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Fish fauna of Doon Valley, District Dehradun, Uttarakhand, India

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Abstract

The fish fauna of Doon valley, part of District Dehradun was studied for a period of 2 years from March, 2010 – February, 2012. 56 species belonging to 5 Orders, 13 Families and 30 Genera were collected from various sampling stretches set on 5 rivers *viz*., Baldi, Song, Suswa in the East and Tons and Asan in the West. Of them, 6 are the new records *viz*., *Puntius terio* (Hamilton), *Lepidocephalichthys annandalei* Chaudhuri, *Colisa lalia* (Hamilton), *Colisa labiosus* (Day), *Channa marulius* (Hamilton) and *Channa harcourtbutleri* (Annandale). Family Cyprinidae was the most dominating family contributing 53% (30 species) to the fish fauna of Doon Valley, followed by Balitoridae and Channidae, both contributing 7% each to the percentage, represented by 4 species each. *Cyprinus carpio* (river Song, S_7) and *Clarius gariepinnus* (river Tons, S_{15}) are accidental catches of exotic species. As per the *fishbase.org status* (2007), 52 species (92.85%) are adjudged native, 2 species (3.57%) endemic and 2 species (3.57%) introduced. On the other hand, the IUCN (2015 - 4) status outlines that 41 species are Least Concern, 3 Vulnerable, 1 Endangered, 3 Near Threatened, and 8 Not Assessed.

Keywords: Fish fauna, District Dehradun, species composition, species diversity, threat status.

Introduction

The subjects like fish assemblages influenced by environmental factors or fish assemblage variation between geographically defined regions or spatial and temporal characterization of fish assemblages has been an area of interest among Ichthyologists in India (Bhat, 2003, 2004; Sreekantha *et al*., 2007; Sarkar et al., 2010; Lakra *et al*., 2010; Shahnawaz *et al*.,2010; Vijaylakshmi *et al*., 2010; Vijaylakshmi and VijayKumar, 2011) and abroad (Jayaratne and Surasinghe, 2010, Sumith et al., 2011).

Himalayan system as a whole, Garhwal, Kumaon and neighbouring Himachal regions of Western Himalaya in particular, have been explored for assessing the fishery wealth from a wide variety of angles (Johal, 2002: Nautiyal, 2005; Pathani and Upadhyay, 2006; Negi and Negi, 2010).

Doon valley is bestowed with rich network of perennial rivers/hillstreams, ponds and reservoirs, which provides an ideal habitat for the diversified fish

fauna to flourish. Geographically Doon valley is divided into Eastern and Western Doon valley. As per the review of literature the research work on fishes was carried out mostly on Eastern Doon valley (Ganga drainage) the important contributors are Hora and Mukerjee (1936), Lal and Chatterjee (1962), Singh (1964), Grover (1970), Mishra and Joshi (1970), Tilak and Husain (1973, 1976, 1977a, b, 1990), Husain (1985, 1987, 1995), Grover and Tripathi (1985), Husain and Tilak (1995), Grover *et al.* (1994), Rauthan *et al.* (2000). Western Doon valley (Yamuna drainage) was explored by Singh (1964) for the first time surveyed the Western Doon valley later Singh and Gupta (1979), Husain (1985, 1987, 1995,) worked on selected parts. Recently Uniyal *et al.* (2001, 2002, 2006), Bahuguna *et al.* (2001), Uniyal (2002), Uniyal and Kumar (2006), Uniyal and Mehta (2007), Gupta and Rana (2009a, b, c, d) conducted the extensive survey of Western Doon valley and worked on the taxonomy, ecology, food and feeding, breeding habitat, hydro-biology, fishing methods and conservation and management approach related to the fish and fishery of the area. In our present study, we have carried out a more extensive survey to document and update the diversity of fish fauna of Doon Valley. Also, for the first time an attempt has been made to make a comparative study of fish in the streams of Eastern and Western Doon.

Materials and Methods

Doon Valley, part of district Dehradun (latitude - 29°58′ and 30°32′ N and longitude - 77°35′ and 78°20′E) (Image 1) comprises of 2 main river basins, namely, the Ganga and the Yamuna river basin. The present study was carried out on these two river systems comprising of five main rivers i.e., Baldi, Song, Suswa, Tons and Asan (Image 2).The climate of the area varies from humid, moist sub-tropical in the southern part to temperate in the northern mountainous region with wide temperature range varying from 4.40 - 35.10°C during the study period. The mean minimum and maximum temperature recorded were 11.90°C (January, 2011) and 28.0°C (June, 2011), respectively. The annual rainfall is highly variable and is mainly controlled by the orography, 82-87 % of the annual rainfall occurs under the influence of the South - West monsoon. Maximum rainfall was recorded during June - September and July, 2010 was the wettest month, receiving about 545.80 mm rainfall. Winter rains were prevalent during December - March, accounting for about 8 % of the total annual rainfall.

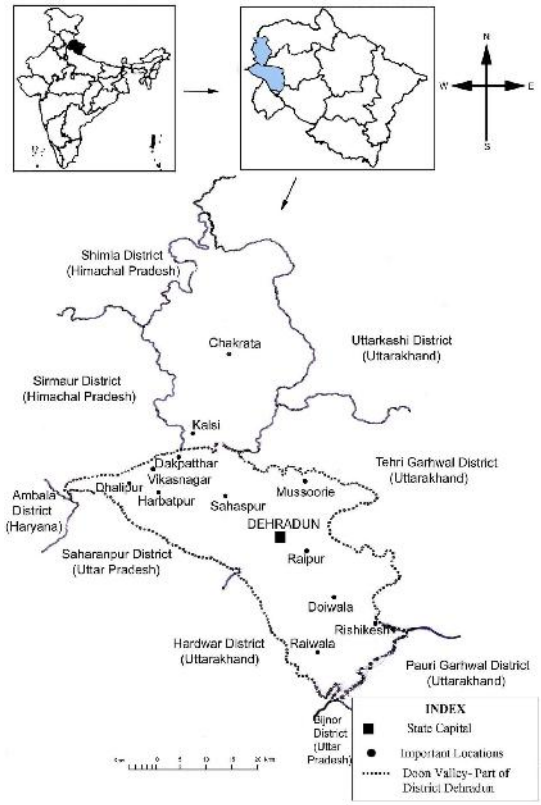

Image 1. Location of the study area

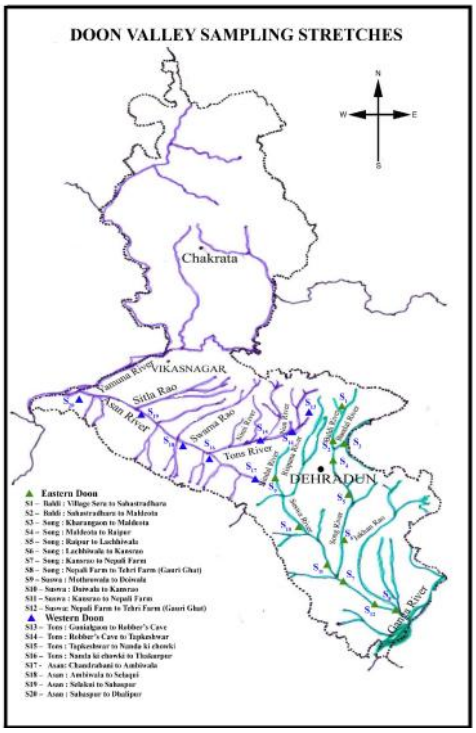

Image 2. Study area showing sampling stretches in Eastern and Western Doon.

The relative humidity was also variable. June, 2011 was the most humid (63 %) at 071 hours. Sandy loam, sandy clay, coarse sand, silty clay loam, silty loam, sand and clay types are the chief soil types of Doon Valley.

Sampling was periodically done for a period of 24 months (March, 2010 - February, 2012) at the 20 sampled stations established along the rivers mentioned above.

Each river was divided into stretches along its length, according to altitudinal variations to adjudge the spatial and temporal interrelationships. Each stretch covering an approximate distance of about 4 - 7 km, was thus established as sampling sites. Fish samples were collected by employing standard gears, using variety of fishing nets of varying mesh sizes – gill nets, cast nets, drag nets with the help of trained fishermen on the sampling in the Eastern and Western part of Doon Valley, respectively (Image 2). Fish samples were preserved in 4% formalin and bought to the laboratory for routine identification, meristic and morphometric analyses under the light of available standard literature and revisionary works (Day, 1878; Jayaram, 1981, 1999; Talwar and Jhingran, 1991; Nelson, 2006; Vishawanath *et al.*, 2007).

Results

Two years' observations have revealed that a total of 56 species, belonging to 5 Orders, 13 Families and 30 Genera [Table 1], represent the fish fauna of all the selected 5 streams of Doon Valley. Of them, 6 are the new records *viz.*, *Puntius terio* (Hamilton), *Lepidocephalichthys annandalei* Chaudhuri, *Colisa lalia* (Hamilton), *Colisa labiosus* (Day), *Channa marulius* (Hamilton) and *Channa harcourtbutleri* (Annandale). Family Cyprinidae was the most dominating family contributing 53% (30 species) to the fish fauna of Doon Valley, followed by Balitoridae and Channidae, both contributing 7% each to the percentage, represented by 4 species each (Fig. 1). *Cyprinus carpio* (river Song, S_7) and *Clarius gariepinnus* (river Tons, S_{15}) are accidental catches of exotic species. As per the *fishbase.org status* (2007), 52 species (92.85%) are adjudged native, 2 species (3.57%) endemic and 2 species (3.57%) introduced. On the other hand, the IUCN (2011) status outlines that 45 species are Least Concern (LC, 81%), 4 Vulnerable (VU, 7%), 3 Endangered (EN, 5%), 3 Near Threatened (NT, 5%), and 1 Not Assessed (NA, 2%) (Table 1).

Table 1: Number of fish species in Doon Valley streams.

S. No.	Classified List (Nelson, 2006)	EAST Number of species (S. No.)	Streams of East			WEST Number of species (S. No.)	Streams of West		Local Name	†Status *fishbase.org* (2007)	††IUCN (2015-4) Status	
			Baldi	Song	Suswa		Tons	Asan				
	Phylum :Chordata Subphylum :Craniata Superclass : Gnathostomata Class : Actinopterygii Subclass : Neopterygii Division : Teleostei Subdivision : Ostarioclupeomorpha Superorder : Ostariophysi Order: Cypriniformes Superfamily : Cyprinoidea Family: Cyprinidae											
	Subfamily : Cyprininae											
1.	*Cyprinus carpio* Linnaeus	1	-	+	-	-	-	-	Introduced	-	VU	Ex. Infr.
	Subfamily : Barbinae											
2.	*Puntius chola* (Hamilton)	2	-	+	+	1	+	+	Katcha, Puti	Native	LC	Fr.
3.	*Puntius conchonius* (Hamilton)	3	+	+	+	2	+	+	Puti	Native	LC	Fr.
4.	*Puntius sarana* (Hamilton)	4	-	+	+	3	-	+	Puta	Native	LC	Fr.
5.	*Puntius sophore* (Hamilton)	5	+	+	+	4	-	+	Puti	Native	LC	Fr.
6.	*Puntius ticto* (Hamilton)	6	+	+	+	5	+	+	Bhuri, Puti	Native	LC	Fr.
7.	*Puntius terio* (Hamilton)	7	-	-	+	-	-	-	Putiyah	Native	LC	Nr. Infr.
8.	*Chagunius chagunio* (Hamilton)	8	-	+	+	6	-	+	Chibban, Pathali	Native	LC	Fr.
9.	*Shizothorax richardsonii* (Gray)	9	+	+	-	7	+	+	Asela, Sohal	Native	VU	Fr.
10.	*Shizothoracthys progastus* (McClelland)	10	+	+	+	-	-	-	Dinnawah, Paharimacchi	Native	NA	Fr.
	Subfamily : Labeoninae											

11.	*Labeo dyocheilus* (McClelland)	11	+	+	+	8	-	+	Boalla	Native	LC	Fr.
12.	*Labeo pangusia* (Hamilton)	12	-	+	+	-	-	-	-	Native	NT	Fr.
13.	*Labeo dero* (Hamilton)	13	+	+	+	9	+	+	Kalbans, Moili	Native	LC	Fr.
	Subfamily : Rasborinae											
14.	*Aspidoparia jaya* (Hamilton)	14	-	+	+	10	-	+	Chilwa, Chal	Native	LC	Fr.
15.	*Aspidoparia morar* (Hamilton)	15	-	+	+	11	-	+	Chilwa, Chal	Native	LC	Fr.
16.	*Barilius barna* (Hamilton)	16	+	+	+	12	+	+	Dhaur, Childi	Native	LC	Fr.
17.	*Barilius bendelisis* (Hamilton)	17	+	+	+	13	+	+	Chedra	Native	LC	Fr.
18.	*Barilius vagra* (Hamilton)	18	+	+	+	14	+	+	Popta, Dhaur, Chalra	Native	LC	Fr.
19.	*Barilius tileo* (Hamilton)	19	-	+	-	-	-	-	Chilwa	Native	LC	Infr.
20.	*Barilius shacra* (Hamilton)	-	-	-	-	15	-	+	Chelwa	Native	LC	Infr.
21.	*Danio rerio* (Hamilton)	20	+	+	+	16	+	+	Dharidar Salari	Native	LC	Fr.
22.	*Devario devario* (Hamilton)	21	+	+	+	17	+	+	Chand	Native	LC	Fr.
23.	*Esomus danricus* (Hamilton)	22	+	+	+	18	+	+	Chal	Native	LC	Fr.
24.	*Raiamas bola* (Hamilton)	23	-	+	-	-	-	-	Bhola, Balala	Native	LC	Infr.
25.	*Rasbora daniconius* (Hamilton)	24	+	+	+	19	+	+	Bhuri	Native	LC	Fr.
26.	*Crossocheilus latius latius* (Hamilton)	25	+	+	+	20	+	+	Dhanaura	Native	LC	Fr.
27.	*Garra gotyla gotyla* (Gray)	26	+	+	+	21	+	+	Dhanura, Gotla	Native	LC	Fr.
28.	*Tor putitora* (Hamilton)	27	+	+	+	22	+	+	Pila-par Mahseer	Native	EN	Fr.
29.	*Tor tor* (Hamilton)	28	-	+	+	23	-	+	Lal-par Mahseer. Machiyari, Makhani	Native	NT	Fr.
30.	*Tor chelynoides* (McClelland)	29	+	+	-	24	+	-	Kala Mahseer	Native	NA	Fr.
	Superfamily : Cobitoidea Family: Cobitidae Subfamily : Cobitinae											
31.	*Lepidocephalichthys guntea* (Hamilton)	30	+	+	+	25	+	+	Ghiwa, Nauni	-	LC	Fr.
32.	*Lepidocephalichthys annandalei* (Chaudhuri)	31	-	-	+	-	-	-	Gadera, Ghiwa	-	LC	Nr., Infr.
	Family : Balitoridae											

	Subfamily : Nemacheilinae											
33.	*Acanthocobitis botia* (Hamilton)	32	+	+	+	26	+	+	Baktia, Gadera, Ghiwa, Nauni	Native	LC	Fr.
34.	*Schistura montanus* McClelland	33	+	+	-	27	+	-	Gadiyal, Gadera	Endemic	NA	Fr.
35.	*Schistura rupecula* McClelland	34	+	+	-	28	+	-	Ghidiyala, Gaderi, Nauni	Native	LC	Fr.
36.	*Schistura savona* (Hamilton)	35	+	+	-	29	+	+	Gadera, Nauni, Savna	Native	LC	Fr.
	Order- Siluriformes Family : Amblycipitidae											
37.	*Amblyceps mangois* (Hamilton)	36	-	+	+	30	-	+	Chhoti singhi	Native	LC	Fr.
	Family : Sisoridae Subfamily : Glyptosterninae											
38.	*Glyptothorax pectinopterus* (McClelland)	37	+	+	+	31	+	+	Pathar-chatti	Native	LC	Fr.
39.	*Glyptothorax saisii* (Jenkins)	38	+	+	-	32	+	-	Pathar-chatti	Endemic	VU	Fr.
40.	*Glyptothorax telchitta* (Hamilton)	39	-	-	+	-	-	-	Sipliya	Native	LC	Infr.
	Superfamily : Siluroidea Family: Clariidae											
41.	*Clarias batrachus* (Linnaeus)	40	+	+	+	33	+	+	Mangur	Native	LC	Fr.
42.	*Clarias gariepinnus* (Burchell)	-	-	-	-	34	+	-	-	Introduced	NA	Ex., Infr.
	Family : Heteropneustidae											
43.	*Heteropneustes fossilis* (Bloch)	41	-	+	+	35	+	-	Singhi	Native	LC	Fr.
44.	*Mystus tengara* (Hamilton)	42	-	+	+	-	-	-	Kater	Native	LC	Fr.
45.	*Mystus bleekeri* (Day)	43	-	+	+	36	-	+	Kater	Native	LC	Fr.
	Superorder : Cyprinodontea Order : Beloniformes Superfamily : Scomberesocoidea Family : Belonidae											
46.	*Xenentodon cancila* (Hamilton)	44	+	+	+	37	+	+	Sua	Native	LC	Fr.
	Series : Percomorpha											

	Order : Synbrachiformes Suborder : Mastacembeloidei Family: Mastacembelidae											
47.	*Macrognathus pancalus* Hamilton	45	+	+	+	38	+	+	Baam	Native	LC	Fr.
48.	*Mastacembelus armatus* (Lacepede)	46	+	+	+	39	+	+	Baam	Native	LC	Fr.
	Order : Perciformes Family : Nandidae Subfamily : Badinae											
49.	*Badis badis* (Hamilton)	47	-	+	+	40	+	+	Chiri	Native	LC	Fr.
	Suborder : Anabantoidei Family : Osphronemiidae Subfamily : Luciocephalinae											
50.	*Colisa fasciatus* (Bloch and Schneider)	48	-	-	+	41	-	+	Sunera	Native	NA	Nr., Fr.
51.	*Colisa lalius* (Hamilton)	49	-	-	+	-	-	-	-	Native	NA	Nr., Infr.
52.	*Colisa labiosus* (Day)	50	-	-	+	-	-	-	-		NA	Nr., Infr.
	Suborder: Channoidei Family: Channidae											
53.	*Channa punctatus* (Bloch)	51	+	+	+	42	+	+	Sauli, Sewal	Native	NA	Fr.
54.	*Channa gachua* (Hamilton)	52	-	+	+	43	+	+	Sowan, Dawla	Native	LC	Fr.
55.	*Channa marulius* (Hamilton)	53	-	-	+	-	-	-	Saur	Native	LC	Nr., Infr.
56.	*Channa harcourtbutleri* (Annandale)	54	-	-	+	-	-	-	-	-	NT	Nr., Infr.
	Total		30	46	45		32	38				

‘+’ = presence of species.
‘-’ = absence of species.
† = IUCN (2015-4) status.
VU = Vulnerable, EN = Endangered,
NT = Near Threatened, LC = Least Concern, NA= Not Assessed.

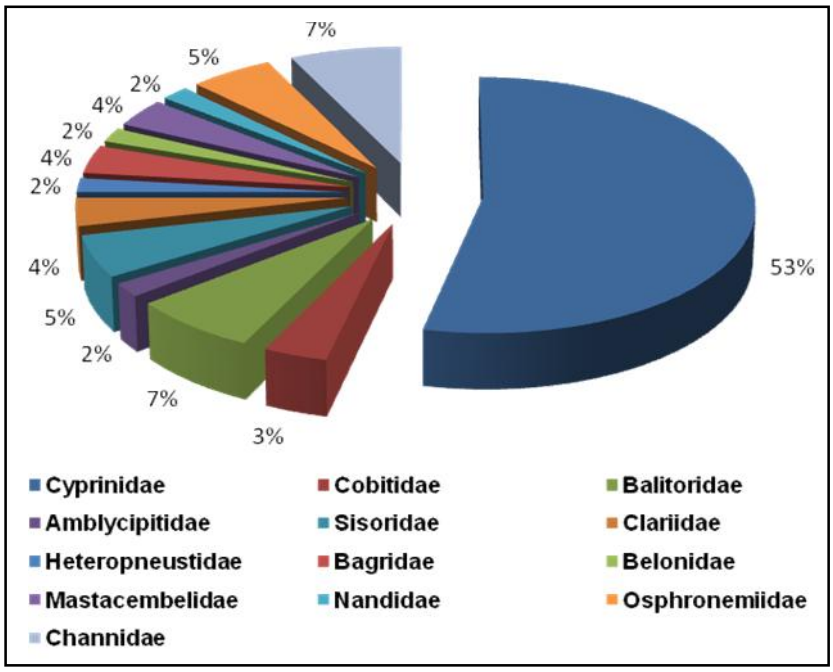

Fig. 1 Percentage occurrence of fish families of Doon Valley, India

Eastern Doon (Baldi, Song, Suswa; S_1 - S_{12}) represents richer fish diversity as evidenced by a total of 54 species belonging to 13 Families and 30 Genera. Here too, Family Cyprinidae, is dominating, contributing 54% (29 species), followed by Balitoridae and Channidae, both similarly (like whole valley data) contributing 7% each to the percentage represented by 4 species each (Fig. 2), as observed for the whole Doon valley.

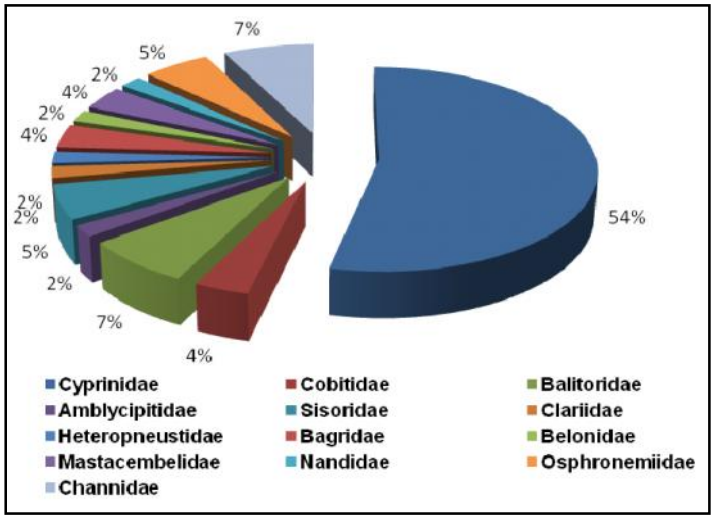

Fig. 2 Percentage occurrence of fish families of Eastern Doon Valley, India

Western Doon valley streams (Tons and Asan; S_{13} – S_{20}) support relatively lesser number of species *i.e.*, 43 species (13 Families and 24 Genera) but besides the domination of Cyprinidae (24 species; 56 %), next in order comes only Balitoridae (4 species, 9%) [Fig. 3].

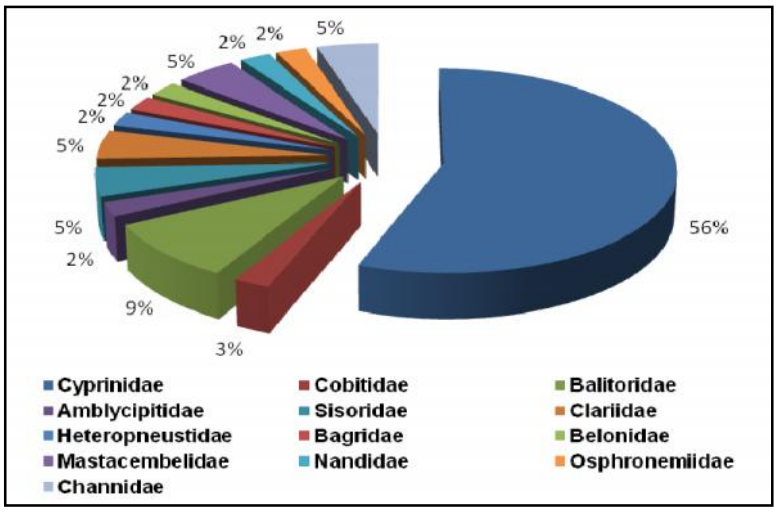

Fig. 3 Percentage occurrence of fish families of Western Doon Valley, India

In the present observations, majority of species (41) appeared common to both East and West (Fig. 4) and the maximum were unique to East (13) as compared to West where only 2 species were adjudged unique (but of these 2, the number may be reduced to 1 as *C. gariepinnus*, from S_{15} is an exotic accidental catch).

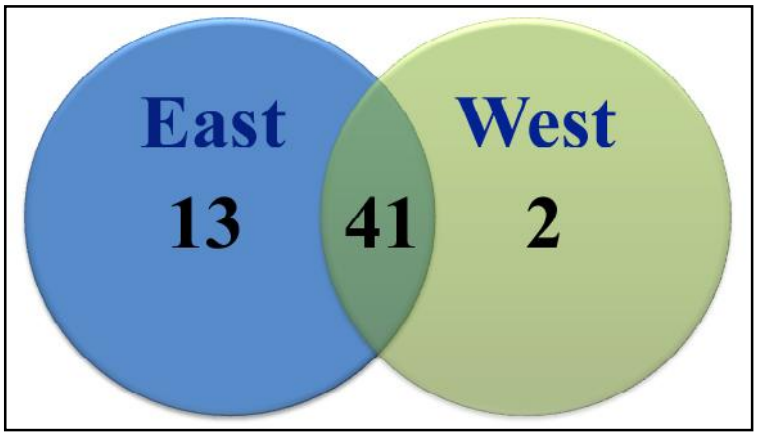

Fig. 4 Number of shared and unique species in Eastern and Western Doon.

Discussion

The present findings about fish fauna of Doon Valley (56 species, 5 Orders, 13 Families and 30 Genera; represented in East and West, respectively, as 54 species, 13 Families, 30 Genera and 43 species, 13 Families, 24 Genera) [Table 1] are worth to be critically examined in the light of the earlier faunistic works centered around Western Himalayas in general and Doon valley in particular.

There has been a practice to assign a definite status (Endangered, Vulnerable, Least Concern, Near Threatened) to fish diversity (Sreekantha, *et al*., 2007; Sarkar *et al*., 2010) on the basis of the world recognized criteria set under CAMP (1998); IUCN (15-4). The same has been adopted in the past when the fish fauna of Doon valley was discussed (Uniyal *et al*., 2002; Uniyal and Kumar, 2006; Uniyal and Mehta, 2007).

The latest criterion, set by IUCN (2015-4) has been followed in the present observations and the difference between the CAMP and the IUCN status is summarized in Table 1.

On the other hand, the IUCN (2015 - 4) status outlines that 41 species are Least Concern, 3 Vulnerable, 1 Endangered, 3 Near Threatened, and 8 Not Assessed, a healthy state of affairs as compared to earlier works. Also, it is worth mentioning here that as many as 9 species have been evaluated for the first time for Doon valley [Table 1].

An attempt has also been made to assess Doon valley fishes as per the *fishbase.org status* (2007) which highlighted, 52 species as native, 2 species endemic and 2 species introduced. It is worthwhile to mention here that this has been attempted for the first time for Doon valley fishes.

The overall assessment regarding the family-wise representation all over Doon Valley in general and Eastern and Western drainages in particular, has revealed the domination of the members of family Cyprinidae (Hora and Mukherjii, 1936; Uniyal and Kumar, 2006; Uniyal and Mehta, 2007) as has also been reflected in earlier observations from Himalayas and Doon Valley (Grover *et al*., 1994; Uniyal, 2002; Johal, 2002; Nautiyal, 2005; Pathani and Upadhyay, 2006; Negi and Negi, 2010b) or other parts of the country (Bhat, 2003, 2004; Lakra *et al*., 2010; Shahnawaz *et al*., 2010) and abroad (Jayaratne and Surasinghe, 2010; Sumith *et al*., 2011). This fact lends support to the widely acclaimed fact that Cyprinidae tops the list of 9 largest (most species - rich) families *viz*., Cyprinidae, Gobiidae, Cichlidae, Characidae, Loricariidae, Balitoridae, Serranidae, Labridae and Scorpianidae (Nelson, 2006).

The family domination in Doon valley show that families Balitoridae and Channidae comes next in order after Cyprinidae a fact very well substantiated by the earlier studies (for Balitoridae, Bhat, 2003) (for Channidae, Vijaylaxmi *et al*., 2010 and Vijaylaxmi and Vijaykumar, 2011).

Conclusion

The results of the present study *i.e*., fish faunal assessment of Eastern and Western Doon valley presents an updated checklist of the fish fauna of Doon valley. Also, the present study presents a comparative analysis of fish fauna in Eastern and Western Doon valley streams (river – wise).

Acknowledgments

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