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Exploring the diversity, physiochemical analysis and morphometric measurement of fish fauna of Khudo Khail stream District Buner Pakistan

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Abstract--The aim of this research to investigate the diversity, physiochemical analysis, and morphometric measurement of fish fauna of Khudo Khail stream District Buner Pakistan. The present study was conducted on the Khudo Khail stream District Buner during the period of October 2019 to October 2020 to explore the fish fauna of Khudo Khail stream. The study was conducted in 7 different localities in Khudo Khail stream that is Bato, Kalaan, Dambaray, Dhandar, Baba Berr, Qasam Khail and Totalai. During the study 94 specimens were together from the collection points. The collections were taxonomically treated in the result of 9 species of fish under 5 orders, 6 families and 9 genera. The species were *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Cyprinus carpio* (Linnaeus, 1758), *Channa punctata* (Bloch, 1993), *Cyprinion watsoni* (Day, 1872), *Mystus bleekeri* (Francis Day, 1877), *Oreochromis mossambicus* (W. K. H. Peters, 1852), *Pinctus ticto* (Hamilton, 1822), *Wallagu attu* (Bloch and Schneider, 1801) and *Matacembelus armatus* (Lacepede, 1800). The water quality parameters of the Khudo Khail stream were also analyzed and were found to be suitable for the survival of the fish fauna. It was found that the fish fauna of Khudo Khail stream is very rich. The family Cyprinidae was dominant in Khudo Khail stream. During the research also studied the morphometric measurement and the different parameters.

Keywords--diversity, fish, fauna, Khudo Khail, stream, district buner, KP.

Introduction

Fishes are cold blooded animals among the vertebrates which having gills for breathing and fins for swimming which live under water to get oxygen, food, shelter and support for the movement in search of other biological activities¹⁻⁶. Fishes are cold blooded aquatic vertebrates which breathe with the help of pharyngeal gills, propelling and balancing themselves by means of fins⁷⁻⁹. Fishes are the one important group of vertebrates that influences the life of human in various ways. Fishes are the rich source of food and provide meat, several by-products such as fish meal, fish glue, fish oil, etc. fish diet provides proteins, fat, vitamins A, B and D, minerals like Ca (Calcium), Mg (Magnesium), P (Phosphorus), Na (Sodium), Fe (Iron), I (Iodine) etc. Fishes have good taste and are very easily digestible and have growth promoting value¹⁰⁻¹⁴. Fishes are one of the most significant groups of vertebrates that assist humans in a variety of ways and are found in almost every region of the world. They may vary in quantity and quality, but man uses them everywhere.

The oceans cover one-third of the earth's surface. Almost all fish, both freshwater and marine, can be eaten and are a significant source of protein. A great supply of protein can be found in fresh fish meat. For human intake, this protein has a reasonably high level of biological, growth-promoting value. Studies on nutrition have shown that fish proteins are superior to milk, cow protein, and egg albumen and are in the same class as chicken proteins¹⁵⁻¹⁶. Fisheries are important for

producing food, but they are also a major source of money and work for people worldwide. It means that fisheries also play a very great role in the economy of every country¹⁵. About 400,000 people are employed directly by the fishing industry in Pakistan, while another 600,000 work in supporting sectors. Pakistan's maritime and inland waters host a wide variety of aquatic species due to its 1046 kilometers of coastline. Fish, crustaceans, and mollusks of various species are part of the aquatic diversity. Pakistan's marine fishing industry is crucial to the country's economy¹². Fish exhibit a wide range of morphologies. The largest bony fish in the world is the ocean sunfish (*Molamola*), which can weigh up to 2,235 kg and is found in all tropical and subtropical waters. Adult Gobies (*Pandaka pygmae*) can be as small as 8 mm, while the whale shark, *Rhincodontypus* (Smith, 1828), can reach a maximum length of 12 m. They are present practically everywhere there is water, including all seas, rivers, canals, lakes, dams, ponds, and lakes¹⁴. Fishes show the greatest biodiversity of the vertebrates with over 22,000 species. Out of these, approximately 58 percent are marine, 41 percent are freshwater species, and 1 percent move back and forth between marine and freshwater. As estimated, marine fishes are the most diverse because saltwater covers 70 percent of the earth. Only 1 percent of the earth is covered by freshwater. This small area is home to 8,000 species of freshwater fishes. Fish comprise half of the total number of vertebrates in the world and live in almost all water habitats.

A total of 8,411 freshwater fish species have been reported throughout the world, out of these 930 species live in freshwater aquatic system of India. India is one of the extra-large biodiversity countries in the world and occupies the ninth position in terms of freshwater extra-large biodiversity⁴. In Pakistan there are about 180 species of fishes are reported to exist in freshwaters, including representatives from important groups such as Loaches, Carps and Catfish. There are 28 fish species listed as inhabiting cold waters of Pakistan. Most of the snow trout are restricted to the Trans-Himalayan Region of the Indus system. The famous game fish *Tor putitora* (F. Hamilton, 1822) and *Schizothorax plagiostomus* (Heckel, 1838) are becoming rare due to overfishing and the disappearance of spawning grounds, submerged by reservoirs such as Tarbela and the Ghazi Barotha¹⁵. In India, there are around 2500 species of fish, of which 930 are freshwater and 1,570 are marine. India is a global resource hub. India has 742 freshwater fish species organized into 233 genera, 64 families, and 16 orders. Fish species number 2546 and are divided into 969 genera, 254 families, and 40 orders. Devi and Indra (2012) documented an inventory of 667 freshwater fish species of India¹.

Freshwater fish fauna of Pakistan contains 179 species belonging to 82 genera, 26 families, 10 orders, 5 super orders and 3 cohorts. There are 28 fishes recorded which inhabits in the cold water habitats of Pakistan. Fish diversity is usually called Ichthyo-diversity which is referred to the variety of fish species. In Pakistan majority of fishes belongs to family Cyprinidae inhabitants, which inhabitant in the riverine environment. Fishes of the family Cyprinidae are considered highly valuable to its commercial and economic importance in Pakistan¹⁷⁻¹⁹. Saeed *et al* 2013 studied the fish fauna of river Barandu district Buner, who recorded total 11 species under 3 orders and 4 families. The reported Species were *Tor putitora* (F. Hamilton, 1822), *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Triplophysa naziri* (Ahmad and Mirza, 1963), *Crossocheilus latius* (Hamilton, 1822),

Schizothorax plagiotomus (Heckel, 1838), *Channagachua*(Hamilton, 1822), *Gara gotyla* (J. E. Gray, 1830),*Glyptothorax punjabensis*(Mirza and Kashmiri, 1971), *Matacembelus armatus* (Lacepede, 1800),*Schistura punjabensis* (Hora, 1923) and *Puntius sophore* (F. Hamilton, 1822)¹⁵.Din and his worker carried out study at river Chamla and reported seven species. These species were *Garagotyla*(J. E. Gray, 1830), *Puntiussophore*(F. Hamilton, 1822), *Tor putitora* (F. Hamilton, 1822),*Channa gachua*(Hamilton, 1822),*Matacembelus armatus* (Lacepede, 1800), *Schisturapunjabiansis*(Hora, 1923)and *Barilius pakistanicus* (Mirza and Sadiq, 1978) belonging to seven genera and four families namely Cyprinidae, Chilidae, Metacembelidae and Nemachilidae⁹.The current research was performed to investigate the ichthyofauna of Khudo Khail stream Buner District, Pakistan.

Materials and Methods

In Pakistan's Khyber Pakhtunkhwa province, District Buner is located between 34° 11° and 34° 43° North Latitude and 72° 13° and 72° 45° East Longitude. With a total area of 1865km² and a population of 897,319 people, this district is flanked by Swat on the north, Malakand Agency on the west, Mardan on the south, and Hazara Division on the east. Mountains slopes and plain, undulating plains make up District Buner. Lower elevation areas are simple and undulating, while higher elevation areas are mountain slopes with bare rocks. Seasonal streams are the District's primary source of water¹. Buner district is further subdivided into 6 Tehsils

- Daggar Tehsil
- Gagra Tehsil
- Gadezai Tehsil
- Mandanr Tehsil
- Chagharzi Tehsil
- Khudo Khail Tehsil

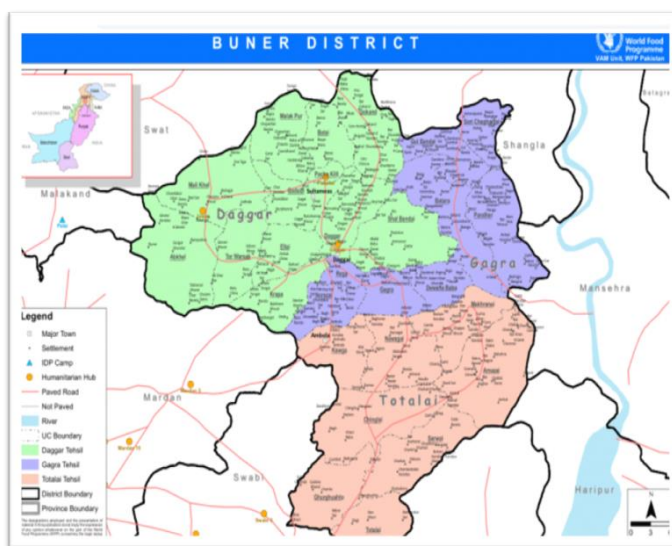


Fig 3.1. Map of District Buner¹³

Map of Khudo Khail stream



Fig 3.3. Map of Khudo Khail Stream¹²

Sampling Methodology

Fish Sampling

The fish were caught using a variety of tools, including cast nets, hand nets, gill nets, hook and hook nets, and dragon nets. Other tools used in the catch included a pH meter (HANNA HI 8314 Membrane pH Meter), measuring tap, digital camera (Canon Power Shot A3300 IS, 16 Mega pixel), and thermometer. To prevent species from being missed, the collection was made from various locations. After being collected, fish were gently put to death and stored in 10% diluted formalin solution. To prevent bacterial contamination, the larger fish had formalin injected into their abdomen and other body sections. The name of the location and the time of collection were written on the labels of jars containing the same species. After being collected, the fish were taken to the University of Buner's lab. Fish were measured in a variety of morphometric ways using a vernier calliper and a ruler. Petri dishes, medical gloves, forceps, tissue paper, a counting needle, a magnifying lens, and a mask were other tools used in laboratories. Through multiple taxonomic and systematic keys, fish were identified and categorized for scientific research.

Stream width

The stream's width was measured at seven distinct locations, and the average width was determined by dividing the total by seven.

Stream depth

Seven separate locations were used to gauge the depth of the water at each point. Next, the average value is divided by 7.

Temperature

HANNA HI 8314 Membrane pH Meter, a digital thermometer, was used to measure the temperature.

Water pH (Power of Hydrogen)

A digital pH meter (HANNA HI 8314 Membrane pH Meter) was used to determine the pH of the water.

Results

In the months of October 2019 and October 2020, the current study was undertaken to investigate the fish fauna of Khudo Khail stream District Buner KP. Seven separate locations—Bato, Kalaan, Dambaray, Dhandar, Baba Berr, Qasam Khail, and Totalai—were the subject of the exploration survey. 94 fish specimens were gathered for the investigation. The taxonomy of this collection showed that there are 9 species of fish in 9 genera, 5 orders, and 6 families. Fish from the Metacembelidae, Cyprinidae, Channidae, Bagridae, Cichlidae, and Siluridae families were reported. The morphometric measurement and analysis of the various Khudo Khail stream parameters were also explored during the investigation. Family Cyprinidae was predominant and was found in all locations along Khudo Khail stream during the investigation.

Table 1
Taxonomic position of species collected during study

S.NO	Order	Family	Genus	Species
1	Synbranchiformes	Matacembelus	Matacembelus	<i>Matacembelus armatus</i> (Lacepede, 1800)
2	Cypriniformes	Cyprinidae	Cyprinus	<i>Cyprinus carpio</i> (Linnaeus, 1758)
3	Perciformes	Channidae	Channa	<i>Channa punctata</i> (Bloch, 1993)
4	Siluriformes	Bagridae	Mystus	<i>Mystus bleekeri</i> (Francis Day, 1877)
5	Cichliformes	Cichlidae	Oreochromis	<i>Oreochromis mossambicus</i> (W. K . H. Peters, 1852)
6	Cypriniformes	Cyprinidae	Puntius	<i>Puntiusticto</i> (Hamilton, 1822)

7	Siluriformes	Siluridae	Wallagu	<i>Wallagu attu</i> (Bloch and Schneider, 1801)
8	Cypriniformes	Cyprinidae	Cyprinion	<i>Cyprinion watsoni</i> (Day, 1872)
9	Cypriniformes	Cyprinidae	Barilius	<i>Barilius pakistanicus</i> (Mirza and Sadiq, 1978)

***Barilius pakistanicus* (Mirza and Sadiq, 1978)**

The species was collected from collection point Dhandar. Total 9 specimens were collected. These species were found in Dhandar with the temperature of 32°C and pH of 8. These species also contain pattern of golden lines on their body.

***Cyprinus carpio* (Linnaeus, 1758)**

The species were together from collection point Dambaray. Total 9 samples were together. These species were reported in Dambaray with the temperature of 28°C and pH of 8. Their body color is brown white. These species can nurture to a maximum length of 120cm and maximum weight of over 40kg. These species have forward protruding mouth.

***Channa punctata* (Bloch, 1993)**

These species were together from collection point Baba Berr. Total 6 specimens were collected from the site. These species were reported in Baba Berr with the temperature of 31 °C and pH of 8. Their head is look like snake and local peoples do not hunt them. These species can grow up to 31cm. These species mainly carnivore. Their favorite food is other small fishes and larvae of fishes.

***Mystus bleekeri* (Francis Day, 1877)**

These species were collected from collection point Baba Berr. Total 6 samples of fish were collected from collection point. These species were mainly set up with the temperature of 31 °C and pH of 8. Local peoples do not eat them. Their body is elongated and compressed. These species mainly found in freshwater, rivers and canals. Its maxillary barbels long up to anal fin.

***Oreochromis mossambicus* (W. K. H. Peters, 1852)**

These species were collected from all collection site. From collection point Qasam Khail 25 specimens were collected and total number of 47 samples were together. These species mainly set up with the temperature of 32 °C and pH of 7. Their color is from black to slight white and most dominant species. Owing to the human introductions, it is now originate in many tropical and subtropical habitats around the world.

***Wallagu attu* (Bloch and Schneider, 1801)**

These species were collected from collection point Totalai. Total number of 3 samples were recorded. These species were reported from Totalai with the

temperetaure of 33 °C and pH of 8. Their body color is black brown. These species can reach a total length of 1m.

***Puntius ticto* (Hamilton, 1822)**

These species were collected from point Bato. Total number of 7 species were togathered from the sample point. These species were found in the temperature of 29 °C and pH of 7. These species were recorded in the month of April. These pecies are silver and gold with two black spots. These species grow up to 10cm in length.

***Cyprinion watsoni* (Day, 1872)**

These species were collected from collection point Dambaray. Total number of 10 species were crecorded from the point. These species were found in the temperature of 28 °C and pH of 8. These species were recorded in the month of September. These species contain 10 dorsal soft rays, 4 dorsal spines and 7 anal soft rays.

***Metacembelus armatus* (Lacepede, 1800)**

These species were collected from point Kalaan. Total number of 2 species were collected from collection point. The species is mostly reported with pH of 8 and 29 °C temperature in the month of May. These are long alongated fish, that has a snake like body without pelvic fins. Its anal and dorsal fins are alongated, and are connected to the caudal fins.

Collection of fishes from each point

In the recent study total number of 94 specimens were together which belonging to different order and families. The maximum specimens were collected from collection site Qasam Khail because it is the mid part of Khudo Khail stream which near to the road side and peoples here stricly follow rule and regulation of hunting of fish. The particulars of the reported fishes from different sites are given below.

Table 2
Table showing reported species of fishes from each site

S.No	Point name	Frequency	Percentage
1	Bato	9	9.57%
2	Kalaan	5	5.3%
3	Dambaray	24	25.53%
4	Dhandar	10	10.63%
5	Baba Berr	14	14.89%
6	Qasam Khail	25	26.59%
7	Totalai	7	7.44%
	Total	94	100%

Dominant species of each collection point of Khudo Khail stream District Buner

During the study the dominant species were *Oreochromis mussambicus* (W. H. K. Peters, 1852). The species were recorded from all sample points. While the *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Cyprinion watsoni* (Day, 1872) and *Puntius ticto* (Hamilton, 1822), were dominant species at Bato, Dambaray and Dhandar. The particulars of fish species recorded from each sample points are given under the table 3.

Table 4.3
Table showing dominant fish species from each collection point

S.No	Spot name	Latitude	Longitude	Leading species
1	Bato	34°31'06" N	72°56'58" E	<i>Puntius ticto</i>
2	Kalaan	34°31'37" N	72°53'21" E	<i>Oreochromis mussambicus</i>
3	Dambaray	34°31'18" N	72°50'40" E	<i>Cyprinion watsoni</i>
4	Dhandar	34°27'25" N	72°52'62" E	<i>Barilius pakistanicus</i>
5	Baba berr	34°27'25" N	72°52'62" E	<i>Mystus bleekeri</i>
6	Qasam khel	34°22'76" N	72°51'62" E	<i>Oreochromis mussambicus</i>
7	Totalai	34°20'98" N	72°50'74" E	<i>Wallagu attu</i>

Special water parameters of the same points in Khudo Khail stream District Buner

The recent study was conducted in Khudo Khail stream. This stream covers up most of the area and passing through many villages and finally falls into the river of Abaseen Swabi. The Khudo Khail stream the width and depth varies on each point. The average width and depth were calculated at each collection points. The details of the depth and width of each collection point is listed below table 4.

Table 4
Showing average depth and width of the collection sites

S.No	Point name	Latitude	Longitude	Average Depth	Average Width
1	Bato	34°31'06" N	72°56'58" E	2 Meter	6 Meter
2	Kalaan	34°31'37" N	72°53'21" E	0.24 Meter	4 Meter
3	Dambaray	34°31'18" N	72°50'40" E	1 Meter	5 Meter
4	Dhandar	34°27'25" N	72°52'62" E	1.5 Meter	19 Meter
5	Baba Berr	34°27'25" N	72°52'62" E	1 Meter	8 Meter
6	Qasam Khail	34°22'76" N	72°51'62" E	0.18 Meter	11 Meter
7	Totalai	34°20'98" N	72°50'74" E	4 Meter	9 Meter

Temperature of Water

In the recent study the temperature of water was calculated in the month of June which was reported unpredictable. The particulars of the temperature of each collection point are given below the figure 4.10

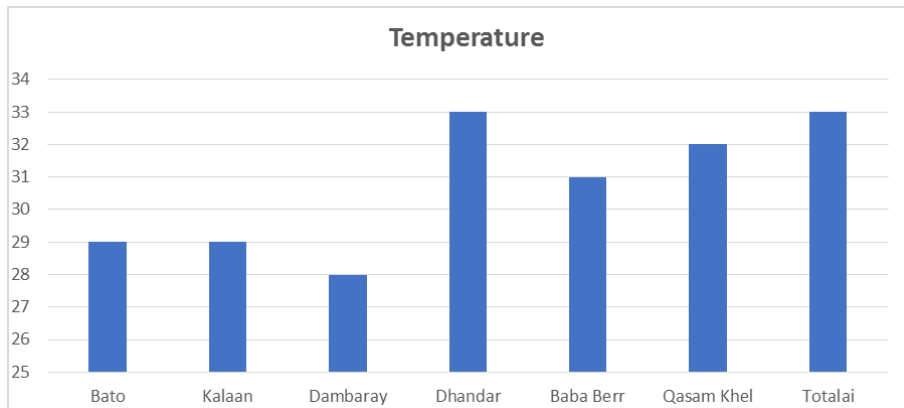


Fig 4.10. Statistical study of temperature of each sample point

Water pH

In the current research the pH of each sample point was recorded. The pH was appropriate for fish. The details of pH rate of each point are given below the figure 2.

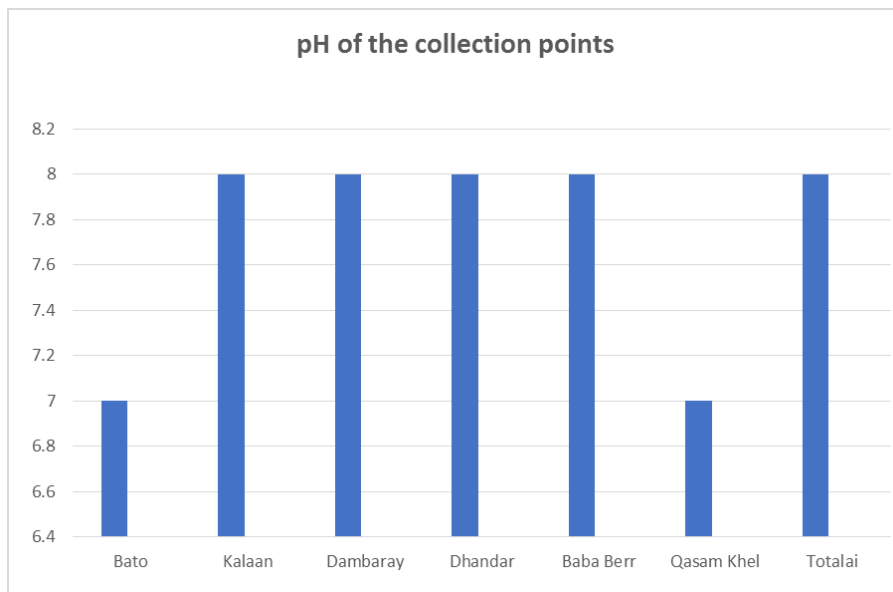


Fig 02. Table showing pH of each sampling points

Fish Morphometry

During the current study fishes were collected of different sizes. The large fish collected was *Metacebelus armatus* (Lacepede, 1800) and the smallest fish reported was *Puntius ticto* (Hamilton, 1822). The morphometry of collected fishes are given below the table 5.

Table 5
Morphometric measurement of fish collected during study Khudo Khail stream

S.No	Species	Total length	Standard length	Fork length	Postorbital length	Head length
1	<i>Metacembelus armatus</i>	41.5 cm	24.1 cm	39.5 cm	31.5 cm	3.2 cm
2	<i>Puntius ticto</i>	7.8 cm	7.2 cm	8.2 cm	6.5 cm	1.2 cm
3	<i>Cyprinion watsoni</i>	15.1 cm	12.5 cm	14 cm	10.3 cm	2.7 cm
4	<i>Cyprinus carpio</i>	15.3 cm	12.1 cm	13.1 cm	8.7 cm	2.8 cm
5	<i>Barilius pakistanicus</i>	9.7 cm	8.9 cm	7.1 cm	6.6 cm	2.1 cm
6	<i>Mystus bleekeri</i>	16.1 cm	11.4 cm	13 cm	6.7 cm	1.5 cm
7	<i>Channa punctata</i>	9.2 cm	8.1 cm	8.9 cm	7 cm	2.2 cm
8	<i>Oreochromismossambicus</i>	17.5 cm	14.2 cm	14.8cm	31.6 cm	4.9 cm
9	<i>Wallagu attu</i>	9.2 cm	8.4 cm	9 cm	8 cm	2.6 cm

Discussion

During the current study, 9 fish species were reported from Khudo Khail stream District Buner. These species belonging to 5 orders, 6 families and 9 genera. The orders are Cypriniformes, Perciformes, Siluriformes, Cichliformes and Synbranchiformes. These fish species are *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Cyprinus carpio* (Linnaeus, 1758), *Channa punctatus* (Bloch, 1993), *Cyprinion watsoni* (Day, 1872), *Mystus bleekeri* (Francis Day, 1877), *Oreochromismossambicus* (W. H. K. Peters, 1852), *Pinctus ticto* (Hamilton, 1822), *Wallagu attu* (Bloch and Schneider, 1801) and *Matacembelus armatus* (Lacepede, 1800). In the rivers of Southern Western Ghat, total of 64 species, belonging to 6 orders, 14 families and 31 genera were reported. The order Cypriniformes was found dominant belonging 3 families, 18 genera and 49 species (76.6%) as similar to the other orders⁶. The recent survey was performed to explore the diversity of ichthyofauna of Khudo Khail stream District Buner. In the recent survey the family of Cyprinidae was dominant.

While the species which reported rare are *Matacembelus armatus* (Lacepede, 1800), *Mystus bleekeri* (Francis Day, 1877) and *Channapunctatus* (Bloch, 1993). The most dominant species recorded were *Oreochromis mossambicus* (W. H. K. Peters, 1852). In the inland waters of Telangana state, 165 species of fishes belonging of 11 orders and 29 families. Order Cypriniformes were most dominant group represent by 96 species followed by Siluriformes, Perciformes, Beloniformes, Cyprinodontiformes, Synbranchiformes, Osteoglossiformes and Anguilliformes. Among the families Cyprinidae was the most dominant family followed by the Bagridae¹⁰. Similarly in the recent study, we reported total of 9 fish species which belonging to 5 orders and 6 families. Order Cypriniformes were most dominant group represented by 4 species. These species were *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Puntius ticto* (Hamilton, 1822) *Cyprinus carpio* (Linnaeus, 1758), and *Cyprinion watsoni* (Day, 1872). The fish fauna of Manglawar Valley, Swat Khyber Pakhtunkhwa, Pakistan and recorded a total number of 18 fishes belonging to 3 orders and 3 families.

These species were *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Bariliusvagra* (Hamilton, 1822), *Cirrhinusmrigala* (Hamilton, 1822), *Crossocheilusdiplocheilus* (Heckel, 1838), *Garra gotyla* (J. E. Gray, 1830), *Cyprinuscarpio* (Linnaeus, 1758), *Glyptothoraxcavia* (Hamilton, 1822), *Glyptothorax sufii* (K. Asghar Bashir and Mirza, 1975), *Labeorohita* (Hamilton, 1822), *Glyptothorax punjabensis* (Mirza and Kashmiri, 1971), *Mastacembelus armatus* (Lacepede, 1800), *Puntius sophore*, *Rasboradaniconius* (Hamilton, 1822), *Salmophasiabacaila* (Hamilton, 1822), *Salmophasia punjabensis* (Day, 1872), *Schizothorax plagiostomus* (Heckel, 1838), *Tor macrolepis* (Heckel, 1838) and *Tor putitora* (F. Hamilton, 1822). The dominant family was family Cyprinidae¹. A fish survey was carried out in the river Swat locally called river Khiali was determine, that flows through district Charsadda Khyber Pakhtunkhwa, and reported a total of 13 fish species belonging to 4 orders and 7 families. Cyprinidae family was the dominant family of recent survey.

The fish species collected are below as *Bariliusvagra* (Hamilton, 1822), *Puntius sophore* (F. Hamilton 1822), *Cirrhinusmrigala* (Hamilton, 1822), *Gagatapakistanica* (Mirza, Parveen and Javed, 1999), *Tor macrolepis* (Heckel, 1838), *Carassiusauratus* (Linnaeus, 1758), *Glyptothoraxcavia* (Hamilton, 1822), *Glyptothoraxsufii* (K. Asghar Bashir and Mirza, 1975), *Mystusbleekeri* (Francis Day, 1877), *Clupisomanaziri* (Mirza and M. I. Awan, 1973), *Channapunctatus* (Bloch, 1993), *Ompokpabda* (Hamilton, 1822) and *Mastacembelus armatus* (Lacepede, 1800)¹³. In the recent exploration the fish fauna of Khudo Khail stream District Buner *Mystus bleekeri* (Francis Day, 1877), *Matacembelus armatus* (Lacepede, 1800) and *Channa punctatus* (Bloch, 1993), were reported from Baba Berr and Kalaan points. A survey was conducted to investigate Ichthyofauna of River Indus at Hazara region Khyber Pakhtunkhwa, Pakistan.

They selected five sites from River Indus for fish sampling. These fish sampling sites were Dasu, Pattan, Thakot, Jubda and Biliani respectively. From the Biliani maximum collection (10) of fish species was carried out while minimum collection (12) was done from Thakot site. Collectively 26 species of fishes were recorded from all the 5 selected sites. These 26 fish species belong to 4 Orders, 8 Families and 19 Genera respectively. They accomplished that the family Cyprinidae is the dominant family among all the 8 recorded families of the fishes¹⁷. During the present study to investigate the fish fauna of Khudo Khail stream five sites were selected for collections. The fish sampling sites were Bato, Kalaan, Dambaray, Baba Berr, Qasam Khail and Totalai. The maximum collection (25) was done from Qasam Khail site. A research study was conducted at Darmai upper Swat Khyber Pakhtunkhwa and were reported 2 orders, belonging to 3 families, 5 genera and 7 species. These reported species were *Schizothorax esocinus* (Heckel, 1838), *Schizothorax plagiostomus* (Heckel, 1838), *Orienuisplagiostomus* (Heckel, 1838), *Glyptothoraxpunjabensis* (Mirza and Kashmiri, 1971), *Schisturaalepidota* (Mirza and Banarescu, 1970), *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Glyptothoarx stocki* (Mirza and Nijseen, 1978). *Schizothorax plagiostomus* (Heckel, 1838), was the dominant species in the river Darmai². In the fish fauna of river Siranthe most abundant species was *Schizothorax plagiostomus* (Heckel, 1838), 25 (33.3%) followed by *Cyprinuscarpio* (Linnaeus, 1758), 20 (26.7%) and *Crossocheilusdiplocheilus* (Heckel, 1838), 17

(24%), while the least abundant species was *Triplophysachoprai* (Hora, 1934), 11 (16%). The largest fish species was *Schizothorax plagiostomus* (Heckel, 1838), (20 cm) and the smallest fish species was *Triplophysachoprai* (Hora, 1934), (10 cm). They also concluded that the family Cyprinidae has the maximum number and Balitoridae has the minimum number of fish species⁶. In the current study of Khudo Khail stream District Buner the most abundant species was *Oreochromismossambicus* (W. H. K. Peters, 1852), 25 (26.5) followed by *Cyprinion watsoni* (Day, 1872), 10 (10.6). The largest fish species was *Matacembelus armatus* (Lacepede, 1800), (43 cm) and the smallest fish species was *Puntius ticto* (Hamilton, 1822), (7.9 cm).

Akhtar *et al.*, (2015) worked on river Chagharzi and reported total number of 7 fish species which belonging to 3 orders and 3 families, 7 genera and 7 species. These species were *Pantius spohore* (F. Hamilton 1822), *Tor putitora* (F. Hamilton, 1822), *Matacembelus armatus* (Lacepede, 1800), *Crossocheilus latius* (Hamilton, 1822), *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Schizothorax plagiostomus* (Heckel, 1838), and *Channa gachua* (Hamilton, 1822). They reported that *Glyptothorax punjabensis* (Mirza and Kashmiri, 1971), is endangered species of this area⁴. The fish fauna of river Arunai Matta Swat Khyber Pakhtunkhwa Pakistan was explored. The study reveals a total number of 20 fish species belonging to 3 orders and 4 families were recorded. These species were *Barilius modestus* (F. Day, 1872), *Cirrhinus mrigala* (Hamilton, 1822), *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Crossocheilus diplocheilus* (Heckel, 1838), *Crossocheilus latius* (Hamilton, 1822), *Cyprinus carpio* (Linnaeus, 1758), *Garra gotyla* (Gray, 1830), *Glyptothorax armeniacus* (Berg, 1918), *Glyptothorax cavia* (Hamilton, 1822), *Glyptothorax punjabensis* (Mirza and Kashmiri, 1971), *Glyptothorax sufii* (K. Asghar Bashir and Mirza, 1975), *Labeo rohita* (F. Hamilton, 1822), *Matacembelus armatus* (Lacepede, 1800), *Puntius sarana* (Hamilton, 1822), *Paraschistura sargadensis* (Nikolskii, 1900), *Puntius spohore* (F. Hamilton 1822), *Salmophasiabacaila* (Hamilton, 1822), *Salmophasia punjabensis* (Day, 1872), *Schizothorax plagiostomus* (Heckel, 1838), *Schizothorax progastus* (McCland, 1839). They reported that the dominant family was family Cyprinidae⁴. The fish fauna of River Barandu District Buner, Pakistan was explored and recorded total of 11 species which belongs to 3 order and 4 families.

These Species are *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Triplophysa naziri* (Ahmad and Mirza), *Tor putitora* (F. Hamilton, 1822), *Crossocheilus latius* (Hamilton, 1822), *Schizothorax plagiostomus* (Heckel, 1838), *Channa gachua* (Hamilton, 1822), *Gara gotyla* (J. E. Gray, 1830), *Glyptothorax punjabensis* (Mirza and Kashmiri, 1971), *Matacembelus armatus* (Lacepede, 1800), *Puntius spohore* (F. Hamilton 1822), and *Schistura punjabensis* (Hora, 1923). Minimum fish species collected belong to family Channidae while maximum fish species collected belong to family Cyprinidae¹⁴. A study was carried out at Keenjhar lake district Thatta Sindh, Pakistan and observed 51 species among them 30 species were most popular as food as well as game fishes and possess high economical value. The collected fishes include 2 exotic, 19 species belonging to family Cyprinidae, 6 species belonging to family Bagridae, 4 species belonging to family Channidae, 3 species belonging to family Mastacembelidae, 2 belonging to each family Clupeidae, family Notopteridae, family Siluridae, family Schilbeidae, family Chandidae, family Nandidae and family Belontiidae, 1 specie belonging to family

Gobidae, family Claridae, family Heteropneusitidae, family Belonidae and family Cichlidae⁹. Look into the fish fauna in the River Dor at the Dobandi site in Pakistan's Khyber Pakhtunkhwa.

The recognized fish species fall into the Actinopterygii class, the Cypriniformes Order, the Synbranchiformes Order, the Suliformes Order, the Cyprinidae Family, the Siluridae Family, the Bagridae Family, the Mastacembelidae Family, the five genera, and the five species, respectively. They found that the Cyprinidae family has the most species, with two species representing it, compared to one species for each of the Siluridae, Bagridae, and Mastacembelidae families in their study¹⁶. The Cyprinidae family had the most species during the current investigation of the Khudo Khaile stream District in Buner, while the Siluridae, Bagridae, and Mastacembelidae families each had only one species. Compared to their morphology, fish variety is more obvious. Fish can be very small or very huge; for example, mature gobies can be as small as 8 mm, while the whale shark *Rhincodontypus* (Smith, 1828) can grow up to 12 m. Others are strongly armored or have adaptations for producing sound, venome, electricity, or light, while some species lack eyes, scales, or fins.

To investigate variables impacting the structure of the fish community, studies of geographical and temporal patterns of diversity, distribution, and species composition of freshwater fishes are helpful¹. During our study we found that in Khudo Khaile stream of District Buner every size of fishes were present. During the study the smallest fish collected were *Puctius ticto* having total length 7.9cm and the largest fish collected was *Matacembelus armatus* having total length of 43cm. The reported pH (Power of Hydrogen) and temperature of different collections points of river Darmai upper Swat. The temperature of water at collection point Sakhra was 18-25°C and pH was 6.8, temperature of water at collection point Darmai was 18-25°C and pH was 7.2 and temperature of water at collection point Kalakot was 16-22°C and pH was 7.0.² The River Chamla's temperature and pH (power of hydrogen) were calculated by Din *et al.*, (2016) temperatures between 17 and 25 °C. Because most of the water at Khanano Derai's gathering site comes from chilly, snow-covered highlands like the Malka highlands, the temperature there was low.

At various times of collection, the pH of the water was also determined and ranged from 7.2 to 7.9. In comparison to the lower section of the river Chamla, the pH is higher at the collection locations Agarai, Kawga, Nawagai, and Janga. The collection location Gatto Kandaw, which has a pH of 7.2, recorded the lowest pH, and the collection point Kawga, which has a pH of 7.9, recorded the highest pH⁸. During our study we calculated the temperature and pH (Power of hydrogen) of each collection point which varies. The temperature range between 29-33°C while the pH range between 7- 8. The highest temperature was recorded at point Totalai which was 33°C. Reported the temperature and pH (power of hydrogen) of river Chagharzi.³ The temperature ranges from 20-30°C. While the pH value was in range from 7.8-8.5. Water temperature of River Barandu ranges between 15 to 25°C⁵.

Conclusion

It was concluded that the present study reveals a total of 9 fish species were reported from Khudo Khail stream District Buner. These species belonging to 5 orders, 6 families and 9 genera. The orders are Cypriniformes, Perciformes, Siluriformes, Cichliformes and Synbranchiformes. These fish species are *Barilius pakistanicus* (Mirza and Sadiq, 1978), *Cyprinus carpio* (Linnaeus, 1758), *Channa punctatus* (Bloch, 1993), *Cyprinion watsoni* (Day, 1872), *Mystus bleekeri* (Francis Day, 1877), *Oreochromis mossambicus* (W. H. K. Peters, 1852), *Pinctus ticto* (Hamilton, 1822), *Wallagu attu* (Bloch and Schneider, 1801) and *Matacembelus armatus* (Lacepede, 1800).

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