali, the Western Ramganga, the Ganga and the Yamuna with important sub-systems the Saryu, the Kosi, the Alaknanda and the Bhagirathi. These sub-systems have numerous tributaries of which the major ones are the Dhauli, the Gori, the Ramganga (E), the Gagas, the Binnau, the Nayar, the Pinder, the Nandakini, the Mandakini, the Bhilangna, the Song and the Tons. Most of these systems originate from glaciers thus maintain low temperature profile throughout their course in hills. However, in valleys and plain areas, temperature is relatively higher. The inventory of fish fauna [illegible] Gadwal region recorded 25 species

organised commercial fishery but local youth are involved in subsistence fishing which provides them Rs. 40-60 per kg of fish in the local market. In terms of natural feed resources the systems are rich in bottom fauna represented by mayflies and caddis larvae. The plankton population are low but significant epiphytic flora comprising members of bacillariophyceae, chlorophyceae and cyanophyceae are recorded.

Fishery enhancement in Wetlands

Kumaon lakes were investigated for assessment of their production functions and fishery potential. The data generated sofar reveal that some of the systems can be ecologically managed to obtain higher fish yields. The existing models on fish yield ehnhancement are based purely on tropical warm-water systems. But the species cqmposition, ecological interactions and growth period in uplands is very different in comparison to plains. Therefore, the present data will form a basis to suggest a suitable ecological model both for conservation and fishery enhancement in such unique ecosystems.

Snow-trout seed resources

Among the Schizothoracid fishes, *Schizothorax richardsonii* is the most common in the Kumaon streams. Its fishery in these upland streams contributes approximately 80% to total catches. In certain pockets of these river systems it forms nearly 95% of catches. On the basis of survey conducted during the year, it has been observed that the fish breeds in shallow streams where current is moderate and substrate is stony with pebbles and sand. The intensity of fry collection was higher in the Ramganga (E) at Thal, Nachni, and Tejam. The potential seed collection sites have also been located in the Panar, the Bhujbal, the Ladhya, the Kali, the Ramganga (W), the Kosi and the Gori, with the fry availability in the range of 5-17 numbers m^2

Artificial diets for Coldwater Fishes

Large number of trials were made during the year on feeding of mahseer and snow-trout test fishes with artificial diets compounded by the institute and one commercial carp feed (CIFACA). It has been revealed through experiments that NRCCWF feed-I showed promising results in terms of fish growth, weight gain, feed conversion ratio and survival. However, NRCCWF feed-II in which 50% quantity of caesin was replaced by fish meal, did not record any significant gain in growth but it gave better conversion. The use of chitin, about 2% in NRCCWF feed, was also

Exotic carp farming in uplands

The technology developed by the institute after having pilot tested, was applied at different pond sites at Bhimtal and Champawat in U.P. hills. The fishery management practice adopted in these ponds located in the altitudinal range of 800-1700 m asl under two temperature regimes 12-18°C and 5-24°C with different morphometric features, recorded variation in fish yield estimates. Further, the fish yield was also influenced by the type of substratum of each pond. The cemented pond recorded lower production as compared to mud pond. However, three species combination of common carp, silver carp and grass carp seems to be suitable for promoting rural aquaculture in hills, where indigenous species do not record faster growth rate.

Mahseer programme under NATP

The institute after having worked out basic technological aspects of mahseer breeding, has during the year initiated a special programme on mahseer which will focus on the areas of work which could not be addressed earlier. Further, this NATP programme has four co-operating centres located in Srinagar (J & K), Palampur (H.P.), Pantnagar (U.P.), ICAR complex Barapani (NE region). This will help to generate specific information and develop technology for its culture under different agro-climatic regions. The nodal centre of this project (NRCCWF) has during last couple of months intitiated the basic survey work in the river systems of the entire Kumaon region.

Extension activities of NRCCWF progressed quite satisfactorily during the year. The ponds / tanks available with local farmers were brought under fish culture. Under this activity nine (9) ponds in Bhimtal block (Distt. Nainital) and eight (8) ponds in Pati block (Distt. Champawat) varying in their size and located within altitudinal range of 800 - 1700 masl, were brought under this programme. The species combination tested were three exotic chinese carps viz., silver carp, grass carp and common carp alone or in combination with indigenous fishes namely snow-trout and mahseer. The indigenous carps recorded better growth performance in this polyculture. The estimated yield from ponds ranged from 1018 kg/ha/7 months to 1870 kg/ha/10 months. Awareness about fish conservation was projected through a documentary **"Conservation of golden mahseer** "telecast by **ZEE NEWS.** The technical advice on various aspects of hill aquaculture was provided to local farmers, other government and non-government

The **Human Resource Development** pursuits of the year covered deputation of various scientists, technical and administrative staff to various training programmes within the country. Most of the scientists of the Institute participated in different national workshops, seminars, symposia and presented their papers. Two junior scientists of the institute were also deputed to different universities to undertake their Ph.D programmes.

To improve the visibility of the institute, a number of publications were printed and released by different dignitaries from time to time during the year The working in Hindi at the institute was given priority. In fact, the ICAR Hindi Committee appreciated our efforts in this direction. During the year a special quiz in Hindi was organised and One special publication in Hindi entitled **"Kumaon Mein Matsya Palan Evam Sanrakshan"** was also released.

In order to promote total personality development of our staff, a team was deputed to participate in ICAR zonal sports meet held during Nov-Dec, 1999 at NDRI, Karnal.

During the year the Institute organised two major events. The first was between October 25-30, 1999 an International Conference on "Tropical Aquatic Ecosytem : Health, Conservation and Management "held at Nainital and NRCCWF was one of the key organisers of this important conference. In this international event about 40 overseas participants from UK, USA, Canada, Brazil, Sweden, Netherlands, Denmark, Japan, Egypt, and Nepal attended the five day conference and presented their papers. The DDG (Fy) Dr. Gopakumar presided over the inaugural function and delivered presidential and keynote address. The institute set-up an exhibition at the conference venue which was appreciated among others by Dr. Tewari, Member, Science & Technology, Planning Commission, Govt. of India. The work of the institute was focussed during this international event and many overseas delegates evinced keen interest in our activities. The second was "Brainstorming Session on Coldwater Fisheries" held at Dehradun between November 19-20, 1999. It was first of its kind in the country to focus the problems of coldwater fisheries and hill aquatic resource management. Large number of participants representing development departments and research organisations from hill states attended this important meeting. A number of valuable recommendations were formulated in the meeting under the chairmanship of DDG (Fy) Dr. Gopakumar and Vice-Chancellor SKUAST, Dr. Kamal.

Another important event during the [illegible]

The institute vigorously persued at various levels the matter regarding creation of its own infrastructure. In this connection, during the year, the award of work to CPWD for construction of Phase-I of NRCCWF complex at Bhimtal is a matter of satisfaction to NRCCWF family.

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.

INTRODUCTION

Establishment and Growth

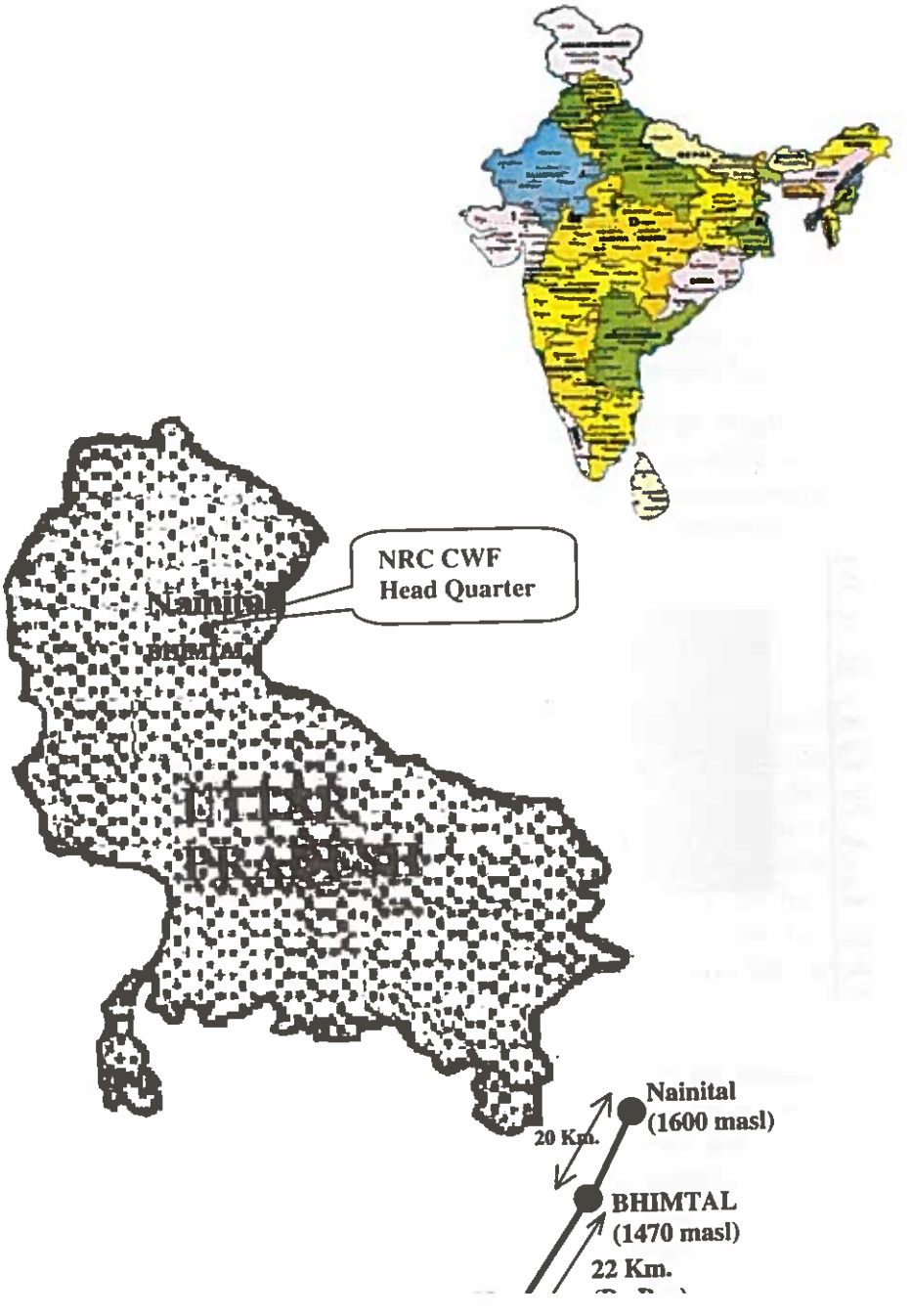
The NRCCWF was established in 1987 by ICAR after carving it out from the then CIFRI. The main purpose of its establishment was to specifically focus on the research related problems on Coldwater Fisheries in the upland regions of the country so as to provide back-up support to development activities for this important but neglected sub-sector of Inland Fisheries.

The institute started functioning w.e.f. September 24, 1987 initially with three scientists and the Project Dirctor. It was housed in a rented building at Haldwani, district Nainital in the State of U.P. It continued to function at Haldwani till April, 1997 and on May 1 of the same year it was shifted to Bhimtal, the approved headquarter of the institute. It continues to operate in three separate rented accommodations at Bhimtal (District. Nainital) U.P. In terms of infrastructure development, the institute has sofar established an experimental farm facility at Chirapani in the District of Champawat in U.P. hills which became operational from January, 1992.

Mandate

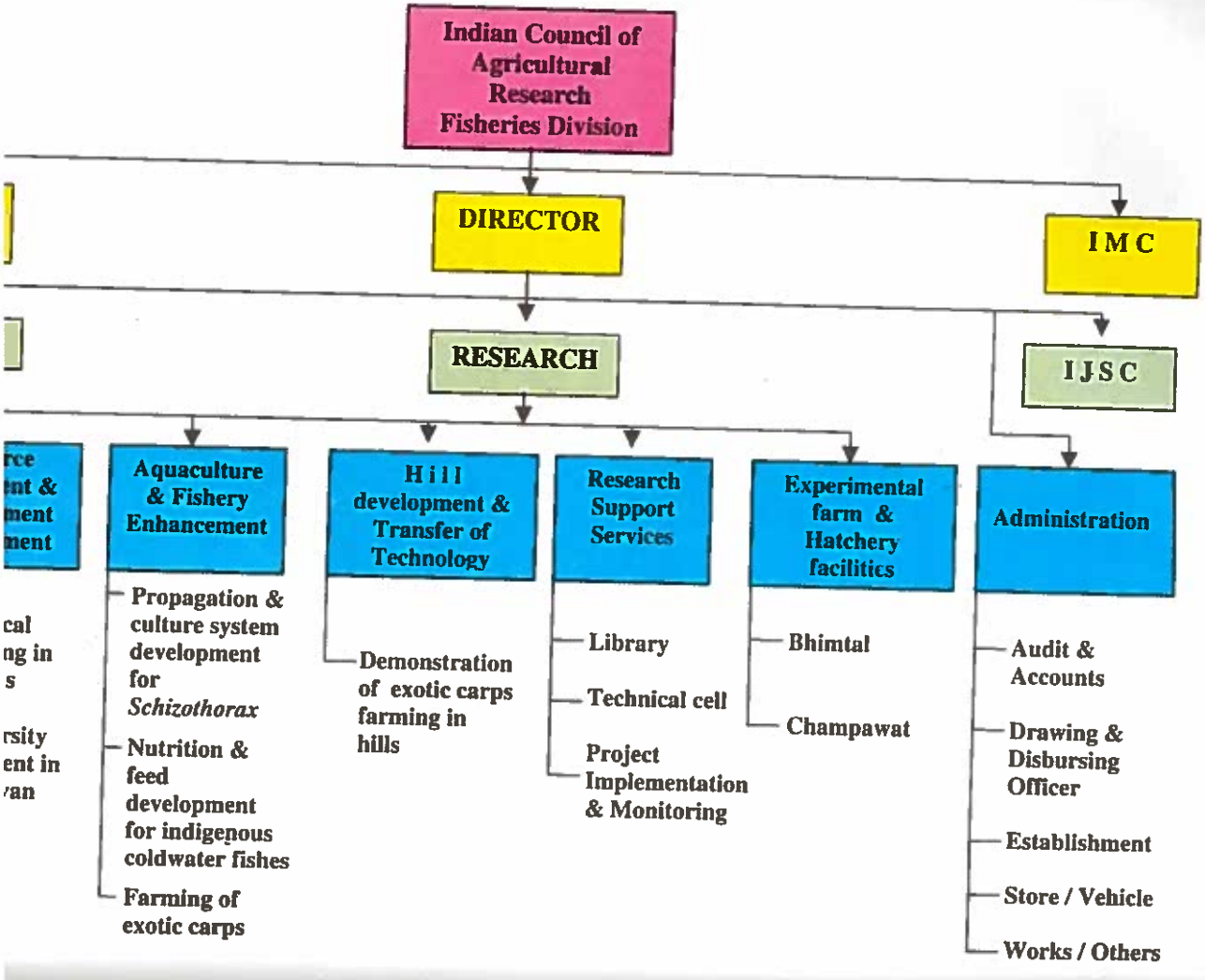
In accordance with the changing demands of coldwater fisheries sector, the mandate of NRCCWF has undergone necessary changes from time to time. As guided by its perspective plan (VISION-2020), the revised mandate of NRCCWF covers the following commitments to the Coldwater Fisheries Sector in the country.

- 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 open-waters.


NRC CWF
Head Quarter
Nainital
BHIMTAL
UTTAR
PRADESH
Nainital
(1600 masl)
20 Km.
BHIMTAL
(1470 masl)
22 Km.

[ONAL RESEARCH CENTRE ON COLDWATER FISHERIES

ORGANOGRAM



Location

The headquarters of NRCCWF is located at Bhimtal, a place famous due to a lake of same name. It is about 25 km away from world famous tourist place Nainital with nearest rail-head at Kathgodam / Haldwani. The nearest air port is IGIA, New Delhi. The details of location are indicated in the map.

Organisation and Management

As shown in the organogram, the institute is pursuing its research programmes through three main divisional approaches, which are supported by nine cells / units, one field centre, one flow-through hatchery facility and one experimental farm facility.

The institute is headed by Director in Research Management Position. The responsibility of overall management of the institute lies with Management Committee under the Chairmanship of the Director NRCCWF. Specific recommendations pertaining to research and extension activities of the institute are made by Staff Research Council and Research Advisory Committee.

Infrastructure

Building and Farm

At present the institute has very modest infrastructure. At Bhimtal (Hq.) the Phase-I of the NRCCWF complex is in the process of construction, but presently the institute is operating from three (3) rented buildings. A pilot scale flow-through hatchery for mahseer seed production, currently in operation, has been established at Bhimtal on a piece of land belonging to U.P. Fisheries Department. The Institute has an experimental fish farm facility at Chirapani in the Champawat district. This farm has hatchery, nursery, and brood-stock rearing cemented raceways apart from circular iron tanks for conducting various aquaculture related studies on indigenous and exotic fish species.

Library section

The NRCCWF library is providing its services to the scientists of the Headquarters and Field centre, apart from scholars and students from other local organisations interested in pursuing the research activities in cold-water fisheries and hill aquatic ecology. The library during the year added 18 scientific books, 20 journals (both Foreign and Indian) and 58 other documents. The current holdings of the library comprise 1063 books, 375 Indian journals, 1138 Foreign Journals, and 1388 miscellaneous publications and other documents. The library section continued its effort in collection, processing

Documentation section

The section mainly looks after the publication of scientific bulletins, brochures and pamphlets. During the year under report (3) bulletins and (6) pamphlets were processed by the section for their publication.

Project Implementation section

The section monitors the implementation and progress of research project programmes of the institute. It annually organises the meeting of Staff Research Council for evaluating the progress and according approval to fresh project proposals. It is also responsible for keeping records of project report through RPF system. The section is also responsible to compile and process the Annual Report and NEWS letter of the institute, which were published as per schedule during the year.

Technical cell

It is entrusted with the responsibility of dealing with all technical matters of the institute within and outside the ICAR system. It also looks after HRD activities and RAC meetings.

ARIS cell

In order to keep pace with information technology, this cell is providing the computer related facilities to the scientists and other staff of the institute. The institute has provided basic computer hardware and software facilities to majority of members of staff at their work places. The ARIS cell has also made efforts to make staff, computer literate. The cell is being further strengthened.

Extension wing

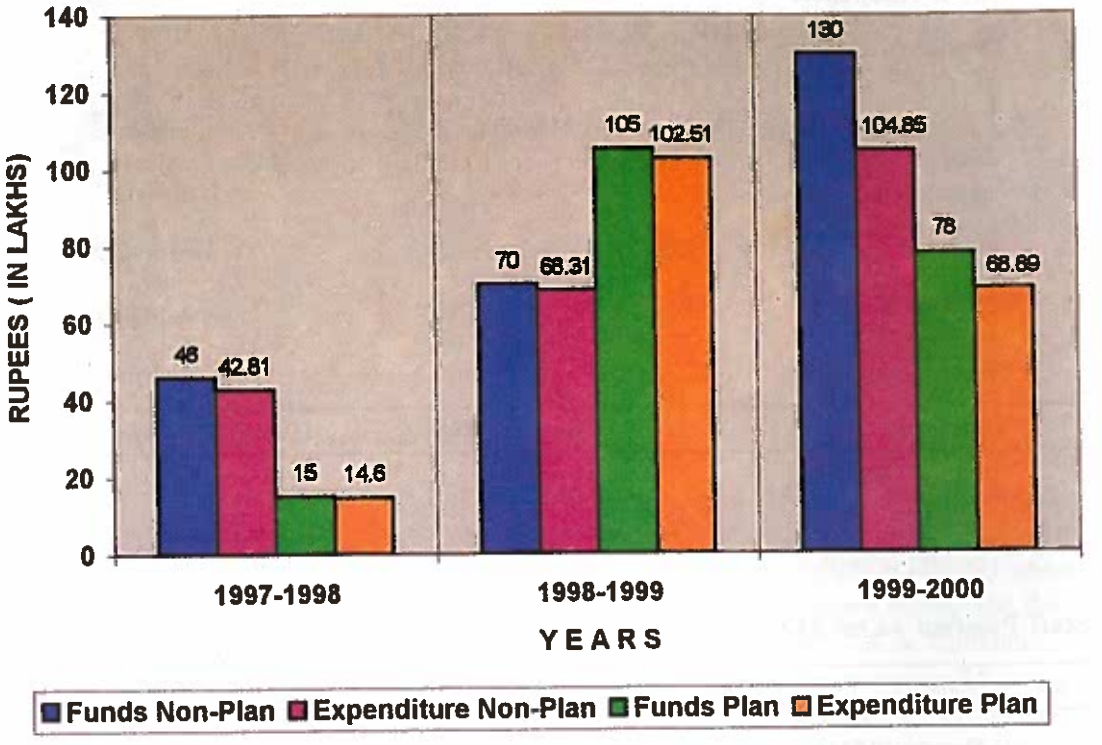
The institute has a skeleton extension wing which looks after the transfer of technology programmes and other farmer related activities.

National Agriculture Technology Project

The institute, as a lead centre is operating one NATP project on **"Evaluation of mahseer fishery potential in Himalayas and its conservation through artificial propagation"** This project has four co-operating centres viz., Pantnagar Agriculture

Financial Statement

Budget / Expenditure for the Year 1997-98 to 1999-2000



ABSTRACT

(Rupees in Lakhs.)

	Budget(RE)	Expenditure(upto 31.03.2000)
PLAN	130.00	104.85

Budget Statement for the year 1999-2000

(Rupees in lakhs)

Code	Head of Account	Budget (R.E.)		Expenditure	
		Plan	Non-plan	Plan	Non-plan
02	Pay & Allowances	-	64.00	-	56.48
06	Overtime Allowance	-	-	-	-
10	T.A.	3.00	0.90	2.39	0.88
15	Other charges including equipments	26.00	11.20	24.22	10.03
20	Works & Land	100.00	1.50	77.73	1.50
25	Other times Fellowship/ Scholarship/awards	1.00	0.40	0.51	
	Grand total	130.00	78.00	104.85	68.89

Staff Position as on 31.03.2000

S.No.	Category	Posts sanctioned	In position
1.	Director (R&M)	1	1
2.	Scientific	20	11
3.	Technical	14	11
4.	Administrative	14	09
5.	Supporting	18	17
	Total	67	49

RESEARCH ACHIEVEMENTS

PROJECT RAEM/A/1

ECOLOGICAL MODELING AND FISHERY ENHANCEMENT IN LAKES/ WETLANDS IN HIMALAYAN/SUB-HIMALAYAN REGION

Sub-project	Sustainable fishery development in Kumaon lakes
Personnel	K.K. Vass, H.S. Raina, C.B. Joshi, Yasmeen Basade
Duration	December 1998 - July 2003
Location	NRCCWF Bhimtal

Accomplishments

Water quality and primary production profile

The Kumaon lakes situated in the altitudinal range of 1400-1600 m asl covering water spread area of 385 ha approx, are generally alkaline in nature except for a brief period during summer months when bottom waters reflect slightly acidic pH values ranging from 6.4-6.8. The average pH values for the bottom waters during the study period ranged between 6.8-9.4 in Nainital, 6.4-7.4 in Sattal, 6.8-7.8 in Naukuchiatal and 6.8-7.4 in Bhimtal. The pH for surface waters was always above 7.0 with a maximum of 9.3 in Naukuchiatal lake. The maximum depth recorded in Naukuchiatal lake was 36.4 m followed by 24.0 m in Nainital, 23.0 m in Garurtal, 20.5 m in Bhitmal and 8.5 m in Sattal with the sechhi transparency, ranging between 0.65-1.20 m, 0.80.1.32 m, 4.89 m, 2.60-2.80 m and 1.18-2.30 m in the respective lakes. The thermal difference between surface and bottom water in these lakes was 3.5°C in Sattal, 3.0°C Naukuchiatal, 1.5°C in Bhimtal and 1.0°C in Nainital during spring (March), while during summer months (May), the temperature difference was high, registering 8.5°C in Sattal, 10.0°C in Nainital 8.0°C in Bhimtal, 12.5°C in Naukuchiatal and 9.0°C in Garurtal. A low water temperature of 7.5°C was recorded in Nainital lake during

The dissolved oxygen data indicated that surface water of Kumaon lakes was always well oxygenated. In surface water it ranged between 7.8-10.4 mg/l in Nainital, 8.0-8.8 mg/l in Sattal, 8.8-12.0 mg/l in Naukuchiatal, 8.2-9.6 mg/l in Bhimtal and 8.2-9.6 mg/l in Garurtal lake. The middle and bottom layers of these lakes, however, depicted lower concentrations of dissolved oxygen, ranging from 2.0-5.2 mg/l in Nainital, 1.2-6.0 mg/l in Sattal, 4.4-6.0 mg/l in Naukuchiatal, 3.59.6 mg/l in Bhimtal and 3.6-5.6 mg/l in Garurtal lake. It has been observed that during summer months, there was a sharp decline in dissolved oxygen values between surface to bottom, this drop in oxygen on an average was (5.0 mg/l) in Garurtal, (6.6 mg/l) in Nainital, (5.4 mg/l) in Naukuchiatal, (7.2 mg/l) in Sattal and 4.9 mg/l in Bhimtal, but the levels never dropped to anoxic values. However, the average variation in oxygen content during spring was 2.8 mg/l in Sattal, 5.0 mg/l in Nainital, 1.4 mg/l in Bhimtal and 7.0 mg/l in Naukuchiatal lake. The maximum variation in dissolved oxygen value of 7.2 mg/l was recorded in Sattal lake during summer months and 7.0 mg/l in Naukuchiatal lake during March. During the study period the free carbon-dioxide was not recorded in the surface waters of these lakes but in the middle and bottom layers, values ranged between Nil-5.6 mg/l with the maximum 4.0-5.6 mg/l in Naukuchiatal lake.

The total alkalinity values were estimated to be highest (312 mg/l) in the bottom layer of Nainital lake and the lowest (54 mg/l) in the surface water of Sattal during summer. During winter months the maximum (206 mg/l) and minimum (52 mg/l) concentrations were estimated in these lakes in the middle and surface layers, respectively. The seasonal difference in total alkalinity values in the surface and bottom layers in these lakes were 42.0 and 112.0 mg/l in Nainital, 32.0 and 30.0 mg/l in Sattal, 6.0 and 35.3 mg/l in Naukuchiatal, 18.0 and 50.0 mg/l in Bhimtal, 22.0 and 30.0 mg/l in Garurtal lake. Total dissolved solids and conductivity values were on the higher side in Nainital lake ranging between 77.6-328.4 mg/l and 153-656 µmhos/25.0°C, while the lower range of 43.4-74.0 mg/l and 96-152 µmhos recorded in Garurtal lake. The dissolved organic matter was usually recorded in bottom water with highest of 26.0 mg/l in Nainital lake and lowest of 8.0 mg/l in Naukuchiatal and Bhimtal lakes during spring.

The gross primary production of these lakes ranged between 20.8-312.5 mgC/m^3/hr in the euphotic zone and 31.2-333.3 mgC/m^3/hr in the surface. The highest value for primary production in surface water was recorded in Nainital lake ranging between 20.83-333.3 mgC/m^3/hr and the lowest range of 31.25-109.3 mgC/m^3/hr in Naukuchiatal lake during summer. But during spring months the gross primary production ranged between 15.6-48.8 mgC/m^3/hr in Nainital, 7.8-125.0 mgC/m^3/hr in Bhimtal and 31.2-

Biological profile

Phytoplankton

Plankton population in Kumaon lakes exhibited a tropical seasonality almost similar to sub-temperate situation, reflecting sub-tropical and tropical species characteristics and composition. The phytoplankton population in these lakes was mainly represented by Chlorophyceae followed by Bacillariophyceae, Dinophyceae and Cyanophyceae. The compositon of various groups in Nainital lake was 41.0% green algae, 36.0% diatoms, 8.5% dinophyceae and 1.7% blue greens, whereas in other lakes diatoms dominated phytoplankton populations contributing more than 50% of total plankton followed by green algae. The maximum density of phytoplankton ($7.5x10^4$ units/l) was recorded in Nainital while minimum ($2.1x10^4$ units/l) in Sattal lake. In Naukuchiatal lake the density was ($4.0x10^4$ units/l) while in Garurtal and Bhimtal it was ($2.3x10^4$ units/l) and ($3.6x10^4$ units/l) respectively.

The main taxa recorded among the phytoplankton were *Navicula, Amphora, Cymbella, Asterionella* and *Fragillaria* from bacillariophyceae; *Zygnema, Scenedesmus, Rhizogonium* and *Chaetophora* from chlorophyceae; *Oscillatoria, Anabaena* and *Rivularia* represented the cyanophyceae.

Zooplankton

The zooplankton population in these lakes mainly comprised rotifers, cladocerans and copepods in order of abundance. The maximum zooplankton density 110.0 units/l was recorded in Bhimtal and minimum of 49.0 units/l in Naukuchiatal. In Nainital, Sattal and Garurtal, the respective density was 86,73 and 78 units/l. The dominant forms encountered were *Asplanchna* and *Brachionus* among rotifers, *Daphnia longiremis* among Cladocerans and *Mesocyclops* and *Eucyclops* among Copepods.

Benthos & Macrophytes

In most of the samples from these lakes, Diptera, Ephemeroptera and Molluscan shells represented the macrobenthic fauna. In Nainital lake, however, the tubifax was the dominant group reflecting enrichment impact on the system. The macrobenthic population density in Kumaon lakes is set in the table as under.

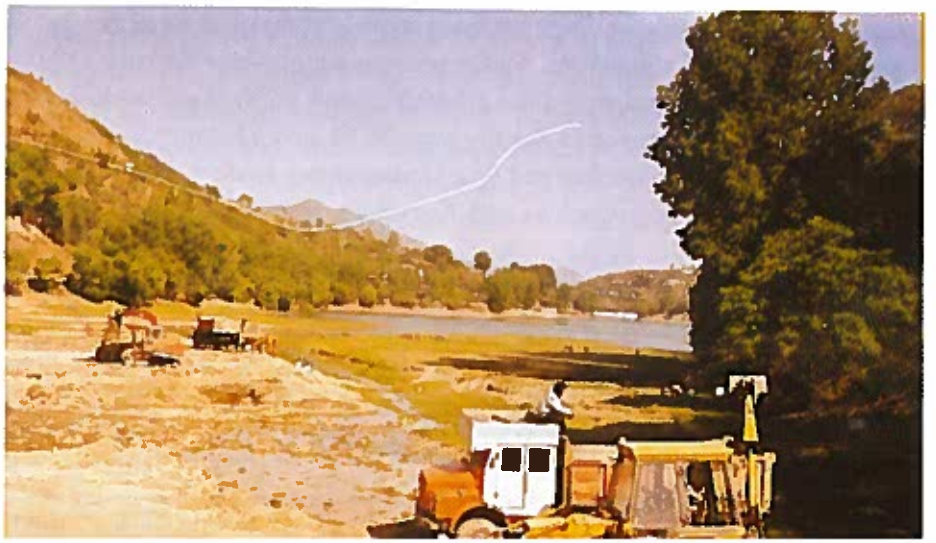
	Nainital	Bhimtal	Sattal	Naukuchiatal	Garurtal

The common macrophytes recorded in the littoral zone of Kumaon lakes are *Potamogeton, Myriophyllum, Ceratophyllum, Polygonum* and *Hydrilla*. The *Potamogeton* is dominant form in Nainital lake while *Myriophyllum* in Naukuchiatal and Bhimtal lakes and *Ceratophyllum* in Sattal and Garurtal lakes.

Fish & Fisheries

The fishing in the Kumaon lakes is mainly carried out by angling but gill nets are also operated by the State Fisheries Department. The Bhimtal and Sattal are contributing maximum to the catches in Kumaon lakes because of regular fishing using gill nets and angling. Among different species, *Tor putitora* is the dominant in the catches from Bhimtal, Sattal, Garurtal and Naukuchiatal contributing more than 54% followed by common carp. The introduced fishes like Chinese carps and Indian major carps are of late appearing in the catches contributing about 20% to biomass from these lakes while other species viz; *Schizothorax* sp. and *Tor tor* are insignificant and rarely recorded in catches but littoral zones of lakes have plenty of *Puntius conconius* and *Gambusia affinis*.

Size of golden Mahseer recorded in these lakes ranged between 300-485 mm in length and 320-1200 g in weight. In Bhimtal, Naukuchiatal and Sattal CPUE ranged between 35.0 to 510 g./man/hr. The fish production in these systems is of low magnitude which is estimated to range between 3.6 to 5.0 kg/ha/yr, in Nainital lake however, no major commercial fishery is recorded.



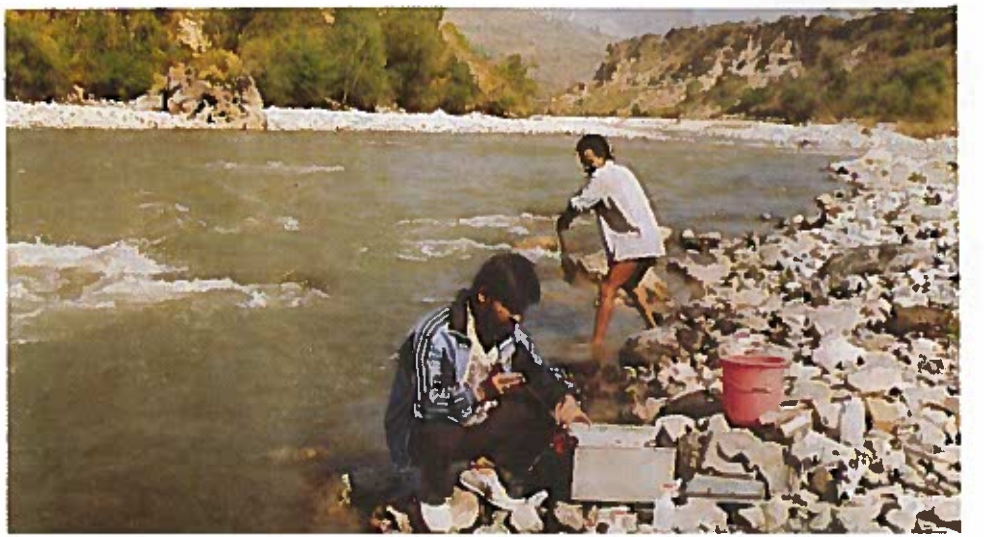
PROJECT RAEM/B/1

ESTABLISHMENT OF BASELINE INFORMATION WITH REGARD TO AQUATIC RESOURCE ASSESSMENT AND BIODIVERSITY WITH APPLICATION OF GIS

Sub-project	Resource assessment, ecology and aquatic Bio-diversity characteristics in Central Himalayas
Personnel	H.S. Raina, Shyam Sunder, K.D. Joshi
Duration	November 1998-October 2003
Location	NRCCWF Bhimtal and Champawat

Accomplishments

During the period under report the periodical surveys were conducted for resource assessment and aquatic biodiversity evaluation of various river systems and their important tributaries in Kumaon and Garhwal Himalayas. In all 29 sampling stations located on the rivers Kali, Gori, Dhauli, Saryu, Ramganga (E), Ladhiya, Kosi Western Ramganga, Alkananda, Pinder, Nandakini, Mandakini, Bhilangana, Bhagirathi, Tons, Song, Ganga and Yamuna, were investigated and significant differences were noticed in the bio-diversity at various river stretches.



Water quality

The water quality parameters analyzed from the upper riverine stretches were well within the tolerance limits and conducive for wide variety of fish species of coldwaters. At various stations in the Ganga and the Yamuna river systems in Garhwal Himalayas, the water quality was highly alkaline in reaction with a pH range of 8.0-8.4 but low values (7.2-7.4) were also recorded at some stations. The water temperature ranged between 12.0-22.5°C with high concentrations of dissolved oxygen ranging between 12.8 mg/l to 17.8 mg/l. The values of free carbon dioxide were negligible and generally ranged between nil-1.6 mg/l. The total alkalinity in these systems ranged between 36.0-60.00 mg/l, but in the river Song higher alkalinity of (110.0 mg/l) was recorded. The total dissolved solids in these rivers generally ranged between 46.7-93.1 mg/l except in river Song (tributary of river Ganga) and in river Tons (tributary of R.Yamuna) where TDS values were 164.3 mg/l and 186.4 mg/l, respectively. The corresponding specific conductivity values for these two subsystems were 329 and 373 µmhos/25.0°C, respectively. Among other parameters, the concentration of chlorides and dissolved organic matter ranged between 10.0-19.0 mg/l and 8.4-12.8 mg/l, respectively. The water flow rate for these streams ranged between 0.9-2.0 m/sec at various stations.

Biological profile

In the hill streams, benthic fauna is an important component of natural food for coldwater fishes. The benthic population both qualitatively and quantitatively reflects the productive potential of the stream in terms of fish diversity and likely production. The benthic density varied between 12-215 ind m^2 in Kumaon rivers and 22-418 ind m^{-2} in Garhwal rivers with their respective wet biomass ranging between 0.130-11.510 g m^{-2} and 0.475-23.530 g m^{-2}. The range of major benthic population structure in Kumaon and Garhwal river systems was, Ephemeroptera 1.6-42.0% and 2.0-37.7%, Trichoptera, 7.5-65.5% and 12.6-71.7%; Coleoptera, 2.1-23.2% and 1.7-21.6%; Odonata, 0.0-4.8% and 2.1-7.3%. A total of 37 taxa of benthic forms were recorded from Kumaon rivers while 29 from Garhwal waters. The dominant forms recorded in both the regions were *Iron, Epeorus, Caenis, Rithrogena, Heptagenia, Baetis* (Ephemeroptera), *Perla, Nemoura* (Plecoptera), *Elmis, Gyrinus, Helachares, Psephenus* (Coleoptera), *Leptocella, Rhycophila, Philopotamus, Hydropsyche* (Trichoptera), *Athrex, Chironomus, Simulium, Chaoborus* (Diptera) and *Enallagma, Gomphus, Cordulegaster* (Odonata).

population density. Similarly the epiphytic forms in these lotic systems, among planktonic forms, were dominated by diatoms followed by green algae, blue-green algae and miscellaneous forms. However, the population density contribution of chlorophyceae was more as compared to other groups. The bacillariophyceae was the main contributor to plankton diversity in these streams.

The zooplankton population was mainly represented by the members of Protozoa, Rotifera and Crustaceans in order of their abundance. The protozoa contributed more than 50% to population density in hill streams while the crustacean contribution was very low ranging between 1.5-6.5% in total zooplankton density.

Fish Diversity

Based on the experimental fishing and field observations in the local markets during the study, it was revealed that the CPUE (g/man/hr) ranged between 65-680 g and 95-746 g by experimental fishing in which 134-710 g and 97-816 g for cast net, 182-970 g and 207-851 g for gill net 120-1865 g and 205-1545 g for Surkajal and Nil -330 g and Nil -270 g for other local fishing methods, from Kumaon and Garhwal streams, respectively. The dominant fishery in Kumaon and Garhwal rivers were: *Tor putitora* 7.8-56.7% and 3.5-36.8%, *Schizothorax richardsonii* 21.1-88.9% and 28.8-100.0 and others 15.7-63.1% and 21.6-42.3, respectively. The other important species encountered were *Labeo, Garra, Barilius, Nemacheilus, Pseudecheneis, Glyptothorax, Mastacembelus* etc.

A total of 30 fish species were recorded during the survey, 16 from Kumaon and 20 from Garhwal rivers belonging to cyprinidae (8 and 11), cobitidae (4 and 6), Sisoridae (3 and 1), Channidae (nil and l), Homalopteridae (nil and l) and Mastacembelidae (l and nil). In Garhwal Himalayas, the upper reaches of the Yamuna at Naugaon (Barkot), lower zones of Nandakini at Nandprayag and Tons near Kalsi and lower zones of river Bhilangana, a tributary of river Bhagirathi at Tehri were observed to be the potential sites for snow-trouts, contributing more than 70% to the total fish catches. During the survey, the catches were dominated mainly by snow-trouts (170-240 mm in length and 55-280 g in weight) and followed by golden Mahseer (200-290 mm in length and 180-320 g in weight).

It was observed that large number of unemployed youth engage themselves in subsistence fishing in this area and earn some livelihood for their families. The local

PROJECT AFE/B/1

CONSERVATION AND PROPAGATION OF THREATENED AND VULNERABLE FISH SPECIES

Sub-project	Propagation and development of culture system for Schizothoracids
Personnel	K.K. Vass, Shyam Sunder, C.B. Joshi, K.D. Joshi
Duration	August 1998—March 2003
Location	NRCCWF Bhimtal and Champawat

Accomplishments

To generate database on resource potential and population structure of snow-trout fishery in the Himalayan uplands, consequtive surveys were undertaken during the year in Kumaon and Garhwal region of U.P. hills. Sampling was conducted at Dharchula, Jhulaghat, Amori, Lohaghat, Charma and Jauljibi in river Kali; Madkot in R. Gori; Someshwar, Nankosi and Ramnagar in river Kosi; Bagheshwar, Kapkot and Ghat in river Saryu; Thal and Nachni in river Ramganga (E); Mehalchaura, Kedar, Gagas, Bhikiasain and marchula in Western Ramganga (Kumaon) and Nand Prayag, Rudraprayag and Karnaprayag in river Alaknanda; Rishikesh, Doiwala and Tehri in river Ganga and Barkot and Kalsi in river Yamuna (Garhwal).

Snow-trout fishery

Based on experimental fishing conducted at different sampling stations, *Schizothorax richardsonii* was found dominating throughout, contributing 52.6-92.7% to the total catches in rivers from Kumaon region whereas in Garhwal rivers its contribution in catches was 46.5-94.8%. The CPUE value (g man^{-1} hr^{-1}) in Kumaon and Garhwal regions varied from 44-392 g and 75-472 g with respective weight frequencies in the range of 45-295 g and 210-615 g. The Mahseer, *Tor putitora* another important constituent of hill fishery contributed 4.8-32.5% to catches in Kumaon rivers and 2.9-24.3% in Garhwal. The other species in catches were small sized fishes of lesser economic importance.

The catches of local fisherfolk were also examined during the survey. The pooled

from these fishing methods, constituted 82-91% to the total catches. The snow-trout fishery was found to be more dominant in the upper reaches of the rivers both in Kumaon and Garhwal region.

Snow-trout seed resources

A number of potential sites for fry and fingerling collection of *S.richardsonii* were located and pin-pointed in various rivers and their tributaries in Kumaon as well as in Garhwal region. The maximum seed availability was estimated in river Ramganga (E) registering a density of 51-117 nos. m^2 followed by 22-87 nos. m^2 in its tributary, the Bhujbal stream at Nachni. The other important seed collection centres alongwith their quantification are Quarali at Amori (9-21 m^2), Lohawati at Lohaghat (11-29 m^2), Nankosi at Kamleshwar (10-32 m^2) Binnau at Kedar (11-37 m^2), Gagas at Gagas (5-16 m^2), Gori at Madkot and Jauljibi (9-32 m^2), Saryu at Ghat (8-25 m^2), Tons at Kalsi (17-32 m^2), Bhilangana at Tehri (18-29 m^2) and Pinder at Karanprayag (27-41 m^2).

Water quality

The water quality details estimated during the survey are depicted in the following table.

Parameters	Kumaon (streams)	Garhwal (streams)
Water temperature(°C)	10.0-24.0	12.0-22.5
Water flow rate(m/sec)	0.2-2.8	0.4-1.8
pH	7.3-8.6	7.2-8.4
Dissolved oxygen(mg/l)	7.4-8.6	10.2-11.4
Free carbon-dioxide(mg/l)	0.0-2.2	0.0-1.6
Total alkalinity(mg/l)	50.0-156.0	36.0-111.0
Chlorides(mg/l)	10.0-15.2	10.0-20.3
TDS(mg/l)	57.5-156.6	46.7-186.1
DOM(mg/l)	7.6-10.5	8.4-12.8

Rearing of Snow-trout

Rearing experiments using *S. richardsonii* seed were carried out in cemented ponds at Chairapani Fish Farm, Champawat. The fishes stocked during the first week of April 1999 with different initial average weight of 16.2 g, 29.2 g and 123.1 g grew to final average weights of 27.8 g, 49.5 g and 154.4 g, respectively, under different treatments. The respective net weight increment and survival rate at the end of the experiment was 11.6 g and 69.2%, 20.3 g and 70.8% and 31.3 g and 70.7%. The experiments revealed that snow-trout is a very slow growing fish and its growth was further conditioned during the colder months (November-February) when water temperature decreases to 5.0°C or below resulting in drastic reduction in feeding potential of the fish. The monoculture of fish does not seem to be holding promise for table size rearing.

PROJECT AFE/A/2

CONSERVATION AND PROPAGATION OF THREATENED AND VULNERABLE FISH SPECIES

Sub-project	Nutrition and feed development for upland fishes with focus on indigenous species
Personnel	Madan Mohan, S.K. Bhanja, Suman Kapila, Yasmeen Basade
Duration	August 1998-July 2003
Location	NRCCWF Bhimtal and Champawat

Accomplishments

During the period under report, feeding trials with two test diets i.e. CIFACA (carp feed developed by CIFA, Bhubaneshwar) and NRCCWF-I (formulated by NRCCWF) on golden Mahseer, *Tor putitora* and Snow-trout, *S. richardsonii* were conducted. Trials on replacement of casein with fishmeal and impact of chitin on fish growth were also carried out, which were followed by analysis of digestive enzyme profile after completion of experiments.

Feeding trials on Mahseer fry

that among the two test diets the NRCCWF-I feed resulted in higher weight gain in all the three sets with highest specific growth ratio. Feed conversion efficiency and survival rate was also better in NRCCWF-I feed as compared to the CIFACA feed. Further, it has also been observed that the net weight gain and specific growth rate was highest in the fishes reared at low density (0.15 g/l) for both the diets. Feed conversion ratio was also better at lower density except in case of CIFACA fed fishes, where FCR and consequently FCE were better at 0.25 g/l density. The digestive enzyme profile depicted a significant increase in the amylase activities in the fishes fed with both the test diets. In CIFACA fed fishes the increase was 4.18 folds against 3.45 folds in the fishes fed with NRCCWF-I. The increase in protease activity was 3.0 and 2.5 folds in fishes fed with NRCCWF-I and CIFACA feeds, respectively.

At Chirapani fish farm the feeding trials were conducted with golden Mahseer and snow-trout. The Mahseer fed with NRCCWF-I feed recorded significantly higher weight gain, specific growth ratio and feed conversion ratio as compared to CIFACA feed. Though the increased amylase activity in the gut was observed with both the test diets but it was significantly higher in the fishes fed with CIFACA feed. However, the digestibility of protein and fat was significantly higher in NRCCWF-I as compared to CIFACA.

Proximate composition of test diets

Composition(%)	NRCCWF-I	CIFACA
Crude protein	50.80	30.00
Crude fat	15.30	9.00
Nitrogen free extract	21.30	35.53
Crude fibre	4.40	10.00
Total ash	8.20	15.47
Metabolizable energy (K cal/g)	4.84	3.80

Impact of Chitin incorporated diet

To observe the impact of Chitin on the growth of Mahseer fry, an experiment was

Trial on Casein replacement

The experiments were conducted with a different formulated test diet in which 50% casein was replaced with fishmeal in the NRCCWF-I diet and named as NRCCWF-II feed. This replacement resulted in change in the chemical composition, recording 6% decrease in crude protein level in NRCCWF-II feed. The chemical composition was: crude protein 45.35%, fat 16.00% nitrogen free extract 22.65%, ash 9.50% and crude fibre 6.50%. These short term experiments revealed higher weight gain, body length and specific growth ratio in the fishes fed with NRCCWF-I as compared to the fishes fed with NRCCWF-II, however, feed conversion ratio was higher with NRCCWF-II diet.

PROJECT AFE/A/3

DEVELOPMENT OF TECHNOLOGY FOR RUNNING WATER AQUACULTURE IN HILLS WITH EXOTIC SPECIES

Sub-project	Propagation and farming of exotic carps in uplands
Personnel	B.C. Tyagi and K.D. Joshi
Duration	April 1998 - March 2000
Location	NRCCWF Bhimtal and Champawat

Accomplishments

During the year under report, concluding set of experiments on polyculture of Chinese carps were performed at experimental farm. Four raceways (150 m^2 each in area) were stocked with *Hypophthalmichthys molitrix* (35%) *Ctenopharyngodon idella* (30%) and *Cyprinus carpio* (35%) at two density levels 1.5 and 2 fish m^2. The supplementary feed consisting of 40% oil cake, 20% rice polish, 20% wheat bran and fish meal and soyaflour 10% each was provided in dough daily@ 2-3% of their body weight. In one cemented pond soil-bed was provided and fertilization carried out@ 1241-2731 kg/ha/yr, urea 37-57 kg/ha/yr and lime 120-150 kg/ha/yr. The physico-chemical characteristics of pond water were recorded at monthly intervals. The feeding of *Ctenopharyngodon idella* was carried out using terrestrial weeds available in the farm especially grasses based on their seasonal availability

fertilization. The individual fingerling stocked in this pond were also on an average, double the weight as compared to fingerlings stocked in other ponds, thus recording higher growth through better utilization of feed. The individual Specific Growth Rate was also higher in all the species viz; silver carp 0.64, grass carp 0.80, and common carp 0.89 g/day.

The total estimated biomass was (2313 kg/ha/yr/196 days) at stocking density of 2 fish m^{-2} but growth/day decreased. Once again, the earlier observations have been confirmed that stocking density between 1.0-1.5 fish m^{-2} was quite appropriate where fish can attain 185-300 g weight in one season (April-October). The stocking ratio of different species can be further adjusted according to specific management practice and agro-climate of the area.

It has been confirmed from the experiments conducted so far that water temperature acts as a constraint in growth performance of fish at higher altitudes. The maximum growth rate was recorded during May to August (19.0-25.5°C) and it decreased as the water temperature dropped from September onwards, even registering negative growth in peak winter.

The feed conversion ratio (4.2) was better in pond stocked with bigger size group of fishes and also receiving regular fertilization. The feed efficiency ratio was high 3.73 at higher stocking density of 2 fish m^{-2} in comparison to 5.2 ratio obtained at lower stocking density of 1.5 fish m^{-2}, keeping the feeding rate constant.

The results of rearing experiments conducted at higher altitute (1620 m asl) during last couple of years and after having pilot tested the farming practice between 1998-2000, have enabled NRCCWF to develop farming system based on exotic carp combination suitable for the mid-Himalayan region.

The experiments conclusively reveal that the three exotic carps viz.; Common carp, Silver carp and Grass carp are suitable for Aquaculture in lower and mid Himalayan region. Better management practices involving judicious stocking rate, right species ratio, adequate feeding in quantity and quality with suitable doze of fertilizers, the fish can be grown to 300-400 g in one season between April to October. Fish production can be further enhanced if the fishes are reared in earthen ponds of 400 m^2 or more in area.

Maturation & Breeding

Common carp

Cyprinus carpio did not register any problem in its maturation, breeding and fry production at the farm. Sufficient brood stock of good size (0.5-1.0 kg) is available to produce 8-10 lakh spawn but at present 30-40 thousand fry are being produced as sufficient rearing space is not available in the farm. Attempts are also on, to breed the species in May and again in September/October every year.

Silver carp & Grass Carp

Since the experimental farm is stream fed, the low water temperature during winter (5-12.0°C) and below optimum during other seasons significantly affects the growth and maturity of grass carp and silver carp. These species under farm conditions have attained the size of 2-2.5 kg and 1-1.5 kg but have not matured even at 5+ yr. age. The other reasons contributing against their maturity could be higher biomass of brood fishes stocked in ponds of smaller area and lower availability of natural food because ponds are cemented and not earthen. The problem is being addressed by overcoming the management problems and use of sex hormones. At present, ovaprime (LHRH analogue) is being administered to 5+ yr. age brood stock @ 0.1 ml/kg at 20 days intervals. Brood fishes of 2,3 and 4 yars of age are also being reared for developing future brood stock.

PROJECT TOT/E/1

TECHNOLOGY DISSEMINATION TO THE CLIENTS THROUGH PILOT SCALE TESTING AND DEMONSTRATION PROGRAMME

Sub-project	Demonstration of exotic carp farming in coldwaters
Personnel	B.C. Tyagi, S.K. Bhanja and Suman Kapila
Duration	June 1998 to March 2000
Location	NRCCWF Bhimtal and Champawat

Accompoishments

The demonstration of exotic carp farming in coldwaters of Kumaon himalayan region continued in 15 ponds located in the districts of Nainital (Bhimtal block) and Champawat (Pati block) for the period under report. Two fish ponds have been harvested completely in Bhimtal block and fish production to the level of 1098 and 4778 kg/ha/yr was obtained indicating importance of management practices. One pond at Ghorakhal was partially harvested by netting out 104 kg fish (expected 234 kg fish biomass) for consumption.

The ponds under demonstration were located at different altitudes, had 3, 4 and 5 species combination at varied densities ranging from 2-5 fish m^2 and subject to different management practices. Fish production, of course, is a complex process but two variables namely water temperature because of altitudinal range and management practices adopted, influenced the fish growth, survival and fish production (Table).

Results achieved in farmers ponds under demonstration programme

Pond name	Altitude masl	Area m^2	No. of species	Density No. m^2	Stocked biomass (kg)	Survival recorded (%)	Biomass harvested/ estimated (kg)	Net production estimated kg/ha/hr
Dogaon	800	62	5	4.0	0.92	86.9	54.0	4778
Vohrakum	1360	24	4	4.0	1.27	86.0	12.2	2541
Nisola	1380	90	4	3.0	24.5	89.0	74.4	5544
Nisola	1380	350	4	3.0	82.8	71.4	169.1	2959
Birla	1400	1056	4	3.0	4.24	41.5	100.8	1098
-do-	1400	1056	4	2.3	42.6	64.3	165.4	1268
Gethia	1280	180	4	4.0	1.98	88.9	88.5	2813
Ghorakhal	1440	486	5	2.0	7.33	87.5	234.2	2800
-do-	1440	400	5	2.0	29.1	87.0	279.5	4846
PG Toli	1640	84	3	5.0	3.7	55.9	64.7	4357
KN Toli	1640	30	3	5.0	0.65	48.6	25.9	5040
-do-	1640	56	3	3.0	0.96	85.4	20.7	3524
-do-	1640	42	3	3.0	1.13	87.3	16.8	3730
PR Champawat	1660	40	3	4.0	1.0	87.5	15.1	2490

Based on various indices, fish biomass and production was estimated. The mean fish production for all the ponds was estimated at 3403 kg/ha/yr being 3183 and 3735 kg/ha/yr in Bhimtal (9 ponds) and Pati (6 ponds), respectively. According to the management practice adopted a lowest production of 1183 kg/hr/yr was estimated in ponds receiving no feeding but fertilized with RCD, urea and lime in moderate dozes. Fish production increased after using supplementary feed at different rates indicating direct correlation between feed and production. Fish production was higher ranging from 3544-4778 kg/ha/yr when feed was given @ 3% of their body weight apart from regular fertilizer application. Grass carp performed better in ponds having good macrophytic vegetation but silver carp ranked 2nd and 3rd in fertilized ponds. Common carp performed well in cemented ponds but better in earthen ponds. Fish stocking density affected the total biomass and individual growth rate i.e. higher density led to higher biomass but slow growth. Two fish m^2 seems to be appropriate density in these ponds. Fast growth and higher production was recorded at lower altitude. However, the adverse impact of climate could be reduced by utilizing summer months efficiently and providing higher doze of supplementary feed and fertilizers.

The results obtained revealed that polyculture of chinese exotic carps in mid Himalayan region is viable and can help in increasing fish production and generating extra income apart from providing opportunities to conserve and manage the water resources. However, the constraints are inadequacy of funds for constructing fish ponds, less availability of quality fish seed and application of appropriate management practices to offset the adverse climatic impact, but they have to be addressed at scientific and administrative level.

TECHNOLOGY ASSESSED AND TRANSFERRED

Extension Activities

World Environment Day

The World Environment Day was celebrated on June 5th, 1999 at this institute focussing the theme of *"Our Earth-Our Future-Just Save it"*. The main function was organized at the NRCCWF Experimental Farm, Champawat. The programme was inaugurated by Shri Navin Chandra, District Magistrate Champawat and was attended by other district authorities, development departments, educational institutions, farmers, NGOs working in the area apart from students and teachers from schools, colleges and local residents. In his remarks the chief guest, Shri Chandra, emphasized the need to conserve and manage the natural resources in general and aquatic resources in particular. He complimented the NRCCWF for taking this initiative in this remote hilly region for organizing this programme. The Director of the institute also addressed the gathering.

To generate awareness about the environmental issues a drawing competition was organized for the students of local schools on the topic "Aquatic Environment - Necessity of Man". The Institute activities were also highlighted through exhibition and demonstration of fish culture activities on the occasion.

Aquaresources

The institute on the occasion of International Conference on "Tropical Ecosystem : Health, Conservation and Management "organised between October 25-30, 1999 at Nainital participated in the "Aquaresources Exhibition. "The stall set-up by NRCCWF depicted the activities of the institute in the field of coldwater fisheries and hill aquatic resources management. The institute stall attracted large number of both national and international visitors who evinced keen interest in the presentations. Dr. D.K. Tewari, Member Science & Technology, Planning Commission. Govt. of India visited the stall and appreciated NRCCWF activities.

Aqua-fair

Institute participated in Aqua-fair held at CICFRI, Barrackpore between December 22-23, 1999 on the occasion of "National Seminar on Eco-friendly management of resources for doubling fish production - Strategies for 21st century". The NRCCWF stall at the fair was a good attraction for a large number of visitors.

Fishennium - 2000

The institute participated in the exhibition "FISHENNIUM-2000 organized on the occasion of 5th Indian Fisheries Forum & Seminar held at Bhubaneshwar during January 17-20, 2000. The NRCCWF stall was visited by many national and international participants of this forum.

Farmer—Scientist interaction

The Champawat centre of NRCCWF participated in 'KRISHI GOSHTI EVAM NIVESH MELA' organized by the district administration between February 22-25, 2000 at block head quarters, Champawat, Lohaghat and Pati.

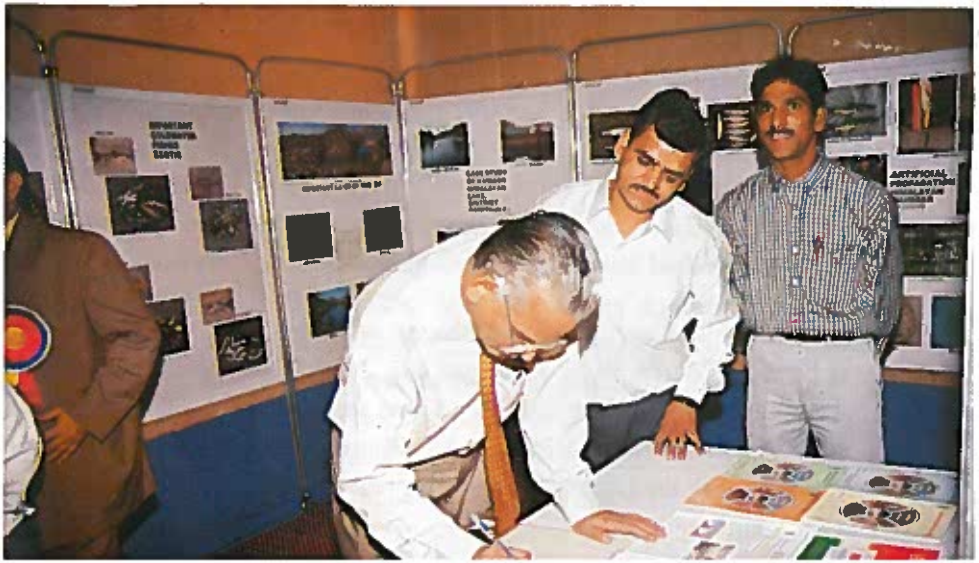
Awareness

Dr. Shyam Sunder, Senior Scientist delivered a talk highlighting the management and rehabilitation initiatives taken by NRCCWF to conserve stocks of golden mahseer. The talk was telecast by Doordarshan under the programme "EARTH MATTERS".

International Angling Festival

The NRCCWF organised series of exhibitions at Champawat, Lohaghat, and Pancheshwar between March 30,31 and April 6-7, 2000. These coincided with the international angling festival. The exhibition was inaugurated at Champawat on March 30, 2000 by Smt. Jayanti Chandra, IAS, Commissioner of Kumaon region. She took keen interest in the Coldwater fisheries research activities of the institute displayed at the venue.

Exhibition of NRCCWF activities at Champawat



Scientist-Farmer interaction at Champawat

EDUCATION AND TRAINING

Shri Baldev Singh (T-I-3) attended the training programme on Computer Application in Libraries and Information Centres organized by the National Academy of Agricultural Research Management, Hyderabad from August 17-27,1999.

Dr. K.K. Vass, Director delivered lecture on "Bio-monitoring-An effective tool in EIA studies" in the summer school on Ecology, Fisheries and Fish stock assessment in context of Indian rivers at CICFRI, Barrackpore on August 11, 1999.

A basic training on "Fish farming in hill regions" was organised for 25 farmers including 10 women belonging to Thal, Muwani, Munsyari blocks in the Pithoragarh district between March 24-26, 2000 at our Chirapani experimental fish farm.

Shri Ashok Kumar Nayak, Scientist (Computer Application) attended a course on "Internet Usage in Agriculture" organized by NAARM, Hyderabad during March 27 to April Ist, 2000.

AWARDS AND RECOGNITION

Shri Madan Mohan, Principal Scientist, was awarded Ph.D. degree in Zoology by the CCS University, Meerut on the topic "Pre-impoundment bio-ecological Characteristics of river Gaula in Kumaon Himalayas" in March, 2000.

The Association of Aquaculturists, Bhubneshwar, India during 5th Indian Fisheries Forum Meet held between January 17-20, 2000 conferred a Honorary Fellowship to Dr. K.K. Vass for the year 2000 in recognition of his contribution to aquaculture and Fisheries Science.

LINKAGES & COLLABORATION IN INDIA AND ABROAD INCLUDING EXTERNALLY FUNDED PROJECTS

- National Agriculture Technology Project (NATP) on Mahseer fishery has been initiated with NRCCWF as Lead Centre and four co-operting centres spread along Himalayan region.
- The import of better strain of *Cyprinus carpio* through NACA is being finalized so that the existing germplasm could be replaced with faster growing strain.
- The cryopreservation programme for conservation of Mahseer, *Tor putitora* in collaboration with NBFGR, Lucknow was continued for current year also.
- As usual the Mahseer breeding, its seed production and ranching programmes are being continued in collaboration with U.P. State Fisheries Department.
- The institute has also developed linkage with Department of Fisheries, Govt. of Himachal Preadesh with regard to rainbow trout.
- The institue has developed strong linkage with CIFA, Bhubaneshwar with regard to pilot scale production of coldwater fish feed.
- The NRCCWF has established linkage with DRDO, Pithoragarh in connection with fishery development initiatives in hills.
- The institute has established strong linkage with Sainik School, Ghorakhal with regard to transfer of technology programme for Aquaculture in hills with a focus on exotic carps.
- The NRCCWF established a linkage with CSWCR & TI, Dehradun with regard to use of watershed programmes in fishery development.

LIST OF PUBLICATIONS

Book Chapters

Raina, H.S. 1999. Coldwater fish & Fisheries in Indian Himalayas: Lakes & Reservoirs, In FAO, Tech. Paper No. 385, Rome. Fish and fisheries at higher altitude, Asia. pp. 64-88.

Vass K.K. 1999. Aquatic Pollution and its impact on Fish and Fisheries. pp. 1-15 NCERT publication.

Vass, K.K. 2000. Coldwater fisheries Research in India. Fifty Years of Fisheries Research in India. (Eds.K.Gopakumar, B.N. Singh & V.R. Chitranshi). pp. 114. ICAR Fisheries Division Publication.

Vass, K.K. 2000 Strategy for Hill fisheries Development and Aquatic Resource Management. Ibid. pp. 190.

Research Articles

Vass, K.K. 1999. Bharat mein sheetjal matsya vikas hetu bhavi niti (Hindi).pp. 7-18. In 21st shatabdi mein matsyaki anusandhan evam vikas hetu sambhavit dishayaen, CICFRI Barrackpore.

Popular Article

Vass, K.K. 1999. Achievements of National Research Centre on Coldwater Fisheries. Fishing Chimes. Vol. 19; No. (2) : 23-27.

Papers presented in Symposia/Sminar/Workshops

Kapila, Suman *et. al.* 1999. Impact of pH on haematology and serum Enzyme activities in a coldwater fish, *Schizothorax richardsonii.* National Symposium on Sustainable Develpment of Fisheries towards 2020 A.D.-Opportunities and Challenges, April 21-23, Cochin.

Tyagi, B.C. *et.al.* 1999. Impact of species introduction on fishery of Central

Madan Mohan 1999. Phytoplankton dynamics in a Kumaon Himalayan Lake. Abst. No. 168. *Ibid.*

Kapila, R.; S. Kapila & Yasmeen Basade 1999. Abst. No. 161 *Ibid.*

Vass, K.K. 1999. Fishery and Aquatic Resource Management in Himalayas. pp. 1-11. Keynote lecture at the National Symposium on Aquatic Bio-diversity & Emerging Trends in Freshwater Biology, Garhwal University, Garhwal.

Tyagi, B.C., Kapila, S. & Bhanja, S.K. 2000. Development of carp culture Technology and its adoption in Kumaon Himalayas. Abst. No. 32 National Conf. Fisheries Economic-Extension & Management, Mumbai.

Madan Mohan 2000. Cultural possibilities of coldwater fisheries in North-Eastern Hill region of India. Abst. No. 44. Workshop on North-East India fish Germplasm. Feb. 10-11, Shillong, Meghalaya.

Vass, K.K. & Raina, H.S. 2000. Prospects and problems of angling tourism with regard to Golden Mahseer in India. Abst. No. 10. National workshop on Bio-diversity and conservation of Aquatic Resources with respect to threatened fish-Mahseer. February 26-27, Bhopal.

Joshi, C.B. 2000. Status and distribution of mahseer in himalayas with reference to some conservation strategies. Abst. No. 23 Ibid.

Sunder, S. & H.S. Raina, 2000. Mahseer Fishery in Central himalaya-a review. Abst. No. 50 Ibid.

Joshi, K.D. 2000. Composition of Golden Mahseer, *T. putitora* in some lotic systems of Kumaon hills. Abst. No. 54 Ibid.

Bhanja, S.K. et. al. 2000. Study on effect of supplemental vitamins on growth and survival of golden mahseer. Abst. No. 44 Ibid.

Joshi, K.D. 2000. Artifical breeding of an important Himalayan Cyprinid, *Schizothorax richardsonii* (Gray). Abst. No. AQ4 Fifth Indian Fisheries Forum, January 17-20, CIFA, Bhubneshwar.

Special publications

Vass, K.K. 1999. Status of Coldwater Fisheries Research & Management in India.

Joshi, K.D. 1999. Kumaon mein matsya palan evam sanrakshan, NRCCWF Bulletin No. 4. pp. 22, Bhimtal.

Vass K.K. 2000. NRCCWF Profile, Pamphlet No. 2. Bhimtal.

Joshi, C.B. 2000. Flow-through hatchery for Mahseer, Pamphlet No. 3 Bhimtal.

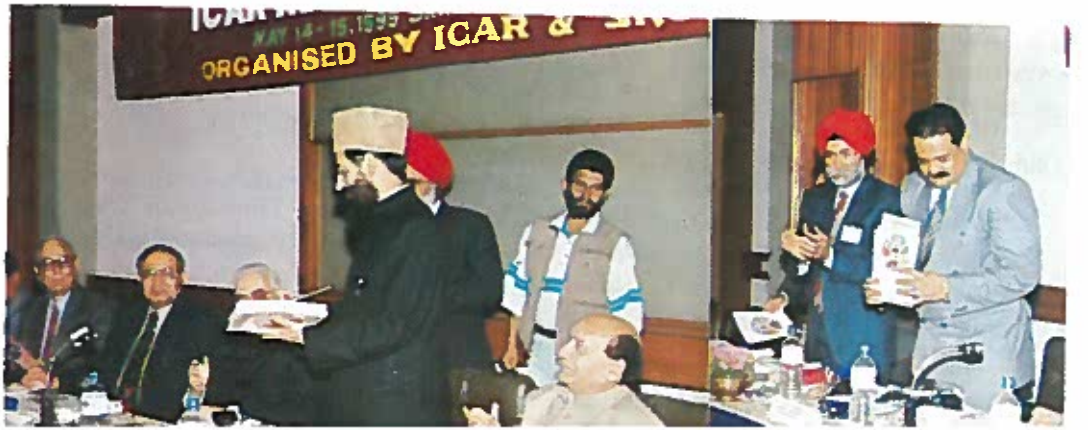
Basade Yasmeen 2000. Wetlands of Kumaon, Pamphlet No. 5. Bhimtal

Kapila, Suman 2000. Streams of Kumaon, Pamphlet No. 6. Bhimtal

Sunder, S. 2000. Himalayan Environment & Fishery. Pamphlet No.7. Bhimtal

Special Releases

The Institute's publications entitled "Himalayan Mahseer" and "Fishes of Indian Uplands" were resepctively released by the Honourable Minister of Animal Husbandry and the Honourable Minister of Agriculture, J & K Government during the inaugural function of ICAR Regional Committee No. I meeting held at Srinagar on May 14, 1999. The other dignitaries present on the occasion were Honourable Dy. Chief Minister of J & K Government, the Honourable Minister from Himachal Pradesh, the Secretary DARE & DG, ICAR, Vice Chancellor, SKUAST, Srinagar and Agriculture Production Commissioner, J & K Government.

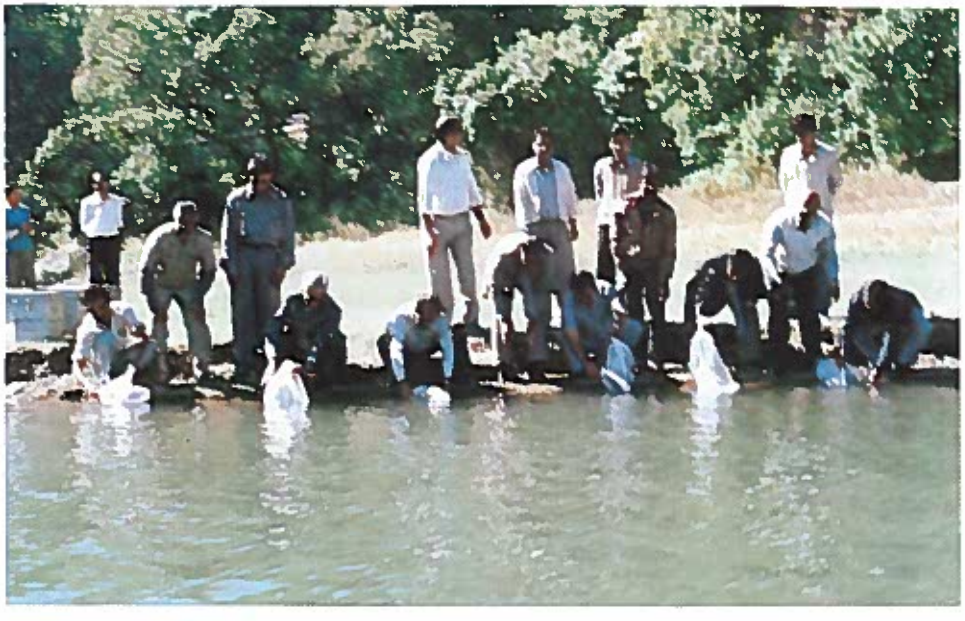


LIST OF APPROVED ON-GOING PROJECTS

Project No.	Title of the project
RAEM/A/1	Ecological modeling & fishery enhancement in lakes/ wetlands in Himalayan/Sub-Himalayan region.
RAEM/B/1	Establishment of baseline information with respect to aquatic resource assessment and bio-diversity with application of GIS.
AFE/B/1	Conservation and propagation of threatened and vulnerable fish species
AFE/A/2	Nutrition and feed development for upland fishes with focus on indigenous species.
AFE/A/3	Development of technology for running water aquaculture in hills with exotic species.
TOT/E/1	Technology dissemination to the clients through pilot scale testing and demonstration programmes

CONSULTACY, PATENTS, COMMERCIALIZATION OF TECHNOLOGY

The Institute has highlighted technology on the design and working of flow-through hatchery for Mahseer seed production, in a technology book, recently released by the Engineering Division of ICAR.



Members of RAC releasing hatlings produced Mahseer seed in Bhimtal lake

RAC, MANAGEMENT COMMITTEE, SRC, QRT ETC. MEETINGS

Staff Research Council

The Staff Research Council (SRC) meeting of the Institute was held on May 11, 1999 under the chairmanship of the Director to evaluate the progress made under various projects during 1998-1999 and new project programmes for the year 1999-2000 were finalized.

Management Committee

The fifth meeting of the Institute Management Committee was held on August 9,1999 at Bhimtal under the chairmanship of the Director NRCCWF in which various agenda items were discussed and decisions taken for smooth functioning of the institute. The following members of the committee attended the meeting.

Dr. K.K. Vass	Director NRCCWF Bhimtal	Chairman
Dr. V.R. Chitranshi	Senior Scientist (IF) ICAR HQ	Member
Dr. Shyam Sunder	Senior Scientist NRCCWF, Bhimtal	Member
Dr. B.C. Tyagi	Senior Scientist NRCCWF, Bhimtal	Member
Dr. H.S. Raina	Principal Scientist & Head of Office,	Member Secretary

Hindi Committee

Regular quarterly meetings of Hindi Implementation Cell were held during the period. The committee reviewed the progress made by the Institute in use of Hindi as an official language.

A three member team led by Shri A.K. Joshi, Deputy Director, Hindi Implementation Commitee of ICAR, New Delhi visited the Institute during August 6-9, 1999. The team was apprised about the Hindi activities and the efforts made by the Institue to promote the use of Hindi in various official and scientific activities. The team members appreciated the initiatives taken by the Institute for promotion of 'Rajbhasha'.

IJSC meeting

Regular quarterly meetings of IJSC were held on 3.4.1999, 29.6.1999 and 1.10.1999 under the chairmanship of the Director in which various issues related to staff welfare and other activities were discussed and implementation of previous decision reviewed in detail.

Sports meet

A team of eight members of staff from NRCCWF Bhimtal participated in ICAR Zonal Sports meet held at National Dairy Research Institute (ICAR), Karnal between November 29 to December 2nd, 1999. The team participated in different events.

Research Advisory Committee

The second meeting of Research Advisory Committee was held on October 7 & 8, 1999 at Bhimtal under the Chairmanship of Dr. S.P. Ayyar. Following members of the committee alongwith the scientists of NRCCWF participated in the meeting.

Dr. S.P. Ayyar	Ex-Director, CIFRI, Barrackpore	Chairman
Dr. M. Shahul Hameed	School of Industrial Fisheries, Cochin University	Member

Prof. S.K. Garg	CCS Agriculture University Hisar, Haryana	Member
Prof. K. Chatterjee	NE Hill University, Shillong	Member
Dr. B.N. Singh	ADG(IF) ICAR New Delhi	Member
Dr. K.K. Vass	Director NRCCWF	Member
Dr. H.S. Raina	Principal Scientist NRCCWF	Member Secretary

The committee evaluated the action taken report, critically reviewed the progress achieved under various project programmes and lent its approval for the projects approved by the Staff Research Council. The committee also suggtested/proposed various recommendations for further improving the research facilities for the institute. The committee was very much satisfied with the progress achieved by the institute despite various constraints.

Quinquennial Review Team

The ICAR has constituted a Quinquennial Review Team for NRCCWF vide order No. 8(6)/99-IA (VI) dated 13.10.1999 to assess the research and other achievements for the period between 1994-1998. The team will take-up the review under the Chairmanship of Dr. M.Y. Kamal, Vice-Chancellor, Sher-e-Kashmir University of Agricultural Science & Technology. The other members of the team are Prof. D.P. Zutshi, Ex-Director CORD, Kashmir Univeristy; Prof. C.S. Singh, Ex-Dean, G.B. Pant Agricultural University, Pantnagar; Prof. H.R. Singh, Dean Science faculty, Allhabad University; and Shri K.K. Chaudhary, Director Fisheries, Govt. of Arunachal Pradesh. The preliminary meeting between the Chairman, DDG (Fy) ICAR and the Director NRCCWF was held on November 19,1999 to finalize the basic modalities for conduct of review. The memorandum prepared by the institute has been submitted to the members of team.

Research Programmes under discussion at RAC meeting

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

Conferences/Meetings/Symposia/ Seminars/Workshops	Authors/ participants
Seminar/Symposia	
National Symposium on "Sustainable Development of Fisheries Towards 2020 AD-Opportunities and Challenges", April 21-23, 1999, School of Industrial Fisheries, University of Science & Technology, Cochin	Mrs. Suman Kapila
International Conference on Tropical Aquatic Ecosystem : Heath, Management & Conservation, October 25-30, 1999 at Nainital	Dr. K. K. Vass Dr. Madan Mohan Dr. H.S. Raina Dr. C.B. Joshi Dr. Shyam Sunder Dr. B.C. Tyagi Mrs. Suman Kapila
National Conference on Fisheries Economics - Extension & Management, January 5-6, 2000 at CIFE, Mumbai	Dr. B. C. Tyagi

Conferences/Meetings/Symposia/ Seminars/Workshops	Authors/ participants
Workshop	
Workshop on Freshwater Prawn Farming, April 20-21, 1999 at CIFA, Bhubaneshwar	Dr. K.K. Vass
Interaction workshop for the PIs/CCPIs/Associate Investigators of the Livestock and Fish Production System Programme of NATP, June 15-16, 1999 at CSWCR & TI, Dehradun	Dr. K.K. Vass Dr. C.B. Joshi
Hindi workshop on "21st Shatabdi mein matsyaki anusandhan evam vikas ki sambhavit dishai", September 23, 1999 at CICFRI, Barrackpore	Dr. B.C. Tyagi
Fish biodiversity workshop for North-eastern region, Organised jointly by NEC and NBFGR, Lucknow between February 10 & 11, 2000, at Shillong	Dr. K.K. Vass Dr. Madan Mohan
National Workshop on "Biodiversity & Conservation of Aquatic Resources with Special reference to threatened fish Mahseer", February 26 & 27, 2000 organized by the M.P. Council of Science & Technology at Bhopal	Dr.K.K. Vass
Meetings	

Conferences/Meetings/Symposia/ Seminars/Workshops	Authors/ participants
Aquaculture for Sustainable Rural Livelihood Development under FAO-NACA joint programme at ICAR HQ, New Delhi on May 3, 1999	Dr.K.K. Vass
17th meeting of ICAR Regional Committee No. I at Srinagar (J & K) on May 14-15, 1999.	Dr. K.K. Vass
181th meeting of the ICAR Governing Body at ICAR HQ On July 15, 1999	Dr.K.K. Vass
ICAR Director's Conference at NBPGR, PUSA, New Delhi on September 7-8, 1999.	Dr. K.K. Vass
Project Screening Committee and the Scientific Panel for Fisheries at ICAR HQ on September 27-30, 1999	Dr. K.K. Vass
Fisheries Divisional Meeting at CIBA, Chennai on December 27-28, 1999	Dr. K.K. Vass
Expert Committee meeting on Fisheries Research ICAR HQ, New Delhi on February 2, 2000	Dr.K.K. Vass

WORKSHOPS, SEMINARS, SUMMER INSTITUTES, FARMER'S DAY ETC. ORGANIZED BY THE INTITUTE

International Conference on "Tropical Aquatic Ecosystem: Health, Conservation and Management"

The Institute jointly with National Institute of Ecology and Kumaon Univeristy, organized this International Conference which was held at U.P. Academy of Administration, Nainital between October 25-30, 1999. The conference was attended by 40 overseas participants from UK, USA, Canada, Brazil, Sweden, Netherlands, Denmark, Japan, Egypt, and Nepal. Prof. J.G. Tundsi, Vice Presedent of International Union of Biological Science attended the conference and delivered the inaugural address. Dr. K. Gopakumar, Deputy Director General (Fisheries) ICAR presided over the function, delivered presidential address and also keynote lecture. Nearly 150 delegates from India and abroad presented their research papers which covered all aspects of aquatic ecology involving production functions of lakes/wetlands, river-basin studies, open-water fisheries and their management, fish health, bio-diversity, toxicology, eutrophication and ecological management of aquatic ecosystems for sustainable use of resources and their benefits to the local community. It was strongly appreciated by all participants that fish is eco-friendly and should be used as tool for ecosystem management. A strong concern was expressed in the conference that freshwater will become critical resource in years to come, therefore, it was recommended that more serious thought should be given by all stake holders including policy makers for its wise and sustainable use.

Brainstorming Session on Coldwater fisheries

A two-day "Brainstorming Session on Coldwater Fisheries" was organised by NRCCWF between 19-20 November 1999 at CSWCR & TI, Dehradun. Dr. K. [illegible]

in respect of their regions. A detailed presentation was made by the Director, NRCCWF highlighting the present state of knowledge and future thrusts in Coldwater fisheries research and development in the country.

A number of recommendations were made at the end of two days deliberations which addressed main issues of open-water fisheries, aquaculture and sport fishery in hills. It was recommended that aquaculture based on indigenous and exotic species should be supported/promoted in hills to serve the twin purpose of conservation and production of fish for local people. It was emphasized that sport fishery in hills should be developed on scientific lines and it needs to be linked-up with tourism to generate additional income for people living in the remote hilly areas. For sustainable development of hill fishery, it was recommended that local fishery departments should have control over water resources *vis-a-vis* fishery development and exploitation. Necessary legal and administrative changes to be initiated in this regard. It was agreed upon that NRCCWF will take the initiative to document all the existing knowledge about this sector in the country with necessary co-opertion from all participating agencies.

A Foreign delegate presenting his paper at Nainital conference

DISTINGUISHED VISITORS

Following distinguished dignitaries visited the Institute during the year 1999-2000.

Shri Bachi Singh Rawat, Honourable Minister of State, Department of Science & Technology, Government of India paid a visit to NRCCWF Experimental Fish Farm, Champawat

Dr. S.P. Ayyar, Former Director of CICFRI, Barrackpore

Prof. S.K. Garg, Department of Zoology, CCS Haryana Agricultural University, Hissar 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

Shri S.K. Maheshwari, IAS, District Magistrate, Champawat visited NRCCWF Experimental Fish Farm at Champawat

Shri M. Aslam, Director, Department of Agricultural Research & Educaton, Indian Council of Agricultural Research, New Delhi

Dr. U.P. Singh, Dean, College of Fishery Sciences, G.B. Pant University of Agriculture & Technology, Pantnagar

Prof. S.P. Singh, Department of Botany, Kumaon University, Nainital

Dr. Uma Palni, Department of Botany, Kumaon University, Nainital

PERSONNEL (AS ON MARCH 31, 2000)

I. Research and Management

1.	Dr. K.K. Vass	Director

II. Scientific

1.	Dr. Madan Mohan	Principal Scientist
2.	Dr. Harbhajan Singh	Principal Scientist
3.	Dr. C.B. Joshi	Senior Scientist
4.	Dr. Shyam Sunder	Senior Scientist
5.	Dr. B.C. Tyagi	Senior Scientist
6.	Shri Rajeev Kapila	Scientist (on study leave w.e.f. 7.1.1999)
7.	Smt. Suman Kapila	Scientist
8.	Miss Yasmeen basade	Scientist (on study leave w.e.f. 1.9. 1999)
9.	Dr. S.K. Bhanja	Scientist
10	Dr. K.D. Joshi	Scientist
11.	Sh. V.R.K. Nair	Scientist (from 25.11.1999 to 12.12.1999)
12.	Shri A.K. Nayak	Scientist (w.e.f. 27.12.1999)

2.	Shri A.K. Joshi	T-II-3
3.	Shri Baldev Singh	T-I-3
4.	Shri Ravinder Kumar	T-II
5.	Shri Santosh Kumar	T-II
6.	Shri Gopal	T-I
7.	Shri R.K. Arya	T-I
8.	Shri Hansa Dutt	T-I
9.	Shri T.M. Sharma	T-I
10.	Shri Bakshi Ram	T-I (Driver)
11.	Shri Bhagwan Singh	T-I (Dirctor)

IV. Administrative

1.	Shri Prakash Chandra	Asst. Fin. & Accts. Officer
2.	Shri R.L. Raina	Asst. Admin. Officer (w.e.f. 14.5.1999)
3.	Smt. Susheela Tewari	Stenographer
4.	Shri Harish Ram	Assistant
5.	Shri Manni Lal	Assistant (w.e.f. 6.10.1999)
6.	Smt. Khilawati Rawat	Senior Clerk (w.e.f. 6.10.1999)
7.	Shri P.C. Tewari	Junior Clerk

V. Supporting

1.	Shri Madan Lal	SS Gr IV (retired on 31.12. 1999)
2.	Shri Japju Ram	SS Gr IV
3.	Shri Sant Ram	SS Gr IV
4.	Shri Ravinder Kumar	SS Gr III
5.	Shri Om Raj	SS Gr III
6.	Shri H.S. Chauhan	SS Gr II
7.	Shri H.S. Bhandari	SS Gr II
8.	Shri Sunder Lal	SS Gr I
9.	Shri. H.C. Bhakt	SS Gr I
10.	Shri Manoj Kumar	SS Gr I
11.	Shri Pooran Chandra	SS Gr I
12.	Shri Dharam Singh	SS Gr I
13.	Shri Prakash Akela	SS Gr I
14.	Shri Neeladhar	SS Gr I (died on 9.8.1999)
15.	Shri Bhola Dutt	SS Gr I
16.	Shri Chandra Shekhar	SS Gr I
17.	Shri Kuldeep Kumar	SS Gr I

ANY OTHER RELEVANT INFORMANTION SUCH AS SPECIAL INFRASTRUCTURAL DEVELOPMENT

The institue has awarded the construction work of Phase I of NRCCWF complex at Bhimtal, having an estimated outlay of Rs. 3.52 crore, to CPWD. The boundary wall construction work earlier awarded to CPWD is already in progress at Bhimtal. Further, CPWD has also been awarded the work order for electrification of NRCCWF experimental farm complex at Champawat, U.P. In order to meet the information technology requirements of the Institute, a specially designed facility has been created for housing ARIS Cell. To support these efforts, necessary hardware/software are being procured for establishing local area network.

हिंदी खण्ड

आमुख

मुझे राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केंद्र द्वारा शीतजल मात्स्यिकी अनुसंधान, पर्वतीय जल संसाधनों के प्रबंधन, विस्तार एवं राष्ट्र निर्माण की गतिविधियों के क्षेत्र में प्राप्त की गयी उन्नतियों को संस्थान की वार्षिक रिपोर्ट (१९९९–२०००) में प्रस्तुत करने पर बड़ा हर्ष हो रहा है।

वर्ष १९९९–२००० को संस्थान के इतिहास में कुछ स्मरणीय घटनाओं के रूप में याद किया जाएगा, इनमें से प्रमुख घटना "ऊष्ण कटिबंधीय जलीय पारिस्थितिकी प्रणाली : स्वास्थ्य, प्रबंधन तथा संरक्षण" शीर्षक पर संस्थान द्वारा अक्टूबर, १९९९ को संयुक्त रूप से एक अंतर्राष्ट्रीय सम्मेलन का आयोजन करना था। इस सम्मेलन में विदेशी प्रतिभागियों ने भी भाग लिया। दूसरी प्रमुख घटना में देश में शीतजल मात्स्यिकी के विकास के लिए कार्यकारी योजना का निर्माण व उसकी समस्याओं पर विचार–विमर्श हेतु "ब्रेन स्टारमिंग सम्मेलन" का आयोजन किया जाना था।

अनुसंधान के संबंध में इस वर्ष संस्थान ने छह (६) अनुसंधान परियोजनाओं पर कार्य करने के अतिरिक्त एक राष्ट्रीय कृषि तकनीकी परियोजना (एन.ए.टी.पी.) के अंतर्गत भी कार्य करना शुरू कर दिया है। इस परियोजना के संचालन हेतु संस्थान को मुख्य केंद्र बनाया गया है। अनुसंधान मूल्यांकन, बीज उत्पादन, देशी तथा विदेशी दोनों प्रजाति की मछलियों के लिए भोजन–निर्माण, रख–रखाव आदि विषयों पर ध्यान केंद्रित किया गया है तथा शीतजल मात्स्यिकी के सर्वांगीण विकास के लिए आवश्यक कारकों को उपलब्ध कराने हेतु कार्य किया जा रहा है।

इस वर्ष संस्थान द्वारा प्राप्त की गयी उपलब्धियों के अंतर्गत संस्थान द्वारा राष्ट्रीय स्तर की विभिन्न प्रदर्शनियों में भाग लिया जाना शामिल है नामशः "एक्वारिसोर्सेज", "एक्वाफेयर", तथा "फिशिनियम", जो क्रमशः नैनीताल (उ.प्र.) बैरकपुर (प. बंगाल) एवं भुवनेश्वर (उड़ीसा)

भी पर्वतीय क्षेत्रों के मत्स्य आखेटकों एवं विभागीय कर्मचारियों के लिए जारी की गयी हैं। स्थानीय लोगों के मध्य जागरुकता लाने के उद्देश्य से संस्थान ने चम्पावत केंद्र में विभिन्न प्रदर्शनियां एवं संगोष्ठियां आयोजित की थीं।

वैज्ञानिकों एवं तकनीकी व प्रशासनिक कर्मचारियों ने मानव शक्ति के विकास कार्यक्रम एवं व्यवसायिक सहभागिता के लिए उचित अवसर प्रदान किया। भारतीय कृषि अनुसंधान परिषद् के खेल–कूदों में हमारे संस्थान के सदस्यों द्वारा उचित सहयोग दिया गया, यह हमारे संस्थान परिवार के सदस्यों के व्यक्तित्व विकास में सहायक होगा।

मैं आशा करता हूँ कि पर्वतीय राज्यों के जलीय परिस्थितिकी एवं मात्स्यिक कार्मिक इन प्रकाशनों से उपयोगी एवं लाभकारी सूचनाएं प्राप्त कर सकेंगे। पाठकों की कोई भी अमूल्य टिप्पणी एवं सुझावों का स्वागत है जो हमारे संस्थान की वार्षिक रिपोर्ट को समर्थ बनाने में सहायक होगी।

मैं परिषद के महानिदेशक डा. आर.एस. परोदा, सचिव, डी.ए.आर.ई., भारत सरकार को भी हार्दिक धन्यवाद देना चाहूंगा जिन्होंने संस्थान के कार्यकलापों के लिए अपना अमूल्य सहयोग प्रदान किया। मैं डा. गोपाकुमार, उपमहानिदेशक (मात्स्यिकी) भा.कृ.अनु. परि. का भी अत्यंत आभारी हूं जिन्होंने संस्थान की गतिविधियों को आगे बढ़ाने के लिए उचित सहयोग एवं मार्गदर्शन किया।

संस्थान के सर्वांगीण विकास का श्रेय संस्थान के सभी अधिकारियों एवं कर्मचारियों को दिया जाता है क्योंकि इस वर्ष उन्होंने जिस लगन, श्रद्धा, भाईचारा, ईमानदारी व समर्पण से कार्य किया उसी के परिणामस्वरूप संस्थान को यह विकसित स्वरूप मिल सका जिसे भविष्य में देश के मात्स्यिकी संस्थानों में गौरव मिल पाएगा और विदेशों में भी यह संस्थान गौरवान्वित हो सकेगा।

संस्थान के रचनात्मक विकास की दृष्टि से यह वर्ष विशेष महत्वपूर्ण रहा क्योंकि इसी वर्ष भीमताल में रा.शी.ज. मा.अनु. केंद्र के परिसर निर्माण के कार्य की केंद्रीय सार्वजनिक निर्माण विभाग को स्वीकृति प्रदान की गयी। आशा की जाती है कि एन.आर.सी. परिवार का स्वयं का परिसर होने की अभिलाषा शीघ्र ही पूर्ण होगी।

मैं इस अवसर पर संस्थान के वरिष्ठ वैज्ञानिक, डा. सी.बी. जोशी को उनके गंभीर प्रयासों के लिए धन्यवाद देता हूं जिन्होंने इस प्रतिवेदन की मूल प्रति तैयार की। साथ ही कंप्यूटर कंपोजिंग करने के लिए श्रीमती सशीला तिवारी का भी आभारी हूं।

परियोजना संख्या आर.ई.एम./ए/१

हिमालय/उपहिमालय क्षेत्रों की झीलों में पारिस्थितिकी परिरूपण

केंद्रीय हिमालय के कुमाऊं क्षेत्र में नैनीताल जिले की ४० कि.मी. की परिधि में ६ मुख्य झीलें—नैनीताल, सातताल, नौकुचियाताल, खुर्पाताल, भीमताल एवं गरुणताल स्थित है। इनमें खुर्पाताल की परिस्थितिकी, जैविकी एवं मात्स्यिकी उत्पादन स्तर का मूल्यांकन इस संस्थान द्वारा पूर्व में ही किया जा चुका है। इसलिए वर्तमान में चल रही अनुसंधान परियोजनाओं की प्रासंगिकता, उपरोक्त झीलों में मत्स्य उत्पादन में और अधिक वृद्धि प्राप्त करने के लिए परिस्थितिकी मौडल तैयार किया जाना है। अध्ययन की अवधि में इन झीलों में मापी गई गहराई से पता चलता है कि नौकुचियाताल झील सर्वाधिक गहरी (३८.० मी.) तथा सातताल झील मात्र ८.० मी. गहराई के साथ सर्वाधिक उथली है। सामान्यतः इन झीलों का जल स्वच्छ होने के कारण, पारदर्शिता गरुड़ताल में ४.० मी. रिकार्ड की गयी जबकि निम्नतम् १.० मी. नौकुचियाताल में रिकार्ड की गयी। इन झीलों की तापीय रूप रेखा सतह से गहराई की ओर आंशिक परिवर्तन को दर्शाती है, जो मार्च २००० में नैनीताल झील में १.० डिग्री सेंटीग्रेड तथा सातताल में ३.५ डिग्री सेंटीग्रेड दर्शाती है। गर्मी के महीनों में (मई १९९९) तापीय विभिन्नता भीमताल में ८.० डिग्री सेंटीग्रेड तथा नौकुचियाताल में १२.५ डिग्री सेंटीग्रेड पायी गयी। जल का तापमान सबसे कम नैनीताल झील में (७.५ डिग्री सेंटीग्रेड) मार्च २००० में तथा सबसे अधिक (२७ डिग्री सेंटीग्रेड) नौकुचियाताल में मई १९९९ में रिकार्ड किया गया।

कुमायूं की झीलें सर्दियों के कुछ महीनों को छोड़कर अधिकांशतः क्षारीय रहती हैं। झीलों की निचली सतह का पी.एच. ६.८—१२. पाया गया है। पृष्ठीय सीमा पर अवमुक्त आक्सीजन ५.०—१२.० मिग्रा./ली. के बीच थी जबकि अधोतल (निचली सीमा) में यह १.२—८.४ मिग्रा./ली थी। मुक्त कार्बनडाईआक्साइड पृष्ठीय सीमा पर लगभग शून्य थी जबकि मध्य एवं निचली सतह में यह क्रमशः शून्य—४.६ मिग्रा:/ली. तथा २.०—५२ मि.ग्रा/ली के बीच थी। नैनीताल झील की निचली सतह में कुल प्राथमिक क्षारीयता सबसे अधिक (३१२.० मिग्रा./ली) पायी गयी जबकि सातताल झील की पृष्ठीय सीमा में सबसे कम (५२.० मिग्रा./ली) रिकार्ड की गयी।

नैनीताल में अवमुक्त सौलिड्स का कुल सांद्रण अधिकतम ३२८.४ तथा गरुड़ताल में निम्नतम ४८.४ मिग्रा/ली रिकार्ड किया गया। इन झीलों में अनुकूलित चालकता ६६—६५६ म्यूमौ रिकार्ड

कुमायूं की झीलों में उपस्थित प्लवकों की संख्या ऊष्ण कटिबंधीय मौसम को प्रदर्शित करने के साथ ही यह प्रजातीय विभिन्नता व ऊपोष्णीय विशेषताओं को भी प्रतिबिम्बित करती है। इन झीलों में उपस्थित प्रमुख फाइटोप्लैंक्टन, बैसिलैरोफाइसी, क्लोरोफाइसी, डायनोफाइसी तथा साइनोफाइसी वर्गों को निरूपित करते हैं। नैनीताल तथा नौकुचियाताल झीलों में क्लोरोफाइसी बहुत अधिक मात्रा में प्राप्त किए गए जो कुल प्लवकों की मात्रा का ४० प्रतिशत हैं। इसके पश्चात् प्राप्ति के क्रम में बैसिलैरोफाइसी तथा डाइनोफाइसी आते हैं। सातताल, भीमताल व गरुड़ ताल में डाइटम प्रमुख हैं। इन झीलों में डाइटम का योगदान ५० प्रतिशत से अधिक है। प्लवकों की सर्वाधिक संख्या नैनीताल में रिकार्ड की गई। इन झीलों में जन्तुप्लवक मुख्यतः रोटिफर्स, क्लैडोसिरन्स, तथा कोपिपोडस की संख्या पर्याप्त मात्रा में है। जन्तुप्लवक सर्वाधिक (११० इकाई/ली.) तथा न्यूनतम (४६ इकाई/ली.) नौकुचियाताल में रिकार्ड किए गए। नैनीताल, सातताल, गरुड़ ताल झीलों में जन्तुप्लवकों की संख्या क्रमशः ८६, ७३ व ७८ ई./ली. थी।

झील के तल में पाए जाने वाले कृमियों के समूह में सर्वाधिक संख्या डिप्टेरा, मोलस्का व ट्यूबिफिसिड आदि की थी। नैनीताल झील के तल में ट्यूबिफिसिड प्रचुर मात्रा में पाए गए जबकि दूसरी झीलों में डिप्टीरा कृमी पर्याप्त मात्रा में थे। नैनीताल झील के तल में पाए जाने वाले बृहत अकशेरुकी कृमियों की संख्या अधिकतम (८६२/वर्ग मी.) गरुड़ ताल में तथा निम्नतम् (१६२/वर्ग मी.) नौकुचियाताल झील में पाये गये। इन झीलों के तल में पाए जाने वाले जीव समूहों का शुष्क जैविक भार अधिकतम ३५ ग्रा/वर्ग मी. व गरुड़ ताल में निम्नतम् १२ ग्रा./वर्ग मी. था।

कुमायूं की झीलों के तटवर्ती क्षेत्रों में पायी जाने वाली वनस्पति में सामान्य रूप से पोटोमोजेटोन, मीरियोफिलम, सीरैटोफिलम, पोलिगोनम व हाइड्रिला थे। कुमायूं की झीलों में मत्स्य पालन मुख्यतः सुनहरी माहसीर पर आधारित है। जिसमें टौर प्युटिटौरा का योगदान ५४.० प्रतिशत, साइप्रिनस कार्पिओ (कामन कार्प) व दूसरी संग्रहित मछलियों का योगदान ४६.० प्रतिशत है। इनमें ग्रास कार्प, सिल्वर कार्प व भारतीय मूल की मछलियां अर्थात् रोहू एवं नैन मुख्य हैं।

इन झीलों में स्नो ट्राउट मछली बहुत कम मात्रा में पकड़ी जाती है। तटवर्ती क्षेत्रों में पंटियस, कॉनकोनियस व गम्बूसिया एफिनिस भी उपलब्ध है। नैनीताल को छोड़कर कुमायूं की लगभग सभी झीलों में माहसीर, टौर प्युटिटौरा है तथा आमतौर पर पकड़ी गई मछलियों का आकार ३००–४८५ मिमी. व भार ३२०–१२०० ग्रा. होता है। इन झीलों में मत्स्य उत्पादन की

परियोजना संख्या आई.ए.ई.एम./बी/१

केंद्रीय हिमालय में संसाधन मूल्यांकन, परिस्थितिकी तथा जलीय-जैव विविधता की विशेषताएं

कुमायूं तथा गढ़वाल हिमालय की महत्वपूर्ण सहायक नदियों के साथ–साथ विभिन्न नदी प्रणालियों की जलीय जैव विविधता एवं संसाधन मूल्यांकन हेतु प्रारंभिक सर्वेक्षण किया गया। कुल २६ चिन्हित केंद्रों में से १६ कुमायूं में तथा १० गढ़वाल क्षेत्र में स्थित हैं। मुख्यतः ऊपरी नदी क्षेत्रों में जल की गुणवत्ता का विश्लेषण करने पर ज्ञात हुआ कि इन नदी नालों के ऊपरी क्षेत्रों का जल मछलियों के लिए उपयुक्त है तथा उसकी विभिन्न प्रजातियों की संख्या को स्थिर बनाए रखने हेतु अनुकूल है। दोनों क्षेत्रों में अध्ययन की अवधि के दौरान जल में आक्सीजन की मात्रा तथा क्षारीयता बहुत अच्छी प्राप्त की गयी जबकि कुमायूं क्षेत्र की तुलना में गढ़वाल में टी.डी.एस. तथा डी.ओ.एम. एवं विशिष्ट चालकता मान अधिक रिकार्ड किया गया।

पर्वतीय नदियों की तलहटी में पाए जाने वाले जीव–जन्तु मछलियों के भोजन के मुख्य अवयव हैं। इनका विस्तार, गुणवत्ता एवं मात्रा मछली के भोजन एवं स्वास्थ्य की दृष्टि से एक विशेष प्रकार की नदी/धारा की कार्यक्षमता को प्रतिविम्बित करती है। कुमायूँ की नदियों के गहरे स्थान में पाए जाने वाले जीव समूहों का घनत्व १२–२१५/मी^{2} के बीच तथा गढ़वाल में २२–४१८/मी^{2} के बीच था जबकि उसका क्रमिक जैविक भार ०.१३०–११.५१० ग्रा./मी.^{2} तथा ०.४७५–२३.५० ग्रा./मी^{2} के बीच था, गढ़वाल तथा कुमायूं क्षेत्र की नदी प्रणालियों के गहरे स्थान में पाए जाने वाले जीव समूहों के प्रमुख अवयव क्रमशः इस प्रकार हैं: इफिमैरोप्टेरा, १६–४२.०% व २.०–३७.७%, ट्रिकोप्टेरा ७.५–६५.५% व १२.६–७१.७%; कोलिओप्टेरा २.१–२३.२% व १.७–२१.६%; ओडोनाटा, १.६–२५७ व ०.०–१६.४% व डिप्टीरा ०.०–६.८ व २.१–७.३%। कुमायूँ की नदियों से कुल ३७ प्रकार के नितल जीव समूह पाए गए जबकि गढ़वाल क्षेत्र में २६ प्रकार के पाए गए।

सर्वेक्षण की अवधि में मछलियों की कुल ३० प्रजातियों में से १६ कुमाऊं से तथा २५ गढ़वाल की नदियों से प्राप्त की गई, जिसमें से साइप्रिनिडी (८ व ११) कोबिटिडी (४ व ६), सिसॉरिडी (३ व १७), चन्नीडी (शून्य व १), होमालोपटेरेडी (शून्य व १) तथा मेस्टासिम्बिलेडी (१ तथा शून्य) थे। पर्वतीय क्षेत्रों में मुख्यतः सुदूरवर्ती स्थानों में कोई संगठित मत्स्य पालन नहीं है। इन नदी–नालों में प्रयोगिक तौर पर मछलियां पकड़ी गयी। कुमायूं तथा गढ़वाल में मत्स्य

व २०७–२५१ ग्रा., सिरका जाल (स्थानीय विधि) १२०–१८६५ ग्रा. व २०५–१५४५ ग्रा. तथा अन्य स्थानीय विधियां शून्य–२७० ग्रा.।

परियोजना संख्याः ए.एफ.ई./आई/१

असेला मछलियों के लिए सम्वर्द्धन प्रणाली का विकास एवं विस्तार

हिमालय क्षेत्र की नदियों में असेला प्रजाति के मात्स्यिकी के विकास हेतु अध्ययन व इस प्रजाति की मछलियों के सहज प्राप्ति हेतु उचित सम्वर्द्धन प्रणाली की स्थापना के लिए बीज संग्रहण केन्द्रों की स्थापना की गयी है ताकि स्नो ट्राउट मछलियों के उत्पादन में वृद्धि के लिए पर्वतीय क्षेत्रों में अधिक तेजी से बढ़ने वाली प्रजातियों का अन्वेषण किया जा सके। छिरापानी फार्म, चम्पावत में साइजोथोरैक्स रिचार्डसोनी के प्रजनको की वृद्धि पर भी एक पद्धति का निर्माण किया गया है तथा इस फार्म में इन मछलियों का प्रजनन भी सफलतापूर्वक कराया जा चुका है। हिमालय क्षेत्र के जल में साइजोथोरासिड्स की उत्पादन संभावना के मूल्यांकन के लिए उत्तरप्रदेश के पर्वतीय क्षेत्रों के कुमायूं व गढ़वाल की नदियों में विस्तृत सर्वेक्षण कराया गया तथा इसकी मात्स्यिकी, संरचना व संसाधनों की संभावना पर आंकड़े एकत्रित किए गए। उपरोक्त परियोजना के अंतर्गत कुमायूं व गढ़वाल क्षेत्र की सभी नदियों का अध्ययन किया गया।

इससे पता चलता है कि कुमायूं की नदियों में स्नोट्राउट मत्स्य उत्पादन कुल उत्पादन का लगभग ५२.६–६२.७ प्रतिशत है जबकि गढ़वाल की नदियों में इसका प्रतिशत ४६.५–६४.८ प्राप्त किया गया, इन पर्वतीय क्षेत्रों की नदियों में असेला मछलियों का आकार क्रमशः ४५–२६५ ग्रा. व २१०–६१५ ग्रा. था। कुछ पर्वतीय नदियों में मुख्यतः महसीर मछलियों के पश्चात स्नोट्राउट की प्रमुखता है जिसमें टौर प्युटिटौरा २.६–३२.५ प्रतिशत है। मत्स्य उत्पादन के एकत्रित आंकड़ों के अनुसार कुमायूं में कुल मत्स्य उत्पादन प्रति श्रम इकाई ४४–३६२ ग्रा/व्यक्ति/ घंटा प्राप्त किया गया। साइजोथोरैक्स रिचार्डसोनी व टौर प्युटिटौरा के अतिरिक्त इन नदियों से एकत्र की गयी अन्य मत्स्य प्रजातियों के अंतर्गत गारा, पुंटियस, लैबियो, बेरिलियस, नेमाचिलस, ग्लैप्टोथोरेक्स, सीडोइकाइनस तथा मस्टासिम्बिलस सम्मिलित हैं। पर्वतीय नदियों में मछली पकड़ने की सामान्य विधियां–कास्टनेट, छोटे आकार का गिलनेट, सुरका जाल व टोकरी जाल आदि हैं।

अन्य दूसरी नदियों में जेसे–क्वाराली, लोहावती, चरमा, नानकोसी, गगास, गोरी, सरयू, भिलंगाना आदि में अण्डों व शिशुओं की सहज उपलब्धता ५ तथा ३२/मी^{2} के बीच थी।

वर्ष १९९९–२००० में विभिन्न नदियों के बीज संग्रहण केन्द्रों पर जल की गुणवत्ता इस प्रकार अंकित की गयीः जल का तापमान १०.०–२४.३° से॰; पी.एच.७.२–८.८, घुलित आक्सीजन ७.४–११.४ मिग्रा/ली., अवमुक्त कार्बनडाईआक्साइड शून्य–२.२ मिग्रा./ली., कुल क्षारीयता ३६.२–१५६.३ मिग्रा./ली., डी.ओ.एम. ७.८–१३.२ मिग्रा/ली. तथा विशिष्ट चालकता ६८–३७२ म्यूमौस।

छिरापानी मत्स्य फार्म चम्पावत में साइजोथोरैक्स रिचार्डसोनी पर किए गए प्रयोगों से पता चलता है कि १९९९–२००० के दौरान विभिन्न तालाबों में रखी गयी इन मछलियों में भार वृद्धि ११.६ से १६.२ ग्रा., २०.३ से २६.२ ग्रा. तथा ३१.३ से १२३.१ ग्राम प्राप्त की गयी। जबकि उक्त तालाबों में प्रयोगिक तौर पर रखी गयी मछलियों की सामान्य उत्तरजीवितता दर ६६.२ प्रतिशत, ७०.८ प्रतिशत व ७०.७ प्रतिशत देखी गयी। बड़ी मछलियों में उच्चतम वृद्धि दर तुलनात्मक रूप से कम थी। प्रयोग की अवधि के दौरान ये मछलियां प्रयोगशाला में निर्मित भोजन द्वारा पोषित की गयीं जिनमें विटामिन ए.ई. व सी. का मिश्रण था। भोजन के मुख्य अवयव (संघटक) सोयाबीन आटा (३८ प्रतिशत), मूंगफली का तेल (२० प्रतिशत), चावल की पालिश (२० प्रतिशत) व फिश मील (२० प्रतिशत) तथा २ प्रतिशत की दर से एग्रीमीन था। इन तालाबों में संचित मछलियों को २–५ प्रतिशत की दर से दिन में २ बार उपरोक्त भोजन दिया गया। मत्स्य तालाबों में मछलियों के समुचित रूप से संचय के लिए फार्म में जल की गुणवत्ता संतोषजनक पायी गयी।

परियोजना संख्या ए.एफ.ई./आई/२

देशी प्रजाति पर आधारित ऊंचे क्षेत्रों की मत्स्य प्रजातियों में भोजन एवं पोषण का विकासः

सुनहरी माहसीर (टौर प्युटिटौरा) तथा स्नो ट्राउट (साइजोथोरैक्स रिचार्डसोनी) मछलियों पर दो भिन्न आहारों–"सीफाका" (कार्प भोज्य, सीफा भुवनेश्वर द्वारा विकसित) तथा "एन.आर. सी.–सी.डब्लू.एफ.–I" (राष्ट्रीय अनुसंधान केंद्र, भीमताल द्वारा विकसित) का परीक्षण किया गया। इस अवधि में मत्स्य आहार में केसिन परिवर्तन एवं मत्स्य वृद्धि पर काइटिन के पड़ने वाले प्रभावों पर भी प्रयोग किए गए। आकार सम्बन्धी प्रयोगों के पश्चात पाचक एंजाइमों की गुणवत्ता

टौर–प्युटिटौरा तथा साइजोथोरक्स रिचार्डसोनी की अंगुलिकाओं को नदियों से एकत्रित किया गया तथा उन्हें विभिन्न परीक्षणों से पूर्ण वायुजलानुकूलित किया गया। मछली की लम्बाई व भार की नियमित जांच की गयी। प्रत्येक सप्ताह के अंतराल पर जल की गुणवत्ता की भी जांच की गयी, ये परीक्षण भीमताल तथा चम्पावत में किए गए।

भीमताल में माहसीर मछली (टौर प्यूटीटोरा) ३ विभिन्न घनत्वों ०.१५ ग्रा./ली., ०.२५ ग्रा. /ली. तथा ३० ग्रा./ली. में संचयित की गयी तथा मछली को उसके भार के ५ प्रतिशत की दर से ७५ दिनों के लिए 'एन.आर.सी.–सी.डब्ल्यू.एफ–I, तथा 'सिफाका' आहार दिया गया। दोनों प्रकार के आहारों में एन.आर.सी.–सी.डब्ल्यू.एफ.–I द्वारा पोषित मछली में उत्तरजीवितता, भोजन रूपांतरण क्षमता, विशिष्ट वृद्धि–अनुपात, भार वृद्धि की प्रतिशतता तथा कुल प्राप्त भार 'सिफाका' आहार द्वारा पोषित मछली की तुलना में अधिक थी। एन.आर.सी.–सी. डब्ल्यू.एफ.–I द्वारा पोषित मछलियों में भोजन रूपांतरण क्षमता का अनुपात भी अधिक देखा गया। तीनों संचयी घनत्वों, कुल प्राप्त भार, प्राप्त की गयी वृद्धि की प्रतिशतता व विशिष्ट वृद्धि अनुपात को देखने से पता चलता है कि 'सीफाका' आहार द्वारा पोषित मछलियों के एफ.सी.आर. व एफ.सी.ई. ०.२५ ग्रा./ली. घनत्व पर जहां परिणाम अच्छे थे वहां निम्न घनत्व पर भोजन रूपांतरण अनुपात भी अच्छा था। दोनों आहारों द्वारा पोषित मछलियों में पाचनशील एंजाइम एमाइलेज की क्रियाशीलता में प्रभावकारी वृद्धि देखी गयी। 'सिफाका' आहार पोषित मछलियों में यह ४.१८ तथा एन.आर. सी.–सी.डब्ल्यू.एफ–I पोषित मछलियों में यह ३.४५ थी। इसी प्रकार 'सिफाका' तथा 'एन.आर. सी.–सी.डब्ल्यू.एफ.–I द्वारा पोषित मछलियों में प्रोटीएज की क्रिया में क्रमशः ३.० व २.५ की वृद्धि हुयी। इस पोषण अवधि में जल की गुणवत्ता इस प्रकार थी–जल का तापमान १३.३–३३.५° सें.; घुलित आक्सीजन ५.६–७.८ मि.ग्रा./ली.; अवमुक्त कार्बनडाइआक्साइड १.०–३.० मि.ग्रा./ली.; क्षारीयता १०४–१२४ मिग्रा./ली.; पी.एच. ७.६–८.२; तथा पोषक टैंक (ट्रफ) में जल का बहाव ०.४६–१.२ ली/मिनट।

चम्पावत में केवल गर्मियों में सुनहरी महासीर तथा असेला मछलियों (स्नो ट्राउट) पर प्रयोग किए गए। छिरापानी शीत जल मत्स्य फार्म में महासीर को 'एन.आर.सी.सी.डब्ल्यू.एफ.–I आहार दिया गया और 'सिफाका' आहार की तुलना में उसके शरीर की लम्बाई, भोजन रूपांतरण अनुपात, विशिष्ट वृद्धि दर तथा भार में प्रभावशाली वृद्धि देखी गयी। उपरोक्त दोनों प्रकार के आहारों में पोषित मछलियों में पोषाहार परीक्षण के उपरांत सुनहरी माहसीर तथा असेला मछलियों की आंतों में एमाइलेज की सक्रियता में वृद्धि देखी गयी। सिफाका आहार 'एन.आर.

अम्लीय माध्यम में अघुलनशील 'ऐश' विधि द्वारा किया गया, इन अध्ययनों से पता चलता है कि सीफाका आहार की तुलना में 'एन.आर.सी.सी.डब्ल्यू.एफ.–I आहार में प्रोटीन व वसा की पाचकता बहुत अधिक थी। इन दोनों आहारों में से 'एन.आर.सी.सी.डब्ल्यू.एफ.–I में प्रोटीन ५०.८०%; वसा १५.३०%; मुक्त नाइट्रोजन अर्क २१.३०%; रेशा (फाइबर) ४.४०%; तथा कुल ऐश की मात्र ८.२०%; तथा सिफाका में प्रोटीन ३०.००%; वसा ६.००%; मुक्त नाइट्रोजन अर्क ३५.५३%; रेशा १०.००%; तथा कुल ऐश की मात्र १५.४७% थी। 'एन.आर.सी.सी.डब्ल्यू.एफ.–I की उपापचयी ऊर्जा (K कैलोरी/ग्रा.) ४.८४ तथा सिफाका की ३.८० आंकलित की गयी।

ठण्डे पानी में पायी जाने वाली मछलियों के आहार में काइटिन का प्रभाव देखने हेतु संस्थान के चम्पावत फार्म में अगस्त–अक्टूबर १९९६ तक प्रयोग क़िए गए, माहसीर और असेला मछलियों को दिए जाने वाले आहार में गेहूं के चोकर के स्थान पर २ प्रतिशत काइटिन की मात्रा का प्रयोग किया गया तथा ६० दिनों के पालन–पोषण के पश्चात काइटिन आहारित मछली व बिना काइटिन आहारित मछली का भोजन रूपांतरण अनुपात, वृद्धि, उत्तर जीवितता दर आदि में कोई प्रभावकारी परिवर्तन नहीं देखा गया किंतु काइटिन आहारित साइजोथोरैक्स रिचार्डसोनी मछली में बिना काइटिन आहारित भोजन की तुलना में भोजन रूपांतरण अनुपात एवं भार में वृद्धि अधिकतम थी। अतः इससे पता चलता है कि काइटिन जो कि ग्लूकासामाइन का बहुलक तथा "नानस्टार्च पालीसैकेराइड" है, गोल्डन माहसीर की वृद्धि पर थोड़ा प्रभाव डालता है, किंतु साइजोथोरैक्स रिचार्डसोनी की वृद्धि को बढ़ाने में सहायक है।

एन.आर.सी–सी.डब्ल्यू.एफ–I आहार में फ़िश मील के साथ केसिन के प्रतिस्थापन का परीक्षण माहसीर बीज उत्पादन इकाई भीमताल में सुनहरी माहसीर अंगुलिकाओं पर ३६ दिनों की अल्प अवधि के लिए किया गया। इस प्रयोग में ५० प्रतिशत केसिन के स्थान पर फिश मील को मछली के भोजन के रूप में प्रयुक्त किया गया तथा इस खुराक को 'एन.आर.सी–सी.डब्ल्यू. एफ–II नाम दिया गया। दोनों प्रकार के परीक्षित आहारों के रासायनिक संयोजन से पता चलता है कि उपरोक्त आहार में यद्यपि केसिन की मात्रा ५० प्रतिशत तक कम हुयी है तथापि उसमें प्रोटीन की मात्रा केवल ६ प्रतिशत तक कम हुयी है। ड्राइ मैटर के आधार पर 'एन.आर.सी–सी. डब्ल्यू.एफ–I में इसका संयोजन इस प्रकार थाः प्रोटीन ५१.६५%, वसा १४.८०%, रेशा ४.५०% मुक्त नाइट्रोजन अर्क २१.१५%, तथा कुल रेशा ८.०% जबकि 'एन.आर.सी–सी.डब्ल्यू.एफ–II में मुख्य तत्व प्रोटीन ४३.३५%, वसा १६.००%, रेशा ६.५०%, मुक्त नाइट्रोजन अर्क २२.६५% तथा कुल ऐश ६.५०% थे।

में विशिष्ट वृद्धि अनुपात, शारीरिक लम्बाई, तथा भार में वृद्धि अधिकतम थी। उपरोक्त दोनों आकारों में पोषित मछलियों के संपूर्ण शारीरिक बनावट के विश्लेषण से पता चलता है कि उनमें कोई विशेष अंतर नहीं था।

राष्ट्रीय अनुसंधान केंद्र पर अमीनों अम्ल के विश्लेषण की सुविधा उपलब्ध न होने के कारण ये अध्ययन 'आई.सी.ए.आर.' तथा 'डी.आर.डी.ओ.' के इन्टरफेस कार्यक्रम के अंतर्गत रक्षा कृषि अनुसंधान प्रयोगशाला, पिथौरागढ़ के जैव–रासायनिक प्रयोगशाला में किए गए। सुनहरी माहसीर मछलियों के शरीर की मांसपेशियों में २५ अमीनो–अम्ल में से १८ अमीनो अम्ल पाए गए। १० अति आवश्यक अमीनो अम्ल में थ्रिओनाइन के अलावा ६ अमीनों अम्ल इन मछलियों में उपस्थित थे।

परियोजना संख्या ए.एफ.ई./ई/१

पर्वतीय क्षेत्रों में विदेशी मछलियों के संवर्धन तकनीकी का विकास।

चाइनीज कार्प के मिश्रित सम्वर्द्धन पर अंतिम प्रयोग अक्टूबर, १९९६ में किया गया। चार तालाबों में (प्रत्येक १५० मी.^{2} के क्षेत्रफल में सिल्वर कार्प (३५ प्रतिशत) ग्रास कार्प (३० प्रतिशत) तथा कामन कार्प (३५ प्रतिशत) का १.५ तथा २ मछली/वर्गमीटर की दर से संचय किया गया। मछलियों को दिए जाने वाले भोजन की मात्रा इस प्रकार थीः खली ४० प्रतिशत, चावल की भूसी २० प्रतिशत, गेहूं का चोकर २० प्रतिशत, फ़िश मील १० प्रतिशत तथा सोयाबीन का आटा १० प्रतिशत। भोजन की मात्रा मछली के भार के हिसाब से २.३ प्रतिशत रखी गयी थी। ग्रास कार्प को धरती पर पाए जाने वाले हरित पौधों की उपलब्धता के अनुसार भोजन दिया गया। प्रत्येक तालाब में सोडियम से भरपूर उर्वरक को १२४१–२७३१ किग्रा. तथा यूरिया को ३७–८० किग्रा. एवं चूने को १२०–१५० किग्रा./है./वर्ष की दर से डाला गया, जल के तापक्रम तथा विकास में सम्बंध जानने के लिए प्रत्येक महीने पानी का भौतिक–रासायनिक विश्लेषण किया गया।

१८६ दिन के पश्चात् कुल मछलियों का उत्पादन १.५ मछलियां/वर्ग मी. में ११५७–२५२५ किग्रा./है. तथा २.० मछलियां/वर्ग मी. में २३१३ किग्रा./है. था। कम घनत्व वाले एक तालाव

०.८६ ग्राम/दिन। २ मछली/वर्गमी. (७० प्रतिशत) अधिक घनत्व के क्षेत्र में कुल जैविक भार भी अधिक था जो फिर से पूर्व के इस निष्कर्ष की पुष्टि करता है कि संचय घनत्व की १.०–१.५ की दर बहुत उपयुक्त है तथा मछली एक समय में (अप्रैल–अक्टूबर) १८५–३०० ग्राम का भार प्राप्त कर सकती है। अब तक के प्रयोगों से पता चलता है कि निःसंदेह ऊष्णकटिबंधीय क्षेत्रों में जल का तापमान मत्स्य उत्पादन में रोधक है। मछलियों का सबसे अधिक विकास मई से अगस्त तक देखा गया है तथा तापमान के ह्रास के साथ–साथ मछलियों का विकास भी सितंबर अक्टूबर के बाद के महीनों में घटता जाता है।

भोजन. रूपांतरण दर उर्वरकों के नियमित आपूर्ति वाले तालाबों में बड़ी मछलियों के संदर्भ में उत्तम पाया गयी तथा यह ज्यादा घनत्व (२ मछलियां/वर्ग.मी.) से कम घनत्व १.५ मछलियां/वर्गमी.) की तुलना में अधिक (३.७३) पाया गयी। इससे यह निष्कर्ष निकलता है कि तीन विदेशी चाइनीज कार्प निम्न तथा मध्य हिमालय क्षेत्रों में उत्पादन के अनुकूल हैं।·प्रभावकारी प्रबंधन योजनाएं जिसमें नियंत्रित संचय दर, घनत्व की उत्तम मात्रा तथा विशिष्ट आहार एवं उर्वरकों का प्रयोग सम्मिलित हैं, एक निश्चित समय (अप्रैल–अक्टूबर) में मछलियों का भार, ३००–४०० ग्राम तक बढ़ा सकता है, ४०० मी. व इससे अधिक क्षेत्रफल के मिट्टी के तालाबों में मछलियों का उत्पादन और अधिक बढ़ाया जा सकता है। वर्ष १९९४–९८ व वर्ष १९९८–२००० में ऊंचे स्थानों (समुद्र तल से १६२० मी. की ऊंचाई) में किए गए प्रयोगों ने हिमालय क्षेत्र हेतु चाइनीज कार्प की कृषि में एक मिश्रित व्यवस्था तैयार की है।

शीत ऋतु में जल का तापमान बहुत कम होने के कारण ग्रासकार्प व सिल्वरकार्प का विकास ही नहीं अपितु उनकी परिपक्वता भी अत्यधिक प्रभावित होती है। ये मछलियाँ क्रमशः २–२.५ किग्रा. तथा १–१.५ किग्रा. तक वजन तो प्राप्त करती हैं किंतु इनमें ५ वर्ष की उम्र तक परिपक्वता नहीं आती है। दूसरे कारक जिन्होंने इस विचार पर सहयोग किया है उनमें सम्मिलित हैं–परिपक्व मछलियों का संग्रहण तथा तालाबों में उनका विकास, प्राकृतिक भोजन की कम उपलब्धता क्योंकि तालाबों में उर्वरक लाभ पहुंचाने के स्थान, आक्सीजन आदि पर दबाव पैदा कर सकते हैं। यदि संभव हो तो पर्वतीय क्षेत्रों में विकास आदि के लिए आर. सी.सी. के तालाबों का निर्माण करना चाहिए। इस प्रकार की समस्या का समाधान प्रबंध समस्या का निराकरण एवं सेक्स हारमोन के प्रयोग द्वारा किया जा सकता है। अभी ५ वर्ष की मछलियों को ओवाप्रिम (एल.एच.आर.एच. की भांति) ०.१ मिली./किग्रा. की दर से २० दिनों के अंतराल पर दिया जाता है। २.३ व ५ साल के प्रजननकों को भी प्रजनन के उद्देश्य से पाला

कामन कार्प की परिपक्वता में प्रजनन तथा जीरा उत्पादन की कोई समस्या नहीं होती है। पर्याप्त मात्रा में परिपक्व मछलियों का संग्रह उपलब्ध है जो ८–१० लाख बच्चे पैदा करने हेतु पर्याप्त हैं किंतु स्थान की कमी के कारण अभी मात्र ३०–४० हजार जीरा का ही उत्पादन हो पा रहा है। मछलियों का प्रजनन प्रत्येक वर्ष में मई तथा सितंबर/अक्टूबर में करने का प्रयास किया जा रहा है।

परियोजना संख्या टी.ओ.टी./ए/१

प्रयोगिक स्तर पर परीक्षण तथा प्रदर्शन कार्यक्रमों के द्वारा तकनीकी का ग्राहकों तक प्रचार

इस परियेाजना के अंतर्गत १७ तालाबों का चुनाव प्रारंभ में किया गया था तदन्तर इनमें से ३ तालाब कार्यसंबंधी समस्याओं के कारण निरस्त कर दिए गए। एक तालाब (बिड़ला, भीमताल) में पूर्ण रूप से मछलियों का दोहन १३७५ किग्रा./है./८ माह की दर से कर लिया गया तथा २ तालाबों (घोड़ाखाल, भीमताल) में आंशिक रूप से दोहन किया गया। विदेशी मछलियों की कृषि का प्रदर्शन पाटी तथा भीमताल ब्लाक के तालाबों में भी किया जा रहा है।

मत्स्य उत्पादन, ऊंचाई के साथ सम्बन्धों को भी दर्शाता है। समुद्र तल से ८०० मी. की ऊंचाई पर (जल का तापमान १२–२८°सें) स्थित तालाबों में अधिकतम ४६६४ किग्रा/है./वर्ष की दर से उत्पादन प्राप्त किया गया। किंतु समुद्रतल से १७०० मी. की ऊंचाई पर (जल का तापमान ५–२५°सें) स्थित तालाबों में ३३५७ किग्रा./है. वर्ष की दर से निम्नतम उत्पादन प्राप्त किया गया।

ऊंचाई किसी भी स्थान के वातावरण को निर्धारित करने में महत्वपूर्ण कारक हैं। इसी प्रकार ग्राहकों द्वारा अपनाया गया प्रबंधन कार्य भी मछलियों के विकास तथा पैदावार को प्रभावित करते हैं। सभी तालाबों में विकास, उत्तरजीविता तथा उत्पादन को देखकर पता चलता है कि जिन तालाबों में मात्र उर्वरकों का प्रयोग किया गया था उनकी उत्पादन क्षमता १३७५ किग्रा./है./वर्ष थी। जिन तालाबों में मछली का भोजन १ प्रतिशत की दर से डाला गया उन तालाबों की उत्पादकता दर २७११ किग्रा/है./वर्ष थी। जिन तालाबों में मछलियों को भोजन ३ प्रतिशत की दर से कार्बनिक तथा अकार्बनिक उर्वरकों के प्रयोग के साथ दिया गया उन तालाबों की उत्पादकता दर ४५६४–४३७४ किग्रा./है./वर्ष रही। घोड़ाघाल के २ तालाबों में उर्वरकों

पर उगने वाले हरित पौधे भोजन के रूप में डाले गए थे अधिक प्रभावपूर्ण रही। कामन कार्प का उत्पादन भी संतोषजनक रहा किंतु सिल्वर कार्प में विकास बहुत अच्छा नहीं रहा। भीमताल क्षेत्र के तालाबों में टौर–प्युटिटौरा तथा स्नो ट्राउट का मिश्रित पालन उत्साहजनक रहा। हिमालय माहसीर का विकास चाइनीज कार्प के समतुल्य देखा गया।

कम ऊंचाई वाले क्षेत्रों में (१३३१ मी. ए.एस.एल) ग्रास कार्प जलीय घास का प्रभावकारी तरीके से नियंत्रण करती है। ८ माह में २००० मछलियां (१.२ किग्रा.) जलीय घास का प्रयोग करके ७६.३ किग्रा. मत्स्य जैविक भार उत्पन्न करती है जो उष्ण–कटिबंधीय क्षेत्रों में इसके जलीय घास को नियंत्रित करने के प्रभाव को दर्शाता है। मत्स्य घनत्व भी मत्स्य उत्पादन में एक नियंत्रित कारक का कार्य करता है। मत्स्य उत्पादन में साधनों की उपलब्धता जैसे पानी का क्षेत्रफल, मत्स्य निवेश आदि भी प्रभाव डालते हैं। बड़े क्षेत्रफल के तालाबों में उत्तम उर्वरकों व भोजन एवं ग्राहकों की देखभाल में मछलियों का उत्पादन ७०४२–७७१० किग्रा./है./वर्ष तक पाया गया। सीमेंट के छोटे तालाबों में जिनमें कम मात्रा में भोजन दिया गया उनमें मछलियों का उत्पादन २७३४ किग्रा./है./वर्ष तक पाया गया।

टी.ओ.टी. कार्यक्रम के अंतर्गत मछलियों के पालनपोषण से यह बात सामने आयी है कि विदेशी चाइनीज कार्प का शीत जल की देशी प्रजाति की मछलियों के साथ निवेश मध्य तथा निम्न हिमालयी क्षेत्रों में एक आर्थिक क्रियाकलाप के रूप में लिया जा सकता है।

तकनीकी निर्धारण एवं हस्तांतरण

राष्ट्रीय अनुसंधान केंद्र में विकसित की गई "ठण्डे पानी में विदेशी कार्प की खेती" नामक तकनीकी का प्रौद्योगिकी हस्तांतरण कार्यक्रम के माध्यम से उपभोक्ताओं पर उसके पड़ने वाले संभावित सामाजिक–आर्थिक प्रभावों का मूल्यांकन एवं क्रियान्वयन किया गया है।

इस कार्यक्रम के अंतर्गत मत्स्य उत्पादन से अपनी आय में वृद्धि करने के लिए कृषकों के पास विभिन्न आकार–प्रकार के तालाब/टैंक हैं। भीमताल ब्लाक में ८ तालाब हैं जो समुद्रतल से ८५०–१६७० मी. की ऊंचाई पर स्थित है। इस कार्यक्रम के अंतर्गत ३ विदेशी कार्प के प्रजातीय संयोजन जैसे–सिल्वर कार्प, ग्रास कार्प एवं कामन कार्प पर परीक्षण किए गए। इसके साथ ही देशी प्रजाति संयोजन जैसे–भारतीय स्नो ट्राउट (साइजोथोरेक्स रिचार्ड सोनी) व हिमालयन माहसीर (टौर प्युटिटौरा) पर भी परीक्षण किए गए।

निम्न ऊंचाई पर स्थित तालाबों में मुख्यतः इसके चारों ओर के तापमान के कारण मछलियों की उत्तरजीवितता, उत्पादन तथा वृद्धि दर अच्छी थी तथा उनके भार में ४५–२१० ग्रा. के बीच वृद्धि प्राप्त की गयी। यह वृद्धि सिल्वर कार्प की तुलना में ग्रास कार्प व कामन कार्प में अच्छी देखी गयी। इस मिश्रित सम्वर्द्धन में देशी कार्प की वृद्धि में भी अच्छी संभावना देखी गई। इन तालाबों से मत्स्य उत्पादन का अनुमान १०१८ किग्रा./है./७ माह से १८७० किग्रा./है./१० माह के बीच लगाया गया, अच्छी तरह से देखभाल किए गए तालाबों में मत्स्य वृद्धि (१६१–२२५ ग्रा.) तथा उत्पादन (२५३३ ग्रा./है. ८ माह) का अच्छा स्तर प्राप्त किया गया।

प्रौद्योगिकी हस्तांतरण कार्यक्रम के कार्यान्वयन से पता चलता है कि पर्वतीय क्षेत्रों में मध्य ऊंचाई पर स्थित तालाबों में देशी कार्प के साथ विदेशी चाइनीज कार्प की खेती भी की जा सकती है।

विस्तार सेवाएं

किया गया। समारोह में जिलाधिकारी एवं अन्य अधिकारियों , विकास–विभागों, शिक्षण–संस्थाओं, किसानों तथा इस क्षेत्र में कार्यरत अन्य सरकारी एवं गैर सरकारी संगठनों के अतिरिक्त, स्कूलों के शिक्षकों, छात्रों आदि ने भी भाग लिया। इस समारोह के मुख्य अतिथि जिलाधिकारी चम्पावत थे। अपने संदेश में उन्होंने विशिष्ट क्षेत्रों के प्राकृतिक तथा जल संसाधनों के प्रबंधन तथा संरक्षण की आवश्यकता पर बल दिया।

इस अवसर पर पर्यावरण के विषय में जागरुकता उत्पन्न करने के उद्देश्य से स्थानीय विद्यालयों के छात्रों के मध्य "जलीय पर्यावरण–मानव की आवश्यकता "नामक शीर्षक पर एक कला प्रतियोगिता भी करायी गयी। इसके अतिरिक्त संस्थान की गतिविधियों को मत्स्य सम्बर्द्धन की क्रियाकलापों के प्रदर्शन एवं निदर्शन (व्याख्यान) के माध्यम से प्रचारित भी किया गया।

शिक्षण एवं प्रशिक्षण

- श्री बलदेव सिंह टी–१–३ ने राष्ट्रीय कृषि अनुसंधान प्रबंध अकादमी हैदराबाद द्वारा (१७–२७ अगस्त १९९९) "पुस्तकालय तथा सूचना केंद्रों पर कम्प्यूटर के प्रयोग" पर आयोजित प्रशिक्षण कार्यक्रम में भाग लिया।

- डा. के.के. वास, निदेशक ने भारतीय नदियों के संदर्भ में परिस्थितिकी मात्स्यिकी एवं मत्स्य भण्डार के मूल्यांकन पर आयोजित ग्रीष्मकालीन शिविर में बायोमोनिटरिंग एण्ड इफैक्टिव टूल इन ई.आई.ए. स्टडीज़" विषय पर केंद्रीय अंतस्थलीय मत्स्य संग्रहण अनुसंधान संस्थान बैरकपुर में ११ अगस्त, ९९ को व्याख्यान दिया।

- श्री अशोक कुमार नायक, वैज्ञानिक (कम्प्यूटर एप्लीकेशन) ने राष्ट्रीय कृषि अनुसंधान प्रबन्ध अकादमी हैदराबाद द्वारा मार्च २७ से १ अप्रैल, २००० तक आयोजित "कृषि में इंटरनेट के प्रयोग" कार्यक्रम में भाग लिया।

- शिक्षित मत्स्य कृषकों के लिए चंपावत जिले के विभिन्न ब्लाकों के मुख्यालयों में २२–२५ फरवरी, २००० में प्रशिक्षण कार्यक्रम आयोजित किए गए।

अनुसंधान सलाहकार समिति (RAC) प्रबंध समिति, वैज्ञानिक अनुसंधान समिति (एस. आर.सी.), क्विनक्विनल रिव्यू टीम (QRT) आदि बैठकें

अनुसंधान सलाहकार समिति

डा. एस.पी. अय्यर की अध्यक्षता में अनुसंधान सलाहकार समिति की द्वितीय बैठक ७ व ८ अक्टूबर, १९९९ को भीमताल में हुयी जिसमें संस्थान के वैज्ञानिकों सहित निम्नलिखित सदस्यों ने भाग लिया।

डा. एस.पी अय्यर	भूतपूर्व निदेशक केन्द्रीय अन्तःस्थलीय प्रग्रहण मात्स्यिकी अनुसंधान संस्थान (सिफरी), बैरकपुर	अध्यक्ष

प्रो. एस.के. गर्ग	चौधरी चरण सिंह कृषि विश्वविद्यालय, हिसार हरियाणा	सदस्य
प्रो. के चटर्जी	उत्तर–पूर्वी पर्वतीय विश्वविद्यालय शिलांग	सदस्य
डा. बी.एन. सिंह	सहायक महानिदेशक (मत्स्य) भारतीय कृषि अनुसंधान परिषद नई दिल्ली	सदस्य
डा. के.के. वास	निदेशक राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र भीमताल	सदस्य
डा. एच.एस. रैना	प्रधान वैज्ञानिक राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र भीमताल	सदस्य सचिव

प्रबंध समिति

संस्थान की प्रबंध समिति की ५वीं बैठक निदेशक महोदय की अध्यक्षता में ६ अगस्त १९९६ को भीमताल में हुयी, जिसमें कार्यसूची की विभिन्न मदों पर गहन विचार–विमर्श किया गया तथा संस्थान की निर्बाध प्रगति का निर्णय लिया गया, समिति की बैठक में निम्नलिखित सदस्यों ने भाग लियाः

डा. के.के. वास	निदेशक राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र भीमताल	अध्यक्ष
डा. वी.आर. चित्रांशी	वरिष्ठ वैज्ञानिक	सदस्य

डा. श्याम सुंदर	वरिष्ठ वैज्ञानिक राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र भीमताल	सदस्य
डा. एच.एस.रैना	प्रधान वैज्ञानिक राष्ट्रीय शीतजल मात्स्यिकी अनुसंधान केन्द्र भीमताल	सदस्य सचिव

कर्मचारी अनुसंधान परिषद

संस्थान की कर्मचारी अनुसंधान परिषद् की बैठक ११ मई, १९९९ को निदेशक महोदय की अध्यक्षता मे हुयी जिसमें वर्ष १९९८–९९ की विभिन्न परियोजनाओं पर हुयी प्रगति का मूल्यांकन किया गया तथा वर्ष १९९९–२००० के लिए नवीन परियोजनाओं को अंतिम रूप प्रदान किया गया।

आई.जे.एस.सी. बैठक

आई.जे.एस.सी. की नियमित बैठकें दिनांक ३.४.९९–२९.६.९९ एवं १.१०.९९ को निदेशक महोदय की अध्यक्षता में की गयी जिनमें कर्मचारियों के कल्याण एवं अन्य सम्बंधित गतिविधियों पर विचार विमर्श किया गया तथा पिछले निर्णयों का विस्तार से पुनरीक्षण किया गया।

हिंदी समिति

राजभाषा कार्यान्वयन समिति की तिमाही बैठकें नियमित रूप से आयोजित की गयी, समिति ने संस्थान द्वारा राजभाषा हिंदी के प्रगामी प्रयोग से सम्बंधित गतिविधियों का भी पुनरीक्षण किया।

६–९ अगस्त, १९९९ को भारतीय कृषि अनुसंधान परिषद की राजभाषा कार्यान्वयन सिमति के उपनिदेशक श्री ए.के. जोशी की अध्यक्षता में ३ सदस्यीय दल ने संस्थान का भ्रमण किया। दल ने वैज्ञानिक कार्यों तथा विभिन्न कार्यालयी कार्यों में संस्थान द्वारा किए जा रहे हिंदी के प्रयोग का मूल्यांकन किया। दल के सदस्यों ने संस्थान में राजभाषा हिंदी की प्रगति को देखकर प्रशंसा की।

खेलकूद