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A preliminary survey of fish fauna of river Panjkora at District Upper Dir, Khyber Pakhtunkhwa Pakistan

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Abstract

This preliminary study was conducted from March 2011 to November 2011 to evaluate the fish fauna of River Panjkora at District Dir Upper Khyber Pakhtunkhwa. During the study eleven fish species were identified. These species were belonging to four orders including Cypriniformes, Channiformes, Salmoniformes and Siluriformes, and four families including Cyprinidae, Channidae, Salmonidae and Sisoridae. Cyprinidae was the richest family represented by seven fish species consisting of *Schizothorax esocinus, Racoma labieta, Orienus plagiostomus, Crossocheilus diplocheilus, Gara gotyla, Barilius pakistanicus* and *Carassius auratus*. The family Sisoridae was embodied to two species namely *Gagata cenia* and *Glyptothorax punjabensis*. The family Channidae and Salmonidae were comprised of one species each, *Channa punctata* and *Oncorhynchus mykiss* respectively. It was concluded that River Panjkora at District Dir Upper has got high fish biodiversity and has got potential to be utilized for culturing various other cold water fishes.

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Introduction

Fishes are the most diverse group of vertebrates and have invaded almost every niche of hydrosphere. Fishes are the most ancient and abundant vertebrate. Of the approximately 40,000 species of vertebrates, a total of 21,723 species belong to super class Pisces (Jayaram, 1999). Fish exhibit a great diversity in shape, size and color according to their habitat. Biodiversity is the variety of species in the ecosystem, or variety of life on earth (Lipinski, 2003).

On account of importance in every sphere of life, fisheries and aquaculture is one of the most debatable issues. Fish studies are as clear as bright day light on the horizon of animal research. Fish is having significance in a number of ways. It is a handy sector, boosting the economy of many countries (Ahmad and Hasan, 2011). It is also a stapled food item on account of its nutritional and medicinal values (Ullah and Ahmad, 2014). Fisheries sector is also providing employment to millions of people throughout the world (Nagabhushan and Hosetti, 2010). Fishes also play a crucial role in the second tropic level of the aquatic ecosystem (Dubey *et al.,* 2012).

Ichthyofaunistic studies have been conducted in various parts of Pakistan and throughout the world. Fishes are generally identified on the basis of Morphometric measurements. Different Morphometric measurements show different pattern of relationship among each other at different stages of life. The constant ratio is helpful in identification. Those ratios which change regularly or irregularly are not useful in identifying the species. Furthermore environmental conditions in different regions also bring some changes in different parts of the body like number of scales and vertebrae etc. (Lagler *et al.,* 1962).

Considerable studies on fish fauna from different fresh water bodies of Pakistan have been carried out but still no work has been done on fish biodiversity of river Panjkora at District Upper Dir, Khyber Pakhtunkhwa Pakistan. Therefore, the objective of the present preliminary study was to investigate the fish species diversity of River Panjkora at District Upper Dir.

Material and methods

Sampling Area

District Upper Dir is situated with Longitudes and Latitudes of 35.2042° North and 71.8722° East respectively. District Upper Dir is bounded by District Chitral to the Northern Side, by Bajaur and Afghanistan to the Western side, by District Lower Dir to the Southern side and by District Swat to Eastern side. River Panjkora originates from Kohistan, District Upper Dir and flow southward dividing District Upper Dir into two halves (Ullah *et al.,* 2014a). The name Panjkora is because of the main five tributaries that fall in the River at four different places viz., Gwaldi Stream at Sheringal, Barawal Stream at Chukiatan, Dobando Stream at Akhagram and Usherai Dara Stream and Nurhund Stream at Darora (Ullah *et al.,* 2014b) (Fig. 1).

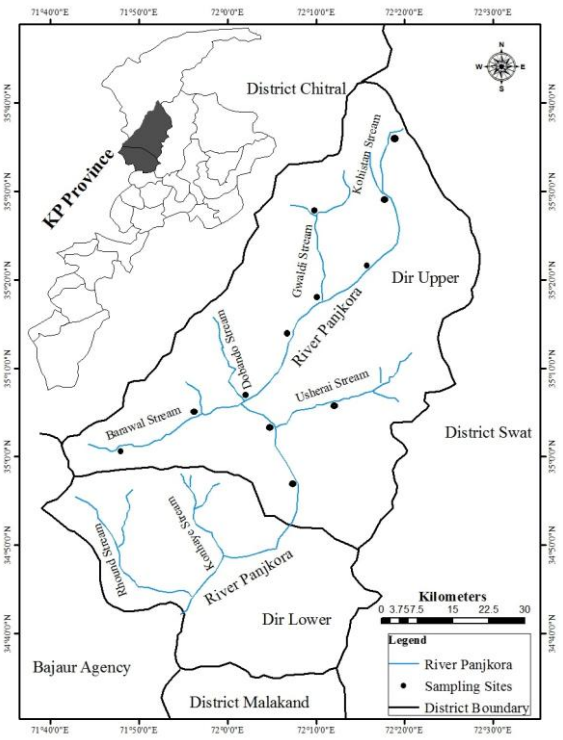

Fig. 1. Map showing sampling sites along river Panjkora at District Upper Dir.

Sampling and data analysis

Sampling was done from different locations to investigate the fish diversity. The sampling was

carried out from March 2011 through November 2011. Different types of nets and hooks and of various mesh sizes were used for collecting fishes. The fishes were first fixed in 10% formalin solution and preserved in 70% alcohol at the laboratory. All fishes were identified using standard taxonomic keys and literature, Fishes of the Punjab (Mirza and Sandhu, 2007), Freshwater fishes of the Indian Region (Jayaram, 1999), Inland fishes of India and adjacent countries (Talwar and Jhingran, 1991), Freshwater Fishes of the Indian Region (Jayaram, 1981).

Water Quality Analysis

Physico-chemical parameters such as temperature, pH, Dissolved Oxygen, Percent Dissolved Oxygen, Electric Conductivity, Total Dissolved Solids, Salinity, Turbidity, Resistivity, Atmospheric Pressure and Absolute Conductivity were also observed and recorded using Hanna Multiparameter Meter (Model HI-9829, US made).

Results and Discussion

Physico-chemical parameters of the river water were showing variation within different ranges as given in Table 1. All the studied parameters were falling within the suggested range of USPHS (1964) for aquatic life.

A total of 11 fish species belonging to 4 orders and 4 families were recorded from river Panjkora at District Upper Dir during the study period. The richest families were Cyprinidae represented by seven species followed by Sisoridae embodied to two species shown in Table 2. The Morphometric measurements and fin formulae of the recorded fish species are given in Table 3 and Table 4 respectively.

Table 1. Physico-chemical parameters' value recorded.

Parameters	***Minimum***	***Maximum***	***Mean ± S.D***
Temperature	20.15	20.21	20.18 ± 0.0424
pH	7.76	7.93	7.845 ± 0.1202
DO	15.68	16.88	16.28 ± 0.8485
Percent DO	188.3	204.6	196.45 ± 11.5258
EC	171	354	262.5 ± 129.4005
TDS	85	191	138 ± 74.9533
Salinity	0.08	0.18	0.13 ± 0.0707
Turbidity	800	1000	900 ± 141.4214
Resistivity	0.0026	0.0059	0.00425 ± 0.0023
At. Pr	0.88	0.927	0.9035 ± 0.0332
Ab. C	155	341	248 ± 131. 5219

DO = Dissolved Oxygen, EC = Electrical Conductivity, TDS = Total Dissolved Oxygen, At. Pr = Atmospheric Pressure, Ab. C = Absolute Conductivity, S.D=Standard Deviation

In the present study it was observed that *Oncorhynchus mykiss* is restricted to Kalkot, Kohistan area only. The possible reason for it may be that it is a cold water fish and in low altitude areas the water temperature rises so it has not thrived in the lower portion of the river. During the study period it was also observed that *Gagat cenia* is embodied to Usherai stream mostly. All the reported fish species are found in the surrounding water bodies of the adjacent districts and rivers.

Table 2. Recorded Fish fauna of River Panjkora District Upper Dir.

S. No	Order	Family	Genus and Species	Local names
1	Cypriniformes	Cyprinidae	*Schizopyge esocinus*	Ranth/ Aasala
2			*Racoma labieta*	Kanesatt
3			*Orienus plagiostomus*	Swati machli
4			*Carrasius auratus*	Paplate
5			*Barilius pakistanicus*	Pepal
6			*Crossocheilus diplocheilus*	Butten
7			*Gara gotyla*	Kanesatt
8	Channiformes	Channidae	*Channa punctatus*	Katasarre
9	Siluriformes	Sisoridae	*Gagata cenia*	Brituky
10			*Glyptothorax punjabensis*	Sulamanne
11	Salmoniformes	Salmonidae	*Oncorhynkiss mykiss*	Trout

Table 3. Morphometric measurements (cm) of the recorded fish species.

Fish Species	T.L	S.L	F.L	H.L	B.D	B.W	Pr.L	Ps.L	E.D	Sn.L	L.C.P
S. esocinus	14.9	12.9	14.1	3.4	3.2	3.4	6.3	5.9	0.8	1.1	4.3
R. labieta	15.8	13	14.4	1.8	2.9	2.4	6.2	6.5	0.6	1.1	4.8
O. plagiostomus	13.1	10.9	12.1	2.2	2.2	1.6	5.2	5.9	0.7	0.9	3.3
C. auratus	10.9	9.8	10.1	1.2	4.3	1.8	4.3	4.5	0.7	0.8	2.9
B. pakistanicus	8.6	7.2	7.8	1.6	1.4	0.8	3.9	4.2	0.8	0.3	2.1
C. diplocheilus	10.7	8.6	9.9	1.4	1.9	1.1	4.5	4.2	0.4	0.3	2.6
G. gotyla	12.5	10.4	11.3	2.3	3.2	2	1.6	5.4	0.4	1.2	3.9
C. punctatus	11.9	10.1	11.2	2.3	2.8	2.1	3.7	6.4	0.6	0.3	0.9
G. cenia	9.1	7.4	8.5	1.2	1.4	1.2	4.2	3.4	0.3	0.5	2.8
G. punjabensis	9.6	9.1	8.9	1.7	1.4	1.3	2.6	5.1	0.3	0.2	1.4
O. mykiss	17	15.5	16.4	3.5	4.1	3.7	7.2	8.1	0.9	0.7	2.6

T.L = Total Length, S.L = Standard Length, F.L= Fork Length, H.L = Head Length, B.D = Body Depth, B.W = Body Width, Pr.L= Pre Dorsal Length, Ps.L= Post Dorsal Length, E.D = Eye Diameter, Sn.L=Snout Length and L.C.P = Length of Caudal peduncle

In our study eight species were edible including *Orienus plagiostomus, Oncorhynkus mykiss, Carassius auratus, Crossocheilus diplocheilus, Gara gotyla, Schizothorax esocinus, Channa punctata* and *Racoma labieta* from river Panjkora at District Dir Upper. Hasan and Ullah (2013) reported twenty five fish species from river Panjkora at district Dir Lower. Their collection was consisting of thirteen edible fish species including *Schizothorax esocinus, Schizothorax plagiostomus, Racoma labiata, Cyprinion watsoni, Cyprinus carpio, Tor putitora, Channa punctata, Channa gachua, Tor macrolepis, Crossocheilus diplocheilus, Gara gotyla, Ctenopheringodon idella* and *Mastacembelus armatus* (Ullah and Hasan, 2013). While comparing these two works, three species, *Orienus plagiostomus, Oncorhynkus mykiss* and *Carassius*

auratus were missing in their study while eight were missing in our study, *Schizothorax plagiostomus, Cyprinion watsoni, Tor putitora, Tor macrolepis, Channa gachua, Cyprinus carpio, Ctenopheringodon idella* and *Mastacembelus armatus*.

Table 4. Fin formula of the recorded fish species.

S.No	Species	D	P	V	A	C	L.L
1	*Schizopyge esocinus*	4/8	20	10	3/5	19	95-98
2	*Racoma labieta*	4/8	20	11	3/5	19	110
3	*Orienus plagiostomus*	4/8	20	11	3/5	19	110
4	*Carrasius auratus*	3/16-18	17	9	3/5	19	27-28
5	*Barilius pakistanicus*	2/7	15	9	2/10-12	19	39-44
6	*Crossocheilus diplocheilus*	3/8	14-15	9	2/5	19	36-38
7	*Gara gotyla*	2/8	15	8	2/5	19	30
8	*Channa punctatus*	29-32	15-17	6	21-23	12	37-40
9	*Gagata cenia*	1/6	1/9	6	3/10-12	19	--
10	*Glyptothorax punjabensis*	1/6	1/8	6	3/9	18	--
11	*Oncorhynkiss mykiss*	14-15	13-15	10-11	12-14	20	120-140

D=Dorsal fins, P=Pelvic fins, V=Ventral fins, A=Anal fins, C=Caudal fins, L.L=Lateral Line Scales

Ullah *et al.* (2014c) reported fourteen fish species from Rhound stream, a tributary of river Panjkora at, district Lower Dir. Their collection was consisting of *Crossocheilus diplocheilus, Barilius pakistanicus, Gara gotyla, Cyprinion watsoni, Schizopyge esocinus, Racoma labieta, Cyprinus carpio, Barilius vagra, Barilius modestus, Puntius sophore, Puntius ticto, Channa punctatus, Mastacembelus armatus* and *Glyptothorax punjabensis*. Comparing both the work of Hasan and Ullah (2013) and Ullah *et al.* (2014) two species *Puntius sophore* and *Puntius ticto* was missing from the earlier one while thirteen species were missing from the later one. While comparing our study to the later one, our study was missing *Cyprinion watsoni, Cyprinus carpio, Barilius vagra, Barilius modestus, Puntius sophore, Puntius ticto* and *Mastacembelus armatus,* while their study was missing *Orienus plagiostomus, Carraius auratus, Gagata cenia* and *Onchorhynchus mykiss*.

Ullah *et al.* (2014) reported eleven edible fishes from Konhaye stream, a tributary of River Panjkora, at district Dir Lower. Their study was embodied to these eleven edible fish species: *Schizopyge esocinus, Raconma labieta, Cyprinion watsoni, Cyprinus carpio, Crossocheilus diplocheilus, Garra gotyla, Puntius ticto, Puntius sophore, Channa Punctatus, Channa gachua* and *Mastacembelus armatus*. While comparing our work to this one, our study was missing *Cyprinion watsoni, Cyprinus carprio, Puntius sophore, Puntius ticto, Mastacembelus armatus* and *Channa gachua*. This may be due to the fact of low temperature at district Dir Upper and bit higher in district Dir Lower.

Hasan *et al.* (2013) worked on River Swat and reported fifty fish species consisting of sixteen edible fish species including *Carassius auratus, Channa gachua, Channa puntatus, Crossocheilus diplocheilus, Clupisoma garua, Clupisoma naziri, Cyprinus carpio, Eutropiichthys vacha, Labeo diplostomus, Mastacembuls armatus, Mystus bleekeri, Oncorhynchus mykiss, Racoma labiata, Salmo trutta fario, Schizothorax plagiostomus* and *Tor macrolepis* after their survey from 2004 to 2010. All the fishes of our study were included in their study.

Conclusions and recommendations

The studied physico-chemical parameters' values fall within the suggested ranges of USPHS for aquatic life and can be classified as good for fish fauna thriving. Concerning the ichthyo diversity eleven fish species including *Schizothorax esocinus, Racoma labieta, Orienus plagiostomus, Crossocheilus diplocheilus, Gara gotyla, Barilius pakistanicus,Carassius auratus, Gagata cenia, Glyptothorax punjabensis, Channa punctata and Oncorhynchus mykiss* were recorded from river Panjkora at District Upper Dir. The diversity can be improved by monitoring the fish fauna regularly, preserving water quality and adding new stoking fish to the river. Fish catch pressure, fishing during breeding season and catching non marketable size fish should be avoided for enhancing fish fauna of the river.

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