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Statistical analysis of fish diversity of Rasul Barrage, Punjab, Pakistan

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ABSTRACT

Biological diversity is very important economically, ethnomedicinally, culturally, scientifically, socially, educationally and aesthetically and it is the one of the most important character of fauna. Diversity is the variety of species present. Variety of species is documented in the natural habitats while number of individuals is higher in anthropogenically moderately modified habitats. The purity of water is very noteworthy for the life of the flora as well as fauna, which is the depended on the nature and human being activities impacts. Purity of water is decreased with time due to human activities impacts. Varieties of pollutants, which are pollute the ecosystem for many decades that also affect on efficiency of ecology. Pollutants in water are caustic for water biological diversity even at small number. Data was collected in each month from January 2016 to December 2016 from Rasul Barrage. Drift nets and hooks were utilized to capture fish fauna in study area. Drift nets and hooks were attached by bamboos and wooden poles. The fishes were collected from both running and standing water. Indirect data were also collected i.e. Group questionnaires. During the survey 15 species of fishes were observed. Shannon-Weiner Index (H') was recorded as 2.357, Dominance (D) as 0.129, Simpson (S) as 0.872, Evenness (E) as 0.704, Brillouin (B) as 1.986, Menhinick (M) as 2.165 and Margalef (R) as 3.616. Diversity Indices indicated the Rasul barrage has high diversity and heterogeneity.

Key words: Diversity, Threats, Freshwater, Barrage

INTRODUCTION

Biological diversity is very important economically (McNeely, 1988), ethnomedicinally (Umair *et al.*, 2017; Altaf *et al.*, 2018b; Farooq *et al.*, 2019), culturally (Maffi, 2005; Altaf *et al.*, 2017), scientifically (Heyer *et al.*, 2014), socially (Cilliers, 2010), educationally (Caro *et al.*, 2003) as well as aesthetically (Lindemann-Matthies *et al.*, 2010) and it is the one of the most important character of fauna (Daly *et al.*, 1978). Diversity is the variety of species present (Altaf *et al.*, 2013; Altaf, 2016). Variety of species are documented in the natural habitats while number of individuals are higher in anthropogenically moderately modified habitats (Altaf *et al.*, 2018a).

Six biogeography regions are present in whole world; out of these, some parts of three i.e. Ethiopian, Palearctic and Oriental are located in Pakistan. This is the reason country having the wide variety of fauna and flora (Roberts, 1997; Roberts, 2005a, b; Altaf, 2017). Pakistan has more than 225 wetlands as well as 19 Ramsar sites and gradual changes in elevation rouse modification in fauna within little distance (Altaf *et al.*, 2014). Pakistan has a lot of the world's vegetation zones within even a little whole area. Freshwater is an significant; which is necessary flora and human along with other fauna; human activities e.g. domestic needs, agriculture as well as industry (Bartram and Ballance, 1996). Water and its resource utilization is very old as the human origin (Gleick *et al.*, 2002). Water has fundamental function in the development and growth of *Homo sapiens* cultures and societies. Evolution of human cultural as well as society began in areas of water. Most of the very old human cultural as well as society created near the water resources e.g. rivers (Gupta and Gupta, 2006).

Purity of water is significant for life of flora and fauna, which is depended on nature and human activities effects. Purity of water is reduced with time due to human activities impacts (Singh *et al.*, 2007; Qadir *et al.*, 2008). Various pollutants, which are polluted the ecosystem for many decades that also affect on efficiency of ecosystem (Majagi *et al.*, 2008). Pollutants in water are caustic for water biological diversity even at small number (Schüürmann and Markert, 1998). This study was planned to know the diversity of fishes of Rasul Barrage, Pakistan.

MATERIALS AND METHODS

Data was collected in each month from January 2016 to December 2016 from Rasul Barrage. Drift nets and hooks were utilized to capture fish fauna in study area. Drift nets and hooks were attached by bamboos and wooden poles. The fishes were collected from both running and standing water. Indirect data were also collected i.e. Group questionnaires.

Study area: Rasul Barrage (Figure 1) has very good habitat for species of fish and other diversity. It is present on river Jhelum. It receives water from northern Kashmir (Muhammad and Janjua, 2010; Mirza *et al.*, 2011).

Statistical Analysis: The statistical analysis was done with the help for Past statistical software to know the indices of the study area (Hammert *et al.*, 2001).

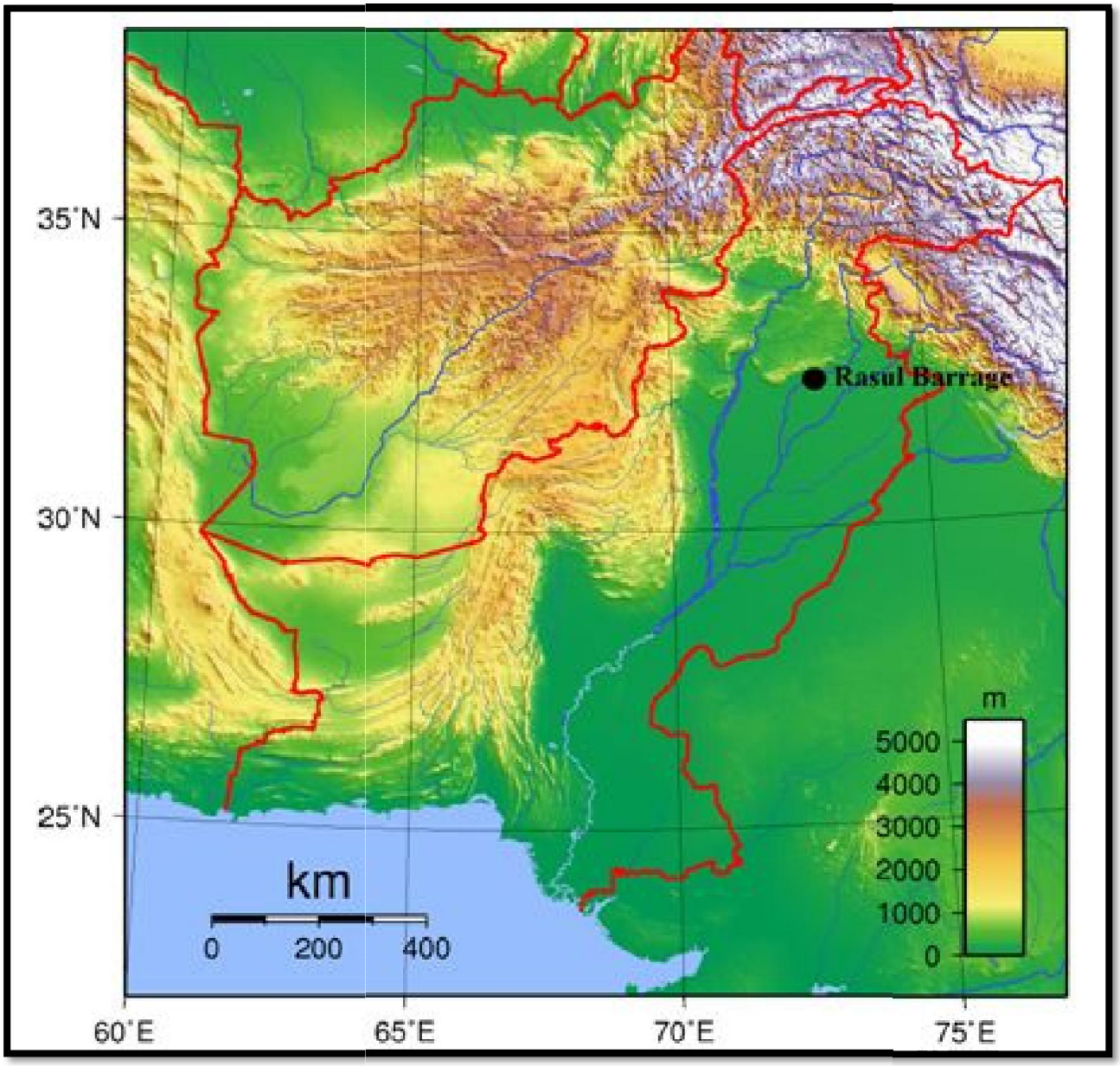

Figure 1. The map of Rasul barrage, Punjab.

RESULTS AND DISCUSSION

During the survey 15 species of fishes were observed. Shannon-Weiner Index (H') was recorded as 2.357, Dominance (D) as 0.129, Simpson (S) as 0.872, Evenness (E) as 0.704, Brillouin (B) as 1.986, Menhinick (M) as 2.165 and Margalef (R) as 3.616. Diversity Indices indicated the Rasul barrage has high diversity and heterogeneity (Table 2) in the study area. Mirza (2004) observed 171 fish species of from Pakistan.

Top abundant species of the Rasul Barrage were as; Tilapia (R.A= 0.271), Sangari (0.125), Dola (0.104), Soul (0.104) and Mali (0.083) (Table 1).

Comparison of the present fish species distribution with previous reported fish species in Pakistan was analyzed (Table 1).

During the study observed the fallowing threats to fish i.e. increase fertilizers, pesticides, waste material, excess fishing for marketing and export, bad construction of fish-ladder and no or low stocking of fish species in river.

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Table 1: Fish species recorded from study area and comparison with previous record in Pakistan.

Common name **English name** **Scientific name** **Species authority**	**Class** **Order** **Family**	**Status**	**Relative Abundance**
Baam Machhali Marbled spiny eel *Mastacembelus armatus* Sykes, 1839	Actinopterygii Mastacembeliformes Mastacembelidae	LC	0.021
But Pari Asiatic knifefish *Notopterus notopterus* Pallas, 1769	Actinopterygii Osteoglossiformes Notopteridae	LC	0.042
Common Carp Aischgrund carp *Cyprinus carpio* Linnaeus, 1758	Actinopterygii Cypriniformes Cyprinidae	VU	0.042
Dola Spotted snakehead *Channa Punctata* Bloch, 1793	Actinopterygii Channiformes Channidae	LC	0.104
Grass Carp Gardd carp *Ctenopharyngodon idella* Valenciennes, 1844	Actinopterygii Cypriniformes Cyprinidae	NE	0.021
Jhali Batchwa vacha *Eutropiichthys vacha* Hamilton, 1822	Actinopterygii Siluriformes Schilbeidae	LC	0.021
Khaga Catfish *Rita rita*	Actinopterygii Siluriformes Bagridae	LC	0.042

Hamilton, 1822			
Mali Boal *Wallago attu* Bloch & Schneider, 1801	Actinopterygii Siluriformes Siluridae	NT	0.104
Mori Mrigal carp *Cirrhinus mrigala* Hamilton, 1823	Actinopterygii Cypriniformes Cyprinidae	VU	0.042
Rohu Roho labeo *Labeo rohita* Hamilton, 1822	Actinopterygii Cypriniformes Cyprinidae	LC	0.021
Sangari Giant river catfish *Sperata sarwari* Mirza, Nawaz & Javed, 1992	Actinopterygii Siluriformes Bagridae	LC	0.125
Silver carp Carp *Hypophthalmichthys molitrix* Valenciennes, 1844	Actinopterygii Cypriniformes Cyprinidae	NT	0.021
Soul Great snakehead *Channa marulius* Hamilton, 1822	Actinopterygii Channiformes Channidae	LC	0.083
Thaila Gibelion catla *Catla catla* Hamilton, 1822	Actinopterygii Cypriniformes Cyprinidae	LC	0.042
Tilapia Blue tilapia *Oreochromis aureus* Steindachner, 1864	Actinopterygii Perciformes Cichlidae	LC	0.271

Table 2: Fish diversity Indices of Rasul Barrage.

Diversity Indices	**Values**
Species (S)	15
Individuals (I)	48
Dominance (D)	0.129
Simpson (S)	0.872
Shannon (H')	2.357
Evenness (E)	0.704
Brillouin (B)	1.986
Menhinick (M)	2.165
Margalef (R)	3.616

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