



## Identification Of Fish Diversity, Distribution, And Fauna At Head Qadirabad, Marala And Khankis, Chenab River, Punjab, Pakistan

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### Abstract:

Surveys were conducted from October 2022 to November 2023 to evaluate the variety and distribution of fish fauna at Marala Head, Qadirabad Head and Khanki Head, which are located on the Chenab River in Punjab, Pakistan. In all, 2720 fish specimens from seven orders, seventeen families, forty-one genera, and fifty-nine species were recorded in this study. In all fishes 53 species, 39 species and 27 species were recorded in this research at Qadirabad Head, Marala Head and Khanki Head, respectively, on the Chenab River. The fish biodiversity of the regions was determined by local names, and identification from local people, fish farmers, contractors and private fishermen. Samples were classified on the Based on morphometric features, conventional keys from study areas. Twelve genera and thirteen species were contributed by the six families that representation of the order Siluriformes. Six families contributed six genera and eight species to the Order Perciformes. With one family, the Order Cypriniformes generated eighteen genera and thirty species. One family, one genus, and four species were represented by the Order Channiformes. With two genera and two species, the order Mastacembeliformes comprised a single family. The Beloniformes order had one family with one species and one genus. One genus and one species were represented by the Order Osteoglossiforms within one family. During this study, both native and invasive fish species were recorded from research areas. Invasive species in Pakistan were identified from several locations along the Chenab River during this research as *Ctenopharyngodon idella*, *Cyprinus carpio*, *Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, and *Oreochromis mossambicus* and *Oreochromis niloticus*. The native carp species in Pakistan include *Cirrhinus reba*, *Labeo rohita*, and *Cirrhinus mrigala* also identified during this study.

**Keywords:** Chenab, Marala, Qadirabad, Khanki, Fish, Fauna, Morphometric Features

### Introduction

Fish are lower vertebrates that have fins and gills and are cold-blooded. Water is mostly necessary for their survival. There are several kinds among them, and they vary in size, structure, and ecology. Fishes include about 33,000 species, making them the most varied group of vertebrates. These are identified based on several visual characters including their shape, color and head (Shah et al., 2019; Bilal, 2021). For a multitude of reasons, including physical and chemical factors, food availability, spawning grounds, water depth, clarity, and turbidity, fish are exclusively found in aquatic ecosystems (Lal et al., 2023; Ul-Hassan et al., 2021). While some species can migrate rather well, others must reside in a certain habitat all the time. The majority of animals utilized in the manufacture of meals derived from animals are fish. Fish is considered one of the healthiest foods in the universe due to its high protein, vitamin, and mineral content. It has a vital role in human nutrition and is especially important for those in developing nations (Chandio et al., 2020; Lal et al., 2023). Fish is the main source of animal protein for one billion people globally due to its flavour and taste (Iqbal et al., 2014; Lal et al., 2023). One possible source of gelatin is fish skins (Jamilah, & Harvinder, 2002). The biggest canal system of world is located in Pakistan (Altaf et al., 2014; Imran et al., 2021). Punjab province of Pakistan is home to five rivers, and the irrigation system there is made up of barrages, dams, canals, and waterways. The vegetation and wildlife of these rivers are varied (Imran et al., 2021). Pakistan's fishing regions offer a respectable standard of living together with scenic attractiveness, allure, and beauty (Khan et al., 2022; Shahzad, 2023). Punjab is a rich and dominating source of aquatic biodiversity, with several significant barrages, including Sukhar, Qadirabad, Khanki, Marala, Rasul, Taunsa, and Chashma (Iqbal et al., 2017; Muhammad et al., 2017b; Muhammad et al., 2019a; Muhammad et al., 2019b; Imran et al., 2021). The Ichthyofaunal variety found in the rivers of Punjab, Pakistan, has been the subject of several studies (Islam and Siddiqui, 1971; Mirza and Ahmad, 1987; Mirza and Khan, 1988; Khan et al., 1991; Afzal et al., 1995; Javed et al., 1997; Qazi et al., 2000; Ahmed and Mirza, 2002; Khan et al., 2008; Qadir et al., 2009; Altaf et al., 2011; Mirza et al., 2011; Iqbal et al., 2013; Hussain et al., 2015; Altaf et al., 2015; Latif et al., 2016a; Shoaib et al., 2022).

Fish belonging to the Cyprinidae family make up the bulk of the riverine fish species in Pakistan (Latif et al., 2016a; Bilal & Ullah, 2021).

The aim of the study is to determine the diversity and distribution species at Headwork Qadirabad, Headwork Khanki, Headwork Marala of Chenab River in Punjab, Pakistan.

## Material and Method

### Study Area

The Chenab River rises in the Indian state of Himachal Pradesh in the districts of Kulu and Kangra. After there, it runs into Pakistan near to the village of Diawara in the Punjab district of Sialkot. This river is around 960 kilometres long in its entirety on the Pakistani side (Latif et al., 2016a). Six link canals (Upper Chenab canal, Marala Ravi link canal, Lower Chenab canal, Rasul Qadirabad link, Qadirabad Balloki link, Trimmu Sidhnai link) and four headworks (Marala, Qadirabad, Khanki, and Trimmu) are located on the Chenab River in Pakistan (Latif et al., 2016b). Head Qadirabad is located at  $32^{\circ}20'16''$  N,  $073^{\circ}42'36''$  E, and 205 metres above sea level. Head Khanki is located at  $32^{\circ}25'07''$  N,  $073^{\circ}57'39''$  E, and 220 metres above sea level. Head Marala has an elevation of 243 metres and is situated at  $32^{\circ}38'59''$  N,  $74^{\circ}28'05''$  E. (Figure-1-3)

During the research period, a thorough sampling of these three study sites— Headwork Qadirabad, Headwork Khanki, Headwork Marala—was conducted to determine the diversity and distribution of fish species. Data was recorded every month from October 2022 to November 2023, from Headwork Qadirabad, Headwork Khanki and Headwork Marala. The fish biodiversity of the regions was determined by local names, and identification from local people, fish farmers, contractors and private fishermen. Local fishermen from the research region assisted in the collection of data on fish diversity's ecology and population state; the data was gathered throughout the entire year. The fish variety was also observed using group surveys (Tufail et al., 2023).



Figure 1 Google Map of Sampling Site (Head Qadirabad, Chenab River) of Current Study

### Identification of Fishes

Three separate regions of the River Chenab (Marala Head, Qadirabad Head and Khanki Head) supplied a total of 59 fish species. The book "Freshwater Fishes of Pakistan" was examined to identify the fish species (Mirza, 2004; Altaf, & Ab, 2021). Based on morphometric features, conventional keys (Mirza and Sharif, 1996; Mirza and Sandhu, 2007) were used to classify and taxonomic identify the collected specimens (Muhammad, Iqbal & Saleemi, 2017).



### Statistical Analysis

Data was tabulated and statistically analyzed by using relevant statistical methods (mean, standard error of mean, range). MS Office (MS Word and MS Excel) was used to enter the data.

### Results and Discussion

Surveys were conducted from October 2022 to November 2023 to evaluate the variety and distribution of fish fauna at Marala Head, Qadirabad Head and Khanki Head, which are located on the Chenab River in Punjab, Pakistan. During the study, 2720 specimens of fish species from 59 species were recorded from three different locations along the Chenab River (Marala Head, Qadirabad Head and Khanki Head). All fish species that have been identified in lists Table 1. In all, 2720 fish specimens from seven orders, seventeen families, forty-one genera, and fifty-nine species (Table 2, Figure 4) were recorded in this study. In all fishes 53 species, 39 species and 27 species were recorded in this research at Qadirabad Head, Marala Head and Khanki Head, respectively, on the Chenab River. Twelve genera and thirteen species were contributed by the six families (Bagridae, Siluridae, Ailiidae, Schilbeidae, Sisoridae, and Hetroptneustidae) that representation of the order Siluriformes. Six families (the Chandidae, Ambassidae, Gobiidae, Belontiidae, Cichlidae, and Nandidae) contributed six genera and eight species to the Order Perciformes. With one family, the Cyprinidae, the Order Cypriniformes generated eighteen genera and thirty species. One family, one genus, and four species were represented by the Order Channiformes. With two genera and two species, the order Mastacembeliformes comprised a single family (Mastacembelidae). The Beloniformes order had one family (Belonidae) with one species and one genus. One genus and one species were represented by the Order Osteoglossiforms within the Notopteridae family.

The most significant wetland in Pakistan, with a diverse range of plants and animals, is the Chenab River. Diversity shows that Qadirabad Head is quite diverse. The reason might be the abundance of artificial and natural ponds that are home to fish culture; these fish migrate to rivers during floods, and fisherman and birds (such as egrets, cormorants, kingfishers, herons, terns, and others) also spread the eggs and fingerlings during fishing operations. However, compared to Qadirabad Head, other places such as Marala Head and Khanki Head have less manmade and natural ponds, meaning that their variety is smaller. Invasive species in Pakistan are identified during this research as *Ctenopharyngodon idella*, *Cyprinus carpio*, *Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, and *Oreochromis mossambicus* and *Oreochromis niloticus*. These species have been identified from several locations along the Chenab River (Qadirabad Head, Marala Head and Khanki Head). The native carp species in Pakistan include *Cirrhinus reba*, *Labeo rohita*, and *Cirrhinus mrigala*.

**Table 1: Fish Diversity of River Chenab at Head Qadirabad, Head Khanki and Head Marala from October 2022 to November 2023**

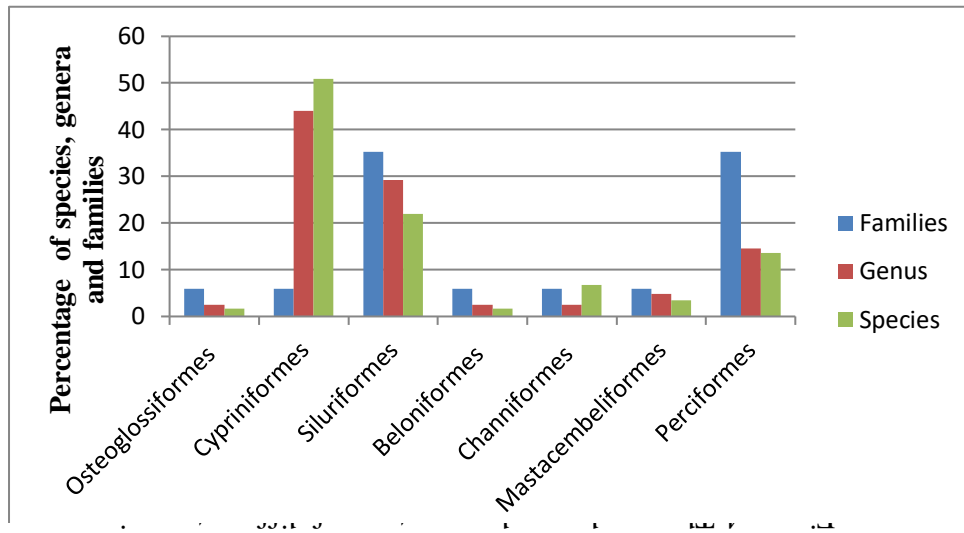
Sr.No.	Order	Family	Scientific Name	Local Name
1	Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i>	Pari
2	Cypriniformes	Cyprinidae	<i>Chela cachius</i>	Cachius Budha, Bidda
3			<i>Salmophasia punjabensis</i>	Punjabi Chal
4			<i>Salmophasia bacaila</i>	Small Chal
5			<i>Securicula gora</i>	Bari Chal
6			<i>Barilius pakistanicus</i>	Pakistani bariil
7			<i>Barilius bendelisis</i>	Patha Chalwa
8			<i>Garra gotyla</i>	Pathar Chat
9			<i>Esomus dandricus</i>	Somara Machli
10			<i>Cirrhinus mrigala</i>	Mori, Mrigal carp
11			<i>Cirrhinus reba</i>	Sunni Machali, Reba Carp, Reba Machhali
12			<i>Giblion catla</i>	Catla, Thaila
13			<i>Catla catla</i>	Thaila
14			<i>Labeo boga</i>	Bhangan
15			<i>Labeo calbasu</i>	Kalbans, Black rohu
16			<i>Labeo dero</i>	Dero Machali, Challi
17			<i>Labeo rohita</i>	Rohu
18			<i>Osteobrama cotio</i>	Pali-ro-Machali
19			<i>Puntius chola</i>	Swamp barb
20			<i>Puntius sophore</i>	Sophore Popra
21			<i>Puntius ticto</i>	Popra, Ritatus
22			<i>Pethia ticto</i>	Ticto poppta
23			<i>Puntius punjabensis</i>	Punjabi popra
24			<i>Tor macrolepis</i>	Masheer
25			<i>Tor microlipsis</i>	Masheer
26			<i>Tor putitor</i>	Golden Mahasheer

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27			<i>Carassius auratus</i>	Gold fish
28			<i>Cyprinus carpio</i>	Gulfam
29			<i>Ctenopharyngodon idella</i>	Grass Carp, China rohu
30			<i>Hypophthalmichthys nobilis</i>	Bighead Carp
31			<i>Hypophthalmichthys molitrix</i>	Silver Carp
32	Siluriformes	Bagridae	<i>Rita rita</i>	Desi khaga, Tarkanda
33			<i>Mystus bleekeri</i>	Kanghar, Tingarableekri
34			<i>Mystus cavasius</i>	Kanghar, Tingara
35			<i>Sperata sarwari</i>	Singhari
36		Siluridae	<i>Ompok pabda</i>	Pafta Machali, Pallu
37			<i>Wallago attu</i>	Mulee, Mali
38		Ailiidae	<i>Clupisoma garua</i>	Bachwa
39		Schilbeidae	<i>Eutropichthys vaucha</i>	Jhalli Machali
40			<i>Clupisa garua</i>	Bachwa, Sher mahi
41		Sisoridae	<i>Bagarius bagarius</i>	Fauji Khaga
42			<i>Gagata cenia</i>	Gagata cenia
43			<i>Sisor rabdophorus</i>	Kirla Machali
44		Heteropneustidae	<i>Heteropneustes fossilis</i>	Sanghi Machali
45	Beloniformes	Belonidae	<i>Xenentodon cancila</i>	Kaan Machali, Cowatokia
46	Channiformes	Channidae	<i>Channa gachua</i>	Doli
47			<i>Channa marulius</i>	Saul
48			<i>Channa punctatus</i>	Daula, Guddu
49			<i>Channa striatus</i>	Snakehead murrel
50	Mastacembeliformes	Mastacembelidae	<i>Macrognathus pancalus</i>	Gaorj
51			<i>Mastacembelus armatus</i>	Baam
52	Perciformes	Chandidae	<i>Chanda nama</i>	Sheesha Machali
53		Ambassidae	Parambassis ranga	Ranga Sheesha
54		Gobiidae	<i>Glossogobius giuris</i>	Golu Machali
55		Belontiidae	<i>Colisa fasciata</i>	Bari Kanghi, Fider, Chidu
56			<i>Colisa lalia</i>	Choti Kanghi
57		Cichlidae	<i>Oreochromis mossambicus</i>	Chirra Machali
58			<i>Oreochromis niloticu</i>	Nile Tilapia
59		Nandidae	<i>Nandus nandus</i>	Patta Machali

**Table 2:** The number and percentage of different orders' families, genera, and species of fish.

Sr. No.	Orders	Families	% of families in an order	Genus	% of genera in an order	Species	% of species in an order
1	Osteoglossiformes	1	5.88	1	2.44	1	1.7
2	Cypriniformes	1	5.88	18	44	30	50.85
3	Siluriformes	6	35.3	12	29.27	13	22.03
4	Beloniformes	1	5.88	1	2.4	1	1.7
5	Channiformes	1	5.88	1	2.4	4	6.78
6	Mastacembeliformes	1	5.88	2	4.88	2	3.4
7	Perciformes	6	35.3	6	14.63	8	13.56
Total		17		41		59	



Latif et al., (2016) recorded 34 species and 1766 individual fish from the Chenab River during the study. Mirza et al. (2006) identified 1191 fish specimens from 51 species in the Jhelum River. Khan et al. (2008a) twenty species were documented from the Chashma barrage and twenty-two species were gathered from the Taunsa barrage. Mirza et al. (2011) 51 species were recorded by during their exploration of the Jhelum River. Altaf et al. (2011b) discovered 33 species from the head of Qadirabad. Khan et al., (2011) thirty species were documented from the Jhelum River and fifty species from the Ravi. Qadir (2010) 24 species and 1506 specimens were reported from the Nullah Aik and Nullah Palku.

Altaf et al., 2011a;b identified as Pakistan's invasive species Grass carp, common carp, and silver carp during this study. The native carp species of Pakistan include mori, reba machhali, and raho. Khan et al., (2011) caught and identified the 21 distinct fish species including foreign species during the six-month investigation at Chashm. While *Gibelion catla*, *Cirrhinus mrigala*, *Eutropiichthys vacha*, *Wallago attu*, *Sperata sarwari*, and *Mastacembelu armatus* have the least amount of richness, the overall catches showed that *Cyprinus carpio*, *Oreochromis aureus*, *Oreochromis mossambicus*, *Labeo rohita*, *Labeo gonius*, *Notopterus notopterus*, *Clupisoma garua*, *Rita rita*, *Hypophthalmichthys molitrix*, and *Ctenopharyngodon idella* dominate.

Khan et al., (2008b) gathered and identified twenty distinct fish species at the Chashma Reservoir. Overall, the catches showed that *Labeo rohita*, *Labeo gonius*, *Notopterus notopterus*, *Clupisoma garua*, *Rita rita*, *Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, and *Carassius auratus* dominated; in contrast, *Gibelion catla*, *Cirrhinus mrigala*, *Eutropiichthys vacha*, *Wallago attu*, *Sperata sarwari*, and *Mastacembelu armatus* had the lowest richness.

Imran et al., (2021) documented out of the entire 579 fish from Head Qadirabad, 68 species, 14 families, and 2674 individuals throughout the study period. In this research region, the majority of foreign species, including *O. mozambicus*, *O. niloticus*, *Hypophthalmichthys snobilis*, *Carassius auratus*, *Ctenopharyngodon idella*, *Cyprinus carpio*, and *H. molitrix*, were either absent or present in very small numbers.

Altaf et al., (2020) identified *Cirrhinus reba*, *Labeo dero*, *Oreochromis niloticus*, *Mystus cavasius*, *Mastacembelu armatus*, *Osteobrama cotio*, *Salmostoma bacaila*, and *Heteropneustes fossilis*, *Hypophthalmichthys molitrix*, *C. idella* and *Channa punctate*.

Latif et al., (2016) identified 38 fish species from six order—the Cypriniformes, Osteoglossiformes, Perciformes, Siluriformes, Channiformes, and Synbranchiformes—were in the research. Fish that were significant to Pakistan's economy and commerce included *Wallago attu*, *Channa marulius*, *Channa punctate*, *Labeo rohita*, *Cirrhinus mrigala*, *Gibelion catla*, *Tor putitora*, *Sperata sarwari*, *Bagarius bagarius*, and *Eutropiichthys vacha*. The five alien fish species that are commercially significant include *Cyprinus carpio*, *Ctenopharyngodon idella*, and *Hypophthalmichthys molitrix*, *Oreochromis mossambicus* and *Oreochromis niloticus*.

Qazi et al. (2000) investigated 37 different species of fish from 28 different genera and 13 families. Some exceptional cold water fish species (*Schizothorax plagiostomus*, *Racoma labiate*, *Lepidocephalus gента*, and *Glyptothorax cavia*) that are not found in the current collection were part of their collection. Altaf et al (2008) documented many hazards to the Chinese and Indian carps found in the Chenab River. Their results corroborate our findings since the Chenab River has low relative abundance of economically significant species that were heavily fished.

(Altaf et al. 2011a) 33 fish species were identified from Head Qadirabad, Chenab. The foreign fish species in the river with the largest relative abundance was *Oreochromis niloticus*. This species was also discovered to have a high relative abundance (0.0474). The study was assessment also listed many risks to fish diversity and ecology. Qadir et al. (2009) performed a survey to determine the distribution of freshwater fish fauna on the two tributaries of the River Chenab in Pakistan, Nullah Aik and

Nullah Palkhu. 1506 fish specimens from 12 families and 24 species during this study. Altaf et al. (2015) conducted a recent research at the three river heads on the fish variety of the Chenab River, reporting 34 species.

Khan et al. (2008) surveyed the freshwater fish status in Taunsa (Indus) and Chashma (Jhelum). Twenty fish species were gathered from the Chashma Reservoir and twenty-two from the Taunsa Reservoir. Although native fish species predominated in their collection, reports of foreign fish species from these two significant freshwater reservoirs included *Carassius auratus*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Hypophthalmichthys nobilis*, and *Cyprinus carpio*. Mirza et al. (2011) investigated 51 species of freshwater fish from the Jhelum River.

### Conclusion

This study shows the diversity and distribution pattern of fish fauna at Qadirabad Head, Marala Head, and Khanki Head, Chenab River. In all, 2720 fish specimens from seven orders, seventeen families, forty-one genera, and fifty-nine species. In all fishes 53 species, 39 species and 27 species were recorded in this research. In this research, study areas have high fish diversity and also have unique fish fauna, but fish population and species. The Chenab River is Pakistan's largest significant wetland, home to a diverse range of plants and animals. This study shows that most fish diversity is recorded at Head Qadirabad than Marala Head, and Khanki Head of River Chenab. During this study, both native and exotic fish species were recorded from research areas. Data collected from local people, fishermen and contractors of the areas. Based on morphometric features, conventional keys (Mirza and Sharif, 1996; Mirza and Sandhu, 2007) were used to classify and taxonomic identify the collected specimens (Muhammad, Iqbal & Saleemi, 2017).

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