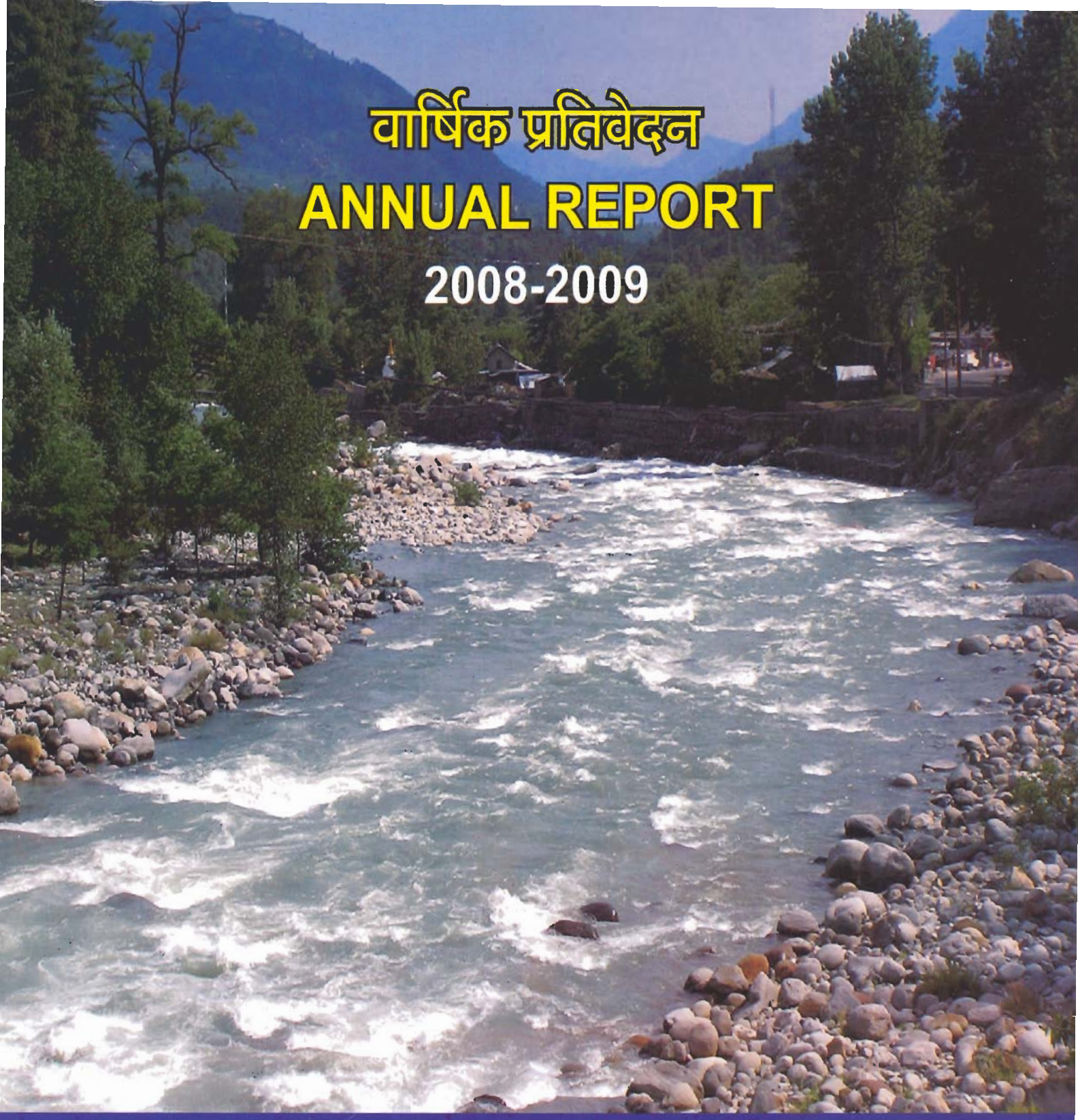

वार्षिक प्रतिवेदन
ANNUAL REPORT
2008-2009

शीतजल मात्स्यिकी अनुसंधान निदेशालय
(भारतीय कृषि अनुसंधान परिषद्)
भीमताल, नैनीताल, उत्तराखण्ड, भारत

DIRECTORATE OF COLDWATER FISHERIES RESEARCH
(Indian Council of Agricultural Research)
Bhimtal - 263 136, Nainital, Uttarakhand, India

भाकृअनुप
ICAR

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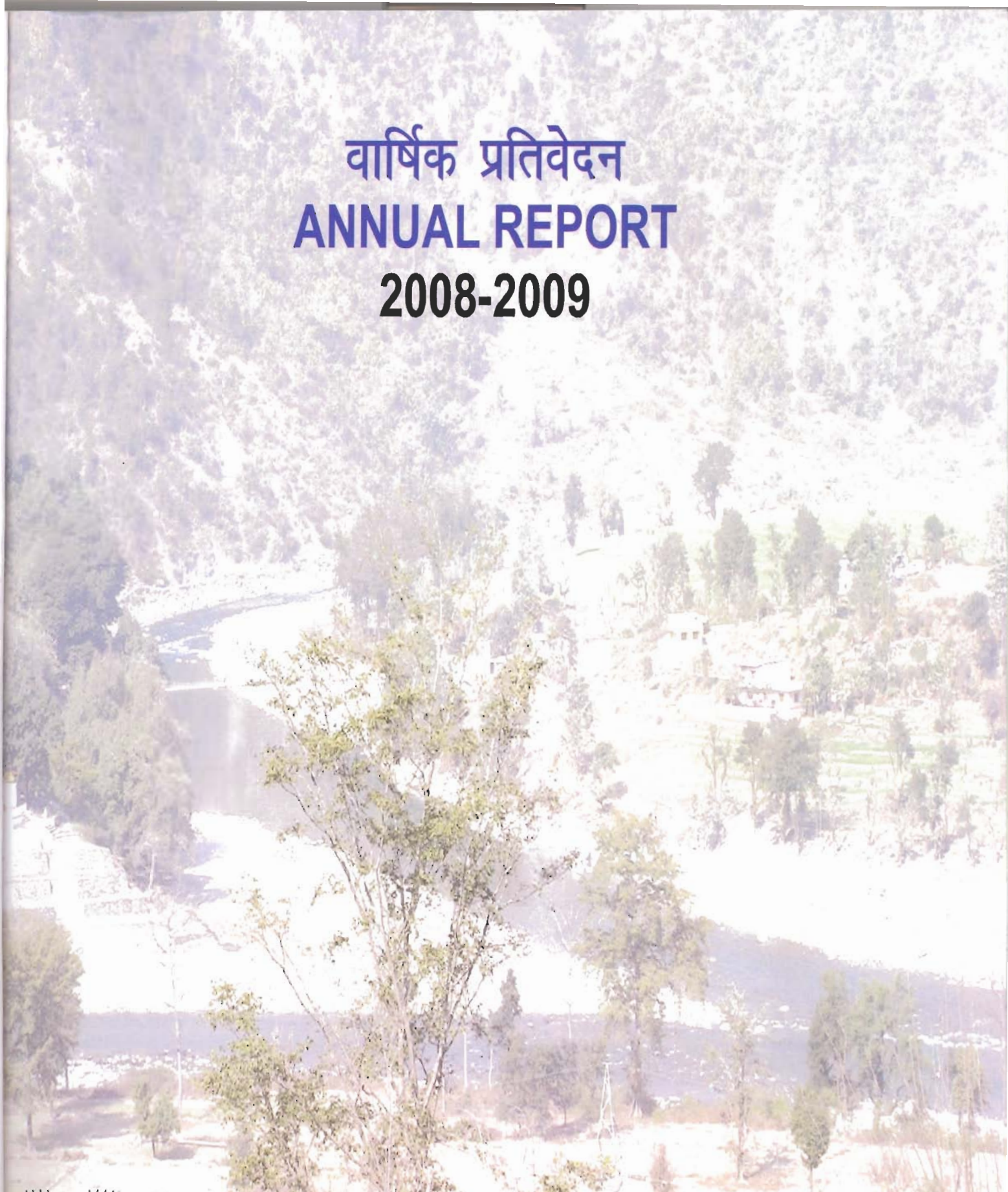

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DIRECTORATE OF COLDWATER FISHERIES RESEARCH
(Indian Council of Agricultural Research)
Bhimtal - 263136, Nainital, Uttarakhand, India

DCFR Annual Report 2008-2009

Published by
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View of River Beas near Patlikulh, HP

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Mahseer Sanctuary near Baijnath, HP

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PREFACE

With an aim to fulfill the objectives of 11th Five year Plan our Institute has entered into a new dimension with the reorganization of the NRCCWF to Directorate of Coldwater Fisheries Research (DCFR). It is a great pleasure that Hon'ble Dr. Mangala Rai, Secretary DARE & Director General, ICAR has unveiled the Institute's new logo on 28th December 2008, in presence of some eminent dignitaries and our partners of five hill states. The year 2008-09 is a great milestone in the history of coldwater fisheries research to develop and utilize the mountain fishery resources. In fulfilling the need of the hill people for economic upliftment we designed our research programmes involving five hill states partners.

During the year we completed successfully some research projects and initiated some more research activities like water harvesting and recirculatory unit. We have participated with other fisheries institutes under ICAR in several activities of Fish Feed, Nutrient Profiling and evaluation of fish as a dietary component and Fish Genetic Stock. Our scientists have initiated some externally funded projects for DNA marker development in some coldwater fish species and also for enhancement of livelihood security through sustainable farming system and related farm enterprises in North-West Himalayas under NAIP. We have generated some revenue through selling of fish seed under ICAR mega seed project and adjudged by Seed Directorate as "Very Good".

We also successfully arranged several training programme for the scientists, fisheries officers, and farmers. Our scientists participated in several national training, workshops, seminars and own several awards and honors. It was the constant efforts of scientists and all staff members of this institute that made possible for such progress and achievements. The continuous support, guidance and encouragement received from Dr. Mangala Rai, Secretary DARE & Director General, ICAR, Dr. S. Ayyappan, Dy. Director General (Fy) and Dr. V.V. Sugunan, ADG (Inland Fisheries) is recorded with sincere thanks and gratitude.

Thanks are also due to Dr. A. Barat, Sr. Scientist and Sri A.K. Nayak, Scientist (SS) in bringing out the Annual Report. The efforts made by Sri Amit Kumar Joshi, T-5, for Hindi Version of the report and other assistance rendered by Smt. Susheela Tewari, PA to Director is also recorded with appreciation.

Date : 02 September, 2009

P.C. Mahanta
DIRECTOR

CONTENTS

स्थिति को दर्शाता है। 2 सितम्बर 2008 को पॉच मादा (400, 420, 450, 390 व 610 ग्रा.) तथा ग्यारह नर (430 ग्रा. सामान्य भार) जो 5 वर्ष से अधिक के थे, उनमें परिपवक्वता देखी गयी। तीन जोड़ो को बिना ओवा प्राइम के दोहा (stripped) गया जननशक्ति 5270 अण्डे/कि.ग्रा. तथा अण्डों का आकार 3.1–3. 7 मि.मी. रिकार्ड किया गया 12 घण्टों के पश्चात उवर्रण दर 78 प्रतिशत थी।

वर्तमान अध्ययन से यह स्पष्ट पता चलता है कि सुनहरी महाशीर (*टौर प्युटिटौरा*) के प्रजनक संग्रहों को तालाब में बिना किसी परेशानी के पाला पोषा जा सकता है। सुनहरी महाशीर की परिपक्वता मे ओवाप्राइम के साथ पी.जी. एक्सट्रैक्ट का मिश्रण, प्रिगनान, एम.टी. आदि, दवाऐ भी प्रभावकारी हैं। इसी प्रकार चम्पावत में स्नोट्राउट (*साइजोथोरैक्स रिचार्डसोनी*) के प्रजनकों को तीन नर्सरी तालाबों (15 मी^{2}) में 8 (18 ग्रा.), 11.3 (57ग्रा.) व 5.3 (85ग्रा.) मत्स्य/मी^{2} की दर से अक्टूबर 2005 में पाला गया तथा जुलाई 2008 में उनमें परिवक्वता देखी गयी।

स्नोट्राउट (*साइजोथोरैक्स रिचार्डसोनी*) के दो भिन्न वर्ग के समूहो को पिजड़ों में पाला गया। इन मछलियों को कृत्रिम रूप से बनाया गया आहार दिया गया। सुनहरी महासीर (*टौर प्युटिटोरा*) के दो भिन्न वर्गो के समूहों को भी इसी प्रकार पाला गया। दोनो पिजड़ों में उनका बड़ा आकार उनकी अच्छी वृद्धि व अच्छी भोजन ग्राहय क्षमता को सूचित करता है। हगंरीयन कामन कार्प को मोनो एवे पौली कल्चर प्रणाली में पाला गया। चौकलेट महाशीर (उ0 पूर्वी भारत की स्थानीय प्रजाति) को शीतजल मात्स्यिकी अनुसंधान निदेशालय, भीमताल की हैचरी में संचालित किया गया और विभिन्न टैंको में इनकी उत्तर जीवितता दर देखी गयी।

कुछ मत्स्य रोगाणुओं के अन्वेषण हेतु प्रयोगशाला का निर्माण किया गया तथा प्रारम्भ में कुछ बैक्टीरिया परजीवियों, फूँफदों को अलग किया गया। विषाणु रोगमूलकों के अध्ययन हेतु एक कोशिका –संवर्धन सम्बन्धी ईकाई को भी विकसित किया गया है।

विभिन्न भौगोलिक स्थितियों से आणविक संकेतकों जैसे–RAPD व माइटोकान्ड्रियल जीनोम के प्रयोग द्वारा भारतीय स्नोट्राउट (*साइयोथोरैक्स रिचार्डसोनी*) का आणविक आनुवंशिक वर्गीकरण किया गया।

प्रथम बार जल प्रबन्धन एवं जल–वजट पर अध्ययन के लिए परियोजना आरम्भ की गयी। तालाबों एवं जीव समूहों पर आधारित आवश्यक जल का आंकलन किया गया। एक पुर्नसंचालित जल ईकाई के प्रारूप का भी निर्माण किया गया।

भारतीय कृषि अनुसंधान परिषद की वृहत बीज परियोजना के अन्तर्गत सुनहरी माहसीर के 103050, कामन कार्प के 20 लाख जीरे, चाकलेट महासीर के 5000 जीरे, स्नो ट्राउट के तथा रेन्वो ट्राउट के 10000 जीरे पैदा किए गए। प्रथम बार सुनहरी महासीर के बीज बेचकर 75000.00 रूपये की आय प्राप्त की गयी। उत्तर पूर्वी पर्वतीय क्षेत्र में कुछ चयनित शीतजल मत्स्य प्रजातियेां के पालन पोषण संरक्षण विकास एवं प्रलेखन सम्बन्धी गतिविधियॉ आयोजित की गई। निदेशालय द्वारा भा0 कृ0 अनु0 परिषद्, नई दिल्ली के मात्स्यिकी विभाग के अन्तर्गत विभिन्न मात्स्यिकी संस्थानों के साथ मिलकर तीन आउटरीच गतिविधियॉ आरम्भ की ये थी – (1) मत्स्य आहार (2) न्यूट्रीन्ट प्रोफाइलिंग तथा खाद्य पदार्थ के रूप में मछली का परिगणन तथा (3) मत्स्य आनुवंशिक संग्रह।

मत्स्य आहार के अन्तर्गत र्लावा (डिंभक) वृद्धि, महासीर की उत्तरजीवितता, चौकलेट महासीर में वृद्धि करने वाले आहार का निर्माण तथा रेन्बो ट्राउट के आहार का परिष्करण, आदि में वृद्धि के लिए तीन विभिन्न कार्यक्रम आयोजित किये गये। नैनीताल जिले के कुछ स्थानीय क्षेत्रों में क्लीनिकों-

ऐपिकीमोलौलिकल सर्वेक्षण किया गया तथा अरूणाचल प्रदेश व उत्तराखण्ड राज्य के विभिन्न क्षेत्रों से मत्स्य नमूनों को भी एकत्र किया गया। न्यूट्रीप्ट प्रोफाइलिंग तथा खाद्य पदार्थ के रूप में मछली के परिगणन के अन्तर्गत नमी, प्रोटीन, खाद्य प्रोटीन, कार्बोहाइड्रेट, खनिज एवं कुछ अमीनों अम्लों का मत्स्य नमूनों में मूल्यांकित किया गया। मत्स्य आनुवंशिक संग्रह के अन्तर्गत *टौर प्युटिटोरा* के नमूनो का एकत्रित करने के लिए कुछ अलग भूगर्भिक क्षेत्रों को परिभाषित किया गया तथा कुछ आंकड़े भी एकत्रित किये गये। पहली बार निदेशालय ने जैव–प्रौद्योगिकी विभाग, नई दिल्ली द्वारा पोषित डिवलपमैंट एण्ड करैक्टराइजेशन औफ माइक्रोसैटेलाइट मार्कर्स इन इण्डियन स्नोट्राउट *साइजोथोरैक्स रिचार्डसोनी* योजना का संचालन किया। *साइजोथोरैक्स रिचार्डसोनी* के डी0एन0ए0 जीनोमिक से जीनोमिक लाइब्रेरी का आरम्भ किया गया। एक अन्य परियोजना एन0ए0 आई0पी0 के अन्तर्गत, उत्तर पश्चिम हिमालय क्षेंत्रों में फार्म उद्यम सम्बन्धी कार्य,एवं सतत् मत्स्य पालन प्रणाली के द्वारा सुरक्षित जीविका को बढाने के लिए कार्य किये गये। रा0शी0मा0अनु0 केन्द्र का नाम शी0मा0अनु0 निदेशालय में परिवर्तित होने के पश्चात निदेशालय द्वारा सस्टेनेबल यूटीलाइजेशन औफ माउन्टेन फिशरी रिर्सोसेज–ए पार्टनशिप मोड पर पॉच पर्वतीय राज्यों, अरूणाचल प्रदेश, हि0प्र0, जम्मू एवं कश्मीर, सिक्किम एवं उत्तराखण्ड के साथ मिलकर एक कार्यक्रम का आयोजन किया।

अनुसंधान गतिविधियों के अतिरिक्त, निदेशालय ने कुछ बैठकों जैसे आर.ए.सी., एस.आर.सी., प्रबन्ध समिति, क्यू.आर.टी. तथा राजभाषा कार्यान्वयन समिति व संयुक्त कर्मचारी परिषद् समिति का भी आयोजन किया।उपरोक्त समितियों में विभिन्न कार्यसूचियों पर चर्चा की गयी तथा उचित प्रबन्धन एवं संस्थान की निर्बाध प्रगति व अनुसंधान गतिविधियों के लिए उचित दिशा–निर्देश उपलब्ध कराये गये। निदेशालय परिवार देश की विभिन्न संस्कृतियों का प्रतिनिधित्व करता है तथा प्रत्येक सदस्य विभिन्न राष्ट्रीय दिवसों, घटनाओं, आदि में साम्प्रदायिक सौहार्द की भावनाओं से भाग लेता है।

EXECUTIVE SUMMARY

National Research Center on Coldwater Fisheries was established as an independent Research Center on 24 September 1987 during the VII Five Year Plan. This is the only national facility in the country to take up the research on capture and culture aspects with a focus on exotic and indigenous coldwater fish species. Since its inception, the NRCCWF in spite of constraints in terms of manpower and infrastructure has made significant contribution for proper appraisal of coldwater fishery resources and evolve suitable technologies to propagate important coldwater fish species in hills. Keeping in view the ever expanding activities of NRCCWF and the greater potential of coldwater fisheries in different Himalayan states, the center has been constituted as Directorate of Coldwater Fisheries Research (DCFR) during XI Five Year Plan, to develop location, situation and system specific technologies by utilizing and augmenting resources in all the Himalayan states from Jammu & Kashmir to Arunachal Pradesh. During the year under report 11 institutional projects including ICAR Mega Seed Project, Outreach activity with five hill states, three outreach activities with Fisheries Institutes under ICAR and two externally funded projects were conducted.

In open water fisheries the toposheet area of coldwater fisheries resources under Nainital District was digitized to develop GIS based support system for aquaculture. Different water resources, namely lakes, rivers, streams and road network were digitized. The physico-chemical parameters of water from different sampling stations were analyzed and ancillary data were also collected from literatures. Thus the combination of computer programming and GIS database can be used as an integrated decision support system to assess the fisheries resources to derive strategies for integrated management in the area.

Some growth models used in fisheries are inappropriate for use with species whose growth is seasonal due to the assumption that growth is invariant over time. A modified version of the logistic model that incorporates cyclical (or seasonal) fluctuations in growth gave significantly improved results when it was fitted to observations of length-at-age from *Tor putitora*. Also, length weight equations for two different groups of various species of snow trout observed from Jhelum River, Kashmir were meaningfully fitted with expected value parameters. Further, efforts were given to collect primary data from different

Assam Matsya Mahotsav, 2009

sites of Kosi River to study the various influencing effects (e.g. sex, season, location, etc.) on length weight relationship of *Tor putitora*.

The fish stocks of *Tor putitora* of different age group initially collected from wild are being reared in pond environment in 2 hired ponds at Bhimtal (1200 m asl) since October 2005. The variables related to water quality were identical for all the brood stock. The fish feed fortified with MT@50 mg/kg of feed was offered to brood stock of the age of 4 years daily during February to June. Few prospective fish specimen were marked and treated with ova prime plus carp PG.

On 22 April 2008, the brood stock having age of 4+ years and treated with MT and drugs found matured. Two females having weight of 280-310 g and 2 males of 180 and 210 g were stripped without using Ova prim as a spawning agent. The fecundity was recorded 4210 eggs/kg and the rate of fertilization was recorded 62%. In mid of June 2008, the untreated brood stock of 5+ years of age was found maturing clearly exhibiting sexual distinction and free oozing condition in males. On September 3, 2008, five females (400,420,450, 390 and 610 g) and 11 males (Av.wt 430g) of 5+ found matured. Three pairs stripped without the use of spawning agent –Ova prim. The fecundity was calculated 5270 eggs/kg and the size off egg was 3.1-3.7 mm. After 12 hrs, the fertilization rate was 78%.

From the present study, it is clearly evident that the brood stock of golden mahseer (*Tor putitora*) can be reared, developed in pond environment with no difficulty. The maturation inducing drugs like MT, Pregnan and PG extract in combination with Ova prime are effective to induce maturation in the species Himalayan mahseer.

Similarly the fish stock of snow-trout (***S. richardsonii***) being reared in 3 nursery ponds (15m²) at Champawat @ 8 (18 g), 11.3(57 g) and 5.3 (85 g) fishes/ m² since October 2005 was found matured in June-July 2008.

Rearing of Snow trout (*Schizothorax richardsonii*) of two different size groups were tried in cages. The fishes were fed with artificial

(NEH Activities at Zero, Arunachal Pradesh)

formulated feed. Golden mahseer (*Tor putitora*) of two different size groups were also tried for rearing in the same way. In both cases bigger size of individuals exhibited better growth performances and feed efficiency.

Growth performances of Hungarian strain of common carp were tried in mono and poly culture system. The chocolate mahseer (A native species of North East India) was stocked in hatchery complex of DCFR, Bhimtal. The survival rate in different tanks was recorded following feeding with artificial feeds.

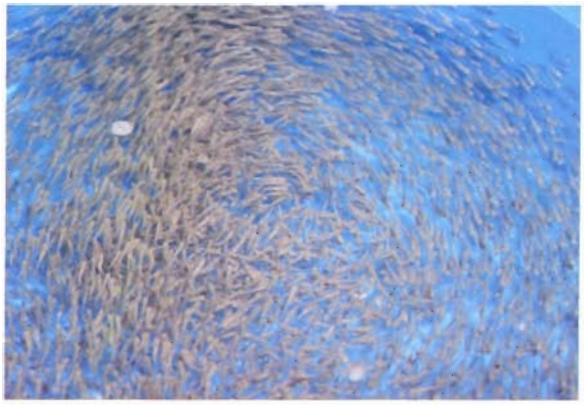
Laboratory set-up was made for investigations on several fish pathogens and initial attempt was made to isolate some bacterial pathogens, parasites and pathogenic fungi. A cell culture facility was also developed to study viral pathogens.

Molecular genetic characterization of Indian Snow Trout (*Schizothorax richardsonii*) from different geographical locations was tried using molecular markers like RAPD and mitochondrial genome.

For the first time a project was initiated to study on water budgeting and management. Initially the water requirement based on the biomass and operational ponds was estimated. One water re-circulatory unit was also designed.

Under ICAR Mega Seed project, seed production of golden mahseer was 103,050, common carp 20lakh spawn and 7lakh fry, 5000 fry of chocolate mahseer, 10000 fry of snow trout and 10000 fry of rainbow trout were produced. For the first time Rs. 75000/- was generated by sale of seed of mahseer.

Director's Conference at CMFRI, Kochi



Seed production under ICAR Mega Seed Project

Packaging of mahseer seed for transportation

In North East Hill region programme several activities were performed for aquaculture development, conservation and documentation of bioprospecting bacterial micro flora from selected coldwater fishes.

The Directorate has initiated three outreach activities with different Fisheries Institute under Fisheries Division, ICAR, New Delhi. These are 1) Fish Feed, 2) Nutrient Profiling and evaluation of fish as a dietary component, and 3) Fish Genetic Stock. Three different activities were performed under "Fish Feed" for enhancement of larval growth and survival of mahseer, development of grow-out feed of chocolate mahseer, and up-scaling of existing grow-out feeds and feeding practices in rainbow trout. Clinico epidemiological survey was made in some localities in Nainital District and fish samples were collected from different areas of Uttarakhand and Arunachal Pradesh. Moisture content, protein, crude fat, carbohydrate minerals and some amino acids were estimated in fish samples under "Nutrient Profiling and evaluation of fish as a dietary component". Under "Fish Genetic Stock", some geographically isolated areas were defined for sampling of *Tor putitora* and some samples were also collected for morphological and genetic assessment using mtDNA amplicons of D-Loop and Cytochrome b gene sequences.

For the first time the Directorate has conducted externally funded project entitled, "Development and characterization of microsatellite markers in Indian Snow Trout, *Schizothorax richardsonii*" funded by Department of Biotechnology, New Delhi. Partial genomic library from genomic DNA of *Schizothorax richardsonii* was initiated. In another project of NAIP under Component 3, work has been initiated for enhancement of livelihood security through sustainable farming system and related farm enterprises in North-West Himalayas.

After the renaming of NRCCWF to DCFR, the directorate has initiated a programme "Sustainable utilization of mountain fishery resources- a partnership mode" with five hill states *viz.* Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Sikkim and Uttarakhand.

Lecture by scientist to students of Infusion College, Haldwani

Packaging of mahseer seed for transportation

Release of mahseer seeds in presence of RAC members

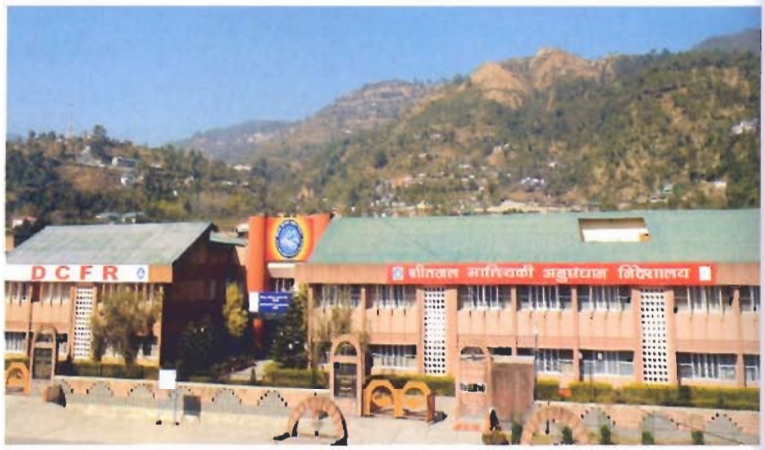
Other than the research activities, the Directorate also has organized several meetings, like, RAC, SRC, Institute Management Committee, QRT, IJSC and official language. The respective committees discussed the various agenda items and provided guidelines for the proper management and smooth functioning of the institute and research activities. The Directorate family is representative of diverse cultures of the country and each member participated in celebration of various national days, events and genuine spirit of communal harmony.

Visit of QRT members of Library

Participation of Scientists at 8th Indian Fisheries Forum, Kolkata

QRT-RAC members

INTRODUCTION



Coldwater fisheries have a great potential in generating rural income and providing food security to the economically underprivileged population residing in Indian uplands. To utilize the available resources and opportunities in the coldwater fisheries sector the involvement of Indian Council of Agricultural Research in this sector started during late sixties which, subsequently culminated in the creation of National Research Center on Coldwater Fisheries as an independent Research Center on 24 September 1987 during the VII Five Year Plan. This is the only national facility in the country to take up the research investigation on capture and culture aspects with a focus on exotic and indigenous coldwater fish species. Since its inception, the NRCCWF in spite of constraints in terms of manpower and infrastructure has made significant contribution for proper appraisal of coldwater fishery resources and evolve suitable technologies to propagate important coldwater fish species in hills.

Keeping in view the ever expanding activities of NRCCWF and the greater potential of coldwater fisheries in different Himalayan states, in a significant decision during the XI plan, it has been made a **Directorate of Coldwater Fisheries Research (DCFR)**, to develop location, situation and system specific technologies by utilizing and augmenting resources in all the **Himalayan states from Jammu & Kashmir to Arunachal Pradesh**.

The DCFR is on its glorious path of virtually actualizing its vision by imparting boon of quality research in sustainable coldwater fisheries production, management and conservation.

Location

The headquarters of DCFR is located at Bhimtal at an altitude of 1470 m asl in the district of Nainital of Uttarakhand state. It is about 25 km away from the famous tourist place of Nainital. The nearest railway station is Kathgodam, which is about 280 km from Delhi. The nearest airport is Indra Gandhi International Airport, New Delhi. The experimental field station of the Institute at Chirapani in Champawat district of Uttarakhand State is about 150 km from Bhimtal.

This Directorate is now emerging as the nodal facility in the country where research investigations are undertaken both on capture and culture aspects with a focus on exotic and Coldwater species.

Faculty

The institute has sixteen scientists among whom one principal scientist retired on superannuation on 31st July 2008 and one senior scientist transferred to NDRI, Karnal on 8th August 2008. Among the available 14 scientists three (two as per sanctioned cadre and one from career advancement scheme) are principal

scientist and five senior scientists and two scientists (SS) and 4 scientists. The revised cadre strength is 30 from which more than 50% of the sanctioned scientists posts are laying vacant.

Management

A high powered Research Advisory Committee (RAC) guides this Directorate in the research in thrust areas and on new initiatives. The RAC also evaluates and monitors the progress of research activities of this Directorate. The Management Committee (IMC) constitutes and mandated by Indian Council of Agricultural Research under the Chairmanship of the Director, supervises at this Institute. A number of Internal committees such as Staff Research Council (SRC), Official Language Committee and Institute Joint Staff Council (IJSC) are in place of decentralized management.

Mandate

- To conduct basic, strategic and applied research in coldwater fisheries and aquaculture
- To develop stock management models and culture technologies for major coldwater fish species
- To create awareness and provide training and consultancy

The organizational set-up

Infrastructure

Building and Farm

The Institute is now functioning from its own new complex constructed at Bhimtal Industrial area. A pilot scale mahseer seed production unit is also operating at Bhimtal on the land belonging to State Fisheries Department, Uttarakhand, which in addition to the mahseer hatchery houses, a laboratory which provides back up facilities to seed production activities of the directorate. The directorate has an experimental fish farm facility at Chhirapani in Champawat district of Uttarakhand State which has trout hatchery, cemented raceways for nursery and brood stock rearing and few circular iron tanks for conducting yard trials on various culture aspects of the indigenous and exotic fish species.

Support Services

Project Implementation and Monitoring Cell

A separate cell called the Project Implementation and Monitoring Cell, monitors the implementation and progress of research project programmes being conducted by the Directorate. This cell annually organizes the meeting of staff research council (SRC) to evaluate the progress made in each research project and accordingly approves the work programmes for the current year. The new proposals are also approved by the SRC after through evaluation of the objectives, practical utility, manpower support and financial involvement. The cell is also responsible for maintaining records of project reports through RPF system.

Technical Cell

The technical cell has given the responsibilities of dealing with all technical matters within and outside the ICAR system. The cell takes care of the training programmes, deputation, participation of scientists in seminars, symposia, workshop, meetings etc. and organizing conferences.

Publication Committee

The committee was constituted for compilation and editing of each year annual report, newsletter, bulletins, brochures and pamphlets of the Directorate.

Library Section

The library of the Directorate subscribes to 19 foreign and 11 Indian Journals yearly. The current holding of the library includes more than 2000 books and 3000 other publications. It provides services to the scientists and other staff members of the institute apart from scholars, researchers, students and other local organizations interested in scientific literature on coldwater fisheries and other allied subjects. The library also provided facilities to access free online download of publications, articles of many international journals through www.cera.jccc.in. The library section is further continuing its efforts in collection, processing and disseminating scientific/technical information to the potential users.

Exhibition/ book display at DCFR, Bhimtal for procurement of our Library

ARIS Cell

The ARIS Cell of this Directorate has so far provided the facilities for Internet through VSAT, scanning, printing to the Scientists and other staff members. The LAN connectivity has also been established for information sharing in the institute. The institute is also equipped with modern plasma display/LCD projection facilities required for the seminars, workshop and other meetings. The institute's website has been regularly upgraded by ARIS Cell. It contains relevant information about the Institute, photographs of the institute's complex, various laboratories, experimental fish farm/hatchery at Bhimtal and Champawat and other related information to Institute mandate, organizational set up, manpower, research projects etc. The major achievements of the Directorate, the technology generated, consultancy services were incorporated in the site. Further, the ongoing and forthcoming training programmes, seminar/symposia conducted by the institute, recruitments, tender notice has been reflected in the website. The Directorate's website finds a place in the Indian Council of Agricultural Research (ICAR) website with the address: http://www.icar.org.in/dcfr

Visit of Scientist from CIFE, Mumbai

Laboratory Facilities

The Directorate has well equipped Aquaculture, Health Management, Nutrition, Genetics & Biotechnology and Transfer of Technology laboratories. In addition to these it has wet laboratory equipped with flow through troughs for installing physiological experiments and nutrient trials. One trout feed mill also installed at main campus of Institute to meet routine requirements of fish feeds.

Extension Wing

The extension wing carries out the various extension activities of the institute such as transfer of technology programmes, organizing the exhibitions, training programmes and other activities related to farmers.

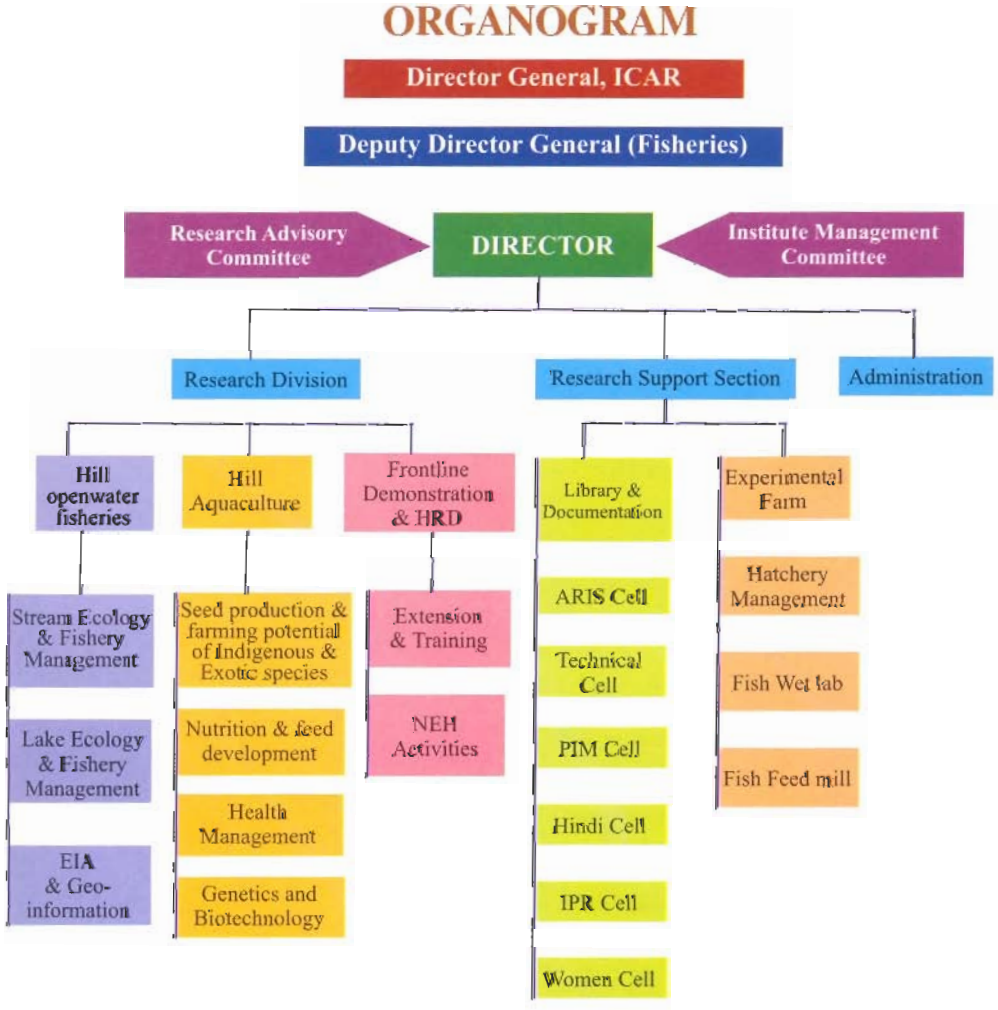
IPR Cell

The Directorate has constituted IPR (Intellectual Property Rights) Cell. It is responsible for providing informations about ICAR guidelines on IPR issues. Trainings to the concerned scientists have also been given regarding IPR issues. The ITMC has also been constituted under the chairmanship of Director for dealing with patents and other intellectual property rights to recognize technologies developed at the Institute and their safe transfer.

Staff strength as on 31.03.2009

Category	Sanctioned	Filled	Vacant
Director (RMP)	01	01	-
Scientific	30	14	16
Technical	14	14	-
Administrative	11	10	01
Supporting	14	14	-
Total	70	53	17

ORGANOGRAM



BUDGET 2008-2009

Financial Statement Abstract

(Rupees in Lakhs)

Year	Funds Non-Plan	Expenditure Non-Plan	Funds Plan	Expenditure Plan
2005-2006	124.03	117.68	235.98	235.90
2006-2007	124.50	116.21	192.91	186.26
2007-2008	146.00	142.40	208.00	207.65
2008-2009	217.30	214.91	270.00	269.23

Budget Statement for the Year 2008-2009

(Rupees in Lakhs)

Head of Accounts	Budget (R.E.)		Expenditure	
	Plan	Non-Plan	Plan	Non-Plan
Pay & Allowances	-	175.60	0	173.54
Traveling Expenses	10.00	1.70	10.00	1.70
HRD	3.00	0	3.00	0
Other Charges including Equipment	182.00	20.00	181.24	19.69
Information Technology	10.00	0	9.99	0
(a) Major Works	65.00	0	65.00	0
(b) Repair & Maintenance	0	20.00	0	19.98
Other Items Fellowship/ Scholarship/Awards including furniture for New Complex	0	0	0	0
NEH	0	0	0	0
Total	**270.00**	**217.30**	**269.23**	**214.91**

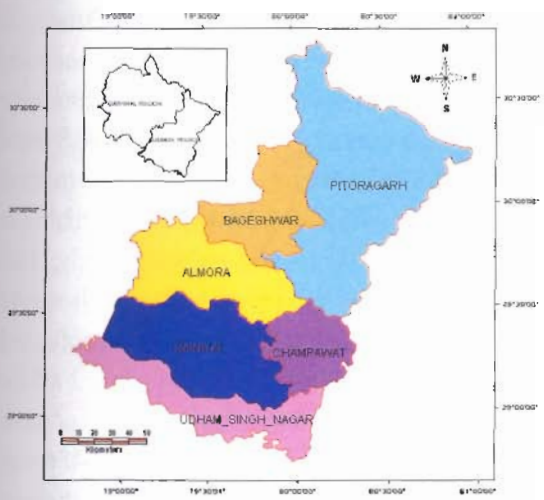
RESEARCH ACHIEVEMENTS

Open Water Fisheries

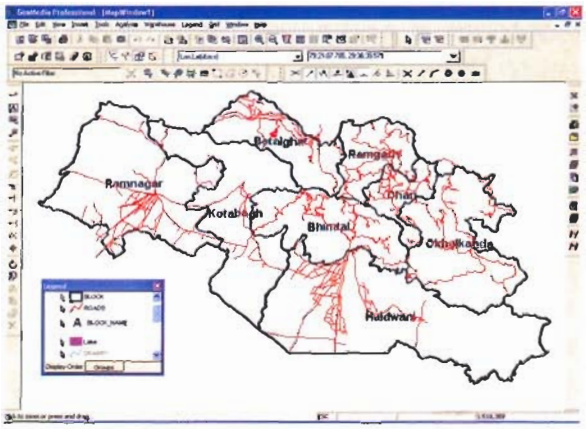
Project Title	**Development of GIS based decision support system for aquaculture in selected coldwater region**
Personnel	Ashok K. Nayak, Prem Kumar, P.C. Mahanta, R.S. Haldar, A.K. Saxena

For developing a GIS based support system for aquaculture, the toposheet of the study area 53 O/3, 7, 11 & 15 were digitized for the coldwater fisheries resources initially for Nainital district. The toposheets were analysed on Geomedia software and also georectified and verified on ground by using global positioning system. A subset of study area was prepared from the mosaiked toposheets. From the subset of toposheet the water resources and infrastructure were digitized to block level. The lakes, rivers, streams, road network, were also digitized. The water quality parameters of different sampling stations were analyzed and ancillary data were also collected from the literatures.

The strength of GIS is that we can create various spatial database layers for physico-chemical parameters of water, locality, and road network, fish market based on the topography of the study area. The different criteria such as very much suitable, suitable and unsuitable are determined for the different parameters such as water quality, slope, soil quality and infrastructure facilities. The Kumaon region of the Uttarakhand state is an ideal region for having different types of aquaculture resources based on low, medium and high altitude ranges. The region is already having the fishponds in different altitudinal ranges. It will be a useful tool to find out the suitable site for aquaculture development in the region depending on different criteria. Thus the combination of computer programming and GIS database can be used as an integrated decision support system to assess the fisheries resources to derive strategies for integrated management in the area. The following thematic maps are created for Nainital district.



Geographical location of Kumaon region of Uttarakhand, India



Road Network of Nainital district in block levels

Project Title	Modelling of Length-Weight Relationship and Growth Pattern of Selected Important Coldwater Fish Species
Personnel	N. Okendro Singh, D. Sarma

Primary and secondary data on length-weight and age-at-length (or weight) of important coldwater fish species have been collected from different sources. Some growth models used in fisheries are inappropriate for use with species whose growth is seasonal due to the assumption that growth is invariant over time. A modified version of the logistic model that incorporates cyclical (or seasonal) fluctuations in growth gave significantly improved results when it was fitted to observations of length-at-age from *Tor putitora*. The modified logistic model was obtained by introducing a sine wave function into the original model.

Different growth models were fitted to observations of length-at-age for *Tor putitora* collected in the foothill section of river Ganga and upstream tributary Nayar during 1993-94 (see Bhatt et al. 2004 for further details). The von-Bertalanffy and Richards growth models failed to give optimal solutions whereas the logistic and Gompertz models gave optimal solutions. The estimates of parameters, RMSE, MAE, run test statistic (|Z|) value is presented in Table 1. The Gompertz model performs better than the logistic model when RMSE and MAE criteria are used to identify the best model (Table 1). The independence assumption about residuals is satisfied because run test |Z| values are below the critical value (1.96 at 5% level of significance). When residuals of the Gompertz and logistic models were fitted against expected length (Fig. 1), a cyclical pattern was seen. Addition of a sine wave to the model is suggested to give a solution. The modified versions of the Gompertz and von-Bertalanffy models failed to meet global convergence, whereas the logistic model with sine wave gave the optimal solution. The parameter estimates are given in Table 1. The values of RMSE and MAE were improved, as compared to the simple Gompertz and logistic models, and the run test value is 0.76 (less than the critical value 1.96). Model growth predictions depicted in Fig. 2 along with observed values. The modified version of the logistic model describes the *Tor putitora* data better than other popular growth models. Moreover, the asymptotic length of *Tor putitora*, estimated using the modified logistic model is approximately 189 cm (Table 1): this seems acceptable because the maximum size recorded in India is 275 cm (Jhingran, 1975) and the largest size in Nepal is 180 cm (Shrestha, 1999).

Moreover, an attempt has been made to develop the length-weight relationship of snow trout considering its six different species from Jhelum River, Kashmir. ANCOVA results have shown that the existing of two distinct groups of snow trout species regarding its length-weight relationship, which do not follow isometric growth.

The combined data for six different species of snow trout say, species – 1: *Schizothorax plagiostomus*; 2: *Schizothorax curvifrons*; 3: *Schizothorax niger*; 4: *Schizothorax esocinus*; 5: *Diptychus maculates* and 6: *Schizothorax labiatus* has been analyzed by ANCOVA (Syntax method of SPSS), Regression (nonlinear) method with the help of SPSS 12.0 version available at DCFR, Bhimtal. In the present study, 160 specimens have been considered for length-weight data of different species of snow trout collected from Jhelum river, Kashmir (see Yousuf, 2005 for details of data collection). The specimens of snow trout presently considered ranged 205-486 mm in length and 70-1295 gm in weight. At the end, only two regression lines for two different species groups of snow trout are fitted.

Table 1. Summary statistics for fitting of various nonlinear models

Logistic: $L_t = L_\infty\left[1+e^{-K(t-t_0)}\right]^{-1}$		**Gompertz:** $L_t = L_\infty \exp[-\exp\{-K(t-t_0)\}]$	**Logistic with sine wave:** $L_t = L_\infty\left(1+e^{-\left[C\sin\left\{\frac{2\pi(t-S)}{P}\right\}+K(t-t_0)\right]}\right)^{-1}$
(1) Parameter estimates			
L_∞	206.37 (79.08)*	545.58 (517.80)	188.54 (44.51)
K	0.25 (0.04)	0.08 (0.03)	0.27 (0.02)
t_0	10.01 (2.82)	16.44 (9.74)	9.19 (1.52)
S	-	-	9.42 (0.85)
C	-	-	0.10 (0.02)
P	-	-	6.56 (1.42)
(2) Model adequacy			
RMSE	2.28	2.06	0.65
MAE	2.15	1.96	0.48
(3) Residual analysis			
Run test (|Z|)	0.68	0.68	0.76

*Bracketed values are the corresponding asymptotic standard errors.

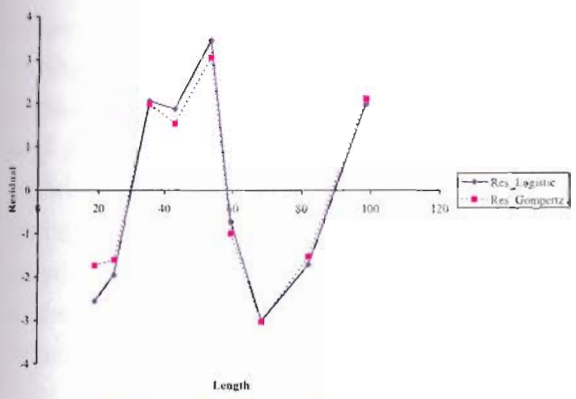


Fig. (1): The residuals remaining after fitting of Gompertz and logistic models to the data

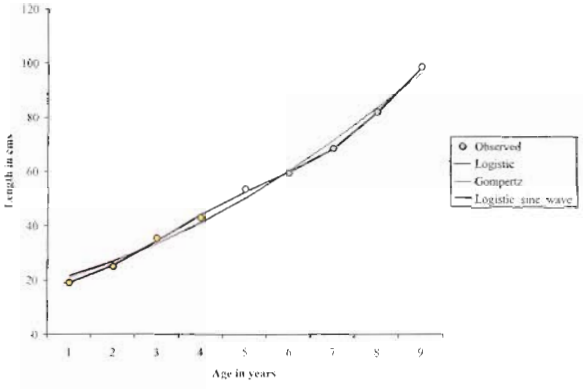


Fig. (2): Graphical display of measured and predicted growth in length of *Tor putitora*

The slopes of the six regression lines due to different species are highly significant different ($p<0.01$). The regression lines due to different species are further examined in detail. Since the species 1 and 2 are not significantly different at 5% level of significance, they are combined

together and slope of this regression line is further compared with species 6 and the corresponding test is not significant different at the critical level. Thus, the species 1, 2 and 6 of snow trout can be combined together regarding length-weight relationship of them. In the similar fashion, species 3, 4 & 5 are not significant different from one another regarding the length-weight relationship and thus they are combined together. The two groups say, group-I: a combination of species 1, 2 & 6 and group-II: a combination of species 3, 4 & 5 has been, further, examined and the corresponding test is found to be highly significant different at 5% level of significance. Thus, we can say that there are only two distinct groups of snow trout species under consideration, regarding its length-weight relationship. Hence, we have to fit only two distinct regression lines at the end.

The allometric model is fitted to the data of snow trout species group-I & group-II, separately. The estimates of parameter, goodness of fit statistics of the fitted models is presented in Table 2. Sometimes, fishery biologists are interested to know if there is either isometric or allometric growth pattern of fish. To check the isometric growth of the fish, a null hypothesis is tested against . The corresponding t-test statistics have been calculated as 3.424 and 5.824 for group-I and II respectively whose values are greater than the critical value 1.96 at 5% level of significance for large sample size say, >50. Thus, the fish growth does not follow isometric growth in both groups.

However, the correlation coefficient between and i.e., is approximately (–1) for both the groups-I & II. An extreme value of indicates that the two parameters 'a' and 'b' are not estimated independently (Prajneshu and Ravichandran, 2003). For getting a possible solution to above, it has been attempted to fit the allometric model using expected value parameters to the data of both groups separately. For group-I, a pair L_1=248, L_2=376 gives the best results in terms of least correlation coefficient. Similarly, a pair L_1=240, L_2=305 has been defined for the group-II. In practice, it is not required to go for all possible pairs of combinations. However, methodology would work satisfactorily so long as L_1 and L_2 are not close to each other. The corresponding values of W i.e., W_1=118, W_2=505 for group-I and W_1=96, W_2=312 for group-II are taken as initial values for computation of the final estimates of the parameters W_1 and W_2. The parameter estimates along with asymptotic standard errors in parentheses are given in Table 2. The correlation coefficients, computed are 0.425 and 0.351 for groups-I and II respectively. Now, we can say that the two parameters W_1 and W_2 are estimated independently. The RMSE values are remained same, which are shown in Table 2. As a consequent of expected-value parameters, the degree of curvature reduces or exhibits close-to-linear behavior. Moreover, the graphs of fitted models along with observed values are shown in Fig. 3 & 4 for group-I and II data sets respectively. It is clearly seen from the graphs that a new model with expected-value parameters entails a very close-to-linear model having optimum properties of the estimators for which the degree of linearness is more in the data set of group-I.

Table 2. Summary statistics of the models fitted

	Model: $W = aL^b$		Model: $W = W_1\left(W_1/W_2\right)^{\log(L/L_1)/\log(L_1/L_2)}$	
	Group-I	Group-II	Group-I	Group-II
Parameter Estimates				
a or W_1	4.46×10^{-7} (0.000)	5.00×10^{-3} (0.005)	117.504 (8.044)	165.157 (7.949)*
b or W_2	3.517 (0.151)	1.905 (0.188)	507.799 (9.837)	260.726 (4.951)
Goodness of Fit Statistics				
R^2	0.875	0.616	0.875	0.616
RMSE	77.923	38.946	77.923	38.946

*The corresponding asymptotic standard errors are shown in parentheses.
Group-I: A combination of species 1, 2 & 6; Group-II: A combination of species 3, 4 & 5.

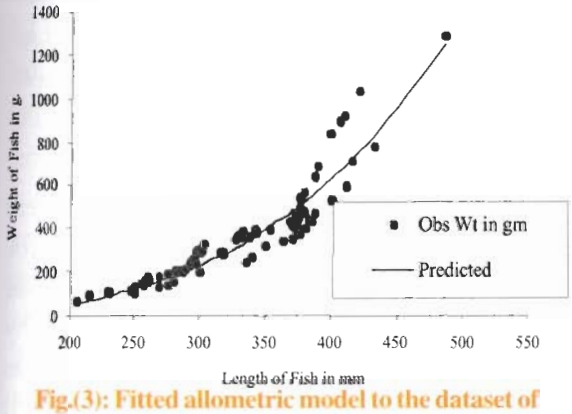


Fig.(3): Fitted allometric model to the dataset of group-I using expected value parameters

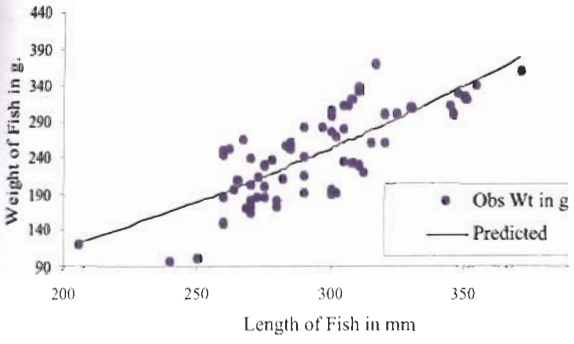


Fig.(4) Fitted allometric model to the dataset of group-II using expected value parameters

The primary data on length-weight of 225 *Tor putitora* fish specimens have been collected

Photo (1): Fish sampling from River site at Marchula of Kosi River

from various sources viz. local fish market, Ramnagar, river sites at Sunderkhal and Marchula of Kosi River, Ramnagar, which covers two seasons only. The fish specimens are collected from the above river sites through experimental fishing with drag net, cast net, etc. Fish samples are also collected and recorded from the local fishermen as and when they are available at the selected river sites. Data collection on length-weight and age-at-length (or weight) of important coldwater fish species will be continued.

AQUACULTURE

Project Title	Studies on induced maturation and seed Production of Himalayan Mahseer, *Tor putitora* and *Schizothorax richardsonii* in pond Environment
Personnel	B.C. Tyagi, S.Sunder (up to July 2008), R. Kapila (up to August 2008) and P.Kumar

The fish stocks of ***Tor putitora*** of different age group initially collected from wild are being reared in pond environment in 2 hired ponds at Bhimtal (1200 m asl) since October 2005 @ 1 fish / m² in ponds having an area of 95 and 104 m with an average weight of 50g /171mm and 183 g /280 mm size in second pond. Creating perforated partitions in ponds reared the brood stock of the age 3 and 4 years in one pond and 4 and 5 years age in second pond. The variables related to water quality were identical for all the brood stock. The fish feed fortified with MT@50 mg/kg of feed was offered to brood stock of the age of 4 years daily during February to June. April. Few prospective fish specimen were marked and treated with ova prime plus carp PG extracts in 1:3 ratio @ 0.2-0.4 ml / kg body weight of fish on every 20 days during 15 February to June. During this period average water temperature was recorded 17.8 °C TO 25.0°C and average sunshine hours were 11.2 hrs. The dissolved oxygen and pH were 7.0-8.6 mg/l and 8.2-84 respectively.

On 22 April 2008, the brood stock having age of 4+ years and treated with MT and drugs found matured. Two females having weight of 280-310 g and 2 males of 180 and 210 g were stripped without using Ova prim as an spawning agent. The fecundity was recorded 4210 eggs/kg and the rate of fertilization was recorded 62%. The fertilized eggs were normal and transferred to hatchery complex for further hatching process. The fertilization was recorded 62%. In Mid of June 2008, the untreated brood stock of 5+ years of age was found maturing clearly exhibiting sexual distinction and free oozing condition in males. On September 3, 2008, five females (400,420,450,390 and 610 g) and 11 males (Av.wt 430g) of 5+ found matured. Three pairs stripped without the use of spawning agent –Ova prim. The fecundity was calculated 5270 eggs/ kg and the size off egg was 3.1-3.7 mm. After 12 hrs, the fertilization rate was 78%. Water temperature was recorded 24.7°C and other parameters of water quality were within normal ranges. The fertilized eggs were transferred after 4 hrs from pond site to Mahseer hatchery. These eggs were reared in perforated trough (1 mm mesh size) of 50 x 30 x 10 cm with a water flow of 1.5 l/m at 24-27°C. The hatching process was normal and similar to the breeding material collected from the wild stock.

From the present study, it is clearly evident that the brood stock of golden mahseer (*Tor putitora*) can be reared, developed in pond environment with no difficulty. The fish density by weight is important factor and should not be more than 1500/kg /ha. Well oxygenated (> 6.0 mg/l) and warm water (21-27°C.) help in inducing/ getting matured brood stock. Low temperature during winter (8.2-11°C.) created problems. The maturation inducing drugs like MT, Pregnan and PG extract in combination with Ova prime are effective to induce maturation in the species Himalayan mahseer in the stock of 4+ ages. However, in pond, the fishes mature without any treatment at 5/ 5+ age. No spawning agent (like ova prime / ova tide) is required for releasing eggs and sperm. Simply, the matured specimen can be stripped using dry stripping method. Rest part of the breeding technique is almost similar to the method already developed at DCFR.

The new technique for raising brood stock and induced maturity in them with and without drugs is complete and may be repeated during April - September 2009 to confirm previous results AFE/A/0021.

Similarly the fish stock of snow-trout (***S. richardsonii***) being reared in 3 nursery ponds (15m²) at Champawat @ 8 (18 g), 11.3(57 g) and 5.3 (85 g) fishes/ m² since October 2005 was found matured in June- July 2008 and stripped for getting eggs and milt by adopting dry stripped method. After 3 years, fishes have attained 47,93 and 118 g weight. The species do not require any kind of treatment to induce maturity and spawning. However to develop its seed in captivity specially from hatchling stage to fry need further research work to develop viable methodology of its seed production in large quantity.

Project Title	**Cage culture of fishes in floating cages in subtropical Himalayan lake- Bhimtal**
Personnel	Madan Mohan, B.C. Tyagi, Yasmeen Basade

Rearing of snow trout in cages

Snow trout (*Schizothorax richardsonii*) of two different size groups- 0.14-0.17g (29-30mm) and 1-1.3g (60-62mm) were stocked in cages keeping suitable replicates. The fish were fed regularly during the culture period with four artificial formulated feed. Two feeds were fish meal based having 30% and 35% dietary protein contents and other two feeds were formulated without fishmeal, fishmeal was completely replaced with soybean meal, having 30% and 35% dietary protein contents. After a rearing period of 15 months the growth performance of fish is given in table 1 and 2.

In smaller sized fish, the average weight attained by fish feed 35% protein diet was significantly higher ($P<0.05$) compared to fish fed 30% protein diet irrespective of adding fishmeal. Further the FCR and SGR were also significantly ($P<0.05$) better in fish 35% protein diet without fish meal. The rate of survival in smaller sized fish fed different feeds on an average was 67%.

In bigger sized fish, the average weight attained by fish feed 35% protein diet was significantly higher ($P<0.05$) compared to fish fed 30% protein diet irrespective of adding fishmeal.

Table 1. Growth performance of small sized snow trout in cage culture system.

Protein content	30% Protein		35% Protein	
Feeds	Without FM	With FM	Without FM	With FM
Initial length (mm)	29	29	30	30
Final length (mm)	102	105	118	117
Initial weight (g)	0.14	0.16	0.15	0.17
Final weight (g)	12	12.5	14	15
SGR	0.96	0.97	0.99	1.01
FCR	4.29	4.23	4.17	4
Biomass	2400	2500	2800	3000
Survival (%)	67%	67%	67%	67%

Table 2. Growth performance of bigger sized snow trout in cage culture system.

Protein content	30% Protein		35% Protein	
Feeds	Without FM	With FM	Without FM	With FM
Initial length (mm)	60	61	60	62
Final length (mm)	112	115	128	127
Initial weight (g)	1.0	1.1	1.3	1.2
Final weight (g)	15	16.6	23	23.5
SGR	0.56	0.58	0.66	0.66
FCR	4.33	4.23	4.35	4.26
Biomass	3000	3320	4600	4700
Survival (%)	80%	80%	80%	80%

However, FCR and SGR were not significantly ($P>0.05$) different in fish fed 30% and 35% protein diet. Hence, fish receiving 35% protein diet without fishmeal expressed better growth performance. The rate of survival in bigger sized fish fed different feeds on an average was 80%.

Rearing of Himalayan golden mahseer in cages

Himalayan golden mahseer (*Tor putitora*) of two-size groups were used for cage culture. The fish with an initial weight of 2.45-2.52 g (108-113 mm) were stocked. The fish were fed regularly during the culture period with two artificial formulated feeds: with and without fishmeal having 30% dietary protein contents. After a rearing period of 15 months the growth performance of fish is given in Table 3.

In bigger sized fish the average weight attained by fish fed 30% protein diet without fish meal was significantly higher ($P<0.05$) compared to fish fed 30% protein diet with fish meal. Moreover, FCR was significantly better ($P<0.05$) in fish fed diet without fish meal compared to fish fed fishmeal containing diet. However, SGR were not significantly ($P>0.05$) different in either group.

Table 3. Growth performance of bigger sized golden mahseer in cage culture system.

Protein content	30% Protein	
Feeds	Without FM	With FM
Initial length (mm)	108	113
Final length (mm)	221	233
Initial weight (g)	2.45	2.52
Final weight (g)	130	120g
SGR	0.88	0.86
FCR	4.1	4.46
Biomass	6110	5640
Survival (%)	94%	94%

Hence, fish receiving 30% protein diet without fish meal exhibited better growth performance. The rate of survival in bigger sized fish fed different feeds on an average was 94%.

For the other trial golden mahseer of 1.0-1.5g were stocked. The fish were fed with artificial formulated feed regularly during the culture period. Two feeds were fish meal based having 30% and 35% dietary protein contents and other two feeds were formulated without fishmeal, fishmeal was completely replaced with soybean meal, having 30% and 35% dietary protein contents. After a rearing period of 15 months the growth performance of fish is given in Table 4.

In smaller sized fish the average weight attained by fish fed fishmeal included diet was significantly higher ($P<0.05$) for both the trials with 30% and 35% protein diets. However, average weight, SGR and FCR were significantly better ($P<0.05$) in fish fed 35% protein diet compared to fish fed 30% protein diet. Hence, fish receiving 35% protein diet with fishmeal exhibited better growth performance. The rate of survival in smaller sized fish fed different feeds on an average was 87%.

Table 4. Growth performance of smaller sized golden mahseer in cage culture system.

Protein content	30% Protein		35% Protein	
	Without FM	With FM	Without FM	With FM
Initial length (mm)				
Final length (mm)	145	158	156	171
Initial weight (g)	1.2	1.0	1.5	1.3
Final weight (g)	34	39	42.5	45
SGR	0.73	0.76	0.78	0.79
FCR	4.33	4.12	4.05	4.1
Biomass	2958	3393	3698	3915
Survival (%)	87%	87%	87%	87%

Artificial feed

The formulated diets used in cage culture rearing trials contained crude protein (30% and 35%) and were with fishmeal and without fishmeal. The feed ingredients used in feed formulation included fishmeal, soybean meal, groundnut oil cake, rice bran, wheat middling, vegetable oil, vitamin and mineral mix.

Physico-chemical characteristics of water

The important water quality parameters assessed inside the cages ranged as: water temperature, 15-22°C, dissolved oxygen 9.4-12 mg/l, free carbon dioxide 0-1.0, total alkalinity 60-86 mg/l and pH 7.2-8.2. The average values for nitrate, nitrite, ammonium and phosphate were 3.0 mg/l, 0.03 mg/l, Nil and 0.005 mg/l, respectively.

Conclusions

In cage culture bigger size group of golden mahseer exhibited better growth performance and feed efficiency when fed a fishmeal free diet having 30% dietary protein. While smaller size group of golden mahseer expressed better growth performance and feed efficiency when fed fishmeal containing diet having 35% dietary protein.

Therefore, cage culture was found to be suitable for rearing snow trout and golden mahseer of smaller and bigger size groups. Moreover bigger sized fishes can be cultured in cages, with significant growth performance, using fishmeal free diets.

Project Title	**Investigations on cold-water fish pathogens and their environment**
Personnel	**Amit Pande, N.N Pandey and Yasmeen Basade**

Setting up of fish health laboratory was given due attention and the lab was further furnished by procuring more equipments namely a laminar flow, autoclave, hot air oven and a table top refrigerated centrifuge. Except for the tabletop refrigerated centrifuge, all equipments have been installed. The equipment procured in the financial year 2007-08 were also installed namely the inverted microscope (Nikon), horizontal gel electrophoresis (Atto) and -80°C deep freezer with CO_2 backup system (Sanyo). Besides these equipments, the laboratory was also equipped with minor equipments like a pH meter, a microwave oven, a refrigerator and LPG cylinders. Consumables like glassware and plastic ware along with some more important media and chemicals were also procured for the smooth functioning of the laboratory.

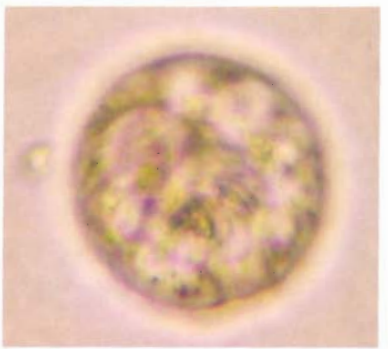
Regular sampling was carried out during March 2008-Feb 2009 from the Institute's Fish Farm at Chirapani, Champawat. Both water and diseased fish were sampled for isolation of fish pathogens. Initially isolation of bacteria and fungi was attempted as the facilities for observing the fish parasites were not adequate. With the installation of Nikon inverted microscope at Champawat work on observation on fish parasites too was initiated.

Isolation of bacterial fish pathogens was attempted from both water and diseased fish. A total of 994 isolates of bacteria were collected from coldwater fish farms of Champawat with a small fraction from Bairangana. Pure culture of these isolates were maintained at -80°C for further characterization as at this stage the laboratory was not having the necessary facilities. However, biochemical characterization of some bacterial isolates was attempted at CIFE using VITEK 2 ID-GNB cards. The equipment identified the selected bacterial isolates as *Aeromonas hydrophila, Aeromonas sobria, Aeromonas caviae, Pseudomonas luteola, Pseudomonas*

fluorescence, Acinetobaceter lowffii, Sphingomonas paucimobilis, Enterobacter asburiae, Bordetella bronchiseptica. Identification of the bacterial isolates was not convincing using the VITEK 2 ID-GNB cards, as on one accession a culture of bacteria when tested twice on same card gave different results. The machine initially identified the culture as *Acinetobaceter lowffii,* but when tested again on the same card the same culture was identified as *Pseudomonas luteola.* Due to the ambiguity in the identification of the bacterial cultures, the need of routine biochemical characterization was realized and the Fish Health Laboratory has accordingly been equipped.

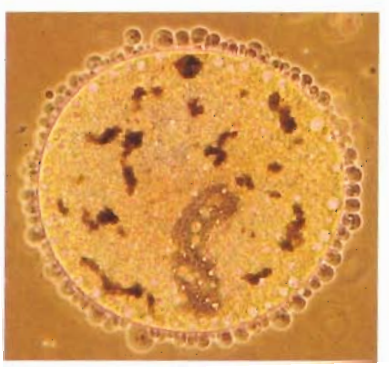
Isolation of fish parasites and pathogenic fungi was also attempted. Among the parasites observed in a managed coldwater water farm at Champawat *Myxosporidium, Costia, Ichthyophthirius, Trichodina, Gyrodactylus* and *Lernia* were observed. Identification of fungal pathogens namely *Saprolegnia and Pithium* too was attempted by growing said pathogens on boiled hemp seeds in distilled water. The work of isolation on fungal pathogens was discontinued at Bhimtal as the laboratory was going to take up cell culture work and in the same place, both cell culture and fungal isolation cannot be taken up.

Setting up of cell culture facility for studying the viral pathogens of coldwater fish species was also taken up. Cell lines namely BF2 (from bluegill fry), FHM (fat head minnow) and RTG-2 (rainbow trout gonads) were procured from NCCS Pune. There was serious problem in maintaining the cells as the fungal contamination was adversely affecting the culture work. However, by the end of March the cell culture technique was standardized using BHK-21 cells obtained from Division of Virology, IVRI Mukteshwar. With the arrival of a good laminar flow, in the laboratory and strict laboratory

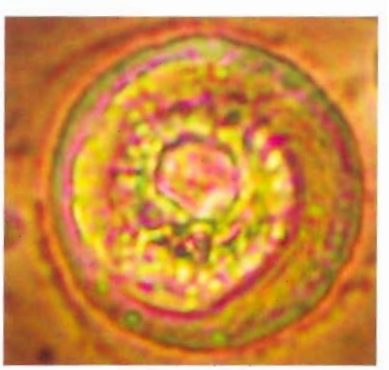


Myxosporidium

Costia

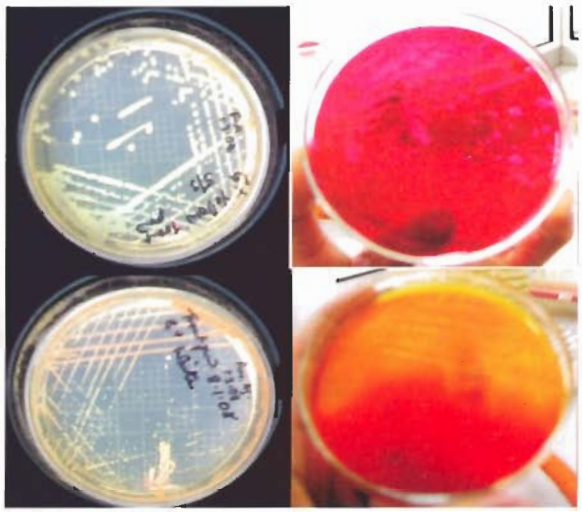


Ichthyophthirius



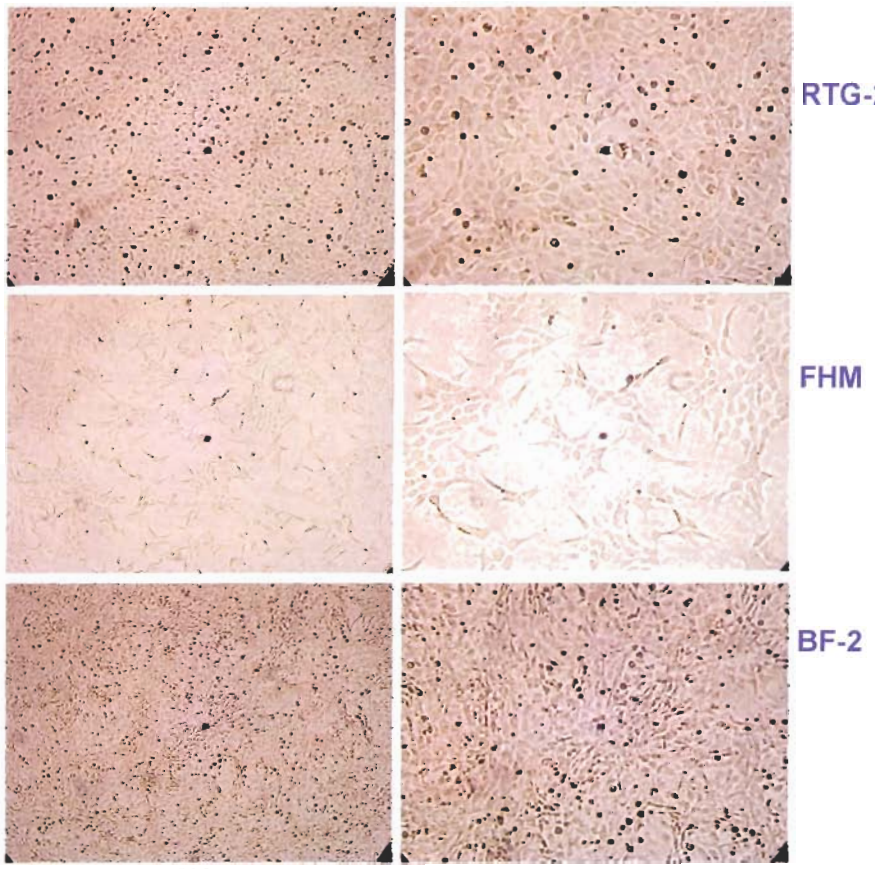
Trichodina sp

Argulus sp



practices, the cell culture is now going on satisfactorily and BF-2 cells have been doing well and are also stored in liquid nitrogen at Division of Virology, IVRI Mukteshwar.

Bacteria isolated coldwater fish farm



Maintenance of fish cell lines

Project Title	**Study on Water Budgeting and Water Management for coldwater Aquaculture system**
Personnel	N.N. Pandey, Prem Kumar

Water Requirement Workout

The water requirement based on the biomass and operational ponds area was estimated based on previous experience.

(1) Water requirement of the Rearing unit:

Total area of the rearing pond, when five ponds are used for this purpose and another sixth pond would be converted as sedimentation-cum-filtration unit. Of which three raceways will be used for Rainbow trout rearing and other two for caps/snow trout rearing.

- On an average one raceway can sustain about 2000 yearling of rainbow trout
- Per day Water requirement of rainbow trout raceways:
- Water liter/mX no. of pondsx60X 24
- 50X 3 X 60 X24 = 216 m^3

(2) Per day water requirement of Carps/ snowtrout

- Water liter/mX no. of ponds x 60X 24
- 5X2X60X24 = 14.4 M^3 say 15 M^3
- Total requirements of rearing unit= 231 M^3
- 10% losses due to evaporation, seepage and leakages = 10% of (231) = 23.1 M^3
- Net requirement of water per day for rearing unit= 254.1 M^3 say 254 M^3

(3) Water requirement of the nursery unit:

Three nursery ponds would be used for Rainbow trout and other seven will be used for other coldwater fish species.

(i) Per day Water requirement of rainbow trout nurseries:

- Stocking density = 2000 fingerlings per pond
- Water liter/mX no. of pondsX60X 24
- 8X3X60X24= 34.5 M^3 say 35 M^3

(ii) Per day Water requirement of other nursery ponds:

- Water liter/m X no. of pondsX60X 24
- 1X7X60X24= 10 M^3
- Total requirement of nurseries pond = (35+10)= 45 M^3
- 10% losses due to evaporation, seepage and leakages = 10% of (45)= 4.5 M^3
- Net requirement of nurseries ponds: 45 + 4.5 = 49.5 say 50 M^3
- Total water requirement of Pocket "A"= 254 + 50= 304 M^3
- Water availability during lean period: On an average there is 50 liters water per minute is available from the stream
- Therefore, per day water availability = liters/mX60 X 24
- 50X60X24= 72 M^3
- Water deficit per day = water requirement /day – water availability/day
- 304-72= 158 M^3

(2) Collected meteorological parameters Air Temp: 2-26 ° C, Humidity: 22-90 %, Wind Vel: 10-56 m/h and Total Rainfall: 1349 mm

(3) Analysed physico-chemical parameters of

water Temp: 4.5.-18 °C, pH: 7.0-8.6, DO: 7.4-9.6 ppm, F. CO_2 0-2.0ppm and T. alkalinity: 28-46 ppm, Ammonium 0.5 ppm, Nitrate 0.5 ppm, Nitrite 0.046 ppm.

Proposed water re-circulatory unit

The one raceway (no:6) would be used for sedimentation-cum filtration unit. The pond will be dig out according to meet the daily requirement of the water.

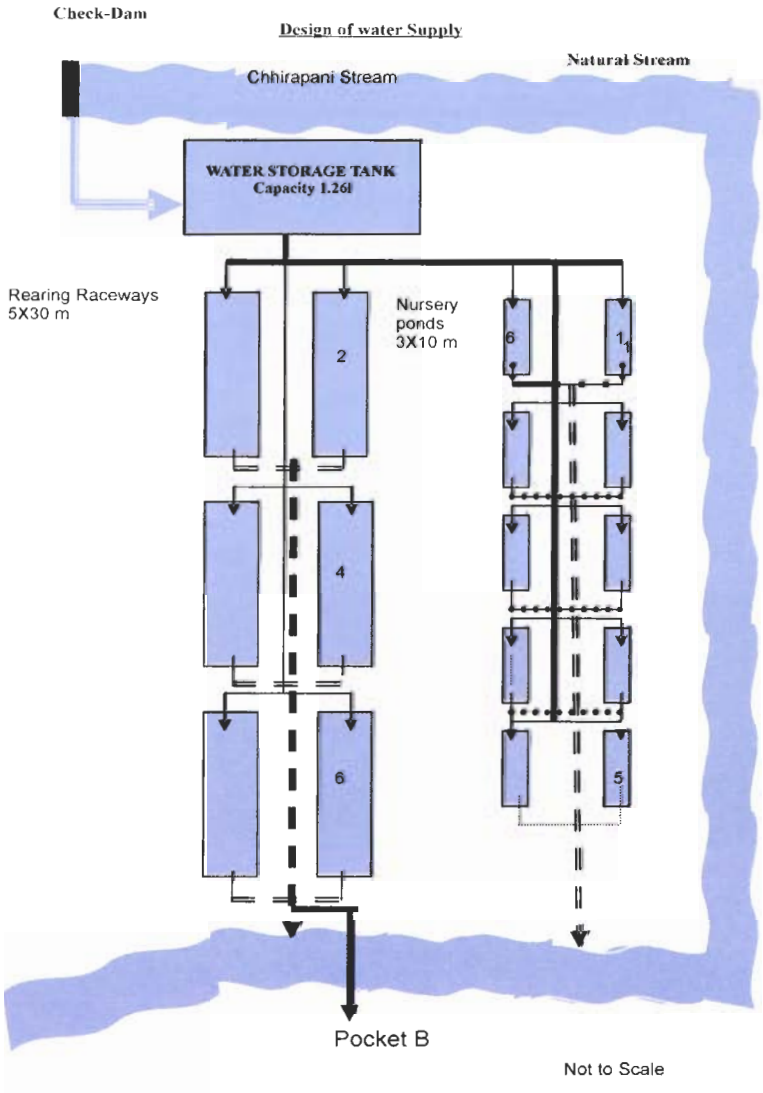
Proposal for sedimentation-cum filtration unit

Total drain rate from rearing unit = 160 lpm

Water to be recalculated to need the demand of deficit =109 lpm

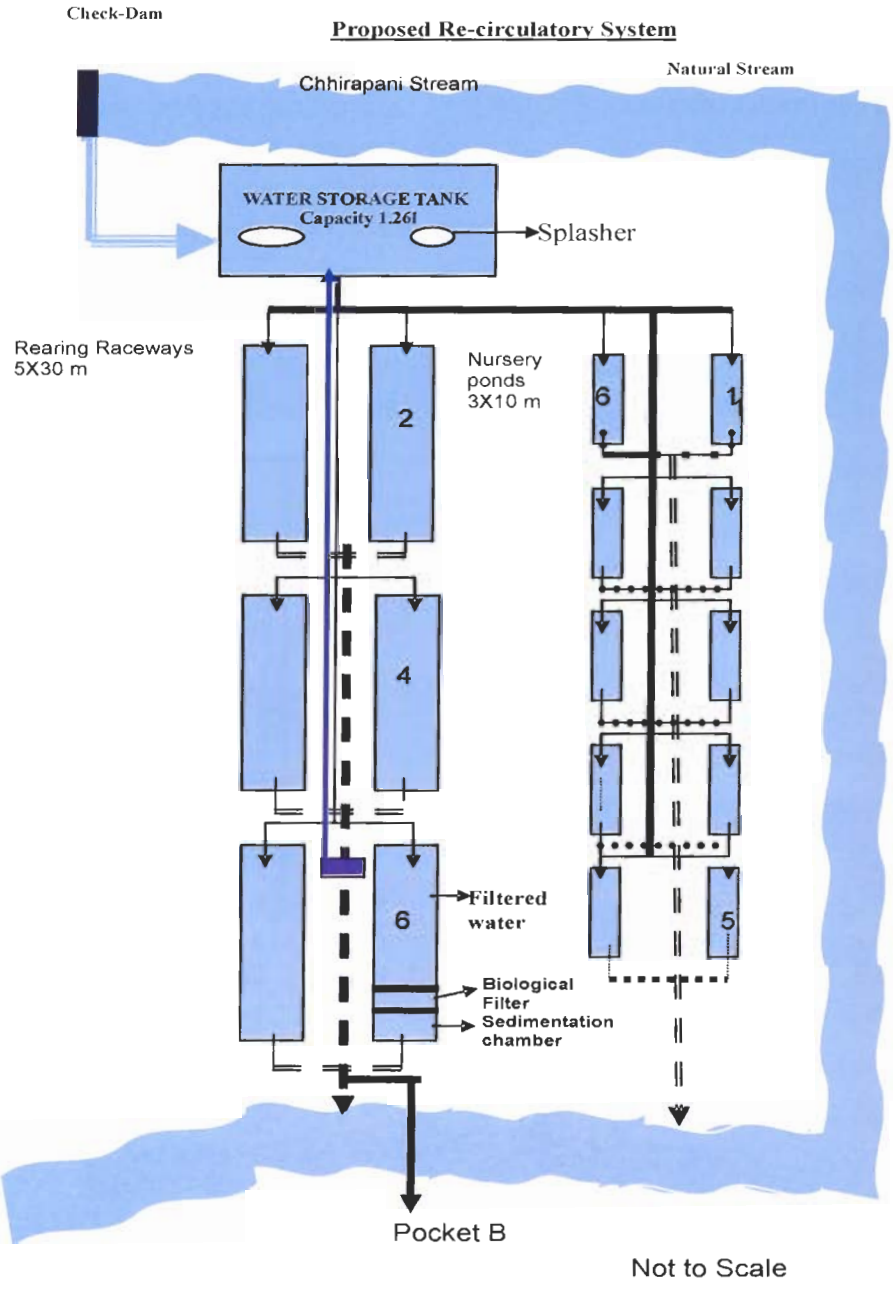
Proposed scenario:

The outflow from the pond is proposed to re-circulate to the tank. The quantity being 2 lps since stream is also contributing at 2 lps discharge. Thus discharge of 1.75 lps is proposed to safely dispose from the system to the stream down to the system. This will fulfill the water requirement and address the problem of water shortage during the lean period flow.



Pond No. six will be divided in to these chambers.

1. The first chamber will be as much deepest that can be drained in to stream without have stroke this chamber will be all as sedimentation unit.
2. A pass to the chamber No 2 would be given from the top of wall. The water free from any sediment would enter to the sides cal filter that would be laving a capacity to treat wakes about 150 LPM.
3. The third chamber would be the largest and would be called as reservoir chamber. This chamber will be made as much as deep so this chamber would be constructed in straining way in order to re-sedimentation of water. The water strong tank, where air ators / splashes. This reservoir will be sufficient to treat the resume amount of water for one day.



Project Title	Evaluation of growth performance of different strains of Common Carp
Personnel	N.N. Pandey, Prem Kumar

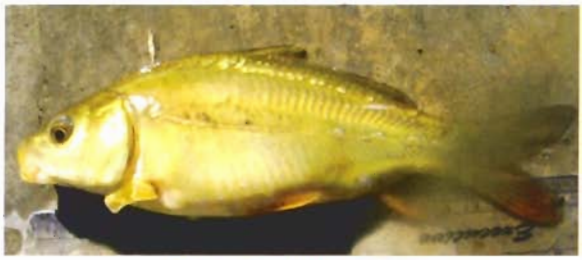
The Institute has already imported two Hungarian strains. Existed local strains of common carp will be used for studying comperative growth performance and breeding programme. Each strain will be characterized for genetic diversity by using suitable molecular markers. Growth performance will be assessed to know the best stock for the intra and inter-strain breeding. Crossbreeds will be generated to compare the growth with parental stock. Stock of better growth performance will be selected among the all parental and crossbred stocks. This selected stock could be used for aquculture purposes in mid Himalayan region. Different activities of the subproject are rendered hereunder:

1. Rearing of different strains (Hungarian & Existing one) separately
2. Assessment of genetic diversity among the parental stocks by using molecular marker.
3. Rearing of imported Hungarian & existing stock with polyculture system.
4. Monitoring of water quality parameters.
5. Analysis of different growth indices of all parental stocks.
6. Bloodstock management of parental stocks.
7. Intra and inter-strain crossbreeding.
8. Analysis of different growth indices of crossbreeds.
9. Genetic characterization of crossbreeds.
10. Development of base stock of better growth performance.

Work Done

- Reared different strain of c. carp in field condition in mono and polyculture system
- Analysed physico-chemical parameters of water Temp: 65.-21 °C, pH: 7.6-8.7, DO: 6.4-10 ppm, F. CO_2: 0-2.0ppm and T. alkalinity: 30-40 ppm.
- Measured growth parameter of different strains in polyculture system. The observation revealed that the Hungarian strain gave 45 % more growth rate over the existing strain.
- Reared brood stock of different strains of C. Carp 100 individual of both the varieties i.e. *communis* & *spacularis* were reared as brood stock for further breeding programme.

Hungarian scale carp

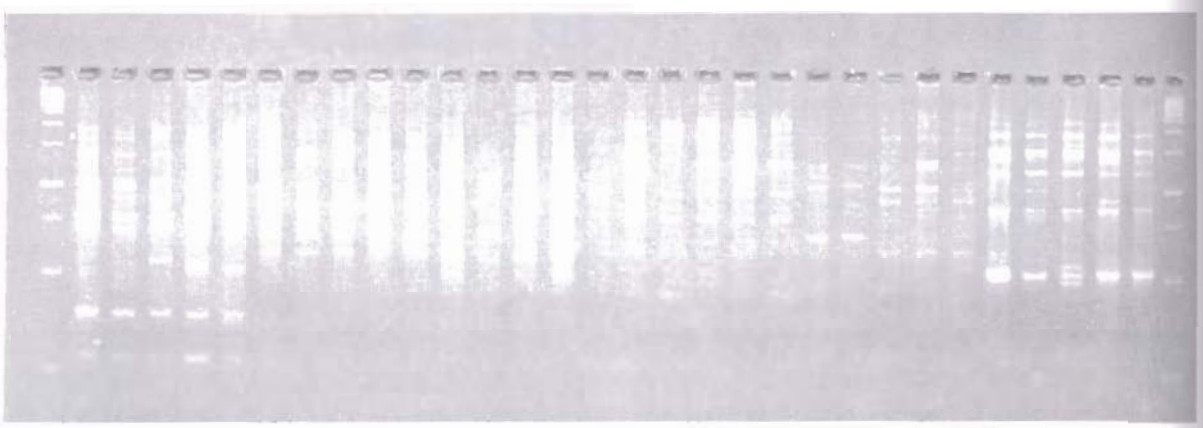


Hungarian mirror carp

Project Title	Molecular Genetic characterization of Indian Snow trout
Personnel	G.K. Sivaraman, A. Barat, R.S. Haldar, P.C. Mahanta

The project with the objectives i) Characterization of snow trout fish species using RAPD marker and mitochondrial genome ii) To assess the genetic variability among these fish species using RAPD and mitochondrial genome, iii) Construction of phylogenetic tree using RAPD data and mitochondrial genome (12S rRNA). To initiate the project, some fin samples from live specimens of *Schizothorax richardsonii* were collected from riverine resources of Kosi River, (near Khairna, Katli Gola River, and Cheerapani, Champawat, Uttarakhand). Genomic DNA was isolated from the same fin samples following Sambrook et al. (1989). Quantity and quality of the genomic DNA was estimated following Agarose gel electrophoresis and UV-Spectrophotometer. Initially, some 10 mer random primers from Operon Technologies (USA) were screened using PCR assay and some of them selected for population characterization using larger samples.

RAPD- PCR amplification was performed by using 60 numbers of random primers from the OPA, OPX and OPY Operon series in the pooled DNA samples of *S. richardsonii*. The pooled DNA is prepared by mixing the DNA samples from the 20 numbers of individual DNA for a species with approximately of 100ng/ ml DNA in TE buffer. Approximately 30 (50%) of the primers were chosen based on the level of polymorphism produced for detailed study of the individual DNA samples study. 10, 12 and 11 primers from OPA, OPX and OPY primers were selected and amplified for population characterization study.



RAPD-PCR- using Primer OPX1- 6

Project Title	**Performance of Chocolate mahseer (*Neolissochilus hexagonolepis*) in Fresh Water Aquaculture System in North East and Western Himalayan Region**
Personnel	Debajit Sarma, B.C. Tyagi and N.O. Singh

The chocolate mahseer (*Neolissochilus hexagonolepis)* is a very important fish of North Eastern Himalayan region in terms of its sports and food value. This fish may be considered as a new candidate species of hill aquaculture in Western Himalayan region. To start with the project on "Development of Grow Out Feed of Chocolate Mahseer (*Neolissochilus*

hexagonolepis)", the initial consignment of chocolate mahseer fry were transported (September-October, 2008) from Meghalaya to Bhimtal and stocked in the hatchery complex of DCFR. The survival rate was observed after the acclimatisation under the new agro climatic conditions. After getting the satisfactory result (90% survival) the final consignment of chocolate mahseer fry were transported from Arunachal to Bhimtal in the Month of end of December 2008. The fishes were stocked in three different experimental tanks of the hatchery complex of DCFR, Bhimtal and Dhoura fish farm. The initial stocking density was 21 nos. fry/m^2. The initial length-weight has been recorded (Control tank: Av. L- 2.25 cm, Av. Wt.-0.14 gm; Tank-1: Av. L-2.57cm, Av. Wt.-0.17 gm; Tank-2: Av. L-2.66 cm, Av. Wt.-0.18 gm). To formulate the feed, different feed ingredients were identified. They are Rice bran, Rice polish, MOC, GNOC, Fishmeal, Wheat middling, Soyabean meal, Wheat bran and Vitamin-mineral mixture which are mostly available in Uttarakhand. Since protein is an important component of the growth of mahseer, two different types of feeds were formulated based on protein % (30, 35 & 40). The selection of the final ingredients was carried out based on the easy availability in the local market throughout the season. The golden mahseer feed prepared by the DCFR was used as control feed. The feeding trial was carried out @ 10% of the body weight daily. The acceptance of the feed was found satisfactory. After one month of feeding the length and weight of the fishes were recorded. Control tank: Av. L- 3.5 cm, Av. Wt.-0.22 gm; Tank-1:

Av. L-3.4 cm, Av. Wt.-0.33 gm; Tank-2: Av. L-3.4 cm, Av. Wt.-0.54 gm. The slow growth rate may be due to extreme low temperature (3-8°C) especially in the winter month (Jan-Feb) in the experimental area at Bhimtal. However, better growth was observed when the fishes were stocked at Dhaura fish farm where the temperature was ranging from (15-22 °C, Jan-Feb). The routine analysis of physico-chemical parameters was recorded (DO, p^H, Total alkalinity, Free CO_2, Total hardness, Nitrate, Phosphate, Chloride, Iron, Ammonium). The further experiment is going on.

Project Title	**ICAR MEGA SEED PROJECT: Seed production in agricultural crops and fisheries**
Personnel	Madan Mohan, Prem Kumar, R.S. Haldar

Review Meeting at NASC Complex in December 2008 & January 2009

A one day review meeting of Mega Fish Seed Project was convened under the Chairmanship of Honorable Deputy Director General (Fisheries), ICAR at NASC Complex on 2nd December 2008 which was attended by the all the fish seed centres involved in this project. Dr. Madan Mohan, Nodal Officer DCFR informed that mahseer seed production of mahseer in ICAR Mega Seed Project was quite high compared to last year and for the first time about Rs. 75,000/- has been generated by sale of seed of mahseer.

A two-day review meeting of Mega Fish Seed Project was convened by our Respected Secretary DARE and Director General, ICAR at NASC Complex on 5-6th January 2009 to review the performance of Seed Project during 2007-08 and progress upto December 2008.

The Annual Report for 2007-08 of this Mega Seed published by Directorate of Seed, Mau was released. **The performance of DCFR during 2007-08 has been adjudged by Seed Directorate as Very Good, which is really encouraging.**

Significant Achievements in ICAR Mega Seed Project

1. Seed production of golden mahseer in **2008-09 was 103,050 compared to 75,000 in 2007-08 and to 25000 in 2006-07**. Seed was produced from May to September 2008.
2. Seed production of common carp **20 lakh spawn and 7 lakh fry during 2008-09 compared to 15 lakh spawn and 5 lakh fry in 2007-08 and 10 lakh spawn and three lakh fry in 2006-07**. About 15 lakh spawn from which 5 lakh fry were produced at Bhimtal hatchery in March 2009. At Champawat, about 5 lakh spawn frpm which 2 lakh fry were produced in April 2008.
3. About 25,000 eggs of chocolate mahseer were stripped and 5,000 fry were produced.
4. About 10,000 fry of snow trout were produced
5. About 10,000 fry of rainbow trout were produced in January-February 2009.

Targets and Achievements during 2008-09		
Target for DCFR for the year 2008-09		Achievements
Common carp	10 lakh	20 lakh spawn and 7 lakh fry
Golden mahseer	1.0 lakh	1.03 lakh advance fry
Chocolate mahseer	1.0 lakh	0.05 lakh fry
Snow trout	0.5 lakhs	0.10 lakh fry
Rainbow trout	0.2 lakh	0.10 lakh fry
Total fish seed	**12.70 lakhs**	**21.33 lakhs**

Seed production of Golden Mahseer during 2008-09

- During this year 2008-09, 31 female brooders of golden mahseer (T.L 370-580 mm and 500-1500 g in weight) were collected through overnight operating gill nets in Bhimtal Lake.
- The ripe eggs (133,400 nos.) were stripped and fertilized with oozing milt from male specimen (T.L 270-510 mm and 300-1200

g in weight) by "dry method". The rates of fertilization varied between 86.5-92.0% and eggs were fertilized.

- About **103,050 seed of endangered golden mahseer** was produced with cumulative survival from fertilized eggs to advanced fry was 77.25%.

Utilization of mahseer seed produced at DCFR

1. About 60,000 seed of golden mahseer produced under this project at NRCCWF sold for Rs. 60,000/- to Deputy Director, Department of Fisheries Siliguri, West Bengal. Similarly 10,000 seed was sold to Dept. of Fisheries, Sikkim for Rs. 15,000/-
2. About 10,000 seed was released and stocked in Bhimtal lake by Secretary ICAR New Delhi.
3. About 15,000 seed of mahseer used for Kosi river ranching at Garampani.
4. About 8000 seed is being used for various experimental purposes.

Seed production of common carp at Bhimtal

Common carp breeding was carried out in FRP tanks of 2m X 2m X 1m size in mahseer seed production hatchery at Bhimtal. Monofilament nylon netting and happa cloth pieces were used as substratum for egg laying for common carp. The ripe brooders were collected from broodstock ponds and released in FRP tanks where temp. was 20.4^{0}C. At first instance 8 pairs were released in tanks which bred within 24 hours.. Again 6 pairs were kept next day morning and within 3 hours breeding started. Both the sexes were seen releasing their gamets above and near the netting material. Fertilized eggs got

Fig.2. Monofilament nylon netting as substrate

Fig.3. Common carp breeding in progress

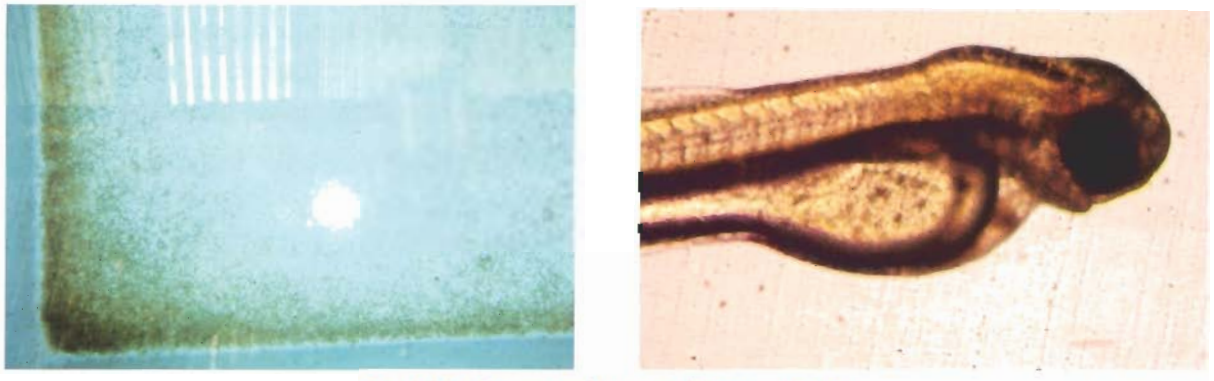


Fig. 4. Newly emerged spawn of common carp

attached to this material immediately where hatching started after four days. In total 22 nos. of females of common carp were bred in the last week of March 2009. About 15 lakh spawn from which about 5 lakh fry have been produced at Bhimtal by using mahseer hatchery facilities.

Common carp seed production at Champawat

In April 2008, at Champawat fish farm common carp was bred and about **five lakh spawn from which about two lakh fry** were produced.

Seed production of Rainbow trout

The breeding of rainbow trout was carried out in last week of January and first week of February 2009. From 9 ripe females (weight 1.6 to 1.80 kg), about 19,783 ripe eggs were stripped and fertilized. The rate of fertilization varied from 60-92% with overall average of 80% . The rate of hatching varied 64-80% and 10,677 fry were produced in the last week of March 2009. The stock is being reared at Champawat fish farm.

Seed production of Snow trout

- Snow trout 3-4 years in age is being maintained at Champawat fish farm.
- Most of the males were ripe from August onwards while female showed maturity in September and upto middle of October.
- About 30,000 fertilized eggs were obtained.
- The fertilization rate ranged 40-70%.
- Incubation period ranged 255-270 hours at 14-18°C.
- Approximately, 10,000 fry of snow trout have been produced till middle of November 2008.

Seed production of Chocolate mahseer

- Breeding carried out during 3-10th August 2008 at Iduli fish farm in Arunachal Pradesh.
- About 67 brooders were collected from Sally lake and maintained at Iduli farm.
- Only 10 brooder female responded to breeding.
- Weight of male was 400-700 g and of female 800-900.
- About 25,000 eggs were fertilized
- Only 5000 advanced fry could be produced.

Training in mahseer seed production

A model training programme sponsored by Dept. of Agriculture and Co-operation, Ministry of Agriculture, Govt. of India on, "Culture and breeding of important coldwater fish species" was organized by DCFR during 14-21 July 2008. The trainees included State Fisheries officials, Research Scholars and Subject matter specialists of Krishi Vigyan Kendras.

Apart from giving lecture on breeding and seed production of coldwater fishes, the trainees were exposed to mahseer breeding and seed production activities at mahseer hatchery of DCFR, Bhimtal and explained in details. This will help them to understand the minor details about seed production.

Project Title	Research & Development activities in NEH region
Personnel	B.C. Tyagi

1. Aquaculture Development through Demonstration on carp farming system

The new "Composite Carp Farming" technology involving three exotic Chinese Carps namely grass carp, silver carp, common carp @ 3-4 fishes/m² in a combination of 40-45%, 20-25% 35-40% and 10% either Rohu / Chocolate Mahseer respectively with the provision of supplementary feed @ 2-3 % of body weight of fish on daily basis and fertilization with lime and only organic fertilizers @ 9000 kg/ha has been demonstrated in Manipur and Arunachal Prades. The technology has become popular and people of 5 districts in Manipur (21 farmers) and in 13 districts of Arunachal Pradesh (63 farmers) have successfully adopted it. The Fisheries Department of these states, 3 KVK and one NGO are helping farmers to adopt the "Composite Carp Farming technology in these states.

2. Conservation of Himalayan Mahseer (*Tor putitora*) in NEH region

The population of Himalayan mahseer is declining sharply in NEH waters. Its conservation through aquaculture and seed production in captivity is a major step to save it. The technology "Flow through Hatchery for Mahseer Seed Production" is a new technology. The Government of Assam and Sikkim joined hands with DCFR, Bhimtal. Both the states have been surveyed and sites for establishing Mahseer hatchery are selected. With the financial aid and consultancy of DCFR. Two mahseer hatcheries have been established at Bagua Fish Farm, South Sikkim and Eco Camp Nameri Tejpur in collaboration with State Fisheries Department of Sikkim and Assam Angler Association, Tejpur.

3. Documentation and bioprospecting of bacterial micro flora from gastrointestinal tract of selected coldwater fishes from Arunachal Pradesh, India. (Collaborative Research Project with RG University, Itanagar)

During the period under report thirteen samples of *Tor putitota* and three samples of *Neiolessochelus hexaganolepis* were randomly collected from Dikrong River at Naharlagun, Pare River at Yupia and Kamla river at Rangaradi of Arunachal Pradesh in the month of May to November. In the laboratory, the gut of each fish was dissected aseptically; contents were collected, serially diluted up to 10^4 dilutions using sterile peptone water and inoculated in Nutrient Agar and Mac-Conkey Agar plates by direct streaking and pore plate methods. Also swabs were prepared and directly streaked in Nutrient Agar plates. The plates were kept for incubation at 27^0 C for 24 hours. The colonies that appeared on the plates were isolated in Nutrient Agar slants. All the cultures were purified by sub-culturing for 3-4 times and preserved for further use.

In this study, there were twenty (T1-T20) and five (N1-N5) bacterial strains isolated from thirteen samples of *Tor putitora* and three samples of *N. hexagonolepis*. Biochemical tests were carried out for identification of bacterial strains and the results are given in the Table1 & 2 below.

Out of the twenty-five bacterial samples collected, eighteen samples were Gram positive and out of which one sample is cocci and all others were short stout rods (bacilli), which are facultative aerobes. All others were Gram-negative short slender bacilli and also facultative anaerobes.

Table-1

	Gram staining	Cocci/Bacilli	Motility	Glucose	Galactose	Sucrose	Maltose	Lactose	Mannitol	Starch	Indole test	MR test	VP test	Citrate utilization	Urease test
Aeromonas hydrophila	-	B	+	+	-	v	+	+	+	+	+	-	+	-	-
Aeromonas salmonicida	-	B	+	+	+	-	-	-	+	-	-	-	-	-	-
Bacillus subtilis	+	B	+	+	-	-	-	-	+	+	-	-	-	-	-
Cardiobacterium divergens	-	B	-	+	-	-	-	-	-	-	+	-	-	-	-
Hafnia alvei	-	B	+	+	-	-	-	-	-	-	-	-	-	+	-
Lactobacillus fermentum	+	B/C	-	+	+	+	+	+	-	-	-	-	-	-	-
Lactobacillus lactis	+	B/C	-	+	+	+	+	+	+	-	--	-	-	-	-
Leuconostoc mesenteroides	+	B	-	+	+	+	+	v	v	-	-	+	-	-	+
Streptococcus infantarius	+	C	-	+	-	-	-	-	-	-	-	-	-	-	-
Vibrio Pelagius	-	B	+	+	-	+	-	-	v	-	-	-	+	-	-

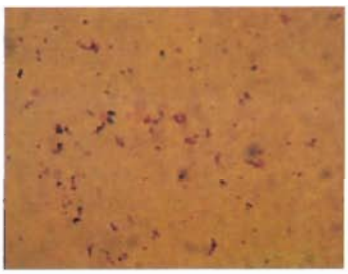
Table-2 Biochemical tests carried out for identification of bacterial strains.

	TSI	N_2 reduction	Oxidase	Catalase	Coagulase
Aeromonas hydrophila	A/A with H_2S	-	+	+	-
Aeromonas salmonicida	A/ B no H_2S	-	-	-	-
Bacillus subtilis	A/B no H_2S	-	-	+	-
Cardiobacterium divergens	A/B no H_2S	-	+	-	-
Hafnia alvei	A/B no H_2S	-	-	-	-
Lactobacillus fermentum	A/A no H_2S	-	-	-	-
Lactobacillus lactis	A/A no H_2S	-	-	-	-
Leuconostoc mesenteroides	A/A H_2S	-	-	-	-
Streptococcus infantarius	-	-	+	-	+
Vibrio Pelagius	A/B no H_2S	+	-	-	-

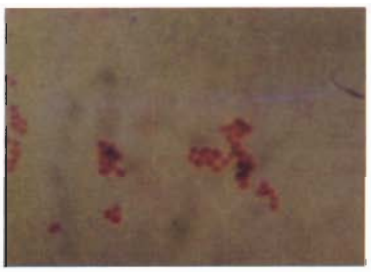
It was observed that *Lactobacillus fermentum* is the dominating species (28%) followed by *Lactobacillus lactis* and *Bacillus subtilis*, from four samples each (16%). And also two samples of *Aeromonas hydrophila*, *Aeromonas salmonicida* and *Leuconostoc mesenteroides* (8%) and one sample of *Hafnia alvei, Cardiobacterium divergens* and *Vibrio Pelagius* (4%) were identified.

Photographs of Gram stained bacteria

Gram -ve bacilli



Gram +ve cocci



Gram -ve cocco bacilli

4. Bioecological status and fish production potentials of selected lakes in Arunachal Pradesh

Based on the data collected two lakes of Arunachal Predesh selected for the present studies representing two Geoecological locations i.e. one at lower altitude near Itanagar namely Ganga Lake (650 m asl; 2.5 ha and influenced by human activities) and one at higher altitude (1560 m asl; 20 ha totally undisturbed in Meheo Wildlife Sanctuary) namely Meheo lake. The bioecological and fisheries status in reference to future development is under investigation.

Project Title	Outreach Activity on Fish Feeds
Personnel	Yasmeen Basade, Madan Mohan, Debajit Sarma

Activity 1: Enhancement of larval growth and survival for production of quality seed of Himalayan mahseer

Morphological development of Himalayan mahseer larvae:

The initial morphological developmental aspects of Himalayan mahseer larvae were studied with reference to duration of yolk sac absorption and mouth size variation with DAH (Days After Hatching). Observations of embryonic development were made from fertilized egg stage up to thirty days after hatching. The embryonic development was studied during the breeding season of Himalayan mahseer, May – June and August –September. During this period water temperature ranged from 21-23°C.

Early larval development of golden mahseer :

0 day – fertilized egg; egg size – 2.9 – 3.1 mm

2nd day – Embryo formation seen

3rd day – Twitching movement seen

4th day – Hatching begins

5th day – Yolk sac fry appears; Yolk sac fry size – 8 – 10mm

14th day – 2/3 yolk-absorbed; larva is 11-12 mm; mouth starts opening; mouth size 300m

15th day – larva is 11-12mm; mouth opens in all larva; mouth size is 300-400m

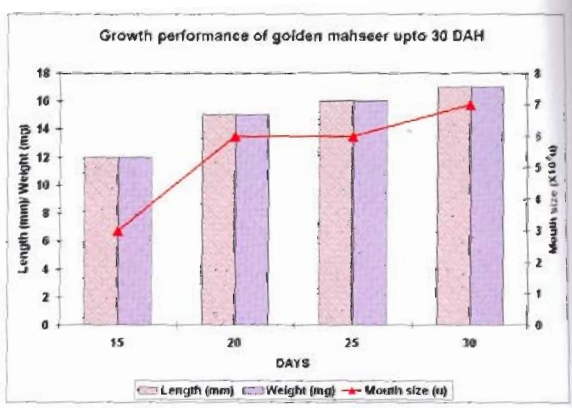
17th day – Yolk sac absorption completed; Swim up fry – 12mm; mouth size 400-500m

18th day – Yolk fully absorbed; Swim up fry size 12mm; mouth size 500m

20th day – Fry size 15mm; mouth size 600m

25th day – Fry size 16 mm; mouth size 600m

30th day – Fry size 17mm; mouth size 700m



Live food organisms present in the natural water bodies:

In the pursuit of getting increased larval survival and growth of golden mahseer, the availability of various live food organisms in and around Bhimtal lake were surveyed. Plankton samples were collected at monthly intervals and analysed. Bacillariophyceae followed by Dinophyceae, Chlorophyceae and Cyanophyceae mainly represented the phytoplankton population. An initial survey indicated that Chlorococcales dominated with blooms of *Chlorella vulgaris* during March-May (Spring season). During June-September (Rainy season) the dominant population changed from chlorococcales to volvocales with massive blooms of *Chlamydomonas* sp., which persisted up to mid-autum (October). In August *Chlamydomonas* sp. showed peak abundance. From September – November *Closterium acerosum* were dominant. In Mid-November *Microcystis sp.* peaked. While in winter season,

December-February algal population declined and winter was characterized by minimal levels of phytoplankton density.

The dominant phytoplankton species encountered were *Chlorella vulgaris, Chlamydomonas* sp., *Closterium acerosum* and *Oocystis sp.* among Chlorophyceae; *Synedra* sp., *Navicula* sp. and *Rhopalodia* sp. among Bacillariophyceae; *Aphanomezenon* sp. among Cyanophyceae; *Peridinum* sp. and *Gymnodium* sp. among Dinophyceae and *Ceratium* sp. among Chrisophyceae.

Zooplankton population chiefly comprised of rotifers followed by cladocerns and copepods. The dominant forms encountered were *Keratella, Philodina, Rotaria, Cephalodella, Asplanchna* and *Brachionus* among rotifers, *Daphnia* among cladocerans and *Mesocyclops* and *Eucyclops* among copepods. Rotifer population was high during March to September being highest during May to July and was low during November to February. Cladocerans were dominant during October and November and Copepods during August and September. Zooplankton population was low during December to February (Winter season).

Phytoplankton species:

Group	Taxa
Chlorophyceae	*Chlamydomonas sp.* *Chloro coccum sp.* *Oocystis sp.* *Closterium sp.*
Bacillariophyceae	*Synedra sp.* *Navicula sp.* *Rhopalodia sp.*
Cyanophyceae	*Aphanomezenon sp.*
Dinophyceae	*Peridinium sp.* *Gymnodium sp.*
Chrisophyceae	*Ceratium sp.*

Zooplankton species:

Group	Taxa
Rotifera	*Keratella sp.* *Philodina sp.* *Brachionus sp.* *Rotaria sp.* *Cephalodella sp.* *Asplanchna sp.*
Cladocera	*Daphnia sp.*
Copepoda	*Cyclops sp.* *Eucyclops sp.*

Culture of live food organisms

Chlorella culture-

To start with *Chlorella* culture was under taken in outdoor tanks. Fertilization was done with GOC, Urea and DAP for 3 days regularly. Then

Fig. Laboratory culture of *Chlorella*

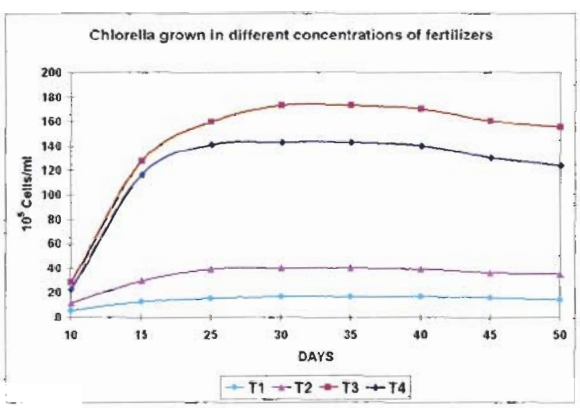
inoculated with *Chlorella* on fifth day. *Chlorella* bloom starts appearing after five days reaching to maximum density on fifteenth day and were retained up to thirty days and then showed decline. On re-fertilization with half the initial dose further the bloom appears after three to four days.

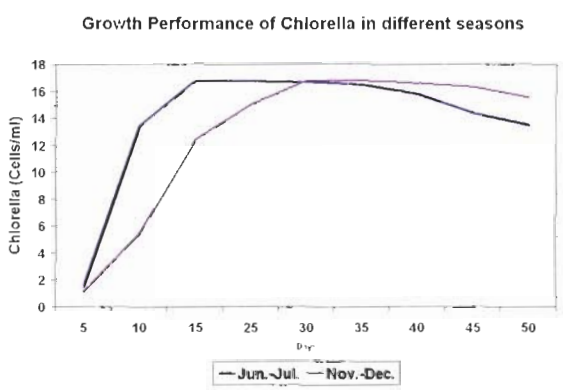
Growth performance of *Chlorella* with different levels of fertilization:

Further outdoor culture of *Chlorella* was continued to ascertain the growth performance at different levels of fertilization. Fertilization was

done with GOC, DAP and Urea (10:3:1) at four different levels- 2x, 3x, 4x and 5x resulting in four treatments namely, T1, T2, T3 and T4, respectively. All the treatment tanks were inoculated on fifth day after fertilization with *Chlorella* @ 5ml per liter (*Chlorella* density – 4.0 x 10^5 cells/ml. The water quality characteristic of culture tanks and *Chlorella* cell density were monitored regularly. During the culture period water temperature ranged from 11.5-19.5°C.

For all the treatments (T1-T4), after inoculation, the values of dissolved oxygen and pH increased with increase in *Chlorella* cell density, while the values for total alkalinity, ammonium and phosphate decreased with the progress of *Chlorella* culture. Moreover, free carbon dioxide was nil through out the culture period.





The growth performance of *Chlorella* was monitored regularly under different treatments. For the treatments T1, T2, T3 and T4 the cell density was 1.15x10^5, 2.13x10^5, 5.24x10^5 and 4.56x10^5 cells/ml, respectively after five days of inoculation. The cell density reached a maximum of 16.8x10^5, 39.8x10^5, 173.2x10^5 and 143.8x10^5 cells/ml, respectively for the treatments on thirtieth day. These higher cell densities were retained above fortieth day and after that decline in cell density was observed. On fiftieth day the cell densities were recorded to be 14.1x10^5, 34.9x10^5, 155.1x10^5 and 124.8x10^5 cells/ml. The growth of *Chlorella* increased with increase in level of fertilization from 2X to 4X but with further increase in level of fertilization to 5X the growth was not much. The above results indicated that *Chlorella* growth is highest when fertilization is done at 4X level.

Growth performance of *Chlorella* in different seasons

The growth performance of *Chlorella* was studied in relation to the seasons. It was observed that during summer season in June-July when water temperature was 23-26oC maximum cell density was attained on fifteenth day. Whereas in winter season, November-December when water temperature was 12-20oC maximum cell density was achieved on thirtieth day.

ACTIVITY 2: Development of grow-out feed of Chocolate mahseer (*Neolissochilus hexagonolepis*)

The chocolate mahseer (*Neolissochilus hexagonolepis)* is a very important fish of North Eastern Himalayan region in terms of its sports and food value. This fish may be considered as a new candidate species of hill aquaculture in Western Himalayan region. To start, the initial

consignment of chocolate mahseer fry were transported (September-October, 2008) from Meghalaya to Bhimtal and stocked in the hatchery complex of DCFR. The survival rate was observed after the acclimatization under the new agro climatic conditions. After getting the satisfactory result (90% survival) the final consignment of chocolate mahseer fry were transported from Arunachal to Bhimtal in the month end of December 2008. The fishes were stocked in three different experimental tanks of the hatchery complex of DCFR, Bhimtal. The initial stocking density was 21 nos. fry/m^2. The initial average total length and average body weight ranged from 2.25-2.66cm and 0.14-0.18g, respectively. To formulate feeds different feed ingredients were identified namely, rice bran, rice polish, mustard oil cake, groundnut oil cake, fishmeal, wheat middling, soybean meal, wheat bran and vitamin-mineral mixture which are mostly available in Uttarakhand. Since protein is an important component of the growth of mahseer, two different types of feeds were formulated based on protein percentage. The selection of the final ingredients was carried out based on the easy availability in the local market throughout the season. The golden mahseer feed (NRCCWF-III) prepared by the DCFR was used as control feed. The acceptance of the feed was found satisfactory. After one month of feeding the average total length and average body weight of the fishes were recorded to be, 3.5cm and 0.22g, respectively in control tank and in experimental tanks 3.4cm, 0.33g and 3.4cm, 0.54g, respectively for varying protein levels. The slow growth rate may be attributed to low temperatures (3-8°C) during winter months (January-February) in the experimental area at Bhimtal. The routine analysis of physico-chemical parameters of water was carried out in terms of DO, pH, total alkalinity, free CO_2, total hardness, nitrate, phosphate, chloride, iron and ammonium.

ACTIVITY 3:Up-scaling of existing grow-out feeds and feeding practices in rainbow trout

Screening and selection of ingredients and feed formulation:

Survey was conducted in the vicinity for selection of locally available ingredients for formulation of feeds for rainbow trout and following ingredients were identified- Fish meal, Soybean meal, Ground nut oil cake, Linseed oil cake, Mustard oil cake, Rice bran, Wheat bran, Wheat middling, Vegetable oil and vitamin and mineral mixture. Among the indigenous ingredients grown in Kumaon region, following were adjudged suitable viz., Millets: Finger millet, Proso millet, Barnard millet, etc.; Amaranth, Buckwheat, Lai oil cake, Black soybean, Horse gram and Corn meal.

The typical trout diet consists of fishmeal, other high-protein plant or animal sources, fish oil, grain-derived products for binding and macronutrient premixes. Diet formulations for trout are very high in protein, fat and digestible energy compared to other animal feeds. This limits the use of many common feed ingredients, namely grains, used in conventional feeds.

Other factor affecting ingredient choice is that undigested feed is excreted into the aqueous environment and becomes a pollutant. Ingredients which contain relatively high amounts of crude fibre or starch, or which are low in protein and metabolizable energy cannot be included in trout feeds. Thus corn and other whole grains are not used.

Ground wheat is used sparingly up to 7-12% level as binder. Protein is an essential nutrient that must be included in the diet at appropriate levels to ensure adequate growth and health of fish. However, because protein is the most expensive component of most aquaculture diets, supplying

protein in excess is not economical. Similarly, it is important to maintain a proper ratio of protein to energy in the diet. Adequate energy must be supplied so that dietary protein is used for growth (protein synthesis) rather than metabolized for energy. So the trend now has been towards increasing the level of fish oil, the lipid content of feed has increased from 15% to over 20%.

Feeds were formulated with different levels of protein and lipid using plant protein source-soybean; animal protein source-fish meal and other ingredients namely, groundnut oil cake, whole wheat, fish oil: vegetable oil, vitamin and mineral mixture.

Starter feeds were formulated with three levels of protein (45, 50 and 55%) and two levels of lipid (14 and 16%) for feeding start-feeding fry (Fish size: 12-35mm; 0.10-0.50g) up to 2 months. Fingerling feeds were formulated with three levels of protein (40, 45 and 50%) and three levels of lipid (14, 16 and 18%) for feeding fingerlings (Fish size: 35-50mm; 0.50-3.0g) from 2-4 months.

Starter feeds have been formulated with three levels of protein (55, 50 and 45%) and two levels of lipid (14 and 16%).

Starter Feed	S1	S2	S3	S4	S5	S6
Feeds	P55L14	P55L16	P50L14	P50L16	P45L14	P45L16
Proximate Composition						
Moisture	2.97	3.24	3.12	3.22	3.19	3.54
Crude Protein	54.43	53.69	50.46	50.17	45.74	45.22
Crude Lipid	14.58	16.54	13.93	15.98	14.42	16.32
Crude Fibre	0.41	0.4	1.42	1.41	3.27	3.16
Total Ash	18.66	18.44	16.14	16.11	13.27	13.16
NFE	9.85	7.69	14.93	13.11	20.11	18.6
Gross Energy (kJ/g)	19.74	19.96	19.63	20.05	19.97	20.31

Fingerling Feed- Fish size: 35-50mm(0.50-3.0g); Pellet size: Crumbles/Mash

For feeding fingerlings from 2-4 months

Fingerling feeds have been formulated with three levels of protein (40,45 and 50%) and three levels of lipid (14, 16 and 18)

Fingerling Feed	F1	F2	F3	F4	F5	F6	F7	F8	F9
Feeds	P50L14	P50L16	P50L18	P45L14	P45L16	P45L18	P40L14	P40L16	P40L18
Proximate Composition									
Moisture	3.54	3.67	3.15	3.48	3.75	3.55	3.46	3.51	3.81
Crude Protein	51.03	50.51	50.42	45.23	45.49	44.91	41.24	40.65	40.21
Crude Lipid	14.22	16.08	18.18	14.64	16.46	18.27	14.71	16.54	18.49
Crude Fibre	2.45	2.03	1.82	4.19	3.97	3.75	4.19	3.97	3.96
Total Ash	15.55	15.76	16.07	12.61	12.42	12.1	10.87	10.69	10.66
NFE	13.21	11.95	10.36	18.85	17.91	17.42	25.53	24.64	22.87
Gross Energy (kJ/g)	19.76	20.07	20.56	20.11	20.44	20.9	20.15	20.54	20.89

Trials are being initiated with these feeds at Champawat.

Project Title	Nutrient profiling and evaluation of fish as a dietary component
Personnel	Debajit Sarma and N. N. Pandey

Coldwater fishes are an important diet in the rural and urban upland population in India. Most of the population residing in hilly areas are fish eaters. It is widely accepted as a healthy food because of its richness in amino acid, fatty acids, vitamins and minerals. It helps to prevent cardio vascular diseases having rich in polyunsaturated fatty acids. Coldwater fishes like trout, mahseer may contain high PUFA compared to other warm water fishes. Under this project an attempt has been made to record the nutritional profile of the important coldwater fishes in respect to different agro climatic conditions. The nutritional status of the coldwater fishes may vary from species to species, in different seasonal conditions and also by types of fish production systems.

The basic objectives of the project are to study nutrient profiling in terms of proximate composition, fatty acids, amino acids selected vitamins and trace elements of *Tor putitora, Neolissochilus hexagonolepis, Schizothorax richardsonii, Oncorhynchus mykisss and* Common carp and assessment of edible fishes and their consumption rate and pattern by different sections of fish eating population.

Clinico epidemiological survey was conducted during December 08-March 09 in the District of Nainital covering the 10 villages namely Mehragaon, Pandeygaon, Mukteshwar, Chaafi, Vinayak, Bhawali, Doblesaal, Kahalquera, Khutani, Dholai. The vegetarian population were having the haemoglobin range of 9-14.3 gm% and non-vegetarian population 10-15 gm%. Fish samples were collected from Bhimtal, Champawat fish farm, Koshi river of Uttaranchal and Jia- Bhoreli river of Assam and Arunachal Pradesh. The results of the present study is showing that Moisture content ranging from 72.65- 79.2%, Protein 15.63-16.96 %, Crude Fat 2.95-14.05 %, Ash 4.10-9.86 %, Carbohydrate 65.66-75% and Total fat 1.096-3.519 gm/100gm. In fish muscle minerals like Na-0.201-0.2089(gm%), K- 1.280-1.448 (gm%) and Ca- 0.226-0.360 (gm%) is present. The results also showed that 16 essential amino acids are present in fish muscle.

Project Title	Fish Genetic Stock
Personnel	A. Barat, Prem Kumar, G.K. Sivaraman

In Out reach activity (ICAR) – **"Fish Genetic Stock"**. PI and Co-PI attended Meeting during 26-27th July 2008, 16-18th February 2009 at NBFGR, Lucknow, and 24-26th February 2009, at CIFRI, Barrackpore, for finalization of sampling location, protocols and data documentation procedure and review of progress under chairmanship of Coordinator and DDG (Fy). Two contractual Project Assistants were recruited at Post Graduate Level. One field survey was carried out in Punn River, a tributary of Bias River near Baijnath-Palampur, H.P. during

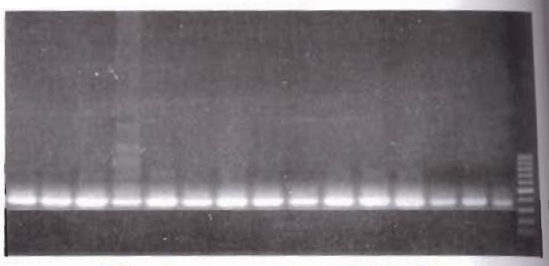
Sample collection in River Punn, Near Palampur

Collection of Fin tissue samples

the month of December 2008. Five small sizes *T. putitora* obtained using single cast net, morphometrical data of those samples were recorded. Genomic DNA extraction from fin tissues was also carried out. PCR Standardization of mtDNA amplicons using D-loop and Cyt b region on Genomic DNA of *T. putitora* was tried.

Cytochrome b gene sequence

T G G G G A A A A A A A C T T A G
C C G A C G A A A G C T G T T A T T A



Cyto b amplification in *T. putitora*

TGACCAGTAGTAGAAGGACTACTC

C G A T G T T T C A G G T T T C
T T T G T A C A G G T A G G A T C C
ATAGTATAGGCCTCGGGCAATGTGCA

TATAAATGCAAATAAAAAAGAATGATGC
T C C G T T A G C A T G A A T A T T G C G G
ATTAGTCATC

C A T A T T T T A C G C C T C G G C A G A T G G
G G G T T A C T G A T G A G A A T G C A G T
TAAGATGTCGGAGG

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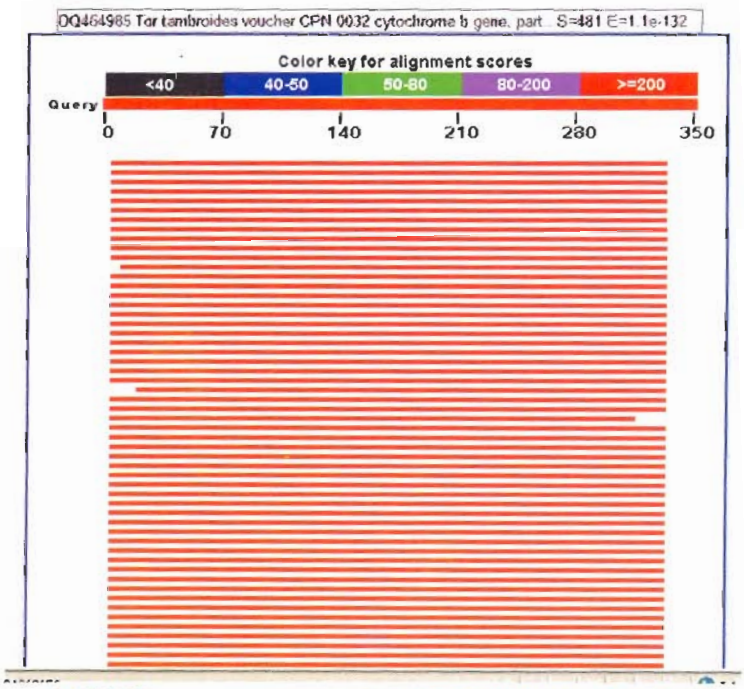
GGTTAGGATTTGAGTGATTAACCAC
GCCCCTAAAG

GGGGTGTAAAATTTAAGG



NCBI Blast search for Cyto b sequence match in *T. putitora*

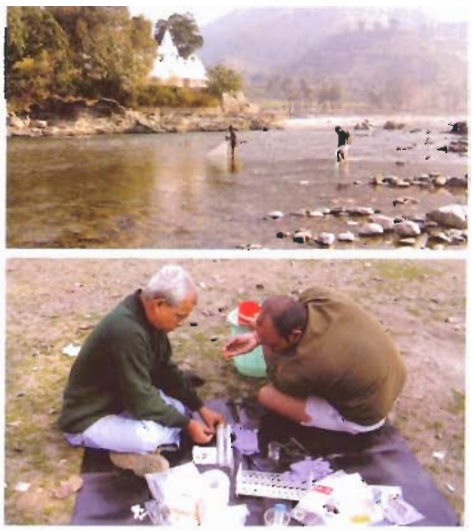
(Click headers to sort columns)

Accession	Description	Max score	Total score	Query coverage	E value	Max ident
EF588203.1	Tor macrolepis isolate TMA cytochrome b gene, partial cds; mitochc	580	580	93%	1e-162	98%
EF588201.1	Tor putitora isolate TPU02 cytochrome b gene, partial cds; mitochor	580	580	93%	1e-162	98%
EF588173.1	Tor putitora isolate TPU04 cytochrome b gene, partial cds; mitochor	580	580	93%	1e-162	98%
EF588172.1	Tor putitora isolate TPU05 cytochrome b gene, partial cds; mitochor	580	580	93%	1e-162	98%
EF588183.1	Tor putitora isolate TPU06 cytochrome b gene, partial cds; mitochor	577	577	93%	1e-161	98%
EF588202.1	Tor putitora isolate TPU03 cytochrome b gene, partial cds; mitochor	575	575	93%	5e-161	98%
EF588200.1	Tor putitora isolate TPU01 cytochrome b gene, partial cds; mitochor	575	575	93%	5e-161	98%
AF532100.1	Tor khudree isolate TP09 cytochrome b gene, partial cds; mitochon	536	536	93%	2e-149	96%
AF532099.1	Tor khudree isolate TP08 cytochrome b gene, partial cds; mitochon	536	536	93%	2e-149	96%
AF532098.1	Tor khudree isolate TP07 cytochrome b gene, partial cds; mitochon	536	536	93%	2e-149	96%
AF532095.1	Tor khudree isolate TP04 cytochrome b gene, partial cds; mitochon	536	536	93%	2e-149	96%
AF532101.1	Tor khudree isolate TP10 cytochrome b gene, partial cds; mitochon	534	534	92%	9e-149	96%
EF588199.1	Tor tambroides isolate TTA02 cytochrome b gene, partial cds; mitoc	531	531	93%	1e-147	95%
EF588175.1	Tor tambroides isolate TTA09 cytochrome b gene, partial cds; mitoc	531	531	93%	1e-147	95%
EF588170.1	Tor tambroides isolate TTA06 cytochrome b gene, partial cds; mitoc	531	531	93%	1e-147	95%
EF588167.1	Tor tambroides isolate TTA01 cytochrome b gene, partial cds; mitoc	531	531	93%	1e-147	95%
EF588166.1	Tor tambroides isolate TTA05 cytochrome b gene, partial cds; mitoc	531	531	93%	1e-147	95%
EF588163.1	Tor tambroides isolate TTA07 cytochrome b gene, partial cds; mitoc	531	531	93%	1e-147	95%
EF588169.1	Tor tambroides isolate TTA08 cytochrome b gene, partial cds; mitoc	527	527	93%	1e-146	95%
EF588161.1	Tor tambroides isolate TTA03 cytochrome b gene, partial cds; mitoc	527	527	93%	1e-146	95%
EF588197.1	Tor tambroides isolate TTA10 cytochrome b gene, partial cds; mitoc	525	525	93%	5e-146	95%
EF588176.1	Tor tambroides isolate TTA11 cytochrome b gene, partial cds; mitoc	525	525	93%	5e-146	95%
EF588160.1	Tor tambroides isolate TTA04 cytochrome b gene, partial cds; mitoc	525	525	93%	5e-146	95%
EF588188.1	Tor tambroides isolate TTA13 cytochrome b gene, partial cds; mitoc	520	520	93%	2e-144	95%
AF532096.1	Tor khudree isolate TP05 cytochrome b gene, partial cds; mitochon	520	520	93%	2e-144	95%
EF588179.1	Tor tambroides isolate TTA15 cytochrome b gene, partial cds; mitoc	514	514	93%	1e-142	94%
EF588178.1	Tor tambroides isolate TTA14 cytochrome b gene, partial cds; mitoc	514	514	93%	1e-142	94%
DQ366170.1	Tor tambra voucher TTBSE1 cytochrome b (cytb) gene, partial cds;	510	510	88%	1e-141	96%
EF588184.1	Tor tor isolate TT002 cytochrome b gene, partial cds; mitochondrial	508	508	93%	5e-141	94%
EF588182.1	Tor khudree isolate TKH2 cytochrome b gene, partial cds; mitochon	508	508	93%	5e-141	94%
EF588180.1	Tor tor isolate TT001 cytochrome b gene, partial cds; mitochondrial	508	508	93%	5e-141	94%
EF588158.1	Tor khudree isolate TKH5 cytochrome b gene, partial cds; mitochon	508	508	93%	5e-141	94%
EF588157.1	Tor khudree isolate TKH4 cytochrome b gene, partial cds; mitochon	508	508	93%	5e-141	94%

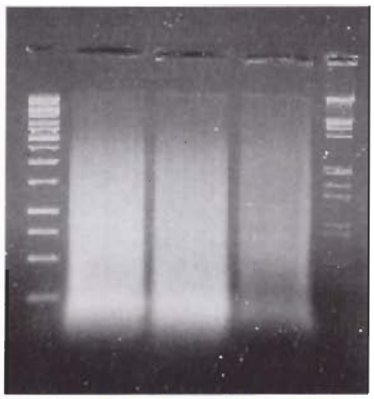
EXTERNALLY FUNDED PROJECTS:

Project Title	**Development and characterization of microsatellite markers in Indian Snow trout, *Schizothorax richardsonii*. (DBT Funded Project)**
Personnel	**A. Barat, G.K. Sivaraman**

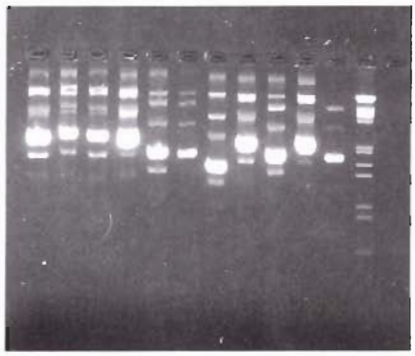
The project received and initiated during June 2008. Live individuals of *Schizothorax richardsonii* were collected from Kosi river near Garampani, Uttarakhand and genomic DNA was isolated from fin tissue using conventional Proteinase K-phenol-chloroform protocols. The genomic DNA was digested by restriction enzymes and an insert DNA of 300-600bp was prepared. The insert DNA was ligated to CIAP treated pUC 19-plasmid vector. The same ligated product was transformed to competent cells (JM 109) and plated on ampicilin-X Gal- IPTG LB agar plate. The same plates were incubated at



Sampling in Saryu River



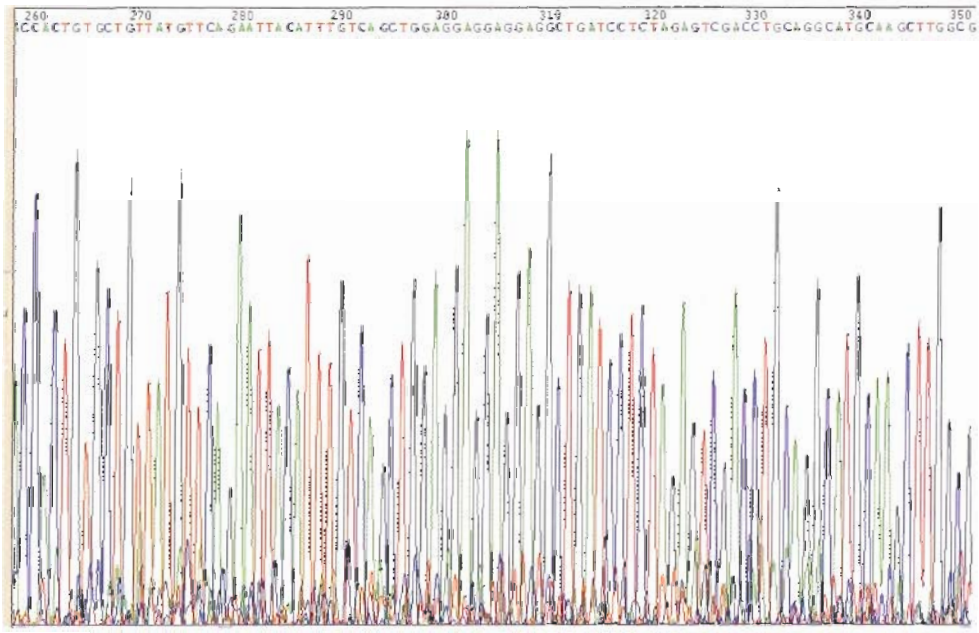
Genomic DNA Digested with MbO-I



Plasmid DNA isolation of Positive clones

Ligation with vector and insert

37^{0}C overnight and 35 positive colonies received in the form of white clonies. Insert DNA was confirmed through plasmid DNA isolation and RE digestion.



Sequence Image consists of GGA repeats

Project Title	**Enhancement of livelihood security through sustainable farming systems and related farm enterprises in North-West Himalaya** ***(An ICAR-NAIP Project under Component-3 "Sustainable Rural Livelihood Security").***
Personnel	Prem Kumar

Three cluster of the villages namely Dharaj in Pati Block, Mudyani in Champawat Block and Gamod- Makot in Lohaghat block were selected for the studies. Where, irrigation poly tanks were constructed for irrigating vegetable and fruit crops. The standing water are being used for the carp culture.

Eight (8) numbers of poly tanks of a total volume of 780 M^3 of water in Dharauj, 2 numbers of polytanks having a total volume of 180 M^3 and one number of pond having 60 M^3 water volume were stocked with the fingerlings of Silver carp, Grass carp and common carp with a recommended rate of 3 no./M^3 in a ratio of 20 % 30% and 50 % respectively.

The fingerlings are being fed with Mustered oil cake and Rice polish @ 4 % of the body weight. The grass carp fingerlings also were fed with green grass.

Project Title:	**Network Project on Fish Germplasm Exploration, Cataloguing and Conservation**
Subprogramme:	**Fish Germplasm Exploration in Middle and Upper stretches of Kosi River system in Kumaon Himalayas**
Personnel	P.C. Mahanta, Ashok K. Nayak

In the present investigation we explored fish germplasm in middle and upper stretches of Kosi river system in Kumaon Himalayas at different stations with an objective, 1) to select coldwater fisheries reserves and 2) future management strategies of some valued species. The Kosi is an important fluvio-erosional Himalayan river of Kumaon foothills originating from the southern slopes of Bhatkot-Kousani range (2715 msl). The fishery resources were surveyed at different sampling stations. The watercourse studied includes the upper stretches of Kosi river at Someswar about 14 km downstream to Kausani and the middle stretches at Bhujan (Garampani). The sampling done at various stations and following information were collected:

The fish species namely, *Tor putitora, Labeo dero, L. dyocheilus, Puntius ticto, Garra gotyla gotyla, Schizothorax richardsonii, Barilius bendelisis, Raiamus bola, Nemacheilus botia, N. rupicola* and *Glyptothorax sp.* were in abundance. We used variables of climate, geomorphology, hydrology and human interference to build the predictive models. Our approach is to address the urgent need to protect the bio-reserves of this coldwater region, which is fast deteriorating.

Sampling Location, elevation, Distance from previous location	Lat/Long	Species / Detail information
Ratighat 1002 masl 30 km from Bhimtal	N 29^0 27.50' and E 079^0 28.75'	Air temp: 21.0 0C 20 cast netting operation was done from which the following species are obtained Schizothorax: 11 Nos. (15-20 cm) Barilius: 2 Nos Tor : 4 Nos
Garampani/Khairna 877 masl 32 km from Bhimtal	N 29^0 29.76' and E 079^0 28.71'	Huge numbers of Barilius spawns are available in the river side. In cast netting of 5 times the following species are obtained Schizothorax : 20 Nos. Average size 7 cm and 4gm each Garra Gotyla Gotyla: 1 No 15 cm and 45g Barilius : 4 No 8 cm 5 g
Suyalbadi 1002 masl 16 km from Khairna	N 29^0 32.33' and E 079^0 33.99'	Garra Gotyla : 6 Nos: 16 cm avg. wt 40g Mahseer 200g Barilius: 40-50 gm
Hawalbagh (Kosi) 1110 m 31 km from Suyalbadi	N 29^0 37.98' and E 079^0 37.73'	Garra Gotyla : 10 Nos: 12 cm avg. wt 35g Mahseer 20g Barilius: few numbers
Manan 1291 masl 20 km from Hawalbagh	N 29^0 44.06' and E 079^0 37.11'	Mahseer species were found very much.
Katli village 1670 masl	N29^0 51.33' and E079^0 34.16'	Mainly schizothorax richardsonii species with few garra sp. were found

Project Title	**Sustainable utilization of mountain fishery resources – A partnership mode**
Nodal officers	Madan Mohan, K.D. Joshi, A. Barat, D. Sarma, N.N. Pandey, Prem Kumar, A.K. Nayak, R.S. Haldar

OUTREACH ACTIVITIES WITH FIVE HILL STATES

NRCCWF has been elevated as Directorate of Coldwater Fisheries research and work is being carried out in networking mode. As per the instructions from ICAR, a meeting of five hill states namely Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh was called on 16-17th May 2008 wherein, all aspects of networking program including fund allocation were discussed and finalized. They were again invited on 15th November and 28th December 2008 on the occasion of this Directorate's renaming ceremony conducted by our Respected Secretary DARE and DG, ICAR and Respected DDG (Fy.), ICAR.

From 1st to 3rd September 2008, Chairman and members of QRT visited Sikkim who is partner in our collaborating program. The Committee members were taken by State Fisheries Department to Memencho lake (14400 feet masl) and other lakes where rainbow trout hatchery is to be renovated and made functional under the program.

As per the fund availability this year, all the partners were provided funds to initiate the work in their respective states. The progress reports and fund utilization certificates from the partners are awaited.

Progress of Work Under Different :

Himachal Pradesh

In this project two partners, Dept of Fisheries, Govt of HP and Department of Fisheries, CSKHP Univ. Palampur, H.P. were identified with technical program, I) Intensive seed production of mahseer and ranching in specific locations for developing aqua-tourism, 2) Value addition of the farm produce, 3) Exploration of new potential and commercially important fish species, 4) Development of suitable location specific runoff water harvesting technology for coldwater aquaculture in the hills. To initiate the project a draft of MoU was made between Institute and collaborative partners.

Uttarakhand

- State Fisheries Department and HNB Garhwal University were identified as partners.
- MoU with the HNB Garhwal University has already been done
- MoU papers with the State Fisheries Department have been communicated.
- Budget for the financial year is already been dispatched to HNB Garhwal University.

J&K

- State Fisheries Department and SKUAS&T, J&K were identified as partners
- MoU with SKUAS&T, J&K has already been completed
- MoU Papers with State Fisheries Departments have been communicated
- Budget for the financial year is already been released to SKUAS&T, J&K

Sikkim

- MOU with the Department of Fisheries, Govt. of Sikkim was made.
- Technical programme for the State Fisheries Deptt. and ICAR Research Complex, Sikkim has been finalized.
- Allotted fund (Rs. 6.25 lakh) has been released for the year 2008-09 to the State Fisheries Deptt. as well as ICAR Research Complex, Sikkim.
- Visited Sikkim and seen the proposed trout farms at Menmoitsho and Uttary which are to be renovated under this project and also discussed the possible developmental planning for those farms with the State Fisheries Officials.

Work done during the period under this activity:

1) Infra structural facilities

The present infrastructure facilities available in the laboratory at ICAR Research Complex, Tadong, Sikkim are being utilized for the smooth running of the research activities. A few equipments like computer, data processing unit, Ekman drager and depth recorder and various chemicals were purchased for analysis of water quality.

2) Deployment of staff

One field worker each under the Department of Fisheries, Govt. of Sikkim and ICAR Research Complex for NEH Region, Sikkim Centre, Tadong has been engaged on contractual basis for data collection and sample analysis.

3) Training of Scientific Staff

Four officials from Department of Fisheries, Govt. of Sikkim have been deputed for five days training programme at Department of Fisheries, Govt. of Jammu & Kashmir, Trout Fish Farming Project, Kokernag. They have been trained on artificial breeding of Rainbow Trout (*Oncorhynchus mykiss*) including husbandry, hatchery activities, grading, feed manufacturing and its preservation, broadcasting and overall farm management.

4) Brief description of research work done

During the period under report, few places of river belt namely Melli Tista, Bardang-Tista, Sigtham Rani Khola were surveyed. Water samples from fishing location and sample of fishes were collected from fisherman. The identification of different available fish species and their physical parameter is done in the laboratory.

Results

The environmental temperature in the river bank ranged between 22 ^{0}C to 29 ^{0}C and the water temperature observed at the fishing location is 17 -19 ^{0}C. Water is alkaline in nature and pH value ranged from 7.7 to 8.1. The alkalinity of water equivalent to calcium carbonate is 6 to 8 mg/l. Dissolved oxygen measured in the river water was 5.76 to 10.94 mg/l. The free carbon dioxide ranged between 0.8 to 1.76 mg/l. The average total dissolved solid (TDS) value observed is 47.15 ppm.

The percent catch fish of available species during survey is depicted in Table 1. *Acrossochelus hexagonolepis* is the predominant species followed by *Schizothorax richardsonaii*.

Expertise for designing of mahseer hatchery under consultancy with LANCO Energy Limited.

Under the work schedule of one of this Institute's Consultancy contract with the LANCO Energy Private Limited, Mazitar, Sikkim the suitable site has been finalized for establishment of mahseer hatchery after proper survey of the

Table 1. Percentage availability of catch fish at survey area during the period

Name of fish	Common name	Percentage (%)
Schizothorax richardspnaii	Dothay asala	23.08
S. progastus	Chuchay asala	1.54
S. esocinus	Asala	3.08
Acrossochelus hexagonolepis	Katle	27.69
Gara annandalei	Buduna	7.69
G. lamta	Buduna	6.15
G. gotyla	Nak-katua buduna	6.15
G. kempi	Buduna	6.15
Pseudecheneis sulcatus	Kabre	3.08
Barilus barila	Chahale	3.08
B. bendelisis	Chaley, chirkay	7.69
Glyptothorax hori	Kafrey	1.54
Semiplotus bendelisis	Cheptey	3.08

site by me jointly with the LANCO Officials. After the finalization of the site, the lay out design and budget estimate for construction of mahseer hatchery farm have been made for the proposed hatchery for seed production of Himalayan mahseer, *Tor putitora* (Ham.) under Teesta stage - VI Hydro Electric Project, Sikkim.

TECHNOLOGY ASSESSED & TRANSFERRED

The innovation and adoption of "**Composite Carp Farming**" in Uttarakhand has spread to various districts and more than 150 farmers are engaged in further demonstration. The same technology has been transferred to 21 farmers in 5 districts of Manipur State and in 63 farmers of 13 districts of Arunachal Pradesh involving 74 demonstration sites through State fisheries Department and KVK in respective State

- Technique of polyculture of exotic carps in hills was discussed with farmers during the training programme organized by Paryavaran Sanrakshan Samitee, Pati, Champawat.
- Fish health management and feeding management in polyculture of exotic carps in hills was discussed with farmers of Kumaon region during the training programmes organized by Krishi Vigyan Kendra, Lohaghat and State fisheries department, Champawat.
- Awareness Programme was conducted on Mahseer Conservation at Amodi and Belkhet villages of Champawat District on 29.9.2008.
- Demonstration on trout culture and trout raceways to the students of the College of Fisheries, Pantnagar during their exposure visit on 24 Oct. 2008.
- Discussion on prospects of aquaculture in hills with extension workers/officers of Uttaranchal Parvatiya Aajivika Sanvardhan Company, Tehri Garhwal.
- Farm advisory service was provided to 10 farmers for carp culture and 2 farmers for trout culture in District Champawat and Chamoli.
- This Directorate has participated in exhibition at NBFGR, Lucknow during National conference on aquatic genetic resources on 26-27 April 2008and at CIFA, Bhubneswar

Hon'ble Agriculture Minister and CM, Uttarakhand Visited to DCFR stall at KVK Meet, Pantnagar

during Brainstorming meet on 7-8 June 2008.

- Installed the stall in exhibition at CIFRI, Barrackpore during Indian Fisheries Forum on 21-26 Nov. 2008.
- Participated in exhibition at G.B.Pant University of Agriculture & Technology. Pantnagar, during National Conference on KVK, 27-29 Dec. 2008. and also during Kisan mela, March 2009. A Special prize was provided to the DCFR stall.

Fish Farmer of Uttarakhand got IARI Award

Shri Krishna Nand Gahtori, a fish farmer trained, guided and adopted under TOT programme of the DCFR, Bhimtal got Farmer Award of IARI, Pusa, New Delhi on 26.02.2009.

Fish Farmer awarded during IARI PUSA Kisan Mela

Interaction of Director and trainees of ISTM, New Delhi

Visit of farmers from Delhi

Fish farm at Sheergaon, Arunachal Pradesh

Mahseer hatchery at Sheergaon, Arunachal Pradesh

EDUCATION & TRAINING

National Training program organized on "**Culture and Breeding of Important Coldwater Fishes**" during 14-21 July 2008 Sponsored by Ministry of Agriculture and Co-operation, New Delhi. Around 30 participants took part in different hill states of India including State Fisheries Officers, Subject Matter Specialists and entrepreneurs.

Another training program on "**Aquaculture development in hill regions of Uttarakhand**" conducted during 26-30 May 2008 sponsored by UPASAC, Dehradun, Uttarakhand. Around 20 farmers from different districts of Uttarakhand were attended the training program.

Training programmes attended

Mr. Ashok K. Nayak attended Management Development Programme on Data Mining & GIS for Decision Support in Agriculture at Indian Institute of Management, Lucknow from August 25 - September 05, 2008

Mr. Ashok K. Nayak attended One-week Advance Training Program on Cyber Laws, Information Security and Computers for Scientists & Technologist (Sponsored by DST, Govt. of India) at Indian Institute of Public Administration, New Delhi from October 13-19, 2008.

Radio Talk

Dr. Madan Mohan, Principal Scientist delivered a radio talk on "Matsya Poshan Tatha Swasthya" recorded on 20th March 2009 and broadcasted over All India Radio Almora on 30th March 2009.

Inauguration of Model Training Course

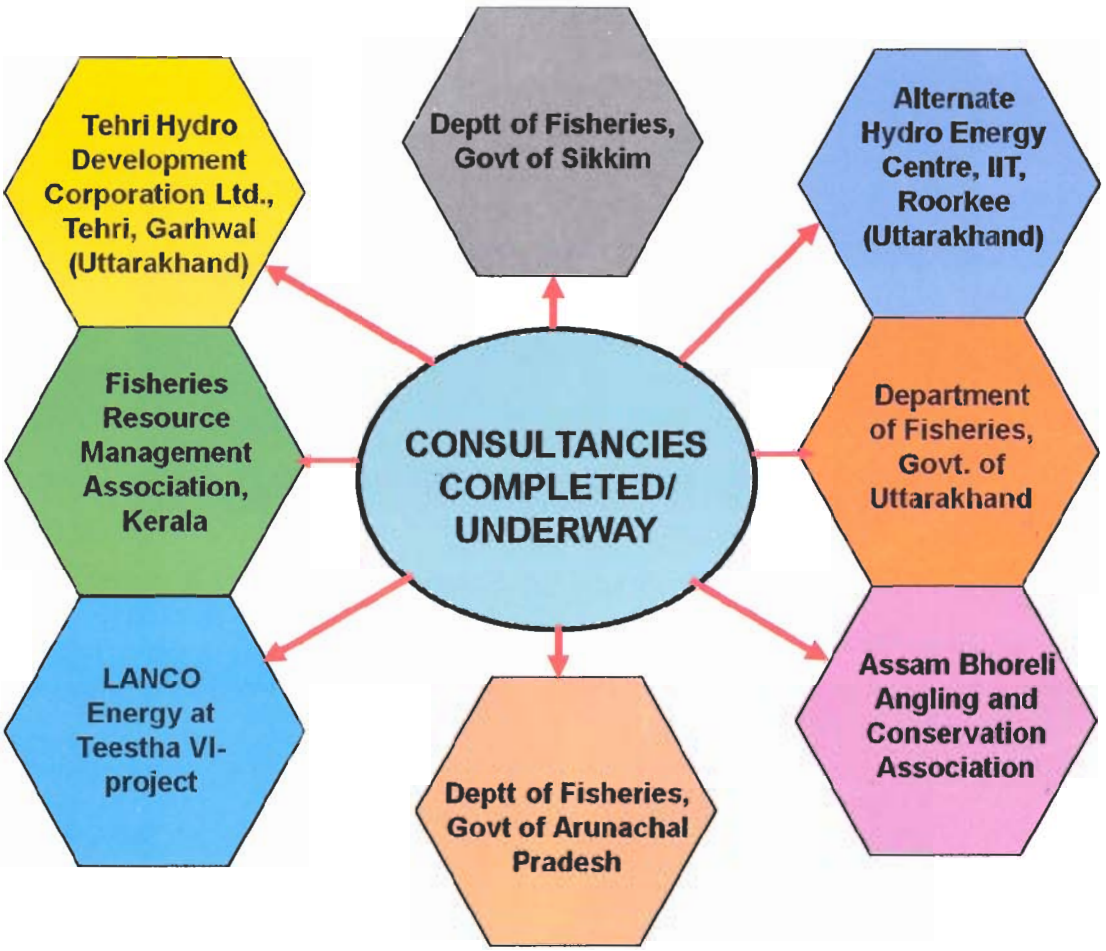
Scientist explaining mahseer breeding to trainees

Participants in Model Training Program

RESOURCE GENERATION/CONSULTANCY

- Consultancy is being given to and the MOU have been signed with Assam Angler Association, Tejpur, Assam to established Mahseer (Tor *putitora*) Seed Production Unit at Eco Camp, Nameri on the bank of River Kameng and a site is selected for establishing Mahseer Hatchery and Farm at Bagua, South Skkim.

- M/s LANCO ENERGY PRIVATE LIMITED teesta stage, East Sikkim,for establishing Mahseer hatchery under institutional consultancy.
- Institutional consultancy provided to Zoology department, H.N.B. Garhwal University, Srinagar, for establishing circular carp hatchery.



AWARDS & RECOGNITION

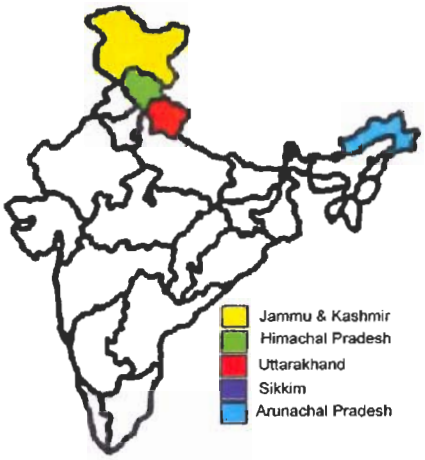
- In International Conference on Novel Approaches for Food and Health Security in High Altitudes organized by Defence Institute of High Altitude Research, Leh Ladakh, a paper entitled "Fisheries Potential in High Altitude Water bodies of Leh Ladakh" was delivered by Dr. A. Barat for which a mementos was presented by Dr. T.H. Terrill, USA during September 6-10, 2008.
- Dr. K.D. Joshi received ***"Distinguished Service Award 2009"*** of the Bioved Research Society, Allahabad in the 11th Indian Agricultural Scientists and Farmers Congress held at Allahabad on 14th February 2009.

Presentation of Momento by Dr. Therril, DIHAR, Leh

WORKSHOP ON OUTREACH ACTIVITIES

A workshop on outreach Activities was organized during May 16-17, 2008 at this Directorate under the chairmanship of Dr. S. Ayyappan, DDG (Fy), ICAR, New Delhi. The following outreach partners attended the meeting and would be able to work with DCFR in a partnership mode under the project entitled "Sustainable utilization of mountain fishery resources - a partnership mode".

The outreach partners presented their progress work and work plan for the next year.



State Name	Partners
Arunachal Pradesh	▪ Department of Fisheries ▪ Rajiv Gandhi University, Itanagar
Sikkim	▪ Department of Fisheries ▪ ICAR Research Complex, NEH,Sikkim Center, Tadong
Uttarakhand	▪ Department of Fisheries ▪ HNB Garhwal University, Srinagar
Himachal Pradesh	▪ Department of Fisheries ▪ CSKHP Agri. Univ. Palampur
Jammu & Kashmir	▪ Department of Fisheries ▪ College of Fisheries, SKUAS&T, Srinagar

Meeting with DDG (Fy.) during Outreach Activity workshop

Presentation of Outreach Partners during the workshop

COMMEMORATION OF RENAMING OF NRCCWF TO DCFR

Commemoration meeting was held on 28th December 2008 for renaming of NRCCWF to Directorate of Coldwater Fisheries Research, (DCFR). The meeting was Chaired by Dr. Mangala Rai, Secretary DARE & Director General, ICAR along with Dr. S.Ayyappan, Deputy Director General (Fy.), ICAR, Dr. H.S. Gupta, Director, IARI, New Delhi, Dr. K.K. Vass, Director, CIFRI, Barrackpore & Ex. Director, NRCCWF and Dr. R.S. Chauhan, Director of Fisheries, Department of Fisheries, Govt. of Uttarakhand.

In the meeting Hon'ble Director General inaugurated the session with lightning of lamp and unveiled the New Logo of DCFR. He also addressed the audience and expressed the reasons of changing the NRCCWF to DCFR. In the same session, our Hon'ble Deputy Director General addressed and highlighted the mode of future direction of DCFR. Dr. P.C. Mahanta, Director presented the achievements made so far by NRCCWF and expected future achievement under Directorate mode involving the partners of five Hill States and finally, vote of thanks was delivered Dr. Madan Mohan, Principal Scientist of this Directorate.

Lightning of Lamp by Hon'ble DG, ICAR

Lightning of Lamp by Hon'ble DDG(Fy.), ICAR

Lightning of Lamp by Ex. Director, NRCCWF

Lightning of Lamp by Director, VPKAS, Almora

Lightning of Lamp by Director Fisheries, Govt. of Uttarakhand

Lightning of Lamp by Director, DCFR

Inaugural session

Address by Hon'ble DG, ICAR

Address by DDG (Fy.), ICAR

Address of Director DCFR

Felicitation to Hon'ble DG by DDG (Fy.)

Unveiling of DCFR, Logo

Releasing of Institutes Publication

Felicitation of farmer

Hon'ble DG, ICAR interaction with scientist

Hon'ble DG, ICAR visit to Genetics Lab

Scientist explaining activities of Genetics to Hon'ble DG, ICAR

Hon'ble DG, ICAR visit to feedmill

PUBLICATIONS

Papers Published

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- Sarma, D., Madan Mohan, Haldar, R.S., Das, P. and Mahanta, P.C. (2009). Captive breeding and growout of the golden mahseer. INFOFISH *International, Malaysia*, **2**: 18-22.
- Singh, N. Okendro, Shyam Sunder, Surinder Kumar and Pande, M.K.. (2009). Realistic Modelling on Length-Weight Relationship of *Schizothoraichthys curvifrons* Heckel from River Jhelum, Kashmir. *Icfai University Journal of Life Sciences,* **3**(2): 4-30.
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- Madan Mohan, Bhanja, S.K. and Basade, S. (2008). Effect of chitin on growth performance of the indigenous Himalayan fishes-Snow Trout, *Schizothorax richardsonii* (gray) and Golden Mahseer *Tor putitora* (Ham.). *Indian J. Fish.* **57**.
- Joshi, K.D. and Tyagi, B.C. (2008). Rearing of carp fry under polyhouse ponds at high altitude of Uttaranchal Himalaya, during winters. *Journal Inland Fish. Soc.* **40**(1): 78-81.
- Kumar, D. and Joshi, K.D. (2008). Status of fishery and its management in wetlands of Uttar Pradesh: Measures for enhancement. *Journal Inland Fish. Soc.* **40**(2): 56-60.
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- Singh, N. Okendro, Wahi, S.D. and Paul, A.K. (2008). Optimum Sample Size for Estimating the Precision of Heritability by Parent-Offspring Regression. *Icfai University Journal of Genetics & Evolution,* **1**(1): 28-35.
- Joshi, K.D. (2007). Preliminary observations on rearing of a rare hill stream fish, *Naziritor chelynoides* (Mc Clelland) under pond environment. *Indian Journal of Fish.* **54**(4): 423-425.
- Singh, N. Okendro, Surinder Kumar, Mahanta, P.C. and Gopimohon Singh, N. (in press). A Modified Logistic Model to Incorporate Cyclical Fluctuations in Growth of *Tor putitora* (Hamilton). *Asian Fishery Sciences*.

Popular article

- Joshi, K.D. and Mahanta, P.C. (2009). Asela snowtrout, *Schizothorax richardsonii* (Gray): its natural history and domestic attributes. *Fishing Chimes*, **28** (10 &11); 90-93.

Technical Bulletins

- Mahanta, P.C., Ali, S. and Pandey, N.N. (2008). Coldwater Fisheries Research: A New Horizon. DCFR, Bhimtal Publication
- Joshi, K.D.; Pathak, V. and Tyagi, R.K. (2008). *Uttar Pradseh: Jheel Parishthitikee evam Matsyikee.* CIFRI, Bulletin (153): 41pp.
- Madan Mohan, Basade, Y. (2008). Coldwater Fish Nutrition. DCFR Special Publ. PP. 55-60.
- Kapila, R., Prem Kumar and Barat, A. (2008). Fish and Fisheries of Leh region: An exploratory Survey. Bulletin No 12, DCFR, Bhimtal

Training Manual

- Training manual on Model training course on Culture and Breeding of Important coldwater fish species. (2008). NRC of Coldwater Fisheries, Bhimtal. 78p.

Books Edited

- Bhuyan, R. N.; Ghosh, D. and Sarma, Debajit. (2009). "Recent Advances and Rebuilding of Fish and Fisheries in North East India". Geophil Publication, Guwahati.
- Pandey, N.N. and Malik, D.S. (2008). Integrated Fish Farming. Published by Daya Publishing House, New Delhi. Released by Dr. S.Ayyappan, DDG (Fy), ICAR on June 8th 2008 during Brain Storming Session at CIFA, Bhubaneswar.

Book Chapters

- Mahanta, P.C., Tyagi, B.C. and Sharma Debajit. (2009). Culture of carps in high altitude- some ideas on its successful management. In: Aquaculture Management (Ed: Goswami U.C. and Dilip Kumar), Narendra Publishing House, Delhi.
- Mohanta, P. C. and Sarma, Debajit. (2009). Fisheries and Aquaculture Scenario in N. E. region. Souvenir, Assam Matsya Mahotsav, 09: pp13-19.
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LIST OF ONGOING PROJECTS

Title of the Project	Project Leader and Associates	Year of Start	Likely year of completion
Development of GIS based decision support system for aquaculture in selected coldwater region	Sh. Ashok K. Nayak Sh. Prem Kumar Dr. P.C. Mahanta	2007	2010
Modelling of length-weight relationship and growth pattern of selected important coldwater fish species	Mr. N. Okendro Singh Dr. Debajit Sarma	2008	2011
Studies on induced maturation and seed production of Himalayan mahseer, *Tor putitora* and *Schizothorax richardsonii* in pond environment	Dr. B.C. Tyagi Dr. Shyam Sunder Mr. Prem Kumar Dr. R. Kapila	2005	2008
Cage culture of fishes in floating cages in subtropical Himalayan lake - Bhimtal	Dr. M. Mohan Dr. B.C. Tyagi Dr. Y. Basade	2005	2008
Investigation on coldwater fish pathogens and their environment	Dr. Amit Pande Dr. N.N. Pandey Dr. Yasmeen Basade.	2008	2011
Study on water budgeting and water management for coldwater aquaculture system	Dr. N.N. Pandey Mr. Prem Kumar	2008	2011
Evaluation of growth performance of different strains of common carp	Dr. N.N. Pandey Mr. Prem Kumar	2008	2011
Molecular genetic characterization of Indian snow trout	Dr. G.K. Sivaraman Dr. A. Barat Dr. P.C. Mahanta	2008	2011
Performance studies of chocolate mahseer in fresh water aquaculture system in North East and Western Himalayan region	Dr. D. Sarma Dr. B.C. Tyagi Sh. N. Okendro Singh	2007	2010
ICAR Mega Seed Project : Seed production in agricultural crops and fisheries	Dr. Madan Mohan Sh Prem Kumar	2006	
Fisheries research and development in NEH region	Dr. B. C. Tyagi		

Outreach activity on fish feeds	Dr. Y. Basade Dr. M. Mohan Dr. D. Sarma	2008	2011
Nutrient profiling and evaluation of fish as a dietary component	Dr. D. Sarma Dr. N.N. Pandey	2008	2011
Fish Genetics Stock	Dr. A. Barat Dr. G.K. Sivaraman Mr. Prem Kumar	2008	2011
Network project on fish germplasm exploration, cataloguing and conservation	Dr. P.C. Mahanta Mr. Ashok K. Nayak	2006	
DBT funded project: Development and characterization of microsatellite markers in Indian snow trout, *schizothorax richardsonii*	Dr. A. Barat Dr. G.K. Sivaraman	2008	2011
Outreach activities with five hill states: Sustainable utilization of mountain fishery resources - a partnership mode.	Dr. M. Mohan Dr. K.D. Joshi Dr. A. Barat Dr. D. Sarma Dr. N.N. Pandey Mr. Prem Kumar Mr. Ashok K. Nayak Mr. R.S. Haldar	2008	

PARTICIPATION IN CONFERENCES/MEETINGS/ SYMPOSIA/SEMINARS/ WORKSHOPS

Conferences/ Meetings / Symposia/ Seminars/ Workshops	Participants
Meeting on outreach activities in Genetics at NBFGR, Lucknow during July 26-27, 2008	Dr. P.C. Mahanta Dr. A. Barat Dr. G.K. Sivaraman
Meeting of the National Knowledge Commission at Delhi on 29.07.2008	Dr. P.C. Mahanta
Directors meeting at CMFRI, Kochi, during November 29-30, 2008.	Dr. P.C. Mahanta Dr. A. Barat
National Conference on KVK, 27-29 Dec. 2008, organized by G.B.Pant University of Ag. & Tech. Pantnagar.	Dr. P.C. Mahanta Dr. N.N. Pandey
Review Meeting of Mega Seed project convened by our Respected Deputy Director General (Fisheries) ICAR at NASC Complex Delhi on Dec. 2, 2008.	Dr. P.C. Mahanta Dr. Madan Mohar. Dr. A. Barat
International Workshop on DNA barcoding on 3 to 4th Dec. 2008 organised by NBFGR, Lucknow at NASC Complex, New Delhi.	Dr. P.C. Mahanta Dr. Madan Mohan Dr. A. Barat .
Meeting of Directors of ICAR Fisheries Research Institutes and other research organizations organized by National Fisheries Development Board at NAARM, Hyderabad on December 22-23, 2008	Dr. P.C. Mahanta
Directors' conference organized at NASC, Pusa, New Delhi during January 15-16,2009	Dr. P.C. Mahanta
Assam Meen Mahatsov at Guwhati during 29-30 January 2009	Dr. P.C. Mahanta Dr. K.D. Joshi Dr. Debajit Sarma
Brainstorming session on "Exotic aquatic animals and quarantine" held at NBFGR, Lucknow on 15.02.2009.	Dr. P.C. Mahanta Dr. K.D. Joshi
Meeting on Fish Genetics Stocks under networking programme on February 16-18, 2009 at NBFGR, Luck now.	Dr. P.C. Mahanta Dr. A. Barat Dr. G.K. Sivaraman
National Seminar on Sustainable Hill Aquaculture organized at ICAR Research Complex, Manipur Centre, Imphal on March 2, 2009	Dr. P.C. Mahanta
Brainstorming Meet on "Aquaculture 2025: Challenges and Opportunities" held at CIFA, Bhubaneswar on 7-8th June 2008.	Dr. Madan Mohan Dr. A. Barat Dr. N.N. Pandey

Meeting on Outreach Activity on Fish Feed at CIFA Bhubaneswar on 8-9th August 2008.	Dr. Madan Mohan
Regional Workshop for Indo-Pacific region on Inland Coldwater Fisheries organized by INFOFISH Malaysia and MPEDA Kochi	Dr. Madan Mohan
32nd Conference of the Ethological Society and National Symposium on Fish Behaviour on 16-17th October 2009 organized by CIFE at Mumbai and presented a paper on "Behavioral pattern in inland coldwater fishes of India".	Dr. Madan Mohan
8th Indian Fisheries Forum organized by Asian Fisheries Forum – Indian Branch and CIFRI at Kolkata from November 22-26, 2008.	Dr. Madan Mohan Dr. B.C. Tyagi Dr. K.D. Joshi Dr. A. Barat Dr. N.N. Pandey Mr. A.K. Nayak Dr. G. K. Sivaraman Dr. S. Ali
Inaugural Session of 89th Session of Indian Science Congress Association on 3-4th January 2009 at Shillong.	Dr. Madan Mohan
Review Meeting of Mega Seed project at NASC Complex, New Delhi during 5-6th January 2009	Dr. Madan Mohan
National Workshop on "Enterpreneurship Development in Fisheries" organized by College of Fisheries, G.B. Pant Uni. of Agri. & Technology, Pantnagar on 29th March 2009.	Dr. Madan Mohan
Coldwater Aquaculture 2025: Challenges and Opportunities. Presentation made in Brainstorming Meet on Aquaculture 2025 held at CIFA Bhubaneswar.	Dr. Madan Mohan
Workshop on "Sustainable Livelihood Development through Fisheries and Aquaculture in NEH Region of India" jointly organized by Indian Fisheries Association, ICAR Research Complex for NEH Region, CIFE, NBFGR & DCFR at ICAR Research Complex for NEH Region, Barapani, Meghalaya on 02.01.2009.	Dr. Madan Mohan Dr. K.D. Joshi Dr. Debajit Sarma Dr. S. Ali
11th Indian Agricultural Scientists and Farmers Congress held at Bioved Research Society, Allahabad on 14.02. 2009	Dr. K.D. Joshi
Brainstorming session of the NBFGR, Lucknow held on "Status of the fish germplasm resources of the Ganga river system" at CIFRI, Allahabad on 06.03.2009	Dr. K.D. Joshi
National Consultation on "Registration, Evaluation, Valuation and In-situ Conservation of Aquatic Germplasm Resources" held at NBFGR, Lucknow from 20-21 March 2009.	Dr. K.D. Joshi
First Inception Workshop on Outreach Activity on Fish Feeds held at CIFA, Bhubaneswar during August 8-9, 2008.	Dr. Yasmeen Basade

First Review Meeting of Outreach Programmes of ICAR, Fisheries Division held at CIFRI, Barrackpore during February 26-27, 2009.	Dr. Yasmeen Basade Dr. A. Barat Dr. Debajit Sarma
International Seminar on Marine Eco-systems: Challenges and opportunities. Organized by MECOS-2009, Cochin.10-12 Feb. 2009.	Dr. Debajit Sarma
International Conference on Novel Approaches for food & Health Security in High Altitudes organized by Defence Institute of High Altitude Research, Leh-Ladakh, J&K during September 6-10, 2008.	Dr. A. Barat Mr. Prem Kumar
National conference on aquatic genetic resources on 26-27 April 2008, organized by NBFGR, Lucknow.	Dr. P.C. Mahanta Dr. N.N. Pandey Mr. Ashok K. Nayak
Methodology workshop on out reach activity-3, Nutrient profiling and evaluation of fish as a dietary component, organized by CIFT, Cochin, during 16-22 Sept. 2008.	Dr. N.N. Pandey
Workshop on Nutrient Profiling of Fishes organized by CIFT, Cochin during 3-7 Feb. 2009.	Dr. Debajit Sarma
Exhibition at G.B.Pant University of Ag. & Tech. Pantnagar, during Kisan mela, March 2009.	Dr. N.N. Pandey

MEETINGS ORGANIZED

Quinquennial Review Team (QRT)

The QRT meeting was held on 21-22 May, 2008 under the chairmanship of Dr. Brij Gopal, Professor, JNU, New Delhi. The other members were Dr. M.L. Bhowmick, Kolkata, Dr. S.P. Biswas, Guwahati University, Guwahati, Dr. A.R. Yousuf, J&K., Dr. S.N. Ogale, Ex. Consultant, Tata Power Corporation, Lonavola and Dr. Modan Mohan, Principal Scientist & Member Secretary. They reviewed last five years performances of the Institute and finalized the report document.

QRT Members at Nutrition Lab.

QRT Meeting with Scientists

Visit of QRT members at ARIS Cell

Scientists interaction with RAC members

Deliberation of scientist during RAC

Research Advisory Committee (RAC)

Research advisory Committee meeting was held during 21-22 June, 2008 under the chairmanship of Dr. S.P. Ayyar, Ex Director, CIFRI, Barrackpore. The progress of each research projects was discussed in detail during the meeting. The meeting was followed by a visit to Kosi River near Sualbari, Uttarakhand, for mahseer seed ranching programme in presence of Dr. S.P. Ayyar , Dr. V.V. Sugunan, ADG (Fy), ICAR, New Delhi, Dr. A. Srivastava VIPKASH, Almora and other eminent person from local villages.

Institute Management Committee (IMC)

IMC meeting was held on March 28, 2009 at DCFR, Bhimtal. In presence of following members

Dr. P.C. Mahanta
Chairman
Director, DCFR, Bhimtal

Dr.V.V. Sugunan,
Member
Asstt. Director General (I.Fy.),
ICAR, KAB II, New Delhi

Proceedings of IMC Meeting

IMC members in Nutrition Lab

Visit of IMC Members at Champawat farm

Dr. A.K. Srivastava,
Member
Principal Scientist,
Vivekanand Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand

Dr.A.K. Sahu,
Member
Principal Scientist,
Central Institute of Freshwater Aquaculture, Bhubaneswar, Orissa

Dr. S. A. Ali,
Member
Principal Scientist,
Central Institute of Brackishwater Aquaculture, Chennai

Shri Harish Ram,
Member Secretary
AAO, DCFR, Bhimtal

The above members discussed the agenda item and gave their valued suggestions and recommendations, which was documented and sent to ICAR for approval.

- **Programme Advisory Committee** of the Department of Science & Technology, Government of India, New Delhi from September 25-26, 2008 at DCFR, Bhimtal. The committee meeting was held under chairmanship of Dr. P.V. Dehadrai, Ex DDG (Fy), ICAR,

Proceedings of PAC Meeting (DST)

PERSONNEL

List of staff (As on March 31, 2009)

Research Management

Dr. P.C. Mahanta, Director

Scientific

1.	Dr. Madan Mohan, Principal Scientist	Fish & Fishery Sciences
2.	Dr. B.C. Tyagi, Principal Scientist	Fish & Fishery Sciences
3.	Dr. Shyam Sunder, Principal Scientist	Fish & Fishery Sciences (Retired on superannuation on 31.7.08)
4.	Dr. K.D. Joshi, Principal Scientist	Fish & Fishery Sciences (Joined on 17.11.08)
5.	Dr. Rajeev Kapila, Senior Scientist	Biochemistry (Transferred to NDRI, Karnal on 8.8.2008)
6.	Dr. Yasmeen Basade, Senior Scientist	Fish & Fishery Sciences
7.	Dr. Ashoktaru Barat, Senior Scientist	Fish Genetics & Breeding
8.	Dr. Amit Pande, Senior Scientist	Biotechnology (Animal Science)
9.	Dr. Debajit Sarma, Senior Scientist	Fish & Fishery Sciences
10.	Dr. Nityanand Pandey, Senior Scientist	Aquaculture
11.	Sh. Prem Kumar, Scientist (S.S.)	Fish & Fishery Sciences
12.	Sh. Ashok Kumar Nayak, Scientist (S.S.)	Computer Application in Agriculture
13.	Sh. N. Okendro Singh, Scientist	Agricultural Statistics
14.	Dr. G.K. Shivaraman, Scientist	Animal Genetics & Breeding
15.	Sh. Sumanta Kumar Mallik, Scientist	Aquaculture
16.	Dr. Shahnawaz Ali, Scientist	Aquaculture

Technical

1.	Sh. R.S. Haldar	Technical Officer, T-6
2.	Sh. A.K. Joshi	Hindi Translator, T-5
3.	Sh. Baldev Singh	T-4
4.	Sh. Santosh Kumar	T-4

5.	Sh. Ravinder Kumar	T-1-3
6.	Sh. Vijoy Kumar Singh	T-3
7.	Sh. Amit Kumar Saxena	T-3
8.	Sh. Hansa Dutt	T-2
9.	Sh. Gopal	T-2
10.	Sh. T.M. Sharma	T-2
11.	Sh. R.K. Arya	T-2
12.	Sh. Bhagwan Singh, Driver	T-2
13.	Sh. Manoj Kumar Yadav, Driver	T-1
14.	Sh. Partha Das	T-1 (Jointed on 19.7.2008)

Administrative

1.	Sh. Harish Ram	Asst. Admin. Officer
2.	Sh. B.C. Pandey	Asst. Fin. & Acc. Officer
3.	Smt. Susheela Tewari	P.A.
4.	Smt. Khilawati Rawat	Assistant
5.	Sh. P.C. Tewari	UDC
6.	Sh. J.C. Bhandari	UDC
7.	Sh. Pratap Singh	LDC
8.	Smt. Munni Bhakt	LDC
9.	Sh. Hayat Singh Chauhan	LDC
10.	Sh. Hansa Singh Bhandari	LDC

Supporting

1.	Sh. Sant Ram	SSG IV
2.	Sh. Ravinder Kumar	SSG IV
3.	Sh. Om Raj	SSG III
4.	Sh. Sundar Lal	SSG III
5.	Sh. Dharam Singh	SSG III
6.	Sh. Prakash Akela	SSG II
7.	Sh. Pooran Chandra	SSG II

8.	Sh. Manoj Kumar	SSG II
9.	Sh. Kuldeep Kumar	SSG II
10.	Sh. Bhola Dutt Mouni	SSG II
11.	Sh. Chander Shekhar	SSG I
12.	Smt Basanti Devi	SSG I
13.	Sh. Mangla Prasad	SSG I
14.	Sh. Sushil Kumar	SSG I (Jointed on 14.7.2008)

Farewell to Dr. Shyam Sunder, Ex. Pri. Sci. on his superannuation

Farewell to Dr. Rajeev Kapila, Sr. Scientist on his transfer to NDRI, Karnal

OTHER EVENTS ORGANIZED

IJSC Meeting

The Institutes's Joint Staff Council meeting was held on May 23. 2008 and issues were discussed including of acquiring land for construction of residential accommodation for NRCCWF staff and engagement of AMA. The new IJSC was constituted after conducting polls on February 19,2008. Following were elected members of staff side.

Administrative Group

1. Sh. Harish Ram
2. Sh. Jagdish Bhandari

Technical Group

3. Sh. T. M. Sharma
4. Sh. Bhagwan Singh

Supporting Staff Group

5. Sh. Ravinder Kumar
6. Sh. Manoj Kumar

Official language Hindi

Quarterly meeting of official language Hindi were conducted under the chairmanship of Director and review was done on the work going on in official language. Time to time instructions were issued to concerned sections of the Institute to carry work in Hindi.

World Environment Day

Environment day was celebrated on June 5, 2008. On this occasion a special lecture was delivered by Dr. N.P. Melkania, Professor, Department of Applied Science, Apex Institute of Technology, Rampur, UP. All staff members of DCFR and students of local Lake International School were present on this occasion. A plantation ceremony was also made.

Inauguration of World Environment Day

Plantation during Environment Day

Hindi Karyashala

One day Hindi Karyashala was organized in this Directorate on August 14, 2008 for promotion of Official language. In this occasion Mr. P.N. Shivpuri, involved invarious social development activities in the region was the Chief Guest.

Hindi workshop

Dr. Niraja Tandan, Head of the Department of Hindi, Kumaun University, Nainital was invited as Guest of Honor in the Hindi workshop.

Official Language Week Celebrations

The official language week was celebrated form 14-20 September, 2008. On this occasion different completions were organized for the promotion of "Hindi" by the Institutes Hindi Cell. The completions included Essay Writing , Vocabulary, Noting and Drafting, Typing and Translation. After the completion the winners were awarded.

Competition during Hindi Week

Independence and Republic Day Celebrations

Institute celebrated Independence and Republic Days on August 15 and January 26 with full devotion. On this occasion Dr. P.C. Mahanta, Director unfurled the National Flag and addressed the gathering of staff members. He emphasized to work in unity for achieving the goals of Institute for National interest.

Independence Day Celebration

Annual Day Celebration

On 15th November 2008, the Institute celebrated the Annual Day. It was observed with *Puja* and *Arti* following a two days meeting with members of QRT, RAC, Institute's Outreach Partners and other invited guests. The meeting was mainly oriented with QRT-RAC interaction for Directorates future mode of activities with five hill state partners (Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Sikkim and Uttarakhand) and other research activities.

Inauguration of Annual Day Celebration

Release of publication during Annual Day

DISTINGUISHED VISITORS

- Dr. S. Ayyappan, Deputy Director General (Fy.), Indian Council of Agricultural Research, KAB-II, New Delhi
- Dr. V.V. Sugunan, ADG (I.Fy.), Indian Council of Agricultural Research, KAB-II, New Delhi
- Dr. P.V. Dehadrai, Former DDG(Fy.), ICAR
- Dr. V.C. Goyal, Director, DST, Govt. of India, New Delhi
- Dr. C. D. Mayee, Chairman, Agricultural Scientist Recruitment Board, KAB-I, New Delhi
- Dr. B.S. Bisht, Vice Chancellor, GBPUA&T, Pantnagar.
- Dr. SPS Ahlawat, Director & VC, IVRI, Izzatnagar, Bareilly
- Drs. A. Bhattacharya & I. Kar, Reader, Vidyasagar College of Woman, Kolkata
- Miss. Rizwana, Dept. of Food Technology, Bhaskaracharya College of Applied Sciences, University of Delhi, New Delhi
- Dr. Anwar Alam, Vice Chancellor, SKUAS&T, Srinagar, Jammu & Kashmir
- Dr. Brahma Singh, Ex.Director, Agriculture and Life Sciences, DRDO, Delhi
- Dr. K.M. Bujarbaruah, Deputy Director General (Animal Science), Indian Council of Agricultural Research, Krishi Bhawan, New Delhi
- Dr. Arni Srinivas Rao, Prof. ISI, Kolkata
- Dr. H.S. Rawat, Advisor, Agriculture, Govt. of Uttarakhand, Dehradun
- Mrs. S.A. Panda, Director, Office of the Principal Director of Audit, Scientific Departments, Government of India, New Delhi

Visit of Vice Chancellor, GBPUA&T, Pantnagar

Visit of Director (Finance) & Director (Works) to this Institute

शीतजल मात्स्यिकी अनुसंधान निदेशालय
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