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Status of fish diversity of Islam Barrage, river Sutlej, Punjab, Pakistan

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ABSTRACT

Introduction: Islam barrage is used for irrigation and flood control. It is situated near Vehari and Hasilpur. It was completed in 1927. The old structure of barrage has been documented as poor since 1998. Due to lack of interest for reconstruction of barrage, and India releases a large amount of water in river Sutlej; have threats to local people of the area. The objective of the study was to know the diversity of fishes of Islam Barrage, river Sutlej, Punjab, Pakistan.

Materials and Methods: Fish samples were collected by direct and indirect methods to know the fish diversity of this area. The data was collected from March 2015 to February 2016 from Head Islam at early morning time. Various kinds of nets including cast net, dragnet, gillnets, and drift nets were used during this study.

Results: During the survey of Islam barrage 23 species were recorded from this area. Most abundant species of this area were mali, rohu, sunni, shinghara, tilapia, jhalli, dola, thaila and singhi. Shannon-weiner diversity index (H') of this area was as 1.31745.

Conclusion: It is concluded that study area has high diversity of fishes.

Key words: Tilpia, Wetland, Water, Diversity, Dhand.

INTRODUCTION

Pakistan is a country which has largest canal system of world; consist of 225 wetlands. Total area of wetland of Pakistan is 0.78 Million hectares, which is consist of 74% of freshwater and 26% of coastal wetland areas and has 19 Ramsar sites (Altaf *et al.*, 2014). Water is an important component for the human and animal life activities e.g. agriculture, breeding, industry, drink, chemical reaction and domestic use (Bartram and Ballance, 1996). Water and life has deep association, without water life on earth was not possible (Gleick *et al.*, 2002). Water played an important role in development of human societies and civilizations. Almost all the human societies were established near the water resources (Gupta and Gupta, 2006).Water quality is also essential for life of human and animals; which are broadly, depend upon the nature and human activities. Water is becoming polluted day by day, due to human activities like use, non-biodegradable chemicals are produced by pesticide and fertilizers, industries and extreme urbanization. Heavy metals are also pollutants, create negative impacts on production and breeding of living being, very low quantity of heavy metals are dangerous for biodiversity (Singh *et al.*, 2007; Majagi *et al.*, 2008).

There are present different diversity indices to know the diversity; each index has its own value i.e. Shannon-Weiner, Simpson (indices increased when both species no. and population is high), Evenness (Index value increased when maximum species has higher number), Richness (Richness increased when population is higher in number) and Dominance (Dominance also increased when population is higher in number) (Altaf, 2016). World ichthyology data showed that 27,977fish species are present; while Pakistan has more than 786 species of marine fishes (Mirza and Alam, 2000) and 171 freshwater species of fishes (Mirza, 2004). Richness of fish in all around the world depends upon the river breeding, nesting and climate condition. Asian

continent has higher production; due to having large nesting and breeding area and favorable climate. Natural hazards and anthropogenic impacts create change on nesting area and production of fish (Thorp *et al.*, 2008); this dynamic change leads to variation in fish morphology and genetic (Taylor *et al.*, 2006). The main objective of study was to determine diversity of fish of Islam Barrage, river Sutlej, Punjab, Pakistan.

MATERIALS AND METHODS

The data was collected from March 2015 to February 2016 from Head Islam at early morning time. Various kinds of nets including cast net, dragnet, gillnets, and drift nets were used during currently study for collection of fish sample; having different length (100 to 10m) and width (1 to 1.6m); and having mesh size in the range of 1.5 to 3 inch in lotic and lentic water.

Study area: Islam Barrage is constructed at River Sutlej, Hasilpur, Punjab, Pakistan (Figure 1).

Figure 1: Map of the study area.

The fundamental work of the Islam barrage is to manage of storage water and control of river water in Islam Barrage. It is around 15km. north of Hasilpur and south of Vehari, Punjab, Pakistan. It was completed in 1927. This barrage has three canals; 2 canals (Mailsi and Bahwalpur) out three which irrigate southern Punjab and third canal (known as Qaim) emerging from the left bank. The annual temperature is not very harsh; winter is short with average temperature is 5^{o}C, while summer is long; average temperature is 45^{o}C and the pH of the river water is 8.

Statistical Analysis: Shannon-wiener Diversity Index was obtained in order to calculate fish diversity. It was calculated by formula as (Shannon and Weaver, 1949).

$$H' = - [\Sigma PI \text{ In } PI]$$

Where, H' = Diversity Index

Species richness Index, the number of fish species was calculated (Margalef, 1958) by formula is written as;

$$SR = (S - 1)/\log nN$$

Where S= total number of fish species and

N = total number of individuals present in the sample

Species evenness Index, was calculated (Pielou, 1966) by the formula written as;

$$E = H'/ \text{Logn } S$$

Where H' = Shannon-wiener diversity index

RESULTS AND DISCUSSION

During the survey of head Islam 23 species and 3367 number of fish individual were recorded (Table 1). Altaf *et al.* (2015) recorded 34 species and 1766 number of the fishes from the river Chenab. Hussain *et al.* (2015) recorded the 22 species and 976 individuals from the river Ravi.

Mirza et al. 2006 recorded 51 species and 1191 fish specimens from the river Jhelum. Khan *et al.* (2008) recorded the 20 species from the Chashma barrage and also 22 species specimen collected from the Taunsa barrage. Altaf *et al.* (2011) identified the 33 species from the head Qadirabad. Khan *et al.* (2011) recorded the 50 species from the Ravi while 30 species recorded from the river Jhelum.

In the present research Shannon-wiener index was noted as 1.31745; Species richness as 6.24; and Evenness as 0.98 (Table 1). Altaf *et al.* (2015) noted the Shannon-wiener index was 1.33 Altaf *et al.* (2011) recorded the Shannon index as, 3.11 from head Qadirabad.

The most abundant species of fishes were present at Islam barrage as; mali, mori, sunni, rohu, shinghara, tilapia, khaga, jalli, dola and bachwa. Total Numbers of each species individuals are as fellows Dola 160, Sol 125, Chirra 99, Kalbaso 45, Gulfam 125, Mori 254, Rohu 234, Thaila 144, But Pari 69, Battu 49, Mali 256, Fojikhaga99, Singhi 131, Shinghara 211, Khaga 197, Keengar 62, Tilapia 200, Bam Machhali 97, Bachwa 148, Jhalli 195, Bhangan 90, Sunni 241 and Doli 136.

Mirza *et al.* (2011) recorded such number of species *Aspidoparia morar* 18, *Barilius vagra* 4, *Chanda nama* 31, *Cyprinus carpio* 3, *Glyptothorax cavia* 2, *Gudusia chapre* 8, *Mastacemelus armatus* 8 *Notopterus notopterus* 3, *Oreochromis aureus* 23 *Osteobrama cotio* 15, *Puntius conchonius* 11, *Puntius ticto* 1, and *Schizothorax plagiostomus* 3, at Sheikhupura Dhand. In Jhelum Bridge the total individuals of fish species were *Acanthocobitis botia* 2, *Amblypharyngodon mola* 9, *Aspidoparia morar* 25, *Barilius modestus* 13, *Barilius naseeri* 4, *Barilius vagra* 9, *Channa marulia* 1, *Channa punctata* 2, *Chela cachius* 3, *Cirrhinus mirgala* 1, *Cirrhinus reba* 2, *Clupisoma garua* 1, *Crossocheilus diplocheilus* 21, *Eutropichtys vacha* 2, *Gara gotyla* 12, *Glossogobius giurus* 31, *Glyptothorax cavia* 1, *Gudusia chapra* 5,

Hetropneustes fossils 2, *Labeo calbasu* 20, *Mastacemelus armatus* 4 *Mystus bleekeri* 4, *Mystus vittatus* 2, *Notopterus notopterus* 1, *Oreochromis aureus* 38, *Puntius conchonius* 4, *Puntius sophore* 12, *Puntius ticto* 6*, Salmophasia bacaila* 31, *Salmophasia punjabensis* 3, *Schizothorax plagiostomus* 1, *Securicula gora* 4, *Sperata sarwari* 1, *Systomus sarana* 2, *Tor macrolepis* 2, *Wallago attu* 1*, Xenentodon cancila* 3. In Saila species were recorded as *Amblypharyngodon mola* 3, *Chela cachius* 1, *Cirrhinus mirgala* 3, *Colisa faciata* 13, *Crossocheilus diplocheilus* 5, *Cyprinus carpio* 14, *Esomus danricus* 2, *Labeo dero* 2, *Osteobrama cotio* 76, *Puntius conchonius* 8, *Puntius sophore* 16, *Salmophasia bacaila* 39, *Salmophasia punjabensis* 8, and *Securicula gora* 8. At Darapur Dhand the species individuals were recorded such as *Channa marulia* 6, *Channa punctata* 7, *Colisa faciat* 8, *Labeo calbasu* 2, *Osteobrama cotio* 86, *Rita rita* 2, *Salmophasia bacaila* 40, *Salmophasia punjabensis* 10, *Sperata sarwari* 9, *Wallago attu* 2, and *Xenentodon cancila* 3. In at Rasool Headworks the individual of species were recorded such as *Salmophasia bacaila* 32, *Salmophasia punjabensis* 4, *Cyprinus carpio* 4, *Mystus cavasius* 2, *Mystus vittatus* 6, *Sperata sarwari* 3, *Bagarius bagarius* 2, *Gagata cenia* 1 and *Chanda nama* 65. In at Marala Dhand the individual of species were recorded such as *Salmophasia punjabensis* 1, *Aspidoparia morar* 14, *Barilius modestus* 5, *Osteobrama cotio* 33, *Mystus cavasius* 1, *Mystusvittatus* 1, *Gagata cenia* 3, *Sisor rabdhophorus* 1, *Sicamugil cassasia* 4 and *Chanda nama* 16.

Altaf *et al.* (2015) recorded the total number of species individual which were following Keengar 70, Khaga 28, Shinghara 9, Kaan 1, Dola 129, Doli 14, Soli 48, Sol 6, Chirra 89, Kalbaso 37, Grass carp 43, Gulfam 53, Mori 22, Rohu 110, Silver 53, Thaila 107, Garoj 7, Pari 15, Battu 49, Mali 68, Foji khaga 2 and Singhi 16.

Table 1: Summary of the fishes of Islam barrage, Punjab, Pakistan.

Sr.	Common Names	Scientific Names of Fishes	Population	R.A./Pi	logPi	PilogPi
1	Dola	*Channa punctata*	160	0.04752	-1.32312	-0.06287
2	Sol	*Channa marulia*	125	0.037125	-1.43033	-0.0531
3	Chirra	*Oreochromis aureus*	99	0.029403	-1.53161	-0.04503
4	Kalbaso	*Labeo calbasu*	45	0.013365	-1.87403	-0.02505
5	Gulfam	*Cyprinus carpio*	125	0.037125	-1.43033	-0.0531
6	Mori	*Cirrhinus mrigala*	254	0.075438	-1.12241	-0.08467
7	Rohu	*Labeo rohita*	234	0.069498	-1.15803	-0.08048
8	Thaila	*Gibelion catla*	144	0.042768	-1.36888	-0.05854
9	But Pari	*Notopterus notopterus*	69	0.020493	-1.68839	-0.0346
10	Battu	*Chitala chitala*	49	0.014553	-1.83705	-0.02673
11	Mali	*Wallago attu*	256	0.076032	-1.119	-0.08508
12	Fojikhaga	*Bagarius bagarius*	99	0.029403	-1.53161	-0.04503
13	Singhi	*Heteropneustes fossilis*	131	0.038907	-1.40997	-0.05486
14	Shinghara	*Sperata sarwari*	211	0.062667	-1.20296	-0.07539
15	Khaga	*Rita rita*	197	0.058509	-1.23278	-0.07213
16	Keengar	*Mystus cavasius*	62	0.018414	-1.73485	-0.03195
17	Tilapia	*Oreochromis mossambicus*	200	0.0594	-1.22621	-0.07284
18	Bam Machhali	*Mastacembelus armatus*	97	0.028809	-1.54047	-0.04438
19	Bachwa	*Clupiso magarua*	148	0.043956	-1.35698	-0.05965
20	Jhalli	*Eutropiichthys vacha*	195	0.057915	-1.23721	-0.07165
21	Bhangan	*Labeo boga*	90	0.02673	-1.573	-0.04205
22	Sunni	*Cirrhinus reba*	241	0.071577	-1.14523	-0.08197
23	Doli	*Channa gachua*	136	0.040392	-1.3937	-0.05629
Total			**3367**	**1**	**-32.4682**	**-1.31745**
Shannon-wiener			**1.31745**			
Species Richness			**6.24**			
Evenness			**0.98**			

Conclusion: It is noted that Islam Barrage, river Sutlej, Punjab, Pakistan has high diversity of fishes.

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Availability of data: We have included all relevant data in the manuscript that were collected during the field survey.

Authors' contributions: Iqbal designed and Ashraf supervised this study also performed the research; Haider and Iqbal helped in data analysis; all authors has critically analyzed the article and approved as final manuscript.

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