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Cover: Indian Grey Wolf *Canis lupus pallipes* and Smooth-coated Otter *Lutrogale perspicillata* sharing the territory in Chambal basin. Digital art on Procreate by Aakanksha Komanduri.

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ARTICLE

Assessment of ichthyofaunal diversity of the suborder Cyprinoidei Fitzinger, 1832 (Actinopterygii: Cypriniformes) of western Indian Himalayan Region: present status and conservation - a systematic review

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Abstract: This review discusses the present status of freshwater fish families – Cyprinidae, Danionodae, and Xenocyprinidae of suborder Cyprinoidei and their conservation status, threats to the species diversity and the community-based conservation across the western Himalayan region. The family Cyprinidae, the largest among freshwater fish, consists of over 1,840 species; whereas Danionidae includes 375 species and Xenocyprinidae comprises around 173 species globally. A total of 35 genera and 76 species have been reported from various rivers and streams of four Indian Himalayan states. Of these, 67 species are classified as 'Least Concern', four as 'Vulnerable', two as 'Near Threatened', and one as 'Endangered' species as per the IUCN Red List. Uttarakhand exhibits the maximum species count (63) followed by Jammu & Kashmir (47), Ladakh (38), and Himachal Pradesh (36). The major threats faced by freshwater fish are damming, habitat fragmentation, pollution, invasive species, and climate change. Consequently, modern policies and community-led conservation initiatives play a vital role in preserving these freshwater ecosystems.

Keywords: Community conservation, Cyprinidae, fish diversity, freshwater conservation, freshwater ecology, habitat, IHR, India, IUCN status, rivers.

Abbreviations: IHR—Indian Himalayan Region | IUCN—International Union for Conservation of Nature.

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Author contribution: NC—conceptualization, literature survey, data collection, data organization and curation, data analysis, and manuscript writing and preparation of the final manuscript. DS—conceptualization, development of the study framework, editing, supervision and mentorship. SS—coordination and supervision of the study, and critical review of the manuscript.

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INTRODUCTION

The Indian Himalayan region extends approximately 2,500 km from northern Pakistan to northeastern India, covering an area of about 750,000 km^2 with elevations ranging 300–8,000$^+$ m (Rawal et al. 2013). The region is divided into three zones—Greater Himalaya (Himadri), Lesser Himalaya (Himachal), and Outer Himalaya (Shivalik)—that play a crucial role for ecological security, fertile land, water resources, biodiversity, and scenic landscapes (Dimri et al. 2021). The western Himalayan states of India includes Jammu & Kashmir, Ladakh, Uttarakhand, and Himachal Pradesh forming a mountainous region with rich and fragile freshwater ecosystems created by its snow-fed rivers, streams, and lakes (Choudhary et al. 2023). Major river systems such as Ganga River and Indus River sustain diverse fish communities, particularly carps and other Cypriniformes, as well as cold water hill- stream species including *Tor* (Mahseer) and *Schizothorax* (Snow trout) (Choudhary et al. 2023; Lata et al. 2026). Studies from various Himalayan rivers have documented species distribution across the altitude gradients, with species diversity increasing downstream due to deeper, broader and more environmentally diverse river channels (Ali et al. 2018; Das et al. 2020; Johnson et al. 2020).

The suborder Cyprinoidei Fitzinger, 1832, is a diverse group of freshwater fishes and divided into 12 families, including family Cyprinidae, Danionidae, and Xenocyprinidae, which comprise of freshwater fish species of carps, danionids and sharpbellies (or minnows) respectively (Van der Laan et al. 2026). According to 'The ETYFish Project' (Scharpf 2026) Cyprinidae family (carp or minnow), represents one of the largest and most diverse groups of freshwater fish with 172 genera and 1,840 species globally, particularly in Asia, Europe, and North America. The family Danionidae (danios) comprises 39 genera and 375 species, whereas the Xenocyprinidae (sharpbellies) includes 45 genera and 173 species/subspecies. They flourish in varied aquatic habitats, such as rivers, lakes and ponds, exhibiting remarkable adaptability and unique morphological traits like streamlined body, single dorsal fin, and small mouth suited for grazing algae and organic waste (Gidmark & Simons 2014). They play a crucial role in freshwater ecosystems by contributing to nutrient cycling and serving as prey for larger species (New World Encyclopedia 2008). Several cyprinids, danionids, and xenocyprinids are at risk due to habitat loss, hydropower, overfishing, pollution, invasive species, and climate change (Bhatt et al. 2023). To protect these ecologically significant fishes and their habitats, conservation efforts are essential that emphasizes the need to address environmental degradation and promote sustainable practices (Nelson et al. 2016; Froese & Pauly 2026).

Fish studies in the Indian Himalayan Region (IHR) from past to present: a brief account

The initial prominent research on fishes in the IHR (Image 1) can be traced back to the late 19th and early 20th centuries, particularly highlighting the introduction of non-native species and the documentation of the local fish fauna. According to Burrard & Hayden (1933), the Himalayan rivers can be grouped into four distinct groups. The first one consists of the rivers in the eastern region, located between the Brahmaputra and Tista, referred to as the rivers of the Assam Himalaya. The second group includes the rivers situated between the Tista and the Kali, known as the Nepal Himalaya. The third group encompasses those rivers found between the Kali and the Sutlej, termed the Kumaon Himalaya. Finally, the last group consists of the rivers located west of the Sutlej, identified as the Punjab Himalaya (Burrard & Hayden 1933).

The discovery and documentation of fish diversity in the Indian Himalayas have spanned nearly two centuries. In the year 1838, Heckel first described 10 schizothoracin fish species from Kashmir (Von Hugel & Heckel 1838). Subsequent contributions include Menon's work documenting 23 species from Kumaon, tabulating 92 torrential species across drainage systems, and compiling a list of 218 species from extensive surveys (Menon 1949, 1954). Das (1965) recognized 15 schizothoracin species from Kashmir, while Saxena (1968) reported 68 species from Jammu & Kashmir. Tilak (1967, 1990) detailed 38 species in the River Tawi, and Talwar (1977) discovered new *Gymnocypris* species during the Ladakh Expedition.

Current studies have expanded knowledge across Himalayan regions. Sivakumar (2008) studied the Indus River. Shrestha (2008) analyzed Nepal's Himalayan waters. The regional evaluation includes Central Himalaya (Agarwal et al. 2019), Uttarakhand's reservoirs (Tripathi 2020; Tomar et al. 2021; Uniyal & Uniyal 2021), and Kashmir's River systems (Hussain & Rashid 2021; Awes et al. 2023). Recent studies by Choudhary et al. (2023) highlights the decline of native species like *Schizothorax richardsonii* and the rise of exotic species like *Cyprinus carpio* while Chaudhary et al. (2024) reported 16 species in river Asan, Uttarakhand, with cyprinids being the dominant group in both cases. This comprehensive research highlights the rich but vulnerable fish diversity

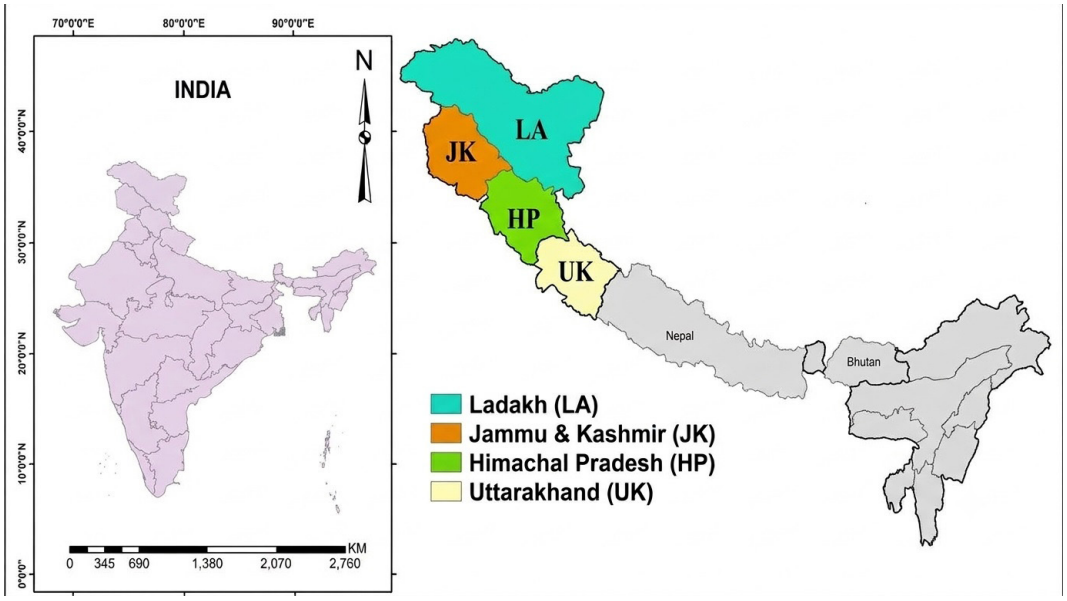

Image 1. The states of western Indian Himalayan Region.

of the Himalaya. Table 1 provides a record of suborder Cyprinoidei fish genera and species documented by various researchers from some major rivers and streams across states of western IHR, highlighting the diversity and distribution status of the fishes.

State-wise distribution of fishes species (family: Cyprinidae, Danionidae, and Xenocyprinidae) in western IHR

A state wise record detailing the distribution of various fish species belonging to the Cyprinidae, Danionidae, and Xenocyprinidae families has been presented here. The fauna of Jammu & Kashmir comprises of 47 species consisting of 30 cyprinids, 15 danionids, and two species of xenocyprinids with *Schizothorax richardsonii* (Gray, 1832) being the most abundant species (Table 2). Ladakh's fish fauna includes 38 species comprising 29 cyprinids, six danionids, and three xenocyprinids species (Table 3). In Uttarakhand, *Opsarius bendelisis* (Hamilton, 1807) is the most abundant among all 63 species recorded in the state's rivers comprising 40 cyprinids, 20 danionids, and three xenocyprinids (Table 4). Himachal Pradesh is the home to 36 species that includes 28 cyprinids and eight danionids but no xenocyprinid species (Table 5).

Present conservation status of fish species (family: Cyprinidae, Danionidae, and Xenocyprinidae) in western IHR

The IUCN Red List Categories and Criteria provide a widely recognized system for assessing species at risk of global extinction (Chandra et al. 2017). The current conservation status as per IUCN Red List for cyprinids, danionids, and xenocyprinids reported in the IHR is presented as Table 6. This table depicts a total of 76 species in the suborder – Cyprinoidei recorded from the four western Himalayan states of India comprising 50 species belonging to the family Cyprinidae, 23 species of the family Danionidae, and three species of the family Xenocyprinidae. Among these species, only one species, *Tor putitora*, falls under the 'Endangered' (EN) category. Four species, namely, *Naziritor chelynoides*, *Schizothorax richardsonii*, *S. plagiostomus*, and *S. esocinus*, are categorized as 'Vulnerable' (VU). Two species are listed as 'Near Threatened' (NT), four as 'Data Deficient' (DD), three as 'Not Evaluated' (NE), while the remaining 62 species belong to the 'Least Concern' (LC) category.

Conservation of fish diversity in western IHR

To conserve fish diversity in the Indian Himalayan region, several strategies have been proposed. Protecting and restoring habitats is critical, requiring measures to reduce pollution and manage water resources effectively (Singh 2016). Engaging local communities through community-based management can encourage sustainable practices, empowering them to monitor fish stocks and protect habitats. Constant research and monitoring are crucial for understanding ichthyofaunal diversity, identifying critical habitats, and tracking population changes to guide flexible management. Reinforcing legislation and policy frameworks is also crucial, including tougher guidelines on fishing practices, habitat destruction, and establishing protected areas.

Table 1. List of recorded fish species (suborder Cyprinoidei; family Cyprinidae, Danionidae, and Xenocyprinidae) in states of western Indian Himalayan Region.

	State	Name of river/ River system	Suborder Cyprinoidei recorded		References
			Genus	Species	
1	Jammu & Kashmir	Jhelum	3	5	Hussain & Rashid 2021
		Chenab	6	11	Bhutyal & Langer 2022; Chib et al. 2024
		Sewa	4	5	Gupta & Dutta 2021
		Ujh	14	23	Rathore & Dutta 2015
		Wajhoo Nullah	22	33	Dutta 2016
		Basantar	12	17	Sharma & Dutta 2012
		Neeru Nullah	1	1	Dutta et al. 1999; Zuber et al. 2010
		Anas nullah	7	9	Dutta 2015
		Marusudar	2	2	Magray et al. 2018
		Poonch	11	16	Awas et al. 2023
		Mendhar	10	12	Hussain & Dutta 2016
		Nowshera-Tawi	9	13	Nisa et al. 2020
		Tawi	10	12	Gandotra et al. 2017
		Lidder	2	4	Shafiya 2022; Gowhar et al. 2023
		Veshaw	2	5	Hamid & Singh 2019
		Kishanganga	1	1	Amin et al. 2022
		Sind	1	2	Gulzar et al. 2022
2	Ladakh	Indus	20	30	Sheikh et al. 2018; Choudhary et al. 2023
		Zanskar	6	8	Chandra et al. 2019; Kumar et al. 2020; Raghuvanshi et al. 2020
		Suru	3	3	Zakiya et al. 2023
		Shyok	4	4	Kumar et al. 2020
3	Uttarakhand	Song	17	25	Rauthan et al. 2023
		Dulhani	12	20	Rauthan et al. 2023
		Suswa	16	22	Rana et al. 2017; Rauthan et al. 2023
		Baldi	14	20	Rana et al. 2020; Rauthan et al. 2023
		Tons	17	25	Rauthan et al. 2023
		Asan	8	9	Chaudhary et al. 2024
		Yamuna	9	13	Rayal et al. 2021
		Ganga	13	16	Sarkar et al. 2012; Kamboj et al. 2023
		Alaknanda	7	13	Tomar et al. 2021; Malik et al. 2022
		Bhaghirathi	7	11	Agarwal et al. 2018; Rawat et al. 2020
		Bhilangna	7	13	Agarwal et al. 2011
		Nayar	6	7	Jeeva et al. 2011
		Ramganga	25	46	Das et al. 2020
		Kharmola	5	7	Singh et al. 2025
		Indrawati	3	6	Agarwal & Singh 2012
		Pinder	9	15	Agarwal et al. 2019
		Mal gad	4	6	Rayal et al. 2021
		Nandakini	5	6	Agarwal & Singh 2014
		Birahiganga	5	10	Singh & Agarwal 2017
		Laster Stream	7	12	Singh & Agarwal 2013
		Kyunja Stream	6	11	Bahuguna 2020
		Koshi	15	28	Badola et al. 2024
		Gaula	7	7	Mir et al. 2015

	State	Name of river/ River system	Suborder Cyprinoidei recorded		References
			Genus	Species	
	Uttarakhand	Mandal	15	21	Badola et al. 2024
		Palain	15	20	Badola et al. 2024
		Sona	14	21	Badola et al. 2024
		Goriganga	9	12	Ashok 2014
4	Himachal Pradesh	Beas	11	20	Kumar & Khanna 2014; Modeel et al. 2024
		Ravi	13	21	Moza 2014; Sharma & Dhanze 2018
		Maan Stream	8	10	Singh et al. 2023
		Kunah Stream	8	9	Sharma & Banyal 2024
		Son Stream	6	6	Pal et al. 2024
		Spiti	1	1	Sharma & Dhanze 2013
		Giri	6	7	Rumana et al. 2015
		Parbati	2	2	Kumar 2010
		Sutlej	11	16	Sharma & Dhanze 2018

Table 2. Fish fauna of Jammu & Kashmir (Suborder Cyprinoidei; family Cyprinidae, Danionidae, and Xenocyprididae).

TAXON Phylum: Chordata Class: Actinopterygii Order: Cypriniformes	Jhelum	Chenab	Sewa	Ujh	Wajhoo Nullah	Basantar	Neeru Nullah	Anas nullah	Marusudar	Poonch	Mendhar	Nowshera tawi	Tawi	Lidder	Veshaw	Kishanganga	Sind
Family: Cyprinidae																	
Bangana dero (Hamilton, 1822)	-	-	-	+	+	-	-	-	-	+	-	+	-	-	-	-	-
Cyprinus carpio Linnaeus, 1758	+	+	-	-	+	-	-	-	-	+	+	+	-	-	-	-	-
Tariqilabeo latius (Hamilton, 1822)	-	-	+	-	-	-	-	-	-	+	-	-	+	-	-	-	-
Tariqilabeo diplochilus (Heckel, 1838)	+	-	+	+	+	+	-	+	-	-	+	-	-	+	+	-	-
Cirrhinus reba (Hamilton, 1822)	-	-	+	+	+	+	-	+	-	-	-	-	-	-	-	-	-
Cirrhinus mrigala (Hamilton, 1822)	-	-	-	+	+	+	-	-	-	-	-	+	-	-	-	-	-
Garra gotyla (Gray, 1930)	-	+	-	+	+	+	-	+	-	+	+	+	+	-	-	-	-
Garra lamta (Hamilton, 1822)	-	-	-	+	+	-	-	+	-	+	+	+	-	-	-	-	-
Labeo dyocheilus (McClelland, 1839)	-	-	-	+	+	-	-	-	-	+	+	-	-	-	-	-	-
Labeo pangusia (Hamilton, 1822)	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-
Labeo calbasu (Hamilton, 1822)	-	-	-	-	+	+	-	-	-	+	-	-	-	-	-	-	-
Labeo gonius (Hamilton, 1822)	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
Labeo rohita (Hamilton, 1822)	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-
Labeo boggut (Sykes, 1839)	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Labeo bata (Hamilton, 1822)	-	-	-	-	+	-	-	-	-	+	+	+	+	-	-	-	-
Labeo boga (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-
Labeo catla (Hamilton, 1822)	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-
Osteobrama cotio (Hamilton, 1822)	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Puntius sophore (Hamilton, 1822)	-	-	-	+	+	+	-	-	-	-	-	+	+	-	-	-	-
Puntius chola (Hamilton, 1822)	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-
Systomus sarana (Hamilton, 1822)	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
Pethia conchonius (Hamilton, 1822)	-	-	-	+	+	-	-	-	-	+	+	-	+	-	-	-	-
Pethia ticto (Hamilton, 1822)	-	-	-	+	+	+	-	-	-	-	-	+	+	-	-	-	-

TAXON Phylum: Chordata Class: Actinopterygii Order: Cypriniformes	Jhelum	Chenab	Sewa	Ujh	Wajhoo Nullah	Basantar	Neeru Nullah	Anas nullah	Marusudar	Poonch	Mendhar	Nowshera tawi	Tawi	Lidder	Veshaw	Kishanganga	Sind
Schizothorax richardsonii (Gray, 1832)	-	+	-	-	-	-	+	+	+	+	+	+	+	-	+	-	-
Schizothorax plagiostomus Heckel, 1838	+	+	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+
Schizothorax curvifrons (Heckel, 1838)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Schizothorax labiatus (McClelland, 1842)	+	+	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-
Schizothorax esocinus (Heckel, 1838)	+	+	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+
Tor putitora (Hamilton, 1822)	-	+	-	+	+	-	-	+	+	+	+	+	+	-	-	-	-
Tor tor (Hamilton, 1822)	-	+	-	+	+	+	-	+	-	+	-	+	-	-	-	-	-
Family Danionidae																	
Amblypharyngodon mola (Hamilton, 1822)	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Cabdio morar (Hamilton, 1822)	-	-	-	+	+	+	-	-	-	-	-	-	+	-	-	-	-
Barilius vagra (Hamilton, 1822)	-	-	+	+	+	+	-	+	-	+	+	-	+	-	-	-	-
Opsarius bendelisis (Hamilton, 1807)	-	-	+	+	+	-	-	+	-	-	-	-	+	-	-	-	-
Barilius modestus Day, 1872	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Chela cachius (Hamilton, 1822)	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Devario devario (Hamilton, 1822)	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-
Esomus danricus (Hamilton, 1822)	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-
Laubuka laubuca (Hamilton, 1822)	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Rasbora danioconius (Hamilton, 1822)	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rasbora sp.	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rasbora rasbora (Hamilton, 1822)	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-
Salmostoma bacaila (Hamilton, 1822)	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-
Salmostoma punjabense (Day, 1872)	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-
Securicula gora (Hamilton, 1822)	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Family Xenocyprinidae																	
Ctenopharyngodon idella (Valenciennes, 1844)	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-
Hypophthalmichthys molitrix (Valenciennes, 1844)	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-

Also, educational programs and awareness campaigns can highlight the importance of fish diversity and encourage sustainable practices that support both ecosystems and local communities (Suski & Cooke 2007; EIA EMP Report of Lakhwar Multipurpose Project 2020).

Traditional conservation methods

For generations, the Himalayan communities have used traditional fish conservation methods integrated in cultural practices and community-led initiatives to preserve aquatic biodiversity. Cultural and religious beliefs, such as bans on fishing during specific periods by Buddhist sects or in sacred places, plays a vital role in protecting threatened species and maintaining ecological balance (Gupta et al. 2016). There are over 30 temple-based fish sanctuaries, established near temples or shrines to honor the fish deity, Matsya avatar (first incarnation of Vishnu), in various Indian states and some are present in Uttarakhand and Himachal Pradesh, with ancient traditions like offering mahseer fish to honor ancestors further reinforcing conservation efforts (Jumani et al. 2023). Furthermore, sustainable fishing techniques minimize environmental impact and support healthy fish populations (Srivastava et al. 2002).

Threats to the fish diversity

The ichthyofaunal diversity in the Himalayan states of India faces severe threats from habitat degradation,

Table 3. Fish fauna of Ladakh (Suborder Cyprinoidei; family Cyprinidae, Danionidae, and Xenocyprididae).

TAXON Phylum: Chordata Class: Actinopterygii Order: Cypriniformes Family: Cyprinidae	Indus	Zaskar	Suru	Shyok
Family: Cyprinidae				
Gymnostomus ariza (Hamilton, 1807)	+	-	-	-
Barbonymus gonionotus (Bleeker, 1849)	+	-	-	-
Cyprinus carpio Linnaeus, 1758	-	+	-	+
Tariqilabeo latius (Hamilton, 1822)	-	+	-	-
Cirrhinus reba (Hamilton, 1822)	+	-	-	-
Cirrhinus mrigala (Hamilton, 1822)	+	-	-	-
Chagunius chagunio (Hamilton, 1822)	+	-	-	-
Carassius auratus (Linnaeus, 1758)	+	-	-	-
Diptychus maculatus Steindachner, 1866	-	+	-	+
Labeo calbasu (Hamilton, 1822)	+	-	-	-
Labeo gonius (Hamilton, 1822)	+	-	-	-
Labeo rohita (Hamilton, 1822)	+	-	-	-
Labeo bata (Hamilton, 1822)	+	-	-	-
Labeo catla (Hamilton, 1822)	+	-	-	-
Osteobrama cotio (Hamilton, 1822)	+	-	-	-
Puntius sophore (Hamilton, 1822)	+	-	-	-
Puntius chola (Hamilton, 1822)	+	-	-	-
Systomus sarana (Hamilton, 1822)	+	-	-	-
Pethia conchonius (Hamilton, 1822)	+	-	-	-
Pethia ticto (Hamilton, 1822)	+	-	-	-
Pethia phutunio (Hamilton, 1822)	+	-	-	-
Ptychobarbus conirostris Steindachner, 1866	-	+	+	-
Schizothorax richardsonii (Gray, 1832)	-	+	-	-
Schizothorax plagiostomus (Heckel, 1838)	+	-	-	-
Schizothorax labiatus (McClelland, 1842)	+	+	-	-
Schizothorax esocinus (Heckel, 1838)	+	-	-	-
Schizothorax progustus (Heckel, 1838)	-	+	+	+
Schizopygopsis sp.	-	+	+	+
Tor putitora (Hamilton, 1822)	+	-	-	-
Family: Danionidae				
Amblypharyngodon mola (Hamilton, 1822)	+	-	-	-
Barilius barila (Hamilton, 1822)	+	-	-	-
Opsarius tileo (Hamilton, 1822)	+	-	-	-
Chela cachius (Hamilton, 1822)	+	-	-	-
Salmostoma bacaila (Hamilton, 1822)	+	-	-	-
Securicula gora (Hamilton, 1822)	+	-	-	-
Family: Xenocyprinidae				
Ctenopharyngodon idella (Valenciennes, 1844)	+	-	-	-
Hypophthalmichthys molitrix (Valenciennes, 1844)	+	-	-	-
Hypophthalmichthys nobilis (Richardson, 1845)	+	-	-	-

overfishing, pollution, invasive species and climate change. Human activities like dam construction, deforestation and water diversion lead to fragmentation of aquatic ecosystems, disrupting fish migration and spawning. Contaminants from agricultural runoff, domestic waste and industrial effluents deplete oxygen levels, reducing species richness. Unsustainable practices and overfishing further reduces populations, while invasive species out-compete native fishes, altering ecosystems. Moreover, climate change exacerbates these challenges by disturbing spawning cycles and threatening cold-water species. These dangers draw attention to the urgent need for conservation measures to protect Himalayan aquatic biodiversity (Raina & Petr 1999; Negi 2010; Mishra et al. 2011; Dash et al. 2020; Malik et al. 2020; Bhatt & Manish 2023; Pandey et al. 2023).

CONCLUSION

This paper examines the diversity of Cyprinidae, Danionidae, and Xenocyprinidae fish families (Suborder Cyprinoidei) present in the India's western Himalayan states. The observations showed that out of all four states Uttarakhand hosts the highest diversity of Cyprinidae species, followed by Jammu & Kashmir, Ladakh, and Himachal Pradesh. The data of 57 rivers and streams that flows across these Himalayan states have been analyzed revealing that the Ramganga River in Uttarakhand exhibits the highest genus as well as species diversity. The Ganga River system and the Indus River system form the major drainage systems in northern India, highlighting the region's rich aquatic biodiversity. While rivers like Spiti and Parbati in Himachal Pradesh and Kishanganga and Sind in Jammu & Kashmir recorded the lowest species diversity. The diversity typically increases downstream or at lower altitude. Most of the recorded species are still categorized as Least Concern but several important endemic species such as snow trout and mahseer remains under threat. Furthermore, the degradation of freshwater ecosystems due to various human-induced threats such as urbanization, water pollution and over-fishing shows a negative impact on the fish population and highlights the need for habitat focused conservation in this Himalayan region.

Table 4. Fish fauna of Uttarakhand (Suborder Cyprinoidei; family Cyprinidae, Danionidae, and Xenocyprididae).

TAXON Phylum: Chordata Class: Actinopterygii Order: Cypriniformes	Song	Dulhani	Suswa	Baldi	Tons	Asan	Yamuna	Ganga	Alaknanda	Bhaghirathi	Bhilangna	Nayar	Ramganga	Kharmola stream	Indrawati stream	Pinder	Mal gad stream	Nandakini	Birahiganga	Laster Stream	Kyunja stream	Koshi	Gaula	Mandal	Palain river	Sona river	Goriganga
Family Cyprinidae																											
Bangana dero (Hamilton, 1822)	+	+	+	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+	+	+	+
Cyprinus carpio Linnaeus, 1758	-	-	-	-	-	-	-	+	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tariqilabeo latius (Hamilton, 1822)	+	-	+	+	+	-	+	+	+	-	-	-	+	-	-	+	-	+	-	+	-	+	-	+	+	+	-
Cirrhinus reba (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cirrhinus mrigala (Hamilton, 1822)	-	-	-	-	-	-	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chagunius chagunio (Hamilton, 1822)	+	+	+	+	+	-	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	+	-
Garra mullya (Sykes, 1839)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Garra gotyla (Gray, 1930)	+	+	+	-	+	+	-	+	+	+	+	+	+	-	-	+	-	+	+	+	+	+	+	+		+	+
Garra lamta (Hamilton, 1822)	+	+	+	+	-	-	-	-	-	-	-	-	+	-	-	+	-	-	+	+	+	+	-	+	+	+	-
Garra annandalei Hora, 1921	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Labeo catla (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Labeo dyocheilus (McClelland, 1839)	+	+	+	+	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	+	+	+	+
Labeo pangusia (Hamilton, 1822)	+	+	+	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Labeo calbasu (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Labeo gonius (Hamilton, 1822)	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Labeo rohita (Hamilton, 1822)	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Labeo boggut (Sykes, 1839)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Labeo bata (Hamilton, 1822)	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Labeo angra (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Labeo boga (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Neolissochilus hexasticus (McClelland, 1839)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	+	+	+	-
Osteobrama cotio (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puntius sophore (Hamilton, 1822)	+	+	+	+	+	+	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	+	-	+	+	+	-
Puntius chola (Hamilton, 1822)	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-
Systomus sarana (Hamilton, 1822)	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puntius terio (Hamilton, 1822)	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pethia gelius (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-
Pethia conchonius (Hamilton, 1822)	+	+	+	+	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pethia ticto (Hamilton, 1822)	+	+	+	+	+	+	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+	+	+	+

TAXON Phylum: Chordata Class: Actinopterygii Order: Cypriniformes	Song	Dulhani	Suswa	Baldi	Tons	Asan	Yamuna	Ganga	Alaknanda	Bhaghirathi	Bhilangna	Nayar	Ramganga	Kharmola stream	Indrawati stream	Pinder	Mal gad stream	Nandakini	Birahiganga	Laster Stream	Kyunja stream	Koshi	Gaula	Mandal	Palain river	Sona river	Goriganga
Pethia phutunio (Hamilton, 1822)	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Schizothorax richardsonii (Gray, 1832)	+	-	+	+	+	-	+	-	+	+	+	-	+	+	+	+	+	+	+	+	+	-	+	+	+	-	+
Schizothorax plagiostomus Heckel, 1838	-	-	-	-	-	-	+	-	+	+	+	+	-	+	+	+	+	+	+	+	+	-	-	-	-	-	+
Schizothorax niger Heckel, 1838	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Schizothorax curvifrons (Heckel, 1838)	-	-	-	-	-	-	-	-	+	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Schizothorax kumaonensis Menon, 1971	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Schizothorax progastus (McClelland, 1839)	+	-	-	-	+	-	-	-	-	+	+	-	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-
Tor putitora (Hamilton, 1822)	+	+	-	-	+	+	+	-	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	-	-	-	+
Tor tor (Hamilton, 1822)	+	+	-	-	+	-	+	+	+	+	+	+	+	-	-	+	-	+	+	+	+	+	-	-	-	-	+
Tor mosal (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naziritor chelynoides (McClelland, 1839)	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	+	+	-	+	+	+	+	-	+	+	+	+
Family Danionidae																											
Amblypharyngodon mola (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cabdio morar (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cabdio jaya (Hamilton, 1822)	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barilius vagra (Hamilton, 1822)	+	-	-	-	+	-	+	+	+	+	+	-	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+
Opsarius bendelisis (Hamilton, 1807)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+
Opsarius barna (Hamilton, 1822)	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	+	+	-	-	+	+	+	-	+	+	+	-
Barilius barila (Hamilton, 1822)	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-	-	-	-	+	-	+	+	+	-
Opsarius tileo (Hamilton, 1822)	-	+	+	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Opsarius shacra (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	+	-	+	+	-	+	+	+	-
Chela cachius (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Devario devario (Hamilton, 1822)	+	+	+	+	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+	+	+	-
Devario aequipinnatus (McClelland, 1839)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-
Danio rerio (Hamilton, 1822)	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-
Esomus danrica (Hamilton, 1822)	+	+	+	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laubuka laubuca (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Raiamas bola (Hamilton, 1822)	+	+	+	+	+	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	-	+	-	-
Rasbora danioconius (Hamilton, 1822)	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-
Salmostoma phulo (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TAXON Phylum: Chordata Class: Actinopterygii Order: Cypriniformes	Song	Dulhani	Suswa	Baldi	Tons	Asan	Yamuna	Ganga	Alaknanda	Bhaghirathi	Bhilangna	Nayar	Ramganga	Kharmola stream	Indrawati stream	Pinder	Mal gad stream	Nandakini	Birahiganga	Laster Stream	Kyunja stream	Koshi	Gaula	Mandal	Palain river	Sona river	Goriganga
Salmostoma bacaila (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Securicula gora (Hamilton, 1822)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Family Xenocyprinidae																											
Ctenopharyngodon idella (Valenciennes, 1844)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hypophthalmichthys molitrix (Valenciennes, 1844)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hypophthalmichthys nobilis (Richardson, 1845)	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5. Fish fauna of Himachal Pradesh (Suborder Cyprinoidei; family Cyprinidae, Danionidae, and Xenocyprididae).

TAXON Phylum: Chordata Class: Actinopterygii Order: Cypriniformes	Beas	Ravi	Maan Stream	Kunah Stream	Son Stream	Spiti	Giri	Parbati	Sutlej
Family Cyprinidae									
Bangana dero (Hamilton, 1822)	+	-	-	-	-	-	-	-	-
Cyprinus carpio (Linnaeus, 1758)	+	+	+	+	+	-	-	-	+
Cirrhinus reba (Hamilton, 1822)	+	+	-	-	-	-	-	-	-
Cirrhinus mrigala (Hamilton, 1822)	+	+	-	-	-	-	-	-	-
Chagunius chagunio (Hamilton, 1822)	+	-	-	-	-	-	-	-	-
Carassius auratus (Linnaeus, 1758)	-	+	-	-	-	-	-	-	+
Carassius carassius (Linnaeus, 1758)	-	+	-	-	-	-	-	-	-
Garra gotyla (Gray, 1930)	-	+	+	+	-	-	-	+	-
Labeo dyocheilus (McClelland, 1839)	-	+	-	-	-	-	-	-	-
Labeo calbasu (Hamilton, 1822)	+	+	-	-	-	-	-	-	-
Labeo gonius (Hamilton, 1822)	+	+	-	-	-	-	-	-	-
Labeo rohita (Hamilton, 1822)	+	+	+	-	-	-	-	-	-
Labeo boggut (Sykes, 1839)	+	-	-	-	-	-	-	-	-
Labeo bata (Hamilton, 1822)	+	+	-	-	-	-	-	-	-
Labeo catla (Hamilton, 1822)	+	-	-	-	-	-	-	-	-
Osteobrama cotio (Hamilton, 1822)	-	-	-	-	-	-	-	-	+
Puntius sophore (Hamilton, 1822)	-	+	-	-	-	-	-	-	+
Puntius chola (Hamilton, 1822)	+	-	-	-	-	-	-	-	+

TAXON Phylum: Chordata Class: Actinopterygii Order: Cypriniformes	Beas	Ravi	Maan Stream	Kunah Stream	Son Stream	Spiti	Giri	Parbati	Sutlej
Systomus sarana (Hamilton, 1822)	+	-	-	-	+	-	+	-	+
Pethia conchonius (Hamilton, 1822)	+	+	+	-	-	-	-	-	+
Pethia ticto (Hamilton, 1822)	+	+	+	+	+	-	+	-	+
Pethia phutunio (Hamilton, 1822)	-	-	+	-	-	-	-	-	-
Schizothorax richardsonii (Gray, 1832)	+	+	-	-	+	+	+	+	-
Schizothorax plagiostomus (Heckel, 1838)	+	-	-	-	-	-	-	-	-
Tariquilabeo diplochilus (Heckel, 1838)	-	+	-	+	+	-	-	-	+
Tariquilabeo latius (Hamilton, 1822)	+	+	-	-	-	-	-	-	+
Tor putitora (Hamilton, 1822)	+	+	+	+	+	-	+	-	-
Tor tor (Hamilton, 1822)	+	-	-	-	-	-	-	-	-
Family Danionidae									
Barilius vagra (Hamilton, 1822)	-	+	+	+	-	-	+	-	+
Opsarius bendelisis (Hamilton, 1807)	-	+	+	+	-	-	+	-	+
Opsarius barna (Hamilton, 1822)	-	-	-	+	-	-	-	-	-
Barilius barila (Hamilton, 1822)	-	-	-	-	-	-	+	-	+
Barilius modestus (Day, 1872)	-	-	-	-	-	-	-	-	+
Danio rerio (Hamilton, 1822)	-	-	-	-	-	-	-	-	+
Rasbora danioconius (Hamilton, 1822)	-	-	+	-	-	-	-	-	+
Salmostoma bacaila (Hamilton, 1822)	-	+	-	+	-	-	-	-	-

Table 6. Current conservation status of some fish species of the suborder Cyprinoidei reported in the western Indian Himalayan Region.

	Suborder Cyprinoidei	IUCN Red List status		Suborder Cyprinoidei	IUCN Red List status
1	*Amblypharyngodon mola* (Hamilton, 1822)	LC	39	*Labeo bata* (Hamilton, 1822)	LC
2	*Cabdio morar* (Hamilton, 1822)	LC	40	*Labeo angra* (Hamilton, 1822)	LC
3	*Cabdio jaya* (Hamilton 1822)	LC	41	*Labeo boga* (Hamilton, 1822)	LC
4	*Barilius vagra* (Hamilton, 1822)	LC	42	*Labeo catla* (Hamilton, 1822)	LC
5	*Barilius shacra* (Hamilton, 1822)	LC	43	*Laubuka laubuca* (Hamilton, 1822)	LC
6	*Barilius tileo* (Hamilton, 1822)	LC	44	*Naziritor chelynoides* (McClelland, 1839)	VU
7	*Barilius barila* (Hamilton, 1822)	LC	45	*Osteobrama cotio* (Hamilton, 1822)	LC
8	*Barilius modestus* Day, 1872	LC	46	*Opsarius bendelisis* (Hamilton, 1807)	LC
9	*Bangana dero* (Hamilton, 1822)	LC	47	*Ptychobarbus conirostris* Steindachner, 1866	LC
10	*Gymnostomus ariza* (Hamilton, 1822)	LC	48	*Puntius sophore* (Hamilton, 1822)	LC
11	*Barbonymus gonionotus* (Bleeker, 1849)	LC	49	*Puntius chola* (Hamilton, 1822)	LC
12	*Cyprinus carpio communis* (Linnaeus, 1758)	LC	50	*Pethia conchonius* (Hamilton, 1822)	LC
13	*Cyprinus carpio nudus* (Bloch, 1784)	LC	51	*Pethia ticto* (Hamilton, 1822)	LC
14	*Cyprinus carpio specularis* (Linnaeus, 1758)	LC	52	*Pethia phutunio* (Hamilton, 1822)	LC
15	*Cirrhinus reba* (Hamilton, 1822)	LC	53	*Puntius terio* (Hamilton, 1822)	LC
16	*Cirrhinus mrigala* (Hamilton, 1822)	LC	54	*Puntius gelius* (Hamilton, 1822)	LC
17	*Ctenopharyngodon idella* (Valenciennes, 1844)	LC	55	*Raiamas bola* (Hamilton, 1822)	LC
18	*Chela cachius* (Hamilton, 1822)	LC	56	*Rasbora rasbora* (Hamilton, 1822)	LC
19	*Chagunius chagunio* (Hamilton, 1822)	LC	57	*Rasbora danioconius* (Hamilton, 1822)	LC
20	*Carassius auratus* (Linnaeus, 1758)	LC	58	*Systomus sarana* (Hamilton, 1822)	LC
21	*Carassius carassius* (Linnaeus, 1758)	LC	59	*Salmostoma phulo* (Hamilton, 1822)	LC
22	*Diptychus maculatus* (Steindachner, 1866)	LC	60	*Salmostoma bacaila* (Hamilton, 1822)	LC
23	*Devario devario* (Hamilton, 1822)	LC	61	*Salmostoma punjabense* (Day, 1872)	LC
24	*Danio aequipinnatus* (McClelland, 1839)	LC	62	*Securicula gora* (Hamilton, 1822)	LC
25	*Danio rerio* (Hamilton, 1822)	LC	63	*Schizothorax richardsonii* (Gray, 1832)	VU
26	*Esomus danricus* (Hamilton, 1822)	LC	64	*Schizothorax plagiostomus* (Heckel, 1838)	VU
27	*Garra mullya* (Sykes, 1839)	LC	65	*Schizothorax niger* (Heckel, 1838)	NE
28	*Garra gotyla gotyla* (Gray, 1930)	LC	66	*Schizothorax curvifrons* (Heckel, 1838)	LC
29	*Garra lamta* (Hamilton, 1822)	LC	67	*Schizothorax labiatus* (McClelland, 1842)	LC
30	*Garra annandalei* (Hora, 1921)	LC	68	*Schizothorax esocinus* (Heckel, 1838)	VU
31	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	NT	69	*Schizothorax kumaonensis* Menon, 1971	DD
32	*Hypophthalmichthys nobilis* (Richardson, 1845)	DD	70	*Schizothorax progastus* (McClelland, 1839)	LC
33	*Labeo dyocheilus* (McClelland, 1839)	LC	71	*Schizopygopsis* sp.	NE
34	*Labeo pangusia* (Hamilton, 1822)	NT	72	*Tariqilabeo diplochilus* (Heckel, 1838)	NE
35	*Labeo calbasu* (Hamilton, 1822)	LC	73	*Tariqilabeo latius* (Hamilton, 1822)	LC
36	*Labeo gonius* (Hamilton, 1822)	LC	74	*Tor putitora* (Hamilton, 1822)	EN
37	*Labeo rohita* (Hamilton, 1822)	LC	75	*Tor tor* (Hamilton, 1822)	DD
38	*Labeo boggut* (Sykes, 1839)	LC	76	*Tor mosal* (Hamilton, 1822)	DD

NE—Not Evaluated | DD—Data Deficient | LC—Least Concern | NT—Near Threatened | VU—Vulnerable | EN—Endangered.

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