Journal of Wildlife and Ecology (2024). 8(1):74-81

*Research Paper* **Open Access**

# Exploring the Fish Diversity along the River Ravi in Punjab, Pakistan

**Noor Muhammad[1*], Muhammad Imran[2] and Syed Muhammad Zain Ul Abideen[3]**

1. Department of Zoology, University of Veterinary and Animal Sciences, Lahore, Pakistan
2. Department of Zoology, University of the Punjab, Lahore, Pakistan
3. Division of reproduction and Genetics, Division of life science and Medicine, Molecular Cytogentic Lab. University of Science and Technology, China

***Corresponding author e-mail:** email.nooor@gmail.com

**Citation:** Muhammad, N., M. Imran, and S. M. Z. U. Abideen. 2024. Exploring the Fish Diversity along the River Ravi in Punjab, Pakistan. Journal of WIldlife and Ecology. 8: 74-81.

**SUMMARY**

The Ravi River in Punjab, Pakistan, is an important wetland. The main objective of this study was to understand the different types of fish species found in the river and their distribution. Local fishermen from the research area were enlisted to assist in documenting the variety of fish. Data was collected throughout the year to capture the variations in fish populations. Both direct and indirect methods were employed to determine the diversity of fish species in the region. The Shannon-wiener Index was used to analyze the diversity indices. As a result of the investigation, a total of 17 fish species were identified in the Ravi River. The Shannon diversity index of the area is H' = 1.077, indicating low diversity. This can be attributed to anthropogenic factors such as pollution and the decrease in water levels.

**Keywords:** Ravi, Fishes, River, Diversity, Wetland

| **Received**: 02-01-2024 | **Revised**: 20-02-2024 | **Accepted**: 27-02-2024 |
|---|---|---|

## INTRODUCTION

Pakistan, with its extensive canal system and over 225 wetlands, has only designated 19 of them as Ramsar sites. These wetlands cover a vast area of 780,000 hectares, accounting for about 10 % of total wetland area in Pakistan, with coastal regions as well as freshwater making up 26.06% and 73% respectively (Altaf et al., 2014). Freshwater is important and resource that is essential for various activities, including agriculture, industry, drinking water, and household needs (Kahlown and Majeed, 2003; Mishra, 2023). The importance of water in human development and civilization is evident from the proximity of historical cultures and civilizations to freshwater sources like rivers, ponds, and streams (Nicolson, 2020).

The survival of living things is heavily dependent on water quality, which can be negatively impacted by both natural and human factors (Khatri and Tyagi, 2015). Unfortunately, human activities like intensified agriculture, industry, and excessive urbanization are causing water quality to deteriorate on a daily basis (Akhtar et al., 2021). One specific concern in water quality is the presence of heavy metals, which can have long-lasting and irreversible effects on the environment (Sankhla et al., 2016). These contaminants not only harm aquatic ecosystems, but also have a detrimental impact on the production and ecology of these ecosystems (Sardar et al., 2013). Even at low levels, heavy metals in freshwater can be harmful to aquatic

biodiversity (Mushtaq et al., 2020), highlighting the need for strict monitoring and control measures (Saroop and Tamchos, 2021).

Pakistan is home to a wide range of freshwater and marine fish species, with approximately 171 species found in freshwater alone (Mirza, 2004). The abundance of fish in tropical and subtropical rivers is closely linked to the river basin itself (Winemiller et al., 2008). The Asian region offers numerous large basins that provide suitable conditions for fish to thrive and reproduce (Dudgeon, 2011). The dynamic nature of these river ecosystems is driven by fluctuations in water levels, which are influenced by changes in rainfall patterns in both nesting and growth areas (Woodward et al., 2016). These dynamics create variations in the shape of fish communities, a result of various factors including environmental conditions within the river ecosystem (Welcomme et al., 2006), species interactions (Salas and Gaertner, 2004), availability of food, and fish migrations (Gebrekiros, 2016). The objectives of this study was to assess the diversity of fishes and their distribution in the river Ravi, located in Pakistan.

## MATERIALS AND METHODS

The research spanned one year, from January 2016 to December 2016. Local fishermen from the research region helped collect data on the status and variety of fish populations from river Ravi along the district Lahore.

### STUDY AREA

The Ravi River is a river that flows between northwest India and eastern Pakistan, serving as a trans-boundary link. It is one of five rivers that are interconnected in the Punjab region. Under the Indus Waters Treaty of 1960, India was granted access to the waters of the Ravi River, along with the Sutlej and Beas rivers. Consequently, Pakistan constructed the Indus Basin Project to transfer water from the western rivers of the Indus system to replenish its portion of the Ravi River. India has also undertaken numerous projects related to inter-basin water transfers, irrigation, hydropower, and multifunctional developments (Figure 1).

### METHODOLOGY

Data were classified using the field guidebook (Mirza, 2004). In addition, a photograph of all fish species were included in the survey form, and interviews and questions were asked to gather evidence regarding the population, and status of fish species. These questions were directed at fishermen, local villagers, hunters, and other relevant individuals.

### STATISTICAL ANALYSIS

Shannon-wiener Index was calculated with the help of formula:

$$H' = -\Sigma P_i Log(P_i)$$

Where:
**Σ:** means “sum”
**$P_i$:** The proportion of the entire community
***Log*:** Natural log

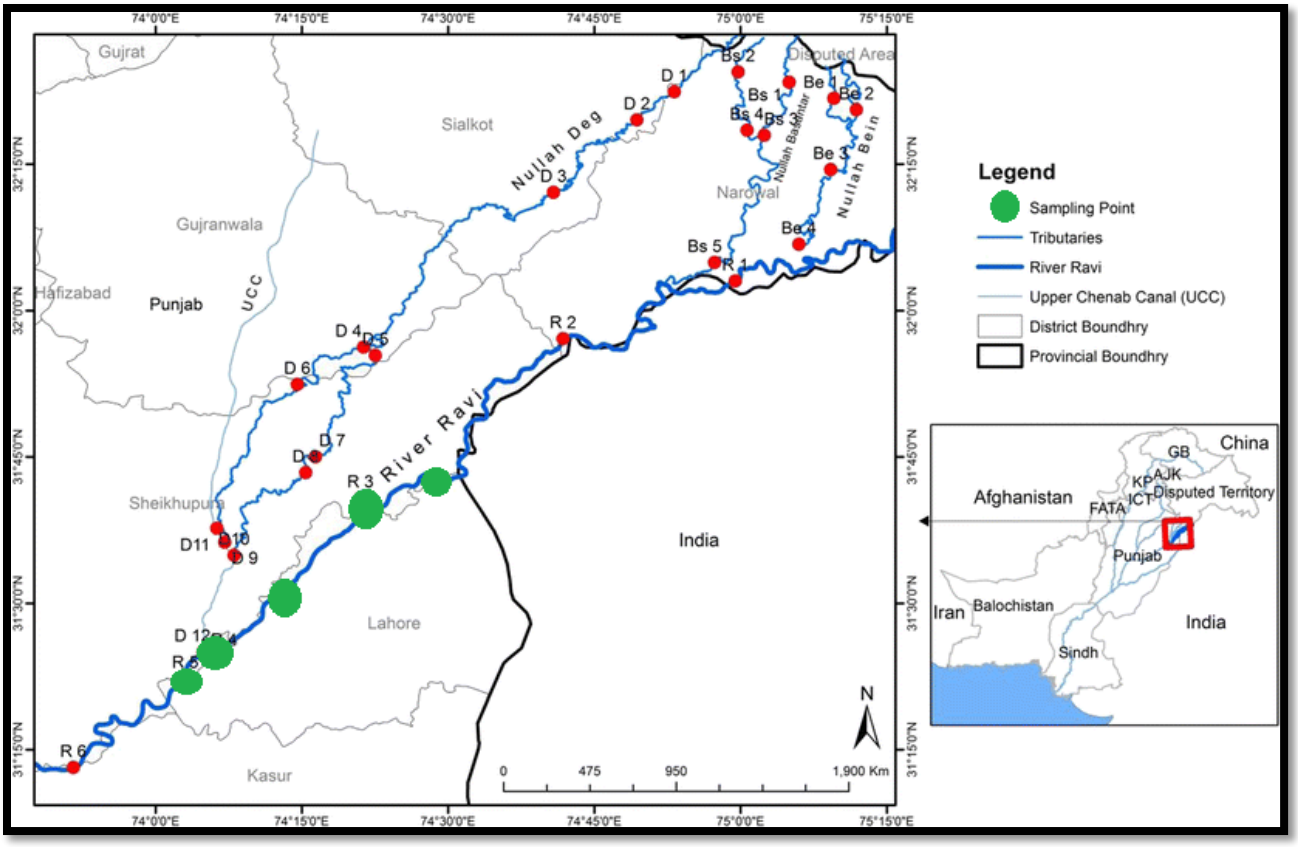


**Figure 1: Map of the study area (Baqar et al., 2017).**

## RESULTS AND DISCUSSION

During a one-year research period, a total of 270 samples were collected from 17 species (Figure 2) belonging to 7 families i.e. Cyprinidae, Channidae, Notopteridae, Bagridae, Sisoridae, Siluridae and Cichlidae (Figure 3) and 5 orders i.e. Cypriniformes, Perciformes, Siluriformes, Osteoglossiformes and Siluriformes (Figure 4). While researchers identified 50 species in their ichthyofaunal study of the Ravi (Khan et al., 2011). The Shannon diversity index of the area is H' = 1.077, indicating low diversity. This can be attributed to anthropogenic factors such as pollution and the decrease in water levels caused by the Indus Water treaty (Table 1). During the three-year study period, a total of 976 individuals belonging to 22 species from nine families were captured and documented (Hussain et al., 2015). Researchers noted that high diversity of fishes were present in river Chenab (Altaf et al., 2011; Altaf et al., 2015), the river Jhelum (Mirza et al., 2006), Taunsa barrage (Khan et al., 2008), and Nullah Aik and Nullah Palku (Qadir, 2010).

During the study, it was noted that the following species were the most dominant at the study area: Spotted snakehead (48), Blue tilapia (42), Roho labeo (32), Catla (31), Gardd carp (20), Boal (18), Black rohu (15), Banded snakehead (14), Clown knifefish (11), and Catfish (8) (Figure 2).

*Oreochromis aureus*, *Ctenopharyngodon idella*, *Cyprinus carpio* and *Hypophthalmicthys molitrix* are invasive species these are also documented in the present study. These species are documented as abundant and high relative abundance

in the water of Ravi (Table 1). Experts noted that the decreasing of native species is greatly influenced by the presence of invasive alien species. This is primarily because they compete for resources, including food, roosting sites, and shelter (Imran et al., 2021; Abideen et al., 2023).

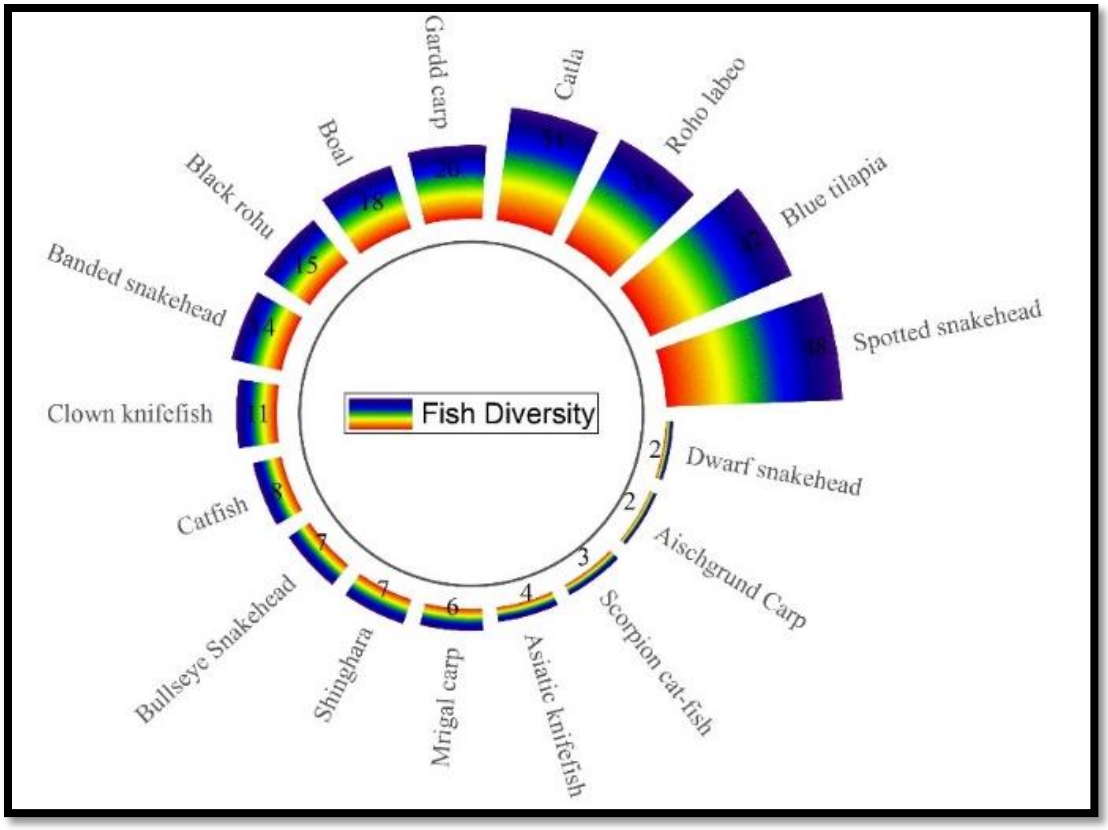


**Figure 2: The diversity of the fishes in the study area.**

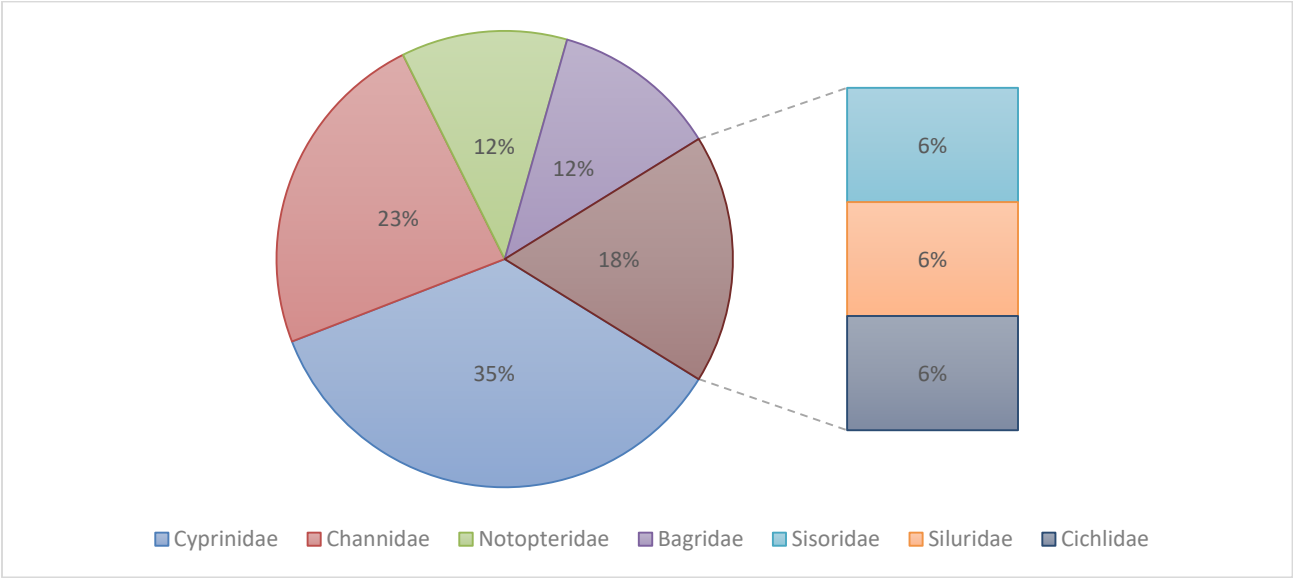


**Figure 3: Families of fishes documented in the study area.**

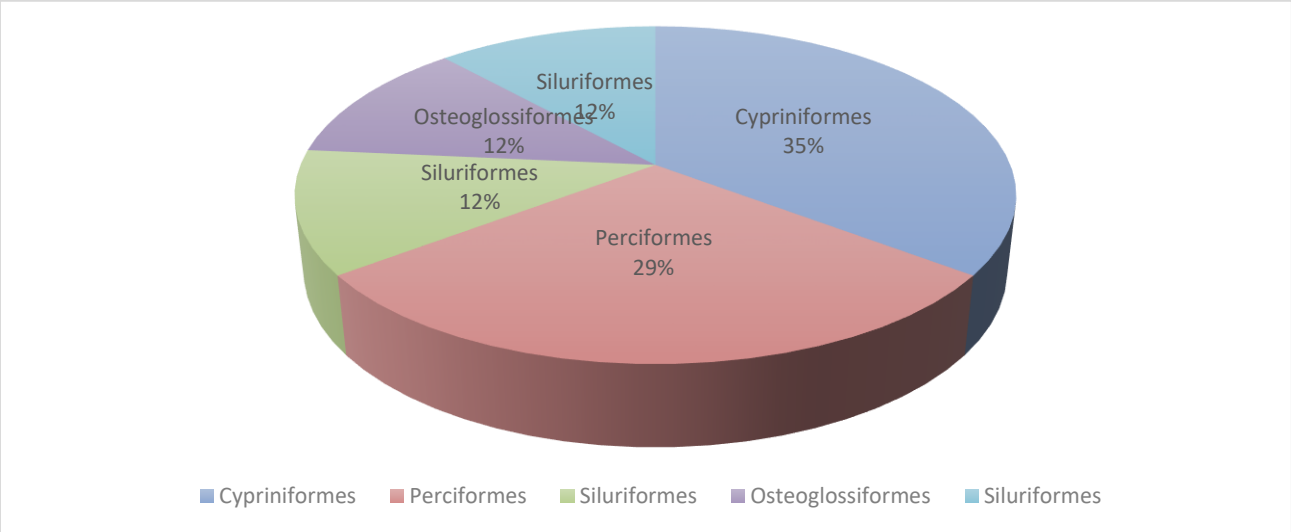


**Figure 4: Orders of fishes documented in the study area.**

## CONCLUSIONS AND RECOMMENDATIONS

The present study demonstrates that the decline in fish diversity and population can be attributed to several factors, notably overfishing, pollution, traditional practices involving fish (such as food, ornamental and medicinal use), and the introduction of invasive species. These findings underscore the importance of conducting further research to evaluate the detrimental effects of industrial pollutants on fish populations and explore the growth patterns and reproductive biology of affected species. Additionally, it is crucial to investigate the impact of non-native fish species and develop effective management strategies to promote the coexistence of native and non-native species.

## REFERENCES

Abideen, S., K. Iqbal, M. Imran, and A. Khan. 2023. Invasive Intruders: A Strategic Approach to Protecting Native Freshwater Fish Species of South Punjab. Pakistan. Journal of Wildlife and Ecology. 7: 142-154.

Akhtar, N., M. I. Syakir Ishak, S. A. Bhawani, and K. Umar. 2021. Various natural and anthropogenic factors responsible for water quality degradation: A review. Water. 13: 2660.

Altaf, M., A. Javid, A. M. Khan, A. Hussain, M. Umair, and Z. Ali. 2015. The Status of Fish Diversity of River Chenab, Pakistan. The Journal of Animal & Plant Sciences. 25: 564-569.

Altaf, M., A. Javid, and M. Umair. 2014. Biodiversity of Ramsar sites in Pakistan. LAP.

Altaf, M., A. M. Khan, M. Umair, M. Irfan, M. Munir, and Z. Ahmed. 2011. Ecology and diversity of freshwater fishes of head Qadirabad, Gujranwala. Punjab Univ J Zool. 26: 1-7.

Baqar, M., Y. Sadef, S. R. Ahmad, A. Mahmood, A. Qadir, I. Aslam, J. Li, and G. Zhang. 2017. Occurrence, ecological risk assessment, and spatio-temporal variation of polychlorinated biphenyls (PCBs) in water and sediments along River Ravi and its northern tributaries, Pakistan. Environmental Science and Pollution Research. 24: 27913-27930.

Dudgeon, D. 2011. Asian river fishes in the Anthropocene: threats and conservation challenges in an era of rapid environmental change. Journal of Fish Biology. 79: 1487-1524.

Gebrekiros, S. T. 2016. Factors affecting stream fish community composition and habitat suitability. Journal of Aquaculture and Marine Biology. 4: 00076.

Hussain, A., M. Ashraf, M. Altaf, W. A. Khan, M. Akmal, and J. Qazi. 2015. Relative diversity and threats to commercially important fishes of the Ravi, Pakistan. Biologia. 61: 145-149.

Imran, M., A. Khan, M. Altaf, M. Ameen, R. Ahmad, M. Waseem, and G. Sarwar. 2021. Impact of alien fishes on the distribution pattern of indigenous freshwater fishes of Punjab, Pakistan. Brazilian Journal of Biology. 82: e238096.

Kahlown, M. A., and A. Majeed. 2003. Water-resources situation in Pakistan: challenges and future strategies. Water Resources in the South: present scenario and future prospects. 20: 33-45.

Khan, A., Z. Ali, S. Shelly, Z. Ahmad, and M. Mirza. 2011. Aliens; a catastrophe for native fresh water fish diversity in Pakistan.

Khan, A., H. Shakir, M. Khan, M. Abid, and M. Mirza. 2008. Ichthyofaunal survey of some freshwater reservoirs in Punjab. Journal of Animal and Plant Sciences. 18: 155-157.

Khatri, N., and S. Tyagi. 2015. Influences of natural and anthropogenic factors on surface and groundwater quality in rural and urban areas. Frontiers in life science. 8: 23-39.

Mirza, M. R. 2004. Freshwater fishes of Pakistan, (Urdu). Urdu Science Board.

Mirza, Z., M. Mirza, and M. Javed. 2006. Fishes of River Jhelum from Mangla to Jalalpur near Head Rasool. Biologia. 52: 215-227.

Mishra, R. K. 2023. Fresh water availability and its global challenge. British Journal of Multidisciplinary and Advanced Studies. 4: 1-78.

Mushtaq, N., D. V. Singh, R. A. Bhat, M. A. Dervash, and O. b. Hameed. 2020. Freshwater contamination: sources and hazards to aquatic biota. Fresh water pollution dynamics and remediation. 27-50.

Nicolson, K. 2020. Water Driven: Revolutionary Cultural Landscapes. Hong Kong University Press.

Qadir, A. 2010. Effect of anthropogenic activities on water quality and fish fauna of Nullah Aik and Nullah Palkhu tributaries of River Chenab, Pakistan, Quad-I- Azam University, Islamabad.

Salas, S., and D. Gaertner. 2004. The behavioural dynamics of fishers: management implications. Fish and fisheries. 5: 153-167.

Sankhla, M. S., M. Kumari, M. Nandan, R. Kumar, and P. Agrawal. 2016. Heavy metals contamination in water and their hazardous effect on human health-a review. Int. J. Curr. Microbiol. App. Sci (2016). 5: 759-766.

Sardar, K., S. Ali, S. Hameed, S. Afzal, S. Fatima, M. B. Shakoor, S. A. Bharwana, and H. M. Tauqeer. 2013. Heavy metals contamination and what are the impacts on living organisms. Greener Journal of Environmental management and public safety. 2: 172-179.

Saroop, S., and S. Tamchos. 2021. Monitoring and impact assessment approaches for heavy metals Heavy metals in the environment. p 57-86. Elsevier.

Welcomme, R., K. Winemiller, and I. Cowx. 2006. Fish environmental guilds as a tool for assessment of ecological condition of rivers. River Research and Applications. 22: 377-396.

Winemiller, K. O., A. A. Agostinho, and É. P. Caramaschi. 2008. Fish ecology in tropical streams Tropical stream ecology. p 107-III. Elsevier.

Woodward, G., N. Bonada, L. E. Brown, R. G. Death, I. Durance, C. Gray, S. Hladyz, M. E. Ledger, A. M. Milner, and S. J. Ormerod. 2016. The effects of climatic fluctuations and extreme events on running water ecosystems. Philosophical Transactions of the Royal Society B: Biological Sciences. 371: 20150274.

***Competing interests:*** Authors have declared that no competing interests exist.
***Funding:*** Authors have no source of funding for this work.
***Authors' contributions:*** Noor has designed this project, collected data and written this article; while Imran and abideen have critically analyzed this article and approved as final.

**Table 1: Fish diversity of River Ravi, Punjab, Pakistan.**

| Sr. | Scientific names | Species authority | English Name | Vernacular Names | Family Order | Pi/RA | LogPi | PiLogPi |
|---|---|---|---|---|---|---|---|---|
| 1 | *Heteropneustes fossilis* | (Bloch, 1794) | Scorpion cat-fish | Singhi | Sisoridae Siluriformes | 0.011 | -1.954 | -0.022 |
| 2 | *Wallago attu* | (Bloch & Schneider, 1801) | Boal | Mali | Siluridae Siluriformes | 0.067 | -1.176 | -0.078 |
| 3 | *Notopterus notopterus* | (Pallas, 1769) | Asiatic knifefish | Pari | Notopteridae Osteoglossiformes | 0.015 | -1.829 | -0.027 |
| 4 | *Chitala chitala* | (Hamilton, 1822) | Clown knifefish | Battu | Notopteridae Osteoglossiformes | 0.041 | -1.390 | -0.057 |
| 5 | *Labeo calbasu* | (Hamilton, 1822) | Black rohu | Kalbaso | Cyprinidae Cypriniformes | 0.056 | -1.255 | -0.070 |
| 6 | *Ctenopharyngodon idella* | (Valenciennes, 1844) | Gardd carp | Grass carp | Cyprinidae Cypriniformes | 0.074 | -1.130 | -0.084 |
| 7 | *Cyprinus carpio* | Linnaeus, 1758 | Aischgrund Carp | Gulfam | Cyprinidae Cypriniformes | 0.007 | -2.130 | -0.016 |
| 8 | *Cirrhinus mrigala* | (Hamilton, 1822) | Mrigal carp | Mori | Cyprinidae Cypriniformes | 0.022 | -1.653 | -0.037 |
| 9 | *Labeo rohita* | (Hamilton, 1822) | Roho labeo | Rohu | Cyprinidae Cypriniformes | 0.119 | -0.926 | -0.110 |
| 10 | *Gibelion catla* | (Hamilton, 1822) | Catla | Thaila | Cyprinidae Cypriniformes | 0.115 | -0.940 | -0.108 |
| 11 | *Oreochromis aureus* | (Steindachner, 1864) | Blue tilapia | Chirra | Cichlidae Perciformes | 0.156 | -0.808 | -0.126 |
| 12 | *Channa punctata* | (Bloch, 1793) | Spotted snakehead | Dola | Channidae Perciformes | 0.178 | -0.750 | -0.133 |
| 13 | *Channa gachua* | (Hamilton, 1822) | Dwarf snakehead | Doli | Channidae Perciformes | 0.007 | -2.130 | -0.016 |
| 14 | *Channa striata* | (Bloch, 1793) | Banded snakehead | Soli | Channidae Perciformes | 0.052 | -1.285 | -0.067 |
| 15 | *Channa marulius* | (Hamilton, 1822) | Bullseye Snakehead | Sol | Channidae Perciformes | 0.026 | -1.586 | -0.041 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 16 | *Rita rita* | (Hamilton, 1822) | Catfish | Khaga | Bagridae Siluriformes | 0.030 | -1.528 | -0.045 |
| 17 | *Sperata sarwari* | (Mirza, Nawaz & Javed, 1992) | Shinghara | Shinghara | Bagridae Siluriformes | 0.026 | -1.586 | -0.041 |
| Total | | | | | | 1.000 | | -1.077 |
| | | | **$H' = -\Sigma P_i Log(P_i)$** | | | | | 1.077 |