



Current status of fish fauna at head Khanki, river Chenab, Pakistan

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Article published on October 30, 2016

Key words: Abundance, Chenab, Diversity, Headworks, Freshwater.

Abstract

Present study was conducted to assess fish diversity at head Khanki situated on river Chenab, Punjab, Pakistan. Various fishing techniques were employed to capture maximum number of fish species from the sampling sites during the period September 2015 to May 2016. A total of 1029 fish specimens belonging to 34 species, 28 genera, 12 families and six orders were recorded from the study area. Order Siluriformes was found dominant contributing five families (41.7%) followed by Perciformes contributing three families (25%) to the present collection. On the basis of number and percentage contribution family Cyprinidae was found dominant contributing 14 genera (50%) and 18 species (52.9%). Overall fish catches were dominated with indigenous species along with four exotic species *Cyprinus carpio*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix* and *Oreochromis niloticus*. The values for Shannon-Weaver diversity (H'), Margalef's richness and Pielou's (E) evenness indices were 3.30, 10.9 and 0.94 respectively. Various anthropogenic stresses such as aquatic pollution, habitat destruction, and introduction of alien species are responsible for low fish species diversity and evenness at head Khanki. Effective conservation measures are strongly recommended to sustain the populations of commercially important fishes in this river.

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Introduction

Fishes play a prime role in maintaining a stable aquatic ecosystem. Fishes are considered important providing a rich source of proteins, Omega-3 fatty acids, vitamins and minerals for human diet. Fishes are also important providing income and employment to millions of people all over the world (Nagabhushan and Hosetti, 2010). Pakistan is bestowed with many freshwater sources such as rivers and their tributaries, streams, canals, natural and manmade lakes and small water ditches. The freshwater bodies of Pakistan are providing habitat to diverse fauna and flora. Freshwater Ichthyofauna of Pakistan is rich represented by 193 fish species, out of fish 31 species are considered as commercially high valued species (Rafique and Khan, 2012).

Many researchers has studied freshwater Ichthyodiversity of Pakistan (Mirza and Khan, 1988; Khan *et al.*, 1991; Afzal *et al.*, 1995; Javed *et al.*, 1997; Qazi *et al.*, 2000; Mirza, 2003; Mirza and Javed, 2003; Mirza *et al.*, 2006; Khan *et al.*, 2008; Altaf *et al.*, 2008; Muhammad *et al.*, 2014; Hussain *et al.*, 2016 and Latif *et al.*, 2016). Pakistan has introduced several alien fish species (Eight warm water species: *Cyprinus carpio*, *Carassius auratus*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Hypophthalmichthys nobilis*, *Oreochromis mossambicus*, *Oreochromis aureus*, *Oreochromis niloticus* and two cold water species: *Salmo trutta fario* and *Onchorynchus mykiss*) intentionally and unintentionally into its rivers for various purposes such as yield enhancement, sports fishing, mosquitoes and aquatic weeds control (Khan *et al.*, 2011). River Chenab is life line for Punjab having 13469 sq. mile catchment area providing habitat to diverse aquatic fauna and flora. Densely populated and expanding urban areas are contributing significantly to aquatic pollution and habitat changes (Brown *et al.*, 2005). During the last century, riverine ecosystems have suffered from intense human interference resulting in habitat degradation and as a result, many freshwater fish species have become highly endangered, mainly in rivers where heavy demand is placed on freshwaters (Rahman *et al.*, 2012).

The objectives of present study are to assess ichthyodiversity of river Chenab at Khanki head works and to find out current status of commercially important fish species in Chenab river at study area.

Materials and methods

Random fish sampling was done on monthly basis from September 2015 to May 2016. The study area mainly includes upstream and downstream of head Khanki. Fish collections were made with assistance of Punjab Fisheries department fishermen and fish contractors by using different fishing nets having variable mesh sizes. Fish samples were also collected from nearby fish markets of the studied area to ascertain the fish species composition from head Khanki.

Fish samples were photographed immediately in the field prior to preservation as Formaldehyde decolorizes the fish color on long time preservation. Collected fish specimens were preserved in 10% aqueous formaldehyde solution and were brought to the Fish Museum, Fisheries Research and Training Institute Manawan, Lahore. Morphometric and meristics studies were done to identify collected fish specimens. Fish specimens were identified up to the species level with the help of standard fish identification keys cited in the taxonomic literature (Mirza and Sharif, 1996; Mirza and Sandhu, 2007). Identified fish species were shifted into 70% alcohol and displayed in glass jars in Fish Museum, FR&TI Manawan, Lahore.

Study Area

Khanki Headworks (32°24'07 N, 073°58'39 E and elevation 219 M) is situated on river Chenab, Punjab, Pakistan. It is considered to be the oldest headworks in Pakistan constructed in 1889 and mainly used for irrigation and flood control purposes. Lower Chenab Canal, one of the major tributary of Chenab river originates from Khanki Headworks. Head Khanki regulates water distribution over an area of 3 million acres (12,000 km²) including agricultural lands by its one major distributary, the Lower Chenab Canal, and 59 minor distributaries. The map of river Chenab including study area is shown in Fig.1.



Fig. 1. Map of the river Chenab showing study area (Khanki headwork).

Statistical Analysis

For estimating fish species diversity, richness and evenness from the study area diversity indices (Shannon-Wiener diversity, 1963; Margalef's richness, 1958 and Hill's evenness, 1973) were used.

Results

Composition of fish fauna

A total of 1029 fish specimens were collected from the study area. These fishes belong to 34 species, 28 genera, 12 families and six orders (Table. 1). On the basis of number and percentage contribution order Siluriformes was found dominant represented with five families (Bagridae, Sisoridae, Heteropneustidae, Siluridae and Schilbeidae) contributing (41.7%) followed by order Perciformes including three families (Chandidae, Belontiidae and Cichlidae) contributing 25.1% to the present collection.

Orders Osteoglossiformes, Cypriniformes, Channiformes and Mastacembeliformes were represented with a single family (8.33%) namely Notopteridae, Cyprinidae, Channidae, Mastacembelidae respectively (Fig. 2). Fishes belonging to order Cypriniformes were found dominant on the basis of the number and percentage contribution to their order represented with 14 genera (50.1%) and 18 species (52.9%) followed by order Siluriformes with seven genera (25%) and eight species (23.5%). Order Perciformes contributed four genera (14.28%) and four species (11.8%). Order Channiformes included two species (5.88%) namely *Channa marulius* and *Channa punctata* under single genera (3.57%). Orders Osteoglossiformes and Mastacembeliformes included single species (2.94%) namely *Notopterus notopterus* and *Mastacembelus armatus*.

Fig. 1. Number and percentage contribution of families, genus and species under various orders.

Sr. No	Family	Scientific Name	Common Name	R.A	PIIn PI
I- 1	Notopteridae	<i>Notopterus notopterus</i>	But Pari	0.0136	-0.0584
II- 2	Cyprinidae	<i>Labeo rohita</i>	Rohu	0.0272	-0.0981
3		<i>Labeo boga</i>	Bhangan	0.0174	-0.0705
4		<i>Labeo dero</i>	Dero Machali	0.0097	-0.0449
5		<i>Labeo calbasu</i>	Kalbans	0.0194	-0.0765
6		<i>Cirrhinus mrigala</i>	Mori	0.0311	-0.1079
7		<i>Cirrhinus reba</i>	Sunni Machali	0.0155	-0.0646
8		<i>Gibelion catla</i>	Thaila	0.0126	-0.0551
9		<i>Chela cachius</i>	Bidda	0.0379	-0.1241

Sr. No	Family	Scientific Name	Common Name	R.A	PIIn PI
10		<i>Barilius modestus</i>	Lahori Chalwa	0.0379	-0.1241
11		<i>Garra gotyla</i>	Pathar Chat	0.0671	-0.1813
12		<i>Puntius sophore</i>	Sophore Popra	0.0602	-0.1692
13		<i>Salmophasia punjabensis</i>	Punjabi Chal	0.0321	-0.1104
14		<i>Securicula gora</i>	Bari Chal	0.0553	-0.1601
15		<i>Esomus danricus</i>	Somara	0.0223	-0.0848
16		<i>Osteobrama cotio</i>	Pali-ro Machali	0.0184	-0.0735
17		<i>Cyprinus carpio*</i>	Gulfam	0.0321	-0.1104
18		<i>Ctenopharyngodon idella*</i>	Grass Carp	0.0126	-0.0551
19		<i>Hypophthalmichthys molitrix*</i>	Silver Carp	0.0165	-0.0677
III- 20	Bagridae	<i>Sperata sarwari</i>	Singhari	0.0311	-0.0179
21		<i>Mystus cavasius</i>	Kanghar	0.0689	-0.1843
22		<i>Mystus bleekeri</i>	Kanghar	0.0204	-0.0794
IV-23	Sisoridae	<i>Bagarius bagarius</i>	Fauji Khaga	0.0126	-0.0551
24		<i>Gagata cenia</i>	Gagata cenia	0.0233	-0.0876
V-25	Heteropneustidae	<i>Heteropneustes fossilis</i>	Sanghi Machali	0.0331	-0.1128
VI-26	Siluridae	<i>Wallago attu</i>	Malli	0.0214	-0.0823
VII-27	Channidae	<i>Channa marulius</i>	Saul	0.0087	-0.0413
28		<i>Channa punctate</i>	Daula	0.0379	-0.124
VIII-29	Chandidae	<i>Chanda nama</i>	Sheesha	0.0534	-0.1564
30		<i>Parambassis ranga</i>	Ranga Shisha	0.0321	-0.1104
IX-31	Belontiidae	<i>Colisa fasciata</i>	Bari Kanghi	0.0282	-0.1006
X-32	Cichlidae	<i>Oreochromis niloticus*</i>	Chirra Machali	0.0359	-0.1194
XI-33	Mastacembelidae	<i>Mastacembelus armatus</i>	Baam	0.0233	-0.0876
XII-34	Schilbeidae	<i>Eutropiichtys vacha</i>	Jhalli Machali	0.0301	-0.1054

*Indicates exotic species

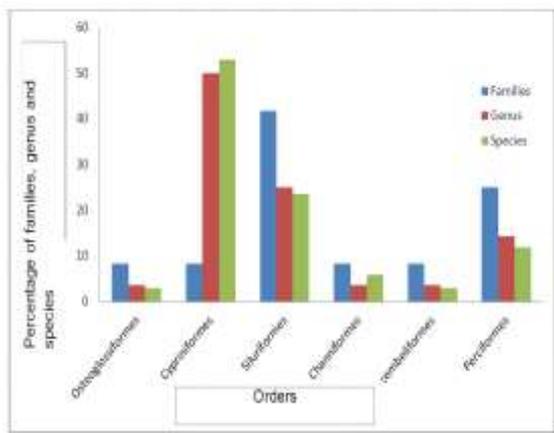


Fig. 2. Number and percentage contribution of families, genus and species under various orders.

Major portion of the present collection comprised of fishes under family Cyprinidae contributing 14 genera (50%) and 18 species (52.9%) followed by Bagridae including two genera (7.14%) and three species (8.82%). Families Sisoridae and Chandidae each contributed two genera (7.14%) and two species (5.88%). Family Channidae contributed single genus (3.57%) and two species (5.88%). Families Notopteridae, Heteropneustidae, Siluridae, Belontiidae, Cichlidae, Mastacembelidae and Schilbeidae each contributed single genera (3.57%) and species (2.94%) to the present collection (Fig. 3 A,B).

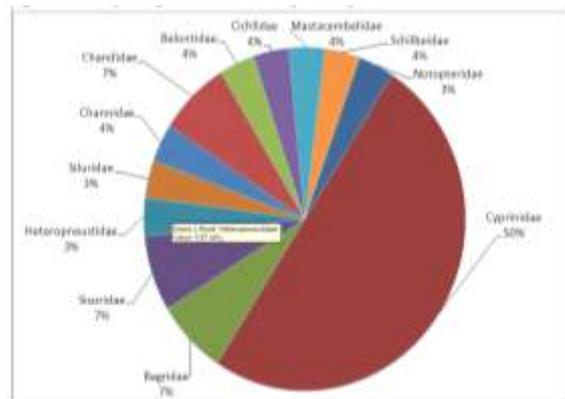


Fig. 3A. Percentage contribution of different fish genera to their families.

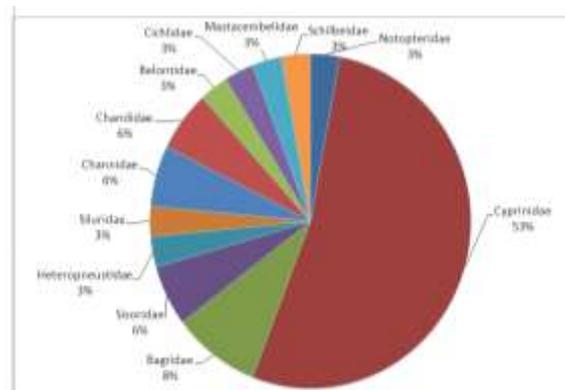


Fig. 3B. Percentage contribution of recorded fish species to their families.

Diversity, richness and evenness indices

The values of Shannon-Weaver diversity (H'), Margalef's richness (R) and Pielou's (E) evenness are 3.30, 10.9 and 0.94 respectively (Table. 2). These values show low diversity and evenness of fish species from the study area. The values for relative abundance (R.A) of recorded fish species from study area is shown in (Fig.4). *Mystus cavasius* (0.0689) and *Garra gotyla* (0.0671) have shown highest values for their relative abundance compared to other species in this collection. Commercially high valued species *Channa marulius* (0.0087) have shown lowest value of relative abundance from the study area.

Table 2. Statistical analysis of recorded fish species from head Khanki, river Chenab.

Number of fish species	34
Shannon diversity (H')	3.30
Margalef's (R)	10.9
Evenness (E)	0.94

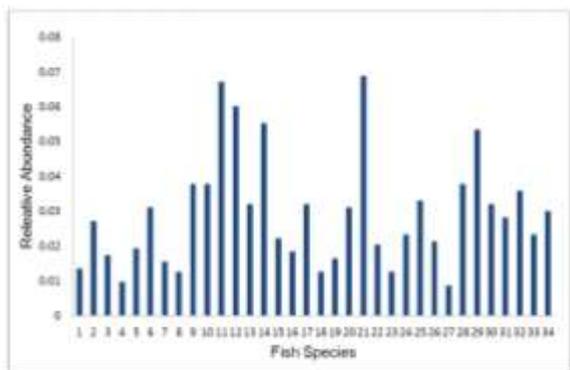


Fig. 4. Fish species diversity and their relative abundance recorded from Khanki headworks, Chenab.

Discussion

The present study on diversity of fish fauna of river Chenab at head Khanki comprised of 34 species including 30 indigenous and four exotic species. Several studies have been conducted to explore fish fauna of river Chenab. Altaf *et al*, (2015) recorded 34 fish species from river Chenab at its three headworks namely Marala, Khanki and Qadirabad headworks. Among these three headworks, Head Khanki has shown lowest value of diversity index (2.57). 32 fish species were reported from head Khanki in their collection. *Tor macrolepis*, *Sisor rabdophorus*,

Xenentodon cancila, *Macrornathus pancalus*, *Salmostoma bacalia* and *Oreochromis aureus* were reported in their collection but these fish species were not found in our collection. Nine fish species *Labeo boga*, *Chela cachius*, *Salmophasia punjabensis*, *Securicula gora*, *Esomus danricus*, *Mystus bleekeri*, *Chanda nama*, *Colisa fasciata* and *Oreochromis niloticus* found in our collection were not reported in their collection. Latif *et al*, (2016a) reported 38 species from Marala headworks situated at river Chenab. They reported various threats and decline to commercially important fishes of river Chenab.

Altaf *et al*, (2011a) reported 33 fish species from Qadirabad headworks, river Chenab. *Oreochromis niloticus*, an exotic fish species in this river has shown highest value of relative abundance. This species was also found in our collection with high relative abundance compared to other exotic species collected from this headwork. Latif *et al*, (2016b) recorded 43 fish species from head Qadirabad, Chenab. In present study head Khanki has showed low ichthyodiversity when compared to fish diversity found from other headworks situated on river Chenab. Altaf *et al*, (2011b) studied diversity and evenness of carps in river Chenab at head Qadirabad and Khanki during the period 2007-09. Their study revealed decline in the population of carps. Their findings support our results. Qadir *et al*, (2009) recorded 24 fish species from Nullah Aik and Nullah Palkhu, tributaries of river Chenab. Their findings showed highest values for diversity indices during post monsoon as compared to pre monsoon season.

Khan *et al*, (2011) reported threats to the populations of commercially important native fish species at Balloki and Trimmu headworks situated at river Jhelum and Chenab respectively. They also reported exotic fish species namely *Cyprinus carpio*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Oreochromis niloticus* and *Oreochromis aureus* have become invasive in the rivers of Pakistan competing with native freshwater fish fauna for their feeding and breeding purposes. Mirza *et al*, (2011) studied ichthyodiversity of river Jhelum, Pakistan.

They reported 51 fish species from this river. Their findings showed that population of commercially important species *Tor macrolepis* was declining while *Oreochromis aureus*, an exotic species has become established in this river. In present study four exotic fish species has also shown high values for their relative abundance from Khanki headwork.

Iqbal *et al*, (2013) surveyed river Indus in Attock region of Pakistan. They reported decline to the populations of commercially high valued indigenous species due to the various stresses such as aquatic pollution, overfishing and competition of exotic fish species with native species. Their finding supports our results as in our collection commercially important fishes of this river namely *Labeo rohita*, *Cirrhinus mrigala*, *Gibelion catla*, *Bagarius bagarius*, *Sperata sarwari* and *Wallago attu* has shown low values for their relative abundance. Hussain *et al*, (2016) reported 22 fish species from Indus river at Ghazi Ghat, Pakistan. Diversity indices values were found low in this region and also there was no significant effect of seasons on fish abundance.

Conclusion

River Chenab is an important freshwater wetland in Pakistan providing habitat to diverse fauna and flora. Anthropogenic stresses such as aquatic pollution, habitat degradation, overfishing of commercially and economically important fishes, damming and introduction of exotic fish species into this river has resulted in the decline of native fish species. To conserve fish fauna at head Khanki, river Chenab, authorities need to play critical role in understanding and managing diverse ichthyofauna of this river.

Acknowledgements

Authors are grateful to the field officer, official staff, fish contractors and private fishermen of district Gujrat for providing assistance in our field work.

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