ICAR-DCFR
NEWSLETTER
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FROM DIRECTOR'S DESK

Directorate of cold-water fisheries research has been continuously working for the enhancement of productivity in coldwater fish farming, assessment of the cold-water aquatic resources and fish diversity conservation of endemic cold-water species. We have formulated and developed a rainbow trout starter feed of which validation has been carried out in 8 different places of 4 Himalayan states of the country. The success of the results has outperformed the existing feed having better feed conversion ratio (FCR), maximizing the growth and survival, enhancing the feed efficiency resulting in reducing the crop duration of rainbow trout during the nursery rearing period. The rainbow trout feed has been now commercialized with Growel pvt Ltd., Andhra Pradesh. DCFR also has been successfully demonstrating rainbow trout production in Recirculatory Aquaculture System (RAS). The RAS technology is expected to disseminate to the coldwater fish farmers, entrepreneurs & other stakeholders within a short span of time. Another breakthrough of this institute is captive breeding and seed production of Golden and Chocolate mahseer with photothermal and substratum manipulation technique. This technology will be helpful in solving conservation and rehabilitation issues of endangered mahseer in our Indian Himalayan waters.

The scientists of DCFR has been putting a lot of efforts in the laboratories to address the issue on health management, molecular approach for sex determination of cold-water species at early stage, development of rapid assay techniques for identification of Saprolegnia species and development of synthetic peptides etc.

DCFR is reaching to the farmers through various developmental programs like SCSP, TSP, Mera Gaon Mera Gaurav and NEH activities giving direct benefit to the farmers while providing training, skill development programs for the improvement of their livelihood security in various Himalayan states of the country.

To fight against the COVID-19 pandemic, DCFR has played a vital role in the state of Uttarakhand. The scientists, technicals and students have performed the COVID testing in VRDL, Haldwani and IVRI, Mukteshwar for the entire pandemic period through RT-PCR. The staff of this Directorate also led from the front by distributing food to the needy among the local people surrounding the institute. During the pandemic, the Directorate has prepared 15 advisories in 7 local languages for the benefit of the farmers of different hill states to maintain the live stocks with proper sanitation.

I congratulate the editor for bringing out this issue of newsletter which will be highly beneficial for scientists, academicians, students, research scholars, farmers and entrepreneurs.

Debajit Sarma
(Director)

RESEARCH HIGHLIGHTS

Aquaculture

Breeding and seed production of stone suckers

Stone suckers belonging to genus *Garra* are one of the suitable substitutes for the popular algae eater fish, Plecos which is considered as an invasive species in several countries including India. *Garra annandalei* and *G. lamta* were collected from Guwahati, Assam and Bhimtal, Uttarakhand. Induced spawning of *Garra annandalei*, and *G. lamta* was achieved in the month of June- July 2019 and May 2020 by intramuscular administration of ovatide in both females and males.

Eggs were incubated in aquarium tanks and periodically photographed for the embryonic developmental study. Hatched larvae were fed with green water for 10 days followed by egg custard and prepared feed. Around 100 fry of *Garra annandalei,* and 400 fry of *G. lamta* are now being maintained.

Rainbow trout farming in re-circulating aquaculture system

ICAR-DCFR initiated research programme on rainbow trout farming in recirculating aquaculture system with an aim to reduce water and land footprints. In northern Hill states of India, generally, rainbow trout farming is done in flow through raceways (FTR). Culture of rainbow trout in FTR requires nearly 200 m^3 of water per kg fish production and growth period is nearly 14-16 months. RAS can reduce water requirement to less than 1m^3 per kg of trout produced and culture duration to 5-6 months. Research work related to production and technological feasibility and commercial variability of farming methods are being studied in a pilot scale RAS unit at the Directorate. Initial production trial suggested that a kg of rainbow trout can be achieved by rearing for 5-6 months. This system provides opportunity to sustainably farm rainbow trout in places with limited water and land availability.

A pilot scale rainbow trout Recirculating Aquaculture System at ICAR-DCFR, Bhimtal

Harvesting rainbow trout from RAS

Haul of rainbow trout harvested from RAS

Harvest of rainbow trout from RAS

Breeding of Golden mahseer in captivity: No more dependency on wild brooders of golden mahseer for seed production!

Until recently, the breeding and seed production of endangered golden mahseer (*Tor putitora*) was carried out using wild gravid brooders collected from natural water bodies, which has been a destructive and non-sustainable practice. This dependence on wild brooders was because golden mahseer females fail to complete ovarian development and maturation in captive conditions due to endocrine dysfunctions.

Therefore, to address this issue on priority, ICAR-Directorate of Coldwater Fisheries Research, Bhimtal embarked upon conducting series of experiments for over last six years and finally achieved captive maturity and breeding through photo-thermal manipulations. This technology of captive maturity and multiple breeding of endangered golden mahseer through photo-thermal manipulations have resulted in producing a substantial number of golden mahseer fry round the year. The technology is being further validated which otherwise has been a major bottleneck for large-scale rehabilitation efforts to conserve this esteemed species.

Stripping of captive matured brooders

Golden mahseer fry produced from captive matured brooders

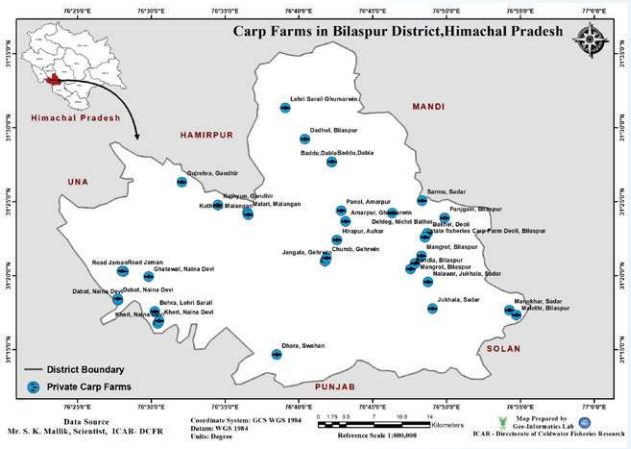
Comparative growth of three species of snow trout in field conditions

Field experiment was conducted by stocking yearlings of three species (*S. richardsonii, S. plagiostomus* and *S. progastus* at a stocking density of 40 fish /m^3 for 120 days in FRP tanks. Fishes were fed with 35% protein diet @ 5% body weight and both the species showed better growth (53-64%) over *S. richardsonii* with net weight gain in the range of 34.22-56.08g. *S. plagiostomus* also showed slightly higher growth (around 7%) than the *S. progastus*. The FCR values were high for both the species (3.82-3.46) which indicates slow growth of the species. Higher survival (>90%) of these species is an indication of better adaptation under cold climatic condition.

Fish Health Management

Surveillance of antimicrobial resistance of fish pathogens in hill aquaculture

The emergence of antimicrobial resistance in aquaculture has presently become a global threat. To meet the threat of antimicrobial resistance in hill aquaculture practices, it is high time for preparedness to combat the risk of developing antimicrobial resistance. Samples of fish gill and intestine were collected from 34 carp farms in Bilaspur district, Himachal Pradesh for the purpose of screening antimicrobial resistance



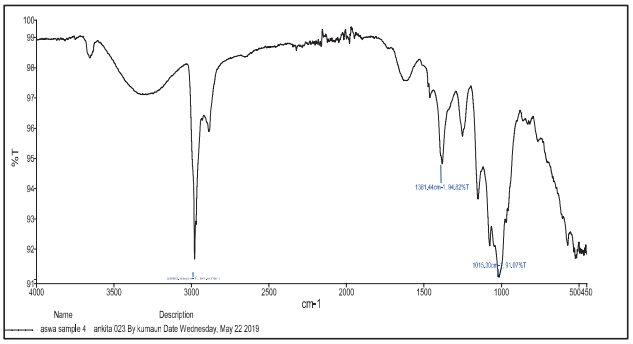
Sample collection sites for investigation of antimicrobial resistance from carp farms

in the isolates of *Aeromonas* group against a panel of selected 14 antibiotics. The results of preliminary screening showed that *Aeromonas* spp. (n=34) demonstrated *highest antimicrobial resistance against* cephalothin (58.8%), followed by cefoxitin (55.9%), ampicillin/sulbactam (52.9%), cefotaxime (26.5%) and trimethoprim/sulfamethoxazole (26.5%). Moreover, these isolates are 100% sensitive to amoxicillin/

clavulanic acid, tetracycline and ciprofloxacin. For preparedness, awareness camps and meetings should be held regularly to educate the fish farmers about the hazards of antimicrobial resistance. Injudicious use of antibiotics and other aqua-drugs in hill aquaculture practices should be prohibited to minimize the developing serious threats of antimicrobial resistance in hill aquaculture.

Identification of *Saprolegnia spp.* from coldwater fish species

Around nine isolates of *Saprolegnia spp*. from different life stages of snow trout, *Schizothorax richardsonii* were identified based on morphological and molecular methods. *Saprolegnia* was also characterised according to geographical areas and temperature regimes on central Himalayan regions. We have also identified the phytochemical compounds of Himalayan plant extract having potential anti-oomycetes activity and working on development of effective and safe control measures for early life stages of Coldwater fishes.

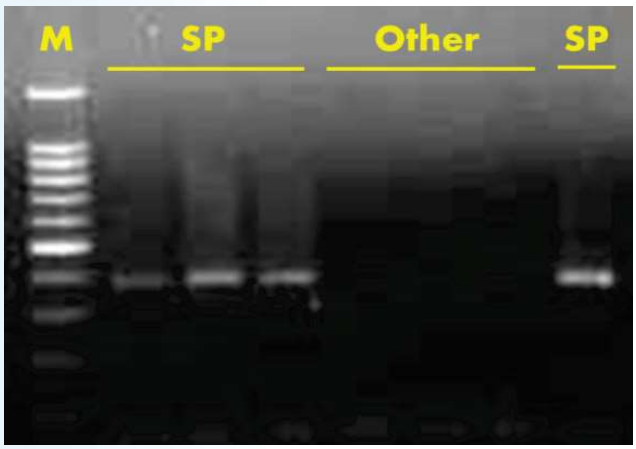


Fourier-transform infrared spectroscopy (FTIR) spectra of Himalayan plant extract

Morphological features of Saprolegnia australis from *Schizothorax richardsonii*

Puf locus targeted PCR for easy identification of *Saprolegniap arasitica*

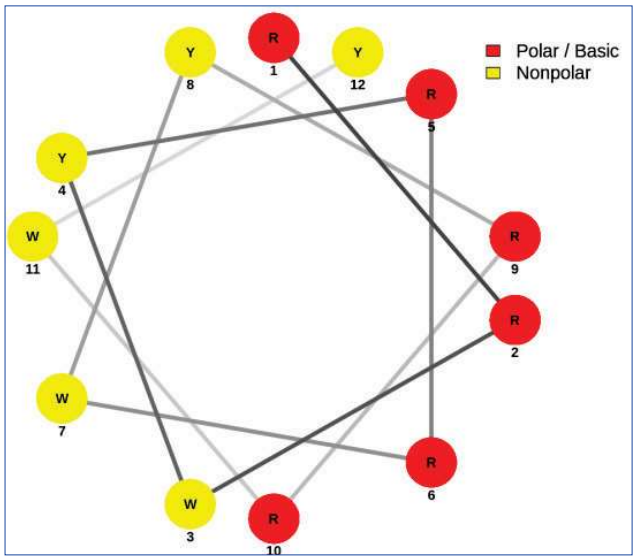
Saprolegnia is a genus of oomycetes within family *Saprolegniaceae* order *Saprolegniales*. Some members such as *S. parasitica* are highly virulent and considered as one of the most destructive fish pathogen causing enormous loss in aquaculture. Morphological identification of *Saprolegnia* species is difficult as the procedure is time consuming. Application of molecular approach can help in an easier and more accurate way to identify *Saprolegnia* species. At present, the most common molecular method for identification of *Saprolegnia* species is sequencing of internal transcribed spacer (ITS) region. Nucleotide sequencing is not a common facility in every laboratory and its outsourcing is time-consuming. Therefore, a simple PCR protocol targeting *Puf* locus was evaluated for easy identification of *S. parasitica*. The amplified product (365 bp approx.) sequenced had great similarity to *S. parasitica* hypothetical protein mRNA (XM_012354450). The sequence was submitted to NCBI GenBank (MT556640). The PCR protocol could also detect up to 100 picogram genomic DNA of *S. parasitica*. When the protocol was tested with other species of *Saprolegnia*, there was no amplification enabling differentiation between *S. parasitica* and other species. Since sequencing is not involved in this protocol, it may prove to be an easier, faster and economical method of molecular identification of *S. parasitica*.



Gel electrophoresis of Puf locus targeted PCR product (365 bp approx.). M: 100 bp marker, SP: S. parasitica, Other: Other Saprolegnia species.

Artificial peptide as potent antimicrobial agent

One artificial peptide, RY12WY, was designed and synthesized in the laboratory. It was evaluated for its antimicrobial activities against various bacterial pathogens including antibiotic resistant bacteria. The peptide showed antimicrobial activities against fish pathogens. The minimum inhibitory concentration (MIC) values ranged from 0.98 to 500 µM and minimum bactericidal concentration (MBC) ranged from 4 to 650 µM. The peptide retained antimicrobial activities at higher temperatures. Moreover, in the



Helical Wheel structure of RY12WY pepti de

presence of physiological salts and serum the peptide was active. The peptide was found to be least hemolytic. Our findings indicate that the designed peptide may have therapeutic importance in aquaculture by virtue of its antimicrobial nature.

Liquid anaesthetic formulation for fish

Safe and effective liquid anaesthetic formulation for fish is developed by ICAR-DCFR, Bhimtal. The anaesthetic, named as Aqua-FSD, is given to Agrinnovate, Dept of Agricultural Research and Education under ministry of agricultural and farmers welfare, Delhi, India as available technology for commercialization.

Fish Feed Development

Field validation and demonstration of rainbow trout starter feed

In the critical first feeding and nursery rearing stages of rainbow trout, the performance efficacy of the starter feed is a critical determinant of the quantity and quality of rainbow trout seed production. In this context, we have developed a high-performance trout starter feed through a series of feeding trials, by evaluating production related phenotypes (growth, feed use and survival); morphometric, tissue and transcriptional markers; and the pellet physical properties. Subsequently, to validate and demonstrate the performance of this starter feed at real-field

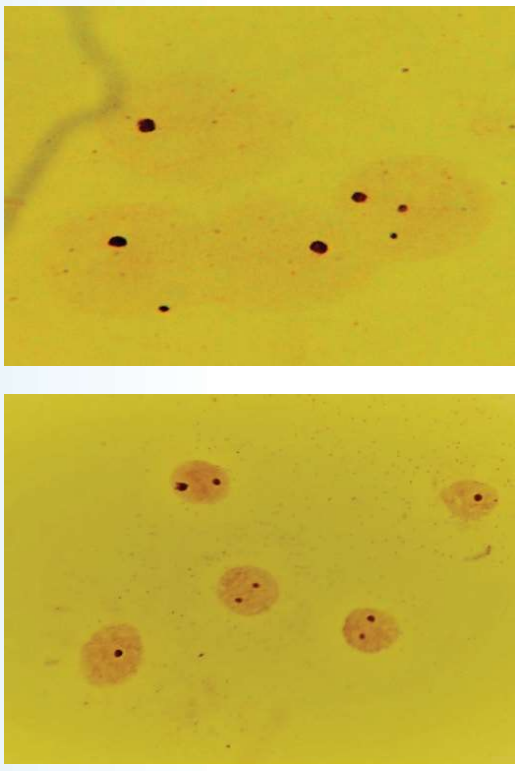
conditions, we conducted on-farm feeding trials at eight public and private trout farms in Himachal Pradesh, Union Territories of Jammu & Kashmir, Ladakh and Sikkim, from January to May 2020. For this, we partnered with Growel Feeds Pvt. Ltd., Andhra Pradesh to produce 2500 kg of nutritionally and physically superior extruded starter 1 (0.4-0.6 mm crumble) and starter 2 (0.8 mm slow sinking pellet) feeds having 50% crude protein and 15% crude fat. In all the test sites, under different environmental conditions, the performance of DCFR starter feed was found to be consistent and very good in terms of feed acceptance, use, growth, survival and size homogeneity. Specifically, on a comparative scale, this feed outperformed the existing trout starter feeds by

50-90% difference in weight gain. Survival was greater than 90% in all the test sites. Feed conversion ratio was found to range from 0.8 to 1.2, with substantially less feed wastage. Importantly, the duration of nursery rearing (from first feeding to 2 g size) was reduced from 75-90 days to 45-60 days. Based on conservative estimates, using this starter feed, DCFR has contributed to the production of more than 0.5 million healthy trout fingerlings across the country. This roughly translates to 125 tonne of trout production (considering 75% survival from stock-size to pan-size) with a combined value of 6.25 crore rupees. For further research, development and commercial supply of rainbow trout feeds, ICAR-DCFR is officially collaborating with M/s Growel Feeds, a prominent Indian feed manufacturer located in Andhra Pradesh, through a memorandum of understanding.

Fish Genetics and Biotechnology

Confirmation of triploidy in rainbow trout by silver staining

Protocol has been developed for almost 100% success in induction of triploidy in rainbow trout by pressure shock treatment using aqua pressure vessel. Karyotyping and erythrocytes measurement are direct methods for conforming the induction of triploidy. However, silver staining or AgNOR method was standardised for indirect conformation without sacrificing the specimen fish. This method is easily applicable, cost effective and less time consuming.



Indirect conformity of ploidy by silver staining in rainbow trout; A- triploids & B- diploids

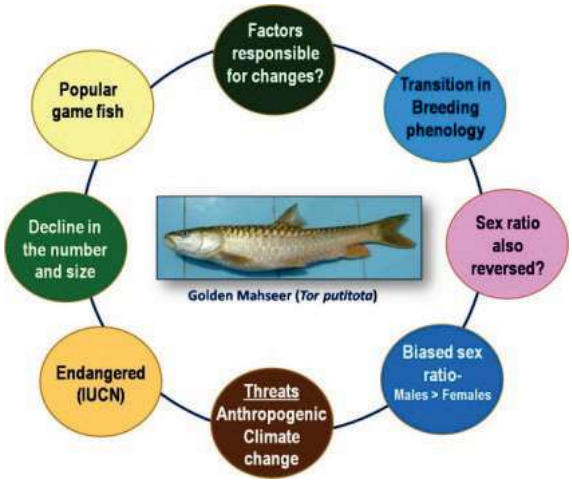
Small pieces of fin/ skin tissue are obtained and sheared on a clean slide with few drops of 50% acetic acid and air dried at room temperature. Likewise, blood smears can be prepared by taking blood from caudal peduncle. Liver tissue may also be used in case of dead specimen. Slide is treated with silver nitrate at fixed temperature and kept in dark to obtain golden staining of cells with dark dots of nuclear material. Diploids show only one and two dots in cells, while triploids show three dots in 15-45% cells along with cells having one and two dots. These findings can pave the way for production of triploids rainbow trout for better growth.

Performance evaluation of triploid rainbow trout

For assessing the physiological and production related advantages of using triploid sterile rainbow trout, a six-week growth trial was conducted to comparatively evaluate the performance traits of triploid and diploid rainbow trout juveniles, during March to May 2020. An experimental diet containing 50% protein and 15% lipid was fed to triplicate groups of diploids (control) and triploid (induced by pressure-temperature shock) fishes, twice a day, for visual satiation. At the end of the trial, significantly higher growth in the triploid group we observed, as compared to the diploids, with correspondingly lower feed conversion ratio. Survival and body condition factor were high in both groups, with no significant difference. Likewise, there was no significant difference in the critical thermal tolerance limits (measured as a fitness trait). Further, comparative evaluation of the ploidy-based differences in growth, metabolism and well-being related molecular biomarkers, external morphology, tissue histology and respiratory physiology is in progress.

Gender specific transcriptomic response to environmental stress in golden mahseer

The Himalayan or golden mahseer (*Tor putitora*) is an endangered species and its population is declining sharply due to various natural and anthropogenic reasons. Further, the species have a skewed sex ratio where males are mostly predominant than females in natural environment, that poses new threat to the sustenance of the species. Recent studies on temperature and precipitation indicated that the rate of warming in Himalayas is three times greater than global average, which makes the region highly vulnerable to climate change. Fishes being ectotherms are metabolically sensitive to environmental temperature. How they likely respond to the challenges associated with global climate change is in many ways depends upon the effects of new environmental inputs on essential physiological processes. The skewed sex ratio in



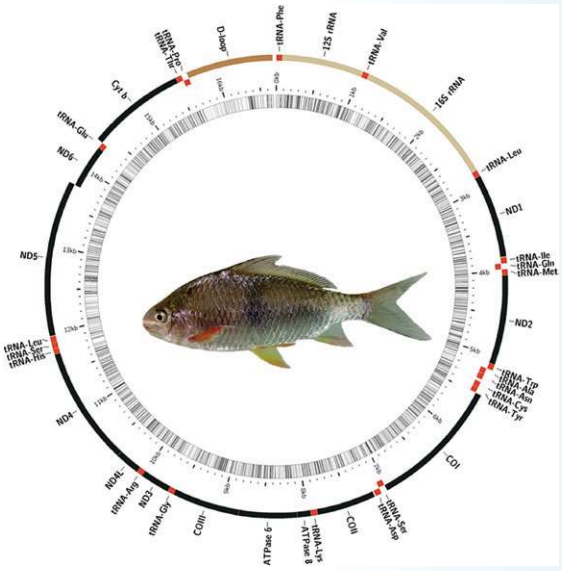
mahseer may be a response to the environmental warming. Temperature plays an important role in sex determination and, identified as an important factor in determining sex ratios, in many other species of fishes, amphibians, and reptiles. Examining these sex differences at a molecular level is important in understanding structural, behavioural, and cellular differences between sexes. Studies of transcriptome level responses to environmental change offer an opportunity to understand the underlying genetic basis for adaptation. Moreover, identifying genes of adaptive significance in a changing environment, particularly increasing temperatures is essentially required for devising appropriate management response for the sustenance of the species.

Development of cell lines from different organs of Rainbow trout

An attempt was made to culture fish cells *in vitro* for which explants were prepared from different tissues of rainbow trout namely, gills, brain, eye stalk, caudal fin, liver, spleen, head kidney and heart. The explants were washed thouroughly with PBS containing antibiotic-antimytotic and seeded in 25cc flasks supplemented with minimal essential medium containing fetal calf serum (FCS). After 24 hours cells were seen radiating from from explants of gills, brain, eye stalk, caudal fin, liver, spleen, head kidney and heart. However, in the subsequent passages, the explants from gills, eye stalk, caudal fin, liver, brain and spleen were lost due to degeneration of cells. However, cells obtained from explants of heart are being propagated *in vitro* at sixth passage with slow growth. These cells are being maintained in the laboratory to acheive higher passage levels.

Complete mitochondrial genome of the medicinal fish, *Cyprinion semiplotum*

Assamese kingfish (*Cyprinion semiplotum*) belonging to the subfamily *Barbinae* is an important food as well as aquarium fish having identified pharmacological benefits. The species has a complex taxonomic history and its phylogenetic position remains uncertain. Molecular data employed in earlier phylogenetic studies was inadequate for its phylogenetic placement. Therefore, we characterized 16,671 bp long complete mitogenome of *C. semiplotum* using next-generation sequencing. The mitogenome encodes atypical set of 13 protein-coding genes, 22 transfer RNA genes, two ribosomal RNA genes and two non-coding regions. Its gene organization, distribution pattern, nucleotide composition, tRNA secondary structure and codon usage was similar to other Cyprinid mitogenomes. However, a distinctive 90 bp insertion was found in 3′ periphery of the AT-rich control region. This can be a tool for identification of the species at population level. Further, we reconstructed the most comprehensive phylogenetic trees of *Cyprinidae* based on complete mitogenome. In the resulting phylogenetic trees, *C. semiplotum* clustered tightly with other *Barbinae* species and exhibited a sister relationship with the species of the genera *Aulopye, Barbus, Luciobarbus* and *Capoeta*. The results presented herein will support future investigations on molecular taxonomy, population genetics, evolution and molecular phylogeny of *C. semiplotum* and its relatives.



Organization of the mitochondrial genome of *C. semiplotum*

Characterization of feed intake regulatory peptides and proteins in snow trout

In order to improve our understanding of the regulation of food intake in the slow growing endemic Himalayan snow trout, *Schizothorax richardsonii*, we characterized the complete or partial nucleic acid sequence of selected feed intake regulating peptides and proteins such as agouti-related protein, apelin, cocaine and amphetamine. Regulated transcript

isoform 1 and 2, cholecystokinin, corticotropin releasing hormone, galanin/GMAP pre-pro-peptide isoforms 1A and 1B, growth hormone secretagogue receptor type 1, leptin, leptin receptor, melanin concentrating hormone, neuropeptide Y, nucleobindin 2, proopiomelanocortin and peptide transporter 1. The characterized *S. richardsonii* mRNA sequences showed maximum homology with the reports available from other cyprinid fishes and they were submitted to NCBI GenBank (MW086922-MW086937). This is the first step towards deciphering the appetite regulatory pathways, which may underlie the slow growth recorded in *S. richardsonii*.

Fish Ecotourism

Aqua-gardening in mid hill region during COVID lockdown

Small land holdings, slow growth of fish due to low temperatures and water scarcity are serious limitations for aquaculture in hilly regions.Therefore, enhancement of livelihood through ornamental fish culture and concept of aqua-gardening was promoted during COVID lockdown period. Location-specific aqua-gardening was demonstrated using low cost materials like UV resistant Silpauline sheets. Moreover, an economically viable package of practices including fish breeding was validated for backyard gardening. Since the ornamental fish culture in mid hill region is a new approach, this initiative can

LOCKDOWN SPECIAL: SHOWCASE ON Aqua-gardening with Ornamental fish (MAY 2020) – Media Coverage by TV18

provide a source of income for small and marginal farmers. Culture of ornamental fish can be carried out in limited land holdings and water resources besides low-cost of establishment and daily maintenance. During lockdown, 20 women from nearby village were motivated to adopt aqua-gardening of ornamental fish in their backyard. Farmers were trained and provided with ornamental fish seed produced at ICAR-DCFR, Bhimtal. In the month of May a demonstration of aqua-gardening was conducted in the backyard of Ms. Deepali Bist, Nisola Bhimtal. The demonstration was highly appreciated by national media and highlighted as option of livelihood security opportunity for mid hill region.

Activities under NSPAAD

Demostration cum awarness meeting was held at Bairgna Trout Farm as well as village Saji, Gasrsan, Chamoli, Uttarakhand. In this programme State Fisheries officials and fish farmers participated. During the programmes discussion regarding fish diseases and ways to overcome this problem was held. Likewise another interaction cum demonstration meet was organized at Patikhul and Bathar trout farms in Kullu, Himachal Pradesh.This programme was also attended by State Fisheries Officials along with the farmers. Stress was laid on good farming practices to prevent the trout farms from deposition of silt, diseases and other environmental problems.

ICAR-DCFR SCSP Plan and Programmes

Three programmes undertaken by ICAR-DCFR under SCSP plan and programmes during the period January to June 2020 in Assam and Uttarakhand benefiting 950 SC fish farmers. Overall, 35.05 ha area was intervened for fish based eco-tourism and unused backyards of 30 women households were developed for raising ornamental fish in Assam with the collaboration of Assam Agricultural University. Quality fish seeds, fish feeds, disinfectants, medicines, fish nets were distributed free of cost to beneficiaries. Reading materials in the form of farmers' bulletin in local Assamese language was also published. In Uttarakhand, 40 raceways were renovated and stocked with high quality trout seeds in collaboration with Department of Fisheries, district Chamoli, Govt. of

Socioeconomic Upliftment of Scheduled Caste Community of Thekeraguri Village, Nagaon & Morigaon District, Assam on 02.03.2020

Uttarakhand. High quality trout feed was provided to the 18 beneficiaries; besides fish nets and fish disinfectants were also distributed by the Directorate.

Awareness programme on Sustainable Ornamental Fisheries Development

A joint collaborative programme on **"Sustainable Ornamental Fisheries Development for Scheduled Caste Women Households in Lower Brahmaputra Valley Zone of Assam for Livelihood Security and Income Generation"** has been undertaken by ICAR-DCFR, Bhimtal with Livestock Research

Awareness programme on Sustainable Ornamental Fisheries Development in Lower Brahmaputra Valley Zone of Assam through the involvement of Scheduled Caste Population

Station, Assam Agricultural University, Hekera, Rural Kamrup district, Assam with an objective to promote ornamental fish farming in their backyards for income generation and socioeconomic development.

An Awareness progamme was organized on 27th February 2020 at Livestock Research Station, Assam Agricultural University Hekera, Rural Kamrup district, Assam for 30 women SC farmers of Kamrup and Goalpara districts of Assam under the project. Glass aquariums, ornamental fish seeds, feeds were distributed to the farmers. Backyard concrete tanks were also constructed by the farmers at their own houses for breeding and raising local ornamental fishes. Dr. D. Sarma, Director and Dr. Deepjyoti Baruah, Sr. Scientist of ICAR-DCFR participated in the programme along with the Chief Scientist and Scientists of LRS, AAU, Hekera. Dr. Jyotismita Thakuria, Scientist of LRS, AAU, Hekera coordinated the programme. Field visit was also conducted for 30 SC women farmers to witness the progress of the work.

ACTIVITIES UNDER NEH

Development of Trout Farming in Arunachal Pradesh

Successful breeding of Brown and Rainbow trout has been done at Shergaon Govt. trout farm in Arunachal Pradesh during the month of January and February, 2020 and about 8000 Brown trout fry and 4000 Rainbow trout fry were produced. Dr. R.S. Haldar, Nodal Officer, NEH activity coordinated the programme. Technical and financial support has been provided to the Department of Fisheries, Govt. of Arunachal Pradesh for maintenance of Shergaon trout hatchery facilities. Renovation of Shergaon trout hatchery has also been done for production of quality seed of Rainbow and Brown trout in relation to expansion of trout farming in the state in a scientific manner. Dr. R.S.Haldar, Nodal Officer, NEH activity coordinated the programme.

stripping

Egg collection

ICAR-DCFR developed trout hatchery in Shergaon Trout farm, Arunachal Pradesh

Promotion of Rainbow Trout Farming in Nagaland

To initiate the Rainbow trout farming in the Nagaland one hatchery and three trout raceways were established to rear quality brooders of Rainbow trout at village Dzuleke, district Kohima Necessary technical and financial support was provided by this Directorate in collaboration with the Department of Fisheries & Aquatic Resources, Govt. of Nagaland. About 3000 rainbow trout advanced fry were stocked in the raceways, which were produced in the trout hatchery established for the purpose at Dzuleke for further rearing as brooder. After 10 months of rearing the rainbow trout attains a growth about 250-300 mm in size and 350-500 g in weight. The trout raceways are of the first kind established in the state. In continuation to it, three trout raceways are under construction with necessary technical and financial support from this Directorate for rearing of Rainbow Trout at Dzuleke, Kohima district, Nagaland. Demonstration of Rainbow trout farming has been done among the Fisheries officers and fish farmers at Village Dzuluke, Nagaland.

Distribution of DCFR made Trout Feed

ICAR-DCFR prepared starter feed of Rainbow trout which was provided to Shergaon (Arunachal Pradesh) Govt. trout farm for better growth and survival of the species. In addition 200 kg grow-out feed of Rainbow trout has been provided to the Department of Fisheries & Aquatic Resources, Government of Nagaland for rainbow trout stocks being reared in raceways at Dzuleke, Kohima district for better growth and survival of the species.

Fish Diversity studies in Northeast Region

For exploration & study of important coldwater fish species Mahseer from the selected Himalayan drainages in North-east, a collaborative project on "Taxonomic identification and genetic characterization of Mahseer population in North-eastern region of India" is taken under NEH activity of this Directorate with the Department of Aquatic Environment Management, College of Fisheries, Assam Agriculture University, Raha, Nagaon district (Assam).

HRD Programme and input distribution in Mizoram

HRD Programme on Hill Fisheries Development in the State of Mizoram for the upliftment of Tribal Fishermen of Mamit District" has been organized in collaboration with the KVK Mamit, Mizoram on 29th May, 2020 at Darlak Village, Mamit District. During the occasion critical fisheries inputs like drag nets, cast nets, fish feeds and fish seeds were distributed to the selected 26 Tribal farmers. A training programme was also conducted to the selected farmers on pond management, water quality management, fish stocking density, acclimatization of fish seeds and composite fish culture. Dr. H. Saithantluanga, Director of Agriculture, Research and Extention, Govt. of Mizoram graced the occasion as Chairman and thanked ICAR-Directorate of Coldwater Fisheries, Bhimtal for their generous contribution in helping the farmers in their time of need and request the farmers to find this generosity as an inspiration to work harder.

Organization of HRD programme and distribution of inputs

IMPORTANT EVENTS

Republic Day Celebration

The Republic Day was celebrated with flag hoisting ceremony attended by all Scientists and staff of the Directorate. The Director unfurled the national flag and saluted the patriots who fought for our freedom besides the importance of 26th January. In his address to the staff of DCFR, he laid stress upon working in harmony and putting up the best for the progress of the organization and the Country. Likewise, the Republic Day was celebrated at Experimental Fish Farm, Champawat with great fervour. The National Flag was unfurled by Mr. Kunal Kishore, Scientist. All the staff (Permanent and contractual) were sensitized on the importance of celebrating 26thJanuary, as the Republic day.

National Consultation on Coldwater Fisheries Development in Arunachal Pradesh

National Consultation on "Coldwater Fisheries Development in Arunachal Pradesh" was organized under NEH activity in collaboration with the Department of Fisheries, Govt. of Arunachal Pradesh on 29th February, 2020 at Itanagar (Arunachal Pradesh) with the objective of initiating and discussing the aspects of promotion and expansion of coldwater fish farming in the state by using all possible natural resources to achieve better productivity augmenting livelihood security. Shri Pasang D. Sona, Hon'ble Speaker, Legislative Assembly, *Arunachal Pradesh* graced the occasion as Chief Guest. Altogether, about 80 participants including Mr. Belatee Pertin (IAS), Fisheries Commissioner, Govt. of Arunachal Pradesh; Prof. Saket Kushwaha, Vice-Chancellor, Rajiv Gandhi University, Arunachal Pradesh; Dr. Dilip Kumar, Former Vice Chancellor and Chairman Institute QRT, ICAR-DCFR, Administrator, Scientists, Officers, Farmers etc. attended the programme.

National Consultation on Coldwater Fisheries Development in Arunachal Pradesh

Addressed to the house by Shri Pasang D. Sona, Hon'ble Speaker, Legislative Assembly, *Arunachal Pradesh*

Quinquennial Review Team (QRT)

The Director General, Indian Council of Agricultural Research constituted a Quinquennial Review Team (QRT) vide office order No F.No. Fy/8/7/2018-IA.VI dated 22.7.2019 to examine the performance and progress of research and other work done by DCFR during the period 1.4.2013 to 31.3.2018, and to provide future guidance and recommendations for improving its performance and quality of research and other mandated activities. This team had Dr. Dilip Kumar, Former Director & Vice-chancellor, ICAR-CIFE, Mumbai as Chairman and Dr. S. D. Gupta, Former Principal Scientist, ICAR-CIFA, Bhubneswar, Dr. J. R. Dhanze, Former Dean, College of Fisheries, Lambuchera, Agartala, Tripura, Dr. Madan Mohan, Former ADG (Marine Fisheries), ICAR, New Delhi, Dr. Atul Borgohain, Professor, Veterinary College, Assam Agricultural University, Khanapara, Guwahati, Assam as members and Dr. N. N. Pandey. Principal Scientist, DCFR, Bhimtal as member secretary. The QRT visited different work places and facilities and held several rounds of discussions individually, in groups and collectively with the Director, scientists, technical staff and administrative personnel, farmers, fishers and other stakeholders. The team also interacted with the client departments (Departments

of Fisheries of northern and northeastern upland states) and collaborating institutions / organisations to get a deeper understanding of the sector and related issues, relevance of research and extension activities undertaken by the Directorate, etc., and to comprehend contributions of the Directorate in different fields of its domain.

Workshop on "IPR dimensions in Coldwater fisheries"

The Institute Technology Management Unit of ICAR-DCFR organised a one-day workshop themed 'IPR dimensions in Coldwater Fisheries' on 7th March, 2020 at Bhimtal. Dr. Shashank Mauria (Former Asst. Director General. IP & TM, ICAR) and Dr.Kajal Chakraborty (Senior Scientist, ICAR-CMFRI) were the invited subject matter experts. The workshop was attended by scientists and research scholars of the Directorate. The key agenda of the workshop was to provide the participants an overview of intellectual property management in ICAR; the basics of patent drafting and prosecution;the challenges and opportunities in technology transfer and commercialization; the possibilities in aquaculture production system design registration / patent; the safety precautions in drafting terms and conditions for contract research; and insights on intellectual property conflict management. Addressing the above points, in his key note talk, Dr. Shashank Mauria provided an overview of Intellectual Assets Management

in ICAR and shared the various initiatives in assimilating IP management aspects in the National Agricultural Research and Education System. In the second keynote presentation, Dr. Kajal Chakraborty comprehensively covered the basics and trends in patenting and technology management in fisheries sector in India and shared his analytical findings in this domain. In the final question and answer session, some ICAR-DCFR technologies were taken up for detailed deliberation related to IP protection and specific recommendations for IP management in DCFR with the inputs of Dr. Debajit Sarma, Acting Director, the external experts and scientists. On this occasion, an informative ITMU bulletin titled 'The Patent Guide for Fisheries Researchers' was also released. The workshop program was coordinated by Dr. R.S. Patiyal and Dr. Biju Sam Kamalam.

Research Advisory Committee (RAC)

The institues RAC was held online on 21-22 May 2020 under the chairmanship of Dr. W.S. Lakra, Former Director and Vice-Chancellor ICAR-CIFE, Mumbai. The meeting was attended by other RAC members Dr. B.P. Mohanty, ADG (I.Fy), ICAR; Dr. Dam Roy, Former Director, CIARI, Port Balir, Andaman & Nicobar Islands; Dr.V.R. Chitranshi, Former ADG (I.Fy) ICAR; Dr. K.M. Shankar, Former Dean, College of Fisheries, Mangalore; Dr. Y. Bassavaraju, Professor & Head, Fisheries Research & Information Centre, Bhutanal, Bijapur, Karnataka; Dr. D. Sarma, Director, ICAR-DCFR and Dr. S. Chandra, member secretary, ICAR-DCFR. The chairman and members joined the meeting on Google meet and reviewed the progress of different projects. The Director, ICAR-DCFR presented the progress and achievements made by the Directorate durng the last year. The Chairman, RAC appreciated the work and progress made by the Directorate and urged the scientist to work towards making the DCFR an 'International Centre of Excellance'. The progress of on-going and externally funded projects presented by respective scientist were reviewed by the RAC and suggestions were made for any improvement or course correction. The Scientists

participated online from their respected offices and the meeting was held keeping COVID-19 guidelines. The member secretary presented the vote of thanks.

Institute Research Committee Meeting (IRC)

The Institute IRC meeting was held on 8th and 9th June 2020 at ICAR-DCFR, Bhimtal under the Chairmanship of Dr. Debajit Sarma, Director (Acting). Scientists of the institute presented the progress of the ongoing research programmes along with concept notes on new project proposals. Discussion was also made on NEH, TSP and farm activities at Experimental Fish Farm, Champawat. The Scientists participated online from their respected offices and the meeting was held keeping COVID-19 guidelines.

Activities at Experimental Fish Farm, Champawat

- Experimental Fish Farm, of ICAR-DCFR located in the District of Champawat, Uttarakhand has seed production and grow-out facilities for rainbow trout (*Oncorhynchus mykiss*) and other indigenous coldwater fishes such as snow trout, exotic carp and ornamental fishes. Presently the experimental farm is maintaining around 1000 kg of rainbow trout brooder with a target of producing around 5 lakh eyed ova. In addition breeding of improved Hungarian carp was carried out and around 5 lakh fry were produced. Among ornamental fishes, Koi carp and Gold were bred and around 500 fry are now being maintained at farm facilities.

- The centre participated in "Champawat Mahotsav" at Goral Chaur Field, Champawat from 27-29 Feb. 2020. The visitors were sensitized about fish culture and mid hills and were also given information about various value added products from fish on the stall.

- Training programme PMKVY (ASCI) on "Freshwater Aquaculture Farmer" was conducted for 20 farmers of Champawat district from 28th Feb 2020 to 18th March 2020.

- Training programme on Value Added Fishery Products: In collaboration with State Fisheries Department, Champawat and District Rural Development Authority, Champawat organized one day training programme on Value Added Fishery Products under Rural Livelihood Mission, GOI on 4th June 2020. Women from two self-help groups namely, MaaPurnagiri SHG and Jai Gaja Baba SHG, Champawat participated in the training programme. Participants were given Hands-on-training on different Fish Value Added products viz. Fish Pickle, Fish tikka and Fish Cutlet for generating their livelihood through self-employment. The training programme was organized by Mr Sanjeev Kumar, DFO, Champawat, MsVimi Joshi, APD, DRDA,

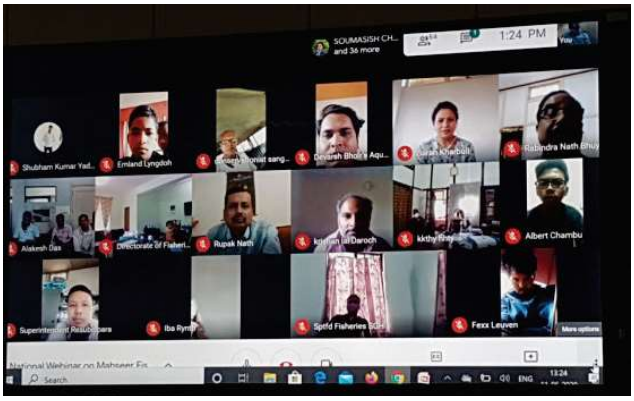
Champawat and conducted & coordinated by Mr. Kishor Kunal, Scientist, Mr. Parvaiz Ahmad Ganie, Scientist, Ms. Garima, Scientist, Dr. Raghvendra Singh, Scientist, ICAR-DCFR, Champawat.

WEBINARS & MEETINGS

- **Online meeting with DDG (Fisheries)** was held under the Chairmanship of DDG (Fy) on 20th April 2020 in the presence of all the Scientists. During the meeting Scientists interacted with the DDG and worked out on the posible intervention of DCFR during the lockdown for creating awareness about COVID19 among the fish farmers through digital means.
- **National Webinar on "Mahseer Fisheries in Meghalaya: Startegies for Conservation and Propagation"** Organized by ICAR-DCFR on 11.06.2020 under the NEH activity of the Directorate at ICAR-DCFR, Bhimtal in collaboration with the Department of Fisheries, Government of Meghalaya; ATARI, Barapani and Division of Fisheries, ICAR Research Complex for NEH Region, Barapani. The HRD programme was meant for the Fisheries Officers, Progressive Farmers, KVK Incharges and SMS Fisheries, Faculty Members of different colleges/ Universities etc. of Meghalaya state. But due to request received from different NEH states and other states we accommodated all participants during the webinar. In total 120 participants were enrolled in which 71 from Meghalaya and rest from other states of the country. Dr. R.S.Haldar, Nodal Officer NEH activity coordinated the Webinar.

TRAINING AND VISITS

- Conducted twelve days training cum exposure program for the B.F.Sc. students of College of Fisheries, AAU, Raha, Assam during 18-29 January, 2020.



- Skill development training in ornamental fishery for 20 participants from 7 Feb.-10 March 2020.
- Exposure visit of 14 PGDIF&AM Trainees (09 males + 05 females) from ICAR-Central Institute of Fisheries Education, Salt Lake, Kolkata Centre (West Bengal) visited ICAR-DCFR, Bhimtal during February 12-17, 2020 and interacted with scientists.
- Exposure visit of 44 Third year B.Sc. (Ag) students along with two faculty members from Bhartiya College of Agriculture (Affiliated to Indira Gandhi Agricultural University, Raipur), Pulgaon Chowk, Durg, (Chhatishgarh) visited ICAR-DCFR, Bhimtal during February 29, 2020 and interacted with scientists.
- Organized Exposure visit at Experimental Fish Farm, Champwat for 12 students of Govt. H.S.S Salli, 28 students of Govt. H.S.S. Funger, 57 students of Govt. Inter College Dyartoli, 113 students from Govt. Inter College, Choume, 100 students from Govt. Inter College Pulhindola, Lohaghat, 45 students from Govt. Inter College

Munch, 140 students from Govt. Girls Inter College, Champawat during the month of February, 2020.

COMBATING COVID-19

Advisory to farmers during COVID-19

A number of advisories were designed and displayed in form of posters at different places to create awareness on COVID-19 among farmers as well as other villagers. These posters laid stress on practicing of social distancing, personal hygine, washing of hands, using alcohol based sanitizers, avoid touching unsanitized materials, use of face mask and moving out from home only when required. These posters also carried a message for the fishing community that there was no risk of infection with COVID-19 on harvesting, transport or eating fish. Simply practicing personal hygene was the only way forward to beat this deadly viral infection.

- Provided Farm advisories on carp culture and mid hill carps with 20 fish farmers of East Siang district, Arunachal Pradesh and 5 trout growers of Menchukha valley, Arunachal Pradesh.

- Prepared 17 advisories in seven local languages that were circulated among farmers & Officers of State Fisheries Department of the seven hill states.
- Provided advisory to the fisheries department of seven hill states and 200 farmers of Himachal Pradesh, Arunachal Pradesh, Sikkim and Uttarakhand.

Distibution of food packets during COVID-19 Lockdown

A group of Scientists from DCFR namely, Dr. R.S. Haldar, Dr. Dimpal Thakuria, Dr Rajesh M. and Biju Samkamalam extended their help to the stranded labours in Bhimtal and Naukuchiatal by distributing ration in the presence of Patwari of Bhimtal and Naukuchiatalarea. These labours had run out of money during the lockdown and thus unable to buy food items. The team of scientists contributed money and procured food materials for the labours. Each person was provided with adequate rice, pulses, vegetables, tea, sugar, salt and spices.

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