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FISH AND FISHERIES OF COLD WATER BODIES IN INDIA

RESOURCES OF COLDWATER FISHERIES IN INDIA

- In India, a number of coldwater streams, river, lakes, reservation are present. The Indian Himalayas are drained by 19 major river systems which include drainage of the Indus, Ganga, Brahmaputra river system.
- The snow fed Himalayan rivers transverse from these physiographic regions. The cumulative length of the major uplands rivers is estimated at about 10,000 km.
- The lacustrine Resources also varied from high altitude freshwater lakes, high attitude brackish to mid and lower attitudinal lakes. Total area under lacustrine resources is about 20,500 ha and 2,65,000 ha of water spread area under reservoir.

FISH DIVERSITY

- The attitudinal and geographical variation, mountain slopes expansion of river valley and vegetation cover has given rise to varying climates in different parts of country.
- As a result, the vast and varied water resources in the uplands harbour rich piscine diversity. The list of fishes comprises 258 species. Belonging to 21 families and 76 genera. Out of these, 255 species are recorded from North East Himalayas, 203 from West and Central Himalayas and 91 from the Deccan plateau.
- Among the cold water fishes Salmons, trouts, mahseers and the mirror carp comprise the major chunk of the economically important fishes. Different species of these fishes and major distribution are summarized below

Exotic fishes

Sl. No.	Name of the species	Family	Main Distribution
1.	<i>Salmo trutta fario</i> (Brown trout)	Salmonidae	Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Andhra Pradesh
2.	<i>Salmo gairdneri iridous</i> (Rainbow trout)	Salmonidae	Jammu & Kashmir, Himachal Pradesh, Tamilnadu, Kerala
3.	<i>Salmo gairdneri Shasta</i> (Rainbow trout)	Salmonidae	Kerala
4.	<i>Salmo hucho</i> (Danube Salmon)	Salmonidae	Jammu & Kashmir
5.	<i>Salmo salar</i> (Atlantic salmon)	Salmonidae	Jammu & Kashmir
6.	<i>Salvelinces fontinalis</i> (Eastern brook trout)	Salmonidae	Jammu & Kashmir

Sl. No.	Name of the species	Family	Main Distribution
7.	<i>Onchorhynchus nerka</i> (Sock eye salmon)	Salmonidae	Tamilnadu
8.	<i>Carpus - Carassius carassius</i> (English & Golden carp)	Cyprinidae	Nilgiris, Andhra Pradesh
9.	<i>Tinca tinca</i> (Tench)	Cyprinidae	Nilgiri & Ooty
10.	<i>Cyprinus carpio</i> (Common carp)	Cyprinidae	Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Nilgiri

Endemic Fishes

Sl. No.	Name of species	Family	Main Distribution
1.	<i>Barillius bola</i> (Indian trout)	Cyprinidae	Arunachal Pradesh, Orissa
	Snow trouts		
2.	<i>Schizothorax moles worthic</i>	Cyprinidae	Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh
3.	<i>Schizothorax richordsonii</i>	Cyprinidae	Himalayas
4.	<i>Schizothorax niger</i>	Cyprinidae	Jammu & Kashmir
5.	<i>Schizothorax planidoxmes</i>	Cyprinidae	Himalayas
6.	<i>Schizothorax longipinis</i>	Cyprinidae	Himalayas
7.	<i>Schizothorax esocinus</i>	Cyprinidae	Jammu & Kashmir
	Mahseer		
8.	<i>Tor tor</i> (Deep bodied mahseer)	Cyprinidae	Uttar Pradesh, Arunachal Pradesh, Madhya Pradesh
9.	<i>Tor putitor</i> (Golden mahseer)	Cyprinidae	Jammu & Kashmir, Uttar Pradesh

Sl. No.	Name of species	Family	Main Distribution
10.	<i>Tor khudree</i> (Deccan mahseer)	Cyprinidae	Tamil Nadu & Jammu & Kashmir
11.	<i>Tor mosal</i>	Cyprinidae	Himachal Pradesh, Uttar Pradesh, Arunachal Pradesh, Madhya Pradesh
12.	<i>Tor mussullah</i>	Cyprinidae	Nilgiris
13.	<i>Tor mahanadicus</i>	Cyprinidae	Orissa
	Minor carps		
14.	<i>Labeo dero</i>	Cyprinidae	Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Arunachal Pradesh
15.	<i>Semiplotus semiplotus</i>	Cyprinidae	Arunachal Pradesh
16.	<i>Chrossocheilus lattices latius</i>	Cyprinidae	Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh

COMMERCIAL IMPORTANCE OF THE SPECIES

As far as commercial importance is concerned, some cold water species are known for sports, some others as food fishes and few for their ornamental value.

- **Sport Fishes** : The important fishes present in cold waters of India with good sport value are – golden mahseer (*Tor tor*), copper mahseer (*Tor mossal*), black mahseer (*Mazirifor chelynoides*) Chocolate mahseer (*Neolissochelilus hexagonolepis*), Indian trout (*Raiamas bola*) among indigenous species and rainbow trout (*Oncorhynchus mykiss Salmo gairdeneri*) and brown trout (*Salmo trutta fario*) among exotics.
- **Food fishes**: Besides the sports fishes, the piscine groups, snow trout, minor carps, major carps, catfish, bagirds, barils, murrels and eel are generally used as food fishes in the region. The important genera among them are – snow trout (*Schizothorax* and *Schizothoraichthys*), garras (*Garra* sp), minor carps (*Labeo* sp) bariels (*Barilius* sp), exotic carps (*Ctenopharyngodon idella*, *Hypopt htalmichthys molitrix*, *Cyprinus carpio*), eels (*Mastacembalus armatus*)

- **Ornamental fishes:** - Some are very colourful and fascinating species also inhabit in different aquatic resources of cold water zones. Some of these have been recognized as ornamental fishes in other parts of country where as few others have some ornamental traits. North east region is known as repository of 187 (74%) are known for their ornamental value. Some of the important species are *Car rassius car rassius*, *Car rassius auratus*, *Puntius conchoni*, *Puntius gelius*, *P. ticto*, *P. sophore*, *Brachydanio rerio*, *Badis badis*, *Barillus vagra*

LACUSTRINE FISHERIES

- Since, the lakes are quite bigger in dimensions than reservoirs and are of natural origin, they support healthy and varied fish fauna ranging from Indian major carps and large catfishes to small sized minor carps, catfishes, clupeids, murrels etc.,
- The lakes situated in coldwater zones of Himalayas or peninsular India support trouts (*Salmo gairdnerii*), snow trouts (*Schizothorax niger*, *S. planiro* and *S. curvifrons*), mahseers (*Tor putitora* and *T. khudree*), common carp (*Cyprinus carpio*) and minor carps (*Labeo dero*, *Crossocheilus*, *Latius latius*) as chief economically important fishes.
- These lakes are either stocked with the natural seed from rivers or with the seed developed after adapting cultural practices. The catches in most of the cold water lakes are dominated by *C. carpio* with sizable contribution to schizothoracids and mahseers in the northern lakes and *Oreochromis mossambicus* in the Deaccan lakes like cold water lakes in Tamil Nadu.

- Very little is known about the fishery potential of upland lakes. On account of their remoteness and the low water regime, drastic increase in yield and production are not expected from these water bodies. The data on fish catch statistics vary from place to place.
- From the capture fishery of different indigenous cold water fisheries, the declining trend in fish catch statistics has become obvious due to changed ecological conditions and improper management. In the lakes of plains, rate of primary production is high. Until recently, development work in cold water fisheries was directed towards establishing trout fishery which is the most popular sport fish in the world. There has, however, been growing realization for developing indigenous cold water fisheries. The production from cold water fisheries is, however, not of much significance in the total inland fish production in the country.

Important cold water lakes in India

The cold water lakes that constitute sizable fishery are in,, Jammu & Kashmir, Kumaun region, Manipur and Tamilnadu

- **Lakes of Jammu and Kashmir:** Dal lake, Kishenser lake and Wular lake are the important cold water lakes in Jammu and Kashmir. The trout hatchery established in Harwan (Kashmir) is one of the potential sources, from where the brown trout has been transplanted to nearby upland waters. The annual fish production is 8.0 – 22.5 kg/ha in Dal Lake and 15 – 45 kg/ha in Wular Lake.

- **Lakes of Kumaun:** Nainital, Bhimtal, Sat Tal, Naukuchiya Tal, Devaria Tal, Khurpa Tal, Garun Tal and Malwa Tal are the coldwater lakes situated in Kumaun hill regions. Nainital is highly polluted. Now only *Puntius spp* are found in this lake. Important species found in other lakes are mahseer (*Tor tor*, *T. putitora*), *Cyprinus carpio* and *Schizothorax spp.* (snow trout). Total fish yield from these lakes is very low. Fishery of snow trout and mahseer has declined considerably, while that of mirror carp (*C. carpio*) is dominant.

□ Lakes of Manipur

Loktak lake: It is situated in Manipur. Its total area is 390 km² (4,480 – 27,300 ha) with the depth ranging from 1.5 m to 4.5 m. It receives water from the streams like Nung, Turel, Nembal, Thangia, Orak and Phubalarek. The annual fish production is about 50 kg/ha (262 tonnes/year). It is heavily infested with weeds. The Ichthyofauna of the lake is dominated by air-breathing fishes such as *Channa striatus*, *C. punctatus*, *Anabas testudineus* and *Clarias batrachus*. Other forms are *Wallogo attu*, *Osteobrama belangiri*, *Puntius sarana*, *P. sophore* and *P. ticto*. The recently introduced *Cyprinus carpio* also contributes significantly to the fishery of the lake.

□ **Lakes of Tamilnadu**

a) Kodaikanal Lake

- It is situated in the Palani hills. Its total area is 26 ha with a maximum depth of 10 m and an average depth of 2 m. The annual fish production is 1.8 – 9.3 kg/ha.

b) Yercaud Lake

- It is located in the Shevaroy hills. Its total area is 8 ha with a maximum depth of 5.5 m and an average depth of 2 m. The annual fish production is 16.7 – 49.5 kg/ha.

c) Ooty Lake

- It is situated in the Nilgiri hills. Its total area is 34 ha with a maximum depth of 10 m and an average depth of 3 m. The annual fish production is 33 - 111 kg/ha

FISHING GEARS AND CRAFTS IN COLD WATER LAKES

- Fishing gears and crafts employed for commercial landing in these lakes do not vary much from those used in reservoirs.
- However, the methods of fish capture in the streams, lakes and reservoirs fall under four categories, viz., nets, traps, angling and illegal methods (poisoning, electrocuting, dynamiting)

RIVERINE RESOURCES OF COLD WATER FISHERY (HILL STREAM FISHERY)

- Stream is a mass of water flowing towards a lower level following the line of least resistance.
- The streams, depending upon their source, are either seasonal or perennial.

1. Himalayan region

- A large number of rivers, rivulets, and streams form a vast network in the central Himalayan Mountains (Garhwal and Kumaun region) and have a large no. of indigenous fish species. About 68 species of fish are reported from Garhwal region. Major rivers of Garhwal are the Alakanand, the Mandakini, the Bhagirathi, the Asiganga, the Bhilaganga, the Ganga, the Nayar and the Pinder.
- **Important fish species** are: *Schizothorax* spp., *Tor* spp., *Garra gotyla*, *Labeo* spp., *Crossocheilus latius*, *Glyptothorax*, *Pseudechenies*, *Barilius* spp., *Noemacheilus* spp., *Puntius* spp., *Botia* spp., *Homaloptera*, *Danio*, *Mastacembelus*, *Channa*, *Lepidoccephalichthys* etc.

- The fisheries of Himalayan region are poorly developed primarily due to difficult terrain and its inaccessibility. Low temperature allows scanty production of primary and secondary level organisms. Due to low biological productivity, most cold water fishes in this region are generally of small size in contrast to their counterparts and hence commercial fisheries virtually non-existent except in the man-made reservoirs and natural lakes in the Siwalik Himalayas.

2. Kumaun Region

- Five major rivers and their tributaries form a network in Kumaun region. They are Kali, W. Ramaganga, Kosi, Pinda and Gaula rivers. River Kali is the largest in Kumaun. The important species of this region are:
- **Carp:** *Tor tor*, *T. putitora*, *Schizothorax richardsonii*, *S. plagiostomus*, *Barilius bendelisis*, *B. kagra*, *Labeo dero*, *L. goniis*, *Puntius conchoniis*, *P. chilnoides*, *Garra lamta*.
- **Catfishes:** *Glyptothorax pectinopterus*, *Pseudocheneis sulcatus*
- **Loaches:** *Noemacheilus botia*, *N. rupicola*, *N. montanus*, *Botia almorhae*.

- **Others:** *Channa gachua*, *Mastacembelus* spp
- Of these species, some fishes have become rare and considered threatened species due to unwanted man made activities. The exotic species introduced into the coldwater to enhance fish production are the trout (*Salmo*), the mirror carp, the golden carp and the tench.

State-wise Inland Fish Production in Hill States

Sl. No.	States	Production (t)
1.	Jammu & Kashmir	19,150
2.	Himachal Pradesh	7,300
3.	Uttarakhand	2,790
4.	Sikkim	150
5.	Arunachal Pradesh	2,750
6.	Meghalaya	4,120
7.	Mizoram	3,750
8.	Manipur	18,220
9.	Nagaland	5,500
	Total	63,730