

## Exploring and Identification of Fish Fauna of River Panjkora in District Dir (Lower), Khyber Paktunkhaw, Pakistan

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**Abstract:** Fish fauna of River Panjkora and its physical parameter like velocity of water studied from February to September 2012. Total seven different species were collected and identified, that belongs to three order, viz: cypriniformes, channiformes, salmoniformes and three families, viz: Cyprinidae, Channidae and Salmonidae. Order: Cypriniforms, Family: Cyprinidae is the richest family, because it contains highest number of species in the present collection and is represented by five species including Snow trout: *Schizothorax esocinus*, Chunn machlee, *Racoma labiata*, Swati machlee, *Orienus plagiostomus*, *Dogra*, *Crossocheilus diplocheilus* and Pakistani chalwa, *Barilius pakistanicus*, Order: Channiformes, Family: Channidae is represented by a single species that is Daoly machlee, *Channa punctata*, order Salmoniformes, Family: Salmonidae, represented only one species Rainbo trout, *Oncorhynchus mykiss*. From the collected fish species the total length is 17.5cm and minimum is 9.7cm. Standard length: maximum: 15cm and minimum: 8.1cm: Head length: maximum: 3.9cm and minimum is 1.7cm. Body depth: maximum: 3.7cm and minimum 0.3cm. Body width: maximum 3.1cm. And minimum: 1.3cm. Eye diameter: maximum: 1.1cm and Minimum is 0.5cm. Snout length: Maximum: 1.3cm and Minimum: 0.3cm respectively. The present studies were very helpful to evaluate the present fish fauna of River Panjkora and also the need of conservation of different fish species in this river in future.

**Key words:** Dir Lower • Fish Habitats • Exhilarating Climate • Enthralling • Enchanting • Scales and Fins

### INTRODUCTION

Dir is the District of Khyber Paktunkhaw, (KPK) province of Pakistan. The valley is full of enthralling beauty, enchanting scenes and exhilarating climate is famous worldwide. The area is rich in snow capped mountain, pine thick forest and pleasant climate. It is situated 35° 50' & 34° 22' North and 71° 2' & 72° 3' east. It is surrounded by District Chitral in North-West, District Swat in the East and Malakand Agency in the South. Total area of the District is 5284 Km<sup>2</sup> with a population of 1.294 million people. The District was divided into two separate Districts i.e. Lower and Upper in 1996. The well known River, Panjkora is originated from Dir Kohistan and famous Lowari top is 4, 198 m above the sea level and its height decreases less than 2000 m towards the south west and

in north, the height increases to over 3000 m along the River Panjkora. Hazrat *et al.* [1].

Fish are cold blooded aquatic vertebrates typically with backbone, gills and fins and are primarily dependent on water is a medium in which they live. There are a number of fish species differing in size, shape and habitats. Some have become parasitic, while other lives in caves. They are found from the arctic to the Antarctic and some species carry out great migration. Some fish remain constantly in one environment other move from one place to another during their life time as they grow to maturity, or migrate seasonally by Nicol [2]. The same species were reported from Bajaur agency by Rehman [3]; Khan [4] Upper and Lower Swat by Mirza [5] from Charsadda by Ahmad [6] from Indus River by Urooj *et al.* [7] from Dir Lower and Upper by Muhammad [8] from Mardan by Shakoori and Malik [9].

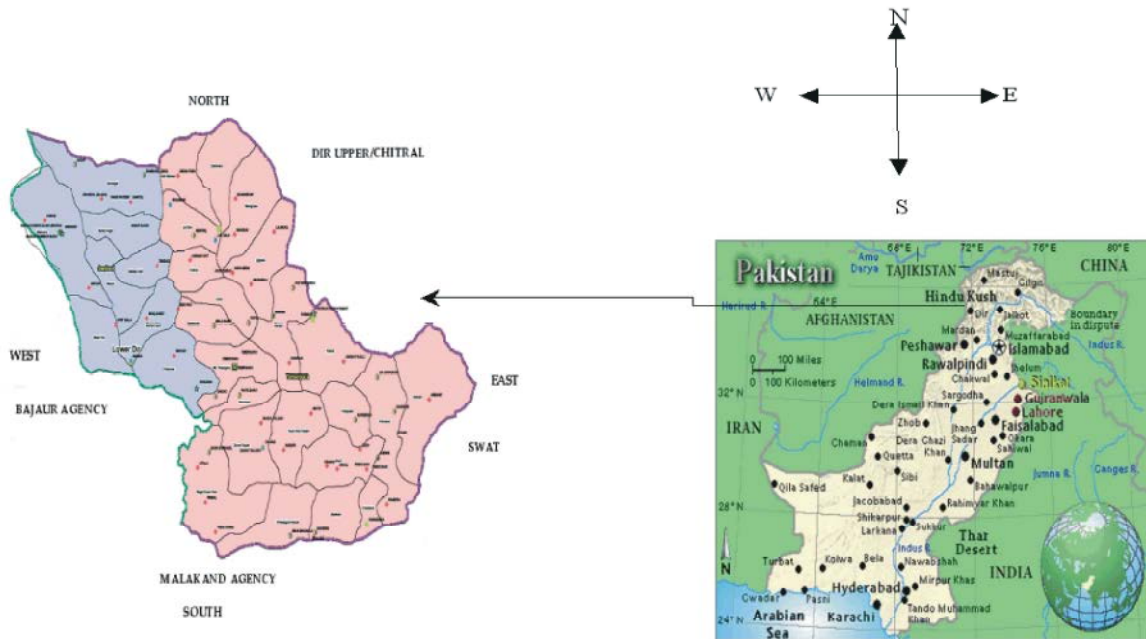


Fig. 1: Map of Study area, District Dir Lower, Pakistan

## MATERIALS AND METHODS

**Collection of Fish:** Fish were collected from various locations i.e. Rani, Mia Banda, Timergara, Khungi bala, Shagokass and Dir (Upper) fish Hatchery Kalkot, of River Panjkora and its tributaries. The collection was made with the help of cast nets, hooks, hand nets and other locally adopted devices.

**Preservation of Fish:** Fish thus caught alive were then directly dropped into a solution of 10% dilute Merck formalin. These preserved specimens were separated from rest of laboratory fish and placed in separate cupboard and were identified and labeled.

**Classifications:** Identification of fish for scientific studies was done through various taxonomic keys. Following keys were used by Talwar and Jhingran, 1991 [10]; Volume 1 and 2; Jayarm [11]; Mirza and Sandu [12].

**Measurement and Laboratory Work:** For morphometric measurements forceps, Petri dishes, magnifying glass, counting needles, ruler and vernier caliper etc were used.

**Physical Parameter:** Some physical parameter like velocity of water studied during the research work.

**Velocity of Water:** To find out the velocity of water point x and y was selected on the bank of river. A wooden piece was dropped in water at point x and time was recorded when it reached to point y.

Then velocity is found with the help of the following formula:  $V = s/t$ ; V: velocity of water; S: distance covered by wooden piece; S: 36 m; T: 38 sec;  $V = s/t$  Putting values;  $V = 36 \text{ m}/38\text{sec}$ ;  $V = 0.9473 \text{ m/s}$ .

**Data Analysis:** The data recorded were analyzed statistically to count fin rays and morphometrical measurements of different fish species.

## RESULT

**Snow Trout, *Schizothorax esocinus* Heckle [1838]:** Distinguishing characters of body stream lined and its depth is 4-5.9 times in standard length. Eye diameter is about 6.5 times in head length. Mouth is wide like a horse shoe shaped and its cleft very deep, lips are thick and fleshy; lower labial fold interrupted in the middle. Barbells are two pair; rostral pair is about 1-5 times longer than eye diameter, maxillary pair slightly shorter. Dorsal fin inserted slightly near to base of caudal fin than to snout tip and dorsal spine equal to head excluding snout. Anal fin when laid laterally, does not reach base of caudal fin. Scales are very small, about 104 in lateral line by Talwar and Jhingran

[13]. The color pattern of its body is silvery with numerous dark, irregular spot on back and flank of body fin silvery gray, with similar numerous dark spot at their base. It is distributed all over Pakistan, Northern areas, KPK, Punjab: Indus River up to Dakhner, a few km downstream from Attock khurd, Azad Kashmir, Afghanistan, India and China by Mirza [14].

**Chun machlee, *Racoma labiata* McLelland and Griffith [1842]:** Distinguishing characters of body is that, elongated, narrow and sub cylindrical and its depth is 4 to 5.1 times in standard length. Head is large and narrow interiorly, snout is pointed and smooth often studded with pores. Mouth is sub terminal, horizontal and arched, protractile; lips are thick and fleshy; lower labial fold uninterrupted and tri lobed, median lobe well develop and free at its tip. Barbells are two pairs and both maxillary and rostral barbells are longer than eye. Dorsal spine is strong and scales are small; lateral line with 10-110 scales. Color is grayish brown on the dorsal side and yellowish below; dorsal and caudal fins are grayish and other fins are pinkish and the distribution in Pakistan is that, it is found in hilly areas of KPK, northern Punjab; that is northern hilly areas in the Indus and its tributaries up to Chashma Barrage. In Baluchistan it is found in river Gomal, Zhob and Bolan. It is also found in Azad kashmir, Afghanistan, Iran and India by Mirza [15].

**Swati Machlee, *Orienus plagiostomus* Heckle [1838]:** Distinguishing characters of body is that, it has streamlined and its depth is 4.1-6.2 times and head length is from 4-5 times in standard length. Eye diameter is 4.1-5.4 times in head length. Mouth is inferior, transverse and slightly arched and hard cartilaginous covering below lower jaw which extends between corners of the mouth, followed by a fleshy and flat. Barbells are two pairs, which usually shorter than eye diameter. Dorsal fin inserted almost midway between snout tip and base of caudal fin; dorsal spine is strong and serrated behind. Scales are very small 85-110 in lateral line. In *S. esocinus* and *R. labiata* the scale around anal fin base are larger in size than body Scale. Color is silvery with grayish back and fins are pinkish; young fish have black spot on the dorsal and lateral sides. In distribution it is found in northern hilly areas of KP, northern Punjab that is Indus and its tributaries up to Kalabagh and Jehlum, northern part of Baluchistan: river Gomal, Zhob and Nari in Ziarat valley. It is also found in Kashmir, Afghanistan, India and China.

**Dogra, *Crossocheilus Diplocheilus* Heckel [1838]:** Many species of fish are collected during the survey from River Panjkora. Distinguishing characters of body is that, rather stout and thick in build and its depth is 4.3-5.5 times in standard length. Head is flat, compressed and length is 4.1-5.3 times in standard length. Eyes are moderate, mouth inferior and barbells are two pairs (maxillary and rostral). Scales are also moderate; lateral lines with 35-38 scales. Colour usually grayish brown on back and yellowish white below; Caudal gray in the lower half and other fins are light pink and distributed through; South eastern Iran, Afghanistan Pakistan, Indus drainage, India and Kashmir. It attains maximum length of 12 cm and is of no interest to fisheries.

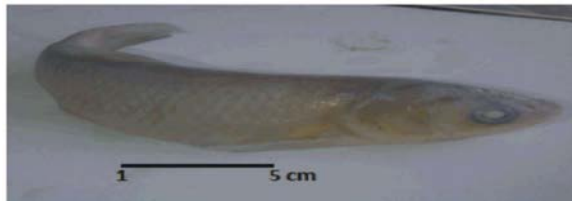
**Pakistani Chalwa, *Barilius Pakistanicus* Mirza [1878]:** Distinguishing characters of the body is shallow and its length is 4.6-4.7 times in standard length. Mouth is moderate and long jaws, maxilla extends to below middle of the orbit. Barbells are two pairs, rostral barbells shorter than eye diameter, maxillary pair is very short, dorsal fin inserted almost anterior to anal fin. Lateral line with 39-44 scales. Color pattern is silvery with bars descending from the back to the lateral line at bellow. Distributed in Pakistan KPK, Punjab, Baluchistan, Azad Kashmir.

**Doaly Machlee, *Channa Punctatus* Bloch [1793]:** Distinguishing character of body is elongated, sub cylindrical interiorly and rounded abdomen. Head is large, depressed and with flat like scales. Mouth fairly large, opening moderate to wide and may extend to bellow orbit. Eyes laterally moderate in the anterior part of head and from below the ventral surface is not visible. Teeth are present on jaws and palate. Gills opening wide membrane of two sides connected beneath estrus. Dorsal fin long inserted and almost above pectoral fins 29-55 rays and no spine and anal fin is long with 21-36 rays. Color is greenish gray above becoming yellowish bellow a Clark strip along the side of head and several short cross bands from back to the middle of the body and spotted fins and distributed throughout Pakistan, KPK, Punjab, Balochistan, Sindh, India, Sri Lanka, Nepal, Malaysia and China

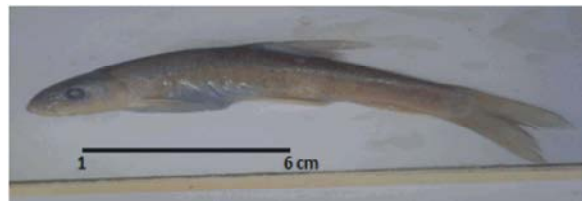
**Rainbow Trout, *Oncorhyncus Mykiss* Walbaum [1792]:** It is in exotic fish, which lives in cold water zone. Distinguishing character of body, with both its profile equally arched. Head is slightly smaller than body depth.

Table 1: Systematic Position of Fish

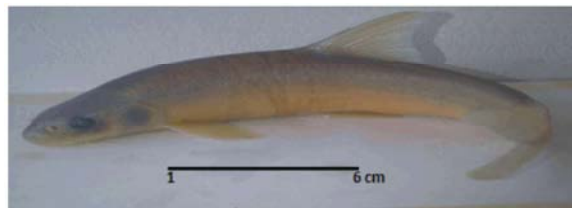
S.No	Zoo.Name	L. Name	C. Name	Kingdom	Phylum	Class	Order	Family	Genus	Species
1	Schizothorax esocinus	Snow trout	Chuwand/Chirruh	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	<i>Schizothora</i>	<i>Esocinus</i>
2	Racoma labiata	Chun mahay	Chun machlee	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	<i>Racoma</i>	<i>Labiata</i>
3	Orienus plagiostomus	Khwayak	Swati machlee	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	<i>Orienus</i>	<i>Plagiostomus</i>
4	Crossocheilus diplocheilus	Spena Deqa	Dogra	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	<i>Crossocheilus</i>	<i>Diplocheilus</i>
5	Barilius pakistanicus	Patty Mahay	Pakistani Chalwa	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	<i>Barilius</i>	<i>Pakistanicus</i>
6	Channa punctatus	Katay/ Kategay	Daoly Machlee	Animalia	Chordata	Actinopterygii	Channiformes	Channidae	<i>Channa</i>	<i>Punctatus</i>
7	Oncorhynchus mykiss	Trout	Rainbow trout	Animalia	Chordata	Actinopterygii	Salmoniformes	Salmonidae	<i>Oncorhynchus</i>	<i>Mykiss</i>



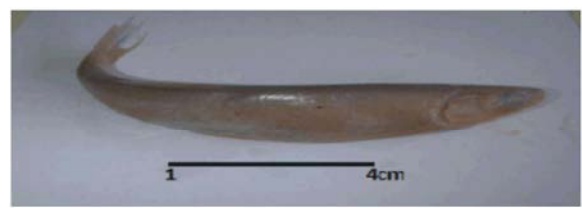
a. Snow trout, *Schizothorax esocinus*



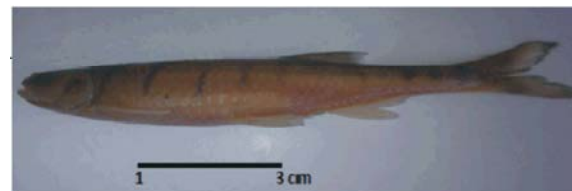
b. Chun machlee, *Racoma labiata*.



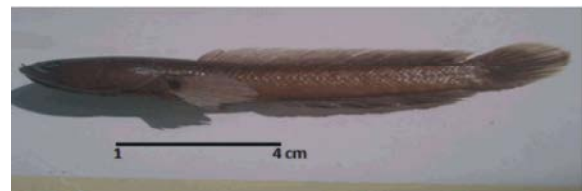
c. Swati Machlee, *Orienus plagiostomus*.



d. Dogra, *Crossocheilus diplocheilus*.



e. Pakistani Chalwa, *Barilius pakistanicus*.



f. Daoly Machlee, *Channa punctatus*.



g. Rainbow trout, *Oncorhynchus mykiss*

Fig. 2: Below are the collected fish species from River Panjkora

Mouth is large and eyes are moderate, dorsal lateral in position and its diameter is about 5 times larger than length of head dorsal fin. Inserted in advance of pectoral fin, adipose dorsal fins placed above anal fin. Pectoral fins are small and much shorter than head, caudal fin emarginated scales very small lateral line with 127-160 scales. In life head dorsal and side of body steel blue, a brilliant red or purplish band along flanks and black spots scattered over body above lateral line, extending as a dorsal and caudal fin; sides for the body often a rainbow iridescence and fin slightly pinkish. Color of male;

particularly in spawning season is very grayish black and a rich mauve luster in female paler. Distribution is in California, India and Sirilanka, USA, Europe, Australia, Antarctica, KPK and Azad Kashmir.

**Comparisons of Morphological Measurements of Fish:** Morphological measurements of the fish collected in the survey carried out in River Panjkora during February-May 2012 and were compared with each other. Comparison of total length revealed in Table 1 i.e.; *Schizothorax esocinus*, 14.6 cm, *Racoma labiata* 16.1 cm,

Table 2: Comparison of morphological measurement of fish collected in the present survey

Length(cm)	<i>S. esocinus</i>	<i>R. labiata</i>	<i>O. plagiostomus</i>	<i>C. diplocheilus</i>	<i>B. pakistanicus</i>	<i>C. punctatus</i>	<i>O. mykiss</i>
Total length	14.6	16.1	17	10.6	9.7	11.8	17.5
Fork length	13.1	15	16.1	9.5	8.9	9.4	16.5
Standard length	11.9	13.8	14.2	8.9	8.1	10.6	15
Head length	2.7	3.2	3.5	3.2	1.7	3.1	3.9
Pre dorsal length	6.7	7.5	7.7	4.5	4.8	3.8	7.8
Post dorsal length	06	4.8	7.5	4.2	2.7	6.3	6.7
Body depth	3.3	0.3	3.7	2.3	2.1	1.9	05
Body width	03	2.4	2.8	1.3	1.7	2.3	3.1
Eye diameter	1.1	0.9	01	0.5	0.6	0.8	1.1
Snout length	1.2	1.1	1.3	0.3	0.5	0.5	1.1
L. Caudal peduncle	2.2	2.9	2.8	02	1.9	0.1	0.3

\*All morphological measurements in cm.

Table 3: Comparison of fin rays of the fish counted during identification in the present survey

Fin rays	<i>S.esocinus</i>	<i>R.labiata</i>	<i>O.plagiostomus</i>	<i>C.diplocheilus</i>	<i>B.pakistanicus</i>	<i>C.punctatus</i>	<i>O. mykiss</i>
Dorsal fin rays	4/8	4/8	4/8	3/8	2/7	29/32	4/10
Anal fin rays	3/5	3/5	3/5	2/5	2/10	21-23	3/10-11
Pectoral fin rays	20	20	No	14-15	15	15-17	No
Caudal fin rays	19	19	19	19	19	12	No

\*All fin rays measurements in cm

Orienus plagiostomus 17 cm, Crossocheilus diplocheilus 10.6 cm, Barilius pakistanicus 9.7 cm, Channa punctatus 11.8 cm, Oncorhynchus mykiss 17.5 cm, respectively. Comparisons of standard length was determined and compared which were, 11.9 cm, 13.8 cm, 14.2 cm, 8.9 cm, 8.1 cm, 10.6 cm, 15 cm. comparison of fork length revealed, 13.1 cm, 15 cm, 16.1 cm, 9.5 cm, 8.9 cm and 16.5 cm, respectively. Comparison of head length was determined and compared which were, 2.7 cm, 3.2 cm, 3.5 cm, 3.2 1.6 cm, 1.7 cm, 3.1 cm, 3.9 cm, respectively. Comparison of body depth was, 3.3 cm, 0.3 cm, 3.7 cm, 2.3 cm, 2.1 cm, 1.9 cm and 05 cm, respectively. Comparison of body width was determined, 03 cm, 2.4 cm, 2.8 cm, 1.3 cm, 1.7 cm, 2.3 cm, 3.1 cm, respectively. Comparison of pre-dorsal length was determined, 6.7 cm, 7.5 cm, 7.7 cm, 4.5 cm, 4.8 cm, 3.8 cm, 7.8 cm, respectively. Comparison of post-dorsal length was determined, 06 cm, 4.8 cm, 7.5 cm, 4.2 cm, 2.7 cm, 6.3 cm, 6.7 cm, respectively. Eye diameter were also determined which shows i.e. 1.1 cm, 0.9 cm, 01 cm, 0.5 cm, 0.6 cm, 0.8 cm, 1.1 cm, respectively. Snout length was determined which shows i.e. 1.2 cm, 1.1 cm, 1.3 cm, 0.3 cm, 0.5 cm, 0.5 cm, 1.1 cm, respectively. Comparisons of the length of caudal peduncle were i.e. 2.2 cm, 2.9 cm, 2.8 cm, 02 cm, 1.9 cm, 01 cm and 03 cm, respectively.

**Comparisons of the Fin Rays of Fish:** Fin rays were counted and compared during identification in the survey carried out in River Panjkora during February-May 2012. The dorsal fin rays comparison shows in Table 3 i.e. 4/8,

4/8, 4/8, 3/8, 2/7, 29/32, 4/10, number of rays respectively. The anal fin rays comparison shows i.e. 3/5, 3/5, 3/5, 2/5, 2/10, 21-23, 3/10-11, respectively. Comparison of pectoral fin rays revealed that, 20, 20, 14-15, 15, 15-17, number of rays respectively. Comparison of caudal fin rays shows i.e. 19, 19, 19, 19, 19, 12, number of fin rays respectively.

## DISCUSSION

Seven fish species were collected from River Panjkora and its tributaries in the months of February-May 2012. These are *S. esocinus*, *R. labiata*, *O. plagiostomus*, *C. diplocheilus*, *B. pakistanicus*, *C. punctata* and *O. mykiss* and in all these the only 1 species which is collected from far areas of Dir (Upper) Kalkot fish hatchery which is *O. mykiss*. According to my observation during the study *O. mykiss* is only restricted to Kalkot Kohistan areas. It becomes absent in River Panjkora below Sheringal Kohistan, because these are cold water fish.

According to Negi [16] temperature of cold water fish largely range from (0-20 °C) and the optimum temperature of (10-20 °C). However in the given fish collection of some species are absent and may be regarded as escaped species. These escaped species were already shown by many students in their research work. In the escaped species *P. sophore*, *M. armatas* *S. alepidota*, *P. ticto* and *B. modestus* are included. The fish fauna of River Panjkora is similar to that of Bajur agency and River Swat.

By Rahman [17] explored 9 species from different streams of Bajour agency. These species were *C. punctata*, *P. ticto*, *M. armatus*, *T. nazeeri*, *B. vagra*, *S. plagiostomus*, *C. latius*, *N. pakisticus* and *S. punjabensis*. The present collection matches only a single species that is *C. punctata*.

Ahmad [18] reported the fish fauna of River Swat. The fish fauna of River Panjkora is nearly similar to River Swat. These two rivers join each other at Chakdara. The fish reported by Ahmad were *B. pakisticus*, *C. auratus*, *C. diplocheilus*, *C. punctata*, *C. gachua*, *M. armatus*, *G. gotyla*, *G. reticulatum*, *G. stocki*, *G. punjabensis*, *O. plagiostomus*, *P. sophore*, *P. conchoniuis*, *P. chola*, *R. labiata*, *S. alepidota*, *T. macrolepis* and *Triploghysa naziri*. In the present survey of fish collection only 5 species are matches to that of Ahmad collection viz; *B. pakisticus*, *C. punctatus*, *R. labiata*, *C. diplocheilus* and *O. plagiostomus*.

The fish fauna of Bajour agency was reported by Khan [19] 11 species. *B. pakisticus*, *B. modestus*, *P. ticto*, *P. conchoniuis*, *C. gachua*, *C. punctatus*, *C. diplocheilus*, *C. auratus*, *M. armatus*, *G. punjabensis* and *Schistura alepidota*. In the present collection only 3 species *C. punctatus*, *C. diplocheilus*, *B. pakisticus*, matches to his reported species.

Muhammad [20] studied the fish fauna of River Panjkora. He reported 11 species from different regions. These include *S. esocinus*, *R. labiata*, *O. plagiostomus*, *C. diplocheilus*, *G. gotyla*, *B. pakisticus*, *C. auratus*, *C. punctata*, *O. mykiss*, *Gagata cenia* and *G. punjabensis*. In the present collection 7 species matches to his reported species e.g., *S. esocinus*, *R. labiata*, *O. plagiostomus*, *C. diplocheilus*, *B. pakisticus*, *C. punctata* and *O. mykiss*. The absence of some species in the present survey is due to certain environmental factors like too hot or cold temperature and water pollution. In aquatic environment temperature plays a vital role and certain organisms including fish are sensitive to water temperature. Water temperature influences the rate of metabolism and growth rate.

The fish fauna of River Panjkora belongs to Class; Telostomi sub class; Actinoptergi Orders; Salmoniformes, Siluriformes and three families viz; Cyprinidae, Channidae, Salmonidae. Among these families Cyprinidae is the richest one which is represented by 5 species viz; *S. esocinus*, *R. labiata*, *B. pakisticus*, *O. plagiostomus*, *C. diplocheilus* and family Channidae is represented by single species that is *C. punctata*. Family Salmonidae

is shown by 1 species *O. mykiss*. In this collection *S. esocinus* and *R. labita* has been collected in very large number. During the study some physical parameter like Velocity (V) of water was measured which was 0.9473 m/sec.

## CONCLUSION

Following conclusions were made after comprehensive study of fish fauna of River Panjkora, Dir Lower during February-May, 2012. During the present study seven species were collected. The collected fish species were preserved, identified and labelled. Minimum fish species were collected, which belong to families: Salmonidae and Channidae. Maximum fish species collected belong to family: Cyprinidae. Widely distributed fish species were; *S. esocinus* and *R. labita*. During the study *O. mykiss* was collected from far area of Kalkot Kohistan.

**Recommendations:** Following suggestions were recommended for concerned authorities for conservation of fish fauna of River Panjkora, District Dir Lower. After discussion with officials related to fisheries such as World Wide Fund (WWF) for Nature, Environmental Protection Society (EPS), several NGOs and fisheries department, following recommendations are made. Fish habitats destruction should be avoided. It means that water pollution should be controlled. Small size nets should be not used because fingerlings are captured which decrease fish population. Washing of automobile and clothes near bank of river should be avoided which causes water pollution. Rules and laws should be refined and they should be implemented in its true spirit for fish conservation. Seminars and workshops should be arranged in Schools, Colleges and Universities to aware teachers and students about the importance of fish and their conservation. Training programs should be arranged for professional fisherman and local watchers. For conservation of natural fish resources, the hatcheries of local fish species should be developed. Hatcheries may provide seedlings to fish farmer as well as to natural water resources. Deforestation is another important problem which causes soil erosion; water becomes muddy which creates hurdle in vision and also block gill filament. To control deforestation plantation is necessary on the banks of river and catchments areas. Grazing should also be avoided on the bank of rivers which increase soil

erosion. Standardized Nets should be used to minimize the capturing of small fish. People should be motivated for fish and biodiversity conservation. Professional fishermen should be convinced not to capture brooder which reduce the fish population. Government should pay attention to fish culture and establishment of small dams in the areas. Illegal and inhuman fishing techniques such as dynamiting poisoning and electrocuting should be avoided for fish capturing.

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