WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

An extensive survey of ichthyofaunal diversity of Ganga River from Devprayag to Haridwar in State Uttarakhand

Rakhi Baliyan[1], Neelam Saini[1], Radhe Shyam[2] ,Sushil Bhadula[3]

[1]Assistant Professor, Department of Zoology Government PG College, Dhanauri, Haridwar, Uttarakhand
[2]Assistant Professor, Department of Zoology SRSD Government Degree College, Jainti, Almora, Uttarakhand
[3]Assistant Professor, Department of Zoology Government Degree College, Vedikhal, Pauri Garhwal, Uttarakhand

ABSTRACT :

The current study carried out from January 2024 to December 2024 to analyze the diversity and composition of freshwater fish in the Ganga River from Devprayag to Haridwar in Uttarakhand. Uttrakhand is home to a diverse aquatic ecology, including rivers, streams, lakes, and reservoirs. The major rivers include Alakhnanda, Bhagirathi, Bhilangana, Mandakini, Kosi, Ganga, and Yamuna. In the current study, we examine the fish diversity of the Ganga at various places between Haridwar and Devprayag. This study addressed the impact of human meddling and pollution on fish variety. During the course of study a total of 34 species belonging to 07 families were reported from this study area. Cyprinidae constitutes 62%, Nemacheilidae constitutes 14%, Bagridae constitutes 6%, Botiidae constitutes 6%, Channadae constitutes 6%, Mastacembelidae constitutes 3%, Claridae constitutes 3%. Cyprinidae were the most species rich order and family of this region. It was also observed that fish population was decline due to the hydropower projects and other anthropogenic activities.

Key words: Fish fauna, River Ganga, biological diversity, Devprayag, Haridwar

Introduction:

Freshwater fish studies in the Indian subcontinent have been limited to scattered commercial fisheries, and even these have been mostly limited to some of the larger river systems, such as the Ganges and Yamuna. The majority of early research on the Indian subcontinent's freshwater systems was conducted by British officials working for the East India Company, who were particularly interested in the region's natural history.

Some early contributions were those of Hamilton-Buchanan in **"The Fishes of the Ganges" (1822)** and by others like **McClelland (1839) and Jerdon (1849)**. Extensive literature is now available on the identification and systematic of freshwater fishes of India, starting with contribution of Hora who addressed the subject of the anomalous distribution of hill stream fishes in peninsula India. Many species found in the peninsular section of India were determined to be the same or congeneric to species found in the north-east of India, as well as those species mentioned in study by Talwar and Jhingran (1991).

Though most of these contributions have been taxonomic in nature, there exist some works on the bio geographic distributions of fishes in the region as well **(Jayaram 1974.)** The Himalaya is mostly disregarded in terms of fish diversity and river ecology. **Sharma (1988)** studied, however, perform research on the ecology and fish fauna of a few Ganga River tributaries. Small hill-streams are quite torrential, with massive attitudinal aviation. These streams provide a wide range of habitat for a diverse and huge fish population. The habitat has been designated as one of the principal western Himalayan streams, as well as a few Western Ghats streams **(Arunachalam 2000).**

Currently, 32,500 fish species are recognized. 3,553 native fish species are currently recognized, with 877 of them found in India. Currently, 2555 finfish species have been documented in the database established by NBFGR Lucknow, with 877 from freshwater, 133 from brackish water, and 1,563 from the marine environment, excluding 291 alien species, along with taxonomic positions and other biological facts.

According to Sarkar et al. (2008), the Gangetic system alone accounts for 143 fish species, accounting for approximately 20% of all freshwater fish reported in India. Aside from taxonomic collection, little research has been conducted on freshwater fishes in Northern India, particularly in the Upper Ganga region. Given the high levels of faunal diversity and local species documented thus far, there is an urgent need to further understand the fish diversity and distribution in this region.

As a result of this study, we able to explain not only the fish diversity and division of this region (Devprayag to Haridwar), but also the impact of human activities in this area. It is commonly recognized that hydroelectric projects have a significant impact on this region. Rivers are not only directly polluted by development activities, but also by additional dangers such as the introduction of exotic species, improper fishing methods, and the disposal of domestic garbage from human settlements.

Before the rich species diversity in this region of the subcontinent is lost forever, it is critical to document the species found here as well as their distribution; this, combined with the identification of threats, will aid in the formulation of necessary conversation measures. As a starting step in this regard, the major goal of this study was to collect data on species that may serve as baseline information to monitor the possible upper Ganga region, which demonstrates that this region is quite diverse.

Materials and Methods :

Study Area:

The Ganga River originates at Gomukh and runs 2525 kilometers to Ganga Sagar. Throughout its journey through eleven states, the river receives various tributaries (each with its own unique quality, pollutant load, and biota), including Bhilangana, Alakhnanda, Ramganga, Kali, Yamuna, Gomti, Ghagra, Gandhak, and Kosi. The study was carried out in the state of Uttarakhand (Devprayag to Haridwar). Uttrakhand is endowed with a diverse aquatic ecology, including rivers, streams, lakes, and rivulets, all of which are home to a diverse range of plants and animals. The climate in the region is predominantly tropical, with a well-defined rainy season from June to October, a very mild winter from December to February, and a comparatively dry pre-monsoon summer from March to May. Devprayag (Latitude: $30^0$08'49.4"N; Longitude: $78^0$35', Elevation: 474m above mean sea level) to Haridwar (Latitude: $29^0$57'20.1"N; Longitude: $78^0$10'56.3"E; Elevation: 290 m above mean sea level). Devprayag is the confluence of the rivers Bhagirathi and Alakhnanda, as well as the Ganga, which flows downstream from Rishikesh to Haridwar via the plains. Before reaching Rishikesh, it joins another tributary, the Nayar. The river stretch includes rapids, riffles, and pools. The substrate includes mature boulders, cobbles, and pebbles. Sand is also found in a few places in this zone. The river water in this stretch appears clear and clean, with high transparency and moderate depth. The current velocity range is between 0.1-3.0 m/s.

Sampling Method

The fish samples were collected from the sampling station from Ganga River, for the period of 1 year from period January, 2024 to December, 2024. In the analysis of the different fish species properties and physiology of different fishes, standard methods prescribed in limnological literature were used **APHA (2005), Jayaram (1974) and Welch (1998).** The fish were collected by hand net, cast net with the help of local fisherman and from the local fish market. The specimen was preserved with identify. The collection of fishes was done with the help of local fisherman and also by interviewing and showing different color photograph of fisherman communities. On the basis of identification by local fisherman communities check list was prepared. Fishes were identified with the help of taxonomic key, **Day, F (1994)** and other literature. Fish base website was also referred for fish fauna (**www.fishbase.org**).

Figure-1: Showing study sites within the Ganga river

Results and Discussion :

In every aquatic ecosystem, the variety of fish species present is known as ichthyo-diversity. In the present investigation 34 fish species belonging to 13 genera (*Barilius barila, Barilius bendelisis, Barilius bola, Barilius vagra, Garra gotyla gotyla, Glyptothorax lineatus, Glyptothorax pectinopterus Labeo bata, Labeo boga, Labeo dero, Labeo dyocheilus, Labeo calbasu, Puntius chola, Puntius conchonius, Puntius sarana, Puntius ticto, Schizothorax plagiostomu, Schizothorax progastus, S. richardsonii, Tor putitora, Tor tor, Noemacheilus botia, Noemacheilus rupicola, Noemacheilus savona, Nemacheilus beavani, Botia almorhae, Botia Dario, Channa gachua, Channa punctatus, Clarias batrachus, Mestacembelus armatus, Mystus aor* and *Mystus tengara*) and seven families (Cyprinidae, Nemacheilidae, Botiidae, Channadae, Claridae, Mestacembelidae and Bagridae) were identified from January, 2024 to December, 2024 in the Ganga river from Devprayag to Haridwar.

Fishes were identified regularly with their various body measurements and fin formulae. Among 34 fish species, four species of Barilus (*Barilius barila, Barilius bendelisis, Barilius bola, Barilius vagra*) exhibits 12.0%; one species of Garra (*Garra gotyla gotyla*) exhibits 3.0%; two species of Tor (Tor tor, Tor putitora) exhibit 6%; two species of Botia (*Botia almorhae, Botia dario*) exhibit 6% two species of Glyptothorax (*Glyptothorax lineatus* and *Glyptothorax pectinopterus*) exhibit 6.0% five species of Labeo (*Labeo bata, Labeo boga, Labeo dero, Labeo dyocheilus, Labeo calbasu*) constitutes 14%; four species of Puntius (*Puntius chola, Puntius conchonius, Puntius sarana, Puntius ticto*) constituted 12.00% ; five species of Noemacheilus (*Noemacheilus botia, Noemacheilus rupicola, Noemacheilus savona, Nemacheilus beavani*) exhibited 14.00%; two species of Channa (*Channa gachua* and *Channa punctatus*) exhibited 6.00%; three species of Schizothorax (*Schizothorax plagiostomu, Schizothorax progastus, S. richardsonii*) exhibited 9.%; two species of Mystus (*Mystus tengara and Mystus aor*) constituted 6.00%; one species of Mastacembalus (*Mastacembelus armatus*) constituted 3.0% one species of Clarias (*Clarias batrachus*) constituted 3.0% in the present study. In Uttarakhand suitable steps should be taken to conserve the fish (most of the fishes are in endangered category like *Tor* spp., *Raiamas bola*) by involving the locals as well as Government and Non Government organizations. The similar observations has been made by **Uniyal *et al.* (2006),** from different parts of the Uttarakhand. Conservation and management is an important tool to preserve the nature for maintaining the ecological balance, which is foremost essential for the survival of human kind. In past, the reference of animal and plant conservation is found in Vedas and linked with Hindu religion and culture **(Hora, 1952).** Uttarakhand state fishing activities are not well organized and it is required that time to time checking should be done, yet no license have been issued to the villagers, and law is not strictly followed which result in the destruction of fish and their habitat. After the careful observation and constant monitoring of water bodies and fish fauna of Uttarakhand, some major factors responsible for the depletion of fish resources. Fish culture is an important aspect for the economic development of the area. In Uttarakhand also fishery can be developed as it harbors good commercially important fishes. As per catch percentage the fish which can be propogated at high altitude is *Schizothorax* spp., and *Glyopothorax* spp.) and in plain area the fishes like *Barilius* spp., *Tor* spp., *Channa* spp., can be cultured.

Table 1:- Ichthyofauna of Ganga River from Devprayag to Haridwar during 2024

S.N	Genera/Species	Family	Devprayag	Haridwar
Cyprinidae				
1.	***Barilius barila***	**Cyprinidae**	**+**	**-**
2.	***Barilius bendelisis***	**Cyprinidae**	**+**	**-**
3.	***Barilius bola***	**Cyprinidae**	**+**	**-**
4.	***Barilius vagra***	**Cyprinidae**	**+**	**-**
5.	***Garra gotyla gotyla***	**Cyprinidae**	**+**	**-**
6.	***Glyptothorax lineatus***	**Cyprinidae**	**+**	**-**
7.	***Glyptothorax pectinopterus***	**Cyprinidae**	**+**	**-**
8.	***Labeo bata (Hamilton)***	**Cyprinidae**	**+**	**+**
9.	***Labeo boga (Hamilton)***	**Cyprinidae**	**+**	**+**
10.	***Labeo dero (Hamilton)***	**Cyprinidae**	**+**	**+**
11.	***Labeo dyocheilus (McClelland)***	**Cyprinidae**	**+**	**+**
12.	***Labeo calbasu (Hamilton)***	**Cyprinidae**	**+**	**+**
13.	***Puntius chola (Hamilton)***	**Cyprinidae**	**+**	**+**
14.	***Puntius conchonius (Hamilton)***	**Cyprinidae**	**+**	**+**
15.	***Puntius sarana (Hamilton)***	**Cyprinidae**	**+**	**+**
16.	***Puntius ticto (Hamilton)***	**Cyprinidae**	**+**	**+**
17.	***Schizothorax plagiostomus (Heckel)***	**Cyprinidae**	**+**	**-**
18.	***Schizothorax progastus (McClelland)***	**Cyprinidae**	**+**	**-**
19.	***Schizothorax richardsonii (Gray)***	**Cyprinidae**	**+**	**-**
20.	***Tor putitora (Hamilton)***	**Cyprinidae**	**+**	**+**
21.	***Tor tor (Hamilton)***	**Cyprinidae**	**+**	**+**
Nemacheilidae				
22.	***Noemacheilus botia (Hamilton)***	**Nemacheilidae**	**+**	**+**
23.	***Noemacheilus rupicola (McClelland)***	**Nemacheilidae**	**+**	**+**
24.	***Noemacheilus savona (Hamilton)***	**Nemacheilidae**	**+**	**+**
25.	***Nemacheilus beavani***	**Nemacheilidae**	**+**	**+**
26.	***Noemacheilus montanus***	**Nemacheilidae**	**+**	**+**
Botiidae				
27.	***Botia almorhae (Gray)***	**Botiidae**	**+**	**-**
28.	***Botia Dario (Hamilton)***	**Botiidae**	**+**	**-**
Channadae				
29.	***Channa gachua* (Hamilton)**	**Channaidae**	**+**	**+**
30.	***Channa punctatus* (Hamilton)**	**Channaidae**	**+**	**+**
Claridae				
31.	***Clarias batrachus* (Linnaeus)**	**Claridae**	**+**	**+**
Mastacembelidae				
32.	***Mestacembelus armatus* (Lacepede)**	**Mastacembelidae**	**+**	*****
Bagridae				
33.	***Mystus aor* (Hamilton)**	**Bagridae**	**-**	**+**
34.	***Mystus tengara* (Hamilton)**	**Bagridae**	**+**	**+**

{+ = Present, - = absent}

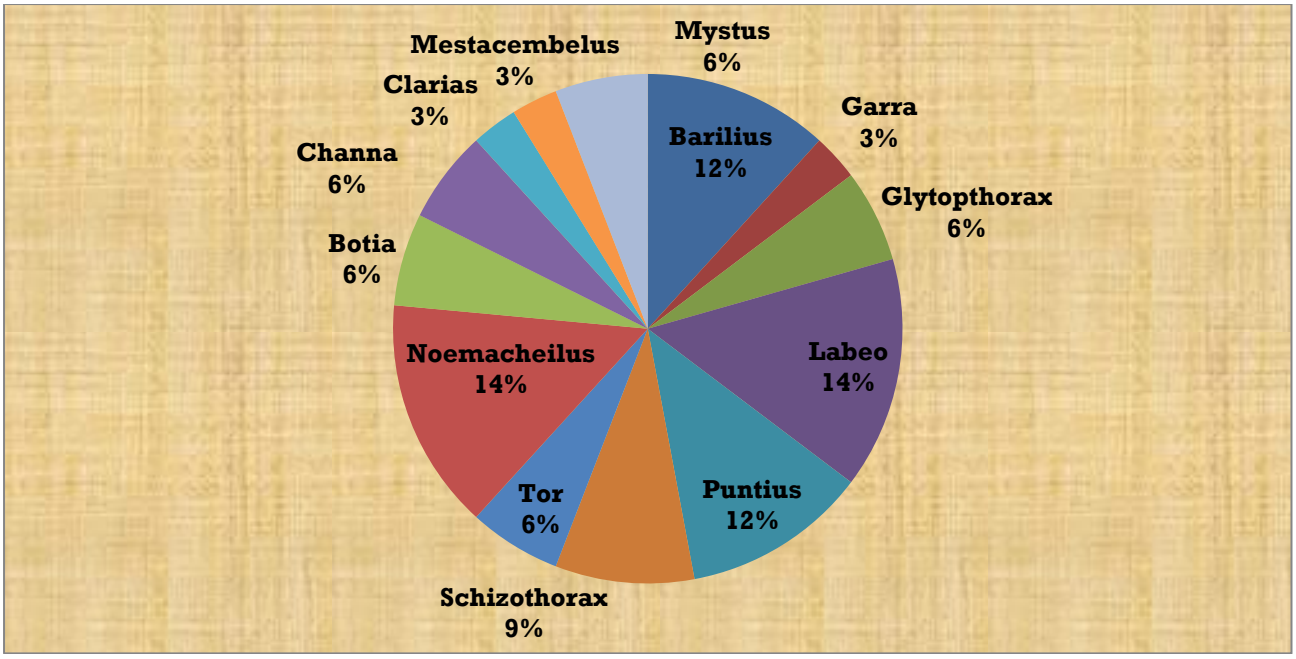

Figure-1: Genera wise composition of fishes in Ganga river from Devprayag to Haridwar during 2024

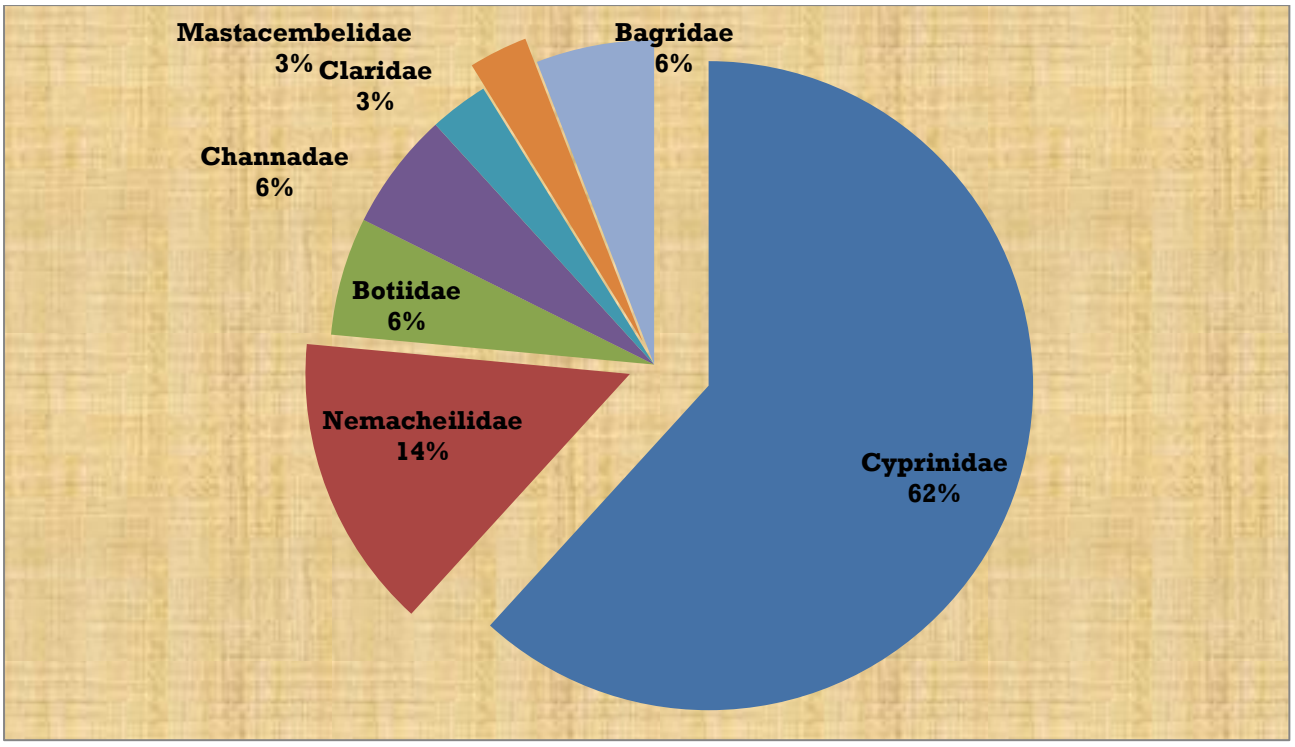

Figure-2: Family wise composition of fishes in Ganga river from Devprayag to Haridwar during 2024

CONCLUSION :

Fishery resources are available in the form of rivers and tributaries, reservoirs, wetlands, lakes, ponds, and tanks with a diverse genetic composition. However, due to the region's ever-increasing need for water, these bioresources face serious risks to mutual variety and ecosystem stability. Several fish species are disappearing as a result of anthropogenic influences. The country's fish biodiversity has been rapidly declining in recent decades as a result of anthropogenic environmental degradation such as urbanization, damming, water abstraction for irrigation, power generation, and pollution, which have subjected our natural water bodies in general and rivers in particular to severe stress, with disturbing effects on fresh water fish diversity. Furthermore, this has altered the Ganga's continuums in the analyzed length. There is a significant gap in knowledge about each species' native range because there has been no dedicated study program for Ganga, which has economic ramifications for the country, particularly irrigation and the variety of livelihoods it supplies to poverty-stricken areas of North India.

REFERENCES:

1. APHA (2005). Standard Method for Examination of water waste water. 21st edition, American Public Health Association Washington D.C.
2. Arunachalam, M. 2000. Assemblage structure of stream fishes in the Western Ghats (India). Hydrobiologia 430: 1–31
3. Day, F. (1875–78). Fishes of India; being a natural history of the fishes known to inhabit the seas and freshwaters of India, Burma, and Ceylon. Text and atlas in 4 parts. London: xx+778,195 pls.
4. Day, F.(1994). The fishes of India, Jagmander book agency, New Delhi,1994, 1&2.
5. Hora, S.L. (1952). The Himalayan fishes. *Himalaya.* **1**(1): 66-74.
6. Hora, S.L. 1949. Satpura Hypothesis of the Distribution of the Malayan Fauna and Flora to Peninsular India. Proc. Nat. Inst.Sci. India 15: 309–314.
7. Jayaram, K.C. (1974). Ecology and distribution of fresh-water fishes, amphibia and reptiles. pp. 517–584. In: M.S. Mani (ed.) Ecology and Biogeography in India, Dr W. Junk, B.V. Publ.,The Hague.
8. Jayaram, K.C. 1974. Ecology and distribution of fresh-water fishes, amphibia and reptiles. pp. 517–584. In: M.S. Mani (ed.) Ecology and Biogeography in India, Dr W. Junk, B.V. Publ.,The Hague.
9. Jayaram, K.C. 1999. The freshwater fishes of the Indian Region.Narendra Publishing House, Delhi-6, 551 pp.
10. Jerdon, T.C. 1849. On the freshwater fishes of Southern India.Madras. J. Lit. Sci. 15: 302–346.
11. McClelland, J. 1839. Indian Cyprinidae. 19, Asiatic Researches,Bishop College Press, Calcutta, 217–468.
12. Nautiyal P., Shivam, A., Verma J. and Semwal, V. P. (2007) Bhagirathi river- An endangered ecosystem. In: Proceedings of DAE-BRNS National Symposium on Limnology, pp. 164-166, Paliwal Printers, Udaipur, India.
13. Sarkar, U.K., Pathak, A.K. and Lakhra, W.S. (2008). Conservation of Freshwater fish resources of India : new approaches , Assessment and Challenges. *Biodvers Conserv*, **17** : 2495-2511.
14. Sharma, R. C. (1988). Fish and fisheries of snow fed river Bhagirathi from of Garhwal Himalayas. In: Proceeding of the National Academy of Sciences, 58 (B), II: 181-192.
15. Singh, H. R., Badola, S. P. and Dobriyal, A. K. (1983). Geographical distributional list of Ichthyofauna of the Garhwal Himalaya with some new records. Journal of Bombay Natural History Society, 84: 126-132.
16. Talwar, P.K., and A. Jhingran. (1991). Inland fishes of India and adjacent countries. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2 volumes: xix + 1158 pp.
17. Uniyal, D.P., Bahuguna, S.N, Uniyal, Manisha and Kumar Arun (2006). Further note on fishing methods and their impact on fish resources of Jaunsar-Bawar, Chakrata hills, Uttarakhand, India**.** *Ann. For.***14** (2): 340-349.
18. Vyas, V.et al., Limnological Studies of River Narmada. Journal of Chem, Bio, Phy, Sci.,2013, 3 (4) ,2722-2736.
19. Welch,(1998).Limnologicalmethods:McGrawHillBookCo.NewYork,199.
20. Wikramanayake, E.D. & P.B. Moyle. 1989. Ecological structure of tropical fish assemblages in wet-zone streams of Sri Lanka. Journal of Zoology (London) 218:503
21. www.fishbase.org