**ISSN 0971-6548** **UGC-CARE List since 2019**
Indian Hydrobiology, 24(1): 151–158, 2025 Received: 28.04.2025; Accepted: 30.05.2025

# Assessment of Edible Fish Diversity in the Karuvatta Region of the Pamba-Achankovil River Basin, Kerala

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## Abstract

The Pamba-Achankovil river basin in the Kuttanad region of Kerala, India, harbours a moderately diverse assemblage of freshwater edible fish with ecological and socio-economic importance. This study assessed the edible fish diversity of the Karuvatta region between October 2024 and March 2025, documenting 26 species across 12 taxonomic Orders through traditional and modern fishing techniques. Cypriniformes (30.4%) and Cichliformes (30.2%) were the most dominant, while Orders such as Beloniformes (0.69%) and Mugiliformes (1.02%) showed minimal representation. The Simpson's Index of Diversity (1–D = 0.6884) reflected a moderate diversity with uneven species distribution across taxa. The findings highlight the ecological significance of dominant species like *Labeo dussumieri* and *Etroplus suratensis*, and stress the importance of targeted conservation strategies to sustain less abundant Orders. This study provides essential baseline data for conservation planning and sustainable management of freshwater fisheries in the Karuvatta region of the Pamba-Achankovil river basin.

**Keywords:** Pamba-Achankovil river basin; Karuvatta region; fish diversity; ichthyofaunal; Kuttanad.

## Introduction

India is well recognised for its exceptional ichthyofaunal richness, with approximately 2,799 fish species recorded across its diverse aquatic ecosystems. Of these, marine habitats account for nearly 1,518 species, while freshwater systems support 877 species, and brackish water environments host 113 species, yielding a total of 2,508 native fish species (Uttam *et al.*, 2012). In addition, 291 exotic species have been introduced and are now established in various aquatic systems across the country (Remya and Amina, 2017).

In the state of Kerala, particularly along the Western Ghats, a globally acknowledged biodiversity hotspot, the diversity and spatial distribution of fish species have been extensively documented. The state is intersected by around 44 rivers, which support an estimated 200 species of freshwater fish, of which approximately 25 species are endemic (Rani and Jobiraj, 2017). This notable endemism highlights the ecological singularity of the region and emphasises the need for conservation of its inland aquatic ecosystems. The Western Ghats' intricate topographical features and heterogeneous hydrology contribute significantly to this biodiversity (Sojomon, 2022).

Kuttanad, located in the Alappuzha district of Kerala, is a distinct low-lying area situated approximately 2–4 feet below mean sea level. The region's alluvial richness has evolved through centuries of sediment deposition from five major rivers such as Meenachil, Pamba, Manimala, Muvattupuzha, and Achencovil which drain into the Vembanad Lake basin (Sobha *et al.*, 2016). Spanning parts of the Alappuzha, Kottayam, and Pathanamthitta districts, Kuttanad forms a key component of the Vembanad-Kole wetland system, which was declared a Ramsar site in 2002 due to its

ecological importance, species diversity, and the livelihoods it supports through traditional agriculture and inland fisheries (Akhil, 2021).

Fish are a functionally pivotal group of vertebrates in aquatic ecosystems, exerting significant influence over trophic interactions and population structures of co-existing organisms. Owing to their sensitivity to alterations in environmental conditions, they are widely regarded as effective bioindicators of water quality and overall ecosystem health. Representing the most species-rich group among vertebrates, fish are widely distributed across a broad range of marine and freshwater habitats globally (Vrinda and Mary, 2021).

The fisheries sector plays a vital role in economic development, offering employment and livelihood opportunities across a range of ancillary industries. In addition to providing an affordable and protein-rich dietary resource, fisheries make substantial contributions to national income and foreign exchange earnings (Vijayasree and Radhakrishnan, 2014).

Given the ecological relevance of small indigenous fish species and the necessity of their sustainable utilisation, the present study aims to document and identify edible fish species within the Karuvatta stretch of the Pamba-Achankovil river system. Despite the ecological and socio-economic importance of this region, there is a notable lack of contemporary scientific data addressing the ichthyofaunal diversity specific to this locality.

## Materials and methods

The present study was conducted in the Karuvatta region, specifically near the Kurichikkal Rail Bridge, within the Pamba-Achankovil river basin, located in Alappuzha District, Kerala, India (9.33407°N latitude and 76.40166°E longitude) (Fig. 1). Field investigations were carried out from October 2024 to March 2025. Karuvatta is situated between Haripad and Thottappally along National Highway 66 and this region is characterised by the convergence of the Pampa and Achankovil rivers, which discharge directly into the Arabian Sea through this locality.

### *Fish collection and preservation*

Fish sampling was conducted thrice weekly, and a total of 3036 fish samples were collected from October 2024 to March 2025. A range of traditional fishing gears, including spears, harpoons, hooks and lines, hand-drawn nets, dip nets, gill nets, drag nets, cast nets, basket traps, and cages, were employed to maximize the capture of diverse fish species across different microhabitats. Visual observations were also undertaken in clear water conditions to assist in recording species that were difficult to capture (Kavya *et al.*, 2023; Shibu *et al.*, 2024). Captured live fishes were immediately subjected to in situ identification, morphometric measurements, counting, and photography.

### *Identification procedures*

Taxonomic identification of the collected fish specimens was carried out with the expertise of the faculty members of the Department of Zoology, St. Aloysius College Edathua, Alappuzha District. Identification was primarily based on external morphological features, meristic counts, and morphometric measurements as described by Das *et al.*, 2010; Munshi and Srivastava, 1988; Bijukumar *et al.*, 2013; Froese and Pauly, 2025. The parameters assessed included total length (TL), snout length (SnL), caudal length (CL), preorbital length (PrOL), postorbital length (POL), head length (HL), pre-dorsal length (PdL), body depth (BD), and eye diameter (ED).

Fin ray counts, scale counts, eye position, fin morphology, and mouth structure were meticulously examined to aid accurate species determination. Particular attention was given to diagnostic features distinguishing closely related taxa. Where necessary, photographic records were consulted to cross-validate field identifications.

## Results

Table 1 presents the list of 26 edible fish species collected from the Karuvatta Region of the Pamba-Achankovil River Basin of Kuttanad during the study period October 2024 to March 2025 and Fig. 2 shows the photographs of the identified fishes. Upon analysis, a total of 26 species

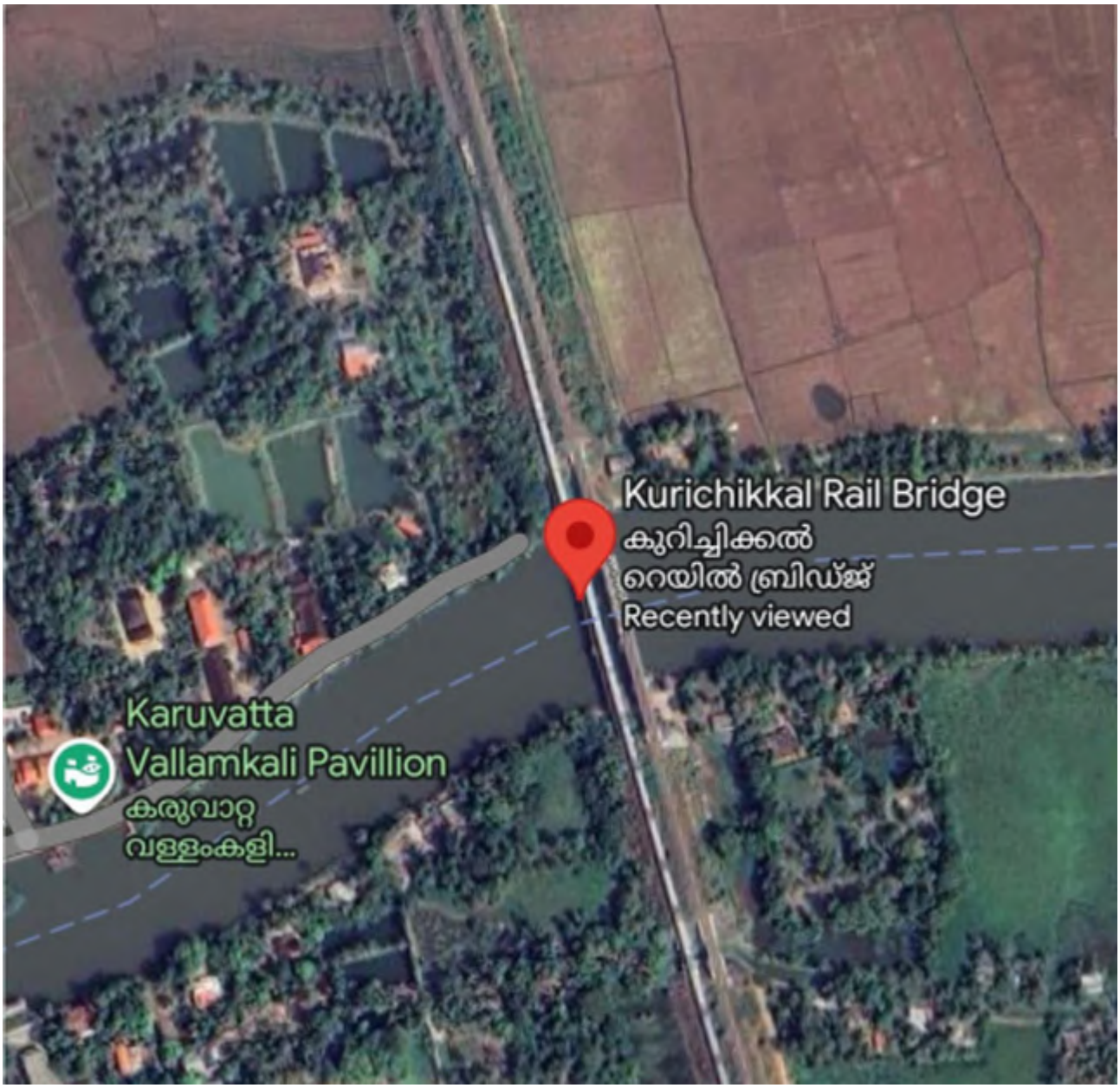


**Fig. 1: Site map of the study area: Kurichikkal Rail Bridge Region of Karuvatta Area of Pamba-Achankovil River.**

distributed across 12 taxonomic orders were identified during the study period. The Orders were Anabantiformes, Siluriformes, Cypriniformes, Cichliformes, Acanthuriformes, Clupeiformes, Carangiformes, Elopiformes, Synbranchiformes, Beloniformes, Mugiliformes, and Perciformes.

### *Species diversity analysis using simpson's index*

A total of 3036 individuals belonging to 12 Orders were recorded. The number of individuals in each Order and the corresponding n (n–1) values are presented in Table 2.

The total number of individuals was N = 3036, and the total of n (n–1) across all Orders was 2,870,848. Simpson's Index (D) was calculated using the formula:

$$D = \frac{\sum n(n-1)}{N(N-1)}.$$

**Table 1: Taxonomic position and IUCN status of 26 species of edible fishes identified from the Karuvatta region of the Pamba-Achankovil river basin during the period October 2024 to March 2025.**

| S. No. | Name of species | Order | Family | Number of Species Obtained | Vernacular Name (in Malayalam) | *IUCN Status |
|---|---|---|---|---|---|---|
| 1 | *Pristolepis marginata* | Anabantiformes | Pristolepididae | 64 | *Chempalli* | LC |
| 2 | *Anabas testudineus* | Anabantiformes | Anabantidae | 186 | *Kallumutti* | LC |
| 3 | *Channa diplogramma* | Anabantiformes | Channidae | 49 | *Vahavaral* | VU |
| 4 | *Channa striata* | Anabantiformes | Channidae | 78 | *Varal* | LC |
| 5 | *Horabagrus brachysoma* | Siluriformes | Horabagridae | 125 | *Manjakuri* | VU |
| 6 | *Wallago attu* | Siluriformes | Siluridae | 63 | *Attuvala* | VU |
| 7 | *Mystus cavasius* | Siluriformes | Bagridae | 56 | *Chilankuri* | LC |
| 8 | *Arius maculatus* | Siluriformes | Ariidae | 44 | *Venkazhuthi* | Nil |
| 9 | *Labeo rohita* | Cypriniformes | Cyprinidae | 47 | *Rohu* | LC |
| 10 | *Labeo dussumieri* | Cypriniformes | Cyprinidae | 800 | *Thooli* | LC |
| 11 | *Dawkinsia filamentosa* | Cypriniformes | Cyprinidae | 78 | *Kachipparal* | LC |
| 12 | *Etroplus maculatus* | Cichliformes | Cichlidae | 307 | *Pallathi* | LC |
| 13 | *Etroplus suratensis* | Cichliformes | Cichlidae | 450 | *Karimeen* | LC |
| 14 | *Oreochromis mossambicus* | Cichliformes | Cichlidae | 160 | *Tilapia* | VU |
| 15 | *Gerres erythrourus* | Acanthuriformes | Gerreidae | 56 | *Pranjil* | LC |
| 16 | *Scatophagus argus* | Acanthuriformes | Scatophagidae | 42 | *Nachukarimeen* | LC |
| 17 | *Sillago sihama* | Acanthuriformes | Sillaginidae | 48 | *Pooyan* | LC |
| 18 | *Tenualosa toli* | Clupeiformes | Dorosomatidae | 52 | *Thodi* | VU |
| 19 | *Stolephorus indicus* | Clupeiformes | Engraulidae | 28 | *Kozhuva* | LC |
| 20 | *Caranx papuensis* | Carangiformes | Carangidae | 45 | Vatta | LC |
| 21 | *Cynoglossus cynoglossus* | Carangiformes | Cynoglossidae | 118 | *Manthal* | LC |
| 22 | *Megalops cyprinoides* | Elopiformes | Megalopidae | 28 | *Palankanni* | DD |
| 23 | *Macrognathus fasciatus* | Synbranchiformes | Mastacembelidae | 31 | *Aaralu* | Nil |
| 24 | *Xenentodon cancila* | Beloniformes | Belonidae | 21 | *Kolan* | LC |
| 25 | *Ambassis nalua* | Mugiliformes | Ambassidae | 31 | Arinjilu | LC |
| 26 | *Parambassis thomassi* | Perciformes | Ambassidae | 29 | *Nandhan* | LC |

*LC: Least Concern, VU: Vulnerable, DD: Data Deficient.

Substituting the values:

$$D = \frac{2870848}{9211260} = 0.3116.$$

The **Simpson's Index of Diversity** (1–D) was therefore:

$$1–D = 0.6884.$$

The Simpson's Index (D) value of 0.3116 indicates a moderate dominance of certain Orders, suggesting that the assemblage is not completely even. The Simpson's Index of Diversity (1–D) value of 0.6884 reflects a relatively high diversity among the recorded fish Orders, implying that there is a 68.84% probability that two individuals randomly selected will belong to different Orders. These results indicate a relatively diverse fish community structure in the studied ecosystem (Fig. 3).

## Discussion

The fish diversity in the Karuvatta Region of the Pamba-Achankovil River Basin reveals important insights into the structure of the aquatic community. A total of 26 edible fish species across 12 taxonomic Orders were recorded during the study period, with the *Cypriniformes* Order dominating both in terms

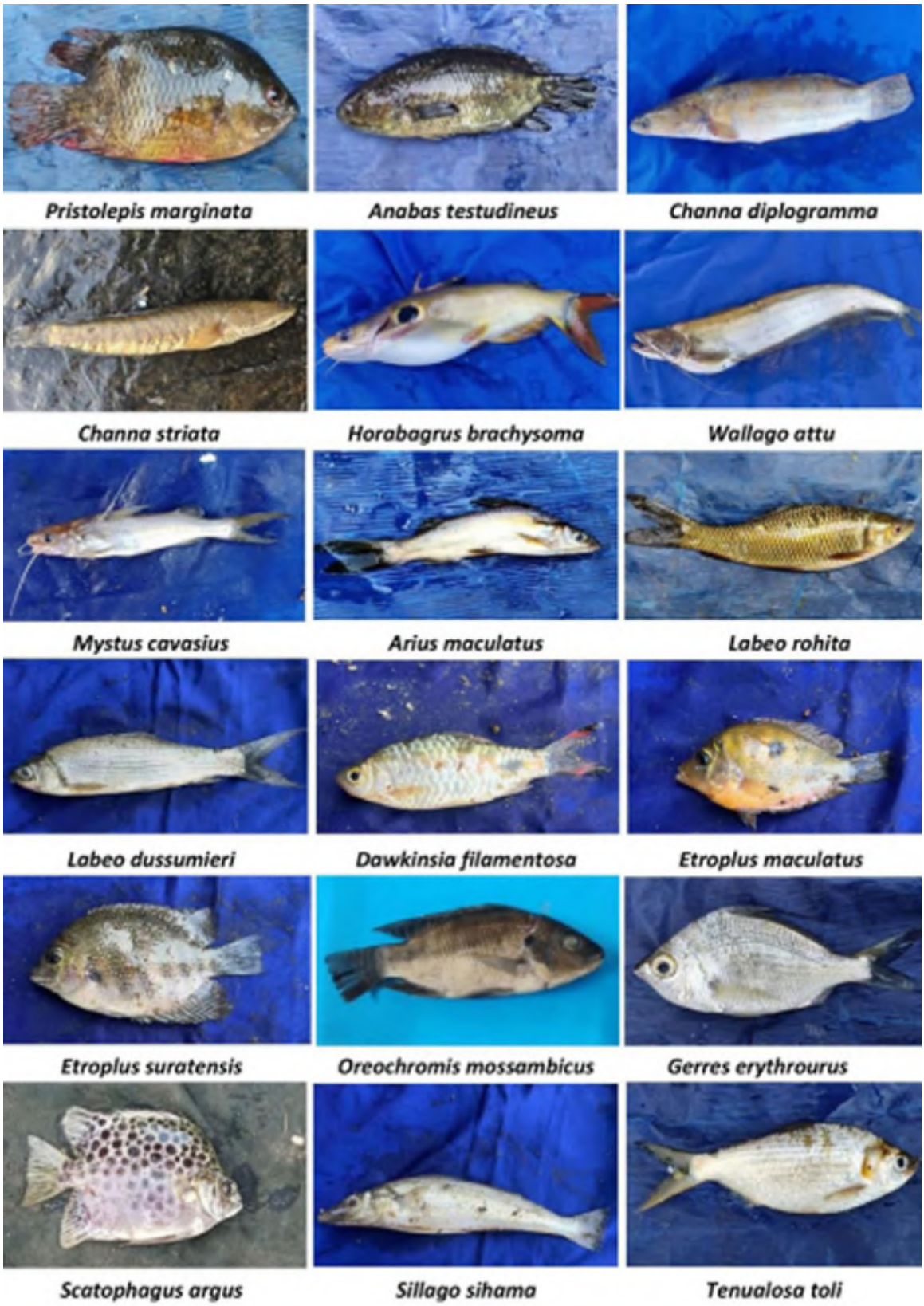


**Fig. 2:** ***(Continued)***


**Fig. 2: 26 species of edible fishes identified from the Karuvatta region of the Pamba-Achankovil river basin during the period October 2024 to March 2025.**

of species number and individual abundance. The *Cypriniformes* accounted for 30.4% of the total individuals, primarily comprising species like *Labeo dussumieri* and *Dawkinsia filamentosa*, which play a significant role in the ecosystem and local fisheries. The high n (n-1) value of 855,300 further emphasizes their prevalence in the study area.

The *Cichliformes* Order, with 30.2% individuals, was also abundant, largely due to species such as *Etroplus suratensis* (Karimeen) and *Oreochromis mossambicus* (Tilapia), both important for aquaculture. These species contribute significantly to the region's economy, especially in freshwater farming, where *Tilapia* is widely cultured.

Other Orders, including *Anabantiformes* and *Siluriformes*, had lower abundances, with 12.41 and 9.48% of individuals respectively. Species from the Order *Anabantiformes*, such as *Anabas testudineus* (Kallumutti) and *Channa striata* (Varal), are common in freshwater environments and are important for nutrient

**Table 2: Fish orders and corresponding abundance.**

| Order | Number of Individuals (n) | n (n–1) |
|---|---|---|
| Anabantiformes | 377 | 141,876 |
| Siluriformes | 288 | 82,656 |
| Cypriniformes | 925 | 855,300 |
| Cichliformes | 917 | 840,272 |
| Acanthuriformes | 146 | 21,170 |
| Clupeiformes | 80 | 6,320 |
| Carangiformes | 163 | 26,406 |
| Elopiformes | 28 | 756 |
| Synbranchiformes | 31 | 930 |
| Beloniformes | 21 | 420 |
| Mugiliformes | 31 | 930 |
| Perciformes | 29 | 812 |
| Total | 3036 | 2,870,848 |

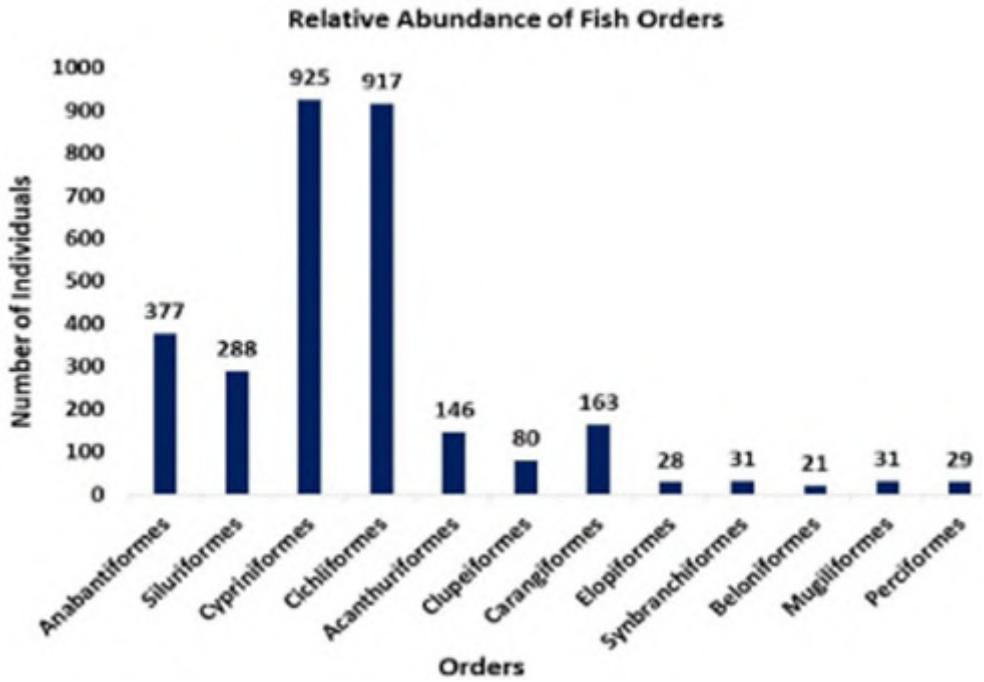


**Fig. 3: Relative abundance of various Orders of edible fishes identified from the Karuvatta region of the Pamba-Achankovil river basin during the period October 2024 to March 2025.**

cycling and as prey for larger predators. Similarly, *Siluriformes*, represented by species like *Wallago attu* (Attuvala), play a crucial role in the food web.

The less abundant Orders, such as *Acanthuriformes* (4.8%) and *Clupeiformes* (2.6%), also contribute to the fish community, but their role is more specialized. *Acanthuriformes*, including species like *Gerres erythrourus* (Pranjil), impact both benthic and pelagic food webs. The *Clupeiformes*, represented by *Stolephorus indicus* (Kozhuva), serves as an important food source for higher trophic levels.

The Orders with the least abundance, including *Beloniformes* (0.69%), and *Mugiliformes* (1.02%), contribute less to the overall fish population but are still essential for maintaining genetic diversity. These species, such as *Xenentodon cancila* (Kolan), play specific roles in the ecosystem.

Overall, 3036 fish individuals were recorded, with *Cypriniformes,* and *Cichliformes* being the most abundant. The Simpson's Index of Diversity (1–D = 0.6884) reflects a moderately diverse fish community, with a 68.84% probability that two randomly selected individuals will belong to different Orders. This moderate dominance indicates that while some Orders are more prevalent, the fish community still exhibits significant diversity.

The findings align with other studies in Kerala, where *Cypriniformes* often dominate freshwater (Seethal *et al.*, 2013). This dominance suggests that species from this Order are well-adapted to the region's ecological conditions. Moreover, the relatively lower abundance of some Orders highlights the importance of targeted conservation efforts to maintain the genetic diversity, and ecological balance of the ecosystem.

## Conclusion

The present study recorded 26 edible fish species belonging to 12 taxonomic Orders in the Karuvatta Region of the Pamba-Achankovil River Basin, with Cypriniformes (30.4%), and Cichliformes (30.2%) dominating the community structure. The Simpson's Index of Diversity (1–D = 0.6884) indicates a moderately diverse fish assemblage, with Cypriniformes species such as *Labeo dussumieri*

and *Dawkinsia filamentosa,* and Cichliformes species like *Etroplus suratensis* and *Oreochromis mossambicus* contributing significantly to the total abundance. Orders like Anabantiformes (12.41%) and Siluriformes (9.48%) were present in lower proportions, while Beloniformes (0.69%) and Mugiliformes (1.02%) showed minimal representation, emphasising the uneven distribution across taxa. The high dominance of a few Orders coupled with the low representation of others highlights the need for focused conservation to sustain taxonomic diversity within the region.

### *Conflict of interest*

The author declares that they have no conflict of interest in this study.

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