ICHTHYOFAUNAL DIVERSITY OF RANJIT SAGAR WETLAND SITUATED IN THE NORTHWESTERN HIMALAYAS

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ABSTRACT

Diversity of fishes was evaluated at the Ranjit Sager Wetland and its three adjoining streams. Factors like altitude, bed gradient, dominated substratum and habitat types of the streams have also been studied. These streams fall under Type-B category on the basis of habitat variability, gradient and sinuosity. 43 fish species represented by 6 orders have been reported from the study area. Out of all 43 fish species, 13 come under threatened categories of Red List of IUCN, out of which 2, 3 and 8 come under Endangered (EN), Vulnerable (VU) and Low Risk near threatened category (LRnt) respectively. It has been analyzed from the above pattern that maximum fish species reported from this wetland have fallen under different threatened categories.

Keywords: abundance; habitat loss; species richness; threatened species

Introduction

The heterogeneous freshwater habitat in rivers, streams, springs and headwaters like variation in altitude, flow rates, physical substrate and the riparian zones provides good opportunity of food, shade and cover for various fish species. Consequently, freshwater habitats harbor diverse fauna, with fish serving as prime indicators of ecosystem status (Armantrout 1990). Though study of assemblage pattern and partitioning of fish diversity is a challenging subject in fishery science (Ross 1986). Fish research has become an increasingly important study area, as fish population is declining throughout the world due to various anthropogenic activities. The decline of fishes has an adverse impact on aquatic ecosystems as well as a significant impact on human population as it is one of the primary food sources for human. Anthropogenic activities such as modification of the environment, culture, harvesting and effects of modernization have contributed to the pollution of water bodies which serve as habitat for fishes (Plafkin et al. 1989; Siligato and Bohmer 2001; Vijaylaxmi et al. 2010; Tiwari 2011). Due to rise of population in all countries, fishes may play an important role in economic development of countries (Sikoki and Otobotekere 1999; Gharaei et al. 2010; 2011).

In India it is estimated that about 2500 fish species are found within which around 930 species are freshwater. The freshwater fishes are distributed amongst approximately 20 orders, 100 families and 300 genera (Daniels 2000; Kar 2003; Ayappan and Birdar 2004). Fishes are the main component of lake and wetlands ecosystems. They play an important role in energy flows, nutrient cycling and maintaining community balances in these ecosystems. The physical, chemical and biological characteristics of a wetland are major determinants of the type, number and size of fish available (Baker et al. 1993; Abbasi 1997).

Fish biodiversity was studied in Punjab and described as many as 116 fish species (Johal and Tandon 1979; 1980). Dua and Chander (1999) have identified 61 species from Harike wetland. Brraich et al. (2003) identified 3 new fish species from Harike wetland viz., *Nandus nandus*, *Lepidocephalichthys guntea* and *Monopterus chuchia*. Further, Brraich and Ladhar (2005) identified one more species viz., *Badis badis*. Furthermore, they also reported 69 fish species from Harike, 55 from Ropar and 16 from Kanjli wetland.

There are various environmental factors which affect fish communities in freshwaters. The most important are streamflow, water quality, food sources, physical habitat and biotic interactions that affect stream fish and aquatic communities. At the most general level of resolution, channel units are divided into fast and slow-water categories that approximately correspond to the commonly used terms "riffle" and "pool". Within the fast – water category, two subcategories of habitats are identified, those that are highly turbulent (falls, cascade, chutes, rapids and riffles) and those with low turbulence (sheets and runs). Different habitat harbour different verities of fish species (Hawkins et al. 1993).

Ranjit Sagar Wetland and its adjoining streams are one of the great potential (Johal et al. 2002) fishery resources in India. The research on fish species of this wetland has not been conducted earlier. The detailed study on fish diversity observed from this wetland will extend great help to start conservation and management practices in future.

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Materials and Methods

The Ranjit Sagar wetland, also known as Thein Dam, is a fresh water ecosystem situated on the river Ravi (tributary of the Indus river system) near Pathankot city, Punjab, India. This wetland falls into three states i.e. Punjab, Himachal Pradesh and Jammu and Kashmir and spread over an area of 87.60 sq km and catchment area consist of 6086 sq km. There are three major streams (Karnal, Basoli and Behni) feeding Ranjit Sagar Wetland (Fig. 1, Table 1). Fish samples were collected on monthly basis from each stream by selecting three fish collection sites with difference of 1 km each. The fish sample were collected in triplicate with the help of local fishermen by using standard fishing gears like cast, gill and hand nets. The sampling was made from different habitats such as riffles, cascades, ripples and runs (Rosgen 1996). After collection, fish specimen were examined, counted and released into the water. The unidentified specimen were preserved in 5% formalin and brought to the laboratory for further analysis and identification. Fish specimens were identified on the basis of morphological characters and with the help of standard keys and taxonomy text books (Johal and Tandon 1979; Day 1888; Jayaram 2010). Rosgen (1996) classified the hillstreams into three major types Type A, B and F. Type-A streams is high altitude streams with high gradient. These streams have stable bed morphology with boulders or bedrock dominated channels. Type-B streams are with gentle gradient, cobble gravel dominated substrate with variable habitat types. Type-F streams are similar to Type-B except that they are more entrenched in the highly weathered materials.

Table 1 List of study sites of Ranjit Sagar Wetland.

Sr. No.	Site	Location	Altitude (m)	Latitude	Longitude	Substrate	Habitat
1.	Dam (Reservoir)	Punjab	1697	75°45′45″E	32°26′37″N	Rocky	Deep pools and shallow pools
2.	Behni (Stream)	Jammu and Kashmir	1778	75°39′10.88″E	32°31′39.79″N	mostly bedrock, boulders, bravel, cobble and leaf litter	Pools, riffles, cascade, run
3.	Basoli (Stream)	Himachal Pradesh	1768	75°50′46.30″E	32°30′35.95″N	Boulders, gravel, cobble and sand	Deep pools, pools, riffles and cascade
4.	Karnal (stream)	Punjab	2118	75°53′01.53″E	32°27′01.27″N	Mix with big boulders, gravel, cobble and leaf litter	Pools, riffles, cascade and run

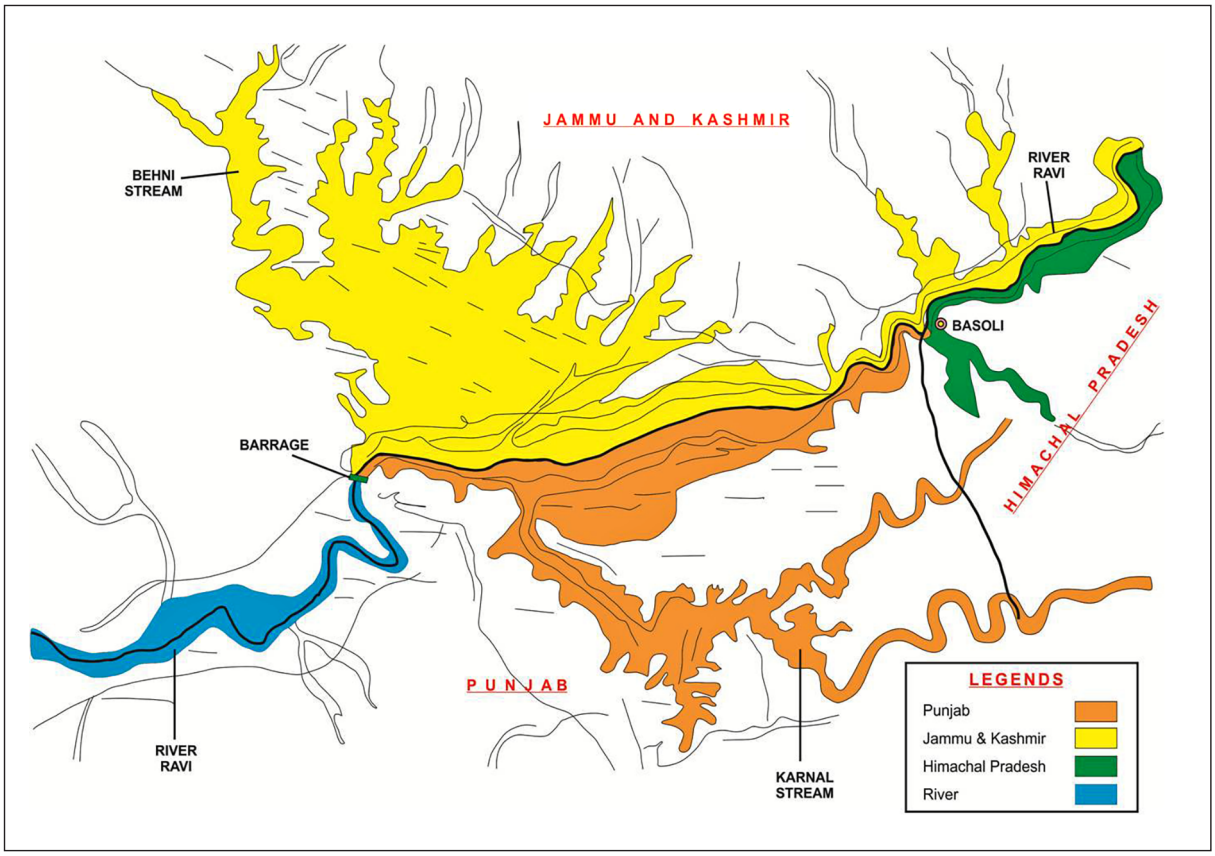

Fig. 1 Map of Ranjit Sagar Wetland.

Results

A total of 43 fish species have been reported from the Ranjit Sagar Wetland and its adjoining streams belonging to 6 orders, 11 families and 27 genera (Table 2). Cyprinidae forms the dominant group among the families with 64% followed by Channidae with 9%, Cobitidae with 5%, Siluridae with 5%, Balitoridae with 5%, and other fami-

Table 2 Classification of the fish species reported from the Ranjit Sagar Wetland and adjoining streams.

S. No.	Name of Fish	English Name	Habitat Preference
I	**Order – Cypriniformes**		
i	Family – Cyprinidae		
	Bangana dero	Kalabans	Inhabit hill-streams in shallow waters. Adults migrate to warmer regions of lakes and streams during winter.
	Barilius bendelisis	Hamilton's Barila	Base of hills in the lotic habitat strewned with pebbles and sandy bottom.
	Barilius shacra	Shacra Baril	Found in streams and rivers.
	Barilius vagra	Vagra Barila	Found in hill streams with gravelly and rocky bottom.
	Cabdio morar	Aspidoparia	Found in streams, rivers and ponds in plains and mountainous regions
	Cirrhinus reba	Reba Carp	Found in large streams, rivers, tanks, lakes and reservoirs
	Devario devario	Devario danio	Fast flowing clear headwater streams.
	Crossocheilus latius latius	Gangetic Latia	Inhabits streams, rivers and lake preferably with gravelly bottom in benthopelagic environment.
	Ctenopharyngodon idellus	Grass Carp	Inhabit large rivers, lakes, and reservoirs with abundant vegetation and relatively shallow waters.
	Cyprinus carpio	Common Carp	Warm, deep, slow-flowing and still waters, such as lowland rivers and large, well vegetated lakes.
	Garra gotyla gotyla	Sucker Head	This species is found in fast flowing streams with boulders and rocks along the Himalayan ranges.
	Hypophthalamichthys molitrix	Silver Carp	It migrates upstream to breed; egg and larva float downstream to floodplain zones.
	Hypophthalamichthys nobilis	Big Head	Inhabits rivers with marked water-level fluctuations, overwinters in middle and lower stretches.
	Labeo bata	Bata Labeo	Found in streams and rivers.
	Labeo dyocheilus	Brahmaputra Labeo	Inhabits clear active currents of large rivers
	Labeo gonius	Kuria Labeo	It inhabits rivers and streams.
	Labeo pangusia	Pangusia Labeo	It inhabits mountain streams, rivers, lakes and ponds
	Labeo rohita	Rohu	It inhabits rivers and streams.
	Pethia conchonius	Rosy Barb, Red barb	Generally inhabits lakes and streams.
	Pethia phutunio	Spotted Tail Barb, Pygmy Barb, Dwarf Barb	Inhibits clear streams and rivers, also muddy waters
	Pethia ticto	Ticto Barb, Firefin Barb, Two-Spot Barb	Inhabits mostly mountain and sub-mountain regions, and flood plains.
	Puntius chola	Swamp Barb, Chola Barb	It inhabits rivers, streams and tanks in the plains
	Rasbora daniconius	Slender Rasbora, Bliack line Rasbora	It occurs in a variety of habitats: ditches, ponds, canals, streams, rivers and inundated fields, but is primarily found in sandy streams and rivers.
	Salmophasia bacaila	Large Razorbelly Minnow	Usually found in slow running streams, but also occurring in rivers, ponds and inundated fields in sub-mountain regions
	Systomus sarana sarana	Olive Barb	It can live in sandy bed mixed with mud and in fairly swift current.
	Tor chylenoides	Dark Mahseer	Inhabits fast-flowing mountain streams
	Tor putitora	Golden Mahaseer, Putitor Mahseer	It inhabits rapid streams with rocky bottom, riverine pools and lakes.
	Tor tor	Tor Mahseer	It grows better in rivers with a rocky bottom.
ii	**Family – Balitoridae**		
	Acanthocobitis botia		Inhabits swift flowing streams in hilly areas with clear water and rocky, pebbly and sandy bottoms.

iii	**Family – Cobitidae**		
	Botia birdi	Botia Loach	Occurs in clear mountain streams.
	Botia lohachata	Y-Loach, Reticulate Loach	Occurs in clear mountain streams.
II	**Order – Siluriformes**		
i	**Family – Clariidae**		
	Heteropneustes fossilis	Stinging Catfish	Inhabits freshwater, rarely brackish waters. This is primarily a fish of ponds, ditches, bheels, swamps and marshes, but it is sometimes found in muddy rivers.
ii	Family – Siluridae		
	Ompok bimaculatus	Indian Butter Catfish	Inhabits plains and sub-mountain regions, and is found in rivers, lakes, tanks and ponds.
	Ompok pabda	Pabdah Catfish	The species inhabits lotic habitats such as rivers and larger streams.
iii	**Family – Sisoridae**		
	Glyptothorax punjabensis		The species inhabits benthopelagic zones of lotic habitats such as rivers and larger streams.
III	**Order – Synbranchiiformes**		
i	**Family – Synbranchidae**		
	Mastacembelus armatus	Tire-Track Spinyeel	Inhabits fresh waters in plains and hills.
IV	**Order- Beloniformes**		
i	**Family – Belonidae**		
	Xenentodon cancila	Freshwater Garfish	Inhabits freshwaters, primarily rivers. It occurs in clear, gravelly, perennial streams and ponds.
V	**Order – Perciformes**		
i	**Family – Channidae**		
	Channa marulius	Giant Snakehead	Inhabits large lakes and rivers; prefers deep, clear stretches of water with sandy or rocky bottoms.
	Channa orientalis	Asiatic Snakehead	Species occurring in rivers, lakes, ponds, mountain streams and even brackish water. Found in quiet, shaded, clear, flowing water with silt or gravel substrate.
	Channa punctatus	Spotted Snakehead	Inhabits freshwater streams, rivers, ponds and tanks, generally in the plains. Also found in rice fields and irrigation channels.
	Channa striata	Striped or Banded Snakehead	Inhabits swamps, freshwater ponds, streams and tanks in the plains; prefers stagnant muddy waters and grassy tanks.
ii	**Family – Nandidae**		
	Nandus nandus	Mottled Nandus	It inhabits fresh waters. Found in rivers and in agricultural lands.
VI	Order – Osteoglossiformes		
i	**Family – Notopteridae**		
	Notopterus notopterus	Grey Featherback	It inhabits fresh and brackish waters, and appears to thrive well in lentic waters.

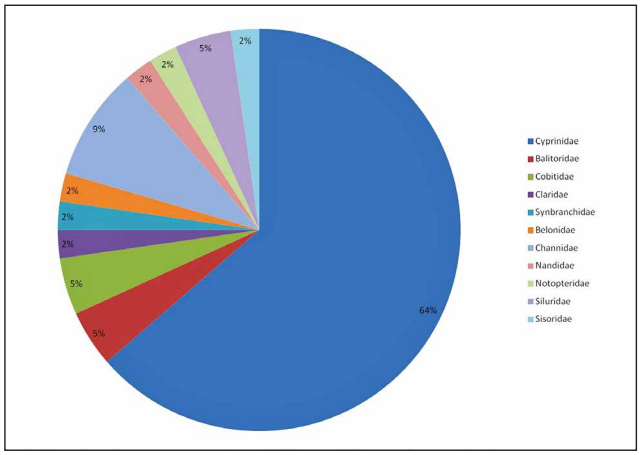

Fig. 2 Family-wise representation of different fish species and their percentage.

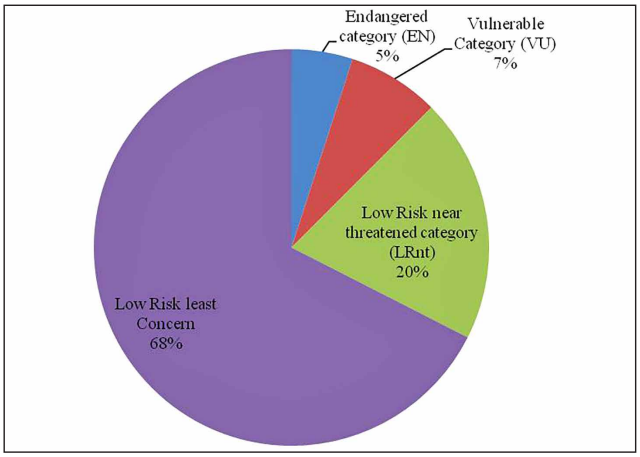

Fig. 3 Percentage-wise IUCN Red List status.

Table 3 Status of fishes from Ranjit Sagar Wetland and adjoining streams based on Red Data list of IUCN (2017) and criteria, threats & research recommendations according to CAMP Report (Molur and Walker 1998).

S. No.	Name of Fish	IUCN Status	Criteria	Sites	Threats	Research Recommended
1.	***Acanthocobitis botia***	**LRlc**	–	Ba, Be, K	Fd, E, F, I, L, Po, Ov, Sn, T(L)	Lh, Hm, M, PP
2.	***Bangana dero***	**LRlc**	(A1acd)	Ba, Be, D, K	Dm, Dr, Fd, F, L, H, I, Lp, Ov, Sn, T (L,D)	S, M, Hm, Lm
3.	***Barilius bendelisis***	**LRlc**	–	Ba, Be, D, K	Fd, F, I, L, Ov, Po, Sn, T (L,C)	M, Lh, Hm, P
4.	***Barilius shacra***	**LRnt**	–	Ba, Be, D, K	I, L, Pu, Sn, T(L)	M, O, P
5.	***Barilius vagra***	**LRlc**	(A1a, 1c)	Ba, Be, D, K	I, L, T(L)	S, M, Hm, P
6.	***Botia birdi***	**LRnt**	–	Be	I, L, Pu, Sn, F, T(L)	Hm, Lh, O, P
7.	***Botia lohachata***	**EN**	(B1, 2c)	Be	Fd, E, I, L, Ov, Po, Sn, T(L)	Lh, Hm, M, P
8.	***Cabdio morar***	**LRlc**	–	Be	I, L, Ov, Pu, T(L,C)	S, M, Lh, T, G
9.	***Channa marulius***	**LRlc**	–	Ba, Be, K	F, L, Ov, T (D, C)	M, H
10.	***Channa orientalis***	**VU**	(A1acd)	Be, K	F, L, T(D)	Hm, S, M, PP
11.	***Channa punctatus***	**LRlc**	–	Ba, Be, D	F, L, Ov, T(D)	H, Hm
12.	***Channa striata***	**LRlc**		D	F, T, (C)	H
13.	***Cirrhinus reba***	**LRlc**	(A1abcd, 2cd)	Ba, Be, D, K	Dm, F, I, L, Ov, Pu, Sn, T(D,C)	S, M
14.	***Crossocheilus latius latius***	**LRlc**	–	Ba, Be, K	L, Fd	Lh
15.	***Ctenopharyngodon idellus***	**DD**	–	Ba, D, K	–	–
16.	***Cyprinus carpio***	**VU**	(A2ce)	Ba, D, K	–	–
17.	***Devario devario***	**LRnt**	–	Be, K	I, Ov, Po, Pu, T(L, D)	S, M, Lr, Hm, Lh, P
18.	***Garra gotyla gotyla***	**LRlc**	(A1acd)	Ba, Be, K	Fd, E, I, L, Ov, Ps, Po, Sn, T(L)	M, Lh, Hm, P
19.	***Glyptothorax punjabensis***	**DD**	–	Be, K	–	–
20.	***Heteropneustes fossilis***	**LRlc**	(A1acd)	Ba, K	F, I, L, T(L,D,C)	S, M, H, Hm, P
21.	***Hypophthalamichthys molitrix***	**LRnt**	–	Ba, D,	–	–
22.	***Hypophthalamichthys nobilis***	**DD**	–	Ba, D	–	–
23.	***Labeo bata***	**LRlc**	–	Be, D, K	L, Ov, Sn, T (C)	M
24.	***Labeo dyocheilus***	**LRlc**	(A1acd)	Ba, D	Dm, Dr, Fd, F, I, H, L, Ov, T(L,D)	S, M, Hm, Lm, PP
25.	***Labeo gonius***	**LRlc**	–	Be, K	I, H, Ov, Pu, T (C)	G, M, S
26.	***Labeo pangusia***	**LRnt**	–	Be,K	I, H, Ov, Pu, T (D)	S, M, Lh, Hm
27.	***Labeo rohita***	**LRlc**	–	Ba, Be, K	L, Ov, Sn, T(C)	G
28.	***Mastacembelus armatus***	**LRlc**	–	Ba, Be, D, K	–	–
29.	***Nandus nandus***	**LRlc**	–	Ba, Be, K	I, L, Po, Pu, Sn, T(L)	S, M, G, P
30.	***Notopterus notopterus***	**LRlc**	–	Ba, D, K	I, Ov, Pu, T(C)	M
31.	***Ompok bimaculatus***	**LRnt**	(A1acd, 2cd)	Ba, D, K	D, Fd, F, I, Po, Ps, Pu, Sn, T(L, D, C)	S, M, G, Hm, Lm, P
32.	***Ompok pabda***	**LRnt**	(A1acd, 2cd)	Ba, D, K	F, I, Pu, T(L, D, C)	S, M, G, Hm, Lm, Lr, P
33.	***Pethia conchonius***	**LRlc**	B1, 2c	Ba, Be, D, K	E, L, Po, Sn, T(L)	Lh, Hm, M
34.	***Pethia phutunio***	**LRlc**	–	Ba, Be, K	T(C)	S, M
35	***Pethia ticto***	**LRlc**	–	Ba, Be, D	F, L, T (L)	Hm
36.	***Puntius chola***	**LRlc**	A1a, 1c, 1d	Be, D, K	I, Pu, T(L)	S, M
37.	***Rasbora daniconius***	**LRlc**	–	Be, K	F, Pu, T (L, D)	S, M, G, Hm
38.	***Salmophasia bacaila***	**LRlc**	–	K	T(L)	Lh, M, S
39.	***Systomus sarana sarana***	**LRlc**	A1acd	Ba, Be, D, K	F, I, L, T (L, D)	S, M, Lr, P
40.	***Tor chylenoides***	**VU**	–	Ba, Be, D, K	–	–
41.	***Tor putitora***	**EN**	A1acd	Ba, Be, D, K	Dm, Dr, Fd, F, I, H, L, Ov, Pi, Sn, T (L, D)	S, M, Hm, Lm, P
42.	***Tor tor***	**LRnt**	A1a, 1c, 1d	Be, D	Dm, Fd, F, I, L, Po, Pu, T(L,D,C)	S, M, G, Hm, Lm, Lr, P
43.	***Xenentodon cancila***	**LRlc**	–	Ba, Be, D, K	F, Pu, T(D)	S, M, Lr, P

Abbreviations

Site: Be – Behni, Ba – Basoli, K – Karnal, D – Dam.

IUCN: EN – Endangered, VU – Vulnerable, LRnt – Lower Risk-near threatened, LRlc – Lower Risk-near least concern.

Threats: I – Human interference, L – Loss of habitat, Lf – Loss of habitat due to fragmentation, Lp – Loss of habitat due to exotic plants, D – Diseases, Dm – Damming, E – Edaphic factors, F – Fishing , Fd – Destructive fishing, H – Harvest, Hf – Harvest for food, P – Predation, Po – Poisoning, Ps – Pesticides, Pu – Pollution, Pi – Powerlines , Sn – Siltation, T – Trade , Ov – Overexploitation, Dr – Drowning.

Research Recommendations: S – Survey search and find , M – Monitoring, H – Husbandry research, Hm – Habitat management, Lr – Limiting factor research, Lm – Limiting factor management, Lh – Life history studies, T – Taxonomic and Morphological genetics studies, G – Genetic Managements, P – Population and habitat viability assessment, PP – PHVA (Pending Further Work), O – Other (Specific to the Species).

lies namely Synbranchidae, Belonidae, Claridae, Nandinae and Notopteridae forming 2% each (Fig. 2). Out of all 43 fish species, 13 come under threatened categories of Red List of IUCN (Table 3), out of which 2, 3 and 8 come under Endangered (EN), Vulnerable (VU) and Low Risk near threatened category (LRnt) respectively (Fig. 3). This wetland also supports four exotic fish species i.e. *Cyprinus carpio, Ctenopharyngodon idellus, Hypophthalmichthys molitrix* and *H. nobilis*. During the study period different type of streams habitats have been studied. All three streams Behni, Basoli and Karnal were dominated by different type of habitats like deep pools, pools, riffles, runs and cascade. Streams banks were stable and covered by riparian vegetation. Different types of stream substrates have also been studied during the course of work in which bedrock type of substrate was predominant, other type of substrates viz. big boulders, gravel, cobble, sand and leaf litter was also present. These types of streams were called Type-B streams which are very productive in nature and support large variety of fish diversity.

Discussion

During the course of study, 25 fish species have been reported from Dam site, 29 from Basoli and 33 each from Behni and Karnal site. A total of 43 fish species have been reported from the Ranjit Sagar Wetland and its adjoining streams were classified under different order and families. Goswami and Goswami (2006) have identified 54 fish species belonging to 36 genera under 22 families in Jamalai wetland in Assam. Sharma et al. (2007) reported 29 species of fishes belonging to six orders from Krishnapura lake, Indore and stated that Cypriniformes was dominant with 15 species followed by Siluriformes with 6 species. Jagatheeswari et al. (2016) also studied the diversity of fish population and their conservation aspects in Kondakarla fresh water lake ecosystem, Visakhapatnam, Andhra Pradesh, India and reported 26 species of fishes.

Occurrence of variety of fish species depends upon the availability of different habitats (Arunachalam 2000). Hence, fishes have also been classified on the basis of their habitat preferences. The dominant fish habitats in the streams were cascade, rapids, riffles and run. Similarly, dam has deep pools in the middle and shallow pools near the banks. Rosenzweib (1995) revealed that number of species increase with an increase in habitat area which supports the phenomenon of species habitat area relationship. Arunachalam (2000) studied the macro and microhabitat of 10 streams of Western Ghats and provide information about the habitat requirement of fish species in different stream/rivers. They stated that habitat diversity is directly related to fish diversity.

Kar and Sen (2007) studied the distribution of fishes on the basis of habitat preference. During the study we study that, the edges of the run habitats have been found to be inhabited mainly by *Puntius chola, Pethia conchonius* and *Barilius shacra* in Behni and Karnal stream while the cascade habitats are colonized by *Labeo pangusia* and *Garra gotyla gotyla* in Behni stream. Dammed pools, backwater pools and deep pool edges with bedrock substratum are the highly preferred habitats for *Botia birdi, Botia lohachata, Tor tor* and *Cirrhinus reba* as found in Basoli stream and main reservoir. *Barilius bendelisis* and *Acanthocobitis botia* are abundant in the riffle-type of habitats in the Basoli, Behni and Karnal stream where the substrata have been found to be mainly dominated by small boulders and cobbles. Among the cyprinids, *Tor tor* and *Tor piutitora* are confined to large deep pools in Basoli stream and main reservoir. Nevertheless, species like *Crossocheilus latius latius, Garra gotyla gotyla* and *Glyptothorax punjabensis* have been recorded from the cascade to riffle regions in the upper gradient zones of rheophilic streams.

In India, the introduction of exotic fish species into Dal lake and Loktak lake has been reported to affect the population of indigenous fish species. The population of native catla and mahseer were depleted considerably in Gobind Sagar reservoir after the introduction of Silver Carp. The freshwater aquatic biodiversity is depleting alarmingly due to introduction of exotic species and other anthropogenic activities (Menon 1979; Molur and Walker 1998; Kumar 2000). The indiscriminate transfers of exotic fishes have brought about a wide array of problems including extirpation of indigenous species. During the present course of work four exotic carps i.e. *Cyprinus carpio*, *Ctenopharyngodon idellus*, *Hypophthalmichthys molitrix* and *Hypophthalmichthys nobilis* have been reported from the Ranjit Sagar Wetland. It is important to note that these exotic carps are voracious feeders as well as breeders and can pose serious threats to native fauna

in future if proper management and research activities will not be initiated about their control (Kumar 2000).

Though this wetland and its adjoining streams were highly productive, but some anthropogenic activities like rampant removal of big and small boulders from the stream bed, mining of sand and gravel by builders or constructor and siltation posing a big threat to the various fish species. Besides, these serious threats, discharge of sewage water and poaching of fishes have also been consider as potential threats to the fish diversity which need to be curbed for their sustainability.

Conclusion

During the study period 43 species have been reported from the Ranjit Sagar Wetland due to availability of variety of habitats. Out of all 43 fish species 13 fish species come under threatened categories of Red List of IUCN. There is a dire need to start conservation and management practices for their sustainability in future. If appropriate steps towards their conservation will not be taken of now, then the day is not far away when these fish species will slip towards extinction. This wetland also supports four exotic carps and these are voracious feeders as well as breeders and can pose serious threats to native fauna in future. Proper management and research activities should be initiated for the conservation of valuable fish fauna of this wetland.

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