

## Exploring Ichthyofaunal Richness and Conservation in Selected Water Bodies of Southern Khyber Pakhtunkhwa, Pakistan

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### ABSTRACT

Fish exhibit remarkable biodiversity and are distributed across a wide range of aquatic environments. Their distribution is strongly influenced by Eco physiological factors such as habitat type, nutrient availability, and other environmental conditions. In the present study, a variety of fish species were recorded from different water bodies, contributing to the documentation and conservation of the ichthyofauna of the selected regions, as well as highlighting their potential economic importance. The survey was conducted in three Districts i.e. Kohat, Karak and Bannu, all of which demonstrated considerable fish diversity. Among the recorded taxa, 14 belonged to the family Cyprinidae, followed by Cichlidae, Channidae, Siluridae, and Balitoridae, respectively. Cyprinidae is the largest fish family, comprising about 10% of all known fish species and nearly 25% of freshwater fishes. Members of this family are ecologically diverse, occupy a wide range of habitats, utilize varied food resources, and exhibit numerous adaptive traits.

**Key words:** Ichthyofauna, Fish diversity, Fresh water species, Cyprinidae, Conservation, Khyber Pakhtunkhwa.

## Introduction

Fish diversity is a key indicator for assessing the health of aquatic ecosystems and plays a crucial role in monitoring ecological changes (Zou et al., 2020). The term *ichthyodiversity* refers to the variety of fish species, and depending on the context and scale, it may also encompass genetic diversity, including alleles or genotypes within fish populations. Studying fish diversity and population stability is essential, as fish communities within aquatic habitats can fluctuate considerably from year to year.

Fish are ecologically and economically important. In addition to serving as a source of food and recreation, they contribute to biological control by preying on planktonic organisms and aquatic vegetation, thereby maintaining ecological balance. Understanding fish faunal diversity is fundamental to the sustainable exploitation of freshwater reservoirs for food and other resources (Battul et al., 2007).

Over the past few decades, fish biodiversity in many regions has declined significantly due to anthropogenic pressures, including urbanization, dam construction, water abstraction for irrigation and power generation, and pollution. These factors have severely impacted natural water bodies—particularly rivers—resulting in substantial losses in freshwater fish diversity (Pandey & Das, 2006; Kumar et al., 2011; Naik et al., 2014).

In Pakistan, knowledge of freshwater fish fauna has primarily been derived from scattered studies conducted across various regions and time periods (Mirza et al., 1975; Rafique et al., 2003). While these studies provide valuable baseline data on species distribution and diversity, they are limited in scope and often fail to comprehensively address species of particular ecological or conservation significance (Rafique et al., 2012).

## Methodology

### Ichthyofaunal Collection

Fish species were collected from southern districts including Kohat, Karak, and Bannu. The assortment was made for a season (June 2020 to September 2020). During the entire assortment various sorts of instruments were utilized for assortment. A few spaces of the dam were liked for assortment in light of essence of higher variety of fish contingent on the presence of food and some other actual properties of water appropriate for fish life (Junaid et al., 2017).

### Preservation of Collected fauna

Fishes were safeguarded in 10% formalin arrangement. Live fish were straight forwardly dropped into a major container containing formalin on the spot of assortment. Huge size fishes were infused with 37% formaldehyde answer for protect it from interior viscera and external body parts from a contamination brought about by microscopic organisms and growths (Kar et al., 2006 and Shinde et al., 2009).

## Identification of Collected fauna

Different types of taxonomical keys were used for identification and naming of the collected fishes (Yousaf et al., 2016 and Asmat et al., 2014).

## Keys Used for Fish Identification

Fishes of Punjab, Pakistan.

Freshwater fishes of the Indian region.

Pakistan main taza pani ki machlian.

## Results

### Ichthyofaunal Diversity of Southern Districts

In the current research effort, the fish fauna of District Kohat, Karak and Bannu was read for around four months (June 2020 to September 2020). During this examination period, assortment of fish was produced using distinctive water collections of these Districts. A sum of 300 fishes was gathered are summed up as follow.

### Fish fauna in different water bodies

Fresh water is a significant body owing a gigantic fauna of vertebrates including fish and there are in excess of 186 types of fish are known and further work is important to investigate more fauna. This investigation gives a base to prologue to geological appropriation of fish and other fauna. This dissemination of fish is assorted and relates with the eco-physiological variables range from environment, accessibility of supplement, etc. Various fish were recognized in various water bodies which would be venture toward the preservation of ichthyofauna of the chose regions and improvement toward our economy (Table:1,2,3 and Fig:1).

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**Figure 1: Collection of Different Fish Species from Southern Districts of Pakistan**



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**Table 1: District Karak Fish Collection Systematic Classification**

| Image Labeling | Fish                        | Order         | Family     | Genera             | species               |
|----------------|-----------------------------|---------------|------------|--------------------|-----------------------|
| <b>A</b>       | Crossocheilus diplocheilus  | Cypriniformes | Cyprinidae | Crossocheilus      | <i>C. diplochilus</i> |
| <b>B</b>       | Puntius sophore             | Cypriniformes | Cyprinidae | Puntius            | <i>P. sophore</i>     |
| <b>C</b>       | Puntius ticto               | Cypriniformes | Cyprinidae | Pethia             | <i>P. ticto</i>       |
| <b>D</b>       | Oreochromis aureus          | Cichliformes  | Cichlidae  | Oreochromis        | <i>O. aureus</i>      |
| <b>E</b>       | Cirrhinus marigala          | Cypriniformes | Cyprinidae | Cirrhinus          | <i>C. mrigala</i>     |
| <b>F</b>       | Hypophthalmichthys molitrix | Cypriniformes | Cyprinidae | Hypophthalmichthys | <i>H. molitrix</i>    |
| <b>G</b>       | Labeo rohita                | Cypriniformes | Cyprinidae | Labeo              | <i>L. rohita</i>      |

**Table 2: District Kohat Fish Collection Systematic Classification**

| Image Labeling | Fish                       | Order          | Family     | Genera                 | species               |
|----------------|----------------------------|----------------|------------|------------------------|-----------------------|
| <b>H</b>       | Channa punctata            | Anabantiformes | Chanidae   | Channa                 | <i>C. punctata</i>    |
| <b>I</b>       | Puntius sophore            | Cypriniformes  | Cyprinidae | Puntius                | <i>P. sophore</i>     |
| <b>J</b>       | Barillius vagra            | Cypriniformes  | Cyprinidae | Barilius               | <i>B. vagra</i>       |
| <b>K</b>       | Oreochromis Nilotica       | Cichliformes   | Cichlidae  | Oreochromis            | <i>O. niloticus</i>   |
| <b>L</b>       | Crossochielus diplochielus | Cypriniformes  | Cyprinidae | Crossocheilus          | <i>C. diplochilus</i> |
| <b>M</b>       | Ompok pabda                | Siluriformes   | Siluridae  | <i>Ompok</i>           | <i>O. pabda</i>       |
| <b>N</b>       | Ctenopharyngogon idella    | Cypriniformes  | Cyprinidae | <i>Ctenophryngogon</i> | <i>C. idella</i>      |

**Table 3: District Bannu fish Collection systematic classification**

| Images Labeling | Class               | Order          | Family      | Genera         | species            |
|-----------------|---------------------|----------------|-------------|----------------|--------------------|
| <b>o</b>        | Channa punctata     | Anabantiformes | Channidae   | Channa         | <i>C. punctata</i> |
| <b>p</b>        | Puntius sophore     | Cypriniformes  | Cyprinidae  | Puntius        | <i>P. sophore</i>  |
| <b>q</b>        | Barillius vagra     | Cypriniformes  | Cyprinidae  | Barilius       | <i>B. vagra</i>    |
| <b>r</b>        | Oreochromis aureus  | Cichliformes   | Cichlidae   | Oreochromis    | <i>O. aureus</i>   |
| <b>s</b>        | Aspidoparia morar   | Cypriniformes  | Cyprinidae  | <i>Cabdio</i>  | <i>A. morar</i>    |
| <b>t</b>        | Gara gotyla         | Cypriniformes  | Cyprinidae  | Garra          | <i>G. gotyla</i>   |
| <b>u</b>        | Acanthcobitis botia | Cypriniformes  | Balitoridae | Acanthocobitis | <i>A. botia</i>    |

## Family wise abundance of fishes

The family Cyprinidae is the biggest of all fish families. In excess of 2,000 individuals from the family have effectively been portrayed, addressing about 10% of all fish species on the planet, or about 25% of freshwater fish species. They are exceptionally different in territory, feed on assortment of food and have numerous adoptable components. In the current examination among every one of the detailed animal types cyprinides were tracked down the most bountiful with regards to add up to 21 species around 14 species were of family Cyprinidae followed by Chichlidae, Siluridae, Channidae and Balitoridae individually. The following huge family found was Chichlidae in the chosen regions. The fish of the equivalent word family are profoundly different freshwater having unconventional qualities. The third huge quantities of fish were found of the Chanidae family while the rest two families were observed to be less plentiful in the chosen regions. The fish distinguished in the chose region need further investigation (Fig:2).

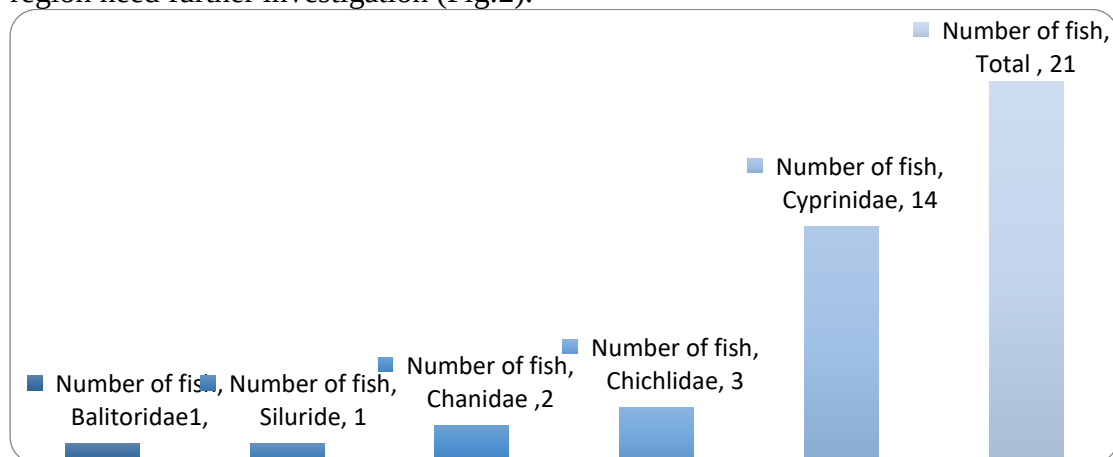


**Figure 2: Graphical representation of overall abundance of reported species**

## Morphometric analysis of collected fauna

Fish show more noteworthy morphological contrasts between the populaces and inside species than some other vertebrates. Practically all species show morphological variety inside and among populaces because of ecological and hereditary components, or as an outcome of conduct and physiological contrasts. Morphometric characters of fish are the quantifiable characters normal to all fishes. Morphomeric study is a fundamental device used to think about development and advancement of organic entities, methodical, variety and varieties and other primary qualities of fish and it has been assuming a significant part to gauge connection between different pieces of body.

(Table: 4,5,6).

**Table.4: Morphometric Measurement of Fish from District Karak**

| Fish Species                       | T.L  | S.D  | F.D  | H.L | B.D | P.D.L | PO.D.L | E.D | S.L | C.P | P.O.L |
|------------------------------------|------|------|------|-----|-----|-------|--------|-----|-----|-----|-------|
| <i>Crossocheilus diplocheilus</i>  | 14   | 11   | 12.5 | 3   | 3   | 5     | 4      | 0.5 | 2.4 | 1   | 2.6   |
| <i>Puntius sophore</i>             | 6.4  | 5    | 5.7  | 1.5 | 1.5 | 3     | 3.4    | 0.4 | 0.4 | 1   | 1.6   |
| <i>Puntius ticto</i>               | 8.0  | 6.4  | 7.3  | 1.9 | 2.3 | 3.0   | 2.1    | 0.5 | 0.5 | 1.1 | 0.9   |
| <i>Oreochromis aureus</i>          | 5    | 4    | 4.5  | 1.4 | 1.6 | 3.2   | 4      | 0.5 | 0.4 | 0.5 | 1     |
| <i>Cirrhinus marigala</i>          | 8.8  | 7.3  | 8    | 1.4 | 1.5 | 1.5   | 1.5    | 0.3 | 0.5 | 3.1 | 0.9   |
| <i>Hypophthalmichthys molitrix</i> | 15   | 12   | 13.5 | 3.5 | 3.4 | 2.9   | 1.8    | 0.4 | 1   | 2   | 2.4   |
| <i>Labeo rohita</i>                | 13.2 | 10.5 | 12.5 | 1.2 | 2.9 | 2     | 1.6    | 0.5 | 0.5 | 1.6 | 1.2   |

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**Table.5: Morphometric Measurements (c.m) of Fish from District Kohat**

| Fish Species                  | T.L  | S.D  | F.D  | H.L | B.D | P.D.L | PO.D.L | E.D | S.L | C.P | P.O.L |
|-------------------------------|------|------|------|-----|-----|-------|--------|-----|-----|-----|-------|
| Channa punctata               | 10   | 7    | 8.5  | 2.5 | 2.5 | 4     | 3      | 0.4 | 1.8 | 0.8 | 1.8   |
| <i>Puntius sophore</i>        | 5.8  | 3.2  | 4.7  | 1   | 0.9 | 2.7   | 2.8    | 0.5 | 0.3 | 0.8 | 1.5   |
| Barillius vagra               | 7.5  | 5.4  | 6.3  | 1.9 | 2.3 | 3     | 2.1    | 0.5 | 0.5 | 1.1 | 0.9   |
| Oreochromis<br>Nilotica       | 13.2 | 10.5 | 12.5 | 1.2 | 2.9 | 2     | 1.2    | 0.5 | 0.5 | 1.6 | 0.9   |
| Ompok pabda                   | 12   | 9    | 10.5 | 2.5 | 2.4 | 1.9   | 1.8    | 0.3 | 0.9 | 1.8 | 1.9   |
| Crossochielus<br>diplochielus | 10.5 | 8    | 9.4  | 1.8 | 1.8 | 3.8   | 2.9    | 3.8 | 0.7 | 1.1 | 0.6   |
| Ctenopharyngogon<br>Idella    | 10.7 | 8    | 9.6  | 1.9 | 1.9 | 3.9   | 2.6    | 3.9 | 0.8 | 1.2 | 0.8   |

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**Table.6: Morphometric Measurements (cm) of Fish from District Bannu**

| Fish Species               | T.L  | S.D | F.D | H.L | B.D | P.D.L | PO.D.L | E.D | S.L | C.P | P.O.L |
|----------------------------|------|-----|-----|-----|-----|-------|--------|-----|-----|-----|-------|
| <i>Channa punctata</i>     | 10   | 7   | 8.2 | 2   | 2   | 3.5   | 3      | 0.3 | 1.4 | 0.5 | 1.3   |
| <i>Puntius sophore</i>     | 5.4  | 4   | 4.7 | 1.2 | 1.3 | 2.8   | 2.4    | 0.3 | 0.3 | 0.8 | 1.2   |
| <i>barillius vagra</i>     | 7.0  | 5.4 | 6.3 | 1.5 | 1.3 | 2.5   | 1.8    | 0.3 | 0.3 | 0.9 | 0.6   |
| <i>Oreochromis aureus</i>  | 4    | 3   | 3.5 | 1.2 | 1.2 | 2.8   | 3      | 0.3 | 0.3 | 0.4 | 0.9   |
| <i>Aspidoparia morar</i>   | 6.8  | 5.3 | 6   | 1.4 | 1.5 | 1.5   | 1.5    | 0.3 | 0.5 | 3.1 | 0.8   |
| <i>Gara gotyla</i>         | 11.2 | 8.5 | 9.5 | 1.1 | 2.4 | 1.9   | 1.2    | 0.5 | 0.5 | 1.3 | 1.1   |
| <i>Acanthcobitis botia</i> | 5    | 4   | 4.5 | 1.2 | 1.2 | 2.8   | 3      | 0.3 | 0.3 | 0.4 | 0.9   |

## Discussion

Freshwater habitats serve as a critical living environment for fish. Numerous studies have been conducted to investigate fish diversity across various regions. Such studies are essential as they provide clear insights into species distribution and the environmental and anthropogenic factors influencing fish populations.

In the present study, various fish species were identified from different freshwater bodies. These findings contribute to the conservation of ichthyofauna in the selected regions and offer potential benefits for local economies.

Azeem et al., (2016) conducted a study aimed at exploring the fish fauna of the Bahawal Garh waterway in the Kohat district. Seasonal sampling methods similar to those used in the present study were employed. The family *Cyprinidae* was found to be the most abundant and diverse, consistent with the current findings. Haseeb et al., (2015) conducted a comparable study in the Kohat district, selecting a freshwater body from the region for sampling. Again, cyprinids were reported as the most abundant group, echoing the findings of the present research.

Similarly, Zaryab et al., (2016) examined fish biodiversity in Dandi Idhar Khel Lake, located in the Karak district of Khyber Pakhtunkhwa, Pakistan. Among the recorded species, cyprinids were dominant, aligning with the results of the present study. Hameed et al., (2017) also investigated fish fauna in the Karak region and reported that most collected specimens belonged to the family *Cyprinidae*. The importance of fish to human livelihoods was also emphasized in the work of Khan and Hasan (2011), who investigated the fish fauna of Karak district. Multiple species were collected from this region, mirroring the results of the current study.

In the present study, the fish fauna of the Bannu district was examined. This region exhibits a considerable degree of fish biodiversity, with several species identified, many of which also belong to the *Cyprinidae* family. A related study by Abbas et al., (2020) in the same district reported similar findings. The ability of fish to survive in diverse environmental conditions contributes to the high diversity observed across the water bodies of Bannu. The current investigation also revealed a strong correlation between environmental factors and fish diversity.

Finally, Asmat Ullah et al., (2014) explored aquatic life in various freshwater bodies in Bannu district. Both their research and the present study share the common objective of documenting fish diversity in the region. In both cases, the *Cyprinidae* family emerged as the most dominant, followed by other less common families.

## Conclusion

The present study revealed considerable ichthyofaunal diversity in Districts Kohat, Karak, and Bannu, with the family *Cyprinidae* emerging as the most dominant group. The high representation of *Cyprinidae* reflects their ecological adaptability and wide habitat preferences. The diversity of fish fauna in these regions indicates that further exploration is required to document additional species and understand their ecological dynamics. The findings highlight the need for systematic surveys and conservation strategies to protect the ichthyofauna of southern Khyber Pakhtunkhwa, which may also contribute to local livelihoods and the regional economy through sustainable utilization of fish resources.

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