

## Study on Distribution and Abundance of Indigenous Ornamental Fishes from Water Bodies of Jammu (J&K)

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Jammu division of Jammu and Kashmir is a region of high biological diversity and endemism of fish fauna, but very little is known about the distribution of freshwater indigenous ornamental fish. The study was carried out across the tributaries of three rivers viz., Chenab, Tawi and Basantar to study the diversity of ornamental fish. Regular collection trips were carried out at 13 different stations for a period of one year from December 2017 to December 2018 and a total of 30 species were reported belonging to 8 families and 18 genera. In all the study stations Cyprinidae family was found to be most prevalent (85%) and Osphronemidae (1%) was the least. The present work is a preliminary study on the distribution and abundance of ornamental fishes from freshwater bodies of Jammu.

**Keywords:** Indigenous, Ornamental, Cyprinidae, Osphronemidae.

Ornamental fishes conventionally include the attractive colourful fishes of diverse characteristics which are kept in home aquariums and have aesthetic value hence popularly known as 'Aquarium fishes'. These living jewels need not always have bright colours as sometimes their curious characteristics such as morphology, colour combinations, innumerable fin structures, mode of taking food and preying habit may also add to their attractiveness and which also made them objects of considerable aesthetic value. Not only this, ornamental fishes categorized as small indigenous species (SIS), play an important part in the diet as a source of vitamin A and minerals (calcium, iron,

zinc and other micronutrients) which are vital for healthy growth and development of lactating mother.

Attempt to assess the Indian freshwater fishes for conservation was made by NBFGR which enlisted 2610 species of fin fishes from different aquatic ecosystems of the country, inhabiting marine, brackish and freshwaters of which 291 species of fishes are exotic. India also possesses a rich diversity of colorful ornamental fishes with over 100 varieties of indigenous species. However, 85% of the different ornamental fishes exported out of the country are wild collections made from the various rivers and streams while remaining 15%

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are exotic fishes (Kurup *et al.*, 2003 and Swain *et al.*, 2008).

Fish fauna of various lotic water bodies of Jammu region has earlier been described by Das and Nath (1965, 1966 and 1971), Malhotra *et al.* (1975), Malhotra and Jyoti (1971), Malhotra and Dutta (1976), Tilak (1971), Sharma and Sharma (1973 and 1974), Joshi *et al.* (1978), Jyoti and Gupta (1978), Dutta (2003 and 2012), Dutta *et al.* (2001a, 2002a,b, 2003 and 2006) Dutta and Malhotra (1984), Dutta and Kour (1999, 2005 and 2006), Dutta and Fayaz (2003), Sharma and Dutta (2012) Khajuria and Langer 2016, Sharma *et al.* (2016) and Mohan *et al.* (2013). However, there is no detailed information about the ornamental fish fauna of various water bodies of Jammu. Hence an attempt was made to study the freshwater ornamental fish diversity of Jammu adding to the knowledge of the farmers undertaking fish stocking programmes in various water bodies of Jammu.

## MATERIAL AND METHODS

### Study area

Random and regular field surveys were carried out at thirteen lotic water bodies located in the Jammu Division of Jammu and Kashmir, India for a period of one year from December 2017 to December 2018.

*viz.*, Station I (Jhajjar Kotli) 32°53' N latitude and 74°57' E longitude.

Station II (Nagrota) 32°47' N latitude and 74°55'

E longitude.

Station III (Sidhra) 32°77'N latitude and 74°57' E longitude.

Station IV (Gujjar Nagar) 32°43' N latitude and 74°52' E longitude.

Station V (Mandal) 32° 67' latitude and 74°74' longitude.

Station VI (Phallian) 32°70' N latitude and 74°79'E longitude.

Station VII (Gho-Manhasan) 30° 67' N latitude and 74° 79'E longitude.

Station VIII (Gajansu) 32° 90' N latitude and 74° 82' E longitude.

Station IX (Chakrali) 30° 68' N latitude and 74° 80' longitude.

Station X (Sehi) 32° 30'N latitude and 74° 43' E longitude.

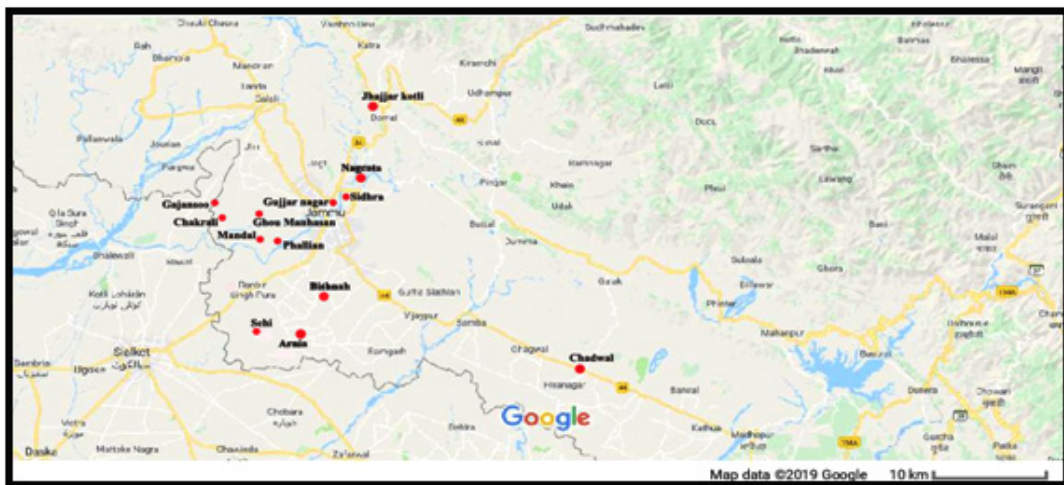
Station XI (Bishnah) 32° 59'N latitude and 74° 84'E longitude.

Station XII (Arnia) 32° 50'N latitude and 74°77'E longitude.

Station XIII (Chadwal) 32° 77'N latitude and 74° 89' E longitude.

### Identification of the fishes

Fishes were collected from lotic water bodies of Jammu region using different types of nets namely gill net, cast net and drag net. The ornamental fishes were categorized based on the characteristics like colorations, body shapes, banding patterns, fin structure, transparency and preying habits. The fish fauna were identified using the reference works of Talwar & Jhingran (1991),



Map showing various study station

Jayaram (1999) the confirmation of the same was done at FBRC ZSI Hyderabad.

**Biodiversity parameters**

Fish species diversity was subjected to diversity analysis using indices like species richness

(S = number of species); Shannon – weiner diversity Index (1949); Simpson’s Index (Simpson 1949); Species Dominance Index (Berger and Parker 1970); Margalef Index and Perilous Evenness (Pielou 1966).

**Shannon-weiner index**

$$H = S / 1 = 1 [\sum (Pi) (\text{Log}2Pi)]$$

Where,

H = Shannon-Weaver index

$\Sigma$  represents a capital epsilon

S= number of species, pi= proportion of individuals of the total sample belonging to their species calculated as ni/N for each I<sup>th</sup> species with ni being the number in species I and N, the number of individuals in the sample.

**Simpson Diversity index: Sn**

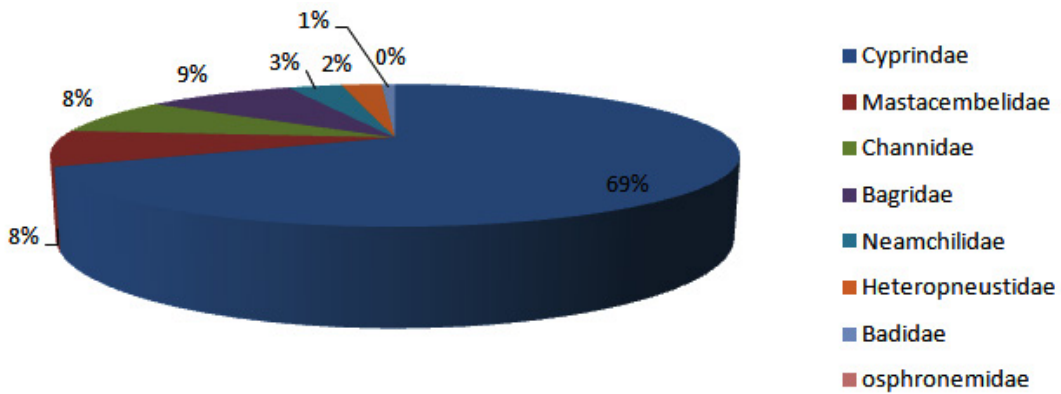
$$D2 = \sum (nj/n) (n - nj/n - 1)$$

J=I

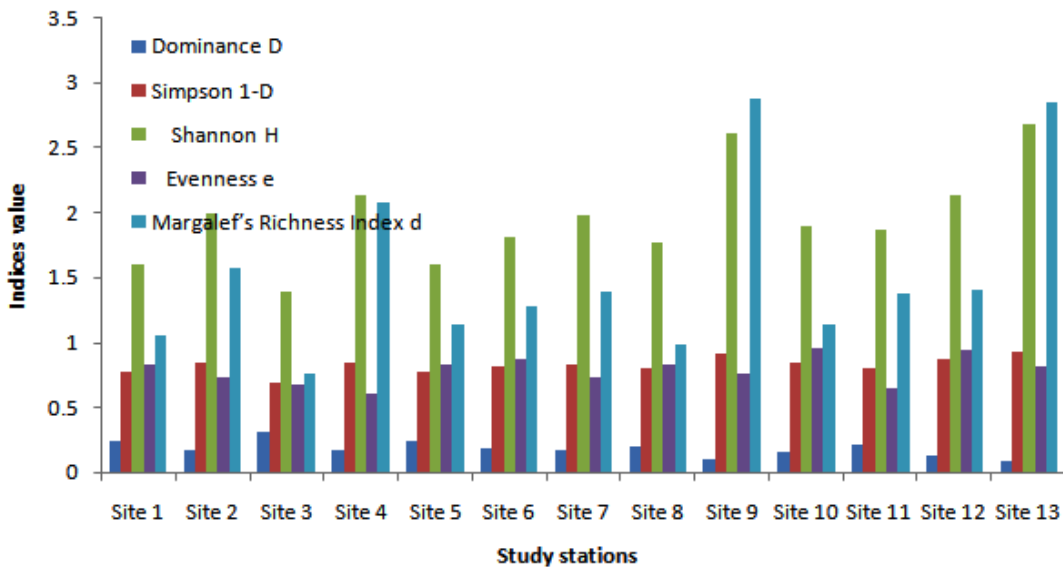
Where, nj = number of individuals of the j<sup>th</sup> species in the sample

n =  $\sum nj$  = total number of individuals

jSn = number of species in the sample



**Graph 1.** Showing the family wise ornamental fish species at different Stations, their total number along with their percentage occurrence in lotic water bodies of Jammu region



**Fig. 2.** Showing the fish diversity indices of 13 different lotic water bodies of Jammu

**Margalef’s Richness Index**

$$d = S - 1 / \log N$$

Measurement of species richness  
Margalef’s index was used as a simple measure of species richness (Margalef, 1958).

S = total number of species

N = total number of individuals in the sample

log = natural logarithm

Evenness:

For calculating the evenness of species, the Pielou’s Evenness Index (e) was used (Pielou, 1966).

$$e = H / \log S$$

H = Shannon – Wiener diversity index

S = total number of species in the sample

**RESULTS AND DISCUSSION**

The survey of thirteen stations of Jammu division revealed the presence of 30 ornamental fish species belonging to 8 families and 18 genera. In all the study stations, Cyprinidae family was found to be dominant with highest percentage occurrence (85%) followed by family Bagaridae (11%), Channidae (10%), Mastacembelidae (10%), Neamchilidae (4%), Heteropneustidae (3%), Badidae (1%), and Osphronemidae (1%).

Diversity indices (Table 3) showed the Shannon-Weaver ( $H_{max}$ ) highest at Station-13 (2.689) and lowest at Station-3 (1.385). The Simpson indices were highest at Station-13

**Table 1.** Showing the fish diversity at different study stations of Jammu viz., Station I (Jhajjar Kotli) Station II (Nagrota) Station III (Sidhra) Station IV (Gujjar Nagar) Station V (Mandal) Station VI (Phallian) Station VII (Gho-Manhasan) Station VIII (Gajansu) Station IX (Chakrali) Station X (Sehi) Station XI (Bishnah) Station XII (Arnia) Station XIII (Chadwal) ('+' represents the presence and '-' represents the absence of fish species.)

Scientific Name	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Salmostoma bacaila</i> (Ham. Buch.)	-	-	-	-	-	-	+	-	-	+	+	+	-
<i>Salmostoma panjabensis</i> (Ham. Buch.)	-	-	-	-	-	-	+	-	-	+	+	+	-
<i>Aspidoparia morar</i> (Ham. Buch.)	-	+	+++	+	-	-	+	+++	-	+	-	-	-
<i>Barilius vagra</i> (Ham. Buch.)	+	+	+++	+	-	-	+++	+++	-	-	-	-	+
<i>B. bendelisis</i> (Ham. Buch.)	+	+	+++	+	-	-	+++	+++	-	-	-	-	+
<i>Rasbora rasbora</i> (Ham. Buch.)	-	-	-	-	-	-	-	-	+	-	-	+	+
<i>Esomus danricus</i> (Ham. Buch.)	-	-	-	-	-	-	-	-	-	+	-	-	-
<i>Danio devario</i> (Ham. Buch.)	-	-	-	-	-	-	+++	-	-	+	+++	+	++
<i>Chela cahius</i>	-	-	++	-	-	-	-	+	+	-	-	-	+
<i>C.laubuca</i>	-	-	-	-	-	-	-	+	+	-	-	-	+
<i>Tor tor</i> (Ham. Buch.)	+	+	-	-	+	-	-	-	-	-	-	-	-
<i>T. putitora</i> (Ham. Buch.)	+	+	+	+	+	-	-	+	-	-	-	-	-
<i>Puntius sophore</i> (Ham. Buch.)	-	+	-	+	-	+	-	-	-	-	-	-	-
<i>P. chola</i> (Ham. Buch.)	-	-	-	-	-	+	-	-	+	-	-	-	-
<i>P. ticto</i> (Ham. Buch.)	-	+	-	+	+	+	+++	-	+	+	+++	+++	+
<i>P. conchoniis</i> (Ham. Buch.)	-	+	-	+	+	-	+++	-	+	+	+++	+++	+
<i>P.sarana</i> (Ham. Buch.)	-	-	-	-	-	-	+++	-	-	-	+++	+++	+
<i>Crossocheilus latius</i>	+	+	+	+	+	-	-	+	+	-	-	-	-
<i>Nemacheilus botia</i> (Ham.)	-	+	-	+	+	+	-	-	+	-	-	-	-
<i>Mystus seenghala</i> (Sykes)	-	-	-	+	+	+	-	-	+	-	-	+	+
<i>Mystus bleekeri</i> (Day)	-	-	-	-	-	-	-	-	+	-	-	+	+
<i>Heteropneustes fossilis</i>	-	-	-	-	-	-	-	-	+	-	+	-	+
<i>Xenentodon cancilia</i> (Ham. Buch.)	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Mastacembelus armatus</i> (Lac.)	-	-	-	-	-	+	-	-	+	-	-	-	+
<i>Macragnathus pancalus</i> (Ham. Buch.)	+	-	-	+	-	-	-	-	+	-	-	-	+
<i>Channa punctatus</i> (Bloch.)	-	-	-	+	-	-	+	-	+	-	+	-	+
<i>C. striatus</i> (Schneider)	-	-	-	-	-	-	+	-	-	-	-	-	-
<i>C.marulius</i>	-	-	-	+	-	-	-	-	+	-	+	-	+
<i>Badis badis</i>	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Trichogaster fasciatus</i>	-	-	-	-	-	-	-	-	+	-	+	-	+

**Table 2.** Showing the fish diversity indices of 13 different lotic water bodies of Jammu

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Taxa_S	6	10	6	14	6	7	10	7	18	7	10	9	18
Individuals	119	310	791	530	83	109	679	462	373	201	686	309	396
Dominance D	0.2355	0.1635	0.3144	0.1655	0.2333	0.1864	0.168	0.1972	0.09324	0.1569	0.2055	0.1259	0.0818
Simpson 1-D	0.7645	0.8365	0.6856	0.8345	0.7667	0.8136	0.832	0.8028	0.9068	0.8431	0.7945	0.8741	0.9181
Shannon H	1.603	1.993	1.385	2.13	1.60	1.803	1.98	1.76	2.609	1.89	1.86	2.13	2.689
Evenness e	0.8276	0.7339	0.6661	0.601	0.8253	0.8673	0.7303	0.833	0.7549	0.9531	0.6447	0.9351	0.8175
Margalef's	1.046	1.569	0.7493	2.072	1.132	1.279	1.38	0.9779	2.871	1.131	1.378	1.395	2.842
Richness Index d													

(0.9181) and lowest at the Station-8 (0.8028) but the species dominance was high at Station -3(0.3144) and lowest at Station 13(0.0818). The Evenness values were recorded high at Station-10 (0.9531) and lowest at Station-4(0.601). The Margalef's richness index value was found highest at Station-9 (2.871) and lowest at Station-8 (0.9779). The diversity indices of all the 13 study Stations during present study shows variability at all the study stations. From the above statistical indices applied, it can be concluded that there is variation among the diversity values from all the indices. This can be attributed to fluctuations in the abiotic factors like topography, pH, substratum, pollution and biotic factors like feeding habits of the fish and various anthropogenic activities. Present conclusion are in line with other workers who also correlate rich diversity in rivers with better food availability, breeding sites and water depth (Marais,1988; Welcomme,1985; Hina,2010; Khajuria *et al.*,2013;Andotra,2014; Samal *et al.*, 2016).

## CONCLUSIONS

The detailed survey of water bodies of Jammu region disclosed the presence of 30 ornamental fish species which not only serve decorative purpose but also are exploited for food value. These fishes has the great potential for commercial trading which inturn will help to improve the economic status of local population of Jammu region. It is thus necessary on the part of State government and local people to make contribution towards conservation of the natural habitat of these fishes.

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