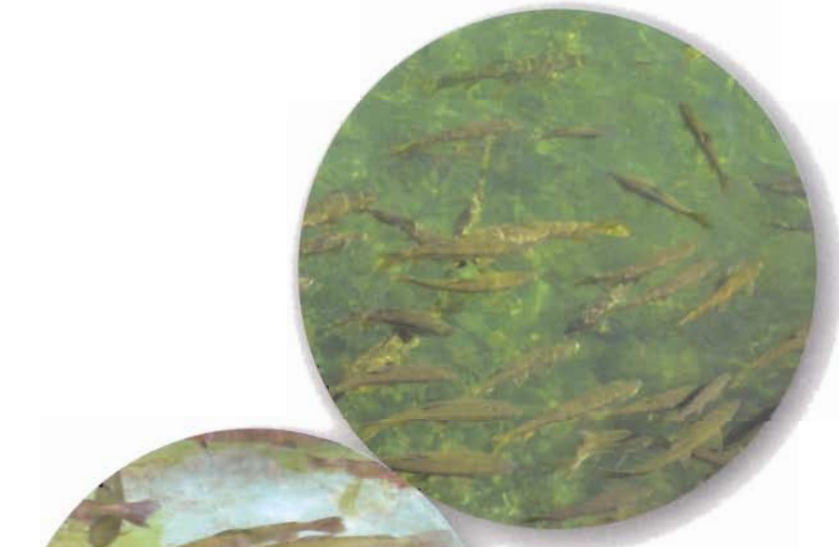
वार्षिक प्रतिवेदन

Annual Report

2012-2013



शीतजल मात्स्यिकी अनुसंधान निदेशालय, भीमताल
(भारतीय कृषि अनुसंधान परिषद)

Directorate of Coldwater Fisheries Research, Bhimtal
(Indian Council of Agricultural Research)

Front Cover

Mahseer in Vaijnath Pools
Trout in Champawat farm

Back Cover

Poly Lined Fish Ponds in Uttarakhand

Annual Report
2012–13

Directorate of Coldwater Fisheries Research
(Indian Council of Agricultural Research)
Bhimtal- 263136, Nainital, Uttarakhand, India

@ DCFR Annual Report 2012-2013

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Director

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Preface

The Directorate of Coldwater Fisheries Research (DCFR), Bhimtal has been continuously providing empirical inputs through imparting quality research and services for sustainable coldwater fisheries production, management and conservation.

During the year, the Directorate has put sincere research efforts for the betterment of the sector. To address the issue of species diversification for coldwater aquaculture, *Labeo dero* and *Neolissochilus hexagonolepis* have been bred successfully under captive conditions. Use of poly tanks with stepladder sides and earth covering has been proved to be a feasible design for carp culture in hills with additional benefits of water conservation. The issues and challenges of coldwater fish diseases are precisely being addressed by putting sincere efforts in identification of pathogens and development of management measures. The locally available herbal extracts have been tried for disease control. Efforts to increase rainbow trout culture and production in potential areas resulted in expansion of trout culture activities in the state of Sikkim. Now, the Directorate is geared up to further intensify its activities in NEH region, Himachal Pradesh, Jammu & Kashmir and Uttarakhand during the 12th five year plan. Attempts are also being made to document the ornamental fishes of coldwater region. The use of molecular biology and biotechnological tools are becoming promising to address the issues related to aquaculture enhancement and species development. In this line, the Directorate has made significant achievements in species characterization using different molecular markers and also for gene and allele mining for abiotic stress tolerance. The Directorate, in collaboration with KVK Deomali, Arunachal Pradesh has adopted 19 fish farmers of Tirap district for integrated fish farming and extended financial & technical support to enhance their livelihood. The activities under Tribal Sub Plan (TSP) have also been adequately addressed by extending technical and financial support for aquaculture to 28 farmers of Uttarakhand. I am glad to mention here that a North East Information Centre has been created at Guwahati to enable the flow of information from laboratory to land with the objective of 'Farmers First'. The Directorate has prepared the documents of 'Vision 2050' and 12th Five Year Plan EFC.

The infrastructural facilities at field centre Chhirapani, Champawat has been expanded to facilitate the breeding and seed production of rainbow trout and also to maintain other species.

In commemoration of Silver Jubilee Year of the Directorate, lecture series, special workshops and a National Seminar on "Mountain Fisheries: Challenges and Opportunity for Livelihood Security" were organized during 5 - 6 November, 2012. Representatives from farming community, State Fisheries Departments and R&D institutions as well as eminent scientists, aquaculture experts and students participated in the deliberations. I hope, the recommendations emerged out of this national seminar will strengthen the future activity of the Directorate. DCFR is further gearing up to face the challenges and tasks ahead.

During the year, various training programmes and extension activities were conducted. It was the constant efforts of all scientists and staffs of this Directorate that made possible for such progress and achievements during the year. The continuous support, guidance and

and encouragements received from Dr. S. Ayyappan, Secretary, DARE & Director General, ICAR was commendable. The keen interest and support received from Dr. B. Meenakumari, DDG (Fisheries) and Dr. S.D. Singh, ADG (I.Fy), ICAR are recorded with sincere thanks and gratitude.

I complement the Editorial Team for putting their sincere efforts in compilation of the Annual Report 2012-13.

Date : 26.06.2013

(Dr. Ashoktaru Barat)
Director

Contents

Executive summary

Directorate of Coldwater Fisheries Research (DCFR) with mandate of (i) to conduct basic, strategic and applied research in coldwater fisheries and aquaculture (ii) to develop stock management models and culture technologies for major coldwater fish species (iii) To create awareness and provide training and consultancy. Under 12 institute research projects and 10 other externally funded projects, the following research activities were carried out.

Salient Research Achievements

- A new species of loach *Schistura obliquofascia* was identified from Kalsa, a stream near Chanfi, tributary of Gola River, Ganga basin in Uttarakhand using molecular and morphometric methods.
- The two minor carps of economic importance, *Labeo dero* and *Labeo dyocheilus* were successfully bred and their biology was studied in detail.
- Performance of poly lined fish ponds was studied in Uttarakhand, in terms of fish growth and survival. Water temperature in polylined tanks were found to be 2-4 °C higher than earthen and cement tanks.
- *Aeromonas hydrophila*, *A. sobria*, *A. veronii* and *Pseudomonas* spp. were isolated from diseased fish.
- Several indigenous plants were screened for their antibacterial property against *Aeromonas* spp. and *Pseudomonas* spp.
- Fungal infestation in fertilized egg of rainbow trout was the reason for low survivability of hatchlings.
- Some of the samples collected for virus isolation were found to be positive by ELISA and CPE effect in culture supernatant.
- Partial Hepcidin mRNA sequence of *Tor putitora* (Golden mahseer) was characterized.
- The first preliminary investigation on fish faunal diversity of coal mines affected areas of Simsang River, Meghalaya was undertaken.
- Samples of *Schistura sikmaiensis* were collected from Garo hills of Meghalaya for development of microsatellite markers.
- Fifteen microsatellite markers for *Tor putitora* have developed from di-nucleotide enriched partial genomic library.
- Liver specific cDNA library was constructed for *Schizothorax niger* collected from River Sutlej, Kashmir Valley (Jammu & Kashmir).
- Identification of heat shock responsive transcripts of liver RNA was carried out by whole transcriptome sequencing.
- Amplification of GPDH gene in *Schizothorax niger* and estimation of substitution rates of amino acids was also done.
- Growth performance of chocolate mahseer under culture system was found to be 20 % higher than the golden mahseer.
- A detailed survey was undertaken to investigate the coldwater ornamental fishes from river stretches of Uttrakhand and North eastern region of India.
- Performance evaluation of improved strain of Hungarian common carp at different thermal regimes was carried out successfully.
- Suitable aquaculture sites in Uttarkashi district of Uttarakhand was identified by using GIS tools.
- Under Tribal Sub Plan (TSP) twenty eight potential farmers were selected for livelihood security through aquaculture intervention in Uttarakhand. To ensure the regular availability of seed, a mini-hatchery (CIFA model) was also set up at one of the farmer's premises in foothill area under TSP.

- Nutrient profiling of five fishes were carried out and they were found to be very rich source of omega 3 fatty acids.
- Successful breeding of chocolate mahseer was done with production of 5000 hatchlings.
- *Argulus*, Ich, *Trichodina* and *Dactylogyrus* are the main parasites of coldwater fishes.
- Fry of golden mahseer were successfully reared in cage for ranching.

Important Events

- Fish farmer's day was celebrated at Champawat field centre of DCFR on 10th July 2012.
- Independence Day was celebration on 15th August 2012.
- Institute Management Committee (IMC) meeting was held on 18th August 2012 under the chairmanship of Dr P. C. Mahanta, Director DCFR.
- Two days review workshop on "Sustainable Utilization of Mountain Fishery Resources-a partnership mode" was conducted on 8-9 September, 2012 in collaboration with Faculty of Fisheries, Sher-e-Kashmir University of Agricultural Sciences and Technology.
- Hindi Chetna Mas was observed during 1.9.2012 to 30.9.2012 at DCFR, Bhimtal.
- Two days training programme on " Post harvest utilization and value addition of trout and carp" was jointly organized by CIFT, Cochin and DCFR, Bhimtal during 9-10th September 2012.
- Training cum exposure visit for the tribal farmers of Dunagiri and Almora was conducted under TSP programme on 29th September 2012.
- Inaugration of Northeast Information Centre of DCFR, Bhimtal was organized at CIFRI, Guwahati on 8th October 2012.
- On the occasion of Silver jubilee, Directorate organized National Seminar on "Mountain Fisheries: Challenges and Opportunity for Livelihood Security" on 5-6th November 2012.
- Dr. P. C. Mahanta, Director DCFR was superannuated on 31st December 2012.
- Republic day celebration was observed on 26 January 2013.
- Hon'ble Minister of State for Agriculture and Food Processing Industries, Shri Tariq Anwar Ji has visited the DCFR, Bhimtal on 29th March 2013. During his visit, he had distributed seed to the progressive fish farmers of Uttarakhand and inaugurated the website of DCFR Bhimtal.
- Rainbow trout seed production was carried out successfully at Champawat and 50,000 eyed ova were supplied to the Department of Fisheries, Govt. of Arunachal Pradesh.

Introduction

Directorate of Coldwater Fisheries Research has completed 25 years of its inception in the year 2012. Keeping in view the large coldwater resources in the form of natural lakes, reservoirs, rivers and streams in the upland and the fish diversity inhabiting in these water bodies, Indian Council of Agricultural Research, New Delhi started planning for organizing this sector to have undisturbed faunal diversity and sustainable productivity during late sixties. As a result National Research Centre on Coldwater Fisheries came to existance in 1987 during VII Five Year Plan. Subsequently with the expansion of its activity it has been upgraded to the Directorate in the XIth plan, facilitating to work in collaberative mode with various Himalayan states extending from Jammu & Kashmir to North eastern states and the hills of Western Ghats.

It is intriguing to know that the fish fauna found in this region can withstand extreme cold in high altitude lakes and rivers which are generally frozen three to six months in a year. This makes the fish genome unique for valuable traits and chartcterized by slow growth rate. Such a diversified natural resource base with wide range of climatic diversity depending on altitudinal zones is a challenge for researchers, policy makers as well as farmers. The hills where the livelihood options are limited, fish and fishery have a great potential in generating rural income along with nutritional security. It can be a new horizon for the hill prosperity. Directorate acts in a mission mode for the holistic development of the coldwater fishery.

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

Location

The headquarters of DCFR is located at Bhimtal at an altitude of 1470 msl in the district of Nainital, Uttarakhand. 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 Indira Gandhi International Airport, New Delhi. The Experimental Field station of the Institute at Chhirapani 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 under taken both on capture and culture aspects with a focus on exotic and indigenous coldwater species.

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 Institute Management Committee (IMC) constituted and mandated by Indian Council of Agricultural Research under the Chairmanship of the Director, supervises various management aspects of this Institute. A number of internal committees such as Institute Research Council (IRC), Official Language Committee and Institute Joint Staff Council (IJSC) are in place of decentralized management.

Organizational set-up

Infrastructure

Building and Farm

The Institute is functioning from its complex constructed at Bhimtal, Industrial area. The main building has several facilities such as library, laboratories, AKMU cell, aquarium and auditorium. A pilot scale mahseer seed production unit is also under operation at Bhimtal. 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 trials on various culture aspects of the indigenous and exotic fish species.

Fish ponds & hatchery complex in the Directorate campus

Support Services

PME Cell

A separate cell called the Project Monitoring and Evaluation Cell (PME) monitors the implementation and progress of research project programmes being conducted by the Directorate. This cell biannually organizes the meeting of Institute Research Council (IRC) 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 IRC after thorough evaluation of the objectives, practical utility, manpower support and financial involvement. The cell is also responsible for maintaining records of project reports through RPF system.

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

Library and Documentation

The library provides services to the scientists and other staff members of the Institute apart from scholars, researchers, students and other persons from local organizations interested in scientific literature on coldwater fisheries and allied subjects. All scientific books have been catalogued with barcoding. The digitization works of the Institute's publications are also under process. The library provided facilities to access free online downloads of publications, articles of many international and national journals through www.cera.jccc.in. The library maintained active reprography services by producing departmental publications and providing required photocopies to the scientists, research scholars as well as to other research organizations. The documentation section is entrusted with responsibility of publication of scientific bulletins, brochures, pamphlets, annual report and newsletters. The library maintained exchange relationship with various research organizations and institutes of national and international levels. The annual reports, special publications and technical bulletins published from time to time have been mailed to about 250 organizations, institutions, fishery agencies etc.

AKMU Cell

The AKMU Cell of this Directorate provides the facilities for Internet through BSNL and having scanning and printing fasilities. It also acts as Network Administrator and monitors the LAN connectivity of around 50 computers at this Directorate. In AKMU Cell computer and Internet facilities also available for other research scholars and M.Sc./Ph.D. students working under various project/programmes. The AKMU Cell provides internet facilities at Experimental Field Centre, Champawat through VSAT.

The website of this institute is being updated from time to time as per instructions of the ICAR and under the AGROWEB project. The site contains the information about manpower, institute mandate,

project programmes and achievements, tenders & job announcements etc. The DCFR's website has been uploaded with the new domain name http://www.dcfr.res.in. 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 web address: http://www.dcfr.res.in. The mail & messaging solutions (mail server), maintained at this Directorate for smooth information communication via email. Individual user IDs and passwords for new scientists and officers were allotted from time to time for proper use of the mail server.

Laboratory Facilities

The Directorate has well equipped laboratories of Fish Nutrition, Environmental Fish Biology & Nutrient Profiling, Molecular Genetics, Diagnostic Virology Laboratory, Diagnostic Bacteriology Laboratory. A Geoinformatics Laboratory is newly set up under the process of setting up to conduct research on remote sensing and GIS application in coldwater fisheries. In addition, wet laboratory facility is well equipped with flow through troughs for setting up physiological experiments and nutrition trials for coldwater fishes. One feed mill is also installed at the 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.

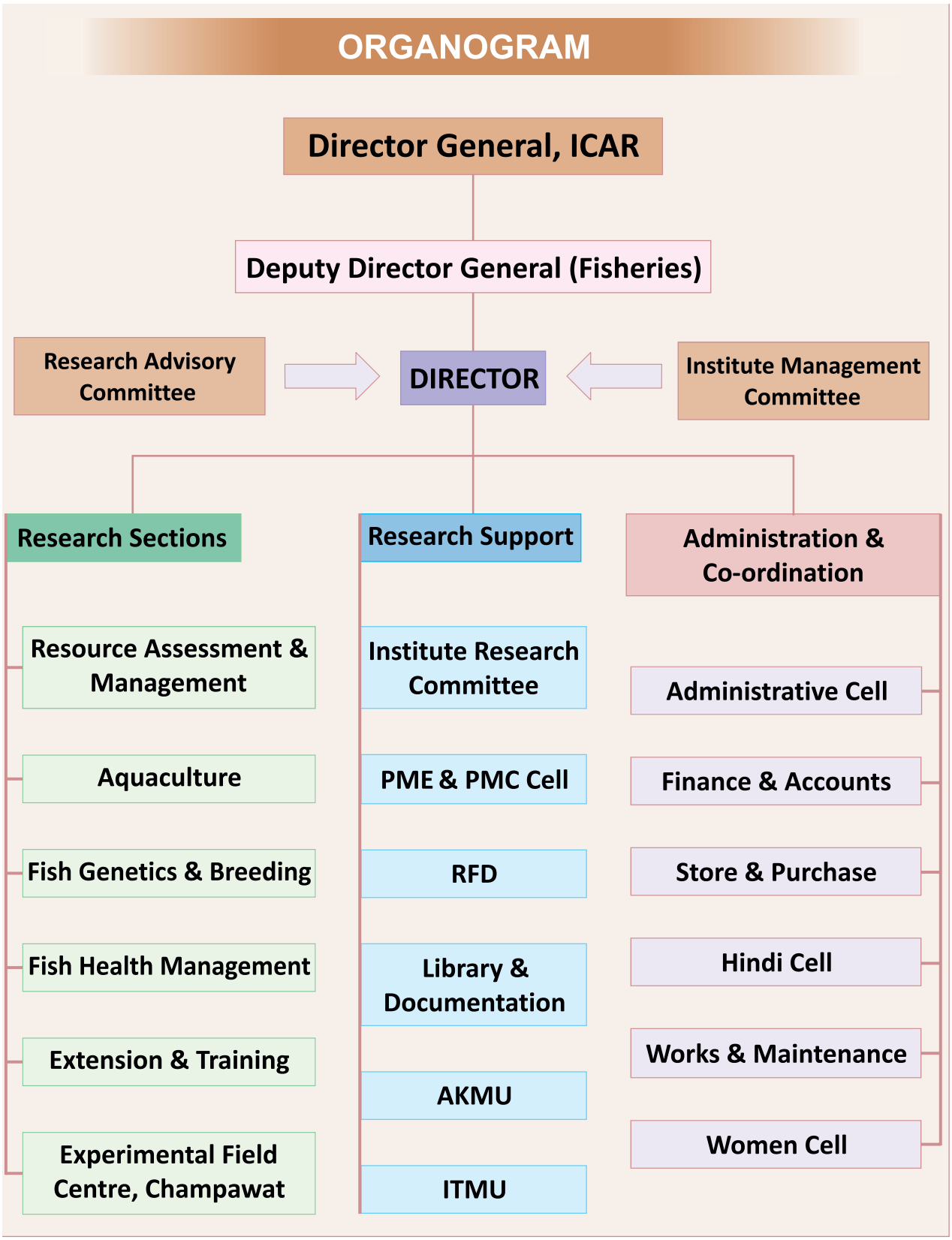
ITMU

The Directorate has constituted Institute Technology Management Unit (ITMU). It is responsible for providing information about ICAR guidelines on IPR issues. Trainings to the concerned scientists have also been given regarding IPR issues. The ITMU Cell observes World Intellectual Property Day on 26th April. The ITMC has 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 31.03.2013)

Category	Sanctioned	Filled	Vacant
Director (RMP)	01	-	01
Scientific	30	16	14
Technical	14	13	01
Administrative	13	12	01
Supporting	14	12	02
Total	**72**	**53**	**19**

ORGANOGRAM


Director General, ICAR
Deputy Director General (Fisheries)
Research Advisory Committee
DIRECTOR
Institute Management Committee
Research Sections
Research Support
Administration & Co-ordination
Resource Assessment & Management
Aquaculture
Fish Genetics & Breeding
Fish Health Management
Extension & Training
Experimental Field Centre, Champawat
Institute Research Committee
PME & PMC Cell
RFD
Library & Documentation
AKMU
ITMU
Administrative Cell
Finance & Accounts
Store & Purchase
Hindi Cell
Works & Maintenance
Women Cell

BUDGET 2012-2013

Financial statement Abstract

(Rupees in lakh)

Major Head of Account	Approved R.E. 2012-13	Actual Expenditure during 2012-13
Non -Plan	447.30	373.71
Plan	395.00	388.17

Budget statement for the year 2012-13

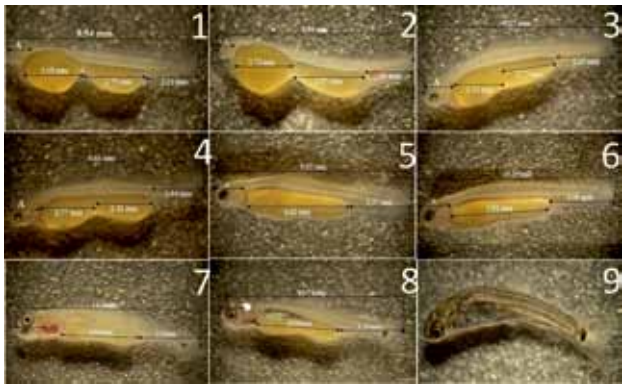
Head of Account	Budget (R.E.)		Expenditure	
	Plan	Non-Plan	Plan	Non-plan
Pay & Allowances	-	330.00	-	301.82
Traveling Allowances	20.00	3.00	20.00	2.98
HRD	5.00	0.00	4.99	0.00
Other Charges Including Equipment	285.00	45.30	278.51	44.91
Information Technology	10.00	0.00	9.69	0.00
(a)Major Works	0.00	0.00	0.00	0.00
(b) Repair & Maintenance	0.00	24.00	0.00	24.00
Other items	0.00	0.00	0.00	0.00
NEH Component	50.00	0.00	50.00	0.00
TSP Component	25.00	0.00	24.98	0.00
Total	**395.00**	**402.30**	**388.17**	**373.71**

Research Achievement

Project Code	AQ-3
Project Title	Performance of chocolate mahseer (*Neolissochilus hexagonolepis*) in aquaculture system of Kumaun region
Personnel	D. Sarma and M.S. Akhtar

The rearing of chocolate mahseer is being carried out in the hatchery complex of DCFR, Bhimtal to evaluate the growth and breeding performance of chocolate mahseer in the pond environment. Growth performance of chocolate mahseer under culture system showed that they have got 20% better growth in compare to golden mahseer. Fry of chocolate mahseer are carni-omnivore, while the advanced fingerling and yearling are herbi-omnivore. Presence of sand and mud in the gut shows that fish is column to bottom dweller. The results of the present investigation revealed that chocolate mahseer at the temperature ranging from 19–23 °C gained maximum growth. Analysis of maturity and spawning trial were done. Breeding of chocolate mahseer was performed successfully for two pairs with more than 90% fertilization and hatching. Approximately 5000 nos. of larvae were produced and are being reared in pond environment. Grow out feed for chocolate mahseer were developed and regular feeding is being given for the adult and the fry.

Stock of chocolate mahseer



Larval developmental stages (hours after hatching) 1: 0 hours, 2: 12 hours, 3: 24 , 4: 32 hours,5: 44 hours, 6: 52 hours, 7: 112 hours , 8: 142 hours and 9:

Project Code	AQ-8
Project Title	Development of molecular markers for identification of usable traits in important coldwater fishes.
Personnel	A. Barat, P.K. Sahoo, R. S. Patiyal and S. Ali

Construction of partial genomic library

Schizopyge niger Heckel (1838) is an indigenous cyprinid species of Kashmir Himalayas. It is an important food fish of the region and production of this species is mainly based on capture fishery in River Jhelum and Dal Lake, Srinagar, Jammu & Kashmir (33°52'11" North, 75°01'11" East), India. Partial genomic library enriched with dinucleotide microsatellite motifs was constructed by following method.

- DNA was extracted from fin tissues using standard phenol: chloroform: isoamyl alcohol followed by ethanol precipitation. Genomic DNA was digested with Mbo I (Fermentas, USA) and 300-750 bp fragment was ligated in Bam HI digested and dephosphorylated pUC19 vector (Fermentas, USA) which was cloned in JM109 strain of *Escherichia coli*.
- After transformation total 1000 recombinant clones were screened by colony hybridization to identify microsatellite containing clones.

36 positive clones were detected using the DIG-Nucleic-Acid-Detection-Kit (Roche, Germany) and subjected to colony PCR with two vector standard primers to confirm insert. Plasmid–DNA was isolated and sequenced on ABI 3130 Genetic Analyzer (Applied Biosystem, USA).

- Twelve sequences were found with microsatellite sequences. Primers were designed from these sequences. All the primers were validated in 20 individuals of *S. niger*.

The number of alleles per locus was ranged from 3-7 with an average frequency of 4.75. The expected heterozygosity ranged from 0.60 to 0.80 and observed heterozygosity from 0.22 to 1.00. No linkage disequilibrium was detected for any pairwise combination of loci. All the loci were in Hardy-Weinberg equilibrium (HWE). PIC (polymorphic information content) was ranged from 0.50-0.77 and mean PIC value over all loci was 0.63. There was no evidence of scoring error due to stuttering or large allele dropout. The microsatellite loci identified here will be a useful genetic resource for assessment of genetic diversity within/between the populations of *S. niger* and future studies for conservation of this indigenous species.

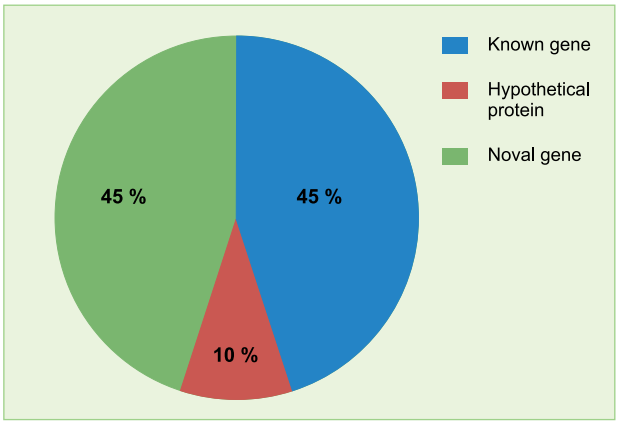
Microsatellite loci identified from the genome of *S. niger*.

Locus	Repeat motif	Primer Sequence (5'-3')	TA (°C)	Size range (bp)	N_A	H_O	H_E	PIC	Estimated Null allele frequency*	GeneBank accession
SNM11a	$(AC)_{12}$	**F**:GGGGAAAGGAATAAAAATACA **R**:AAAAGTATCTGTTGTGTTGAACC	55	148-178	5	0.88	0.78	0.73	-0.061	KC339285
SNM11b	$(GA)_{22}$	**F**:GGAGGTTCAACACAACAGATA **R**:ACACAAACTCATTCCCTCTG	52	112-160	6	0.87	0.79	0.74	-0.057	KC339285
SNM01a	$(GT)_{24}(GA)_7$ $(GT)_{10}$	**F**:TCGTGTTTCCTACATACATCA **R**:CTCTCACACACACTCACACAC	57	114-124	3	0.81	0.60	0.50	-0.153	KC339275
SNM02a	$(CA)_{16}$	**F**: GGGGAAAGGAATAAAAATACA **R**: AAAAGTATCTGTTGTGTTGAACC	58	100-138	7	0.52	0.80	0.77	0.074	KC339276
SNM09	$(TG)_{18}$	**F**:GTATGTGAGAGCGGCTAAAC **R**:ACTTCTGTCGACACACACTCT	52	158-174	4	0.22	0.65	0.55	0.151	KC339283
SNM02b	$(GA)_{22}$	**F**:GGAGGTTCAACACAACAGATA **R**:GGATCTCTACAAGGACACAAA	56	196-248	4	1.00	0.70	0.61	-0.196	KC339276
SNM03a	$(TG)_{22}$	**F**:TGTTTGAGTGAATGTGTGAGA **R**:GAAGTGTGGTAATCAATTTGC	56	200-240	5	0.77	0.64	0.57	-0.090	KC339277
SNM08	$(GT)_{30}$	**F**:GAACTTCCACCTGCACGATT **R**:ATTCATCAGGTTGGCTGAGG	57	126-142	4	0.35	0.70	0.59	0.007	KC339282

T_A, annealing temperature; N_A, mean number of alleles per locus; H_O, observed heterozygosity; H_E, expected heterozygosity; PIC, polymorphic information content; * estimated null alleles frequency based on Brookfield1 estimate from Micro-checker software.

Construction of liver specific cDNA library.

Liver specific cDNA library was constructed for *Schizothorax niger* collected from River Sutlej, Kashmir Valley (Jammu & Kashmir). The cDNA was synthesized from total RNA using cDNA synthesis kit (Fermentas, USA). The cDNA was cloned into pJET1.2 vector which was used to transform Gencomp competent cells. Around 800 colonies were obtained after transformation. All these clones were screened by colony PCR method for confirmation of insert using pJET1.2 forward and reverse primers. Sixty clones were screened with appropriate insert and these clones were sequenced by ABI 3130 Genetic Analyzer (Applied Biosystem, USA). The sequencing results were analyzed by CLC Genomic Workbench software. These sequences were BLAST to NCBI for gene annotation. Overall, 44% (18 sequences) of the sequenced clones were known genes, 17% (7 sequences) were unknown genes.



Distribution of ESTs

Project Code	AQ-9
Project Title	Performance of Indigenous minor carps *Labeo dyocheilus* and *Labeo dero* as candidate species for hill aquaculture
Personnel	N.N.Pandey, P. Kumar, S. Ali, R. S. Patiyal and R. S. Haldar

Brood stocks of *Labeo dyocheilus* and *Labeo dero* were maintained at Directorate of Coldwater Fisheries Research, Bhimtal in the temperature range of 8.0-23.5 °C. Fishes were fed @ 3% of their body weight daily with conventional carp feed. Biology of *L. dero* was studied in detail. This minor carp carry out upstream migration in stream during May to June. During September, after breeding, spent fish start downstream migration. Stomach content was consisted of 78% algae with debris and sand, which indicates that this fish is herbivorous in nature. The brooders of *L. dero* of age > 3 years and body weight 110.0-450.0 g showed full maturity. Gonado-somatic index (GSI) was increased gradually from April to July and decreased in August in females. GSI ranged from 3.32 ± 0.14 to 14.11 ± 1.21 in reared females and 4.136 ± 0.254 to 15.546 ± 1.104 in wild females.

Attempt was made to breed *Labeo dero* in captivity under coldwater condition at 18-22.8°C. Hormone (OVAPRIM) at the dose of 0.7 ml/kg body weight for females and 0.2 ml/kg body weight for males was found optimum for spawning with 85-90% fertilization and 66-74% hatching rate at 18-22.8°C. The hatching took 20-48 hrs at different temperature. 18-22.8°C water temperature was found to be optimum for the incubation of egg with higher hatching rate and better survivability of larvae. Egg incubation and recovery of hatchlings was better in the bucket hatchery than the FRP tanks, hapa and trough. The fertilized eggs were semi adhesive and settled in the bottom. The fertilized eggs took 4-5 hrs for water hardening. The diameter of the fertilized egg was 1.6-2.8 mm. The average size of one day hatchling was 3.24 ± 0.48mm, weighing 0.005 gm. Yolk sac was absorbed in 70-84 hrs of hatching at 22.8°C and larvae started external feeding on 4th day.

The survival percentage of fry was 42-68% at 18-22.8°C. Water temperature below 16°C adversely affected the survival of fry in FRP tanks.

Successful larval rearing of *L. dyocheilus* and *L. dero* in small polytanks

A field trial of two months (60 days) of larval rearing in four different systems was carried out. The highest length and weight was achieved in polylined tank, that is 16.77 ± 1.5 mm and 0.030 ± 0.04 g, respectively, followed by earthen tank. Length and weight in cemented tank and FRP tank was 13.90 ± 1.2 mm, 0.023 ± 0.03, 12.32 ± 1.3 mm and 0.022 ± 0.05g, respectively which was significantly different from the earthen and polylined tank. Highest survival rate was found in polytank (79%) followed by FRP tank (78%).

Food and feeding for larva of *L. dyocheilus* and *L. dero*

Periphyton based supplementary feed having 25% protein prepared with ground nut oil cake, fish meal and rice polish is a suitable food for the production of fingerlings of *L. dyocheilus* and *L. dero*.

Growth performance of *L. dyocheilus* in field conditions

Fry were stocked in the polytanks at Dharonch and Dudholi in polyculture system with grass carp and silver carp. The stocking density was 3 fish per m^3 water volume with species composition of 30, 40 and 30 % for silver carp, grass carp and *L. dyocheilus* respectively. The new species, *L. dyocheilus* had average weight of 92.5 g with highest growth of 145 g.

Indigenous minor carp *Labeo dero*

Eggs of minor carp

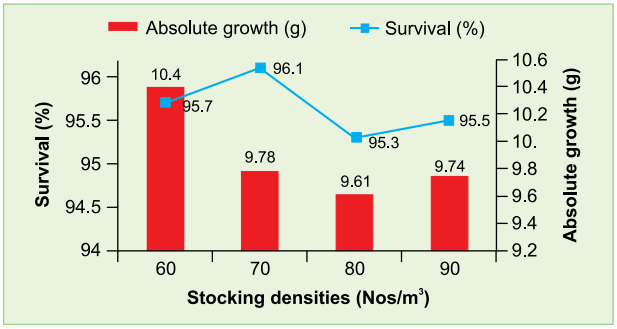
Larval rearing in Polytank

Fingerlings of minor carp

Project Code	AQ-10
Project Title	Evaluation of seed rearing techniques of golden mahseer and common carp for stock enhancement in semi-temperate lakes using floating cages.
Personnel	M.S. Akhtar, N.N. Pandey, S.K.Mallik, D. Sarma and R. S. Haldar

To optimize the *in situ* rearing density of golden mahseer upto advanced fingerling stage for stock enhancement, fry of golden mahseer has been stocked in four stocking densities viz. 60 nos/m^3, 70 nos/m^3, 80 nos/m^3 and 90 nos/m^3 in the floating cages (2m x 2m x2m) at Bhimtal lake. Periodic monitoring of growth and water quality parameters like temperature, alkalinity, free CO2, pH, TDS, phosphate, nitrate, ammonia, sulphate, dissolved oxygen, nitrite, pH, and alkalinity were done. The range of different water quality parameters during the rearing period were temperature – 6.8 to 21.2°C, pH – 8.0 to 8.8, DO- 5.2 to 8.4 mg/L, Free CO_2 – 0 to 10 mg/L, total dissolved solids – 95.0 to 97.2 mg/L, nitrate – 2.6 to 5.0 mg/L, ammonia – 0 to 0.07 mg/L, phosphate – 0.07 to 1.0 mg/L, total hardness – 86 to 120 mg/L, sulphate – 12 to 16.6 mg/L and total alkalinity – 84 to 94 mg/L. At the end of the completion of the experiment i. e after 10 months rearing, the weight of yearlings of mahseer in 60, 70, 80 and 90 nos/m^3 groups were 10.1 ± 0.31, 9.84±0.42, 9.68±0.27 and 9.81±0.33 gram respectively.

In situ cage reared haul of golden mahseer fingerlings



The growth and percentage survival of golden mahseer reared in cages at different stocking densities

The growth performance showed that there was no significant ($p>0.05$) difference in weight in all the stocking density groups which warrants further experimentation to optimize the stocking with higher densities to explore the maximum carrying potential. The survival percentages were 95.7, 96.1, 95.3 and 95.5 in 60, 70, 80 and 90nos/m^3 respectively.

At the end of the experiment, the cage reared fingerlings of golden mahseer were harvested and brought to the DCFR's Mahseer Hatchery Complex and conditioned for a period of two days. A total of one thousand fingerlings were then oxygen packed (40 nos/6L pack) and air transported to Dighalipokhari, Guwahati, Assam for ranching purpose. Dighalipokhari is a historic pond in Guwahati which has connections

to the streams falling to Brahmaputra river.

The successful ranching was done on 3rd July, 2012 in the presence of more than 150 people including Director & officials of Directorate of Fisheries, Govt. of Assam, Managing Director & officials of Assam Fisheries Development Corporation, NGO personel and the Director, DCFR, Bhimtal. This ranching initiative was done under the NEH activity.

Rearing of golden mahseer at higher stocking densities

The experimental trial for *in situ* seed rearing of golden mahseer in floating cages at Bhimtal Lake has been initiated to optimize the stocking with higher densities to explore the maximum carrying potential.

The fry of average weight 0.191g and average length 2.75cm we are stocked in four stocking densities viz. 100, 150, 200 and 250nos/m^3 during the last week of October, 2012. They are being fed with microdiets *ad libitum*. The growth, survival and water quality parameters are being monitored periodically. The range of water quality parameters during the period were : temperature – 13.4 to 14.0 ^{0}C; pH – 8.26 to 8.6; DO- 6.87 to 9.0 mg/L; Free CO_2 – 2.2 to 3.2 mg/L; total dissolved solids – 108.0 to 137.0 mg/L; nitrate – 2.9 to 3.1 mg/L; ammonia – 0.01 to 0.06 mg/L; phosphate – 0 to 0.02 mg/L; total hardness – 100 to 120 mg/L; sulphate – 3.0 to 4.0 mg/L and total alkalinity – 70 to 84 mg/L.

The growth and survival of golden mahseer fry stocked in floating cages for *in situ* seed rearing at higher stocking densities were analyzed. The percentage weight gain after two months of rearing was 46.59, 36.13, 36.13 and 30.89 % in the stocking densities 100, 150, 200 and 250nos/m^3 respectively. There was no mortality observed in all the stocking densities.

Project Code	AQ-11
Project Title	Study on viral diseases in trout producing states of India
Personnel	A. Pande and R.S. Haldar

In the second year of this project, total 159 samples were collected from different trout farms of J&K, while the analysis of eight samples collected from Himachal Pradesh in March 2012 is also under progress. To enable quick screening of the samples before attempting virus isolation in cultured fish cell lines, we attempted direct screening of infected tissue homogenates by dot-ELISA, using available polyclonal or monoclonal antibodies, a method that was standardized under the DBT project using the cell culture supernatant of infected cells. The supernatants obtained from infective tissue homogenates were tested by dot-ELISA to detect the presence of IPNV, VHSV and IHNV. Using anti-IHNV reference serum, 19 samples were found to be positive. Similarly, 22 samples were found to be positive for IPNV, and three for VHSV using respective monoclonal antibodies. Out of the 53 samples screened in cultured fish cells, CPE was observed in 32 samples in the first passage that faded away by the third passage in all the samples tested. Those samples, which demonstrated CPE in cultured fish cells also tested positive in dot-ELISA so they were further analyzed by RT-PCR for the confirmation of the said viruses. To detect the presence of IHNV, VHSV and IPNV 109 samples collected in RNA later were tested by RT-PCR and 27 samples tested positive for IHNV using N-gene specific primers. However, respective amplicons of VHSV and IPNV were not detected in any of the samples. The nucleotide sequence of the amplicons obtained after RT-PCR using N-gene primers of IHNV had no similarity with N-gene, thus possibly indicating the absence of this virus in the farms screened. To detect the presence of emerging fish viruses 90 samples were tested by sequence independent single primer amplification (SISPA), and amplicons were observed in four samples which were cloned and outsourced for nucleotide sequencing. The nucleotide sequence obtained from random clones did not confirm the presence of any of the viruses. The findings of the investigation are summarized in Table below.

Results of diagnostic tests conducted in samples collected from Jammu & Kashmir and Himachal Pradesh

Test Conducted (Till March 2013)	Total no. of samples collected: 167 (Collected in RNA later:103) (Collected in Transport media:64)		
	Samples screened	Suspected positive samples	Negative samples
Cell culture	53	32	21
IHNV dot-ELISA Anti – IHNV Polyclonal antibody	35	19	16
IPNV Dot-ELISA Anti –IPNV Monoclonal antibody	35	22	23

Test Conducted (Till March 2013)	Total no. of samples collected: 167 (Collected in RNA later:103) (Collected in Transport media:64)		
	Samples screened	Suspected positive samples	Negative samples
IPNV Dot-ELISA Anti –IPNV Polyclonal antibody	35	10	25
VHSV Dot ELISA Anti –IPNV Monoclonal antibody	35	3	32
IHNV RT-PCR	109	27	Nucleotide sequence did not reveal similarity with IHNV N-gene.
IPNV RT-PCR	109	0	109
VHSV RT-PCR	109	0	109
SISPA	90	4	The nucleotide sequence did not reveal any significant similarity corresponding to the fish viral genomes.

Project Code	AQ-12
Project Title	Seasonal incidences of parasitic, fungal and non-infectious diseases of coldwater fishes and evaluation of herbal extracts for their control
Personnel	S. Chandra, A. Pande and S.K.Mallik

Investigation on parasitic, fungal and non-infectious health disorders in farmed rainbow trout and carp species was carried out. Eye infection in rainbow trout, dermal head necrosis, ich disease and fungal infestations in eggs and adults were the four major infectious/mixed health disorders documented in present study during year 2012-2013.

Eye infection in *Oncorhynchus mykiss*

Opaqueness of eye or loss of vision was the major disease problem in trout. Diseases predominantly infected older rainbow trout. About 15 % trout population were infected with different stages of infection in grow out raceways. In advance stages of eye infection, liquefaction of cortical region was observed. Lens degeneration with complete blindness of both the eyes in about 65 % infected population reported with mortality rate of 30-40 % in infected fishes.

Healed trout showing loss of lens

Eye infected and emaciated trout

Complete opaqueness of rainbow trout eye

Complete opaqueness of rainbow trout eye

Acutely infected both males and females did not show sign of maturity during breeding season and jaw hook as a secondary sexual character was poorly developed.

Rainbow trout head ulceration

Another health disorder was superficial ulceration of the epidermis over head region in about 3-4 % population in February to March with high mortality rate. The ulceration was confined to head region with epidermal necrosis. Head lesions developed initially were invaded by secondary pathogens with increase of temperature, which might have stressed the fish leading to mortality.

Initial head ulceration of rainbow trout

Spread of ulceration

Egg loss during prolonged incubation period in trout hatchery

Fertilized egg during hatchery incubation showed maximum mortality of 1-2 % in third and fifth week of incubation. Infestation of *Saprolegnia sp.* was found in dead eggs. Variation in water quality parameters like temperature, pH etc. had direct correlation with fungal infestation in trout hatchery.

Post hatching egg damage

Post hatching larval damage (15-20 days old) showed fungal hyphae over the body. Among dead larvae, 10.2- 48.10% showed deformity due to increased water temperature in April, 2012. The weight attainment by normal postlarvae was 0.868 g while it was 0.118g in deformed larvae showing impaired weight gain in deformed died larvae.

Initial head ulceration of rainbow trout

Deformed post larvae of trout

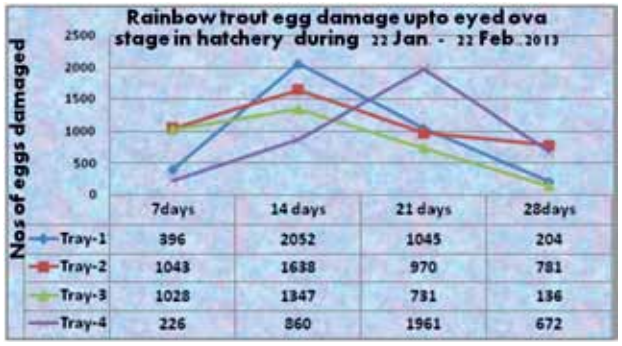


Fig.1: fertilized egg damage of rainbow trout

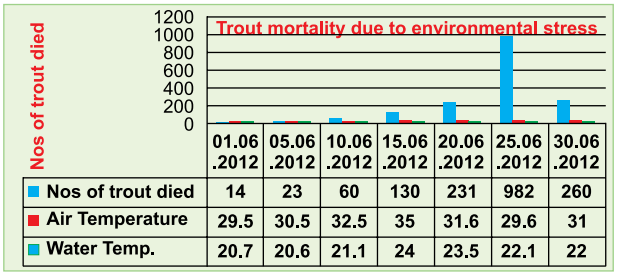
Ich infection

In nursery raceways, small pin head like white spots were visible in rainbow trout fry , in the month of September 2012. Gills and fin swab of infected specimens showed *Ichthyophthirius multifiliis* parasite. As the parasite burrows into the skin and gills, white pin head size spots could be seen on these organs. Irritation and itching caused by this parasite was evident in the form of abnormal behavior and swimming pattern. The infection was controlled through dip treatment in salt solution and by disinfecting the nursery tank

Ich infected fishes

Large scale rainbow trout mortality due to environmental stress

Mass mortality of trout recorded in the month of June 2012. Predisposing factor/factors for mass kill was investigated in detail and sample of water and fish for histopathological and virological studies were collected.



	01.06.2012	05.06.2012	10.06.2012	15.06.2012	20.06.2012	25.06.2012	30.06.2012
Nos of trout died	14	23	60	130	231	982	260
Air Temperature	29.5	30.5	32.5	35	31.6	29.6	31
Water Temp.	20.7	20.6	21.1	24	23.5	22.1	22

Owing to impaired water supply 40-60L/min from Chirrapani stream, prolonged dissolved oxygen depletion in May to June 2012, coupled with higher water temperature 20.6-24^{0}C resulted in mass mortality of rainbow trout.

Mortality due to stripping stress

Brooders of rainbow trout at Champawat farm attain peak gonadal maturity in the month of January and striping was done for seed production. After stripping, gradual mortality was observed. Mishandling during brooder selection and pressurized improper striping probably impaired protective mucus layer of body and caused injury which gave way for the secondary fungal and opportunistic bacterial infection. During netting, hooked lower jaw in males gets entangled to net also caused injury to jaw region and strong reflective behavior also leads to injury in internal organs. However, post breeding mortality of striped males observed less compared to striped female trout indicating higher level of stress received by females during striping.

Unstripped trout mortality

Stray incidence of death of healthy trout in raceways recorded from last week of February and continued till September-2012. Died specimens showed swelling of body cavity and genital opening with redness. Examination of dead trout specimens showed dead and putrefied decomposed eggs in the abdominal cavity. Compared to peak maturity when Gonad somatic index (GSI) varies from 18-25%, GSI in these died females brooders recorded from 2.38-19.18% in decreasing order month wise. Development of new ovary also found with weight range of 3.48-3.64 g in theses died brooders.

Unstripped eggs in the month of April

Died female trout showing swelling of genital opening

Trout loss due to non-selective feeding habit

Voracious feeding behavior was found to be responsible for trout death in raceways. Dissected specimens showed accumulation of putrefied fluids

in the abdominal cavity, presence of wood sticks, stone, and cement block. In some cases, stomach found extraordinarily swollen because of congestion. Examination of specimens revealed chocking of lower alimentary canal which might have exerted stress on fishes.

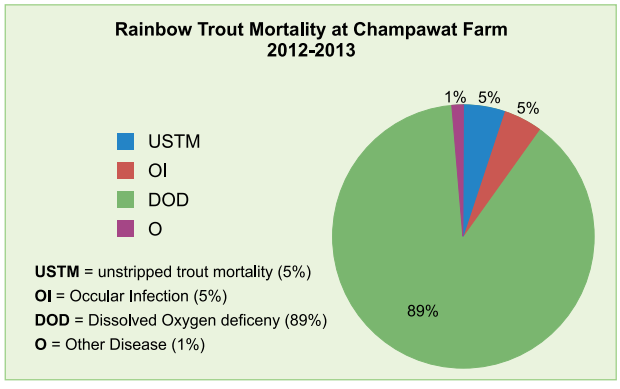
Dactylogyrosis and lower temperature induced stress in silver carp

Around 4-8 % mortality of silver carps of weight of 200-250 g reported in the month of December 2012. Lower water temperature coupled with presence of *Dactylogyrus* sp. in gills was identified as probable causative factor for large scale mortality. The silver carp cultured at the farm also showed abnormal body shape indicating nutritional deficiency due to insufficient growth of phytoplankton.

Dactylogyrus infection on gills of silver carp

Health problems in farmed rainbow trout at Champawat farm (2012-2013)

During this period seasonal mortality of trout specimens due to various health problems in raceways at Champawat field centre were grouped into four major categorizes i.e. dissolved oxygen deficiency (DOD), mortality due to ocular (eye) infection (OI), un-stripped female trout kills (USTM) and other health problems (O). Contribution of these problems is depicted in following pie diagram. Among these, only about 5-6% trout loss was reported in grow out raceways due to involvement of pathogens at initial stage.



Rainbow trout mortality at Champawat farm

Herbal extracts

Locally available herbal extract was tried on fertilized eggs as disinfectant. Compared to other treatments and control, herbal treatment showed uniform and better hatching rate with higher survival of postlarvae. The extract also showed bactericidal properties. Fish cell lines were used for determining the effect and toxicity of this extract at different dilutions.

Project Code	AQ-13
Project Title	Potential bacterial pathogens in Rainbow trout farms from northern India and maintenance of bacterial agents
Personnel	S. K. Mallik, N. Shahi and S. Chandra

To isolate the potential bacterial pathogens of rainbow trout (*Oncorhynchus mykiss*), samples were collected at trout farms of Arunachal Pradesh (Shergaon trout farm), Kashmir (Kokernag and Laribal Trout farm), Uttarakhand (Chhirpani trout farm of DCFR at Champawat), Himachal Pradesh and Sikkim. Diseased fish samples such as body ulcer, eye lesions, tail and fin rot etc were collected and brought to the diagnostic bacteriology laboratory in Amies transport medium. Bacteria were identified by biochemical, molecular and enzymetic assays. For molecular assay, PCR amplification of conserved genes (16S rRNA gene, *gyr*B gene, *rpo*D gene) was carried out and the identity of bacteria was further confirmed by total protein profiles assay by SDS PAGE.

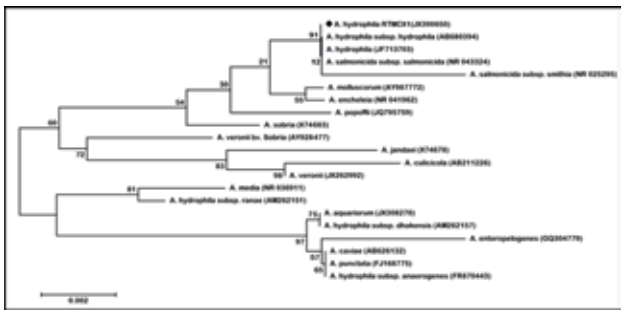
Fish pathogenic bacteria identified were *Aeromonas hydrophila* (KC603616, JX390650, and KC603615), *Aeromonas popoffii* (KC603614), *Aeromonas allosaccharophila* (KC603617), *Aeromonas sobria, Aeromonas veronii* (KC582608, JX390651), *Pseudomonas fluorescens*, *P. lurida* and *P. koreensis* (JX390644). These bacteria were gram negative motile rods and very few of them were gram positive. Out of 89 isolates, 65 % were fish pathogenic bacteria and remaining 35 % were non pathogenic. Virulence of the bacteria was determined by enzymetic assays, histopathological examination of fish tissue after i.p injection, serum resistance test and PCR amplification and cloning of virulent genes. Pathogenic *Aeromonas* spp. and *Pseudomonas* spp. were ß hemolysin positive on sheep blood agar plates.

Majority of the fish pathogenic bacteria were positive for hydrolysis of starch, urea, gelatin, DNA, lipid and protein. These bacteria were also able to survive in fish, goat and chicken serum.

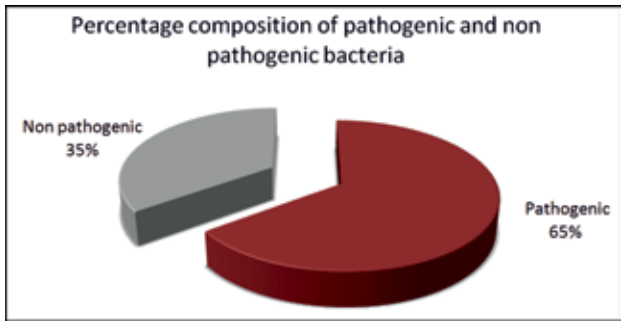
A 219 bp aerolysin gene of *A. hydrophila* was also amplified by PCR using primer specific to this species. The primer was designed from conserved region of ß-haemolysin gene of *A. hydrophila*. PCR amplification of DNA from hemolytic *Aeromonas popoffii*, *Aeromonas veronii, Aeromonas sobria* and *Pseudomonas fluorescens* were negative.

Few local herbs were also screened for antibiotic property for the isolated bacterial fish pathogens. Some of them (*Utrica parviflora* and *Punica granatum*) were found to have significant bactericidal property, when tested for antibacterial affects by disc diffusion assay.

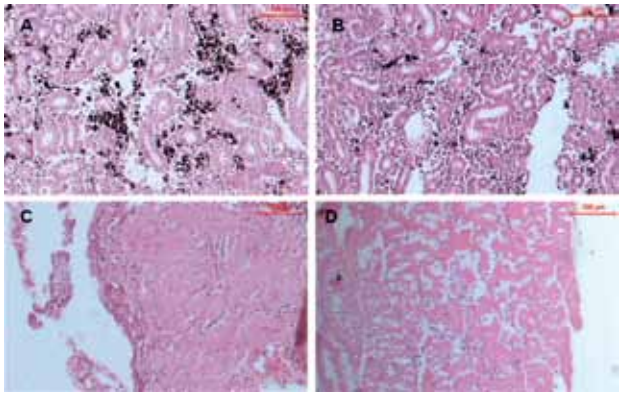
The isolated and identified bacterial pathogens were preserved long term in bacterial freezing medium at -80 °C.



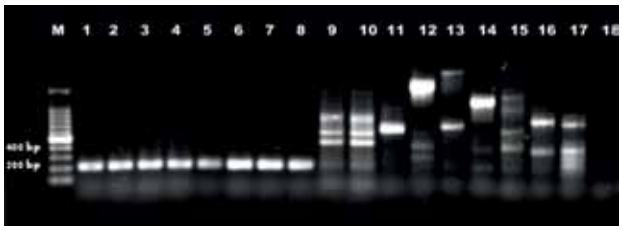
Phylogenetic tree of *Aeromonas* spp.,based on 16S rRNA gene sequence.



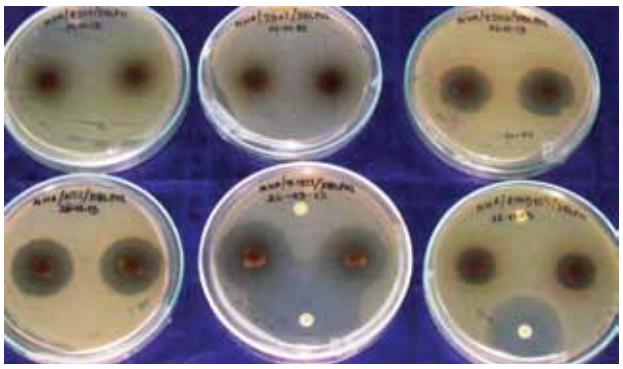
Percentage composition of pathogenic and non pathogenic



Tissue sections from rainbow trout injected with *A. hydrophila* showing pathological changes in (A) Kidney had congestion and infiltration of inflammatory cells between the tubules depicting interstitial nephritis, (B) Kidney showing marked degenerative changes of tubules with severe vascular congestion, (C) Gall bladder is having moderate infiltration of inflammatory cells, (D) Muscle tissue from subcutaneous ulcer showing disintegration of muscle fibers with infiltration of mononuclear cells. H & E Bar = 100 µm.



Distribution of 219 bp fragment among ß-hemolytic positive *Aeromonas hydrophila* and other bacteria. Lanes: M- 100 bp DNA ladder; Lane 1-8: ß- hemolytic positive *Aeromonas hydrophila*, Lane 9-10*: A. veronii*, Lane 11: *P. fluorescens*, Lane 12: *A. sobria*, Lane 13-14: *A. hydrophila* (hemolysin negative), Lane 15: *A. besterium*, Lane 16: *A. popoffii*, Lane 17: *Micrococcus luteus*, Lane 18: *Bacillus* sp.



Antimicrobial activity of ethanolic extract of *Utrica parviflora* and *Punica granatum*

Project Code	AQ-14
Project Title	Performance evaluation of improved strain of common carp, Champa-1 & Champa-2 at different thermal regimes
Personnel	S.K. Srivastava, S. Chandra, R.S. Patiyal, S.K.Gupta and D.Sarma

Breeding of improved strain of Hungarian common carp, Ropsha scaly and Felsosomogy Mirror carp were done at DCFR experimental field station at Champawat. Total 15000 seed were produced.

Average survivability recorded was 80%. The seed were distributed to the different farmers of district Champawat and state fisheries department Himanchal Pradesh for rearing purpose. Performance of Hungarian common carp were evaluated from fish farm of Mr. Partha Hajarika ,village Senchowa, Nagaon Assam, fish farm of Department of Fisheries, St. Antony college Shillong, State Fisheries-Gumto Fish farm, Doimukh, Itanagar, Arunachal Pradesh, State Fish farm Rangpo at East Sikkim, Kabi fish farm North Sikkim, five famers ponds of Uttarakhand. Physicochemical parameters such as air temperature, water temperature, pH, hardness, chloride, nitrate, dissolved iron, floride of water were analyzed. Among all the sites the maximum growth were found in, Rangpo fish farm at East Sikkim (200 gm to 340 gm) while minimum growth were reported (04-11 gm) in the fish pond of St. Antony College of Shillong. The maximum water temperature were recorded in October (28.7°C) at Nagaon Assam followed by east Sikkim (27°C) while minimum temperature were recorded at Shillong (18°C).

Analysis of physico-chemical parameter of water and evaluation of growth of Ropsha scaly and Felsosomogy Mirror carp at St.Antoney College of Meghalaya.

In Uttarakhand stocked fish at village Chhamola, Toli and Kharkbagar in Champawat district were sampled and examined for health conditions. Tail and fin rot and fungal infection over the body in the stocked common carp detected at village Chhamola. Remedial measures adopted. No parasites were detected from the gills and skin of stocked fishes. During October to January slow growth were recorded from almost all the ponds at lower water temperature (1-14°C). In Uttarakhand maximum growth were recorded in farm of Raghubar Datt Morari, Village- Bheti, Karnaarayat, Champawat where average weight recorded was 85 gm , followed by Shri Krisnanad Gahtori, Village-Toli , Patti block (64 gm), Shri Krisnanad Gahtori, Village-Toli , Patti (55 gm), Mr Hari Singh Deopa Village-Bangaon (42 gm), Mr. Amba Datt Kharkawal Village- Kharkbagar, Narial Gaon (39gm), respectively. The results show that temperature is playing important role in growth of Ropsha scaly and Felsosomogy Mirror carp.

Project Code	CF-3
Project Title	Ornamental fish resources in coldwater region of India: Investigation and Documentation
Personnel	S. K. Gupta, D. Sarma and S.K. Srivastava

A detailed survey was undertaken to investigate the coldwater ornamental fishes from river stretches of Uttrakhand and Northeastern region of India. Sampling was done at river Dikrong near Rono village of Arunachal Pradesh. Fish species captured were *Psilorichus arunachelenisis* and *Puntius sophore*. Other species caught were *Botia dario, Botia rostrata* (loaches) *Barilius barna, Chanda nama, Labeo gonius, Labeo pangas, Danio rerio* and *Esomus danricus*. *Aborichthys kempi* was the dominant species caught by the electric fishing method besides, the *Botia dario* and *Botia rostrata*. From, bakcha Chhu River, 24 km away from Gangtok at an altitude of about 2000m above MSL, only single species of *Schizothorax richardsonii,* was collected. Survey was undertaken in the streams of Nagaland (Dimapur) and species collected were *Colisa fasciatus*, *Colisa lalia*, *Chela* sp., *Danio acquipinnatus*, *Danio rerio*, *Nemacheleius* sp. *Puntius ticto*, *Garra* species, *Glossogobius* sp. and *Badis badis*. Seven stretches of river Saryu, Koshi, Gaggas and Ramganga in Uttrakhand state were surveyed and species recorded were *Barilus bendelensis*, *Garra gotyla gotyla*, *Tor putitora*, *Puntius* sp. *Crosocheilius* sp. and *Nemachelius* sp. Based on the survey activity carried out at different rivers and streams of

Chanda nama

Psilorichus arunachelenisis

Aborichthys kempi

Garra gotyla gotyla

Puntius shalyinus

Botia dario

Ornamental fishes from coldwater regions of India

coldwater region, we identified *Puntius shalyinus* as potential ornamental species.

Survey of Ladhiya River was carried out (Chalthi, Uttrakhand) and *Garra gotyla gotyla* was collected.

Project Code	CF-4
Project Title	Study on selection of suitable sites for aquaculture in selected coldwater area using GIS Tools
Personnel	P. Kumar, R.S. Haldar and Amit Kumar Saxena

Work accomplished

The aim of present work was to create a map of suitable sites for aquaculture based on physico-chemical parameters of soil, water and infrastructure facilities. In addition, there are number of infrastructural issues such as road connectivity, technical know-how, availability of seed, availability of feed etc. which was recognised as major parameters. A network of river systems, lakes and reservoirs are the primary inland water resources for potential fish production and has greatly helped to improve the rural economy.

The present study encapsulates the GIS based aquaculture suitable sites in Uttarkashi district of Uttarakhand, which is located in-between 77°49' to 78º 26' E and 30º 44' to 31°28'N. A comprehensive study has been carried out using spatial and non spatial data to prepare a map for suitable site for aquaculture that may be useful for planners and people at large. Uttarkashi district is considered to be a difficult area which has three altitudinal zones such as lower zone up to the height of 800 m, middle zone; 800-1500m and upper zone more than 1500 m.

To fulfill the objective, the spatial database of the study area of Uttarkashi district was developed. The spatial database is optimized to store and query data related to objects in space, including points, lines and polygons. The spatial database system offers spatial data types in its data model and query language. It supports spatial data types in its implementation, providing at least spatial indexing and efficient algorithms for spatial join. The boundary map of Uttarkashi was prepared that has a total geographical area of 7816 km^2 of which 6680 km^2 is considered as constraints such as forest roads and snow cover. Following criteria were used for preparing the suitability map for aquaculture sites:

Following equations were used to prepare suitability maps:

1. Water quality

$$Water_{grid} = Grid_{Temp} \times 0.23 + Grid_{pH} \times 0.17 + Grid_{DO} \times 0.16 + Grid_{CO2} \times 0.10 + Grid_{Alkal} \times 0.10 + Grid_{Hardness} \times 0.09 + Grid_{Phosphate} \times 0.05 + Grid_{Nitrate} \times 0.05 + Grid_{Transp} \times 0.05 \quad \textbf{- Equ (1)}$$

2. Soil quality

$$Soil_{grid} = Grid_{pH} \times 0.30 + Grid_{texture} \times 0.16 + Grid_{OM} \times 0.54 \quad \textbf{- Equ (2)}$$

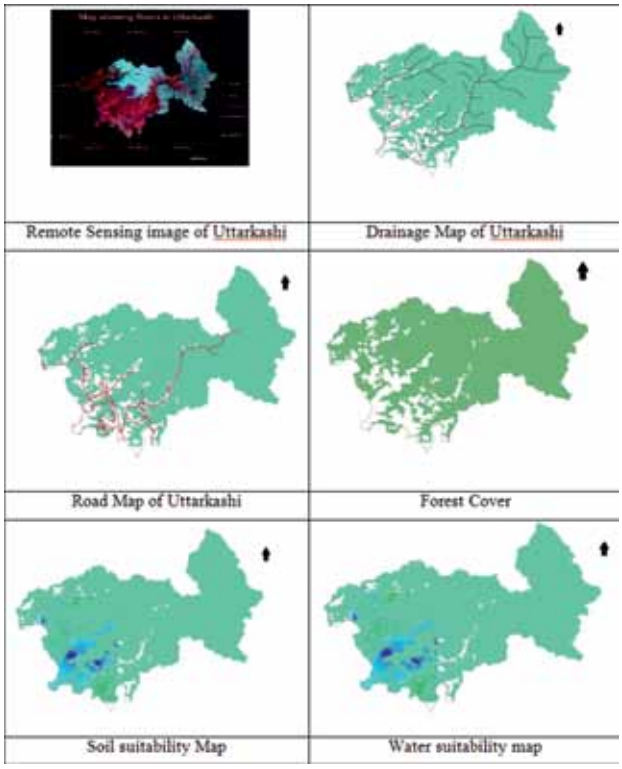
3. Infrastructural Facility

$$Infrastructure_{grid} = Grid_{water\ source} \times 0.60 + Grid_{road} \times 0.40 \quad \textbf{- Equ (3)}$$

4. Final criteria

$$\text{Site suitability grid} = Grid_{water\ quality} \times 0.54 + Grid_{soil} \times 0.26 + Grid_{infra.} \times 0.20 \quad \textbf{- Equ (4)}$$

Criteria base analysis was carried out for the different parameters which interns into a map that indicate that a area of about 41 hectares in lower carp zone, 31 hectare under mid carp zone and 30 hectares in upper zone can be used for trout culture.



GIS based information for the site suitability for aquaculture in Uttarkashi district

Project Code	CF-5
Project Title	Development of database and evaluation of culture and breeding status of rainbow trout (*Oncorhynchus mykiss*) in India
Personnel	S. Ali, N.N. Pandey, Prem Kumar, P.K. Sahoo and R.S. Patiyal

The present study is aimed to collect the basic information on the culture, breeding and production status of rainbow trout both in private and state government owned farm from the coldwater regions of the country (Arunachal Pradesh, H.P, J&K, Sikkim, Tamil Nadu and Uttarakhand).

A detailed protocol for data collection, planning and monitoring of survey was developed and relevant literature on trout culture practices were also collected.

(i) Data collection from J&K state: Preliminary data were collected from J&K state through primary and secondary sources.

- Trout ova was brought in Kashmir from Scotland in the year 1900 through Mr. J.S.Macdonall and were transferred to Dachigam (Harwan) about 24km from Srinagar. After the initial introduction trout was then reared in Kashmir and trout fish farm were established in Kokernag. Another trout farm was established at Laribal. Both the farm has hatchery facilities to produce trout seed. With the assistance of European Union the state of art facilities were established for trout seed production. About 0.3 million eggs were produced from these hatcheries. The Department of Fisheries has established about 32 trout farms with facilities of trout rearing.

Trout farms in the state of Jammu & Kashmir

S.No.	Trout farm	District
	Kashmir Division	
1.	Fish Farm Narbal	Budgam
2.	Fish Farm Pandach	Srinagar
3.	Fish Farm Achabal	Anantnag
4.	Fish Farm Trigam	Baramulla
5.	National Fish Seed Farm Manasbal	Baramulla
6.	Fish Farm Dewar	Kupwara
7.	Fish Farm Khoru	Kupwara
8.	Fish Farm Chatlam	Pulwama
	Jammu Division	
9.	Fish Farm Ghomanhasan	Jammu
10.	Fish Farm Doomi	Jammu
11.	Fish Farm Nowabad	Jammu
12.	Fish Farm Poonch	Poonch

S.No.	Trout farm	District
13.	Fish Farm Anji	Reasi
14.	National Fish Seed Farm	Kathua
15.	Fish Farm Muradpur	Rajouri
16.	Fish Farm Thanpal	Reasi
17.	Fish Farm Banihal	Ramban
Leh-Ladakh Division		
18.	Fish Farm Shey	Leh
19.	Fish Farm Dhamsana	Kargil
Trout hatchery in the state of J&K		
1.	Trout Hatchery Kokernag	Anantnag
2.	Trout Hatchery Laribal	Srinagar
3.	Trout Hatchery Mammer	Ganderbal
4.	Trout Hatchery Shokbaba	Bandipora
5.	Trout Hatchery Phalni	Rajouri

Trout production status in J&K

Particular	Unit	2009-10	2010-11	2011-12
Fish Production	Tonnes	19.30	19.70	19.90
Trout Production	Tonnes	165	195	225
Trout Seed Eggs	Lacs	40.00	50.00	79.73
Trout Rearing Units Established	Nos.	35	37	42
Trout Hatcheries Established	Nos.	05	05	05

(ii) Data collection from Uttarakhand state: preliminary data were also collected from Uttarakhand state in respect of trout farming practices.

- There are around 35 raceways under the State Fisheries Department of Uttarakhand and around 8 raceways under the private sector. Presently there are only four private trout growers doing trout farming. However, the interest for trout farming among private farmers is growing in the state.
- The state has seed production unit at Bairangna which produces the trout seed. Annual trout seed production from state farm is around 2 lakh advanced fry.
- Apart from this, DCFR has trout raceways and seed production unit at Experimental Field Centre at Champawat.
- The average trout production is around 5kg/m^3 in the raceways.
- The trout feed is mainly imported from adjacent state Himachal Pradesh and also prepared by DCFR.

Trout farms/farmers and raceways in Uttarakhand (2010-11)

Trout breeding centre	01 (Under state fisheries department) 02 (Under DCFR, Champawat)
Trout farmers (private)	04 (in Garhwal dist)
Trout raceways	35 under State Fisheries Deptt. 8 under private farmers
Trout seed production	2 lakh advanced fry
Average production:	5.0 kg/m3 in the farmer's ponds/raceways.

(iii) Data collection from Himachal Pradesh

- Himachal Pradesh is one of the leading states in trout farming and trout seed production. The upper zones of rivers in H.P inhabit indigenous Schizothoracids and exotic salmonids (trout). There are 12 fish seed farms under the control of Himachal Pradesh Fisheries Department out of which 6 are trout farms and another 6 are carp farms.

Trout farms and hatcheries in Himachal Pradesh

S. No.	Trout farm	District	Estd.	Raceways	Capacity Production/fry/eyed ova
1.	Patlikuhl	Kullu	1909	14	10 tonnes
2.	Bather	Kullu-Manali	1996	8	60000-70000 fry
3.	Barot	Mandi	1959	6(R) /8 (N)	1,20,000 eyed ova
4.	Holi	Chamba	2000	6 (R) /10 (N)	2 tonnes/ 1,00,000 eyed ova

S. No.	Trout farm	District	Estd.	Raceways	Capacity Production/fry/eyed ova
5.	Dhamwari	Shimla	2005	11 (R) /8 (N)	5 tonnes/ 1,00,000 eyed ova
6.	Sangla	Kinnaur	1965	14 (R) /16 (N)	5 tonnes/ 1,00,000 eyed ova

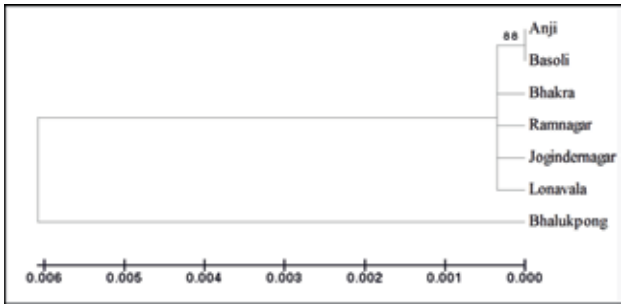
Project Code	NP-1
Project Title	Fish Genetic Stock (Outreach)
Funding agency	ICAR
Personnel	A. Barat, P. Kumar and S. Ali

The Golden Mahseer (*Tor putitora*, Family: Cyprinidae) is an endangered cold water fish of the Himalayan region. For molecular and morphotaxonomic study 348 individuals of *Tor putitora* were collected from seven geographically isolated location of India.

Location for sample collection from different rivers.

Collection Site/Abbreviation	Time of sample collection	No of Samples	Coordinate location
Uttarakhand			
Kosi river/ Ramnagar (RUM)	a. 2009/May	43	29°24'20"N 79°07'50"E
Himachal Pradesh			
Beas River/ Jogindernagar (BHM)	a. 2009/September	17	31°24'37"N 76°26'26"E
	b. 2011/May	27	
Satluj River/Bhakara	a. 2009/September	20	31°34'38"N 76°26'25"E
	b. 2011/May	28	
Assam/Arunachal Pradesh			
Jia Bhoreli River/ Bhalukpong (BAM)	a. 2009/April	36	27°02'58"N 92°35'48"E
Jammu & Kashmir			
Chinab River/ Anji (AJM)	a. 2010/July	51	33°04'33"N 54°49'62"E
	b. 2011/May	38	
Ravi River /Basoli (BJM)	a. 2010/July	38	32°30'14"N 75°48'68"E
	b. 2011/May	30	
Maharashtra			
Walvan dam/ Lonawala	a. 2010/February	20	18°45'56"N 73°45'24"E

The molecular characterization was carried out using two mitochondrial gene, Cytochrome b and ATPase 6/8 genes and 13 microsatellite markers. A total of 133 and 130 sequences of Cytochrome b gene (1140bp) and ATPase6/8 (842bp) gene were analysed to determine genetic variation between the seven populations of *Tor putitora*. A total of 47 and 44 distinct haplotypes were identified in Cyt b and ATPase6/8 gene of *Tor putitora,* respectively. The mtDNA gene Cyt b and ATPase6/8 sequence analysis showed that Bhalukpong population has the highest nucleotide and haplotype diversity. The pairwise FST Comparison and genetic distance data of populations showed that samples of *T. putitora* collected from river Jia Bhoreli, Bhalukpong was highly diverge than other population.

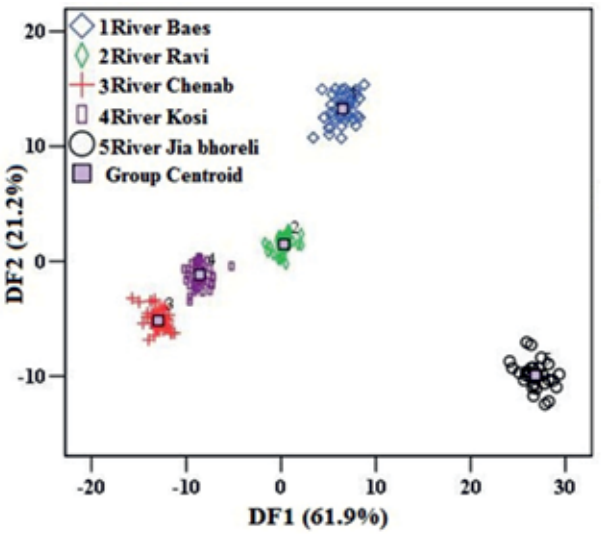


Neighbour-joining tree of *T. putitora* inferred from cytochrome b gene.

Fifteen microsatellite markers for *Tor putitora* have developed from di-nucleotide enriched partial genomic library. Out of that 13 marker were validated in two population of *T. putitora.* A total of 71 alleles were detected with average frequency of 5.46 alleles per locus (ranged from 8-3). The mean observed and expected heterozygosity were 0.66 and 0.74

respectively. Most of the developed and validated microsatellite loci were highly polymorphic and has PIC value > 0.6.

Truss morphometric analysis of 5 populations of golden mahseer from River Jia Bhoreli, Beas, Ravi, Chenab and Kosi were carried out using 12 truss landmarks. The transformed truss measurements were subjected to principal component analysis, discriminant function analysis and univariate analysis of variance. Principal component analysis generated eight components explaining 86.5% of total intraspecific variance in samples. Step-wise discriminant function analysis retained four variables that significantly discriminated the populations. The first canonical discriminant function (DF1) of the discriminant analysis explained 61.9% of the total variance with eigenvalue of 176.1. Second (DF2), third (DF3) and fourth (DF4) accounted for 21.1%, 11.5% and 5.4% of the total variance with eigenvalues 60.0, 32.7 and 15.3 respectively. The main differences among these five populations were noted in the areas of the head, body depth and caudal peduncle. Morphological variations in the head and middle region of fish have been considered to occur due to differences in feeding regimes and water quality parameters.



Coordinate plots of five populations of *Tor putitora* by plotting first two discriminant functions from morphometric data analysis.

The analysis of L-W relationship and condition factor (K) showed that the *Tor putitora* populations in Jia Bhoreli and Beas River have better growth in comparisons to the populations of Chenab and Ravi River. It can be concluded that the population at eastern Himalayan region in Jia Bhoreli River assume to be in good condition as compared to the western Himalayan region. The population at Ravi River reflects condition of the fish among the populations of western Himalayan region.

Project Code	NP-3
Project Title	ICAR Out-reach activities: Nutrient Profiling and Evaluation of Fish as a Dietary Component
Personnel	D. Sarma, N.N. Pandey, N. Shahi and M.S. Akhtar

Nutrient profiling in terms of proximate composition (crude fat, crude protein, moisture, ash), fatty acid, amino acid and minerals composition of selected five edible fish (*Tor putitora, Neolissocheilus hexagonolepis, Schizothorax richardsonii, Oncorhynchus mykiss, Cyprinus carpio*) was carried out. The moisture, crude protein (CP), crude fat and ash content were 74.00-79.24 gm/100gm, 15-19.44 gm/100gm, 0.5-5.18 and 1-1.37%, respectively.

Protein had a well-balanced amino acid composition, with high amounts of proline (96.37 mg/g CP), aspartic acid (85.23 mg/g CP), tyrosine (83.84 mg/g CP), glycine (69.87 mg/g CP), serine (66.63 mg/g CP), arginine (65.26 mg/g CP), isoleucine (64.56 mg/g CP) and tryptophan (61.63 mg/g CP). The highest amino acid score was observed for tryptophan (560) followed by isoleucine (230).

Total monounsaturated fatty acids were the highest (35.88%) followed by saturated fatty acids (34.51%) and polyunsaturated fatty acids (PUFA) (31.39%). Oleic acid (C18: 1) was dominant, followed by palmitic acid (C16:0), linoleic acid (C18: 2n-6), palmitoleic acid (16:1n-7), stearic acid (C18:0), DHA (C22: 6n-3), linolenic acid (C18: 3n-3), myristic acid (C14:0) and EPA (C20: 5 n-3). The ratio of n-3/n-6 PUFA was 0.77. Among the minerals analyzed, Ca, Na, Fe, Zn, Se and Mn highest followed by K. From the analysis, it could be revealed that the studied fishes are rich in DHA, essential amino acids and micro minerals which could be a healthy addition to the human diet.

Clinico epidemiological survey in four different states viz. Assam (Dung Dang, Kalang Paur, Mali Bagan, Bogi Bari, Borbila villages), Arunachal Pradesh (Rama Camp, Dirang Basti, Shergaon, Yewang, Dhum, Dirang) and Uttarakhand (Nainital & Champawat) and Meghalaya (Maw-Punkshaid, Pyllum, Nongsder, Umroi) during June –July 2011 were carried out and more than four thousand rural populations in the states were covered and data were recorded and analyzed statistically. Salient achievement clinico-epidemiological studies on

general health profile of 4000 populations from the state of Uttarakhand, Assam, Arunachal Pradesh, Meghalaya were conducted to correlate the fish intake and "Low Birth Weight" of children.

Project Code	NAIP
Project Title	Bioprospecting of genes and allele mining for abiotic stress tolerance.
Personnel	A. Barat and S. Ali

Objective I : Generation of genomic resource base to facilitate gene prospecting and allele mining

Activity: Identification of Heat shock responsive transcripts by Whole Transcriptome Sequencing of liver RNA.

Fishes were collected from wild and acclimatized for at least one month before experimental setup. After the acclimation period, fishes were subjected to heat shock at 26°C for 3 hours. The control group were maintained at the ambient temperature (10°C, Control). The liver tissue samples were collected after the cessation of heat shock and at 3, 12, and 24 hours. The liver tissue samples were also collected from the control tank at the same time.Total RNA was isolated from the above collected tissue samples and were quantified by using the Nanodrop. Then, the samples were pooled together. The two cDNA library was constructed in accordance with illumina protocol and sequenced for 75bp paired end reads.*Denovo* assembly and annotation is in process by using CLC Genomics Workbench.

Under objective II: Prospecting of new genes and alleles for cold tolerance

Activity undertaken was: Amplification of GPDH gene in *Schizothorax niger* and estimation of substitution rates of amino acids.

A partial fragment of 1012 bp were obtained from *S. niger* (Accession No. JX477099) liver cDNA by RT-PCR using the primers GPO1F/R. While, a partial fragment of 200bp was obtained from *S. esocinus* and it is excluded from the present study for its short length. The translated GPDH transcripts of *Schizothorax niger* and *S. esocinus* showed homology with other known GPDH genes, with a maximum score of 94.36% identity with *Danio rerio* GPDH (GenBank accession number AAH55382).

To estimate the substitution rates of amino acids

The ratios of the number of non-synonymous substitutions per non-synonymous site (*Ka*) to the number of synonymous substitutions per synonymous site (*Ks*) were calculated among GPDHs of cyprinids viz, *S. niger, S. richardsonii* and *Danio rerio* using the Nei and Gobojori's method.

Ka and *Ks* values were estimated and the ratios of *Ka/Ks* were calculated for the GPDH domain of the sequences from *S. richardsonii, S. niger* and *Danio rerio*. Overall, the *Ka/Ks,* ratios for all the sequences were <1, and ranged from 0.0106 to 0.5775 for the GPDH domain sequences. The ratios among *Schizothorax* species ratios ranged from 0.0106 to 0.0444. These results suggested that these genes have been evolving under purifying selection.

Sequence pair	GPDH domain		
	Ka	Ks	Ka/Ks
Danio rerio vs S. richardsonii	0.5775	0.0348	0.06
Danio rerio vs S. niger	0.5738	0.0365	0.06
S. richardsonii vs S. niger	0.0444	0.0106	0.23

Under activity 2: Comparative qRT-PCR expression analysis of GPDH gene among geographically isolated co generic species of genus *Schizothorax* belong to Indus and Ganga river basins was undertaken

To examine the expression profile of GPDH gene among co generic species of Genus *Schizothorax* total RNA was extracted from liver of *Schizothorax niger, S. richardsonii* and *S. esosinus.* The cDNA synthesized as described above was used as a template for qRT-PCR analysis. The results showed that GPDH cDNA expression was highest in *S. richardsonii* and lowest in *S. esocinus*. The expression level in *S. richardsonii* was about 10.18 and 8.45 fold ($p<0.05$) than that of *S. esocinus* and *S. niger* respectively.

The different levels of gene expression in different species of *Schizothorax* are indicating different levels of cold adaptation in respect to geographical locations and also may be species specific nature. *S. richardsonii* was found to have highest level of GPDH expression and predicted to be temporarily adapting cold stress but the other two species under the genus *Schizothorax* observed to have permanent adaptation to cold.

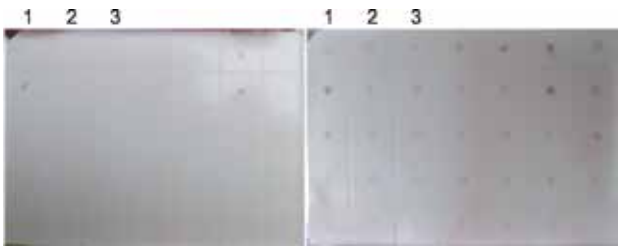
Project Code	NAIP
Project Title	Enhancement of livelihood security through sustainable farming systems and related farm enterprises in North-West Himalaya
Personnel	Prem Kumar

At Champawat district of Kumaon region of Uttarakhand, (80° 10' E, 29° 60' N and an altitude of 1750 msl), a field trial of aquaculture in Low density poly ethylene (LDPE) film lined ponds suitable in temperature range of 5-29° C was undertaken. Polyculture with three exotic carps viz. Grass carp, Silver carp and Common carp stocked @ 2.8-4 fish/ m^3 in the ratio of 4-5:2.5-3:3-3.5, respectively, with recommended supplementary diet was the trial protocol standardized. The growth rate of the fish cultured at the poly lined pond was higher than that of the earthen. This study also observed that the water temperature of the poly pond was 2-6 °C higher than that of the conventional earthen ponds thereby increase the rearing and growing period of the culture fish to 9 months compare to 7 months period in conventional earthen ponds. The increased temperature helps in better growth of fish. By adopting this technology, unprivileged population of the upland will be benefited in terms of food production, improvement of livelihood, economic and nutritional security and providing self employment.

External Funded Projects

Project Code	DBT
Project Title	Molecular characterization and development of a diagnostic test for the identification of a filterable agent isolated from diseased rainbow trout
Personnel	A. Pande and N.N. Pandey

Under this project, 367 samples were collected from different trout farms to screen viral infections in trout. The number of samples from J&K, Uttarakhand, Sikkim and Arunachal Pradesh were 159, 117, 89, and 2 respectively. Out of these, 173 samples were screened for cytopathic effect (CPE) in cultured fish cells and 48 samples tested positive in the first passage. However, CPE was not observed after 3rd passage in any of the samples tested. We tried to standardize dot-ELISA from the cell culture supernatant obtained from infected cells after the first passage so as to screen several samples at a go for the presence of IPNV, IHNV and VHSV using either polyclonal or monoclonal antibodies. We have successfully screened 105 samples out of which 42 samples tested positive for IHNV, using IHNV hyperimmune serum, 36 for IPNV using IPNV monoclonal antibodies and 18 for VHSV using VHSV monoclonal antibodies. The samples, which demonstrated CPE in cultured fish cells also tested positive in dot- ELISA. To detect IHNV, N-gene specific primers were used and 206 samples were tested out of which 27 were found positive using N-gene specific primers. 209 samples were tested for the presence of IPNV using VP3-gene specific primers and only six tested positive. Similarly 220 samples were tested by RT-PCR for detection of VHSV out of which only two samples tested positive using N-gene specific primers. These amplicons were cloned in InsTA PCR Cloning kit (Fermentas) and sequenced but no similarity was observed to IPNV, IHNV or VHSV genomes thus, possibly indicating absence of the viruses being investigated. An attempt was made to standardize sequence independent single primer amplification (SISPA), which would enable to detect emerging viruses. The non specific amplification has been now cut down by "using not so random hexamers". The results are compiled in Table .



Dot-ELISA of cell culture supernatent. Cell culture supernatants from J&K were dottedon to nitrocellulose membrane, blocked and treated with (A) anti-IPNV hyperimmune serum (B) anti-IPNV monoclonal antibody. Slots 1, 2 & 3 are mock infected BF-2 cell culture supernatant.

Results of Diagnostic tests conducted on samples obtained from different states

Test Conducted	Total No. of samples – 367 RNA later-164 Transport media -203		
	Samples screened	Suspected positive samples	Negative samples
Cell culture	173	48	125
IHNV dot-ELISA Anti – IHNV Polyclonal antibody	105	42	63
IPNV Dot-ELISA Anti –IPNV Monoclonal antibody	105	36	69

Test Conducted	Total No. of samples – 367 RNA later-164 Transport media -203		
	Samples screened	Suspected positive samples	Negative samples
IPNV Dot-ELISA Anti –IPNV Polyclonal antibody	84	22	62
VHSV Dot ELISA Anti –IPNV Monoclonal antibody	105	18	87
IHNV RT-PCR	206	27	Nucleotide sequence did not reveal similarity with IHNV N-gene.
IPNV RT-PCR	209	6	The nucleotide sequence was not similar to IPNV VP3 gene
VHSV RT-PCR	220	2	The nucleotide sequence did not reveal any similarity with N-gene.
EHNV PCR	21	0	-
SISPA	115	18	The nucleotide sequence did not reveal any similarity to any fish viral gene.

TLRs are key players in innate immune recognition and TLR-3 is known to help in recognition of viral pathogen associated molecular patterns (PAMPs). Thus, TLRs and AMPs can have a possible role in the prevention of viral infections in fish. So far we have obtained partial nucleotide sequence of *Barilius bendelisis* (Hamilton 1807) TLR-3 mRNA and *Schizothorax richardsonii* (Snow trout). Likewise, AMPs are effector molecules and an important component of innate immune system. Hepcidin an important AMP is known to inhibit viral propagation. We have characterized partial Hepcidin mRNA sequence of *Tor pitutora* (Golden mahseer). Full length characterization of these mRNAs is under process.

Sequence Submitted to NCBI	
Sequence Name	**Accession Number**
Toll like receptor-3 (TLR-3) of *Barilius bendelisis* (Hamilton 1807) partial sequence	JX566893
Toll like receptor-3 (TLR-3) in *Schizothorax richardsonii* (Snow trout) partial sequence	ZX855121
Hepcidin gene in *Tor pitutora* (Golden Mahseer) partial sequence	KC693650

Project Code	DBT
Project Title	Economic development of SC and ST community of mid hill region of Pithoragarh district through aquaculture intervention
Personnel	R.S. Patiyal and P.K. Sahoo

A survey was conducted in tribal area of Dharchula block of district Pithoragarh in Uttrakhand. In First phase twelve potential farmers were selected for developing aquaculture activities. Out of twelve, ten water harvesting structures were created for scheduled tribe community and two for Scheduled cast community. In order to develop better understandings of aquaculture, group meetings were organized in two places Pangu and Himkhola. Baseline data was generated by using semi-structured interview as schedule. Beside the carp culture intervention, ornamental fish culture promotion is also targeted. In this regards ornamental fish germplasm like indegenious *Barilius ,Tor, Nemacheilus* species, and exotic koi carp, gold fish were collected from river Kosi, Chafi Gola and from the fish markets for maintaining brood banks. A successful breeding of koi and gold fish was carried out and about 2000 fry were produced in first phase. As a new approach/ concept that these fishes were successfully reared in small Size (1 x 2 x 0.5 m) silpoline lined pond, which may be very popular for garden ornamental fishery.

Project Code	DBT
Project Title	Evaluation of genetic toxicity and ecological damage caused by coalmines on fish fauna of Simsang River, Meghalaya and development of microbial bioremediation measures
Personnel	D. Sarma, N. Shahi and S. K. Mallik

Preliminary investigation on fish faunal diversity of coal mines affected areas of Simsang river was under taken in the present study. The different fish species recorded in coal mines affected sites (JADP, Baghmara, William Nagar, Dangshway) of Simsang river were *Chaudhuria khajurial,*

Channa orientalis, Sisor rhabdophorus, Tor tor, Glyptothorax cavia, Schistura sikmaiiensis, Garr annandalei, Tor putitora, Chagunius chagunio, Barilius sp., *Botia Dario, Salmostoma bacaila, Mastacembelus armatus, Chrla Cachius, Barilius bendelisis, Badis badis, Barilius barna, gagata gagata, Salmostoma horai, Puntius conchonius, Aspidoparia morar, Monopterus cuchia, Danio aequipinnatus, Glossogobius gutum, Macroganthus, Puntius sophore, Puntius gelius, Lepido cephalichthys guntea, Puntius terio, Xenentodon cancila, Glossogobius giuris, Tetradon cutcutia, Chanda nama, Clupisoma garua, Nandus nandus, Chanda ranga, Anabas testudineus, Channa striatus, Ailia coilia, Colisa lalia, Colisa fascicatus, Machrobrachium assamense peninsulare, Machrobrachium assamense, Schistura* sp., *Psilorhynchus balitora and Cirrhinus mrigala.* Water samples from affected sites were also collected and analyzed for pH, conductivity, TDS, free CO_2, total alkalinity, total hardness, nitrate, ammonium, phosphate, chloride, sulphate, potassium, silicate and iron. pH of water was recorded below 5 in the affected sites indicating presence of residuals and wastages from drainages of coal mines. Some fish species were found tolerant to this acidic condition of waters. Samples of *Cirrhinus mrigala, Barilius bendelensis, Schistura* sp., *Badis* sp., *Psilorhynchus balitora* were collected for histopathological resource and genotoxicity studies.

Coal mine affected Stretches of river Simsamg

Project Code	DBT
Project Title	Development and characterization of microsatellite markers and assessment of genetic diversity of *Schistura sikmaiensis* from North-east India
Personnel	A. Barat and P.K. Sahoo

Schistura sikmaiensis is a highly valued aquarium fish. It is reported from Assam, Meghalaya, Tripura and Nagaland. The Camp Report (1998) lists *Schistura sikmaiensis* under the endangered category. Different steams and drainages of Manipur, Assam and Meghalaya were surveyed for the sample collection. Samples of *Schistura sikmaiensis* were collected from Garo hills of Meghalaya and genomic DNA was isolated from all the samples for development of microsatellite markers.

Project Code	AICRP
Project Title	Use of plastic in agriculture (Fisheries Component) All India coordinated Research project.
Component	Enhancement of carp fish production by using polytanks in mid hills under APA programme in collaboration with VPKAS, Almora
Personnel	N.N.Pandey and P. Kumar

It was recorded that polytanks are more suitable for the polyculture of exotic carp in terms of production in mid altitudinal area than the earthen and cemented ponds. Further, field study was conducted for the refinement of polytank design suitable for higher growth of carp. Polytank with steps ladder sides and earth covering, polytank with bottom sand (3-4 inch) bed, polytank without soil and cemented pond were constructed at Doonagiri area of Almora District in double replication. Polytank with stepladder sides

Growth of grass carp in the polytank at Doonagiri

and earth covering and polytank with bottom sand performed 20-60% increase in production than the other types of ponds. This is due to the advantage of comparatively higher water temperature and better production of plankton and periphyton. The diurnal fluctuation in the water temperature and less variation of the temperature in vertical columns in these ponds might be favorable for the better performance. The soil substance provides base for the nitrification process. Hence, the nitrite and ammonia level remains in lower sides in these ponds. Polytank with stepladder sides and earth covering was found to be feasible design for the aquaculture practice in hills.

Programme	Tribal Sub Plan (TSP)
Nodal Officer	R.S. Patiyal

A survey was conducted in tribal dominant areas such as Dharchula, Khatima and Lalkuan and twenty eight potential farmers were selected for livelihood security through aquaculture intervention. Before selecting the farmers, for better understandings and visualizing the successful integrated approach a training-cum-exposure visit was arranged to one of the progressive farmer's farm located at Dunagiri village of Uttrakhand. To initiate the aquaculture intervention activities, twenty eight (28) polytanks infrastructure were created for selected 28 farmers including five woman farmers. Out of 28 infrastructures, 18 were created at Mid-hill region, 4 in valley of mid hill and 6 in foot hill of Uttarakhand. To ensure the regular availability of seed a mini-hatchery (CIFA model) was also set up at one of the farmer's premises in foothill area. Three group awareness and pond management meeting was conducted. Seed and feed was distributed to these farmers.

Interaction with the Bhotiya tribes

Interaction with tharu tribes

Upcoming ponds in foot hills

Tribal village selected for TSP Programme

Upcoming ponds in mid hill region

Seed stocking in pond

Programme	North East Hill (NEH) Region
Nodal Officer	Debajit Sarma

DCFR, Bhimtal in collaboration with KVK, Tirap implemented the developmental project on "Rural livelihood support through integrated fish farming in Upland region" for the upliftment of poor tribal fish farmers of Tirap district, Arunachal Pradesh. During the first phase of the project a total number of 15 ST fish farmers were benefited along with 4 women. The project was implemented in 10 different villages namely Sipini, Kheti, Nginu, Bera, Makat, Natun Kheti, Subang, Wasathong, Namsang and Soha village. During the second phase, another 4 ST fish farmers (Woman 1 and Men 3) were selected in the project. Through this project an attempt was made to popularize integrated Fish-Pig farming for their socio economic upliftment. The beneficiaries of the project were provided with financial assistance for construction of a 0.06 ha fishpond and a low cost pigsty near the fishpond. Apart from this, the farmers also received critical inputs like piglets, feed for pig, fish fingerlings, quick lime, medicines etc. During the culture period of 8 months, the pigs attained an average growth of 72 kg, while an average production of 170 kg of fish was achieved from each unit.

Small-scale integrated fish farming at Tirap, Arunachal Pradesh

Experimental culture and breeding of *Osteobroma belangari* (Pengba) was carried out in Manipur and brood stock are being reared in farmers field in Manipur and at Jasingffa, Nagaon, Assam. The fishes were bred with artificial hormonal injection. The nursery rearing of the fishes were carried out successfully and the protocol for culture and breeding of this important indigenous species has been developed in collaboration with progressive fish farmers of this region.

The construction and establishment of hatchery for seed production of golden mahseer was carried out at Eco-camp, Nameri, Tezpur, Assam. The hatchery complex was developed with the infrastructure of two brood stock ponds, field laboratory, hatchery, stores, and bore well pump etc. The complex is fully functional and broodstock management of golden mahseer is being carried out successfully. The similar hatchery was also established in Bagua Fish Farm, Sikkim in association with the Department of Fisheries, Sikkim.

Mahseer hatchery complex at Eco-camp, ABACA, Nameri, Assam

The North East Information Centre of DCFR, Bhimtal was created at CIFRI, Building, Guwahati to facilitate the different stakeholders and to enable the flow of information from lab to land with the objective of 'FARMERS FIRST'. A total number of 100 participants including State Fisheries officers, farmers, NGO's and KVKs of the North East states were trained in two different batches.

Successful brood stock rearing of golden and chocolate mahseer has been carried out in captive condition at Jasingffa, Nagaon, Assam and it gains popularity as a famous eco-tourism centre of the region.

Fish pond for mahseer brood bank at Jasingffa, Nagaon, Assam

Important Events & Meetings

Farewell to Dr. P.C. Mahanta

Dr. P.C. Mahanta, Director superannuated on 31st December, 2012 and Dr. A. Barat succeeded Dr. P.C. Mahanta as Acting Director of DCFR, Bhimtal. The staff of DCFR bid a poignant farewell to Dr. Mahanta.

Independence day celebrated

Flag hoisting ceremony was observed on the eve of Independence Day. Dr. P.C. Mahanta, Director hoisted the National Flag in the presence of staff members and addressed them. He congratulated the staffs for successful management and appreciated the scientists for their achievements in different fields. He also emphasized to work in coordination with different coldwater states to have a better impact of our research.

Institute Management Committee Meeting

Institute Management Committee (IMC) meeting of the Directorate was conducted on 18 August, 2012 under the chairmanship of Dr. P.C.Mahanta, Director. Dr. S.D. Singh, Assistant Director General (Inland Fisheries), Dr. P. Punia, HOD, NBFGR, Lucknow, Dr. A.B. Pandey, Head, IVRI Station, Mukteshwer, Dr. P.K. Agarwal, Principal Scientist & Head,VPKAS, Almora (Uttarakhand), Dr. Pradeep Katiha, CIFRI, Barrackpore, Shri S.R. Chanyal, Joint Director, Department of Fisheries Govt. Of Uttarakhand, Dehradun, Shri Farooq Nawchoo, Joint Director, Department of Fisheries, Govt. of J&K, Dr. Malavika Das, Professor, College of Fishery Science, GBPUAT, Pantnagar, Shri Ashish Srivastava, Finance & Accounts Officer, IVRI, Izatnagar Shri Y.S. Dhanik, Member Secretary & Administrative Officer, DCFR attended the meeting. Scientists and other invitee members of DCFR, Bhimtal were also present in the meeting. During the meeting approval of the proceedings of previous IMC meeting held on 17.03.2012 was confirmed. The members of the IMC were duly apprised about the status of the previous action taken on suggestions of previous IMC. Discussions in various agenda items related to purchase, infrastructure development etc. was taken.

IMC Meeting

Institute Research Council Meeting

A meeting of the IRC was held under the Chairmanship of the Director, on 15th June, 2012 to discuss new project proposals and to review the progress of the ongoing projects as per the recommendation of the RAC. The Director advised the Scientists to rearrange the ongoing projects into four major thematic areas and prioritise "Trout based programmes".

Dr. D. Sarma, PI, presented the project "Performance of Chocolate Mahseer (*Neolissochilus hexagonolepis*) in freshwater aquaculture systems in North Eastern and Western Himalayan region. Dr. Sarma's request for the extension of the project was accepted with an advice to take up the work under "New species diversification." Dr. A. Barat,

PI of the project "Development of molecular markers for identification of usable traits in important coldwater fish species" was advised to collect information on the growth in different species of snow trout with a word of appreciation. Dr. N.N. Pandey PI of the project "Performance of Indigenous minor carps *Labeo dyocheilus* and *Labeo dero* as candidate species for hill aquaculture" presented the progress report of the project which was appreciated by IRC and the Director advised that the project may be taken up as a component of the programme on "New Species: Diversification of Aquaculture". The project on "Evaluation of seed rearing techniques of common carp and golden mahseer for stock enhancement in semi-temperate in Himalayan lakes using floating cages" was presented by Mr. S.K. Mallik in the absence of its PI Mr. M.S. Akhtar. The progress was appreciated with a need to replicate and demonstrate the findings in other coldwater states of country.

IRC Meeting

Under Fish Health, three projects were reviewed. Dr. Amit Pande, PI, presented his findings on "Study on viral diseases of trout in India". He laid emphasis on surveillance of viral diseases in the farms of J&K and Himachal Pradesh as these states are the major suppliers of trout seed across the country. Dr. Suresh Chandra shared his views of the project "Seasonal Incidences of Parasitic, Fungal and non-infectious Diseases in Coldwater Fishes and evaluation of herbal extracts for their Control". Mr. S.K. Mallik presented his data on "Potential Bacterial Pathogens in Rainbow Trout Farms from Northern India and maintenance of bacterial agents" and reported the isolation and characterization of *Aeromonas sobria* and *A. veronii*. The Director appreciated the work carried by fish health section and advised to compile the work in form of publications like leaflets, bulletins and pamphlets in regional languages for creating awareness among the fish farmers.

Dr. S.K. Srivastava presented his preliminary data on "Performance evaluation of improved strain of common carp, Champa-1 & Champa-2 at different thermal regimes". Dr. Prem Kumar presented the findings of the project "Study on selection of suitable sites for aquaculture in selected coldwater area using GIS tools". IRC advised to prepare a map of coldwater resources of India depicting water bodies for quick reference. Dr. S. Ali presented his preliminary findings on the project "Development of Database and evaluation of culture and breeding status of Rainbow trout (*Oncorhynchus mykiss*) in India". The house felt the importance of the project to unravel any changes in the genetic status of cultured rainbow trout across the country. Dr. D. Sarma presented the overview of the completed project "Sustainable utilization of mountain fishery resources - A partnership mode" and expressed his concern over the inadequate funds received during the XIth Plan. He was advised to compile a report of the achievements made during the duration. The Director also suggested that the programmes that were completed during the XIth plan may be extended in XIIth Plan.

Dr. A. Barat highlighted the progress made in the project on Fish Genetic Stock and NAIP funded "Bioprospecting of genes and allele mining for abiotic stress tolerance". Dr. N.N. Pandey, briefed the house about the Fish Feed and the project in which larval mahseer feed (nanhe mahseer), grow out feed for rainbow trout and grow out feed for chocolate mahseer were developed. Dr. D. Sarma briefed the house about the project on "Nutrient profiling and evaluation of fish as a dietary component". Dr. Ali informed the house that the project "Genomic scale mining of phylogenetic markers of *Schizothorax richardsonii* fish species for formulation of selective breeding programme" was successfully completed and the final project report had been submitted to DST. Dr. Amit Pande presented the progress made in the project "Molecular characterization and development of diagnostic test for the identification of a filterable agent isolated from diseased rainbow trout". He informed that DBT had extended the project.

Hindi Chetna Mas observed

The DCFR celibrated Hindi Chetna Mas during 1.9.2012 to 30.9.2012. A function was organized on this occasion in which Chief guest, Dr. P.C. Mahanta inaugurated the programme. During the programme different Hindi competitions like essay writing, debate and passage writing were organized among staff members of the institute to promote the use of Hindi in official work. All the winners were given prizes by chief guest.

Hindi Chetna Mas

Inaugural Lightening of Lamp by Dr. (Mrs.)B.Meenakumari,

Silver Jubilee Year and National Seminar on 'Mountain Fisheries: Challenges and Opportunity for Livelihood Security'

The Directorate observed 2012-13 as the Silver Jubilee year and arranged a series of programme to celebrate it. Silver Jubilee Lecture series and regional workshop were arranged throughout the year. Besides a two days national seminar on 'Mountain Fisheries: Challenges and Opportunity For Livelihood Security' was organized on 5-6th November, 2012 in commemoration of Silver Jubilee year of Directorate. The function was inaugurated with silver jubilee flag hosting by Honourable chief guest, Dr. K.L. Sehgal, the founder Director of the institute. It was followed by the Inauguration of exhibition stall by Dr. S.A.H. Abidi, Former ASRB members. Institutes like DCFR, CIFA, PDFMD, VPKAS, CIFT and CIFRI were participated in the exhibition.

Silver Jubilee Flag hoisting by K.L. Sehgal (Founder Director)

Dr. (Mrs.) B. Meenakumari, Honourable Deputy Director General (Fy.) ICAR, Govt. of India, chaired the inaugural session. Dr. P.C. Mahanta Director, DCFR welcomed all the dignitaries, participants and media persons from various corner of the country. In the inaugural session, 8 books & bulletins and

Release of Publication

25 extension leaflets were released by various eminent scientists and subsequently Coldwater Fishery Society of India (CFSI) was launched by Dr. S.P. Ayyar. The main objective of the seminar was to address the issues, challenges and opportunities in hill fisheries and to draw action plans for enhancing the productivity in upland waters for livelihood security. In order to achieve these objectives the seminar was conducted in six separate sessions. The technical sessions were (i) Rescourse Assessment (ii) Aquaculture (iii) Biotechnology & Fish health

Exhibition Stall

Launching of Coldwater Fisheries Society by Dr. S.P. Ayyar

(iv) Water Management and conservation (v) Sport Fisheries and Eco-tourism (vi) Livelihood Security and Gender Issues.

In concluding session the draft recommendation of the seminar was proposed by Dr. P.C. Mahanta and accepted by the experts and participants after detailed discussion. Dr. P.C. Mahanta was declared as the president of newly launched coldwater fisheries society of India and Dr. K.L. Sehgal was conferred as first fellow of the society. The national seminar was concluded with the vote of thanks by Dr. D. Sarma and ended with the national anthem. Besides the technical sessions, poster sessions were also organized and Three prizes were distributed to the best poster presentation. Dignitaries, experts contributing the coldwater sector and the retired persons of the DCFR were also felicitated in Silver Jubilee celebrations.

Review workshop on "Sustainable Utilization of Mountain Fishery Resources- a Partnership Mode"

The Directorate in collaboration with Faculty of Fisheries, Sher-E-Kashmir University of Agricultural Sciences & Technology of Kashmir organized 2-days workshop on "**Sustainable Utilization of Mountain Fishery Resources- a partnership mode"** on 8-9th September, 2012.

During the review workshop, deliberations were made on the progress of different programs taken up during XIth 5-year plan and programmes to be taken up during XIIth five year plan. Dr. Tej Partap, Hon'ble Vice Chancellor of SKUAST-K, chaired the workshop as Chief Guest. Dr. P.C. Mahanta Director, DCFR presided over the meeting. Dr. P.C. Mahanta during his address emphasized upon the issues and constraints of coldwater fisheries development in

Discussion with Director of Fisheries, J&K

India and strategies to be followed for its holistic growth. Among other dignitaries present were Dr. Balkhi, Dr. S.A. Wani, Director Research, Dr. B. Hassan, Director, Research & Education, Dr. A.S. Kamili, Director, Extension Education, and Dr. F.A. Zaki, Registrar, SKUAST, Sh. R.K. Dogra, Director Fisheries Jammu & Kashmir, Sh. T.D. Bhutia, Ji Director, Department of Fisheries, Sikkim, prominent scientists Dr. S.K. Das from Meghalaya, Dr. Rani Danze from Himachal Pradesh, Dr. Atul Borgohain, from ABACA, Assam and scientists of

Felicitation to Chief Guest, Dr. Tej Partap, Honourable V.C. SKUAST-Kashmir

Outreach presentation by Dr. D. Sarma, P.S.

Interaction among the review partners

the Faculty of Fisheries, SKUAST-K. Dr. Balkhi highlighted the importance of coldwater/hill fisheries in the country, diversity of fishes in Jammu & Kashmir and need for conservation of fish fauna for nutritional security and poverty alleviation. Dr. Wani identified some of the thrust areas in coldwater fisheries and need for co-ordinated research. Dr. Tej Partap, Hon'ble Vice Chancellor of SKUAST-K spoke about the increasing demands of fish in the near future and emphasized on increasing the production and strengthening the marketing. He appreciated the linkage between DCFR and SKUAST-K and also suggested to further strengthen the institutional collaboration and linkage. Sh. R.K. Dogra, Director Fisheries, J&K informed about the progress made in trout farming in Jammu & Kashmir and stressed upon collaboration and Integration with SKUAST-K which will be helpful for the development of coldwater fisheries.

Dr. Debajit Sarma, Principal Scientist, DCFR, Bhimtal presented the scientific achievement made by the Directorate during last 25th years with special emphasis through network project on "Sustainable utilization of mountain fishery resources- a partnership mode". The workshop concluded with a road map for future course of action on coldwater fisheries development of the country giving adequate attention for the conservation and production enhancement of coldwater fishes to meet future demand.

Inauguration of North East Information Centre of DCFR, Bhimtal

Added to a new feather on its cape, Directorate of Coldwater Fisheries Research, Bhimtal has expanded its activities in the North East by creating a Northeast Information Centre at CIFRI building, Guwahati on 8th October, 2012. Sri Basanta Dasji, Hon'ble

Front view of N-E Information Centre

Inauguration of DCFR N-E Information Centre by Hon'ble Minister of Fisheries, Govt. of Assam, Sri Basanta Dasji

Minister of Fisheries, Govt. of Assam, inaugurated the centre. Dr. Dilip Kumar, former Director cum Vice Chancellor, Central Institute of Fisheries Education, Mumbai and Dr. A.K. Roy, Secretary, Department of Fisheries, Govt. of Assam also graced the occasion as Guest of Honour. About 200 dignitaries from all the Northeastern states participated in the programme. On the occasion, Dr. P.C. Mahanta, Director, DCFR,

Display units

Bhimtal expressed his gratitude to the people of the region and emphasized that this centre will definitely help the students, scientists, and academicians by providing information not only on coldwater sector but also the entire fisheries in a holistic manner.

Hindi Divas and Hindi Workshop

Hindi Diwas and Hindi workshop was organized at Champawat field centre on 11th Sept., 2012 by Programme coordinators Dr. S.K. Srivastava and Dr. S. Chandra (Sr. Scientist).

Hon'ble Minister of State for Agriculture and Food Processing Industries, Govt. of India Visits DCFR

Hon'ble Minister of State for Agriculture and Food Processing Industries, Shri Tariq Anwar Ji visited the DCFR, Bhimtal on 29th March 2013. Dr. A. Barat, Acting Director welcomed the hon'ble MOS and briefed the ongoing activities and research programme of the institute. The Hon'ble minister showed his keen interest in visiting different laboratories and infrastructure at the Directorate. He also expressed his happiness and satisfaction over the ongoing activities of the Directorate. During the visit, he distributed fish seed to the progressive farmers of Uttarakhand. He was happy to know that farmers are getting benefits of research conducted and technology

Hon'ble Minister of State for Agriculture and Food Processing

developed at the Institute. He addressed the gathering of scientists and farmers and emphasized the need to enhance production in order to feed the over growing popultion on the country. He appreciated the scientific progress made by the ICAR in the field of crops, vegetables, animal and fisheries. The role of scientific organizations working in these areas under the ICAR system. He also stated that India is a unique country having rich biodiversity with a varying geography and there is a need to develop location specific technologies with an aim of community development. Role of agriculture in alleviating poverty and creating opportunity for employment were also emphasized by the Hon'ble Minister.

During his speech he emphasized the importance of farmers who must be given due consideration and ICAR is fully committed for them. He falicitated progressive farmers from Uttarakhand state and congratulated them for doing commendable work. He released the ISO 9001:2008 certificate conferred to the DCFR and inaugurated the website of the institute. During this occasion, Director PDFMD Mukteshwar, Dr. B. Pattanaik, Director VPKAS Almora, Dr. J.C. Bhatt, Incharge Regional Station, CITH, Mukteshwar, Dr. B.L. Attari and Incharge Regional Station, IVRI, Mukteshwar, Dr. A.B. Pandey were presented. The hon'ble Minster had profusely thanked the DCFR Director, Scientists and all the staff and extended his good wishes.

Address by MOS

Fish seed distribution to tribal farmers by MOS

Release of ISO 9001:2008 certificate by MOS

Felicitation of Women tribal farmer by MOS

Human Resource Development

Training on Post Harvest Utilization and Value Addition of Trout and Carp

Two days training programme was organized jointly by Central Institute of Fisheries Technology, Cochin and Directorate of Coldwater Fisheries Research on "Post harvest utilization and value addition of trout and carp" at DCFR Field Centre Champawat on 09-10th September, 2012. The programme was inaugurated by Shri S.C. Negi, 2nd in Command , Sashatra Seema Bal Champawat range. He emphasized on organizing such training for hilly women, unemployed youth and retired army soldiers, for additional income generation.

Dr. S.K. Srivastava, Scientist In-charge of the centre and co-coordinator of the training programme welcomed all the participants and briefed about the objectives of the training programme. Total about 70 participants including women, soldiers from SSB and unemployed youth participated in the training. Dr. George Ninan, Senior Scientist, CIFT and Coordinator of the programme demonstrated the preparation of fish pickle, fish cutlet, fish ball, fish fillet, fish roll and the use of fish wastes for making fish feed. A special session was devoted to processing and value addition of rainbow trout. Dr. Suresh Chandra, Sr. Scientist, DCFR Field Centre Champawat and Dr. Prem Kumar, Sr. Scientist, Co coordinators of the programme along with team of CIFT helped in organizing various demonstration activities. Extension officers of state fisheries

Inauguration of the training programme

Hands on training of the participant under supervision of CIFT experts

CIFT Cochin experts guiding the trainees at Champawat

Hands on training at DCFR field Centre Champawat

department, Govt of Uttarakhand, representatives of Krishi Viggyan Kendra, Lohaghat, State District administration, food processing department, local people and media personnel were present during the training programme.

Model Training Course Organized by Champawat Field Centre

Directorate of Extension, Ministry of Agriculture & Cooperation, Govt. of India, sponsored eight days Model Training Course (MTC) for the extension officials and progressive fish farmers on "Management Practices for Coldwater Aquaculture" was organized by Champawat, (Uttarakhand) Field centre of Directorate of Coldwater Fisheries Research (DCFR), Bhimtal. The training programme was inaugurated on 1st March, 2013 by Dr. A. Barat, Director DCFR. In his inaugural address, he briefed participants about the challenges that coldwater fisheries is facing today with rapid developmental activities taking all around us and urged participants to utilize this opportunity to employ scientifically developed aquaculture techniques and knowledge for own livelihood security and also for the society at large. He also appreciated the efforts of Extension Directorate, Ministry of Agriculture for encouraging such model training programmes which are very much needed in these difficult hilly areas for livelihood generation as well as for augmenting rural income. Course Director Dr. S.K. Srivastava, Sr. Scientist and in-

Inaugural session of Model Training Course (MTC) for the extension officials and progressive fish farmers on "Management Practices for coldwater Aquaculture"

charge, welcomed the participants and briefed about the centre's activities. Course Co-Director, Dr Suresh Chandra, Sr. Scientist gave detailed about the training programme to the participants and informed that emphasis will be given on demonstrations/practicals. During inauguration Dr. N.N. Pandey, Sr. Scientist, DCFR spoke about the value addition of fishery products. At the end of inaugural session, Dr. S.K. Gupta, Scientist, proposed vote of thanks.

During the training course, lectures on trout and carp culture, breeding, seed production, health management and monitoring, integrated fish farming in hills, feeding practices, etc were delivered by guest lecturers. S.K. Srivastava, Suresh Chandra, S.K. Gupta, (Scientist of the centre) delivered various lecture series from their specific field and

stress was mainly given on learning by doing and followed by field demonstration, where individual participant acquired the techniques of trout stripping, feed preparation and feeding strategies for different stages of fishes, identifying fish health problems with

Participants in the Model Training Course

techniques of disinfection being used for trout and carps. During the field demonstration programme, participants were assisted by Dr. S.K. Gupta, Scientist, Technical officials, supporting and contractual staffs of the centre. In the training, total 40 participants from District Nainital, Champawat and U.S. Nagar participated. Exposure visit for the participants to a progressive fish farmer's farm at Village Bisang (Lohaghat) and to Panchashwar was also undertaken on 5th March to educate the participants. The training programme ended on 8th March, 2013 with an interactive session in which useful feedback from the participants was received. Dr. Amit Pande, Senior Scientist, DCFR concluded the training programme with distribution of certificates to the participants.

Training cum exposure visit for the farmers of Darchula, Uttarakhand organized at village Dhudholi, Duangiri, Almora under TSP Prgramme

With an aim to empower tribal farmers through fish farming technology with special reference to polytanks aquaculture in upland areas, one day training cum exposure visit was organized at village Dudholi, Dunagiri, Almora on 29th September, 2012. Participants (25) from border villages namely Pangu, Rimjhim Dharachula, Uttarakhand were imparted training on latest know- how on polytank fish culture incorporating suitable fast growing coldwater fish species. Dr. R.S. Patiyal, Senior Scientist and coordinator of the programme briefed participants about the aim and objective of the training cum exposure programme and gave important information about utilization of water resources for growing fish. He also added that nutrient rich fish tank water could also be for irrigating agricultural land side by side during summer months and constructing tanks are also a good means of water retention / conservation. Shri Jeet Singh Bajani, Progressive farmer shared his

Tribal participants getting field exposure on the various aspects of carp farming

experience on farming of various agricultural crops and water conservations methods and suggested participating farmers to form clusters or groups in order to get better earning from their agricultural produce. During the programme Dr Suresh Chandra, Senior Scientist, DCFR Field Centre Champawat and Coordinator of the programme also spoke about the recent popular techniques of hill fish farming and suggested participants to utilize these practices for ensuring livelihood and protein availability in remote and disadvantageous border areas where transportation of fresh food items takes a long way to reach them. Participants were taken to a progressive farmer's field at village Dudholi, Dunagiri and were exposed to various farming practices being undertaken by the farmer. On their visit to farm, participants got first hand information about earthworm culture, rain water harvesting system developed by farmer considering local conditions and topography, seasonal fruits and vegetable cultivation in poly houses, drip irrigation, Napier grass cultivation on the embankments for controlling soil erosion and for

Training to Tribal Farmers under TSP

feeding grass carp as well as livestock , fish culture in polytanks etc. Participants were highly encouraged to see the development at the farm. Agricultural practices developed by farmers with the help of ICAR institute presents a perfect amalgamation of both indigenous traditional knowledge and recent scientific farming practices.

Farm Activities

DCFR Experimental Field Centre, Champawat

Induced breeding of Hungarian strain of common carp and old Bangkok strain

Breeding trials of Hungarian strain of common carp and Bangkok strain were conducted in the month of May at water temperature ranging between 17.5 - 22°C. For the adhesive eggs of common carp dry and green needles of pine tree were used as substrate for egg attachment and were placed in the centre of Hapas. The latency period was observed to be 10-12 hrs at water temperature of 17.5± 2°C in all the three strains. Similarly the average fertilization rate was 65%, 80% and 95% in Champa-1, Champa-2 and existing Bangkok strain. Total numbers of 15,000 advanced fry were produced at the centre. The seed were distributed to the farmers and other stake holders for culture purposes and field demonstration.

Grass Carp Breeding

Grass carps brooders with weight range of 1.50-1.80 kg were used for induced breeding in the month of August, 2012. Ovatide hormone in single and two split doses @ 0.6-1.8 ml/kg under different permutations were tried in six breeding trials employing total 14 female. Average water temp. of (22± 3.5°C) was observed for hatching of eggs. Approximate 3000 number of fry was produced.

Health management of rainbow trout

Rainbow trout were treated with 5% solution of salt to cure the fungal infestation at regular interval at Champawat farm.

Water management

Six rearing raceways having size of 150 m^2 containing rainbow trout yearlings were maintained at the centre. Ten nursery raceways of dimension 30 m^2 were maintained for fry rearing of rainbow trout and snow trout. Ten cemented tank with earthen bottom of dimension 120 m^2 were maintained for fry and brooders rearing of Champa-1 and Champa-2, and Grass carp. During summer time temperature of Champawat rises up, therefore to solve the scarcity of water, recycling and filtration of outlet water were done for the maintenance of valuable livestock of rainbow trout fry, yearling and brooders. Owing to impaired water supply 40-60 l/min from Chirrapani stream, prolonged dissolved oxygen depletion in May-June coupled with higher water temperature 20.6-24°C resulted in mass mortality of rainbow trout in the year 2012. Gills and skin of died specimen harboured large number *Trichodina* sp. However, mortality rate in previous year was non significant due to relatively better rain and adequate water supply that helped in maintaining a congenial environment in raceways at Champawat farm.

Dr A. Barat, Acting Director observing the fry rearing raceways at Champawat

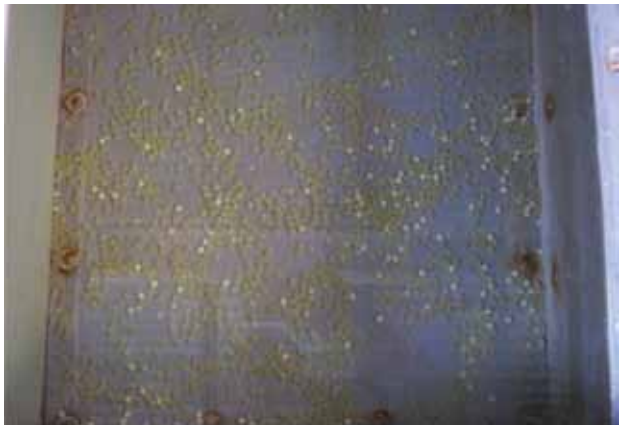
Water quality Parameters of Ponds at Champawat April 2012 to March 2013

Month	Air Temp. (°c)		Water Temp. (°c)		PH		Hardness (ppm)		Iron (ppm)		Nitrate (ppm)		Chloride (ppm)	
	Min.	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
April,12	14.5	26.0	12.0	21.5	7.1	9.4	25	50	0.0	0.2	00	30	30	70
May, 12	20.0	31.0	13.0	24.2	7.2	9.3	25	25	0.1	0.2	00	20	20	100
June, 12	20.5	35.1	18.0	27.2	7.0	9.5	25	50	0.0	0.2	00	25	30	110
July, 12	19.5	26.4	18.8	26.0	7.0	9.4	25	50	0.0	0.3	00	25	20	100
August, 12	19.0	25.5	18.2	24.6	7.1	9.2	25	50	0.0	0.3	00	25	10	100
Sept., 12	16.5	23.7	16.8	24.1	7.0	9.1	soft	50	0.0	0.3	00	20	10	60
Octo.,12	16.0	24.0	11.0	23.5	7.0	9.1	soft	25	0.0	0.3	00	20	10	40
Nov.,12	10.0	18.5	7.5	16.8	7.0	9.0	Soft	25	0.0	0.3	00	20	10	60
Dec., 12	6.0	14.6	4.0	13.0	7.2	8.6	25	25	0.0	0.5	00	30	20	60
Jan., 13	0.0	15.0	2.2	10.0	7.0	9.0	25	50	0.0	0.5	05	20	20	50
Feb.,13	0.2	18.0	3.0	12.7	6.8	9.1	25	50	0.1	0.5	05	25	20	60
March,13	10.0	19.0	7.8	18.5	6.9	9.1	25	50	0.1	0.4	00	25	20	60

Resource Generation

A total of 1.2 lakh eyed ova of rainbow trout were produced during January-March, 2013 at the Champawat field centre. About 15,000 advance fry of grass carp distributed to 50 farmers of Uttarakhand. Fingerlings of Champa-1 and Champa-2 reared at this centre were supplied to north eastern states and to Fisheries Dept.,Govt of Himachal Pradesh.

Rainbow trout and common carp reared in grow-out tanks during 2012-13 were sold and revenue of Rs. 40,577/- (Rs. fourty thousands five hundred seventy seven) was raised.



Total 58,000 eyed ova of rainbow trout were sent successfully to Dept. of Fisheries, Govt. of Arunachal Pradesh with a total value of Rs. 1,74,000/-). A revenue of Rs 27,000/-(Rs. twenty seven thousands only) generated through sale of 3375 Rainbow trout advance fingerlings (1 year old) to Uttarakhand State Fisheries Department. Total net revenue of Rs. 2.41 lakh was raised at DCFR Field Centre Champawat during the period, through sale of table size trout, advance trout fry and trout eyed ova.

Infrastructural facilities developed

One farmers training hall and two scientists chamber has been recently constructed at Champawat centre. Laboratopty block is being strengthened with the addition of new equipments and glassware days by day. Four type-1 residential quarters, one store room and one farmers training hall has been constructed and inaugurated by Honourable DDG (Fy.) on the occasion of fish farmer's day 2012.

New office cum farmers training Hall at Champawat centre

Upgradation of laboratory facilities at Champawat Centre: The laboratories of Champawat Centre were upgraded with scientific equipments like electronic balance, centrifuge, water bath, hot air oven etc. for conducting experiments and analysis of samples.

Lab-2 of Champawat centre

DCFR, Bhimtal

Induced breeding of indigenous minor carp, *Labeo dero*

Labeo dero is a mid-distance coldwater migrant, bottom feeder fish, inhabiting in upland streams and rivers at an elevation of 400-800 masl. This coldwater indigenous minor carp has high consumer preference as well as good market value. Successful breeding of this species was conducted at DCFR, Bhimtal in captivity under coldwater condition at 22.8°C temperature with optimization of synthetic hormone dose. Full maturity was observed during 2nd week of July to end of August. Hormone dose (OVAPRIM) of 0.8 ml kg^{-1}body wt. for females and 0.4 ml kg^{-1}body wt. for males was found optimum for spawning with 87% fertilization, 65% hatching and the incubation period of 20-28 hrs. The size of fertilized eggs was recorded as 2.8mm. This study would be helpful for seed production of the species for wild stock augmentation and species diversification in coldwater aquaculture.

Fertilized eggs of *L. dero*

Earthen poly nursery tank

Fry of *L.dero*

Koi carp breeding

Keeping in view the water and space availability the ornamental fish culture seems to be promising as an alternative source for economic benefit to the people of hill region. Before introducing the activity to the farmers, breeding and culture of koi carp and

Brooder of Koi carp

goldfish was taken up at Directorate's farm. The koi carp of average length 155mm and average weight 125gm were grown to average length of 200 mm and average weight of 160gm in polythene lined tanks in five months. Matured fishes were successfully induced bred by Ovaprim injection. Breeding and larval rearing parameters were standardized.

Induced breeding and larval rearing of gold fish was also done successfully and produced about 5000 advance fry of koi carp and goldfish is now ready for stocking in farmer's field.

Harmone injection for breeding of Koi carp

Fry of Koi carp

Awards & Recognition

- Dr. N.N. Pandey, Sr. Scientist was conferred with "Fellow of Natural Science and Culture (FNSC)" by Foundation of Natural science and Culture, Haridwar (India).
- Dr. R.S. Patiyal Sr. Scientist DCFR was conferred with the Fellowship of Indian Academy of Environmental Science, Haridwar for his contribution in coldwater fishery research. The award was conferred by Prof. Swatantr Kumar, Hon'ble Vice Chancellor G.K. University, Haridwar on 2nd November, 2012 during National Seminar, Haridwar.
- Dr. Neetu Shahi, Scientist DCFR was conferred with "Fellow of Society of Applied Biotechnology (FSAB) 2012" by Society for applied biotechnology, Dharward, Karnataka.
- Dr. S.K. Gupta, Scientist DCFR, Champawat received Bioved "Young Scientist Award 2013" for his outstanding contribution in the field of fish nutrition and physiology.
- Dr. R.S. Patiyal Sr. Scientist received Fellowship Award-2013 by Bioved Research Institute of Agriculture and Technology Allahabad on 22-24th February, 2013.
- Dr. N.N. Pandey and Dr. Amit Pande, Sr. Scientist and Dr. R.S. Haldar (T-6) received "Letter of appreciation" by Govt. of Sikkim, Department of Fisheries for the promotion of the trout farming in the state.
- Dr. Prem Kumar, Sr. Scientist has been awarded Post Graduate Diploma in "Technology Management in Agriculture" by University of Hyderabad and National academy of Agriculture Research Management" (NAARM), Hyderabad.
- Mr. M.S. Akhtar, Scientist has been conferred the degree of Doctor of Philosophy in Fish Nutrition and Biochemistry on 3rd September, 2012 by Central Institute of Fisheries Education (Deemed University), Mumbai on his thesis entitled 'Physio-metabolic responses of tropical and temperate fish to different stressors and their mitigation measure.
- Mr. Rakesh Matura has been conferred the degree of Doctor of Philosophy in Biotechnology on 12th February 2013 by Kuamon University Nainital under the supervision of Dr. A. Barat (Principal Scientist) DCFR Bhimtal on his thesis entitled "Development and characterization of microsatellite DNA Markers for *Garra gotyla* (family Cyprindae, Pisces)".
- Mrs. Seema Sah has been conferred the degree of Doctor of Philosophy in Biotechnology on 12th February, 2013 by Kuamon university Nainital under the supervision of Dr. A. Barat (Principal Scientist) DCFR Bhimtal and Dr. Veena Pande, Head, Department of Biotechnology, on her thesis entitled "Population genetic characterization of *Barilius bendelisis* (Cyprindae: Pisces) from wild population using microsatellite and RAPD markers.
- DCFR stall was conferred the Honour of Award in International Exhibition "IARI" at IARI exhibition ground, Pusa New Delhi during 13-15th December, 2012.
- Miss. Kiran Belwal and Dr. Amit Pande, Sr. Scientist won the thrid position in poster presentation entitled Characterization and expression analysis of Toll like Receptor-3 (TLR-3) and its role in recognizing viral PAMPs in *Barilius bendelisis* at IVRI Mukteshwar on XXI National Conference on Immunobiology and Management of Viral Diseases in 21st Century, held during 8-10th November, 2012.
- Mrs. Pusphita Das, Dr. Debajit Sarma, Pr. Scientist, M. S. Akhtar, Scientist, Mrs. Suman Sanwal, Sh. Partha Das and Mrs. Ciji Akhtar won the 2nd position in best poster award entitled "Amino acids, mineral and nutritional quality of golden mahseer (*Tor putitora*) in coldwater Himalayan region" in the National Seminar on Mountain Fisheries: Challenges and Opportunity for Livelihood Security, DCFR, Bhimtal, 5-6th November, 2012.

- Rohit Kumar won the Best poster awards for Kumar R., Sati J., Sahoo P.K., Patiyal R.S., Barat A. 2012. Multivariate morphometric analysis of population of *Tor putitora* (Hamilton, 1882) along the trans-Himalayan region of India using truss network analysis". Abstract No. BH-10 in National Seminar on Mountain Fisheries: Challenges and Opportunity for Livelihood Security, DCFR, Bhimtal, 5-6th November, 2012.

Dr. R.S. Patiyal, Sr. Scientist receiving Fellowship of IAES, Haridwar 2012

Dr S.K. Gupta, Scientist receiving Bioved "Young Scientist Award 2013"

Training//Workshop/Seminar Organized

- D. Sarma organized National Training Program on "Coldwater Fisheries Management and Eco-tourism for Upliftment of Rural Livelihood in NEH region " as course Director for the Officers of State Fisheries Dept. of Assam, Sikkim, Manipur, Arunachal Pradesh, Meghalaya, KVK of Assam and Mizoram, AAU, Dibrugarh and Guwahati University during 1-5th February, 2013 at DCFR North East Information Centre, Guwahati.
- D. Sarma organized National Workshop on "Sustainable Utilization of Mountain Fishery Resources- a partnership mode", 8-9th September, 2012 at SKUAST- Kashmir in collaboration with College of Fisheries, SKUAST-K.
- D. Sarma organized Training Program on Integrated Fish Farming in Hills during 26-27th September, 2012 at Arunachal Pradesh.
- N.N. Pandey conducted Farmers Training on "Fish Farming in Hills" for farmers of Mandi District Himachal Pradesh during 10-12th September, 2012, sponsored by ATMA scheme of Agriculture Department and State Fisheries Department of Himachal Pradesh.
- N.N. Pandey and R. S. Haldar conducted on farm training for trout growers on "Culture and Breeding of Rainbow trout" at Uttarey and Upper Rimbi, W. Sikkim during 9-10th December, 2012.
- N.N. Pandey and R. S. Haldar conducted Training-cum exposure visit to the department personnel and extension functionaries from Directorate of Fisheries, Sikkim during 10-12th March, 2013, sponsored by NFDB.
- N.N. Pandey organized Farmer's Training in Distt. Mandi (Himachal Pradesh) on Coldwater Fish Farming during 10-12th September, 2012.
- R.S. Patiyal and Suresh Chandra organized one day Training cum Exposure Visit for the tribal farmers of Darchhula, Pithoragarh, Uttarakhand at Dunagiri, Almolra under TSP programme of the Directorate.
- R.S. Patiyal organized one day Training and seed distribution programme for the 25 tribal farmers of Khatima, Sitarganj area on 29th March, 2013 Under TSP programme.
- Model Training course on "Management Practices for Coldwater Aquaculture" was conducted during 1-8th March, 2013 at DCFR Field Centre Champawat.
- Two days workshop on Post Harvest Utilization and Value Addition of Trout and Carp was organized for the woman and unemployed youth during 9-10th September 2012. Total 70 participants participated in the programme.
- S.K. Srivastava and Suresh Chandra, DCFR Field Centre Champawat organized Hindi Divas and Hindi Workshop as programme Coordinators during 11-14th September, 2012.
- S.K. Gupta acted as organizing member to arrange the necessary facilities in connection with the inauguration of recently created Information centre of the DCFR at CIFRI building, Guwahati on 8th October, 2012 at Guwahati (Assam).

Fish Farmer's Day celebrated at Champawat

DCFR Champawat field centre organized Fish Farmer's day event on 10th July, 2012. The programme was presided over by Dr. (Mrs.) B. Meenakumari, Deputy Director General (Fy.), ICAR. Shri Shridhar Babu Addanki, IAS, District Magistrate, Champawat, Uttrakhand graced the occasion as Chief Guest and Dr. S. D. Singh, Assistant Director General (Inland Fisheries) addressed the gathering as Guest of honour. Dr. P. C. Mahanta, Director, DCFR and Dr. S. K. Srivastava, Scientist-Incharge of the centre welcomed all the farmers, entrepreneurs, dignitaries and media persons.

Inauguration session of Fish Farmers Day


Felicitation to farmers by Shri Shridhar Babu Addanki, IAS, District Magistrate, Champawat,

Interaction with farmer


Dr. (Mrs.) B. Meenakumari, DDG (Fy.) and Dr. S. D. Singh, ADG

Dr. (Mrs.) B. Meenakumari inaugurated newly constructed farmer's training hall, laboratory and residential block of the Champawat centre. In her inaugural address, she highlighted the importance of quality seed, nutritionally balanced feed and health management for the up scaling of hill aquaculture. Due to climate change the temperature of the environment is gradually increasing, therefore water conservation is very crucial for sustainable fish farming activities in the hilly region. Dr. S. D. Singh A.D.G. (I.Fy.) in his address emphasized upon the need of transfer of

technology from the laboratory to land. Shri Shridhar Babu Addanki, District Magistrate, Champawat assured the gathering to provide all administrative support for development of fish farming in this area and he stressed upon the need of training programme for the fish farmers at Champawat centre. An exhibition of the institute was also arranged on this occasion. Around 150 farmers and entrepreneurs participated and six farmers were honoured for their outstanding contribution in the coldwater aquaculture.

A lively framer-scientist interaction meet was organized to address the farmers problems. Dr. S.K. Srivastava, Dr. D. Sarma, Dr. N.N. Pandey, Dr. Suresh Chandra, Dr. Prem Kumar and Dr. S.K. Gupta of DCFR, Bhimtal and Champawat centre participated in the interactive session to address the queries raised by the farmers. On this occasion, seedof Champa-1, Champa-2 and Grass carp were distributed to the farmers and entrepreneurs of Champawat and Pithoragarh district.

Trout breeding and culture activities in Sikkim

The State Fisheries Department of Government of Sikkim is associated with Directorate of Coldwater Fisheries Research, Bhimtal under NEH activity. The Directorate has taken all possible initiatives to promote trout culture in the state considering the suitable climatic condition and abundance of water. As desired by state, programme on brood stock management and seed production have been taken on the priority basis under the supervision of Dr N. N. Pandey Sr. Scientist and Dr. R.S. Haldar (T-6). Presently, three trout breeding units have been made functional for production of trout seed. During December, 2012 two days breeding operation was carried out and about 11,0000 fertilized eggs were produced using 80 pairs of brooders in Uttarey Trout Farm. A wooden stripping stand was fabricated by the team for easy operation and to minimize the physical stress during

Trout Brooders at Farmers field in Sikkim

Trout Brooders at Farmers field in Sikkim

stripping of brooders, which was demonstrated to the department personnel. After successful training and demonstration, the department personnel were able to produce 60,000 ova from the remaining stock. To strengthen the trout breeding programme under the NEH, a broodstock of 500 kg trout was developed by DCFR and additionally larval feed and grow out feed for the broodstock was supplied.

The fingerlings of rainbow trout stocked during the month of May, 2012 in the raceways of private farmers of Uttarey, Shree Badam and Upper Rimbi showed an average growth of 500-600 g in 8 months. The Farmers are fetching a good price which ranges from Rs. 600-1000 per kg in the local market. The impact of training was seen while visiting different locations where the farmers have started trout culture and maintaining good brood stock. Some of the trained farmers also performed breeding at their own farms successfully.

Discussion with Hon'ble Minister

Demonstration in Fish Farmers pond in Champawat District

Frontline demonstration (FLD) of improved Hungarian common carp, were carried out in tanks of two farmers in village Chhamola and Khetikan in Champawat district. At village Chhamola fish tank was stocked with silver carp, improved common carp and grass carp, whereas, the Khetikhan farmer had only common carp in the tanks. Difficult uneven terrain, resource limitations, water scarcity and small land holdings are some of the common constraints of hill fish farming which determine the scale of aquaculture activity in a particular area. During FLD

Frontline Demonstration at village Chhamola and Khetikhan

Dr. Suresh Chandra, Sr. Scientist gave a demonstration on water quality management, proper fish handling, health management, netting and feeding to the farmers.

Aquaculture, a success story

Shri Lakshman Singh Mehar (S/o Shri Kesar Singh Mehar) born on 1st January 1972 in a farmer family at Kathar, District Champawat, Uttarakhand, has been honoured as a innovative farmers in Krishi Vigyan Mela IARI, New Delhi, held during 6-8 February 2012 for his remarkable achievements. He has adopted the integrated approach of farming for better income with limited resources. He developed about 15 Nali (1 Nali = 200 m^2) land as orchard for the Tejpat and Malta plants and used this area for fodder production for the milch animals and grass carp. He also established 12 Nali area for the seasonal vegetable production like, tomato, cabbage, capsicum, coriander and radish. The scarcity of water is a common problem leading to the drought like circumstances in the area, which affects these horticultural activities and orchard plants. To overcome this problem, he developed four earthen and two cemented ponds primarily for the harvesting of

Integrated fish farming

Mr. Lakshaman singh receiving Innovative fish farmer National award

rain water and collection of available Gadera water (a small water current from the percolation from hills). The stored water of these ponds is being used for the irrigation purpose particularly during the summer months. Later, he started polyculture of Carp fish in these ponds with farm advisory service from DCFR. By practicing polyculture of silver carp, grass carp and common carp in these ponds he produces 420 kg fish from 600 m^2 pond areas in a year. He also integrated fish ponds with poultry birds and used their waste as manure in fish pond. After every two crops of the fish each pond is completely drained and de-silted. The removed bottom soil of the pond which remains rich in the organic matter is used for the vegetable plots and fruit plants. He never uses any chemicals and fertilizer for vegetable production. He always uses his own products at home and never purchase any food item from the market. The success story of Shri Lakshman Singh Mehar is a model for adoption to the other farmers in hills for better income and better livelihood security.

Other Extension Activities

Radio Talks

- Dr. Suresh Chandra delivered a radio talk on "Pond preparation for fish farming in hills (In Hindi) on 26th July,2012, All India Radio, Almora, Uttarakhand
- Dr. Amit pande delivered a Radio talk on "आमदनीक भल साधण माछ पालण" *in Kumauni* for "Kisan-Vani" at All India Radio, Almora, on 7th September 2012.
- Dr Amit pande delivered Radio talk "शीतजल मछलियों के रोग एवं निवारण" in Hindi for "Kisan-Vani" at All India Radio, Almora, on 23rd May 2012.
- Dr. R.S. Patiyal delivered a Radio Talk on "Parvateey Shetro mai Matysya palan ki Sambhawnaayei'by Radio Komoan Vani,Samudayaik Radio Station, Supee Mukteswar,Nainital.
- Dr. N.N. Pandey delivered a radio talk on Machhliyon ki Vimaria tatha niyantran from AIR, Almora on 7. June 2012.

Students guided

- S.K. Mallik guided Ms. Ramandeep Kaur Dhillon, M.Sc. (Microbiology) student Kumaun University for M.Sc. desertation work on the topic "Study on In-Vitro screening of local medicinal plants for antimicrobial activity using disc diffusion method".
- Neetu Shahi guided Ms. Priyanka Joshi, student, DBT Kumaun University for M.Sc. desertation work on the topic "Biochemical and molecular characterization of Virulent *Aeromonas* species isolated from diseased eye of Rainbow trout (*Oncorhynchus mykiss* Walbaum, 1792)".
- Neetu Shahi guided Miss. Shailaja Verma, student, Sai Institute of Paramedical and Allied Sciences, H.N.B. Garhwal University, Dehradun on the topic "Biochemical and molecular characterization of Bacteria isolated from diseased eye of Rainbow trout (*Oncorhynchus mykiss* Walbaum) and Golden Mahseer (*Tor putitora* Hamilton)".
- Neetu Shahi has given two months training to Miss. Poonam Kumari, student, Sai Institute of Paramedical and Allied Sciences, H.N.B. Garhwal University, Dehradun on the topic "Molecular identification of *Aeromonas species*

by phylogenetic analysis of 16s rDNA and Restriction Fragement Length Polymorphism (RFLP) of *gyrB* genes".

Participation in Exhibition

- M.S. Akhtar, displayed exhibition stall in 'Kisan Mela' organized by GB Pant University of Agriculture and Technology, Pantnagar during 8 to 11 March, 2013.
- N.N. Pandey participated in Exhibition in Kisan Mela, organized by GBPUA &T Pantnagar during 4-7 Oct. 2012.
- N. N. Pandey participated in the Exhibition during Congress on Public Private Partnership in aquaculture and culture based fisheries by CIFRI, Barrockpore, during 9-11March, 2013.
- Prem Kumar and S. Chandra participated and displayed Exhibits in the XI Agricultural Science Congress during 7-9th Feb., 2013 at Orissa University of Agriculture and Technology (OUAT), Bhubaneswar, Odisha
- S. Chandra Participated and organised an Exhibition on 9-10 Septeber, 2012 at Champawat Field station during two days workshop on "Post harvest utilization and value addition of trout and carp"
- S. Chandra, R.S.Patiyal, Sr.Scientist, Shri Santosh Kumar and Shri T.M.Sharma participated in the Kisan Mela and Exhibition at VPKAS, Hawalbag, Almora on 28th September, 2012.
- S. Chandra, Sr. Scientist and Sri T.M. Sharma Tech. Asst. Participated in the International Exhibition "IARI" at IARI exhibition ground, Pusa New Delhi during 13th- 15th December, 2012.
- S.K. Srivastava and S.K. Gupta orgnized frontline demonstration (FLD) of improved Hungarian common carp for the farmers of village Khetikan in Champawat district on 26th October 2012.
- S.K. Srivastava, S.K. Gupta and M.S. Akhtar organised the exhibiton stall at National seminar on "Aquatic Resources for Eradication of Hunger and Malnutrition-Opportunities and Challenges" held during 4 –6 December, 2012 at Mangalore, Karnatak.
- S.K. Gupta actively participated in 16th advisory committee meeting and farmers scientist interaction meet at KVK Lohaghat on 28th may 2012.
- S.K.Gupta, S.K. Srivastava, S. Chandra acted as Programme Co-coordiantor on the occasion of Fish Farmers day on 10th July, 2012 at DCFR Field Centre, Champawat. During the programme, exhibition stall of Champawat centre was organized.

Technical Lecture/Talks deliverd

- D. Sarma delivered a lecture in national workshop on "Mahseer Conservation: Status, Challenges and the way forward" organized by WWF, New Delhi dated on 19th July, 2012
- M.S. Akhtar delivered lecture to framers in "Kishan gosthi" at Kotabagh, Nainital organised by Department of Fisheries, Uttarakhand on 19th March, 2013
- P. Kumar acted as key speaker on Fisheries Resource Assessment in National seminar on Mountain Fisheries: Challenges and opportunity for livelihood security, organized by DCFR, Bhimtal during 5-6 Nov. 2013.
- R.S. Patiyal delivered a lecture on Experience from conservation of Mahseer in Uttrakhand on Training "Co- management of Fisheries Resources for sustainable Utilization (sponsored by NFDB) 21-23 March 2013.
- S. Chandra delivered a talk on "Parasitic Diseases of Rainbow Trout" to the Extension officers/ district Officers of Fisheries Dept. Sikkim on 12th March, 2013 at DCFR Bhimtal.
- S. Chandra and R.S. Patiyal gave a talk on "Scientific Fish Farming in Polytanks for Livelihood and Income" on 29th September, 2013 at Dunagiri(Almora) to the tribal farmers from participants under TSP programme.
- S. Chandra delivered a talk on "Biology of important Coldwater Cultivable Species Methods" to the participants under MTC training programme at DCFR, Field Centre, Champawat on 3rd March, 2013.
- S. Chandra delivered a talk on "Major Coldwater Fish Diseases their Cause, Symptoms and Control Methods" to the participants under MTC training programme at DCFR, Field Centre, Champawat on 7th March, 2013.
- S. Chandra delivered an Invited Lecture on "Fish farming in Hills "at Fish Farm School, Toli" on 9th March, 2013 organized by ATMA, Champawat.
- S. Chandra gave a talk on "Breeding and Seed Production of Rainbow Trout" to the participants under MTC training programme at DCFR,Field Centre, Champawat on 4th March,2013.
- S.K. Srivastava, S.K. Gupta and M.S. Akhtar

delivered lecture in the global symposium on "Aquatic Resources for Eradicating Hunger and Malnutrition-Opportunities and Challenges" held during 4–6 December, 2012 at Mangalore, Karnataka.

- S.K. Gupta delivered a lecture on "Prospects of Integrated fish farming in hill region" during the NAIP sponsored farmers training programme organized by VPKAS, Almora at Champawat field centre on 15th Feb. 2012.
- S.K. Srivastava and Suresh Chandra attended farmers fair and delivered scientific talk on various aspects of hill aquaculture and its management strategies during Research advisory committee of KVK Lohaghat on 11th December 2012.

Visits by farmers and students and interaction

- N. N. Pandey organized an exposure visit of Students, Department of Zoology, Sri Agrasen Kenya PG College, and Varanasi (UP) on 5th, Oct. 2012.
- R.S.Patiyal, as coordinator, demonstrated the ongoing research and breeding programmes of DCFR to 60 students of Central School, Central Command Air Force Allahabad on 25th May 2012.
- S. Chandra, S.K.Gupta and S.K. Srivastava as Programme Coordinator demonstrated farm activities, feeding strategies and health monitoring to B.F.Sc. and M.F.Sc. students of GB Pant University, Pantnagar during 29-30 Oct, 2012 at DCFR Field Centre, Champawat.
- S.K. Srivastava, Suresh Chandra,and S.K.Gupta organised Fish health and feeding management in polyculture of exotic carps in hills with farmers of Kumaon region during the training programmes organized by Krishi Vigyan Kendra, Lohaghat and State Fisheries Department, Champawat during November, 2012.
- S.K. Srivastava, Suresh Chandra, S.K.Gupta organized Farmers field school at Champawat centre on 27th December 2011.
- S.K.Srivastava and S.K.Gupta organized field day and rendered farm advisory services to the farmers of North Sikkim at Kabi fish farm and discussed techniques of polyculture of carps employing good management practices with the farmers at the pond site on 17-18th October, 2012.

Extention materials Leaflets/folders published

- Debajit Sarma, R.S. Haldar, M.S. Akhtar, N.N. Pandey, P.C. Mahanta 2012. Breeding and Hatchery Management of *Tor putitora,* (*In Hindi & Assamese*). DCFR Bulletin No.20.
- M. S. Akhtar, Debajit Sarma and N.N. Pandey. 2012. Nanhe mahseer: a micro diet for larval rearing of golden mahseer. DCFR Publication. (*In English & Assamese*)
- M. S. Akhtar, Debajit Sarma and N.N. Pandey. 2012. Potential of cage culture in coldwater lakes and reservoirs. DCFR Publication. (*In English & Assamese*)
- N.N.pandey 2012. Culture and Breeding of Rainbow Trout (*Onchorhynchus mykiss*) in Mid Hills. DCFR Publication. (*In English & Assamese*)
- S.K. Srivastava, Suresh Chandra, S.K. Gupta N.N. Pandey, Debajit Sarma 2012. Improved Strain of Common Carp Champa-1 and Champa-2 for diversification of Hill aquaculture DCFR Publication. (*In English & Assamese*)
- S.K.Gupta, S.K. Srivastava, Debajit Sarma and P.C. Mahanta 2012. Important coldwater

DCFR Exhibition at VPKAS, Almora

Suresh Chandra,Sr.Scientist explaning to the visitors during IIAI Exhibition at IARI,Pusa New Delhi

List of Projects

Institutional Projects (Ongoing)

Project Code	Project title	Project Leader & Associate	Year of Start	Likely Year of completion
AQ3	Performance of chocolate mahseer (*Neolissochilus hexagonolepis*) in freshwater aquaculture system in Kumaun Himalaya	Debajit Sarma M.S. Akhtar	2008	2013
AQ8	Development of molecular marker for identification of usable traits in important Coldwater fishers	A. Barat P.K. Sahoo R.S. Patiyal S. Ali	2011	2014
AQ9	Performance of indigenous minor carps *L.dero* and *L.dyocheilus* as candidate species for hill aquaculture	N.N. Pandey R.S. Haldar Prem Kumar R.S. Patiyal S. Ali	2011	2015
AQ10	Evaluation of seed rearing techniques of Common carp and golden mahseer for stock enhancement in semi temperate himalayan lakes using floating cages.	M.S. Akhtar S.K. Mallik N.N Pandey Debajit Sarma R.S. Haldar Santosh Kumar	2011	2015
AQ11	Study on viral diseases in trout producing states of India	Amit Pande R.S. Haldar	2011	2014
AQ12	Seasonal incidences of parasitic fungal and non-infectious diseases of coldwater fishes and evaluation of herbal extracts for their control	Suresh Chandra Amit Pande S.K. Mallik	2011	2013
AQ13	Potential bacterial pathogens in rainbow trout farms from northern India and maintenance of bacterial agents	Neetu Shahi S.K. Mallik Suresh Chandra	2011	2016
AQ14	Performance evaluation of improved strain of Common carp champa-1 & champa-2 at different thermal regimes	S.K. Srivastava Suresh Chandra R.S. Patiyal S.K. Gupta Debajit Sarma	2011	2014
CF3	Ornamental fish resources in Coldwater region of India :Investigation and Documentation	S.K. Gupta Debajit Sarma S.K. Srivastava	2011	2014

Project Code	Project title	Project Leader & Associate	Year of Start	Likely Year of completion
CF4	Study on selection of suitable sites for aquaculture in selected Coldwater area using GIS tools.	Prem Kumar R.S. Haldar Amit Kumar Saxena	2011	2014
CF5	Development of database and evaluation of culture and breeding status of rainbow trout (*onchorhynchus mykiss*) in india	S. Ali Prem Kumar P.K. Sahoo R.S. Patiyal	2011	2014
Inter-institutional Outreach Activities (Fisheries Division-ICAR)				
NP1	An outreach activity: Fish genetics stock	A. Barat Prem kumar S.Ali	2007	2013
NP3	An outreach activity: Nutrient profiling and evaluation of fish as a dietary component	Debajit Sarma N.N. Pandey Neetu Shahi M.S. Akhtar	2008	2012
Externally Funded Projects				
NAIP	Bioprospecting of gene and allele mining for abiotic stress tolerance	A. Barat S. Ali	2009	2012
NAIP (Comp-3)	Enhancement of livelihood security through sustainable farming systems and related farm enterprises in North-West Himalaya	Prem Kumar	2009	2013
DBT	Molecular characterization and development of a diagnostic test for the identification of filterable agent isolated from diseased rainbow trout	Amit Pande N.N. Pandey	2011	2013
DBT	Economic development of SC and ST Community of midhill region of pithoragarh district through aquaculture intervention.	R.S. Patiyal P.K. Sahoo	2012	2015
DBT	Evaluation of a genetic toxicity and ecological damage caused by Coalmines on fish fauna of simsang river garohills, Meghalaya and development of microbial bioremediation measures.	Debajit Sarma Neetu Shahi S.K. Mallik	2012	2015
DBT	Development and characterization of microsatellite markers and assessment of genetic diversity of Schistura sikmaiensis from North-east India (DBT Twin program with NE)	A. Barat P.K. Sahoo	2012	2015
AICRP	Enhancement of carp fish production by using polytanks in mid hills under APA programme in collaboration with VPKAS, Almora	N.N. Pandey Prem Kumar	2010	2013

Participation in Seminars/Symposiums/ Workshops/Trainings/Meetings

International

- A. Barat particepated in the traning on "Analyzing data from a DNA micro array experiment designed to evaluate fish gene expression response to alleviated ambient temperature" on 1-21st April, 2012 venue Ocean science Centre, Memorial University of Newfoundland, St John's, Canada."
- A. Barat, Amit Pande, P.K.Sahoo, Suresh Chandra, R.S.Patiyal, and R.S. Haldar, participated in the International Programme on Information Day at Nainital on 26th November, 2012 organized jointly by JNU, New Delhi and EU.
- P.K. Sahoo and R. S. Patiyal participated in International Symposium on Genomics in aquaculture organized by Central Institute of Freshwater Aquaculture in collaboration with Association of Aquaculturists on 22-23rd January, 2013 at Bhubaneswar.
- S.K. Gupta, M.S. Akhtar and S.K. Srivastava attended and presented in the global symposium on "Aquatic Resources for Eradicationg Hunger and Malnutrition-Opportunities and Challenges" held during 4–6th December, 2012 at Mangalore, Karnataka.
- S. Ali attended the International Conference on "Managing Trans-boundary Diseases of Agricultural importance in Asia-Pacific held at New Delhi during 10-12th October, 2012.

National

- A. Barat attended meeting regarding XII plan EFC at NASC, New Delhi on 29-30th April, 2012.
- A. Barat participated in meeting with DG, ICAR, regarding Skill and technologies Development on 8th October, 2012.
- A. Barat participated in meeting with Dr D. Ghosh, Head, Dept of Phisiology, AIIMS, New Delhi to discuss the research and infrastructure facility regarding Microarray facilities for gene expression and analysis on 9th August, 2012.
- A. Barat participated in meeting with Fisheries Commissioner, Govt of India, at Krishi Bhawan, New Delhi on 24th August, 2012.
- A. Barat Participated a meeting regarding project formulation on DNA barcoding at CIFE, Mumbai on 27th October, 2012.
- A. Barat participated in sensitization meeting on PME cell functioning under the chairmanship of DG, ICAR at NDRI, Karnal, Haryana on 8th December, 2012.
- A. Pande participated and delivered a presentation on " Machli mai Visanu janit rog evem unka upchaar" at Model Training Programme sponsored by Directorate of Extension Education Department of Agriculture and Cooperation Ministry of Agriculture, Government of India, organized at Experimental Field Station Champawat from 1-5th March, 2013.
- A. Pande participated and delivered a presentation on "Biotechnological Interventions in DCFR" in the "Meeting to discuss strengthening of Research and Education in Aquaculture and Marine Biotechnology" organized by the Department of Biotechnology, CGO Complex, Lodhi Road, New Delhi on 24th August, 2012.
- A. Pande participated and presented a lead lecture on "Viral Diseases in Coldwater Aquaculture-A difficult Road to Tread" at VIROCON, XXI National Conference on "Immuno-biology and Management of Viral Diseases in 21st Century held at Indian Veterinary Research Institute, Mukteshwar from 8-10th November, 2012.
- A. Pande participated and presented a status paper on Current Status of Coldwater Fish Diseases in India" at the National Consultation on Surveillance programme for Aquatic Animal Diseases" held at NBFGR, Lucknow from 17 -18th April, 2012.
- A. Pande participated and presented a theme paper on "Fish Health in Coldwater Aquaculture" at the National Seminar on Mountain Fisheries: Challenges and Opportunity for Livelihood

Security" organized by Directorate of Coldwater Fisheries Research, Bhimtal during 5-6th November, 2012.

- A. Pande participated in National Workshop on Fish Cell Line Development and Storage held at NBFGR, Lucknow on 19th April, 2012.
- A. Pande participated in the meeting on "Network Project on Fish Health" held at CIBA Chennai on 8th August, 2012.
- A. Pande participated in the meeting on Platform on Diagnostic and Vaccines" held at CIBA Chennai on 7th August, 2012.
- D. Sarma participated in Workshop on " Sustainable rural livelihood development and human resource livelihood security through management of natural resource in BTC", on 22-24th April, 2012 at Kokrajhar, BTC, Assam (participation)
- D. Sarma participated in National Workshop on "Mahseer Conservation: Status, Challenges and the way forward" organized by WWF, New Delhi dated on 19th July, 2012.
- N.N. Pandey Participated in National Seminar on emerging Pollutants and Pathogens: Challenges and Risk reduction, organized by IITR, Lucknow during 20-22nd September, 2012.
- N.N. Pandey participated in the Short Course on Water Shed Based Fisheries organized by Central Soil and Water Conservation Research & Training Institute, Dehradun during 20-24th August, 2013.
- P.K. Sahoo and Neetu Shahi participated in National level Brainstorming workshop at Central Institute of Fisheries Technology, Cochin to identify broad areas where research needs to be taken up on women in fisheries on 4th April, 2012.
- P.K. Sahoo and Neetu Shahi attended the Inauguration of Business Incubation Centre under Zonal Technology Management-Business Planning & development Unit, South Zone on 5th April, 2012.
- R.S. Patiyal participated and presented a paper in the "National Seminar on Status of environment and Biodiversity: Rio+20 and Role of Space Technology" organized by Department of Zoology and Environment Science Gurukul Kangdi University, Haridwar on 2-3rd November, 2012.
- R.S. Patiyal, participated in a training programme on "Quality Management System" organized by Institute of IT Resources, Dehradun on 15th September, 2012.
- R.S. Patiyal, attended foundation day of VPKAS Almora on 4th July, 2012.
- S. Ali attended the 32nd Session of Academy of Environmental Biology & National Seminar on "Emerging pollutants and pathogens challenges and risk reduction" during 20-22nd September, 2012, at IITR, Lucknow.
- S. Chandra attended Third National conference on Innovations in Indian Science Engineering and Technology on 25-27th February, 2013 NPL and IARI New Delhi
- S. Chandra attended XI Agricultural Science Congress Orissa University of Agriculture and Technology (OUAT) Bhubaneswar, Odisa.
- S.K. Gupta attended Winter School Training Programme on "Sustainable fish feeds and nutraceuticals to grow health promoting fish" at CIFA, Bhubaneswar during 15th January to 7th February, 2013.
- S.K. Gupta participate and presented a paper in one day national workshop on "Conclave on Aquaculture development for stakeholders of North Eastern Region" organized by CIFA, Bhubaneswar at Shillong (Meghalaya) on 11th September, 2012.
- S.K. Gupta participated and presented a paper in the National Consultation on "Alien Fish species in Aquaculture and Aquarium trade " organized by NBFGR, Lucknow on 6-7th September, 2012
- S.K. Gupta participated and presented a paper on "Heamato-biochemical response of *Cyrpinus carpio* fry to sublethal exposure of fipronil" in the "15th Indian agricultural scientists and farmers congress" on agricultural and global climate change organized on 22-24th February, 2013 at Allahabad.

Publications

Research paper

- Akhtar, M.S., Pal, A.K., Sahu, N.P., Ciji, A. and Gupta, S.K., 2012: Effects of dietary pyridoxine on growth and physiological responses of *Labeo rohita* fingerlings exposed to endosulfan. *Pest. Biochem. Physiol*., 103: 23-30.
- Akhtar, M.S., Pal, A.K., Sahu, N.P., Ciji, A. and Meena, D.K., 2012: Effects of dietary pyridoxine on growth and physiological responses of *Labeo rohita* fingerlings reared in high water temperature. . *Israeli J. Aquacult-Bamid.,* 64:777-783.
- Barat, A., Ali, S., Khandelwal, S., and Sahoo, P.K ., 2012: Genetic characterization of two coldwater fishes from Kumaun Hills, Uttarakhand. *Caryologia.,* 65(4):311-315.
- Barat, A., Ali, S., Sati, J., and Sivaraman, G.K., 2012: Mitochondrial DNA diversity and phylogenetic analysis of the *Schizothoracinae* fishes (Teleostei: Cyprinidae) from Indian Himalayas. *Indian J. Fish.,* 59(1): 43-47.
- Barat, A., Goel, C., Tyagi, A., Ali, S., Sahoo, P.K., 2012: Molecular cloning and expression profile of Schizo GPDH gene in response to abiotic stress. *Molecular Biology Reports.,* DOI 10.1007/s11033-012-1980-6.
- Barat, A., Matura, R., Sati, J., Kumar, R., Bhatt, F.A., Goel, C., and Sahoo, P.K ., 2013: Development and Characterization of microsatellite markers in *Schizopyge niger*. (Family: Cyprinidae, Pisces) from Kashmir valley. *Conservation Genet Resour.,* Doi: 10.1007/S12686-013-9920-X.
- Barat, A., Sharma, S., and Matura, R., 2012: Permanent Genetic Resources. *Molecular Ecology Resources,*.12(1): 185-189.
- Bisht, A., Singh, U.P., and Pandey, N. N., 2012: *Bacillus subtilis* as a potent probiotic for enhancing growth in fingerlings of common carp (*Cyprinus carpio* L.). *Indian J. Fish.,* 59(3):103-108.
- Bisht, H.C.S., Bisht, R., Kunjwal, S. S., and Pandey, N. N., 2012: Observations on the use of artificial substrates for periphyton based culture of *Schizothorax richardsonii* (Gray) in raceways of mountainous region of Kumaon, Uttarakhand. *J. Env & Bio Sci.*, 26 (1): 99-104.
- Chandra, S., Barat, A., Verma, S.M, Singh, B.K., and Matura, R., 2012: DNA Barcoding of Indian coldwater fishes of Genus *Schizothorax (*Family: Cyprinidae) from western Himalaya. *World journal of fish and marine sciences.,* 4(4): 430-435.
- Chandra, S., Matura, R., Barat, A., and Singh, B.K., 2012: Permanent Genetic Resources. *Molecular Ecology Resource.,* Doi: 10.1111/1755-0998.12016.
- Darshan, A., Mahanta, P.C., Barat, A., & Kumar, P., 2013: Rediscription of the Striped *Mystus Tengra* (Hamilton, 1822) (Siluriformes: Bagridae), *India. Journal of Threatened Taxa*., 5(1): 3536-3541.
- Das P., Sarma D., Bist H.C.S., Das P., 2012: Nutritional Quality of exotic rainbow trout (O.mykiss) and Indigenous snow trout (*S. richardsonii*) in upland Himalayan. *Indian Journal of Animal Nutrition*. 29 (2): 121-126.
- Gupta, S.K., Pal A.K., Sahu N.P., Saharan N., Mandal S.C., Chandraprakash., Akhtar M.S., Prusty, A.K., 2012: Dietary microbial levan ameliorates stress and augments immunity in *Cyprinus carpio* fry (Linnaeus, 1758) exposed to sublethal toxicity of fipronil. *Aquacult Res.,* Doi:10.1111/are.12030
- Gupta, S.K., Pal, A.K., Sahu, N.P., Jha, A.K., Akhtar, M.S., Mandal, S.C., Das, P., Prusty, A.K., 2013: Supplementation of microbial levan in the diet of *Cyprinus carpio* fry (Linnaeus, 1758) exposed to sublethal toxicity of fipronil: Effect on growth and metabolic responses. *Fish Physiol Biochem.,* Doi: 10.1007/s10695-013-9805-7

- Gupta, S.K., Pal, A.K., Sahu, N.P., Saharan, N., Chandraprakash, Akhtar, M.S., and Kumar, S., 2013: Haemato-biochemical responses in *Cyprinus carpio* (Linnaeus, 1758) fry exposed to sub-lethal concentration of a phenylpyrazole insecticide, fipronil. *Proc Nat Acad Sci India Sect B Biol Sci* DOI: 10.1007/s40011-013-0201-y
- Gupta. M., Upadhayay, A.K., Pandey, N.N., and Kumar, P., 2012: Evaluation of fish curry from farmed and wild caught Indian major carps of Tarai region, Uttarakhand, *Fishery technology*., 50 (2013):60-65
- Haldar, R.S., Pandey, N.N., Bisht, H.C.S., 2012: Ichthyo-faunal diversity of river kosi in Kumaoun region, Uttarakhand. *Jr. Inl. Fish. Soc. of India*., 44(2):62-70.
- Lokeshwor, Y., Barat, A., Sati, J., Darshan, A., Vishwanath, W., and Mahanta, P.C., 2012: *Schistura obliquofascia,* a new loach from Uttarakhand, India (Cypriniformes: Nemacheilidae). *Zootaxa*., 3586:255-263.
- Mandal, S.C., Singh, S.K., Das, P., Barman, D., and Gupta, SK., 2013: Trace and heavy metal content in diets and their effect on the growth and survival of Siamese fighting fish, *Betta splendens*. *Indian J. Anim. Nutr.,* 30 (1):80-86.
- Mir J.I., Mir, F.A., Sharma, S., Patiyal, R.S., 2013: Pattern of morphological variations in Alghad snowtrout, *Schizopyge niger* (Heckel 1838) from Kashmir Himalaya using truss network analysis. *Ichthyological Research*. 10.1007/s10228-013-0347-x.
- Mir, J.I., Mir, F.A., Patiyal, R.S. 2013: Phenotypic Variation among Three Populations of Chirruh Snowtrout, *Schizothorax esocinus* (Heckel, 1838) with Insights from Truss Network System in Kashmir Himalaya. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences*. DOI 10.1007/s40011-013-0194-6.
- Pandey, N.N., Haldar, R.S., Ali, S., Kumar, P., Patiyal, R.S., and Mahanta, P.C., 2012: Induced spawning of indigenous minor carp, *Labeo dyocheilus* in captivity under coldwater conditions. *Jr. Inl. Fish. Soc. of India*., 43(2):44-48
- Pandey, N.N., and Malik, D.S., 2012: Recycling of piggery waste in Azolla-Pig-Fish farming system. *J. of Sustain Environ Res.,* 1(1):41-46.
- Shahi N, Mallik S.K, Sahoo M, and Das P. 2013. Biological characteristics and pathogenicity of a virulent *Aeromonas hydrophila* associated with ulcerative syndrome in farmed rainbow trout, *Oncorhynchus mykiss*, (walbaum) in India. *The Israeli Journal of Aquaculture-Bamidgeh*. IJA_65.2013.926.
- Shahi N and Mallik S.K. 2013. Recovery of *Pseudomonas koreensis* from eye lesions in golden mahseer, *Tor putitora* (Hamilton, 1822) in Uttarakhand India. *Journal of Fish diseases*. DOI 10.1111/jfd.12126
- Sarma, D., Singh, N.O., 2013: Fitting of allometric model with expected-value parameters from hatchling to Adult stages of Golden mahseer (*Tor putitora*) in pond environment. *Journal of Aquaculture in the tropics*. 27(3-4), 2012.
- Sarma, D., Akhtar, M.S., Das, P., Shahi, N., Ciji, A., Mahanta, P.C., Yengkokpam, S. and Debnath, S. 2013. Nutritional Quality in Terms of Amino Acid and Fatty Acid of Five Coldwater Fish Species: Implications to Human Health. *Natl. Acad Sci. Lett*. (Accepted) DOI 10.1007/s40009-013-0151-1.
- Singh, R., Pandey, N.N., M, Gupta., 2013: Haematological Changes in parameters of Common carp *(Cyprinus carpio)* and Rainbow trout (*Oncorhynchus mykiss)*, infected with *Saprolegnia* spp. *Israeli J. Aquacult-Bamid.,* Vol: 65.

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- Barat A., Srivastava S.K., Chandra S., 2013: Training Manual Management on Practices for Coldwater Aquaculture published by DCFR Field Centre Champawat, 01-08 March,2013. Pp 1-60.
- Sarma D., Pandey A., Chandra S., Gupta S.K., 2012: Silver Jubilee Compendium on Coldwater Fisheries: 25 Years of Sustainable research & management. (DCFR Publication), pp. 1-184.
- Pandey, N.N., Patiyal, R.S., Shahi, N., and Akhtar, M.S. 2012: Souvenir cum abstract book–National Seminar on Mountain Fisheries: Challenges and Opportunity for Livelihood Security Organized by DCFR, Bhimtal during 5-6 November, pp. 1-135.
- Patiyal R.S., Pandey N.N., Kumar P. Joshi A., 2012: Himjyoti (Hindi), DCFR Bhimtal Publication. pp.1-107.
- Patiyal, R.S., Kumar, P., Joshi, A., (2011-2012). Annual Report Hindi: Directorate of Coldwater Fisheries Research, Bhimtal, ICAR.

Bulletins

- Pande A., Pandey N.N., Chandra S., Mallik S. K., Thakuria D., Kumar A. B.S., Haldar R.S., 2012: Important coldwater fish diseases and their control. DCFR, *Bulletin* No. 21. pp. 47.
- Sarma D., Mahanta P. C., 2012: Captive breeding and growth of Golden Mahseer (*Tor putitora*). A(B)ACA *Bulletin* 2012. Pp. No. 1-7.
- Sarma D., Das D.N., Dutta R., Baruah D., Kumar P., Tyagi B.C., Mahanta P.C., 2012: Coldwater Lakes and Rivers in Aruchachal Pradesh, India. DCFR, *Bulletin* No. 19.

Chapters in Book/Manual/Proceedings

- Barat, A., Ali, S., Sahoo, P.K. and Patiyal, R.S. 2012:Application of molecular markers for studies of fish genetic diversity. *In*: *Souvenir of workshop on sustainable utilization of mountain fishery resources of North East region*, 24-25 March, pp 58-64.
- Chandra, S., Pande, A., Mallik, S.K., 2013: Thande jal ki machalion ke pramukh rog – lakshan, karan, aur unki pehchan *In:* S.K. Srivastava, A.Barat, Suresh Chandra. *Training manual* on "Management practices for coldwater aquaculture" 01-08 March. Published by DCFR. pp. 38-44.
- Chandra, S., Srivastava, S.K., Patiyal, R.S., 2013: Rainbow trout ka beej utpadan avam prajanan taknik *In:* S.K. Srivastava, A.Barat, Suresh Chandra. *Training manual* on "Management practices for coldwater aquaculture" 01-08 March. Published by DCFR. pp. 22-28.
- Chandra. S., Patiyal R.S. 2012: Bhabhar ke talabon main machli palan-gaon ki khushali ka ek uttam sadhan In*:* S.K. Srivastava, A.Barat, Suresh Chandra. *Training manual* on "Management practices for coldwater aquaculture" 01-08 March. Published by DCFR. pp. 08-20.
- Chandra. S., Srivastava, S.K., Patiyal, R.S., and Sahoo, P.K., 2013 Sheetjal mmain pai jane wali pramukh matsya prajation ki jankari. *In:* S.K. Srivastava, A.Barat, Suresh Chandra. *Training manual* on "Management practices for coldwater aquaculture" 01-08 March. Published by DCFR. pp. 01-05.
- Gupta, S.K., Saharan, N., Prusty, A.K., Akhtar, M.S., Mandal, S.C., and Kumar, K., 2013: Ultramicroscopical changes in the gills of *C. carpio* fry due to fipronil toxicity. *In:* Bharti Pawan K. (Ed.) *Aquatic environment and toxicity*, Discovery publishing house, New Delhi, pp. 195-209.
- Gupta, S.K., Saharan, N., Gupta, A., Sharma, K.K., and Prusty, A.K., 2013: Impact of fipronil on the aquatic environment. *In:* Bharti Pawan K and Kaoud H.A. (Eds.), *Biodiversity of aquatic environment*, Discovery publishing house, New Delhi, pp. 118-137.
- Gupta, S.K., Srivastava, S.K., Sarma, D., 2013: Aquarium samayojan evam ran birangi machliyopn ka rakhrakho *In:* S.K. Srivastava, A.Barat, Suresh Chandra. *Training manual* on "Management practices for coldwater aquaculture" 01-08 March. Published by DCFR. pp. 34-37.
- Gupta, S.K., Srivastava, S.K., Sarma, D., 2013: Matsya ahar avam poshan *In:* S.K. Srivastava, A.Barat, Suresh Chandra. *Training manual* on "Management practices for coldwater aquaculture" 01-08 March. Published by DCFR pp.29-33.
- Kumar, P., Nayak, A.K., Pandey, N.N., and Mahanta, P. C., 2012: Application of Geoinformatics in coldwater fisheries management *In*: Sarma, D. Pande, A, Chandra, S. and Gupta, S.K. (Eds.), *Compendium on coldwater fisheries–25 years* on sustainable research and management. Published by DCFR, Bhimtal pp. 83-88pp.
- Pande, A., Mallik, S. K., Chandra, S., Pandey, N.N., Thakuria D., Kumar A.B.S., and Haldar, R.S., 2012: Coldwater fish diseases in India: Status and strategies *In*: Sarma, D. Pande, A, Chandra, S. and Gupta, S.K. (Eds.), *Compendium on coldwater fisheries–25 years* on sustainable research and management. Published by DCFR, Bhimtal pp. 83-88pp.
- Pandey, N.N., Ali, S., Kumar, P., and Mahanta, P.C., 2013: Drought like condition affecting lakes and their fisheries in Kumaon region of Uttarakhad state : *In: Proceedings* of the centenary session of the Indian science congress, Kolkata, pp. 202-203
- Pandey, N.N., Ali, S., Kumar, P., and Mahanta, P.C., 2013: Influence of increasing temperature on coldwater aquaculture practice: *In: Proceedings* of the centenary session of the Indian science congress, Kolkata, pp.102-103.
- Patiyal R.S., Chandra S., Kumar P., Barat A., Pandey N.N. (2012). Parvatiya khshetron meon matasya aakhet paryatan ki sambhavnayen.

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- Patiyal R.S., Mahanta P.C. (2012). "Sajeev matsya jeen bank" Matsyapalan evem Matsya Sangrakshan ke beech kadi ki Bhoomika Mai. *In:Him Jyoti* , annual hindi publication, DCFR, Bhimtal, pp. 88-93
- Sarma, D., Bhagawati, K. and Akhtar, M.S., 2012: Livelihood Security through Aquaculture in Assam, *In:* Pandey, N. N., Patiyal, R. S., Shahi, N and Akhtar, M.S. (Eds.), *Souvenir* cum abstract book – National Seminar on Mountain Fisheries : Challenges and Opportunity for Livelihood Security Organized by DCFR, Bhimtal during 5-6 November, pp. 73-76.
- Sarma, D., Pandey, N.N., Akhtar, M.S., Shahi, N., Gupta, SK., and Mahanta, P.C., 2012: Status and strategies of coldwater fish farming: Scope for its sustainable development and conservation, *In*: Sarma, D. Pande, A, Chandra, S. and Gupta, S.K. (Eds.), *Compendium* on coldwater fisheries–25 years on sustainable research and management. Published by DCFR, Bhimtal pp. 184-189.
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- Srivastava, S.K., Chandra, S., Gupta, S.K., 2013: Common carp (*cyprinus caripo*) ka prajanan avam prabandhan *In:* S.K. Srivastava, A.Barat, Suresh Chandra. *Training manual* on "Management practices for coldwater aquaculture" 01-08 March Published by DCFR. pp.13-18.
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- Srivastava, S.K., Chandra. S., Gupta, S.K., Pandey, N.N., and Mahanta, P.C., 2012: Experimental field centre Champawat: Leaping ahead for development of Hill aquaculture, *In*: Sarma, D. Pande, A, Chandra, S. and Gupta, S.K. (Eds.), *Compendium* on coldwater fisheries–25 years of sustainable research and management. Published by DCFR, Bhimtal pp. 65-71.

Popular /Technical Articles

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- Chandra. S., Pande, A., Mallik, S.K., 2012: Seetjal machliyo ki pramukh Bimariya-Lakshan evem Upchaar *In: Himjyoti,* DCFR Annual publication. pp. 62-72.
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- Pande, A., Pandey, N.N., 2012: Sheetjal machaliyon ke visahanu janit roj evam aur unse bachaoo. *In: Himjyoti*, DCFR Annual publication. pp. 82-84
- Patiyal R.S., Chandra S., Kumar P., Barat A., Pandey, N.N., 2012: Parvatiya khshetron meon matasya aakhet paryatan ki sambhavnayen. *In: Himjyoti,* DCFR Annual Publication. pp. 30-34.
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- Sarma, D., Haldar, R.S., Akhtar, M.S., and Mahanta, P.C., 2012: Breeding and Hatchery Management of Golden Mahseer. *In*: *Himjyoti*, DCFR Annual Publication. pp. 21-29.

Abstract/papers submitted to seminars/symposium/ workshop

- Ali, S., Barat, A., Pandey, H., Sivaraman, G.K., 2012: Population genetic study of five

population of *Schizothorax richardsonii* using Cytochrome b gene sequences. Abstract No. BH-18. *In*: Souvenir cum abstract book of National Seminar on Mountain Fisheries: Challenges and Opportunity for Livelihood Security, DCFR, Bhimtal, 5-6 November, pp 115.

- Ali, S., Pandey, N.N., and Kumar, P., 2012: Investigation of fish fauna along the stretch of the river Ravi falling within the Chamba district of Himachal Pradesh (RA-11): *In*: N.N. Pandey, R.S. Patiyal, Neetu Sahi and M.S. Akhtar (eds.) Souvenir cum Abstract book of national seminar on mountain fisheries challenges and opportunity for livelihood security 5-6 Nov. 2012. pp. 85.
- Barat A., Sahoo, P.K., Goel, C., Ali, S., Patiyal R.S. 2012: Validation of two novel of *S. richardsonii* involved in cold tolerance at Central Institute of poster presentation Fisheries Education, Mumbai 2-3 Nov.
- Barat A., Sahoo, P.K., Patiyal, R.S., Ali, S., and Mahanta, P.C., 2012: Genomics Research at DCFR. Silver Jubilee Compendium on Coldwater Fisheries, Directorate of Cold Water Fisheries Research (ICAR). pp. 89-94.
- Belwal, K. and Pande A., 2012: Characterization and expression analysis of Toll like Receptors 3 (TLR-3) and its role in recognizing viral PAMPs in *Bariliusbendelisis*. Poster presented at VIROCON, XXI National Conference on "Immuno-biology and Management of Viral Diseases in 21st Century held at Indian Veterinary Research Institute, Mukteshwar from 8th-10th Nov.
- Belwal, K., Anand Kumar B.S., Thakuria, D. and Pande A., 2012: Molecular characterization of Toll like receptor TLR-3 in snow trout *Schizothoraxrichardsonii*. Poster presented at National Seminar on "Mountain Fisheries: Challenges and Opportunity for Livelihood Security" organised by Directorate of Coldwater Fisheries Research, Bhimtal during 5-6th Nov.
- Chandra, S., 2013: Seasonal Incidences of Common Health Problems in Farmed Rainbow Trout (*Oncorhynchus mykiss*) at Champawat Fish Farm, Uttarakhand, India .3rd *National Conference on Innovations in Indian Science, Engineering & Technology.,2013*. NPL (CSIR) IARI (ICAR), New Delhi; Feb. 25-27, pp. 254.
- Chaturvedi, P., Thakuria, D. and Pande A., 2012: Molecular cloning and characterization of important antimicrobial peptide genes from golden mahseer (*Tor putitora*) Abstract presented at National Seminar on "Mountain Fisheries: Challenges and Opportunity for Livelihood Security" organised by Directorate of Coldwater Fisheries Research, Bhimtal during 5-6th Nov.
- Darshan, A., Barat, A., Sahoo, P.K., Ali, S., Kumar, P., Mahanta, P.C., 2012: Phylogenetic relationship among the five species of *Mystus* distributed in North east India as inferred from Cytochrome oxidase 1 gene sequence. Abstract No. BH-30, In: Souvenir cum abstract book of National Seminar on Mountain Fisheries: Challenges and Opportunity for Livelihood Security, DCFR, Bhimtal, 5-6 November, 2012, pp. 122.
- Dhanik, M. and Pande A., 2012: Homology modelling of infectious hematopoietic necrosis virus glycoprotein. Abstract presented at VIROCON, XXINational Conference on "Immuno-biology and Management of Viral Diseases in 21st Century held at Indian Veterinary Research Institute, Mukteshwar from 8th-10th Nov.
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Linkages

DCFR promoted collaboration with the following national organizations and agencies during the period under report.

ICAR Institutes

ICAR Research Complex, NEH, Sikkim Centre, Tadong
NBFGR, Lucknow
CIFRI, Barrackpur
CIFA, Bhubaneshwar
CIBA, Chennai
CIFT, Kochi
CIFE, Mumbai
PDFMD, Mukteswar
IVRI, Mukteswar
CITH, Mukteswar
VPKAS, Almora, Uttarakhand

State Ministeries/Department

Department of Fisheries, Arunachal Pradesh
Department of Fisheries, Sikkim
Department of Fisheries, J&K
Department of Fisheries, H.P
Department of Fisheries, Uttarakhand

Universities & College

GBPUA&T, Pantnagar
Rajiv Gandhi University, Itanagar, Arunachal Pradesh
GB Pant Institute of Himalayan Environment and Development, Almora,UK
College of Fisheries, SKUAS&T, Srinagar, J&K
CSKHP Agri. Univ., Palampur, H.P
Kumaun Univ., Nainital, UK
HNB Garhwal Univ., Srinagar, UK

Library & Information Services

The DCFR Library and Documentation Unit acts as a repository of literature and information. It provides latest information in the field of fisheries and allied aspects.

During 2012-13, Directorate subscribed 16 foreign and 10 Indian journals and procured 178 scientific books of both Indian and foreign author. The current holding of the library includes 2809 books, 1693 volumes of foreign journals, 536 volumes of Indian journals and 3000 other publications. The library provides services to the scientists and other staff members of the Institute apart from scholars, researchers, students and other person from local organizations interested in scientific literature on coldwater fisheries and allied subjects. The total expenditure incurred by the library during the year under report was Rs. 35,66,603/-

Exhibition of scientific books at DCFR

Library Automation

The various activities of library have been computerized using TLLS software. The records of books, journals, bulletins etc were entered in the database. The barcoding of books and periodicals are actively being done. The digitization work of the Institute's publications are also under process.

Information Services

The library also provides facility to access free online downloads of publications and articles of many international and national journals through www.cera.jccc.in. The library is further continuing its efforts in collection, processing and disseminating scientific/ technical information to the potential users.

Reprography Services

The library maintained active reprography services by producing departmental publications and supplying required photocopies to the scientists, research scholars as well as research organizations.

Exchange Services

The library maintained exchange relationship with various research organizations and institutes of national and international level. The annual reports, special publications and technical bulletins published from time to time have been mailed to about 250 organizations, institutions and fishery agencies.

Documentation Section

The documentation section of the library is entrusted with responsibility of publication of

Important publications of DCFR during 2012-13

scientific bulletins, brochures, pamphlets, annual reports and newsletters. During the period, this section published 3 bulletins, 8 silver jubilee publications, annual report, newsletters, 24 extension leaflets/ folders and other important publications. Most of them have been published both in English and Hindi for the benefit of scientific as well as farming community.

Directorate's publications during the year

Bulletin	:	3 nos
Souvenir cum abstract book	:	1 nos
Compendium	:	1nos
Others	:	3 nos
Leaflets/folders	:	24 nos

Distinguished Visitors

The following distinguished personalities visited DCFR during the year 2012-2013.

- Mr. Tariq Anwar Ji, Hon'ble Minister of State for Agriculture & Food Processing Industry, Govt. of India
- Dr. (Mrs.) B. Meenakumari, Deputy Director General (Fisheries), Indian Council of Agricultural Research, Krishi Anusandhan Bhavan II, Pusa, New Delhi
- Dr. S.D. Singh, Asstt.Director General (I.FY.), Indian Council of Agricultural Research, Krishi Anusandhan Bhavan II, Pusa, New Delhi
- Prof. Brij Gopal, Ex-Head, School of Environmental Sciences, Jawaharlal Nehru University(JNU), New Delhi
- Prof. R.S. Chauhan, College of Fishery Science, G.B. Pant University of Agriculture & Technology, Pantnagar
- Prof. I.J. Singh, Dean, College of Fishery Science, G.B. Pant University of Agriculture & Technology, Pantnagar
- Prof. A.K. Pant, Director, Birla Institute of Applied Sciences, Bhimtal
- Dr. Dilip Kumar, Former Director, Central Institute of Fisheries Education (CIFE), Mumbai
- Dr. S.D. Tripathi, Former Director, Central Institute of Fisheries Education (CIFE), Mumbai
- Dr. S.A.H., Abidi, Former Member, ASRB, New Delhi
- Prof. M.Y. Kamal, Former Vice Chancellor, Sher-E-Kashmir University of Ag. & Tech., Srinagar
- Dr. V.V. Sugunan, Former ADG (I.Fy.), ICAR, PUSA, New Delhi
- Dr. V.R. Chitranshi, Former ADG (I.Fy.), ICAR, PUSA, New Delhi
- Dr. Madan Mohan, ADG (M.Fy.), ICAR, PUSA, New Delhi
- Dr. K.L. Sehgal, Former Director, Directorate of Coldwater Fisheries Research, Bhimtal
- Dr. P. Jayasankar, Director, Central Institute of Freshwater Aquaculture, Bhubaneshwar
- Dr. A.P. Sharma, Director, Central Inland Fishery Research Institute, Barrackpore
- Dr. S.P. Ayyar, Ex-Director, Central Inland Fishery Research Institute, Barrackpore
- Dr. Piyush Punia, Head & Pr. Scientist, National Bureau of Fish Genetic Research, Lucknow
- Dr. Malvika Das, Associate Professor, College of Fisheries, G.B. Pant University of Agriculture & Technology, Pantnagar
- Dr. K.D. Joshi, Head Central Inland Fishery Research Institute, Allahabad
- Dr. A.K. Nayak, Sr. Scientist, Directorate of Water Management, Bhubaneswar
- Dr. C.B. Joshi, Ex-Pr. Scientist, Directorate of Coldwater Fisheries Research, Bhimtal
- Dr. B.C. Tyagi, Ex-Pr. Scientist, Directorate of Coldwater Fisheries Research, Bhimtal
- Dr. Krishna Gopal, Head, Industrial Toxicology Research Centre, Lucknow
- Dr. D.N. Das, Professor, Department of Zoology, Rajiv Gandhi University, Itanagar
- Prof. Sarvesh Kumar, Former H.O.D., Department of Zoology, Kumaon University, Nainital
- Dr. A.S. Ninanwe, Advisor, Department of Biotechnology, New Delhi

Visitors at Champawat Centre

- Dr. (Mrs.) B. Meenakumari, DDG (Fy.) visited DCFR Champawat Centre on 8th July 2012.
- Shri, Tripathi, SDM Lohaghat, visited Champawat Centre on 18th December, 2012
- Dr. K.D. Joshi, Head & PS Riverine Division, CIFRI, Allahabad visited the Field Centre Champawat on 14th November, 2012
- Dr. Arun S. Ninawe, Scientist 'G" Advisor (DBT), Govt. of India, visited the Field Centre Champawat on 22nd December, 2012
- Prof. R.S.Chauchan along with BFSc and MFSc students visited DCFR Champawat Centre on 29th October, 2012

Staff News

Joining

The following members joined DCFR family during the period under report:

- Mr. Arun Khulbe, Assistant joined DCFR on 15th June, 2012.
- Mr. Ankesh Kumar Sinha, Assistant joined DCFR on 19th September, 2012.

Promotions

The following staff members of the DCFR were promoted to the next higher grade:

- Dr. (Mrs.) P.K. Sahoo was promoted from Sr. Scientist to Pr. Scientist w.e.f 1st January, 2009.
- Mr. Amit Kumar Joshi was promoted from T-5 to T-6 w.e.f. 13th November, 2012
- Mr. Santosh Kumar was promoted from T-4 to T-5 w.e.f. 26th December, 2010.
- Mr. Amit Kumar Saxena was promoted from T-3 to T-4 w.e.f. 28th July, 2011.
- Mr. Vijay Kumar Singh was promoted from T-3 to T-4 w.e.f. 26th July, 2011.
- Mr. Manoj Kumar Yadav was promoted from T-1 to T-2 w.e.f. 26th July, 2011.
- Mr. J.C. Bhandari was promoted from U.D.C. to Assistant w.e.f. 26th December, 2012.
- Mr. Pratap Singh Bisht was promoted from L.D.C to U.D.C. w.e.f. 19th June, 2012.
- Mrs. Munni Bhakt was promoted from L.D.C to U.D.C. w.e.f. 27th December, 2012.

Retirement

- Dr. P.C. Mahanta, Director, DCFR retired from ICAR services on superannuation on 31st December, 2012.

Farewell to Dr. P.C. Mahanta, Director

Personnel

List of staff (As on March 31, 2013)

Research Management

Dr. Ashoktaru Barat, Director (Acting)

Scientific

1.	Dr. (Mrs.) P. K. Sahoo, Principal Scientist	Fish & Fishery Science
2.	Dr. Debajit Sarma, Principal Scientist	Fish & Fishery Science
3.	Dr. Amit Pande, Senior Scientist	Biotechnology (Animal science)
4.	Dr. Nityanand Pandey, Senior Scientist	Aquaculture
5.	Dr. Prem Kumar, Senior Scientist	Fish & Fishery Science
6.	Dr. S.K. Srivastava, Senior Scientist	Fish & Fishery Science
7.	Dr. Suresh Chandra, Senior Scientist	Fish Pathology
8.	Dr. R. S. Patiyal, Senior Scientist	Animal/Fish Genetics & Breeding
9.	Sh. Sumanta Kumar Mallik, Scientist	Aquaculture
10.	Dr. Shahnawaz Ali, Scientist	Aquaculture
11.	Dr. Neetu Shahi, Scientist	Biotechnology (Animal Science)
12.	Dr. Md. Shahbaz Akhtar, Scientist	Fish & Fishery Science
13.	Dr. Dimpal Thakuria, Scientist	Biochemistry (Animal science)
14.	Dr. Ananda Kumar B.S., Scientist	Veterinary Microbiology
15.	Dr. Sanjay Kumar Gupta, Scientist	Fish & Fishery Science

Technical

1.	Sh. R.S. Haldar	T-6 (Farm Manager)
2.	Sh. A.K. Joshi	T-6 (Hindi Translator)
3.	Sh. Baldev Singh	T-5 (Librarian)
4.	Sh. Santosh Kumar	T-5
5.	Sh. Ravinder Kumar	T-4
6.	Sh. Vijoy Kumar Singh	T-4
7.	Sh. Amit Kumar Saxena	T-4
8.	Sh. Hansa Dutt	T-3
9.	Sh. Gopal	T-3
10.	Sh. T.M. Sharma	T-3
11.	Sh. R.K. Arya	T-3
12.	Sh. Manoj Kumar Yadav, Driver	T-2
13.	Sh. Partha Das	T-1

Administrative

1.	Sh. Y.S. Dhanik	Admn. Officer
2.	Sh. Harish Ram	Asstt. Admn. Officer
3..	Sh. B.C. Pandey	Asstt. Fin. & Acc. Officer
4.	Smt. Khilawati Rawat	Asstt. Admn. Officer
5.	Smt. Susheela Tewari	Private Secretary
6.	Sh. P.C. Tewari	Assistant
7.	Sh. Arun Khulbe	Assistant (Joined on 15.6.12)
8.	Sh. Ankesh Kumar Sinha	Assistant (Joined on 19.9.12)
9.	Sh. J.C. Bhandari	Assistant
10.	Sh. Pratap Singh	UDC
11.	Smt. Munni Bhakt	UDC
12.	Sh. Hayat Singh Chauhan	LDC
13.	Sh. Hansa Singh Bhandari	LDC

Skilled Supporting Staff

1.	Sh. Ravinder Kumar	Skilled Supporting Staff
2.	Sh. Om raj	-do-
3.	Sh. Sunder Lal	-do-
4.	Sh. Prakash Akela	-do-
5.	Sh. Pooran Chandra	-do-
6.	Sh. Manoj Kumar	-do-
7.	Sh. Kuldeep Kumar	-do-
8.	Sh. Bhola Dutt Mouni	-do-
9.	Sh. Dharam Singh	-do-
10.	Smt. Basanti Devi	-do-
11.	Sh. Mangla Prasad	-do-
12.	Sh. Sushil Kumar	-do-

OBITUARY

The Director and all the Staff of DCFR express their condolence and deepest sympathies on the sad demise of **Dr. K.L. Sehgal**, Former Director, DCFR, Bhimtal who has left for heavenly abode on 5th March, 2013. May his soul rest in peace and Almighty God give strength to his bereaved family.

Appendix-I

DCFR Field Centre Champawat

An experimental fish farm is located at Chhirapani in Champawat, Uttarakhand. This centre is carrying out Human Resource Development and extension activities including various research programmes. Research activity includes breeding and culture of coldwater fishes, Quality seed production, hatchery and pond management.

Address:

Scientist In-charge
DCFR Field Centre Chhirapani Fish Farm,
Tarkeshwar, Post Morari,
Distt. Champawat-262 523, Uttarakhand, India
Phone: 05965-230052
E-mail: srivastavask100@gmail.com

Consultancy

Investigation of fish fauna in river Sutluj basin, Himachal Pradesh

Under Institutional consultancy for cumulative environmental Impact assessment studies of Satluj basin in HP as partner Institute with ICFRE, Dehradun, A survey on the occurrence of important fish fauna in the River was conducted by a team of Scientists from Directorate of Coldwater Fisheries Research (DCFR).

- Dr. D. Sarma provided consultancy services regarding "Construction and Establishment of Mahseer Hatchery" to Assam Bhoreli Angling and Conservation Association, Tezpur, Nameri, Assam, Department of Fisheries, Govt. of Himachal Pradesh and LANCO Energy Pvt. Ltd., Teestha-VI project, Sikkim.

Important Committees

Members of The Institute Management Committee

Dr. P.C. Mahanta Director, DCFR, Bhimtal	Chairman
Dr. S. D. Singh Asstt. Director General (I. Fy.), ICAR, KAB II, New Delhi	Member
Dr. A.B. Pandey Head, IVRI Station Mukteshwar, Uttarakhand	Member
Dr. P.K. Agarwal Principal Scientist & Head, VPKAS, Almora, Uttarakhand	Member
Dr. Pradeep Katiha Principal Scientist, CIFRI, Barackpore	Member
Dr. Piyush Punia Principal Scientist, NBFGR, Lucknow	Member
Shri S.R. Chanyal Joint Director, Department of Fisheries, Govt. of Uttarakhand, Dehradun	Member
Shri Farooq Nawchoo Joint Director, Department of Fisheries, Govt. of J & K	Member
Dr. Malavika Das Professor, College of Fishery Science, GBPUAT, Pantnagar	Member
Shri Ashish Srivastava Finance & Accounts Officer, IVRI, Izzatnagar	Member
Shri Y.S. Dhanik, AO, DCFR	Member Secretary

Members of The Research Advisory Committee

Dr. K.K. Vass, Former Director, CIFRI, Barrackpore	Chairman
Dr. S.D. Singh, ADG (I. Fy.), ICAR, New Delhi	Member
Prof. Amalesh Dutta Department of Zoology, Gauhati University, Guwahati	Member
Prof. D.N. Das Department of Zoology, Rajiv Gandhi University, Itanagar, Arunachal Pradesh	Member
Prof. P.C.Joshi, Department of Environmental Sciences, Gurkul Kangri University, Haridwar	Member
Prof. R. S. Chauhan College of Fishery Sciences, GBPUA&T, Pantnagar	Member

Dr. Krishna Gopal, Head, Division of Aquatic Toxicology, IITR (CSIR), Lucknow	Member
Dr. A. Barat, Principal Scientist, DCFR, Bhimtal	Member Secretary

Members of The Quinquennial Review Team

Dr. M. Sinha, Ex-Director, CIFRI, Barrackpore, Directorate of Fisheries, Pandit Nehru Complex, Agartala	Chairman
Dr. M.H. Balkhi, Dean, Faculty of Fisheries Sciences, SKUAST, Srinagar	Member
Dr. B.D. Sharma, Former Director, Fisheries Department, Govt. of Himachal Pradesh, Bilaspur, Himachal Pradesh	Member
Dr. M.M. Goswami, Professor, Zoology Department, Guwahati University, Guwahati	Member
Dr. V.K. Sharma, Ex-SIC CIFE Rohtak Centre, Karnal	Member
Dr. Prem Kumar, Senior Scientist, DCFR, Bhimtal	Member Secretary

Members of Institute Technology Management Committee

Dr. P.C. Mahanta Director, DCFR, Bhimtal	Chairman
Dr. A. Barat Principal Scientist, DCFR, Bhimtal	Member
Dr. D. Sarma Principal Scientist, DCFR, Bhimtal	Member
Dr. S.K. Srivastava Senior Scientist, DCFR, Champawat	Member
Dr. S. Ali Scientist, DCFR, Bhimtal	Member
Dr. P.K. Agarwal Principal Scientist, VPKAS Almora	Member
Dr. Prem Kumar Senior Scientist, DCFR, Bhimtal	Member Secretary

Members of Project Monitoring & Evaluation Cell

Dr. (Mrs.) P.K. Sahoo, Principal Scientist, DCFR, Bhimtal	Officer Incharge PME Cell
Dr. R.S. Haldar, T-6, DCFR, Bhimtal	Member

Sh. Amit Kumar Joshi, T-5, DCFR, Bhimtal	Member
Sh. Amit Kumar Saxena, T-4, DCFR, Bhimtal	Member
Sh. Vijay Kumar Singh, T-4, DCFR, Bhimtal	Member
Mrs. Susheela Tewari, PS to Director, DCFR, Bhimtal	Secretarial Assistance

Members of Project Monitoring & Evaluation Committee

Dr. A. Barat, Director, DCFR, Bhimtal	Chairman
Dr. D. Sarma, Principal Scientist & Incharge, Aquaculture DCFR, Bhimtal	In-charge
Dr. Amit Pande, Senior Scientist & Incharge, Fish Health DCFR, Bhimtal	Member
Dr. N.N. Pandey, Senior Scientist & Incharge, Res. Assessment & Extension, DCFR Bhimtal	Member
Dr. S.K. Srivastava, Senior Scientist & Incharge, Exp. Field Centre, Champawat DCFR, Champawat	Member
Dr. Prem Kumar, Senior Scientist & Incharge, AKMU, ITMU & GIS, DCFR, Bhimtal	Member
Dr. (Mrs.) P.K. Sahoo, Principal Scientist, DCFR, Bhimtal	Member Secretary

Members of Result Framework Documentation

Dr. (Mrs.) P.K. Sahoo, Principal Scientist, DCFR, Bhimtal	Nodal Officer
Dr. S. Ali, Scientist, DCFR, Champawat	Co - Nodal Officer
Dr. Prem Kumar, Senior Scientist DCFR, Bhimtal	Member

Institute Joint Staff Council

Official Side	
Dr. P.C. Mahanta	Chairman
Dr. A. Barat	Member
Dr. S.K. Srivastava	Member
Shri Y.S. Dhanik	Member
Shri Harish Ram	Member Secretary
Shri B.C. Pandey	Member

Smt. Khilawati Rawat	Member
Staff Side	
Shri J.C. Bhandari	Member
Shri P.S. Bisht	CJSC Member
Shri Santosh Kumar	Member
Shri T.M. Sharma	Member Secretary
Shri Bhola Dutt Mouni	Member
Shri Sushil Kumar	Member

HYPM, PERMISNET & PIMS

Dr. Prem Kumar, Senior Scientist DCFR, Bhimtal	Nodal Officer,HYPM, PERMISNET& PIMS

Notes

Notes

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

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भीमताल, नैनीताल, उत्तराखण्ड, भारत

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