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ICHTHYOFAUNAL DIVERSITY IN SOME LENTIC WATER BODIES OF JAMMU

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ABSTRACT

Perennial and temporary water sources of R.S.Pura tehsil of Jammu District were investigated for the presence of fish fauna. Fishes were collected by using cast and drag net and brought to laboratory for identification upto species level. These aquatic sources, when investigated revealed the presence of 20 fish species (Puntius conchonius, P.ticto, P.sophore, Heteropneustes fossilis, Channa punctatus, Cyprinus carpio, Cirrihinus mrigal, C. reba, Labeo rohita, Catla catla, Ctenopharyngodon idella, Aspidoparia morar. Amblyopharyngodon gadighari, Danio devario, Mystus vittatus, Wallago attu, Mystus bleekari, Esomus danricus, Trichogaster fasciatus and Chela laubucca) belonging to four orders (Cypriniformes, Siluriformes, Perciformes and Ophiocephaliformes) and six families(Cyprinidae, Saccobranchidae, Ophiocephalidae, Anabantidae, Bagridae and Siluridae The recorded data also showed the presence of two exotic fishes viz Cyprinus carpio and Ctenopharyngodon idella which were introduced by state fishery development in some lentic water bodies. Of the recorded families, family Cyprinidae showed its dominance at all the study sites.

KEY WORDS: ***Perennial, temporary, families, cyprinidae.***

INTRODUCTION

Fishes are an important component of ecosystems and comprise over 40% of the earth's vertebrate species. They are vital link between primary producers and various levels of consumers of the food chains. Among the aquatic organisms, fish enjoys the prime position and is of considerable importance in providing proteins, vitamins, minerals, fats and various other nutrients required for nourishment and growth of man. Fish provides raw material for industries. Fishes not only supplement to nutritious diet, but are also a source of income and employment opportunities for the skilled and unskilled workers for which there is a great demand in the present day scenario. The fishery sector contributes about 5% to the total agriculture GDP. Fish are exploited for recreation, through angling and fish keeping, and are commonly exhibited in public aquaria.

Researchers across the country have worked on different aspects of biodiversity including the piscine diversity. Hamilton (1822); Day (1878); Hora (1940), Chaudhary (1955); Alikunti (1963); Jhingran (1991); Jayaram (1999); Sakhare (2001); Paik (2003); Haniffa (2005); Yadav (2006); Sharma *et al.* (2007); Kumar and Joshi *(*2008) and Rahim *et al*. (2009) are few ichthyologists who have furnished details on fish fauna from different parts of the country. It is the fruit generated by the hard work of these researchers that India now ranks third in the world fisheries production (Stevenkunna, 2010).

Because of their commercial exploitation to cater the increasing demand, existing natural resources of fish are very much limited and are getting depleted at an alarming rate. All over India, freshwater fish diversity is on a decline. Many of them have become endangered and are at the verge of extinction. Few studies have been carried out so far regarding this aspect. The threats to global fish biodiversity are grouped under five interacting categories: overexploitation, water pollution, flow modification, destruction or degradation of habitat, and invasion by exotic species (Allan & Flecker 1993; Naiman *et al*., 1995; Naiman & Turner 2000; Jackson *et al*., 2001; Malmqvist & Rundle 2002; Rahel 2002; Postel & Richter 2003; Revenga *et al*., 2005; Dudgeon *et al*., 2006).

The present study thus encompasses the various lentic water bodies in R.S.Pura tehsil of Jammu. The aim of the study is to comprehend the fauna of these water bodies so as to get more scientific information to reach the ultimate goal of wise and sustained use of aquatic resources of this tehsil in general and Jammu district in particular. Research efforts have been directed towards assessment of freshwater fish stocks so that fishery could be exploited to near optimum level through regulation of fishing efforts and ecosystem management. The present study, thus intends to highlight the existing scenario of fish species to set the ball rolling for conservation of fish diversity of the state.

MATERIAL AND METHODS

For the present study fishes were collected from the various lentic water bodies of R.S.Pura with the help of local fisherman. Cast nets, drag nets, rod and hook and hand picking were used for catching fishes at different water bodies. As soon as fishes were collected, they were examined for various taxonomic characters and numbers of individuals of each species were counted. The fishes were then preserved in 10% formalin and brought to lab. For morpho-taxonomic counts and identifications works of (Mishra, 1959; Malhotra et al, 1975; Dutta and Malhotra, 1984; Talwar and Jhingran, 1991; Day, 1994 and Jayaram, 1999) were followed.

During the study period random samples of fish were taken from different water bodies to determine the diversity indices. Total no. of species, total no. of individuals in a sample and total no. of individuals of a species were determined. Fish diversity was calculated using following equations:

Shannon – Weaver index: Diversity of species was calculated following Shannon- Weaver index (H) that depends on both the number of species present and the abundance of each species.

$H = \sum Pi \log_2 Pi$

Where H=Shannon-Weaver index

$Pi = n_i/N$

$\sum$= Sum

n_i = Number of individuals of each species in the sample.

N = Total number of individuals of all species in the sample.

Simpson's diversity indices: Simpson's diversity index is a measure of diversity. It is often used to quality the biodiversity of a habitat. It takes into account the number of species present, as well as the abundance of each species.

a. Simpson's index of dominance:

$$D = \sum ni(ni-1)/N(N-1)$$

Where ni= total no. of individuals of a particular species.

N= total no. of individuals of all species.

b. .Simpson's index of diversity : (1-D)

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

Margalef's index = (S – 1) / In N

S = total number of species

N = total number of individuals in the sample

In = natural logarithm

Pielou's Eveness: For calculating the evenness of species, the Pielou's

Evenness Index (e) was used (Pielou, 1966).

e = H / In S

H = Shannon – Weaver diversity index

S = total number of species in the sample

RESULTS AND DISCUSSION

Perennial and temporary water sources of R.S.Pura tehsil when investigated revealed the of 20 fish species (*Puntius conchonius, P.ticto, P.sophore, Heteropneustes fossilis, Channa punctatus, Cyprinus carpio, Cirrihinus mrigal, C. reba, Labeo rohita, Catla catla, Ctenopharyngodon idella, Aspidoparia morar. Amblyopharyngodon gadighari, Danio devario, Mystus vittatus, Wallago attu, Mystus bleekari, Esomus danricus, Trichogaster fasciatus and Chela laubucca)* belonging to four orders (Cypriniformes, Siluriformes, Perciformes and Ophiocephaliformes) and six families(Cyprinidae, Saccobranchidae, Ophiocephalidae, Anabantidae, Bagridae and Siluridae) were recorded from 16 lentic systems including ponds, ditches and temporary pools.

In lentic water bodies, 70% of fish sp. and 66.66% of fish genera belongs to family Cyprinidae, 10% of fish species and 6.66% of fish genera to family Bagridae and remaining families contributed 5% each to fish species and 6.66% of fish genera respectively as shown in fig (1.a & b).

Fig (1.a) - Percentage contribution of Genus to family of different Lentic water bodies of R.S.Pura.

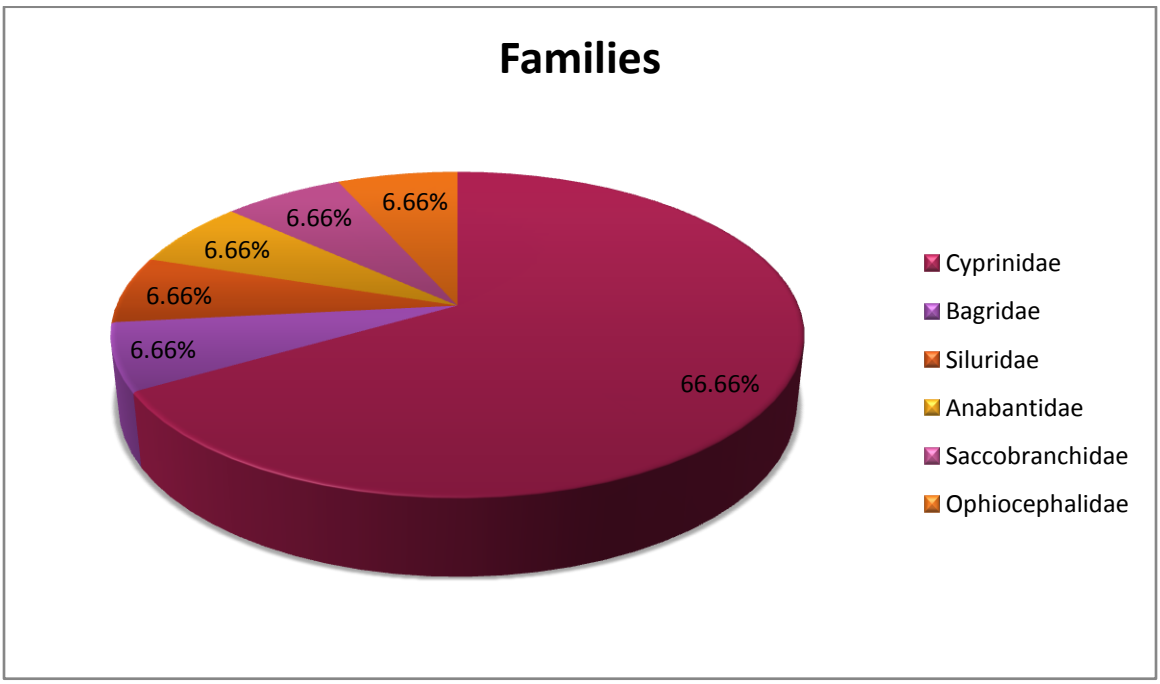
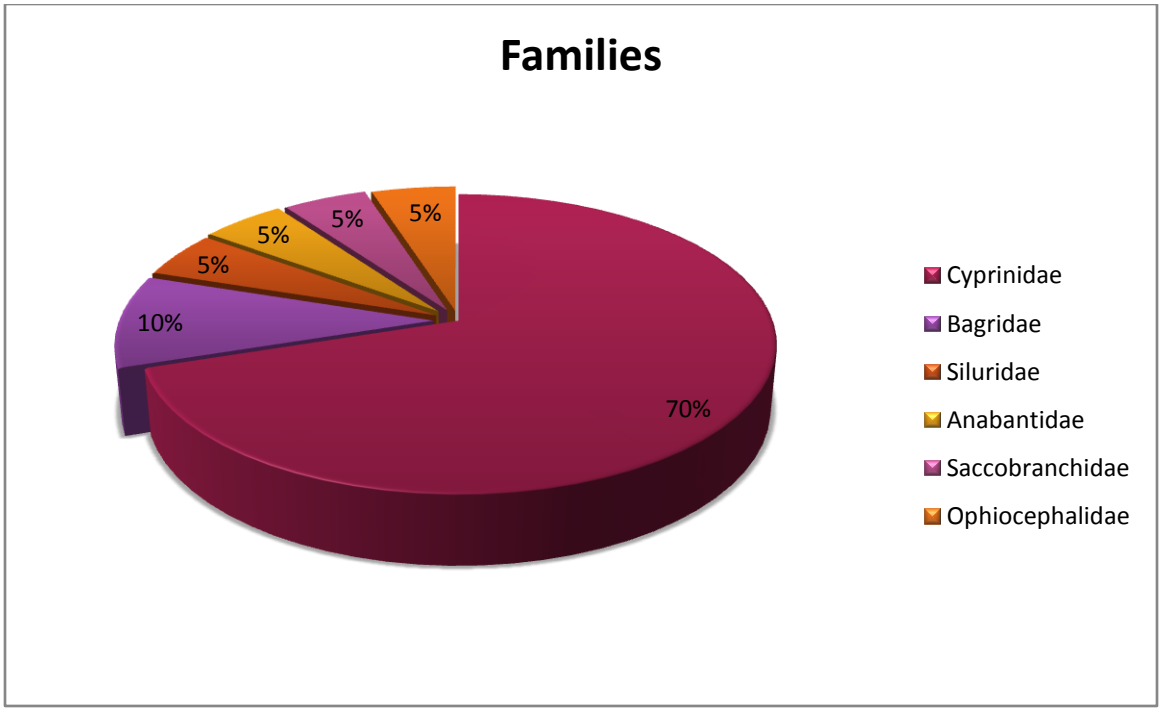


Fig (1.b) - Percentage contribution of Species to family of different Lentic water bodies of R.S.Pura.



The present studies revealed the dominance of family Cyprinidae as its members are fast growing; easily culturable and pollution tolerant. Das and Nath (1966 a, 1971), Tilak (1971); Malhotra and Jyoti(1971); Malhotra *et al*.(1975); Joshi *et al*.(1978); Dutta(1978) ; Guglani (2000); Koul (2000); Baba(2002); Dutta (2003); Dutta and Fayaz (2003); Dutta *et al*.(2006); Dutta and Kour (2006); Kaur (2006); Dutta *et al*.(2007); Rathore(2009) and Sharma (2013) also observed dominance of family Cyprinidae in their respective water bodies of Jammu province.

The fish catch composition was also estimated for different lentic water bodies of R.S.Pura and average values for different fish species were calculated and is represented in table (1). A perusual of table clearly indicated the maximum fish catch compositon of *Puntius conchonius* in most of the sampling sites except at sampling site Tarpal pur and Agrachak and at some commercial fish ponds (Barshalpur, Baspur Bangla and Fatehpur silarian) raised by the farmers.

Table (1) Percentage fish catch composition for different sampling sites of lentic water bodies based on fish species.

Fishes	Site1	Site2	Site3	Site4	Site5	Site6	Site7	Site8	Site9	Site10	Site11	Site12	Site13	Site14	Site15	Site16
Amblypharyngodon gadigarhi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.18 %
Puntius sophore	23.15 %	-	-	-	31.7 %	45.16 %	-	-	-	-	-	22.55 %	-	11.36 %	-	35.22 %
Puntius ticto	20%	36.84 %	-	-	-	14.5 %	-	-	-	40.81 %	37.20 %	27.41 %	34%	27.27 %	-	10.69 %
Puntius conchonius	32.63 %	57.89 %	-	-	56.09 %	19.35 %	80.48 %	40.62 %	-	34.69 %	55.81 %	37.09 %	50%	56.8 %	80%	23.89 %
Aspidoparia morar	-	-	-	-	-	-	-	28.12 %	-	-	-	-	-	-	-	-
Danio devario	-	-	-	-	-	-	-	21.87 %	-	-	-	-	-	-	-	-
Chela laubucca	-	-	-	-	-	11.29 %	-	-	-	-	-	-	-	-	-	-
Esomus danricus	10.52 %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Labeo rohita	-	-	16.92 %	17.5 %	-	-	-	-	39.65 %	-	-	-	-	-	-	-
Cirrhina mrigal	-	-	27.69 %	24.2 %	-	-	-	-	24.13 %	-	-	-	-	-	-	-
Cirrhina reba	-	-	15.38 %	21%	-	-	-	-	12.93 %	-	-	-	-	-	-	-
Ctenopharyngodon idella	-	-	-	16.12 %	-	-	-	-	23.27 %	-	-	-	-	-	-	-
Catla catla	-	-	21.53 %	21%	-	-	-	-	-	-	-	-	-	-	-	-
Trichogaster fasciatus	-	-	-	-	-	-	-	-	-	-	-	4.83 %	-	-	-	-
Cyprinus carpio	-	-	18.5 %	-	-	9.67 %	-	-	-	-	-	8.06 %	-	-	-	-
Heteropneustes fossilis	-	-	-	-	2.4%	-	4.87 %	-	-	6.12 %	-	-	-	-	-	-
Mystus bleekari	4.21%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mystus vittatus	-	-	-	-	-	-	-	9.37 %	-	-	-	-	-	-	-	-
Wallago attu	5.26%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Channa punctatus	4.21%	5.26 %	-	-	9.75 %	-	14.63 %	-	-	18.36 %	6.97 %	-	16%	4.54 %	20%	-
Total Percentage	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100 %	100%	100 %	100%

Site 1: Mahesian, site2: Dablehar, site 3: Fatehpur silarian, site 4: Baspur bangla, site 5: Chowala, site 6: Tarpal pur, site 7: Gharana , site 8: Badyal deharian, site 9: Barshalpur, site 10: Rakh, site 11: Khannechak, site 12: Sheikechak, site 13: R.S.Pura pool, site 14: Kotli, site 15: Fattuchak, site 16: Agrachak.

Puntius conchonius and *Puntius sophore* were the most dominant fish species in all the water bodies of R.S.Pura which may be attributed to their ability to live in different habitats as well as unacceptability by local people as food due to their small size and their high tolerance level to pollution. Othman *et al*. (2001) have also advocated the presence of *Puntius conchonius* from the highly polluted sites indicating their hardy nature. Thus, keeping the species as abundant one in the various water bodies.

Approximately half of the species recorded during our surveys were uncommon (found only in 1 or 2 sites). This may be due to the fairly specific habitat requirements of fresh water fish (Gehrke and Harri 2000).

Diversity indices when applied on the Ichthyofaunal data collected from lentic water bodies of R.S.Pura exhibited variability at all the sites.

Lowest values of Margalef richness and highest Simpson's dominance at Fattuchak (table 2) in case of lentic water bodies was attributed to the degraded water quality as a consequence of anthropogenic pressure in the form of direct discharge of domestic waste in these water bodies. Decline in the species richness of fish fauna at the heavily polluted sites have also been reported by Qadir and Malik(2009) and Sharma(2103).

Table (2) - Fish species Richness, Abundance and biodiversity indices of Lentic water bodies of R.S.Pura.

S.No.	Sites	Abundance(N)	Shannon-Weiner Index(H)	Simpson'S Index of Dominance(D)	Simpson's index of Diversity(1-D)	Margalef's Richness Index d=S-1/logN	Eveness Index E= H'/log(S)
1.	Kotli	44	0.12405	0.3985	0.6015	1.8254	0.20604
2.	Mahesian	95	0.06545	0.1154	0.8845	3.0337	0.0774
3.	Dablehar	19	0.14257	0.4444	0.55557	1.5640	0.29881
4.	Fattuchak	15	0.20469	0.6571	0.3428	0.85027	0.6799
5.	Fatehpur	65	0.06303	0.1971	0.8029	2.20639	0.09017
6.	Baspur Bangla	62	0.06137	0.1908	0.8091	2.23165	0.08780
7.	Chowala	41	0.12705	0.4109	0.5890	1.8601	0.21102
8.	Tarpalpur	59	0.09224	0.0922	0.7054	2.2316	0.13196
9.	Gharana	41	0.20125	0.6634	0.3366	1.24009	0.42368
10.	Badyal Deharian	32	0.09053	0.0905	0.7218	1.9931	0.15036
11.	Camp	159	0.08539	0.2791	0.7208	1.3627	0.14182
12.	Barshal pur	116	0.08619	0.2802	0.7198	1.4531	0.14315
13.	Rakh	49	0.09764	0.3103	0.6896	1.7749	0.16217
14.	Khannechak	43	0.1369	0.4297	0.5703	1.2243	0.2869
15.	Sheikechak	62	0.8204	0.2606	0.739	2.23165	0.11737
16.	R.S.Pura Pool	50	0.11774	0.3787	0.62124	1.7657	0.24677

Regarding eveness index, the highest value was observed at Fattuchak and lowest value was observed at Mahesian. The uneven distribution at Mahesian may be due the water quality parameters, substratum and soil quality.

CONCLUSION

It has been concluded that the lentic water bodies of R.S.Pura tehsil are rich in fish diversity. However this ichthyofaunal diversity has been tremendously facing a threat due to many anthropogenic activities such as deforestation, overfishing, use of pesticides and insecticides, organic and inorganic pollution. So, more such studies are required in future so that immediate steps may be taken to conserve this beauteous fauna which is one of the important components of ecosystem.

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