

Research Article

Cyprinid fauna (Cypriniformes) of River Panjkora, district Lower Dir, Khyber Pakhtunkhwa, Pakistan

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Citation

Abdul Wahab* and Ali Muhammad Yousafzai. Cyprinid fauna (Cypriniformes) of River Panjkora, District Lower Dir, Khyber Pakhtunkhwa, Pakistan. Pure and Applied Biology. Vol. 6, Issue 4, pp1354-1365.

<http://dx.doi.org/10.19045/bspab.2017.600146>

Received: 19/07/2017

Revised: 18/10/2017

Accepted: 21/10/2017

Online First: 26/10/2017

Abstract

This study was conducted to assess Ichthyodiversity of family Cyprinidae in River Panjkora from January 2012 to December 2015. A total of 671 specimens representing 7 genera and 10 species were collected. Species collected were *Barilius pakistanicus*, *Barilius vagra*, *Tor putitora*, *Crossocheilus diplocheilus*, *Garra gotyla*, *Schizothorax labiatus*, *Schizothorax esocinus*, *Schizothorax plagiostmus*, *Carassius auratus* and *Cyprinus carpio*. *Schizothorax plagiostmus* was found to be the most abundant species with a relative density (RD) of 21.01 and relative frequency (RF) of 13.04. It was the only species qualifying the criterion to be ranked as eury species. *Schizothorax esocinus* was rare in the study area with a RD 0.45 and RF 2.17.

Keywords: Cyprinidae; Schizothorax; River Panjkora; Eury species; Relative density; Relative frequency

Introduction

Pisces make one of the important groups of vertebrates inhabiting almost all water bodies from freshwaters to brackish and up to marine ecosystems [1]. Man, is consuming fish as food since the pre-historic ages. Ichthyofauna plays a vital role in aquatic habitats as it mostly dominates the biotic components in terms of number [2].

In *Fish Base* total number of fish species listed are 28900, in which 13000 are fresh water fishes. Fresh water fishes are found in lakes, streams and river which cover only 1 % of the earth surface [3]. From Sagar lake Madhya Pradesh, India, 21 fresh water fish species were reported [4]. In a study at Vattakkayal Kolloam District, Kerala, India, 22 fish species were documented and ranked as critically endangered, vulnerable

and as lower risk level [5]. From River Charju Arunachal Pradesh, India 16 species of family Cyprinidae were reported [6]. It was reported that introduction of exotic fish in Iberia, resulted in the extinction of some native fish species [7]. From Tamor River, Himalayan region, Nepal 30 fresh water fish species were collected in which 61 % fish species belonged to family Cyprinidae [8]. Total fish species reported from Similipal Biosphere Reserve were 66. In a study out of 66 species 29 species were of family Cyprinidae [9]. From Tons River India 15 fresh water species were documented [10]. Increased ichthyofaunal similarities in some localities of Australia were found to be the result of anthropogenic influences [11]. From Rajshahi District, Bangladesh 133 fresh water fish species were collected [12]. During a study on

Family Cyprinidae, 24 species were reported from Coorg District Karnataka, India [13]. From Tinau River Nepal 35 fish species were documented in which 81.73 % were of family Cyprinidae [14]. Family Cyprinidae was found to be the dominant family in Uttarakhand, India from where 19 fresh water species were collected [15]. From River Ramganga Central Himalaya, India 11 fish species of family Cyprinidae were documented [16]. In a study on the distribution of fresh water species in Pakistan 86 fish species were reported [17]. From River Kabul at District Nowshera 14 fresh water species of family Cyprinidae were reported [18]. From Hub reservoir Sindh 21 fresh water fish species belonging to 9 families and 7 orders were documented [19]. From Mighty Indus 180 species were reported [20]. From River Jhelum 51 fish species were collected, in which 25 were of family Cyprinidae. It was further enumerated that low population density of endemic species was due to the introduction of exotic species i.e. *Oreochromis aureus* [21]. From River Zhob, Baluchistan 6 species of family Cyprinidae were collected [22]. From River Swat at Charsadda, 20 fish species of family Cyprinidae were documented [23]. From River Swat 10 fresh water fish species of family Cyprinidae were collected. Major threats to ichthyofaunal were found to be the use of explosive and electricity for fish hunting [24]. Family Cyprinidae with a total of 9 species was documented from different streams of Bajaur agency [25]. Eleven fresh water fishes were collected from Konhaye stream, a tributary of River Panjkora, District Lower Dir [26]. From River Panjkora, District Dir Upper, 11 fish species were collected. Richest family in the area was found to be the Cyprinidae [27]. In the present study *Schizothorax*

plagiostomus was found to be the most dominant species in the study area. The study area is mostly unexplored for ichthyofaunal diversity and present study will provide a baseline of information in this regard.

Materials and methods

Study area

District Dir Lower is situated in the Northern part of Khyber Pakhtunkhwa. It has District Dir Upper in North, District Swat in East, District Malakand in South and Bajaur in West. The name of River Panjkora refers to its origin from five streams i.e. Kumrat-Kohistan, Lawari, Barawal, Usherai and Guladai. River Panjkora begins from Hindukash range at latitude, 35° 45 and passes through North and south faces making it through several tributaries i.e. Dir, Barawal, Usheri, Nihagdara, Konai, Roade, Guladai, Rabat, Toormang, Narhan and Karo. River Panjkora join River Swat at Busak near Qulangi (Figure 1). The study area of the river is about 180 kilometers from its origin. The area is about 70 kilometers from Rabat to Busak. It lies between latitude of 34° 38 and 34° 84 towards north having average altitude of 725 to 850 meters on the bank of River Panjkora.

Collection and identification

A total of six monitoring sites i.e. Rabat, Odigram, Timergara, Khazana, Shagu kas and Busak were established for sampling. Fish samples were collected by cast net, hand net, fishing rods and by hands in shallow water. Samples were taken to laboratory and shifted to plastic jars. Large sized samples were incised and 10% formalin was used as a preservative [28]. Morphometric measurements of each fish sample were recorded and tabulated [28, 29]. Identification was done following standard keys i.e. [28-31].

Quantitative attributes

Quantitative attributes were calculated according to following formulae.

$$\text{Density} = \frac{\text{Number of fish samples of a species collected from all monitoring sites}}{\text{Total monitoring sites}}$$

$$\text{Relative Density} = \frac{\text{Density of a particular fish species}}{\text{Total densities of all fish species}} \times 100$$

$$\text{Frequency} = \frac{\text{Number of monitoring sites at which a fish species was found}}{\text{Total number of monitoring sites}} \times 100$$

$$\text{Relative Frequency} = \frac{\text{Frequency of a particular fish species}}{\text{Total frequencies of all fish species}} \times 100$$

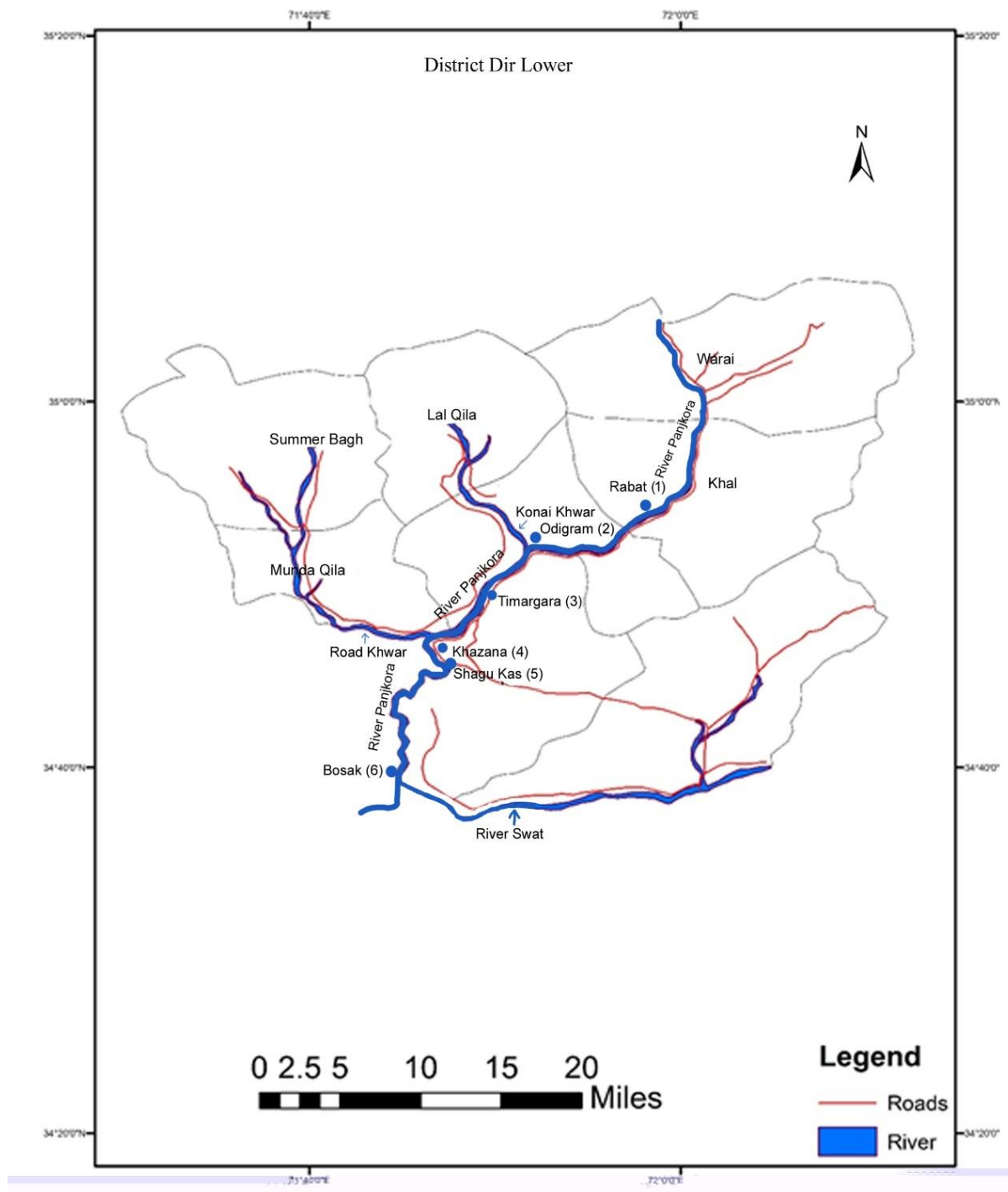


Figure 1. Map of the study area

Results and discussion

A total of 671 specimens representing 10 species under 7 genera of the family Cyprinidae were collected. Taxonomic and morphometric details (Table 1 and 2) of fish species collected are as follows:

Barilius pakistanicus (Mirza & Sadiq, 1978)

Colour

It was silvery in colour having bars which descended from the back to lateral line area as well as below. Mostly found in shallow waters but also found in deep waters.

Morphometric measurements

Total length of this fish was recorded as 9.2 cm with a fork length of 8.5 cm and with a standard length of 7.7 cm. It had an eye diameter and snout length of 0.5 cm respectively. Body depth was measured as 1.7 cm. Its lateral line scale count was 42. It was collected from only two monitoring sites i.e. Konai and Road stream. Its population density was found to be 15.67 while its frequency was 33.33, which reflects its limited range of ecological tolerance (Plate 1, Figure 1).

Ecology

Its relative density was 14.01 and relative frequency was 4.35. This species was reported from Afghanistan [32].

Distribution

In a review this species was documented from Khyber Pakhtunkhwa, Punjab, Sindh, Azad Jammu Kashmir and Baluchistan [17]. This species was reported from different localities of Pakistan i.e. from River Jhelum [21], from Dera Ghazi Khan [33], from River Kabul at Nowshera [18], from Attock [34], from Kalpani stream Mardan [35], from River Swat at Charsada [23], from River Swat [24], from Aronai stream Swat [36] and from River Barandu Buner [37]. It is important to mention that this species was found as a dominant in River Chamla Buner in a previous study [38].

Barilius vagra (Hamilton, 1822)

Colour

It was silvery in colour with bluish vertical bars, descending from back but not reaching the lateral line. Fins were yellowish to pink. Mostly found in shallow water with gravelly and rocky bottom.

Morphometric measurements

Total, fork and standard lengths were recorded as 4.9, 4.5 and 3.9 cm respectively. It had eye diameter and snout length of 0.3 cm. Its lateral line scale count was 43. It was collected from two monitoring sites i.e. Konai (Odigram) and Roade (Khazana) stream.

Ecology

Its population density was 6.33 while its frequency was 33.33, which clearly shows its limited ecological range of tolerance (Plate 1, Figure 2). Its relative density was 5.66 while its relative frequency was 4.35.

Distribution

This species was recorded from abroad i.e. from W. Ramganga Central Himalaya India [16], from Uttarkhand, India [15], from Northeast India [39] and from Nepal [8]. *Baralius vagra* was reported from different localities of Pakistan, such as from River Zhob, Baluchistan [22], from Dera Ghazi Khan [33], from River Jhelum [21], from River Kabul at Nowshera [18], from Attock [34], from Kalpani stream Mardan [35] and from River Swat at Charsada [23].

Tor putitora (Hamilton, 1822)

Colour

Its dorsal side was greenish; sides light pink and ventral side was silvery white. Fins colour was reddish yellow. Mostly found in rapids of river with rocky bottom.

Morphometric measurements

Total length of the fish was recorded as 18.8 cm, fork length 16.7 cm and standard length as 15 cm. It had an eye diameter of 0.8 cm and snout length of 1.5 cm. Body depth was measured as 3.6 cm and lateral line scale count was 42. It was collected from five monitoring sites.

Ecology

Its population density was 4.5 while its frequency was 83.33. Its low density shows that this species is under severe biotic and abiotic stresses, while its high frequency reflects that its ecological range of resistance is wide (Plate 1, Figure 3). Its relative density was 4.02 and relative frequency was 10.87.

Distribution

Tor putitora appears in reports from abroad i.e. from River Ravi and Chanab India [40], from Afghanistan [32], from Ramganga Central Himalaya, India [16], from Uttarakhand India [15], from River Channab, Jammu and Kashmir [41], from Northeast India [39], from River Charju, India [6] and from Garo Hills, India [42]. *Tor putitora* was reported from different parts of Pakistan i.e. from Khyber Pakhtunkhwa, Azad Jammu Kashmir, Punjab, Baluchistan and Sindh [17], from River Jhelum [21], from Attock [33], from Kalpani stream Mardan [35], from River Kabul at Nowshera [18], from River Barandu Buner [37], from River Chamla, Buner [38], from River Swat [24] and from River Swat at Charsada.

Crossocheilus diplocheilus (Heckel, 1838)

Colour

Its dorsal side was greyish and ventral side pinkish yellow. Mostly found in shallow water with rocky bottom.

Morphometric measurements

Its total length was recorded as 12.7 cm, fork length 11.6 and standard length as 10.5 cm. Its eye diameter, snout length and body depth was measured as 0.5 cm, 1.1 cm and 3 cm respectively. Its lateral line scale count was 38. It was collected from five monitoring sites (Plate 1, Figure 4).

Ecology

Its population density was 13 while its frequency was 100. Its low density shows that this species is under severe biotic and abiotic stresses, while its high frequency reflects that its ecological range of resistance is wide. Its relative density was 11.62 and relative frequency was 13.04.

Distribution

This species was reported from Lidder River Kashmir India [43]. Within Pakistan *Crossocheilus diplocheilus* was documented from Zhob, Balochistan [22], from Attock [34], from River Jhelum [21], from Dera Ghazi Khan [33], from River Kabul at Nowshera [18], River Kabul at Machini [44], from Aronai stream Swat [36], from River Swat [24] and from Konhaye stream Dir Lower [26].

Garra gotyla (Gray, 1830)

Colour

Back side was brownish olive and lower side was greyish white. Dots were found on dorsal fin while other fins were light pink in colour. It is found in stream and river of hilly areas. It prefers water with slow speed and bottom with large stones.

Morphometric measurements

Total length of the fish was recorded as 19.2 cm, with a fork length of 18 cm and standard length of 16.5 cm. Diameter of eye was recorded as 0.5 cm and snout length of 2 cm. Body depth was measured as 3 cm. Its lateral line scale count was 30. It was collected from all the six monitoring sites.

Ecology

Its population density was 17.17 while its frequency was 100, which reflects that it is abundant in the study area (Plate 1, Figure 5). Its relative density was 15.35 while its relative frequency was 13.04.

Distribution

This species was documented from abroad such as from Uttarkhand, India [15], from Ramganga Central Himalaya, India [16] and River Charju India [6]. *Garra gotyla* was also reported by many workers from different localities of Pakistan i.e. from River Jhelum [21], from Dera Ghazi Khan [33], from River Zhob, Baluchistan [22], from River Kabul at Nowshera [18], from Kalpani stream Mardan [35], from River Swat [38], from River Swat at Charsada [23], from Attock [34], from River Chamla Buner [38] and from Konhaye stream Dir Lower [26]. This species was the 3rd most abundant species in the study area.

Schizothorax labiatus* (McClelland, 1842)*Colour**

It was greyish brown on back and yellowish below. Dorsal and caudal fins were greyish and other fins were pinkish. It is found in rapids of stream and river.

Morphometric measurements

Total, fork and standard lengths were recorded as 32, 29 and 26.5 cm respectively. It had eye diameter of 0.9 cm and snout length of 2.9 cm. Body depths was measured as 6.1 cm. Its lateral line scale count was 110.

Ecology

It was collected from all the six collection sites. Its population density was 18.83 while its frequency was 100, which reflects that it is abundant in the study area (Plate 1, Figure 6). Its relative density was 15.35 and its relative frequency was 13.04.

Distribution

The species was reported from other countries i.e. from Afghanistan [32], from Lidder River, Kashmir [43], from Nepal [8] and from Himalaya, India [45]. In Pakistan this species was reported from AJK, Khyber Pakhtunkhwa, Punjab, Baluchistan and Gilgit Baltistan [17], from Attock [34], from River Swat at Charsada [23], from River Swat [24] and from Konhaye stream Dir Lower [26]. From Chashma it was reported for the first time [46]. This species appeared to be the 2nd most abundant species in the study area.

Schizothorax esocinus* Heckel, 1838*Colour**

Its colour was silver on back having black spots and lower side was white. It is found in stream and river with rapidly flowing water.

Morphometric measurements

Total fork and standard lengths were recorded as 25, 23 and 20.5 cm respectively. Head length was measured as 5.6 cm. It had eye diameter of 0.7 cm and snout length of 2.2 cm. Its lateral line scale count was 97. Only three specimens were collected at Busak (Qulangi).

Ecology

Its population density was 0.5 while its frequency as 16.67. It shows that it is very rare in the studying area (Plate 1, Figure 7). Its relative density was 0.45 while relative frequency was 2.17.

Distribution

Schizothorax esocinus was documented from Afghanistan [32], from Lidder River Kashmir [43] and from Northeast India [39]. Within Pakistan this species was reported from AJK, Khyber Pakhtunkhwa, Northern Punjab and Gilgit Baltistan [17], from River Swat [24], from River Darmai Upper Swat [47], from River Panjkora, Dir Upper [48] and from Konhaye stream Dir Lower [26]. This species was found to be rare in the study area.

Schizothorax plagiostomus* Heckel, 1838*Colour**

It was silvery greyish in colour and fins were pinkish. It is found in mountains streams and rivers.

Morphometric measurements

Total length was recorded as 32.1 cm, fork length of 29.8 while standard length of 27.4 cm. Diameter of eye was 0.8 cm and snout length of 2.4 cm. Body depths was 5 cm. Its lateral line scale count was 110. It was collected from all the six monitoring sites.

Ecology

Its population density was 23.5 and frequency was 100. Its density and frequency reflects that it is the most abundant species in the studying area (Plate 1, Figure 8). Its relative density was 21.01 and relative frequency was 13.04.

Distribution

This species was reported from abroad i.e. from Afghanistan [32], from Ramganga Central Himalayan, India [16], from Utterkhand, India [15], from Lidder River Kashmir [43], from Kashmir Himalaya, India [49], from Northeast India [39] and from Nepal [8]. This species was also reported from different localities of Pakistan i.e. from Northern Baluchistan, Northern Punjab, Khyber Pakhtunkhwa, AJK and Gilgit Baltistan [17], from River Jhelum [21], from Dera Ghazi Khan [33],

from Allai Khoar Batagram [50], from River Zhob, Baluchistan [22], from Aronai stream Swat [36], from River Swat at Charsada [23] and from River Panjkora District Dir Upper [27]. This species appeared to be the dominant species in River Darmai Upper Swat [47]. The presence of *Schizothorax plagiostomus* in a wide range of freshwater habitats establishes its status as a Eury species.

***Carassius auratus* (Linnaeus, 1758)**

Colour

The fish was greyish brown in colour. It is found in stream and rivers. It is also kept as aquatic pet in aquarium.

Morphometric measurements

Total, fork and standard length were recorded as 19.5, 18 and 15.5 cm respectively. It had eye diameter of 0.9 cm and snout length of 1.3 cm. Its body depth was 5.5 cm while lateral line scale count was 28. It was collected from all monitoring sites.

Ecology

Its population density was 7 while frequency was 100, which shows its wide ecological range (Plate 1, Figure 9). Its relative density was 6.25 and relative frequency was 13.04.

Distribution

This species was reported from Lidder River Kashmir, India [43]. In Pakistan this species was documented from Khyber Pakhtunkhwa, AJK, Punjab, Sindh and Baluchistan [17], from Taunsa and Chasma reservoirs, Punjab [51], from Attock [34],

from Kalpani Mardan [35], from River Kabul at Nowshera [18], from River Swat District Swat [24], from River Swat at Charsada [23] and from River Panjkora District Dir Upper [27].

***Cyprinus carpio* Linnaeus, 1758**

Colour

Its colour was greenish brown. It is found in stream and river.

Morphometric measurements

Its total, fork and standard length were recorded as 29, 26.5 and 24.1 cm respectively. It had eye diameter of 1 cm and snout length of 3 cm. Body depth was measured as 8.6 cm. Its lateral line scale count was 36. It was collected from all monitoring sites.

Ecology

Its density was 5.33 while frequency was 100, which shows its wide ecological range of tolerance (Plate 1, Figure 10). Its relative density was 4.77 and relative frequency as 13.04.

Distribution

This species was reported from Afghanistan [32] and Northeast India [39]. Within Pakistan this species was reported from Sindh, Khyber Pakhtunkhwa, Punjab, Azad Jammu Kashmir and Baluchistan [17], from Attock [34], from Kalpani stream Mardan [35], from River Jhelum [21], from Taunsa and Chasma reservoirs Punjab [51], from River Kabul at Nowshera [18], from River Swat at Charsada [23], from Aronai stream Swat [36], from River Swat [24] and from Konhaye stream Dir Lower [26].

Table 1. Morphometric details of Cyprinidae species of River Panjkora, Pakistan

S. No		Wt-gm	TL-cm	FL-cm	SL-cm	BD-cm	ED-cm	PcFL-cm	PIFL-cm	DFL-cm	AF-cm	CFL-cm	HL-cm	LJL-cm	UJL-cm	SnL-cm	Mga-cm
1	<i>Barilius pakistanicus</i> Mirza & Sadiq, 1978	8	9.2	8.5	7.7	1.7	0.5	1.25	1	1.2	1.2	1.5	1.7	0.75	0.85	0.5	0.6
2	<i>Barilius vagra</i> (Hamilton, 1822)	2	4.9	4.5	3.9	0.8	0.3	0.75	0.65	0.7	0.7	1	1	0.35	0.5	0.3	0.4
3	<i>Tor putitora</i> (Hamilton, 1822)	70	18.8	16.7	15	3.6	0.8	2.7	2.3	3.4	2.5	3.4	4.2	1.4	1.5	3.6	1.3
4	<i>Crossocheilus diplocheilus</i> (Heckel, 1838)	23	12.7	11.6	10.5	3	0.5	1.8	1.7	2.1	1.6	2.1	2.2	0.7	0.8	1.1	1
5	<i>Garra gotyla</i> (Gray, 1830)	72	19.2	18	16.5	3	0.5	3	3	3.3	2.9	3.3	3.5	1.1	1.3	2	1.7
6	<i>Schizothorax labiatus</i> (McClelland, 1842)	385	32	29	26.5	6.1	0.9	4.8	4.3	4.3	4.8	5.5	6.7	2	2	2.9	2.4
7	<i>Schizothorax esocinus</i> Heckel, 1838	130	25	23	20.5	4.2	0.7	3.5	3.3	4.2	3.7	4.4	5.6	3	4	2.2	1.9
8	<i>Schizothorax Plagiostomus</i> Heckel, 1838	376	32.1	29.8	27.4	5	0.8	4.7	4.7	4.4	5.2	5.8	5.6	1.2	2	2.4	2.6
9		145	19.5	18	15.5	5.5	0.9	3.1	3.3	2.9	2.7	3.9	4.4	1.1	1.3	1.3	1.3
10	<i>Cyprinus carpio</i> Linnaeus, 1758	430	29	26.5	24.1	8.6	1	3.9	4	4.2	3.9	6	7.1	2	2.8	3	4.3

Key to the abbreviations

Wt-Weight in grams, TL-Total length, FL-Fork length, SL-Standard length, BD-Body depth, ED-Eye diameter, PcFL-Pectoral fin length, PIFL-Pelvic fin length, DFL-Dorsal fin length, AF-Anal fin length, CFL-Caudal fin length, HL-Head length, LJL-Lower jaw length, UJL-Upper Jaw length, SnL-Snout length, Mga-Mouth gap

Table 2. Presence-Absence data of Ichthyofauna of River Panjkora, District Lower Dir, Pakistan

S. No	Taxon	Rabat	Odigram	Timergara	Khazana	Shagukas	Busak	Density	Frequency	Relative Density	Relative Frequency
1	<i>Barilius pakistanicus</i> (Mirza & Sadiq, 1978)	-	56	-	38	-	-	15.67	33.33	14.01	4.35
2	<i>Barilius vagra</i> (Hamilton, 1822)	-	21	-	17	-	-	6.33	33.33	5.66	4.35
3	<i>Tor putitora</i> (Hamilton, 1822)	8	7	4	6	-	2	4.5	83.33	4.02	10.87
4	<i>Crossocheilus diplocheilus</i> (Heckel, 1838)	4	12	8	17	15	22	13	100	11.62	13.04
5	<i>Garra gotyla</i> (Gray, 1830)	11	13	21	26	18	14	17.17	100	15.35	13.04
6	<i>Schizothorax labiatus</i> (McClelland, 1842)	12	14	20	17	23	27	18.83	100	16.84	13.04
7	<i>Schizothorax esocinus</i> (Heckel, 1838)	-	-	-	-	-	3	0.5	16.67	0.45	2.17
8	<i>Schizothorax Plagiostomus</i> (Heckel, 1838)	18	22	26	36	15	24	23.5	100	21.01	13.04
9		6	8	11	3	5	9	7	100	6.25	13.04
10	<i>Cyprinus carpio</i> (Linnaeus, 1758)	7	3	5	10	5	2	5.33	100	4.77	13.04
	Total	66	156	95	170	81	103	111.83	766.66	99.99	99.98



1. *Barilius pakistanicus*



2. *Barilius vagra*



3. *Tor putitora*



4. *Crossocheilus diplocheilus*



5. *Garra gotyla*



6. *Schizothorax labiatus*



7. *Schizothorax esocinus*



8. *Schizothorax plagiostomus*



10. *Cyprinus carpio*

Plate 1. Cyprinid fauna of River Panjkora, District Lower Dir, Pakistan

Conclusion

During the present study, a total of 671 specimens belonging to 8 genera and 10 species of the family Cyprinidae were collected. *Schizothorax Plagiostomus* was found to be the most abundant species while *Schizothorax esocinus* was least found species in the study area. Rich faunal diversity of this area requires further explorations and documentations.

Authors' contributions

Conceived and designed the experiments: A Muhammad, Performed the experiments and analysed the data: A Wahab, Wrote the paper: A Muhammad & A Wahab.

Acknowledgement

This research work is part of Doctoral research work of corresponding author Abdul Wahab. Authors are thankful to HED Khyber Pakhtunkhwa for financial

assistance during the course of Ph. D research.

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