1991 – 1992
ANNUAL REPORT

NATIONAL RESEARCH CENTRE
ON

वार्षिक रिपोर्ट

ANNUAL REPORT

1991-92

भाकृअनुप
ICAR

राष्ट्रीय शीत जल मत्स्य पालन अनुसंधान केन्द्र (भा. कृ . अनु. प.)
शिल्वा हिल्स नर्सरी, रुपनगर, पोस्ट बाक्स सं० 28.

CONTENTS

INTRODUCTION

Brief History

National research Centre on Coldwater Fisheries (NRCCWF) was formally established in September, 1987 under the scheme of reorganisation of Fisheries Research Institutes in the Country by the Indian Council of Agricultural Research (ICAR). The Centre had its beginning in the Central Inland Fisheries Research Station established at Srinagar, Kashmir. This station, for the first time enriched the knowledge on resource management, biological productivity of torrential rivers, streams, brooks, flood plain and high altitude lakes, reservoirs etc. both in the Himalayan and Deccan Plateau region. In the field of aquaculture, technologies of production of trouts, mahseer, schizothoracids and common carp were standardized with the sole aim of increasing fish yield per unit area of water. Inspite of the great strides made in research leading to development of coldwater fisheries, the centre lacked in its own infrastructure facilities. On the recommendations of the Site Selection Committee of the ICAR, the erstwhile establishment of the Srinagar Research Centre of CIFRI was merged with NRC on Coldwater Fisheries and NRC-CWF was started with its location at Haldwani in April, 1988 with the objectives for improvement and enhancement of fish production in coldwater zones in entire himalayan belt.

Mandate

viable and sustainable culture systems for indigenous and exotic coldwater fish species in upland areas; and

To undertake transfer of technology through training, education and extension programmes and to provide Institutional Consultancy Services for the development of coldwater aquaculture in the Country.

Thrust areas of research for VIII Plan

Fishery resource assessment and management

Continuous monitoring of the existing commercially important fishery to estimate the changes in abundance of fish species and remedial measures.

Complete documentation of coldwater fish species available in different regions and their correct placement in systematics.

Bio-ecological studies of important rivers, lakes and reservoirs to assess their carrying capacity.

Stock enhancement in various lacustrine and riverine ecosystems by intensive stocking of existing species or transplanting some new species of fish to improve the present yield of fish.

Conservation of endangered and

sport and German phenotypes of common carp by induced breeding, hatchery development and seed production.

Developing hatchery, nursery and rearing technologies of threatened coldwater fish species.

Intensive aquaculture of coldwater fishes and German phenotypes of common carp in raceways/ponds to achieve maximum fish yield per cubic metre of water.

Production of fingerlings of endangered coldwater species to rehabilitate depleted coldwater streams to promote angling in the country.

To conduct research in basic discipline of fish nutrition and feed formulation, monitoring of fish health in hatcheries and raceways/ponds; reproductive physiology; selective breeding and finally stock improvement.

Education, Training, Extension and Institutional Consultancy

Transfer of technology so far developed.

Short-term training on induced spawning, hatchery and nursery rearing of principal coldwater fishes

Diploma courses in coldwater aquaculture

To provide Institutional Consultancy Services on coldwater fisheries for development and management of coldwater fisheries in upland states and

programme on coldwater aquaculture 3.3 ha land at Champawat was purchased in 1987 to develop the coldwater fish farm. Infrastructural facilities in the shape of hatchery building, rearing ponds, circular ponds, raceways and small pelletizing, feeding and milling rooms are being developed at Chirapani. To monitor these works a small research unit with two Scientists (Selection Grade) alongwith technical and supporting staff has been set up at Champawat. This research unit was engaged with a couple of research programmes to investigate preliminary observations on the stream ecology feeding the farm and introduction of exotic trout species in it. A standard mahseer seed production unit with flow-through hatchery components has been set up at Bhimtal. The Bhimtal research unit continues to function in a rented building with adequate laboratory facilities.

Staff position

The overall staff position as on 31st March, 1992 is given below:

S.No.	Category of posts	Posts sanctioned	Staff in position	Post vacant
1.	Research Management Project Director	01	01	–
2.	Scientific	15	05	10
3.	Technical	05	04	01
4.	Administrative	07	07	–
5.	Auxiliary	02	02	–

year 1991-92 is as under:

(Figures in lakhs)

Plan/Non-Plan	Allocation BE 1991-92	Expenditure
Plan	33.00	26.20
Non-Plan	13.00	8.50
Total	46.00	34.70

Important Achievements

1. A standard golden mahseer seed production unit with flow-through hatchery components was installed at Bhimtal. To rehabilitate the stock of this endangered species in natural waters of this region, artificial fecundation of wild spawners collected from kumaon lakes was undertaken. For the first time more than 25,000 advanced fry of this species were raised in the farm by adopting this flow-through technology. Its efficiency was almost three times that of the conventional methods. Under management/conservation programme the fishes produced were stocked in different streams and lakes in kumaon region.

2. The eco-based strategies for the development of lakes in himalayan region with an aim to enhance fish production to provide a model for developing mountain lakes based on the principles of culture and capture fisheries to obtain sustained fish yield, work on Khurpatal lake was continued during this period. The system was bio-limnologically investigated. Under envisaged technical programme seed of golden mahseer were stocked in this ecosystem.

3. Studies on bio-ecology of a mountain river Gaula in view of proposed construction of Jamrani dam revealed the scope for improving stock of golden mahseer and snow-trout fishery through recruitment in selected riffles and pools in upper reaches of the river.

4. To evaluate suitability of a mountain stream for fish production, a typical coldwater stream in Pithoragarh district was biologically assessed. On the basis of various bio-ecological features, the stream as a whole, appears to be conducive for nursery rearing of *Schizothorax kumaonensis*. However, its upper reaches can be developed for raising fingerlings of mahseer and other coldwater fish species to provide cheap source of protein to local people in this remote area.

GENERAL INFORMATION

Library and documentation service

The technical and non-technical querries of the NRC-CWF from various national and international agencies were attended to by this section. Technical reports on the progress of research activities of the NRC-CWF were compiled and sent to ICAR. Biodata sheets in respect of the Scientists of this Institute were mailed to various organisations for inclusion in different year books, directories etc.

The section maintained active reprography service by producing departmental publications in the form of technical reports and special publication on coldwater fish and fisheries, supplying them to various concerned State Fisheries agencies, Research Institutes and universities free of cost.

Special publication

Artificial propagation of the golden mahseer, *Tor putitora* (Hamilton) in the Himalayas. *NRC on Coldwater Fisheries (NRC CWF). Spl. Publ.* 2 : 12 pp by K.L. Sehgal.

The library continued mailing of the NRC-CWF last year's Annual Report and NRC's spp. bull. to concerned State Fisheries Departments, Universities, Research Scholars free of cost.

During the year, 102 books, 63 Indian and Foreign journals, 66 reports, FAO publications etc. were added to the library of NRC-CWF.

Conferences/ Symposia/ Seminars/ Meetings attended

S.No.	Subject	Organisers	Papers presented	Authors/ participants from the Institute
1.	Conservation of mahseer resources in India	Tata Electric Companies, Bombay-Pune Road, Lonavala	Aquaculture of *Tor putitora vis -a-vis* Stock enhancement of fisheries in the Himalaya	Dr. K.L. Sehgal

Shri R.C. Kapila, Secretary, Ministry of Agriculture & Director General of ICAR with Director, NRC on Coldwater Fisheries at Bhimtal mahseer hatchery complex.

Visitors

A good number of distinguished personalities visited this Institute during 1991-92.

Kapila, R.C. (Mr.)	Secretary to Government of India, Ministry of Agriculture and Director General, ICAR, New Delhi.
Srivastava, G.C. (Dr.)	Secretary, Indian Council of Agricultural Research, Krishi Bhavan, New Delhi.
Paroda, R.B. (Dr.)	Dy. Director General (CS), ICAR, New Delhi.
Singh, Surender (Mr.)	Agriculture Commissioner, Government of India, New Delhi.
Modgal, S.C. (Dr.)	Director of Research, G.B. Pant University of Ag. & Technology, Pantangar (Nainital) U.P
Setu, J.N. (Mr.)	Director of Horticulture, U.P.

Pandey, K.D. (Mr.)	Director of Fisheries, UP, Lucknow
Das, P. (Dr.)	Director, National Bureau of Fish Genetic Resources, Allahabad.
Pahwa, D.V. (Mr.)	Principal Scientist (Inland Fisheries), Indian Council of Agricultural Research, ICAR, New Delhi.

Dr. G.C. Srivastava, Secretary, DARE/ICAR with Scientists of this Institute at Mahseer Seed Production Unit, Bhimtal.

Assistance/ training rendered

The Institute provided the basic design, drawing and lay-out plan for a trout fish farm at Bairangana, Distt. Chamoli (UP) to U.P. State Fisheries Department, Lucknow.

The Institute provided lay-out plan for a

Lectures were given to fisheries trainees of CIFE, Lucknow and Fisheries College, G.B. Pant University of Ag. & Technology, Pantnagar (Nainital) UP.

Advisory Committee

The NRC-CWF's Advisory Committee, as below, has been functioning during the year

3.	Shri D.V. Pahwa, Principal Scientist (Fisheries), Indian Council of Agril. Research, Krishi Bhavan, New Delhi	Member
4.	Dr. Alok Sharma, Vir Chakra, Keval Villa, New Sahastradhara Road, Dehradun	Member
5.	Shri Madan Mohan Scientist, S-3, NRC-CWF, Haldwani	Member
6.	Dr. C.B. Joshi Scientist (Sel. Grade) NRC-CWF-Champawat	
7.	Shri S.C. Roy, AAO/AF & AO, NRC-CWF, Haldwani	Member Secretary

Second meeting of Advisory Committee was held on 16th September, 1991 at this Institute. Discussions were held on the progress of ongoing scientific work and other matters of the Institute.

Other activities

For the recreation of staff members of NRC-CWF, the activities of Staff Recreation Club, Constituted in 1989, were continued. Due to limited space and other constraints, facilities to play Badminton and Carom only could be provided. In December inter sectional matches in Badminton and Carom were organised by the Club. Some cultural activities were organised on 15th August and 26th January. The families of staff were invited to witness the same.

During the period the meetings of the Joint Council of NRC-CWF were held periodically and matters pertaining to welfare activities of the staff were discussed and

Dr. K.L. Sehgal, Director explaining the working of flow-through hatchery unit to members of the Advisory Committee of NRCCWF.

decision taken were implemented from time to time.

The meetings of Hindi Implementaition Committee (Hindi Karyanvayan Samiti) already consitituted in previous year were held quarterly under the Chairmanship of Director and decision taken are sent to the Council. Every possible effort is being made to implement the official language policy of the Government of India at this Centre.

PROGRESS OF RESEARCH

The Kumaon Himalaya has large number of streams, lakes and rivers where fish catches have declined considerably owing to environmental degradation of aquatic ecosystem and hectic activities through human interference on these upland ecosystems. The fish catches in these water bodies have declined sharply thus affecting the economic condition of fishermen who are depending on subsistance fishery. As a part of fulfilment of mandate of the Institute for development and management of fishery resources of coldwaters, eco-based investigations of upland lakes and streams to assess their biological productivity for increasing fish yield, mass scale seed production of coldwater fish species were continued. The progress made under the various research projects is summarized as below:

Eco-based investigations of a kumaon lake for increasing fish yield (NRC-CWF/01)

Haldwani : Madan Mohan (Project Leader) H.S. Raina, Shyam Sunder and Ashim Mukhopadhyay.

To develop a model for obtaining fish yield in mountain lakes of kumaon, based on the principles of ecological characteristics and culture and capture fisheries, biolimnological investigations were made on Khurpatal lake. The lake has a total water spread area of 13.0 ha and situated at an elevation of 1600 m above msl. It is a typical warm-monomictic ecosystem remains stratified from March to November stations was bio-limnologically analysed during the period under report. The physico-chemical features ranged as follows; water temperature, 15.0-27.0°C; pH, 7.7-8.9; dissolved oxygen, 10.5-15.0 mg/1; free carbondioxide, nil-2.2 mg/1; total alkalinity, 52.0-162.0 mg/1; total dissolved salts, 135.0-186.4 mg/1; specific conductivity, 270.0-413.2 μ mhos (at 25 °C); calcium, 16.0-30.4 mg/1; and magnesium, 2.0-3.1 mg/1.

The Khurpatal lake supports a massive growth of algal phytoplankton population and ranged between 1.27×10^4 -15.84×10^4 units/1 mainly dominated by Dinophyceae (55-100%) followed by diatoms (nil-35%) and Chlorophyceae (nil-10%). The monopolised assemblage of dinophyceae was to the tune of 12.45×10^4units/1. The dominance of these forms revealed the high reproductive rates of these forms in the system that allow the populations to be predominant. *Peridinium palatinum, Glenodinium quadridens* and *Ceratium hirudinella* were the chief predominant species in the lake and significantly recorded all the year round.

The zooplankton of this system in Kumaon Himalaya exhibits typical of sub-tropical waters. The diversity of zooplankton assemblage in this lake is of a low grade. The zooplankton population at littoral sites varied between 18-310 units/1; Copepoda (41.2-100%), Rotifera (nil-48.0%) and Cladocera

zoolankton population at pelagic zone of the lake ranged between 150-380 units/1.

The benthic macrofauna of the lake bed varied between 267-1422 ind/m^2 (4.430-86.560g/m^2 as wet biomass). Amongst the major groups Odonata (nil-68.0%), Ephemeroptera (nil-88.0%). Diptera (nil-68.0%), Coleoptera (nil-49.8%), Mollusca (nil-77.7%) and Oligochaeta (nil-46.0%) were most dominant. The predominant forms recorded were *Gomphus, Coenagrion, Octogomphus* from Odonata; *Caenis* and *Heptagenia* from Ephemeroptera; *Chironomus* and *Chaoborus* from Diptera; *Haliplus* and *Hydrophilus* from Coleoptera; *Pristina bilongata, Nais* sp. and *Tubifex tubifex* from Oligochaeta and *Lymnaea* and *Gyraulus* from Mollusca.

Primary production

The gross primary production at littoral zones ranged between 67.5-112.72 mg Cm^{-3} hr^{-1} while at pelagic site of the lake it ranged between 35.5-97.25 mgC^{-3} hr^{-1}.

Fish biology of mahseer

Wild fishes caught with gill nets from the Khurpatal lake were collected for studies on sex ratio, food and feeding, maturity, fecundity etc. The sex ratio of male to female was found to be 1 :1. The fecundity ranged 8,615-9,120 eggs/kg body weight. Aquatic insects and zooplankton were found to be the main food of the golden mahseer in this system. Maximum specimens (83%) of either sex were in the ripe condition during July and August.

Experimental fishing

To ascertain the species composition and production of the system experimental fishing 425 mm in total length (250-625 g in wt.) The catch per unit effort was estimated as 3.460 kg per net per day.

Fish stocking

In July about 1800 advance fry of mahseer having a size range of 12-17 mm (0.015-0.200 g in weight) produced at Bhimtal mahseer hatchery were stocked in this lake. In addition, 2800 fingerlings of common carp ware also stocked in this system.

Studies on the bio-ecology of a mountain river in kumaon (NRC-CWF/02)

Haldwani : Shyam Sunder (Project Leader), H.S.Raina, Madan Mohan, Baldev Singh.

To assess the biological productivity of a Himalayan river with reference to fish production, a project on River Gaula was started in 1989. The Gaula is a wholly lesser himalayan river system draining south-central part of kumaon. Jamrani dam, a multipurpose project has been proposed to be constructed to utilize the run-off of river Gaula about 15 km upstream of Kathgodam.

Physico-chemical features

The water quality parameters at three stations of River Gaula were; termperature, 16.0-30.0 ^{0} C; flow of water, 0.5-1.2 m/sec; depth, 0.3-1.2m; pH, 7.8-8.4; dissolved oxygen, 10.0-13.6 mg/1; free carbondioxide, nil-0.4 mg/1; total alkalinity, 47-120 mg/1; chlorides, 12.0-22.4 mg/1; magnesium, 2.4-3.0 mg/1; calcium, 16.0-30.4 mg/1; T.D.S. 68.9-116.3 mg/1; silicates, 1.0-2.5 mg/1; specific conductivity, 137.0-231.0 µmhos.

group followed by Chlorophyceae and Cyanophyceae. The contribution of zooplankton in the total plankton population was insignificant.

The total epilithic micro-organisms growing over bottom stones varied between 10.83×10^4-35.16×10^4 units/cm^2 in this system. The composition of microbenthic biomass in the samples indicated that microalgae dominated over microanimals at all the stations and throughout the year.

The benthic micro-fauna at three stations of the river bed varied between 4-57 ind/m^2 having a wet biomass range of 0.410-6.510 g/m^2. The major benthic groups recorded in the system were Ephemeroptera (nil-64.7%), Odonata (nil-18.5%), Plecoptera (nil-12.7%), Coleoptera (nil-11.54%), Trichoptera (nil/24.47%), Diptera (nil-37.50%), and miscellaneous items (nil-80.00%). The predominant benthic forms recorded were *Baetis, Rithrogena, Heptagenia, Iron and Epeorus* from Ephemeroptera; *Gomphus* and *Ophiogomphus* from Odonata; *Chloroperla* from Plecoptera; *Elmis, Gyrinus* and *Dityscus* from Coleoptera; *Hydropsyche, Rhyacophila* and *Philopotamus* from Trichoptera; *Chironomus, Tabanus* and *Atherix* from Diptera and crabs (*Paratelphusa mesoniana*), leeches and fish fry from miscellaneous groups.

Fish and Fisheries

The Ichthyofauna of the Gaula river comprised of only indigenous mahseer (*Tor putitora*) and snow trout (*Schizothorax richardsonii*) alongwith species of low commercial value such as *Garra gotyla and Barilius bendilisis.* Fishes at three stations were caught with the help of standard gear at trout in the same system consumed epilithic micro-organisms growing over bottom stones. Contribution of algae, particularly diatoms was the most significant in gut contents of this species. Sex ratio of male to female was 0.5:1.0. Males in oozing stage were recorded in April and June while gravid females were collected in July/August.

Experimental fishing

Experimental fishing with cast net method was conducted to ascertain the catch per unit effort at three stations covering about 50m stretch at each station. The CPUE values ranged between; 200-470 g/m/hr, 107-175 g/m/hr and nil-140 g/m/hr at 1st, 2nd and 3rd station respectively. The contribution of *Schizothorax richardsonii* was nil-67.3%, *T putitora* nil-59.0% and were mainly recorded at station 1st. At other two stations *Garra gotyla* was the most predominant species.

Estimation of carrying capacity of Chirapani stream (NRC-CWF/03)

Champawat : C.B. Joshi (Project Leader), and Ravinder Kumar.

A perennial upland stream Chirapani in Pithoragarh district was selected to undertake investigations to estimate the carrying capacity of the system *vis-a-vis* fisheries development. The stream originates from a spring is situated at an elevation of 1620 m above msl. This is the only source of water to NRCCWF's coldwater fish farm at Champawat. After meandering through the agricultural fields and green pastures in its middle stretch for about 11 kms, it joins River Lohawati near Gauri Power House.

Bio-ecological features

The population of macro-benthic invertebrates in the stream varied between 3-43 ind/m² dominiated by Ephemeroptera (33.59-64.94%) followed by Trichoptera (13.28-27.27%). Plecoptera (9.23-26.5%) and Diptera (11.19-11.45%).

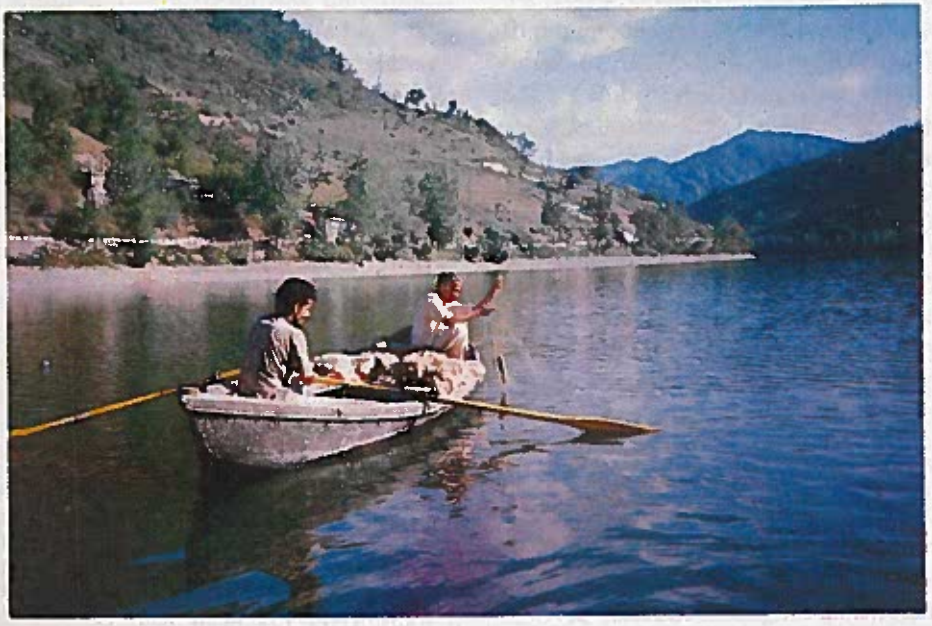
Sample fishing with standard cast net method and fish collected by gamchha cloth in the stream revealed that the *Schizothorax richardsonii* (92.5%) was the predominant species. *Barilius* sp., *Nemacheilus* sp. and *Botia birdi* were other species recorded in this stream. Average 1.26 kg fish biomass per unit effort in 50 castings was recorded from the middle stretch of the stream.

Hatchery

For artificial propagation of golden mahseer (*Tor putitora*), a standard mahseer seed production unit had been installed at Bhimtal which includes lifting of water, a series of overhead tanks, water supply distribution system, flow-through hatching troughs/ trays, aerating devices, flow-through type of fry rearing units with lift water system. Each unit is arranged under a bamboo-shed having roof cover of *Chatais* made out of dried grass.

Seed production

During the seed production season, only



A view of hatchery troughs with trays at Bhimtal mahseer hatchery.

unprecedented draught in entire kumaon region the seed production programme of *T. putitora* was badly affected. Ma jority of brooders caught during the period were having their ovaries in hypotrophic phases. The eggs were stripped from the females and fertilized by milt from the male specimens by *dry method.* The rate of fertilization ranged between 90-95%. In total 29,000 eggs were fertilized and kept in hatching trays for incubation. The incubation period ranged between 92-100 hrs. at a water temperature of 22.5-23.8°C. The hatching rate ranged between 93.0-97.0%, while the yolk absorption was completed in

area) having flow rate of 3-4 l/min @ 2500-4000/m^{-2}. The fry were fed with laboratory compounded dry diet, having a crude protein level of 45.5%. The main ingredients of the artificial diet were Casein, Soybean, Silk-worm pupae, fish oil supplemented with vitamin and mineral pre-mix.

The feeding of fish was done at 10-15% of body weight initially (20-25° C) and reduced to 5-10% later (10-20° C). After about 100 days of rearing the fish of initial size of 11-15 mm (0.080 g wt) had grown to the range of 21-60 mm (weight 0.295-0.720 g) with the survival of 72.5%. In the month of October, about 1800

Stripping operation of Golden Mahseer.

alkalinity, 60-140 mg/1; silicates, 1.4-4.5 mg/1; phosphates. nil-0.02 mg/1; and sulphates, 12.6-25.8 mg/1.

Other research activities

The research programme on Nutritional requirement of *Tor putitora* was sanctioned by the ICAR as Adhoc Cess Fund Scheme. The two Senior Research Fellows have been recruited and the work was initiated. Preliminary feeding trials with purified test diets and formulated diets having different levels of crude protein on mahseer juveniles were started at Mahseer Seed Production Unit, Bhimtal.

PUBLICATIONS

Joshi, C.B. Benthos composiion of a hill stream in Western Himalayas. *J.Indian Inst. Sci.* 17 : 373-382.

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Sehgal, K.L. Coldwater Fish and Fisheries of Western Ghats, India. *FAO Publ.* (In Press).

PERSONNEL

Dr. K.L. Sehgal - Project Director

Scientific

1.	Shri Madan Mohan	Scientist, S-3
2.	Dr. C.B. Joshi	Scientist (Sel. Grade)
3.	Dr. Shyam Sunder	Scientist (Sel. Grade)
4.	Dr. H.S. Raina	Scientist (Sel. Grade)
5.	Shri B.C. Tyagi	Scientist (Sel. Grade) (On Study Leave)

Technical

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

Administrative

1.	Shri S.C.Roy	Asstt. Finance & Accounts Officer (on deputation)
2.	Shri R.L. Raina	Assistant
3.	Shri B.D.Tewari	Sr. Clerk (on deputation)
4.	Smt. Susheela Tewari	Stenographer
5.	Shri Manni Lal	Jr. Clerk
5.	Shri Harish Ram	Jr. Clerk
7.	Km. Khilawati Sayana	Jr. 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
Administrative			
1.	Smt. Susheela Tewari	Stenographer	