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# An Analysis of Fish Diversity in a Freshwater Temple Pond of Tiruchirappalli District, Tamil Nadu, India

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**ABSTRACT**

*Human activities have resulted in drastic degradation of aquatic resources resulting in the alteration of structure and function. As fish constitute almost half of the total number of vertebrates it is very important that their diversity is preserved. Hence the present study was conducted to analyse the fish diversity in Aathivayal lake. A total of 154 fishes belonging to 12 different families were identified. Among the various families, Cyprinidae recorded the highest species richness (6 species), followed by Channidae (3 species) and Bagridae (2 species). All the other families were represented by only one fish species. In terms of percentage, Cyprinidae represented 56% of the total fish population followed by Channidae 14%, Bagridae 10%, Anabaenidae 8%; Clariidae, Siluridae and Cichlidae represented 2% each, while Anguillidae formed 2% and Aplocheilidae formed 1%. A family-wise comparison reveals that in Cyprinidae, among the seven species that was recorded, the most dominant one in terms of number was Catla catla followed by Cirrhinus mrigala. Among Channidae, the most dominant species was Channa striatus and in Bagridae, it was Mystus carasius.*

***Key words:*** *Fish diversity, fresh water, species richness*

## INTRODUCTION

With the exploding human population, fish farming will play a vital role as it is a source of cheap animal protein in human diet in the coming years[10]. According to Jenkins[4] freshwater biodiversity has declined faster than marine or terrestical diversity over the past 30 years. Human activities have resulted in drastic degradation of aquatic resources resulting in the alteration of structure and function. As fish constitute almost half of the total number of vertebrates it is very important that their diversity is preserved. Hence the present study was conducted to analyse the fish diversity in fresh water pond, Tiruchirappalli District, Tamil Nadu.

## MATERIAL AND METHODS

**Data Collection and Analysis**: Fish sampling was performed in five sampling sites during the period from January 2016 to December 2016 with the help of local fishermen using different types on nets.

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Photographs were taken prior to preservation as formalin decolorizes the fish. Fishes brought to the laboratory were fixed in this solution in separate jars according to the size of species. Smaller fishes were directly placed in the formalin solution while larger fishes were given an incision on the abdomen before they were fixed. The fishes were labeled giving serial numbers, exact collection site, date of the collection and the local name of fish used in this region. Identification of fishes was carried out by following Talwar and Jhingran[14].

Water samples were collected between 8 and 9 am and transported to the laboratory immediately for further analyses. Water temperature was measured at the time of sampling using mercury thermometer while pH was measured with standard pH meter. Other parameters were analyzed in the laboratory according to the methods suggested by American Public Health Association[2].

Fish were subjected to diversity analysis using different indices like Shannon – Weiner index (H) (1963), Simpson Dominance index (D) and Simpson index of diversity (I-D) (1949).

Shannon – Weiner index was calculated by using the formula:

$$H = \Sigma p_i \log 2P_i$$

where

H = Shannon-Weiner index

Pi = ni /N

ni = Number of individuals of each species in the sample

N = Total number of individuals of all species in the sample.

Abundance of fish population was calculated by the sum of all available fishes in different sites. Species richness was simply estimated by the variety of fish species in five different sites.

Data regarding threats faced by the fish fauna were obtained from both primary (direct observations and interaction with local stakeholders and fishermen) and secondary sources.

**Simpson's Diversity Indices:** Simpson's diversity index is a measure of diversity. In ecology, it is often used to quantify the biodiversity of a habitat. It takes into account the number of species present, as well as the abundance of each species.

Simpson's index of dominance was calculated by using the formula:

$$D = \Sigma \frac{ni(ni-1)}{N(N-1)}$$

where,

ni = the total number of individuals of a particular species.

N = the total number of individuals of all species.

Simpson's index of diversity 1 =D

## RESULTS AND DISCUSSION

**(Table 1a & 1b)**

Details of the various species of fish that were caught in the system are presented in Tables-1a and b. As evident from the Table, a total of 87 fishes belonging to 9 different families were identified. Among the various families, Cyprinidae recorded the highest species richness (6 species), followed by Channidae (3 species) and Bagridae (2 species). All the other families were represented by only one fish species.

In terms of percentage, Cyprinidae represented 56% of the total fish population followed by Channidae 14%, Bagridae 10%, Anabaenidae 8%; Clariidae, Siluridae and Cichlidae represented 2% each, while Anguillidae formed 2% and Aplocheilidae formed 1%.

A familywise comparison reveals that in Cyprinidae, the most dominant species in terms of number was *Catla catla* followed by *Cirrhinus mrigala* while among Channidae, the most dominant species was *Channa striatus* and in Bagridae it was *Mystus carasius*.

Literature reveals that abiotic and biotic factors play an important role in fish diversity in freshwater ecosystems. Sivakami *et al*.[12] reported that pH and dissolved oxygen are key habitat features which can be correlated to fish diversity, while Sharma and Gupta[8] reported that the ideal temperature for

growth of fishes was between 14.5 and 38.6 °C. In the present study, the water temperature was found to range between 22 and 30°C which appears favourable for growth of fish. Jhingran[5] suggested that the ideal pH for fish growth was between 7 and 9 units. In the present study also, the pH averaged 7 to 8.8 °C units which is favourable for fish growth. Welch[16] reported that DO levels of less than 3 mg/l should be regarded as hazardous to lethal under average conditions and that 5 mg/l or more should be present in waters if conditions are to be favourable for fish culture. A perusal of the DO levels in the present study reveals that DO levels were always above 3 mg/l. Prasad *et al.*[6] suggested that increased BOD values can decrease DO levels and affect fish productivity.

A perusal of literature reveals that Sirajunisa[11] while studying a lake in Pudukkottai district recorded a maximum diversity of Cyprinidae followed by Channidae, Anabantidae and Bagridae while Sivakami *et al.*[13] while analyzing the fish diversity in Uyyakondan channel reported maximum diversity to occur in Cyprinidae followed Clariidae. These results are in conformity with the present observations.

**Table 1a: Fish Diversity of Temple Pond, Vayalur, Tiruchirappalli**

| S. No. | Family | Percentage |
|---|---|---|
| **Cyprinidae** | | |
| 1. | *Catla catla* (Hamilton Buchaman) | 20.0 |
| 2. | *Cirrhinus mrigala* | 10.0 |
| 3. | *Cirrhinus reba* | 4.0 |
| 4. | *Ctenopharyngodon idella* | 6.0 |
| 5. | *Cyprinus carpio* | 7.0 |
| 6. | *Labeo rohita* | 9.0 |
| **Bagridae** | | |
| 7. | *Mystus carasius* | 7.0 |
| 8. | *Mystus vittatus* | 3.0 |
| **Channidae** | | |
| 9. | *Channa punctatus* | 2.0 |
| 10. | *Channa striatus* | 11.0 |
| 11. | *Notopterus notopterus* | 1.0 |
| **Siluridae** | | |
| 12. | *Ompok bimaculatus* | 3.0 |
| **Anabantidae** | | |
| 13. | *Anabas testudineus* | 8.0 |
| **Anguillidae** | | |
| 14. | *Anguilla bengalensis* | 2.0 |
| **Aplocheilidae** | | |
| 15. | *Aplocheilus lineatus* | 1.0 |
| **Clariidae** | | |
| 16. | *Clarias batrachus* | 3.0 |
| **Gobiidae** | | |
| 17. | *Glossogobius giuris* | 1.0 |
| **Cichlidae** | | |
| 18. | *Oreochromis mossambicus* | 3.0 |

**Table 1b: Fish Diversity Indices**

| | |
|---|---|
| Species richness | 17 |
| Abundance number | 146 |
| Shanan weiners index | 0.01 |
| Simpson’s dominace index | 0.036 |
| Simpson’s diversity index | 0.78 |

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