1992—1993
ANNUAL REPORT

NATIONAL RESEARCH CENTRE ON COLDWATER FISHERIES

Indian Council of Agricultural Research

वार्षिक रिपोर्ट
ANNUAL REPORT
1992-93

राष्ट्रीय शीत जल मत्स्य पालन अनुसंधान केन्द्र (भा. कृ. अनु. प.)
शिल्वा हिल्स नर्सरी, रुपनगर, पोस्ट बाक्स सं० 28.
हल्द्वानी-263 139, ज़िला नैनीताल (उ. प्र.)

NATIONAL RESEARCH CENTRE ON COLDWATER FISHERIES
(Indian Council of Agricultural Research)

P.B. No. 28, Roopnagar
Haldwani-263 139
Distt. Nainital (U.P.)
Tel. 20445 Gram : MAHSEER

CONTENTS

INTRODUCTION

Brief History

With a view to conduct and improvise the scientific research on coldwater fisheries in the national perspective, the Indian Council of Agricultural Research with the suggestions of the working Group on Agricultural Research and Education for Seventh Five Year Plan established a National Research Centre on Coldwater Fisheries in the Kumaon region at Haldwani in 1987. This was, of course, an imporant landmark in the history of upland fisheries which filled the long felt need not only for augumenting the production for deriving economic and social benefits to local masses but also for supplying protein rich diet to the defence personnel serving in the difficult terrains of the highland zones. The centre had its origin in Central Inland Fisheries Research Unit established at Srinagar (Kashmir) which was later shifted and merged with NRC on Coldwater Fisheries in 1988 and it started functioning with its location at Haldwani in April. 1988. The two additional units of the Institute located at Bhimtal, district Nainital and Champawat. district Pithoragarh of Kumaon himalaya started catering to the technological needs on different aspects of coldwater aquaculture.

Mandate

With the major motive to give proper direction and attention to thrust areas of scientific research that would enable the development and management of capture cum culture fisheries research in coldwater zones to obtain maximum possible production, the following aims and objectives have been incorporated in the mandate of National Research Centre on Coldwater Fisheries.

- To explore and assess the coldwater fishery resources in the upland areas and develop strategies for their conservation and management;
- To conduct research leading to development of techno-economically viable and sustainable culture systems for commercially important coldwater fish species both indigenous and exotic in upland areas; and
- To undertake transfer of technology through training,

education and extension programmes and to provide institutional consultancy services to various desirous agencies.

Ogranisation

The organisational set-up of NRC on Coldwater Fisheries was structured for meeting the aforesaid objectives. For accomplishment of research programme on coldwater aquaculture, a standard mahseer seed production unit with flow-through hatchery and nursery facilities has been developed at Bhimtal. Capacity of this hatchery unit is to hatch about 2.5 lakh eggs while about 2.0 lakh swim-up fry and 1.0-1.5 lakh advance fry can be reared in nursery units. The whole system can meet the requirement of seed production of *T. putitora* on a mass scale. At Chirapani fish farm infrastructural faciliteis in the shape of hatchery, nursery ponds and raceways have been developed. Preliminary efforts to raise the stocking material of exotic trouts, (brown and rainbow) have also been initiated in the farm. Under ICAR Adhoc Funding scheme on estimation of nutritional requirement of coldwater species, a complete nutritional laboratory has been set-up at Bhimtal unit.

Staff position

The overall staff position of NRCCWF as on 31st March, 1993 is given below :

S. No.	Category of posts	Posts sanctio-ned	Staff in position	Posts vacant
1.	Research Management (Project Director)	01	–	01
2.	Scientific	15	06	09
3.	Technical	05	05	–
4.	Administrative	07	07	–
5.	Auxiliary	02	02	–
6.	Supporting	13	13	–
	Total	43	33	10

Finance

FOR THE YEAR 1992-93

(Rs. in lakhs)

Head	B.E. 1992-93	R.E. 1992-93	Actual expenditure 1992-93
Plan	54.00	32.43	32.24
Non-Plan	10.50	17.25	16.98
Total	64.50	49.68	49.22

Important achievements

- A standard golden mahseer hatchery unit with flow-through facilities was established at Bhimtal for intensive raising of stocking material of golden mahseer (*Tor putitora*) and a methodology has been standardized by adopting this flow-through technology.

- To enhance the seed production and fry rearing capacity of the hatchery, additional troughs with trays were installed in this unit.

- During the period, about 32,000 advanced fry of this species were produced in the farm through artificial fecundation of ripe spawners.

- Under management and conservation programme, different streams and lakes in Kumaon region were stocked with fishes produced in this unit to replenish this depleted fish in these ecosystems.

- Attempts to fecund the wild spawners of *Schizothorax richardsonii* in Kumaon waters have been made and initial success to breed and fertilize the ripe eggs of this species has been achieved.

- Trials were made to establish and raise brood stock of exotic trouts (*Salmo trutta fario* and *Onchorynchus mykiss*) at Chirapani fish farm in Pithoragarh district.

- The eco-based strategies for the development of lakes in himalayan

region especially to obtain sustained fish yield, work on Khurpatal lake was continued during the period. The system was biologically assessed to enhance its overall ichthyomass production and to conserve native mahseer fish fauna in this system. About 5,000 advanced fry of golden mahseer were stocked in this lake.

A lesser himalayan river Gaula has been biologically assessed to enhance its overall fish production and conserve the vulnerable native fish fauna in view of proposed construction of Jamrani Dam on this system.

* Under ICAR Adhoc Research Scheme, a series of experiments were conducted with formulated and purified test diets to ascertain optimum requirement of protein, fats, carbohydrates for better growth and high survival in juveniles of golden mahseer.

GENERAL INFORMATION

Library and documentation service

The Library continued to provide library and documentation services to the scientific and technical staff of the institute, research fellows, students from various universities and scientists from other institutes.

The technical and non-technical querries on the coldwater fisheries from various national and international agencies were attended to by this section. Technical reports on the progress of research activities of the NRCCWF were compiled and sent to the Council regularly for inclusion in the reports of DARE for programme implementation and cabinet secretariat. Biodata format in respect of the Scientists of this Institute were updated and forwarded to the Computer Cell of ICAR and other organisations for inclusion in different year books, directories etc.

The section maintained active reprography service by producing following departmental publications in the form of technical manuals and special publications on coldwater fish and fisheries.

Technical manuals :

1. Trout farming, K.L. Sehgal, 24 p
2. Seed production of Schizothoracids, H.S. Raina, 13 p
3. Common carp farming, Madan Mohan, 17 p
4. Estimation of biological productivity of a mountain stream, K.L. Sehgal and Shyam Sunder, 29 p.

Special publication :

1. Review and status of coldwater fisheries research in India, *Spl. Publ.* 2 : K.L. Sehgal, 60 p.
2. Recent researches in coldwater fisheries, K.L. Sehgal, 27 p.

The Library continued to mailing of the NRCCWF last year's Annual Report, special bulletin and technical manuals to concerned State Fisheries Departments, Universities, Research Institutes free of cost.

During the year, 169 books, 62 Indian and Foreign journals, 51 scientific reports, FAO publications etc. relevant to the Institute's objectives were added to the Library.

Distinguished visitors

A good number of distinguished personalities visited this Institute during 1992-93.

Coates, David (Dr.)	FAO Fishery Consultant UNDP, DB 104, Port Mores, Papua New Guinea
Kamal, M.Y. (Dr.)	ADG (Fisheries), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi
Agarwal, V.P. (Dr.)	Ex-Principal, DAV College, Prof. of Zoology, President of Society of Biosciences, Muzaffarnagar (UP)
Kumar, K. (Dr.)	Chief Warden of Fisheries, Govt. of Himachal Pradesh, Bilaspur (HP)
Singh, C.S. (Dr.)	Professor and Head, Faculty of Fisheries, Fisheries College, G.B. Pant University of Agriculture & Technology, Pantnagar, Nainital, UP
Pahwa, D.V. (Mr.)	Principal Scientist, Indian Council of Agricultural Research, Krishi Bhavan, New Delhi
Rastogi, M.L. (Mr.)	Scientist Incharge, CIFE Operation/Training, Centre Lucknow

Conferences/Symposia/Seminars/Meetings attended

S.No.	Subject	Organisers	Papers presented	Authors/ participants from the Institute
1.	First National Meet on Aquafarming Systems Research	CIFA, Bhubneshwar	Introducing rainbow trout in Kumaon Himalayas, UP	C.B. Joshi
2.	National Seminar on Endangered Fishes of India	National Bureau of Fish Genetic Resources, Allahabad	Endangered, vulnerable and rare cold-water fishes of India	K.L. Sehgal
3.	Seventh meeting of the Committee on Introduction of Exotic Aquatic Species	Central Marine Fisheries Res. Institute, Cochin (Kerala)	Brief note on the proposal to introduce high yielding strain of rainbow trout *Onchorynchus mykiss* in coldwater regions of India	K.L. Sehgal

Assistance/training rendered

- This institute provided technical assistance in construction of a mahseer hatchery at H.N.B. Garhwal University, Srinagar, Garhwal, UP.
- Rendered technical assistance to UP State Fisheries Department in construction of a trout farm at Bairangana, Distt. Chamoli, UP.
- Lectures were delivered on Mahseer Aquaculture in India at Workshop-cum-Seminar on Fish Production Technology organised by Directorate of Extension, Government of India at Fisheries College, G.B. Pant University of Agriculture & Technology, Pantnagar (Nainital) UP.
- Lectures were also given to fisheries trainees of CIFE, Lucknow and

Fisheries College, G.B. Pant University of Agriculture & Technology, Pantnagar (Nainital) UP.

Advisory Committee

The Advisory Committee of NRCCWF, Haldwani whcih was constituted in 1989 continued to function with the following personnel as members :

Chairman

The Director, NRCCWF, Haldwani

Members

1. Director of Fisheries, Government of Uttar Pradesh
2. Shri D.V. Pahwa, Principal Scientist
   Indian Council of Agril. Research,
   Krishi Bhavan, New Delhi
3. Dr. Alok Sharma 'Vir Chakra', Kewal villa New Shahashtradhara Road Dehradun
4. Shri Madan Mohan Scientist S-3 NRCCWF, Haldwani
5. Dr. C.B. Joshi Sr. Fy. Scientist Officer - Incharge NRC on Coldwater Fisheries, Champawat (Pithoragarh) UP.

Member Secretary

The Asstt. Admn. Officer NRCCWF, Haldwani

A view of the meeting of NRCCWF Advisory Committee.

The Committee met once during the year and discussions were held on the progress of ongoing, new proposed research projects and other matters for the betterment of the Institute.

Scientific Research Committee

During the period under report, the SRC met twice to review the progress of research projects being undertaken at the Institute. The SRC proceedings were prepared and sent to the Council. The follow-up action on the recommendations of the SRC was collected from the concerned scientists and presented.

Official Language Implementation Committee

According to instructions laid by the Ministry of Home Affairs, the Official Language Implementation Committee, the programmes of the Institute were implemented for the year 1992-93. The quarterly meetings of the Committee reviewed the implementation activities of NRCCWF.

The periodic reports on the implementation of official language pertaining to the Institute were sent to Council and Official Language Department for inclusion in the report of the Secretariat. Efforts were made to implement the official language policy of the Government of India at this Institute.

PROGRESS OF RESEARCH

In accordance with the mandate NRCCWF has taken up research projects in the past to study crucial issues and field problems for the development and management of coldwater fisheries. Accordingly, several research projects such as eco-based investigations of upland ecosystems to assess their biological productivity for increasing fish yield, technologies for mass scale seed production and culture of indigenous and exotic coldwater fish species etc. were undertaken by NRCCWF. During the year, one study was completed and remaining three studies are under progress. Brief details of the research accomplishments under these projects are given below.

PROJECT NRC CWF/01

Eco-Based Investigations of a Kumaon Himalayan Lake for Increasing Fish Yield

Personnel : Madan Mohan, H.S. Raina, Shyam Sunder and Ashim Mukhopadhyay

Duration : July, 1989—June, 1993

Location : Haldwani

Objectives To develop capture-cum-culture fishery in Khurpa Tal lake in Kumaon Himalayas

Accomplishments

To develop a model for obtaining high fish yield in mountain lake ecosystems of himalayas based on the principles of culture and capture fisheries, bio-limnological and fishery investigations were conducted in Khurpatal lake of kumaon region. The lake having a water spread area of 13.0 ha, situated at an altitude of 1600 m, is a typical close type warm-monomictic system and main source of water in the lake is from underground springs besides local precipitation and run-off from the surrounding catchments during rainy seasons. This system besides providing recreation to mahseer anglers also serve as an important source of fish in this region.

Bio-limnological features

The abiotic characteristics of the lake water at three selected littoral and pelagic sampling zones of the lake

Khurpatal during the period under report ranged as follows; water temperature 14.0-28.0°C; secchi disc reading 1.5-3.6 m; pH 7.9-8.8; dissolved oxygen 8.6-12.2 mg/1; free carbondioxide nil-2.4 mg/1; total alkalinity 87.0-172.0 mg/1; chloride 10.4-26.6 mg/1; calcium 15.2-26.2 mg/1; magnesium 1.8-3.2 mg/1; dissolved organic matter 20.4-36.0 mg/1; specific conductivity 205.0-409.0 µmhos and total dissolved solids 109.0-173.4 mg/1. The overall temperature profile revealed that from late autumn (October) the lake becomes isothermal which continues till February. The isothermal condition changes with the onset of spring when warming of lake takes place, resulting in temperature variation in different zones.

The lake supports a massive growth of phytoplankton population and their density at three stations ranged between $1.34x10^4 - 17.60x10^4$ units/1. The major groups encountered were Dinophyceae (29-100%), Bacillariophyceae (nil-68%) and Chlorophyceae (nil-12%). The predominant phytoplankters comprised *Peridinium palatinum, Glenodinium quadridens* and *Ceratium hirudinella* among Dinophyceae; *Navicula, Pinnularia, Cyclotella, Cymbella* and *Amphora* among Bacillariophyceae and *Spirogyra, Cosmarium* among Chlorophyceae. The monopolised assemblage of Dinophyceae revealed that the reproductive rates of these forms in the system are quite high that allow the population to predominant throughout the year.

The zooplankton of this system in Kumaon himalaya exhibits of sub-tropical waters. The diversity of zooplankton assemblage in this lake is of low grade. The zooplankton density at three sampling sites of the lake varied between 7-215 units/1, minimum being in Autumn and maximum in early Spring. The major groups contributing zooplankton communities were Rotifera (nil-84.25%), Copepoda (11.75-100.0%) and Cladocera (nil-80.0%) in the order of dominance. The predominant forms recorded were *Anuraeopsis fissa, Keratella tropica* and *Brachionus plicatilis* among Rotifera; *Eucyclops serrulatus, Cyclops scutifer* and *Thermocyclops crassus* among Copepoda and *Daphnia similis, Alonella nana, A. rectangula* and *Chydorus gibbus* among Cladocera.

The benthic macro-fauna of the lake bed at three sites varied between 444-1, 377 ind/m^2 and their wet biomass ranged between 4.190-203.100 g/m^2. The major groups recorded were Oligochaeta (0.0-58.09%), Hirudinea (0.0-19.98%), Ephemeroptera (0.0-79.19%), Odonata (0.0-83.28%), Coleoptera (0.0-33.28%), Hemiptera (0.0-26.54%), Diptera (0.0-78.62%) and Mollusca (0.0-37.41%). The wide seasonal variations in the distribution of various groups are mainly due to a) ecological degradation; b) impact of loose earth filling the lake from the adjoining denuded hills from the roadside and; c) number of springs at the lake bottom.

The predominant forms recorded were *Limnodrilus hoffmesteri*, *Stylaria* sp., *Pristina bilongata* and *Tubifex tubifex* among Oligochaeta; *Gomphus*, *Agrion* and *Ischnura* among Odonata; *Ranatara* among Hemiptera; *Chironomus*, *Pentaneura* and *Chaoborus* among Diptera; *Caenis*, *Baetis* and *Heptagenia* among Hemiptera; *Haliplus* and *Hydrophilus* among Coleoptera and *Lymnaea* and *Gyraulus* among Mollusca.

Primary production

The gross primary production at littoral zones in this system during this period ranged between 56.2-96.7 mg $Cm^{-3}hr^{1}$ while the average production at pelagic zone ranged between 40.2-89.2 mg $Cm^{-3}hr^{1}$.

Fish and fisheries

The lake abounds in golden mahseer (*Tor putitora*), the main dominant native fish and the exotic phenotypes of common carp. In addition, *Puntius conchonius* was also dominant as a minor carp in this system.Recently (1992), mosquito fish *Gumbusia affinis* has been introduced with an objective to control malaria in this region. There is no organised fishery in this lake. Rod and line using baits is the only method of fishing by local anglers. Averagely the catch per unit effort by this method was to a tune of 200-350 g/man/day. Golden mahseer was the main fish recorded in the catches having a size range of 250-330 mm in total length and 150-200 g in weight.

Fish stocking

As per the technical programme of the project, the lake was stocked with seed of golden mahseer mainly with an aim to enhance fish production. About 5000 golden mahseer fry (10-15 mm size) produced at Mahseer Breeding Unit of NRCCWF, Bhimtal were stocked at different suitable sites of the lake.

PROJECT NRC CWF/04

Artificial Propagation of Important Coldwater Fishes (golden mahseer and snow-trouts)

Personnel : Madan Mohan, Shyam Sunder, H.S. Raina, Baldev Singh

Duration : July, 1991—June, 1997

Location : NRCCWF, Bhimtal

Objectives To rehabilitate the depleted stocks of goldern mahseer (*Tor putitora*) and snow-trout (*Schizothorax richardsonii*) in Native waters by annual planting with healthy and disease resistant fry and fingerlings produced at the hatchery.

Advance fry rearing troughs for Coldwater fish species at Bhimtal fish farm

Accomplishments

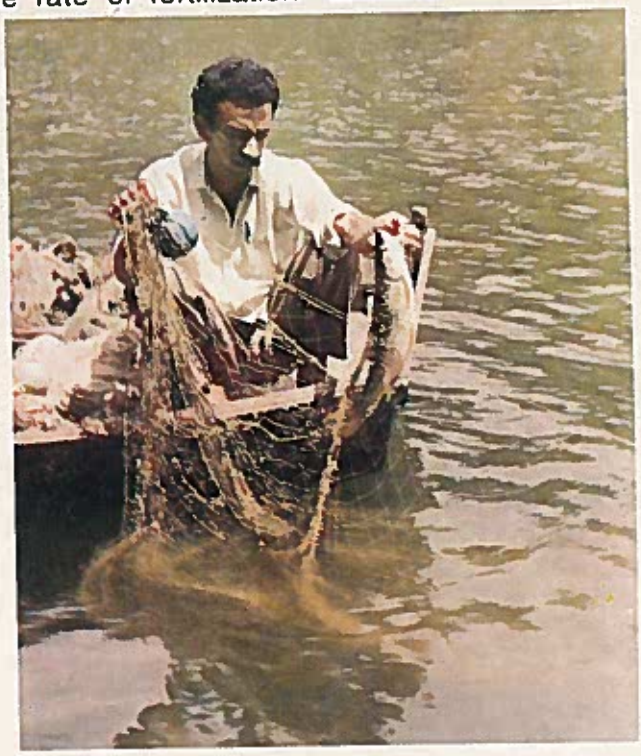
Hatchery

Based on the technology evolved during previous two years, further work on mass scale seed production of golden mahseer under controlled conditions was carried out. Further in order to enhance the seed production capacity of the hatchery at Bhimtal, immediate steps were taken-up by providing more fry rearing capacity through installing additional troughs. To overcome the shortage of natural water supply in the stream at any given time of the year, one artison tubewell has been installed in the hatchery complex.

Seed production

The ripe oozing female and male brooders of golden mahseer caught from Bhimtal and Naukuchiatal lakes with gill nets were utilized for artificial fecundation. During the breeding season (July—October), thirteen female brooders having as size range of 410-550 mm and 600-1500 g in weight were stripped and the eggs were fertilized with ripe males having free floating milt phase (300-470 mm in total length and 300-1000 g in weight). Normally two males for one female were used to ensure better fertilization during stripping operation. 'Dry method' was applied during fecundation procedure. The average number of eggs/kg body

weight released by *Tor putitora* ranged between 2520-4270. After fertilization, the eggs were processed for water hardening. The rate of fertilization recorded during the period was to a tune of 76.5-96.0%. In total about 39,000 ripe eggs were stripped and fertilized.

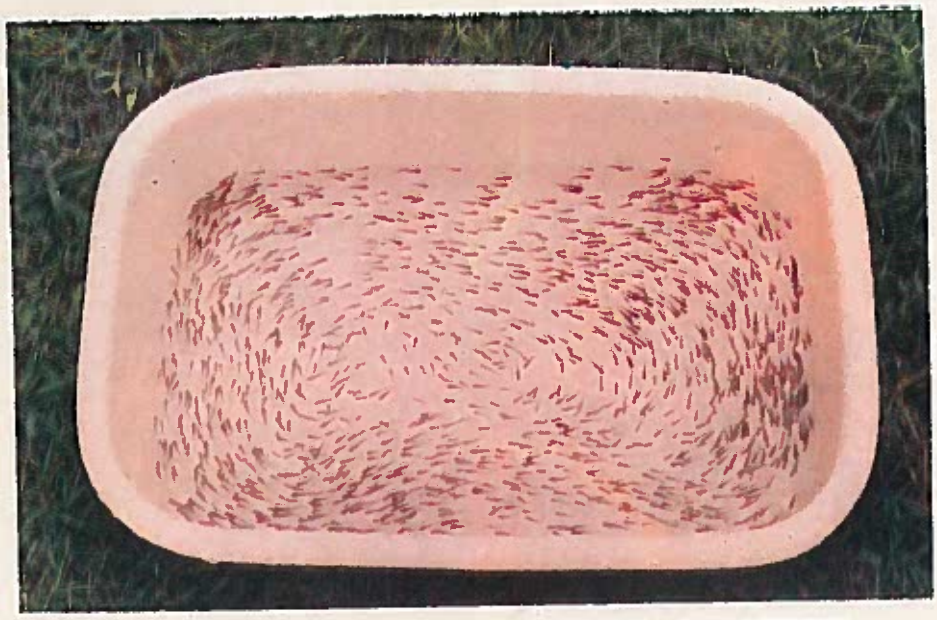


Gill-netting for golden mahseer brooders in a Kumaon Lake

Incubation and nursery rearing

The fertilized eggs of golden mahseer after complete water hardening were spread in hatching trays (50x30x10 cm) kept in troughs with running water facilities for incubation. During this period, the eggs were properly treated with malachite green to prevent *Saprolegnia* infection. The incubation period of this fish at 11.5-23.0°C water temperature ranged between 90-100 hrs. and complete yolk-absorption was observed within a period of 10-12 days. The cummulative survival from fertilized eggs to swim-up fry recorded was 76.8%.

The newly emerged fry were stocked in small nursery tanks (120x70x40 cm) for rearing. These were fed on emulsified yolk of hen's egg every two hourly from sun-rise to sun-set @10% body weight. The flow rate was maintained at 2-3 l/min. The fry attained a length of 15-20 mm (0.010-0.-.020 g) within a period of 35 days and with survival rate of 78.0-82.0%. After size grading, the mahseer fry were stocked in flow-through water troughs (2m² area)



Fry of golden mahseer (Tor putitora) produced at Bhimtal hatchery of NRCCWF

wherein the water flow was maintained @ 3-4 1/min. The fry were fed with laboratory formulated dry feeds having 40-50% crude protein fortified with vitamins and minerals pre-mix. The principal ingredients used to formulate diets for *T. putitora* were mainly roasted soybean powder, casein, starch, fish oil etc. In about 60 days of rearing in rearing tanks, early fry of 15-20 mm in total length and 0.010-0.020 g in weight had grown to 35-60 mm in total length and 0.140-0.350 g in weight, achieving a survival between 50-60%.

Under mahseer management and conservation programme, about 7000 mahseer fry produced in this hatchery unit were stocked in Bhimtal lake and 5000 in Khurpatal lake to replenish this depleted fish.

Artificial fecundation of snow-trouts

Under the breeding programme of snow-trout (*Schizothorax richardsonii*), a comprehensive survey for collection of brooders was undertaken in different streams of Kumaon himalaya, but no gravid spawner was caught. However, at Chirapani stream in Pithoragarh district, artificial fecundation was done in September by collecting brooders from the natural waters. In all 21,000

Stocking of seed of mahseer and other fresh water fish species in himalayan upland ecosystems under conservation and management programme

from the natural waters: In all 21,000 eggs were stripped from 11 females in the size range of 180-296 mm and weight range of 88-230 g and fertilized with male brooders having a size range of 148-220 mm in total length and 25-140 g in weight. The rate of fertilization ranged between 45-86%. As this fish is a typical coldwater species and normally breeds in clear and well oxygenated waters, so for want of flow-through rearing facilities at Champawat, the fertilized eggs of this species could not be incubated further in farm but released back into some selected natural pools of the stream.

PROJECT NRC CWF/05

Raising of Brood Stock of Trouts at Chirapani Fish Farm, Champawat (Pithoragarh) UP

Personnel : C.B. Joshi, Ravinder Kumar

Duration : December, 1992 November, 1994

Location : NRCCWF, Champawat

Objectives: To transplant trouts at Chirapani trout farm with

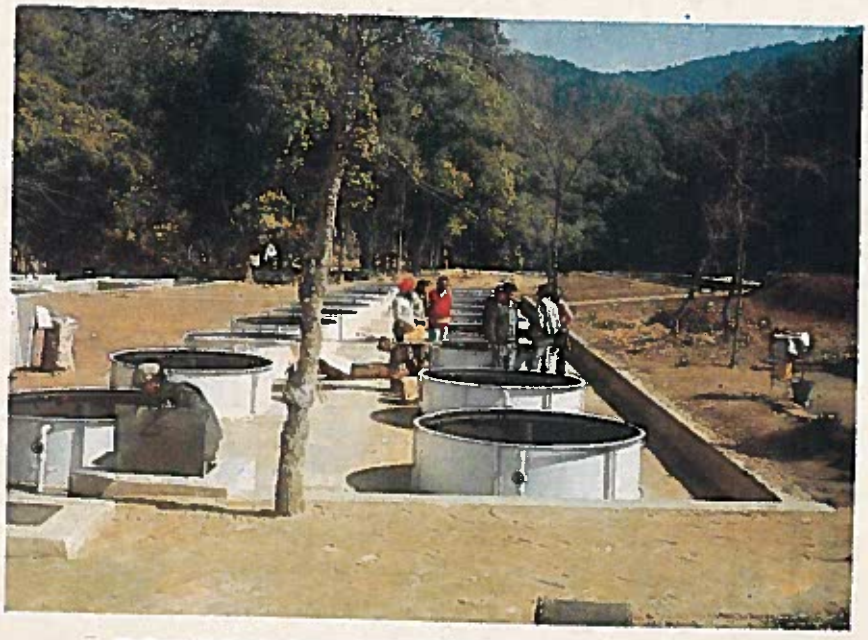
an aim to propagate the species in kumaon himalaya.

Accomplishments

During March, 1992, 1000 eyed eggs of rainbow trout were transported from Talwari trout hatchery, Chamoli to Chirapani fish farm, Champawat in 'Pahari Box'. Only 1.4% mortality of eggs was observed during transportation in the hilly track (approx. 250 kms). The eyed-eggs after a thorough wash with malachite green were spread over in the hatchery trays/ troughs for incubation.

The hatching of these eggs was completed by second week of April within a temperature range of 12.5-17.5°C. In all 809 early fry (swim-up fry) were produced in the hatchery troughs with the survival of 84.18% and 97.47% from eyed eggs to alevin stage and alevin stage to early fry stage, respectively. The overall survival upto early fry stage was counted to be 81.85%. After a week of hatching when all the alevins reached to swim-up fry stage with partial absorption of yolk-sac, the feeding was started with boiled egg-yolk @ 20% of body weight, 5 times a day.

Out of 809 early fry of rainbow trout kept for rearing in the hatchery troughs, 685 advanced fry were produced with 84.67% survival rate. To avoid fungal infection the dead egg/fry were removed daily and treatment to the livestock was given properly as and when needed with malachite green. the feeding of fry was continued on dry pelletized diet @ 5-10% at 14.0-21.0°C for about 15 days inside the hatchery.



Battery of circular fry rearing tanks at Chirapani fish farm, Champawat

The advanced fry of rainbow trout were then shifted in the circular nurseries outside the ova-house. The survival rate upto this stage of trout rearing was 77.5%. The sampling of remaining fry revealed that the growth in the average body weight 0.120 g and ranging 20-35 mm in the size. In last week of May and early June, a large scale mortality was recorded in the circular ponds due to inadequate water supply in the main stream of the farm and other related problems like rise of water temperature (25.0°C) and fall in oxygen concentration (below 3.2 mg/1).

The physico-chemical features of the water supply at Chirapani fish farm in the hatchery troughs and nursery ponds was in the following ranges during rearing experiments; water temperature 14.0-25.0°C; pH 6.8-8.3; dissolved oxygen 3.2-10.0 mg/1; free carbondioxide 0.6-4.6 mg/1; total alkalinity 18.0-30.0 mg/1.

Other research activities

Under ICAR Adhoc Scheme on 'Nutritional requirement of *Torputitora*', a series of experiments were conducted with formulated and purified diets of 21.0-31.7% protein levels for nursery rearing of this species. Roasted soybean, silkworm pupae, rice-bran, casein supplemented with vitamins and minerals pre-mix were used as the main source of feed ingredients. The diet with high protein level gave comparatively better results. A survival rate of 52.4% was obtained while rearing early fry of this species for about two months of experiments. The fry showed an increment of about 28.0 mm from an initial length of 15.0 mm. Effects of different levels of fats and carbohydrates on the growth of the youngones of this species had also been worked out. Biochemical composition of mahseer fry and advance fry were analysed for various nutritional and calorific values of the constituents. The study revealed that fishes in early stages required high level of protein in their diets. The present investigation opened a scope to produce healthy and right sized stocking material of this species on a mass scale both for farm and replenishing depleted mahseer in himalayan waters.

PUBLICATIONS

Joshi, C.B. Introducing rainbow trout in Kumaon himalayas U.P. Proc. *Ist. Nat. meet on Aguafarming Systems Research,* CIFA, Bhubneshwar. p. 52.

Results of the trials to introduce and establish stock of rainbow trout in Kumaon himalaya have been discussed in the paper. Efficiency of transporting eyed-ova of this species in a conventional system 'Pahari Box' through remote hilly terrains has been given. Results of rearing eyed-ova, fry and early fry alongwith constraints, while rearing this species at Chirapani fish farm has also been highlighted in the paper.

Mohan, Madan Coldwater Fisheries Technologies : Common Carp Farming. NRCCWF Manual No. 3 : 17 p.

Methodology for aquaculture of German strain of Common carp in the Himalayan and Peninsular uplands has been briefly described. Designs of various components of rearing systems have been elaborated in the manual. Results so far achieved to cultutre this species under running water systems, rice fields, irrigation tanks and channels alongwith some major diseases have also been discussed in the manual.

Raina, H.S. Coldwater Fisheries Technologies : Seed Production of Schizothoracids. NRCCWF manual No. 2. 13 p

Aquacultural technologies for mass scale seed production of principal commercial species of Schizothoracids inhabiting typical coldwater himalayan ecosystems have been described. Pre-requisite factors for installation of Schizothoracid hatchery, design of hatchery and nursery facilities, health monitoring etc. have been discussed in the manual.

Raina, H.S. Biological resources of high mountainous lakes of Kashmir Himalaya. *Recent Researches in Coldwater Fisheries* Ed. by K.L. Sehgal. *National*

Workshop on Research and Development Need, Coldwater Fisheries, 30-31 January, 1989 : 45-60.

An attempt has been made to study the summer ecology of high mountainous lakes in Kashmir Himalaya with special reference to disposition of fisheries. Lakes depict cold monomictic to dimictic thermal behaviour. *Diptychus maculatus* Steind recorded in a few high altitude lakes in isolation is of significant importance. Behaviour and role of exploitation of exotic brown trout in these lakes has been discussed. Measures to improve trout fish as a sport and endemic species for food in these lakes have also been discussed in the paper.

Raina, H.S. and K.K. Vass Distribution of species composition of zooplankton in Himalayan ecosystems. *Int. Revue ges. Hydrobiol.* 78 (2) : 295-307.

The zooplankton communities of lakes, sars, wetlands and ponds in Jammu & Kashmir Himalayas were investigated. The waters are situated between 600-3800 m asl and in the ordinates 30°-36°N. Significant variations in Rotifers and Crustacean distribution patterns were encountered. Some species having wide tolerance limits are more frequent while a few species due to their rigid environmental demands are restricted to few water bodies. Such species serve as good indicators of trophic evolution. The general distribution of these groups and their ecological implication have been discussed in the paper.

Sehgal, K.L. Coldwater Fisheries Technologies : Trout Farming. NRCCWF Manual No. 1 : 24 p.

Trout farming (*Salmo trutta fario* and *Onchorynchus mykiss*) in detail under Indian sub-continent have been given in the present special manual. Role of artificial diets with moderate to high protein levels to produce these two species to table size have been highlighted. Health monitoring in hatchery unit and other rearing techniques have also been elaborated in this communication.

Sehgal, K.L. Review and Status of Coldwater Fisheries Research in India. NRCCWF Special Publication No. 3 : 60 p.

A brief review and present status of coldwater fisheries in the country has been presented in the paper. Technologies on culture and capture of himalayan fisheries so far evolved have been discussed thoroughly. The

principles of conservation and management of natural coldwater fisheries in Himalayan and Peninsular Deccan Plateau have also been suggested. Constraints and priority areas of research for the development of both endemic and exotic fishes for sport and food have been indicated in the paper.

Sehgal, K.L. Impact of construction and completion of Beas-Sutlej-Link (BSL) Project on Coldwater Fisheries of R. Beas in Himachal Pradesh. *Recent Researches in Coldwater Fisheries, Edited by K.L. Sehgal, National Workshop on Research and Development Need, Coldwater Fisheries, 30-31 January 1989* : 61-70.

The communication is the result of investigations carried out under a multidiscipline coordinated programme on BSL Project sponsored by the Ministry of Environment and Forest, Government of India. The investigations have been made on fish sampling and catch analysis in R. Beas during 1985-87 at nine sampling stations in a stretch of about 200 kms.

Sehgal, K.L. Coefficient of Accessibility (CA) of food of brown trout *Salmo trutta fario* and snow-trout *Schizothorax richardsonii* in R. Beas during 1985-87 in *Recent Researches in Coldwater Fisheries Ed. by K.L. Sehgal. National Seminar on Research and Development Need Coldwater Fisheries, 30-31 January, 1989* : 129-43.

The author has studied the Coefficient of Accessibility (CA) factor or forage ratio in *Schizothorax richardsonii* and *Salmo trutta fario* in R. Beas during 1985-87. The study includes analysis of gut contents of the two species collected from river stretch between Manali and Mandi and analysis of benthic invertebrates and micro-biota or epiphytic organisms growing over substratum stones etc. The paper gives variations in feeding patterns on account of changing ecological parameters of R. Beas.

Sehgal, K.L. and Shyam Sunder. Coldwater Fisheries Technologies : Estimation of biological productivity of a mountain stream. NRCCWF Manual No. 4. 29 p.

For the first time, an attempt has been made to embody the accepted techniques to estimate biological produetivity of a typical mountain stream. Such work would indeed help to formulate reserch projects on rational basis programmes to increase fish yield per km stream length.

Territorial and dominance behaviour of typical coldwater species (trouts, mahseer, Schizothoracids) *vis-a-vis* thermal regime and availability of natural food in various stream systems have also been discussed in this manual.

Sunder, Shyam. A review on the biological studies of Schizothoracids in J & K State and elsewhere in India and their cultural possibilities. *In Recent Researches in Coldwater Fisheries. Edited by K.L. Sehgal, National Workshop on Research and Development Need, Coldwater Fisheries, 30-31 January, 1989* : 157-71.

With the introduction of exotic carp (*Cyprinus carpio*) in Kashmir waters during fifties, its predominance over the indigenous fish population (Schizothoracids) has been reported, especially in lentic conditions by many workers from time to time. Due to fast depletion of endemic fish species, aquaculture to produce stocking material was felt the only possibility to replenish the natural stocks of fish and formulations of proper conservation and management policies for its judicious exploitation in natural biotopes. In the present communication, status on fishery biology of schizothoracids in himalayan waters has been discussed.

Sunder, Shyam. Studies on some aspects of biology and fishery of *Schizothoraichthys curvifrons* Heckel from River Jhelum Kashmir and its bearing on conservation. *J. Inland Fish Soc. India.* 22 (1 & 2) : 80-85.

Schizothoraichthys curvifrons Heckel, one of the important commercial species of Schizothoracids is reported to be declining from catches of River Jhelum in Kashmir. In order to develop scientific restoration policy, a detailed biological investigation was taken up on this species. It has been found that apart from competition for food with other species, the physical changes in river course and flow pattern have reduced natural recruitment considerably. Measures have been suggested for conserving this important fishery.

PERSONNEL

Shri Madan Mohan, Act. Proj. Director (from 01.10.1992)

Scientific

1.	Dr. C.B. Joshi	Sr. Fy. Scientist
2.	Dr. Shyam Sunder	- do -
3.	Dr. H.S. Raina	- do -
4.	Shri B.C. Tyagi	Sci. (Sel. Grade) on study Leave
5.	Dr. S.K. Singhal	Scientist

Technical

1.	Shri R.S. Haldar	T-4
2.	Shri Soumitra Roy	T-II-3
3.	Shri Baldev Singh	T-II
4.	Shri Ashim Mukhopadhyay	T-I
5.	Shri Ravinder Kumar	T-I

Administrative

1.	Shri Prakash Chandra	Asstt. Fin. & Accounts Officer (on deputation from December 1992)
2.	Shri R.L. Raina	Assistant

3.	Shri B.D. Tewari	Sr. Clerk (on deputation)
4.	Smt. Susheela Tewari	Stenographer
5.	Shri Manni Lal	Junior Clerk
6.	Shri Harish Ram	Junior Clerk
7.	Km. Khilawati Sayana	Junior Clerk

Auxiliary

1.	Shri Bakshi Ram	Driver
2.	Shri Bhagwan Singh	Driver

Supporting

1.	Shri Madan Lal	SS Gr IV
2.	Shri Japhu Ram	SS Gr III
3.	Shri Sant Ram	SS Gr II
4.	Shri Hansa Dutt	SS Gr I
5.	Shri J.C. Bhandari	SS Gr I
6.	Shri Gopal	SS Gr I
7.	Shri Ravinder Kumar	SS Gr I
8.	Shri Om Raj	SS Gr I
9.	Shri M.S. Rana	SS Gr I
10.	Shri H.S. Chauhan	SS Gr I
11.	Shri R.K. Arya	SS Gr I
12.	Shri P.C. Tewari	SS Gr I
13.	Shri H.S. Bhandari	SS Gr I

Appointments

S.No.	Name	Designation	Date of appointment
Scientific			
1.	Dr. S.K. Singhal	Scientist	11.01.1993
Administration			
1.	Shri Prakash Chandra	AAO/AFO	14.12.1992
Technical			
1.	Shri R.S. Haldar	T-4 (Farm manager)	19.09.1992

Transfer

S.No.	Name	Post	Date of transfer	Transfer From	To
1.	Dr. S.K. Singhal	Scientist	22.3.93	Haldwani	Champawat
2.	Shri S.C. Roy	AAO/AFO	30.9.92	NRCCWF	CICFRI, B'pore

Retirement

S.No.	Name	Designation	Date of retirement
1.	Dr. K.L. Sehgal	Project Director	30.09.1992

वार्षिक रिपोर्ट 1992-93

पृष्ट भूमि

भारत सरकार की सातवीं पंचवर्षीय योजना की कृषि अनुसंधान व शिक्षा कार्यकारिणी की सिफारिशों को ध्यान में रखते हुए देश के विभिन्न पर्वतीय जल स्रोतों में मछली उत्पादन को बढावा देने की दृष्टि से भारतीय कृषि अनुसंधान परिषद ने राष्ट्रीय शीतजल मत्स्य पालन अनुसंधान केन्द्र खोलने का अनुमोदन किया और वर्ष 1987 में उत्तर प्रदेश के कुमाऊँ क्षेत्र के तराई अंचल में हल्द्वानी नामक स्थान पर इस केन्द्र की स्थापना की गई ताकि इस संस्थान के द्वारा चलाये गये विभिन्न अनुसंधान व विकास कार्यों के परिणाम स्वरूप देश के पर्वतीय क्षेत्रों के नदी, नालों, झीलों, तालावों व पोखरों में क्षमतानुसार मत्स्य उत्पादन का लक्ष्य प्राप्त किया जा सके और इन जल स्रोतों से होने वाली आय से पर्वतीय क्षेत्रों की अर्थव्यवस्था के सुधार में समुचित भागीदारी की जा सके।

वर्तमान में शीतजल मत्स्य पालन अनुसंधान संस्थान अपनी ही अनुसंधान इकाईयों, जो कि भीमताल, जिला नैनीताल व चम्पावत, जिला पिथौरागढ़ में स्थित है के साथ निरन्तर प्रगति की ओर अग्रसर हो रहा है। ठंडे पानी में पायी जाने वाली देशी व विदेशी मछलियों के पालन पोषण की नयी-नयी तकनीकों की खोजबीन की दृष्टि से चम्पावत के छीडापानी नामक स्थान पर एक मत्स्य प्रक्षेत्र की स्थापना की जा रही है तथा भीमताल केन्द्र में माहसीर मछलियों के प्रजनन व रखरखाव पर अनुसंधान कार्य हेतु एक नियमित जल प्रवाही मत्स्य बीज पोषण शाला स्थापित की जा चुकी है। इसके अलावा पर्वतीय शीतजल स्रोतों में समुपयोजन एवं संरक्षण द्वारा मछली उत्पादन में वृद्धि के लिए संस्थान द्वारा कुमाऊँ क्षेत्र की नदियों व झीलों में भी विभिन्न परियोजनायें चलायी जा रही है।

अधिदेश

पर्वतीय क्षेत्रों के ठंडे पानी के स्रोतों में मछलियों के पालन पोषण व संग्रहण के तौर तरीकों को वैज्ञानिक अनुसंधान की सहायता से उचित दिशा निर्देशन हेतु तथा शीत जल मत्स्यकी को व्यवस्थित व विकसित करने की दृष्टि से संस्थान निम्नलिखित लक्ष्यों की प्राप्ति के लिए प्रयत्नरत है:

- सभी शीतजल मत्स्य स्रोतों के संदोहन व संरक्षण के लिए समुचित प्रबन्ध पद्धति विकसित करना
- वाणिज्यिक दृष्टि से महत्वपूर्ण सभी देशी व विदेशी किस्म की ठंडे पानी में पायी जाने वाली मछलियों के पालन पोषण की लाभकारी व दीर्घकालिक तकनीक विकसित करना

प्रशिक्षण, शिक्षा तथा विस्तार के कार्यक्रमों से मत्स्यकी क्षेत्र में विकसित प्रौधोगिकी को इच्छुक व्यक्तियों, संस्थाओं व विभागों को हस्तांतरित करना।

संगठन

उपरोक्त उद्देश्यों की प्राप्ति के लिए संस्थान द्वारा किये जाने वाले अनुसंधान तथा विकास कार्यों को सुविधानुसार दो प्रखण्डों में बॉटा गया है: सभी देशी व विदेशी मछलियों के अण्ड रोपण, निषेचन व पालन पोषण के नये-नये तौर तरीकों पर किये जाने वाले सभी अनुसंधान कार्य मत्स्य पालन कल्चर फिशरीज के अर्न्तगत आते हैं जब कि नदी, नालों व झीलों के पर्यावरण व पारिस्थितिकीय अध्ययन, सदुपयोजन एवं सरंक्षण आदि विषयों पर किये जाने वाले अनुसंधान कार्य संग्रहण मत्स्यकी के अर्न्तगत आते हैं।

भीमताल स्थित केन्द्र में माहसीर मछलियों के बीज की पैदावार बढाने के उद्देश्य से एक नियमित जल प्रवाही हैचरी की स्थापना पूर्ण कर ली गयी है जिसकी क्षमता 2.5 लाख माहसीर के निषेचित अण्डे, 2.0 लाख भ्रूण तथा 1.0-1.5 लाख माहसीर जीरा उत्पादन की है जो कि भविष्य में बहुतायत से माहसीर मछलियों के बच्चों की पैदावार के लिए सक्षम है। संस्थान के चम्पावत केन्द्र में छीडापानी नामक स्थान पर एक मत्स्य प्रक्षेत्र की स्थापना की जा रही है जिसमें हैचरी व नर्सरी के लिए तालाबों का कार्य पूरा हो चुका है और रेन बो तथा ब्राउन ट्राउट मछलियों के अण्डों को प्रत्यारोपित कर इनके पालन पोषण पर अनुसंधान कार्य शुरू किया जा चुका है। भारतीय कृषि अनुसंधान परिषद द्वारा अनुमोदित पौष्टिक आहार परियोजना के अर्न्तगत भीमताल केन्द्र में एक मत्स्य आहार प्रयोगशाला भी स्थापित की जा चुकी है।

पुस्तकालय तथा प्रलेखन सेवा

राष्ट्रीय शीतजल मत्स्य पालन अनुसंधान केन्द्र, हल्द्वानी के पुस्तकालय में इस वर्ष 169 पुस्तकों, 62 भारतीय व विदेशी वैज्ञानिक पत्रिकाओं, 51 वैज्ञानिक प्रतिवेदनों, लेख इत्यादि की बढोतरी की गयी। इसके अतिरिक्त 4 तकनीकी मैनुवल तथा 2 विशेष प्रकाशनों का संकलन किया गया।

पुस्तकालय तथा प्रलेखन सेवा के अर्न्तगत संस्थान ने अनेक अनुसंधान संगठनों, विश्वविद्यालयों तथा सम्बंधित उपक्रमों को अपने निजी प्रकाशन निःशुल्क भेजे ताकि इस क्षेत्र में की गयी प्रगति से उक्त सभी को जानकारी प्राप्त हो सके। संस्थान की तकनीकी रिपोर्ट, मासिक, तिमाही व वार्षिक रिपोर्टों, परियोजना सूची तथा अन्य वैज्ञानिक जानकारियों हेतु भी इस वर्ष पुस्तकालय तथा प्रलेखन सेवा का ही योगदान रहा। इस अनुभाग ने संस्थान के वैज्ञानिकों द्वारा सेमिनार, संगोष्ठी, सम्मेलन आदि में भाग लेने से सम्बंधित कार्यों का भी पर्यवेक्षण किया।

इसी अनुभाग द्वारा इस वर्ष संस्थान की वैज्ञानिक अनुसंधान परिषद की दो बैठकें सम्पन्न की गयी जिसमें संस्थान में चल रही विभिन्न अनुसंधान परियोजनाओं की समीक्षा की गयी तथा बैठकों में लिये गये निर्णयों के कार्यान्वयन के लिए सम्बंधित वैज्ञानिकों को सूचित किया गया। उक्त बैठकों की टिप्पणी संस्तुति हेतु भारतीय कृषि अनुसंधान परिषद को भी अग्रसारित किया गया है।

सलाहकार समिति

संस्थान की सलाहकार समिति की स्थापना वर्ष 1989 में की गयी और इस वर्ष भी इस समिति की एक संगोष्टी आयोजित की गयी जिसमें संस्थान में चल रहे अनुसंधान परियोजनाओं, नयी परियोजनाओं तथा पूर्ण हो चुकी परियोजनाओं पर व संस्थान के उत्थान के लिए किये जाने वाले कार्यक्रमों पर चर्चा की गयी ताकि संस्थान अपने अधिदेश की प्राप्ति के लिए मार्गदर्शन पा सके।

संस्थान की सलाहकार समिति में निम्नलिखित पदाधिकारी सम्मिलित किये गये हैं।

1. निदेशक, राष्ट्रीय शीतजल मत्स्य पालन अनुसंधान केन्द्र हल्द्वानी — अध्यक्ष
2. निदेशक, मत्स्य पालन विभाग, उ. प्र. लखनऊ — सदस्य
3. श्री डी.वी. पाहवा, वरिष्ठ वैज्ञानिक, भा. कृषि. अनु. परिषद, नई दिल्ली — सदस्य
4. डा. आलोक शर्मा, वीर चक्र केवल विला, न्यू सहस्त्रधरा रोड, देहरादून — सदस्य
5. श्री मदन मोहन, वैज्ञानिक एस-3 रा. शी. म. पा. अनु. केन्द्र, हल्द्वानी — सदस्य
6. डा. सी.बी. जोशी वरिष्ट वैज्ञानिक, रा. शी. म. पा. अनु. केन्द्र चम्पावत, पिथौरागढ. उ.प्र. — सदस्य
7. सहायक प्रशासनिक अधिकारी, रा. शी. म. पा. अनु. केन्द्र, हल्द्वानी — सदस्य सचिव

मुख्य उपलब्धियाँ

संस्थान के लिए प्रयुक्त अधिदेश के अन्तर्गत इस वर्ष भी ठंडे पानी की मछलियों के विकास व अनुसंधान के लिए चार विभिन्न परियोजनाओं पर कार्य किया गया जिसमें से एक परियोजना का अध्ययन पूर्ण करने के साथ-साथ अन्य तीन परियोजनाओं का अध्ययन जारी है।

कुमाऊँ क्षेत्र की झीलों में मछलियों की पैदावार बढाने हेतु पारिस्थितिकीय अध्ययन

वैज्ञानिक प्रबन्ध द्वारा पर्वतीय क्षेत्रों में मत्स्य उत्पादन में वृद्धि करना शीतजल मत्स्य अनुसंधान संस्थान के मुख्य दायित्वों में सम्मिलित है। इस लक्ष्य को प्राप्त करने के लिए संस्थान ने कुमाऊँ क्षेत्र की नैनीताल जिले में स्थित खुर्पाताल झील को अपने वैज्ञानिक अनुसंधान के लिए चुना है ताकि इस झील के पानी के भौतिक, रासायनिक व जैविक गुणों के

साथ-साथ अन्य जैविक उत्पादनों के आधार पर झील की मत्स्य उत्पादन क्षमता का आंकलन किया जा सके और झील में मछली की पैदावार बढाने के लिए उचित कार्य प्रणाली का सुझाव दिया जा सके जो हिमालय क्षेत्र में पायी जाने वाली इस किस्म की अन्य झीलों के लिए भी एक मॉडल की तरह कार्य करे।

माहसीर मछलियों का कृत्रिम प्रजनन व बीज संग्रहण

इस परियोजना के अन्तर्गत संस्थान के भीमताल स्थित केन्द्र पर कार्य चल रहा है। विगत वर्षों की तरह इस वर्ष भी भीमताल व नौकुचियाताल झीलों से गिल नेट की सहायता से परिपक्व माहसीर प्रजनकों को एकत्रित करके शुष्क दाव (ड्राई स्ट्रिपिंग) पद्धति द्वारा अण्डों का निषेचन कराया गया। इस विधि द्वारा प्राप्त 13 मादा प्रजनकों से प्राप्त अंडों की संख्या कुल 39,000 थी और इन अण्डों में निषेचन प्रतिशत 76.5-96.0 था। प्रति किलो मादा मछली से प्राप्त अण्डों की संख्या 2520-4270 तक रही और इन मादा मछलियों की लम्बाई 410-550 मि.मि. तथा भार 600-1500 ग्राम था जबकि परिपक्व नर मछलियों की लम्बाई 300-470 मि.मी. व इनका भार 300-1000 ग्राम था। निषेचन के बाद कुछ समय तक इन अण्डों को जल-दृढीकरण हेतु रखा गया तथा ठीक प्रकार से धोने के बाद उन्हें स्फुटनशाला (हैचरी) की तश्तरियों में स्फुटित होने के लिए छोड दिया गया।

संस्थान के भीमताल केन्द्र पर बनी हुई नियमित जल प्रवाही स्फुटनशाला में जी.आइ. शीट, फाइबर ग्लास व प्लास्टिक से निर्मित ट्रफों की कई कतारें हैं जिनमें पाइपों के द्वारा लगातार बहने वाले ताजे पानी का प्रबन्ध किया गया है ओर इन ट्रफों में लकड़ी व मोनोफिलामेंट से बनी हुई जालीदार तश्तरियॉ रख दी जाती हैं जिनमें निषेचित अण्डों को फैलाकर स्फुटित होने के लिए छोड दिया जाता है। इन हेचिंग ट्रफों में लगातार बहने वाले पानी की मात्रा 2-3 लीटर प्रति मिनट के हिसाब से व्यवस्थित की जाती है।

अण्डों के निषेचन के 3-4 दिनों के बाद उनका स्फुटन शुरू होता है तथा छोटे-छोटे बच्चे निकलने शुरू हो जाते हैं जिनमें अण्डपीत थैली के रुप में मौजूद होता है जो कि इन सूक्ष्म बच्चों के पोषण में मदद करता है। 11.5-23.0 डिग्री सें. तापमान में 90-100 घंटों के अन्तराल में धीरे-धीरे अंडपीत थैली समाप्त हो जाती है और इस प्रकार माहसीर मछलियों के जीरे (फिश फ्राई) की उत्पत्ति होती है तब इस जीरे को तश्तरियों से हटाकर ट्रफों में छोड दिया जाता है तथा पानी का बहाव 3 से 4 लीटर प्रति मिनट की रफ्तार से रखा जाता है। इस समय प्रत्येक फ्राई का साइज 15-20 मि.मी. तथा भार 0.010-0.020 ग्राम होता है और उन्हें प्रतिदिन कई-कई बार विटामिन व खनिज युक्त कृत्रिम खुराक दी जाती है जिसमें प्रोटीन की मात्रा 40-50 प्रतिशत के बीच होती है। इससे पूर्व इन बच्चों को ठीक से खुराक की आदत डालने हेतु मुर्गी के अन्डे का अन्डपीत पानी में घोलकर लेई के रूप में छिडकाव करके दिया जाता है। इस प्रकार करीब 2-3 महीने तक इन फ्राई को ट्रफों में पालने के बाद नर्सरी तालाबों में छोड दिया जाता है।

संस्थान ने उक्त परियोजना के अन्तर्गत इस वर्ष 7000 माहसीर फ्राई भीमताल झील में तथा 5000 फ्राई खुरपाताल झील में संचित किये।

शाइजोथोरेसिड (असेला) मछलियों का कृत्रिम प्रजनन

संस्थान के चम्पावत केन्द्र के छीडापानी मत्स्य प्रक्षेत्र में तथा आस-पास के नदी-नालों से शाइजोथोरेसिड मछलियों को कास्टनेट की सहायता से पकड़कर उनका प्रजनन किया गया और इस प्रकार कुल 11 मादा प्रजनकों जिनकी लम्बाई 180-296 मि.मी. तथा भार 88-230 ग्राम था से 21,000 अण्डों का उत्पादन शुष्क दाब विधि (ड्राई स्ट्रिपिंग) द्वारा किया गया तथा इनकों निषेचित करने के लिए 148-220 मि.मी. लम्बाई व 25-140 ग्राम भार वाले नर प्रजनकों का उपयोग किया गया। इन अण्डों के निषेचन का प्रतिशत 45-86 तक रहा चूँकि ठंडे पानी में पायी जाने वाली मछलियों के सफल प्रजनन तथा स्फुटन हेतु स्वच्छ वहते हुए ऑक्सीजन युक्त ठंडे पानी की आवश्यकता होती है और संस्थान के चम्पावत प्रक्षेत्र में इस किस्म की व्यवस्था न हो पाने के कारण इन मछलियों के अण्डों का स्फुटन न कराया जा सका।

ट्राउट मछलियों का पालन पोषण

संस्थान के चम्पावत केन्द्र में छीडापानी मत्स्य प्रक्षेत्र पर ट्राउट मछलियों के पालन पोषण की परियोजना के अन्तर्गत मार्च 1992 में उत्तर प्रदेश राज्य सरकार की तलवाड़ी हैचरी से लाकर रेनबो ट्राउट मछलियों के 1000 निषेचित अण्डों (आइड ओवा) का प्रत्यारोपण किया गया। कुमाऊँ व गढ़वाल की दुर्गम पहाड़ों में जीप द्वारा तलवाड़ी से छीडापानी तक करीब 250 कि.मी. रास्तों में इन 1000 निषेचित अण्डों को लाने के लिए एक विशेष प्रकार का वक्सा वनवाया गया और उसमें पहाड़ी घास तथा वर्फ की सहायता से अण्डों को सुरक्षित गंतव्य तक पहुँचाया गया। इस प्रकार ढुलान के दौरान कुल 1.4 प्रतिशत अण्डों की क्षति हुई।

छीडापानी मत्स्य प्रक्षेत्र में लाने के वाद इन निषेचित अण्डों (आइड ओवा) को सफलता पूर्वक स्फुटित कराने के लिए वहते पानी वाले ट्रफों के अन्दर रखी हुई जालीदार तश्तरियों में रख दिया गया और इस प्रकार 12.5 - 17.5 डिग्री से. तापक्रम के वीच अप्रैल माह के द्वितीय सप्ताह तक सभी अण्डों का स्फुटन हो गया। कुल मिलाकर 84.14 प्रतिशत सफलता के साथ 809 ट्राउट के सूक्ष्म वच्चे प्राप्त किये गये। कुछ दिनों के पश्चात जव इनकी डिम्व पीत थैली समाप्त हो गयी तो इन सभी छोटे-छोटे फ्राइ को मुर्गी के अण्डे की जर्दी को पानी में घोलकर खिलाया गया और कुल मिला कर 685 उन्नत ट्राउट फ्राइ पैदा किये गये जिनका प्रतिशत 84.67 था। इन ट्राउट फ्राइ की लम्बाई 20-35 मि.मी. तथा औसत भार 0.12 ग्राम था।

इन ट्राउट फ्राइ को वृताकार नर्सरी तालावों में डालने के उपरान्त जुलाई महीने में मानसून की वाढ़ के कारण आये प्रदूषित जल व अधिक तापक्रम के कारण नही वचाया जा सका। ट्राउट मछलियों के अण्डों के स्फुटन व पालन-पोषण के दौरान पानी के भौतिक व रासायनिक गुणों का भी विश्लेषण किया गया।

अन्य अनुसंधान कार्य

उपरोक्त अनुसंधान परियोजनाओं के अलावा संस्थान में भारतीय कृषि अनुसंधान परिषद द्वारा पोषित एक तदर्थ योजना पर भी कार्य किया गया। "माहसीर मछलियों में पोषण सम्वंन्धी आवश्यकतायें" नामक इस योजना में 21.0-31.7 प्रतिशत प्रोटीन

बाहुल्य खुराक के परीक्षण हेतु प्रयोग किये गये। इस खुराक के मुख्य अवयव सोयबीन, रेशम का प्युपा, धान की भूसी तथा प्रचुर मात्रा में विटामिन व खनिज तत्व मिला हुआ केसिन मुख्य थे। इस प्रकार परीक्षण किया गया कि जिस खुराक में प्रोटीन की अधिकता थी उसमें माहसीर मछलियों के बच्चों की अधिक बढोतरी हुई और दो महीने के सफल परीक्षण के दौरान 52.4 प्रतिशत बच्चे प्राप्त किये गये। इन फ्राइ की लम्बाई शुरू में 15.0 मि.मी. से अन्त तक 28.0 मि.मी. प्राप्त की गयी। इस योजना के अन्तर्गत बनायी गयी कृत्रिम खुराक में वसा व कार्बोहाइड्रेट की मात्रा तथा फ्राइ की बढोतरी में इनके योगदान पर भी कार्य किया गया।

इस प्रकार इन माहसीर फ्राइ की जैव रासायनिकी विश्लेषण करने पर ज्ञात हुआ कि शिशु मछलियों की खुराक में प्रोटीन की मात्रा अधिकाधिक होनी चाहिए ताकि मत्स्य प्रक्षेत्रों में स्वस्थ व निरोग प्रजनकों की उत्पत्ति की जा सके।