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Research Article

DISTRIBUTION OF FRESHWATER FISHES IN ANNASSERY POND, THALAKKULATHOOR PANCHAYAT, KOZHIKODE THALUK, KERALA

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ABSTRACT

In the present communication, an attempt has been made to systematically classify freshwater fishes in Annassery pond Kozhikode. The survey was conducted for a period from June 2020 to May 2021 mainly focused on the distribution and diversity of freshwater fishes. The field studies identified about 8 species of fish belonging to 7 genera, 6 families, and 5 orders based on IUCN status. The fishes diversity in aquatic ponds are very limited and the first-ever systematic survey on the fish diversity of this pond. Among the diversified fishes, Siluriformes and Anabantiformes were found most dominant order represented by 7 and 2 genera. Currently, most of the freshwater fishes population are gradually decreasing may due to climatic factors influences, and manmade activities, in this context to assess the diversity of fishes are important to understand the existing native fish stocks and exotic fish population ratio at the pond level.

Keywords: Freshwater ponds, Fish diversity, IUCN status, Native fishes and Conservation.

INTRODUCTION

In India, several ponds, lakes, and reservoirs are naturally found and are the home to about 11.72% of global fish biodiversity and 4 of the 34 global biodiversity hotspots; play a key role in the world's biological resources (Lakra *et al*. 2011). India is an exceptional hotspot of freshwater fish diversity with a high degree of endemism contributing to the World's biological resources (Kottelat *et al*. 1996; Dahanukar *et al*. 2004). Freshwater fishery sites are varied like 45,000 Km of rivers, 1, 26,334 Km of canals, ponds, and tanks 2.36 million ha, and 2.05 million ha of reservoirs (Ayyapan 2004). The streams, canals, rivers, ponds, wetlands, reservoirs, and lakes. Networks of small waterbodies, like ponds (waterbodies with a surface area up to 5 ha; Oertli *et al*. 2005), are acknowledged to support a large part of regional biodiversity (Williams *et al*. 2004, Angelibert *et al*. 2006, Davies *et al*. 2008). Therefore, ponds in urban areas could make an important contribution to freshwater conservation, although little is known of their role as refuges (Chester and Robson 2013), or about how to maximize conservation management in these waterbodies (Hassall *et al*. 2016). Ponds are often numerous in the urban environment but are rarely of natural origin. Most are constructed by people (Hassall 2014, Oertli 2018) and their primary function is to provide specific services such as water purification and flow regulation (e.g., stormwater ponds), sediment trapping, aesthetic value (parks and garden ponds), environmental education, leisure activities such as boating and fishing, or irrigation.

About 21,730 species have been recorded in the world, of which about 11.7% are found in Indian waters. Out of the 2546 species so far listed (ICBD 1994), 73(3.32%) belong to the cold freshwater regime, 544 (24.73%) to the warm freshwater domain, 143 (6.50%) to the brackish waters, and 1440(65.45%) to the marine ecosystem. Kerala harbors a rich and diversified fish fauna characterized by many rare and endemic fish species. One of the most important features of ponds is the presence of standing water, which provides a habitat for wetland plants and animals (Verma, 2016). Notable studies on the freshwater fish fauna of Kerala are those of Day (1865, 1878, 1889); Pillai (1929); John (1936); Hora and Law (1941); Silas

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(1951a, 1951b); Remadevi and Indra (1986); Pethiyagoda and Kottelat (1994); Kurup (1994); Kurup and Ranje et (2002); Easa and Shaji (1995); Menon and Jacob (1996); Manimekalan and Das (1998); Ajithkumar *et al* (1999); Raju *et al.* (1999a and b) and Biju, Thomas and Ajithkumar (1999). Morphological diversity within fish faunas increases with habitat volume, habitat diversity, environmental stability, and levels of interspecific competition and predation, (Winemiller 1991) all of which commonly increase with stream size (Minshall *et al*. 1985; Schlosser, 1990). This urban biodiversity is partly associated with rural biodiversity (directly or through corridors or stepping stones) and can contribute to the conservation of global biodiversity (Parris, 2016), predominantly because cities can act as hotspots for some threatened species (Ives, 2016).

Worldwide, due to the sharp decline in the biodiversity of freshwater species biodiversity is in crisis (WWF 2016). Freshwater fish are those that spend some or all of their lives in freshwaters, such as rivers and lakes, with a salinity of less than 0.05%. These environments differ from marine conditions in many ways, the most obvious being the difference in levels of salinity. As human interference is increasing in these water bodies, basic information on the occurrence, abundance, and distribution is important to protect and conserve the existing fish diversity. Measuring biodiversity is one of the dominant issues in the ecosystem because of its importance in emerging conservation policies.

Moreover, the fisheries division occupies a very important place in the country's socio-economic progress (Vijayasree and Radhakrishnan 2014). Therefore, ponds in urban areas could make an important contribution to freshwater conservation, although little is known of their role as refuges (Chester and Robson 2013), or about how to maximize conservation management in these waterbodies (Hassall *et al*., 2016). Fish account for the highest species diversity among all vertebrates and they live in almost all conceivable aquatic habitats (Remadevi, 2003). Fishes form an important element in the economy of many nations as they form a staple item in the diet of many people (Shukla and Singh, 2013). However, most of the water bodies which form the major life support systems of many organisms are facing ecological degradation today due to irrational interference and unsustainable developments (Prasad *et al.* 2009). According to Jenkins (2003), freshwater biodiversity has declined faster than either marine or terrestrial diversity over the past 30 years. The main causes of the deterioration of native fish species are habitation loss and species introductions. The conservation of freshwater fishes has never been effectively addressed in India mainly due to the absence of scientific data and perception about the criteria to be used for the characterization and designating conservation status of threatened fishes. Knowledge of the species composition and distribution patterns of fishes is fundamental for conserving and managing native fish fauna (Mogalekar *et al*. 2015).

Species diversity is likely to be further reduced due to increased temperatures, reduced precipitation, and increased withdrawal of water for agriculture and other uses (Vorosmarty *et al*. 2000; Alcamo *et al.* 2003). Human activities have drastically degraded aquatic resources, resulting in the alteration of structure and function. As fish constitute almost half of the total number of vertebrates their diversity must be preserved. In this context, in the present study, an attempt has been made to collect and identify the available fish species of Annassery pond.

MATERIALS AND METHODS

Study area

The fishes were collected from freshwater Annassery pond (11.3485857, 75.7550285,657) near Thalakkulathoor Panchayath, Kozhikode Thaluk, about 15 km from the south of Kozhikode. The pond was formed in the year of 1938. Initially, it was a natural pond. But it is reconstructed in the year 1996. The pond is formed naturally and is a part of the river system. The water comes from Eliyodu Valley located in Edakkara, Annassery.

Figure 1. The image shows the Annassery pond in Kozhikode.

Fish sample collection

A field investigation was carried out for a period from June 2020 to May 2021. Fishes were collected by using a scoop net and a gill net. Fishes were examined, counted, and then released back into the system. Fishes were examined during the study period and identified with the help of standard keys (Day, 1865, 1878; Silas; 1952 Jayaram, 1981, 1999, 2010; Talwar and Jhingran, 1991; Kowtal, 1994; Babu *et al*. 2012). A standard fish species data collection format was prepared and information on the scientific name with the author's name, common name, taxonomy, economic importance, fishery, morphological characters, and coloration was collected.

RESULTS AND DISCUSSION

A total of 8 species of fish were recorded from the pond. All 8 species including 6 families found during the survey at Annassery pond are shown in the table along with their common name, scientific name and Malayalam name, and also taxonomic position.

Table 1. An annotated list of fishes of Annassery pond.

S.No	Common Name	Scientific Name	Vernacular Name	Endemicity	IUCN Status
1	Banded snakehead	*Channa striatus*	Varaal	Non-endemic	LC
2	Great snakehead	*Channa marulius*	Cherumeen	endemic	LC
3	Walking catfish	*Clarias batrachus*	Muzhi, Mushi	Non-endemic	LC
4	Yellow catfish	*Horabagrus bracysoma*	Manjakkoori	endemic	VU
5	Stinging catfish	*Heteropneustes fossilis*	Kaari	Non-endemic	LC
6	Tilapia	*Oreochromis mossambicus*	Tilapia, Kerala Karimeen	Introduced	NE
7	Orange chromide	*Pseudotroplus maculatus*	Pallathi	Non-endemic	LC
8	Swamb barb	*Puntius chola*	Paral	Non-endemic	LC

Table 2. Number of fish caught in a different season.

Species	Southwest Monsoon (June-September)	Northeast Monsoon (October-December)	Summer (February-May)
Channa striatus	2	3	2
Channa marulius	6	5	7
Clarias batrachus	3	4	5
Horabagrus bracysoma	17	10	9
Heteropneustes fossilis	5	3	6
Oreochromis mossambicus	4	4	5
Pseudotroplus maculatus	3	2	3
Puntius chola	26	15	22

Table 3. Endemic status of the fishes of Annassery pond .

SL.NO.	Endemicity	Number of species	Percentage
1	Endemic	2	25
2	Non-endemic	5	62.5
3	Introduced	1	12.5

Oreochromis mossambicus(3)

Channa striatus(4)

Horabagrus bracysoma(5)

Channa maruliu(6)

Clarias batrachus(7)

Heteropneustes fossilis(8)

Figure (2) *Oreochromis mossambicus*, (3) *Channa striatus* (4) *Horabagrus bracysoma* (5) *Channa maruliu*, (6) *Clarias batrachus* (7) *Heteropneustes fossilis* represent the fishes in Annassery pond .

Table 4. Conservation status of fishes.

S.No	IUCN Status	Number of fishes
1	Least concern	6
2	Not evaluated	1
3	Vulnerable	1

Table 5.Taxonomic distribution of species under different families.

Phylum	Class	Order	Family	Genus	Species name
Chordata	Actinopterygii	Anabantiformes	Channidae	Channa	*C. Striata*
Chordata	Actinopterygii	Anabantiformes	Channidae	Channa	*C. Marulius*

Chordata	Actinopterygii	Siluriformes	Clariidae	Clarias	*C. Batrachus*
Chordata	Actinopterygii	Siluriformes	Bagridae	Horabagrus	*H. Brachysoma*
Chordata	Actinopterygii	Siluriformes	Heteropneustidae	Heteropneustes	*H. Fossilis*
Chordata	Actinopterygii	Cichliformes	Cichlidae	Oreochromis	*O. Mossambicus*
Chordata	Actinopterygii	Perciformes	Cichlidae	Pseudetroplus	*P. Maculatus*
Chordata	Actinopterygii	Cypriniformes	Cyprinidae	Puntius	*P. Chola*

A total of 8 species of fish were collected belonging to diverse families such as Channidae, Claridae, Heteropneustidae, Bagridae, Cichlidae, and Cyprinidae. Channidae is represented by two species and Cichlidae is represented by 2 species. Other groups represent only one species by other families. The present compilation documented,8 species of fish belonging to 7 families and 8 genera covering 2 endemic (25 %) and 5 non-endemic (62.5 %), and 1(12.5%) exotic fish species (Table 2). According to IUCN status, about 6 species were the least concern and were non-evaluated and vulnerable consisting of only one species.

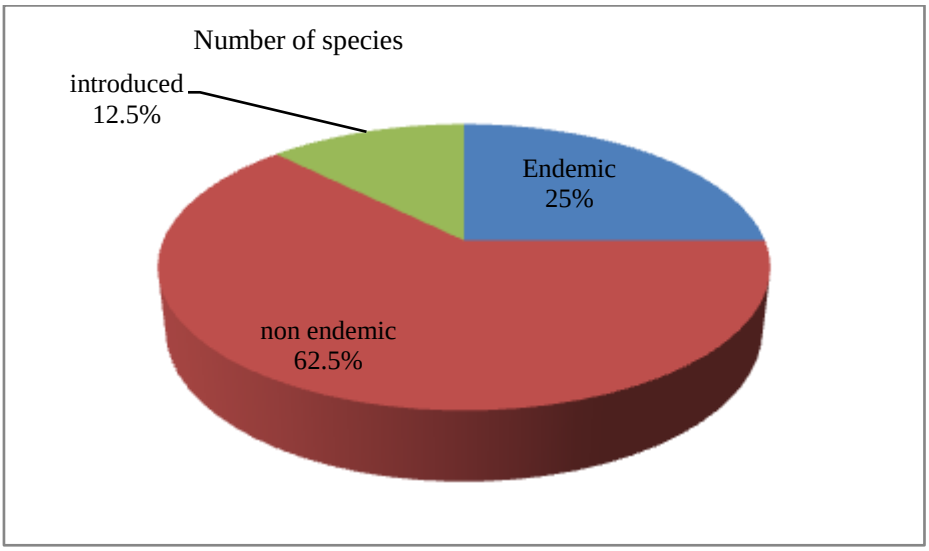

Figure 8. Percentage of the endemic status of fishes.

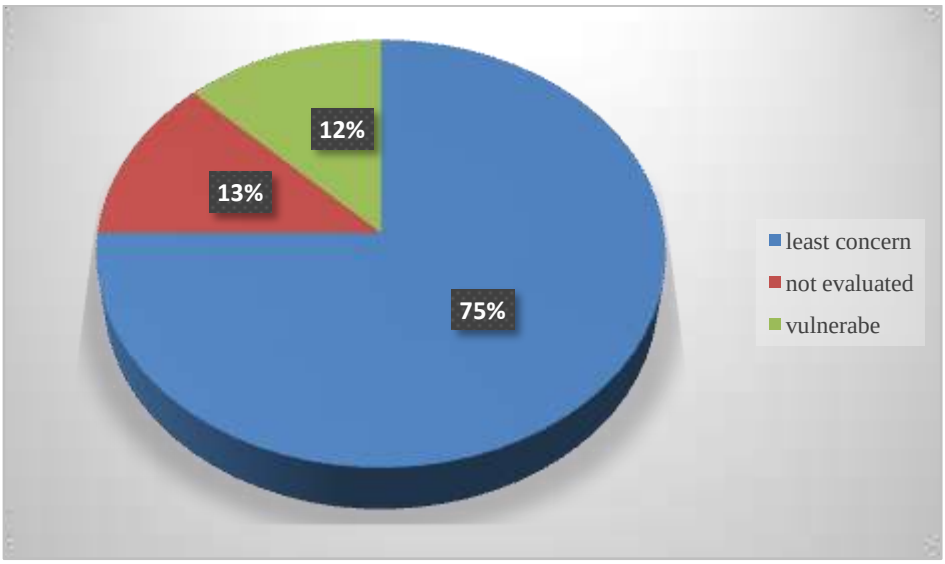

Figure 9. Percentage of the conservation status of fishes.

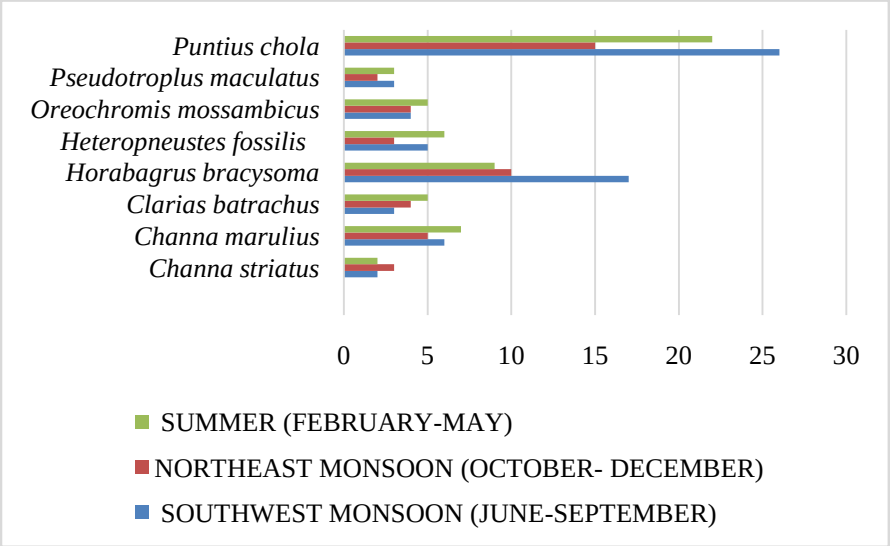

Figure 10. Shows the fish caught during different season.

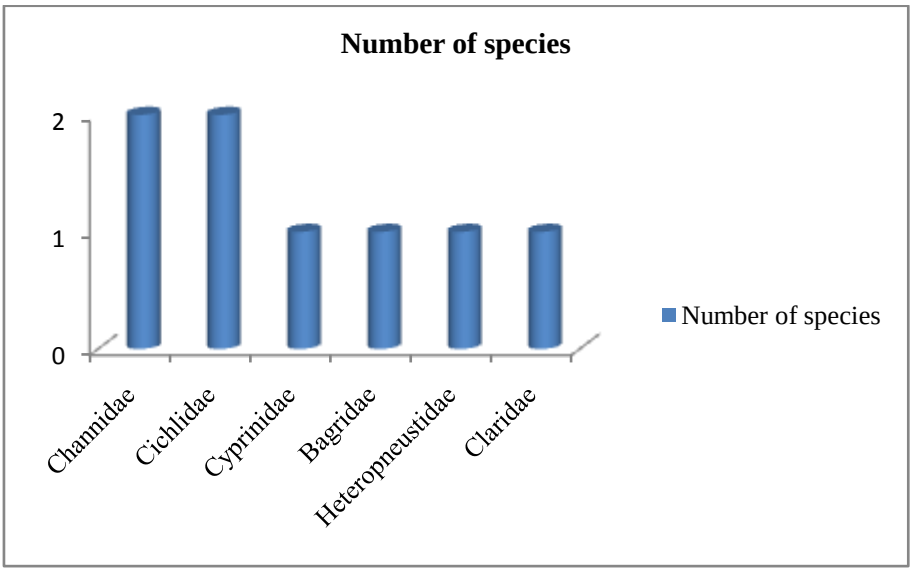

Figure 11. Distribution of species under different families.

In total 8 species of fish of 6 families were recorded during the study from Annassery pond (Table3). The checklist was prepared and provided in Table 3. The conservation status of identified fishes comprises 1 species (*Oreochromis mossambicus*) as not evaluated, 6 species (*Channa striatus, Channa marulius, Clarias batrachus, Heteropneustes fossilis, Pseudotroplus maculatus* and *Puntius chola)* as least concern, 1 species (Horabagrus bracysoma) as Vulnerable. All the reservoirs are home to a variety of fish species. Freshwater fishes are normally found in more than one habitat, ie, paddy fields, ponds, lakes, canals, streams, rivers, and backwaters. The backwaters that are saline for most of the year turn fresh during monsoon. Similarly, so many ecological changes happen throughout the year, but the fishes are well adapted to survive the extreme conditions. Studies have revealed that 210 species of freshwater fishes are identified in Kerala, of which more than 26 are endemic. Most of these are ornamental varieties used in 2 drought, and remain there in a dormant stage, till the next monsoon comes. Evidence regarding approximations of fish production from river stretch in India is scarce (0 keystone species that determine the distribution and abundance of other organisms in the ecosystems they represent and are good indicators of the water quality and health of the ecosystem (Bijukumar 2000). India has vast inland fishery resources in the form of rivers and canals (195210 km), reservoirs (2-94 million ha), tanks and ponds (2.41 million ha), and floodplains. Lakes and derelict waters (0.79 million ha) offer tremendous scope for fish production (Das *et al.*

2007). The capture fisheries in the rivers, lakes, channels, floodplain water bodies, tanks, and ponds, were always the rural livelihoods and food security base. Considering the extent to which small indigenous species of freshwater fish play a role in providing nutrition to the rural poor and in maintaining biodiversity, it is important to consider promoting the sustainable use of small indigenous species in both capture and culture fishery systems (Jhingran 1991). The fish population is declining rapidly among the streams and rivers of the southern Western Ghats. Hence the following immediate conservation measures will help to conserve these precious species.

The examined ponds were located close to each other and had similar abiotic and biotic conditions. Therefore, the ponds might potentially maintain similar native fish communities, if fish can fully migrate among the ponds within the region, and strength in species interactions can be neglected. Riverine fisheries are extremely distributed and disorderly, making the collection of information on fishing and fish harvest difficult (Sinha *et al*. 1999). The presence of non-native invasive species is a characteristic of urban ponds. The existence of these species is still cumulative (Hussner *et al*. 2014) and thus signifies a growing concern. The introduction of game fish has been considered so far non-problematic in Indian waters (Shetty *et al*. 1989). However, trout are reported to compete with native stocks, leading to their elimination, and may even hybridize with genetically similar indigenous species (Rinne, 1995).

Dangerous exotic fishes kept in ponds may escape into the natural water bodies through any small water outlet. There is the possibility of accidental release through the agency of fish-eating birds and mammals. Some people may (knowingly or unknowingly) introduce these fishes directly into natural water bodies; the recovery of exotic aquarium fishes from the natural waters of Kerala (Ajith Kumar *et al*. 1998) stands testimony to this. All this implies the need for the total elimination of these exotic species for which there must be stringent laws and public awareness. Direct evidence remains elusive, which demonstrates the "cause and effect" producing negative relationships between invasions by the two exotic fish and species diversity in native fish communities. For example, the observed relationships can also be achieved when ponds with poor native fish communities are more vulnerable to colonization by these exotic fish (Elton, 1958; Diamond and Case, 1986). The pesticides used in these areas are penetrating the river systems and severely affecting aquatic organisms like insects and diatoms, v

egetation such as phytoplankton, and even the small fish fauna (Ambili, 2013). Studying the mechanism, which demonstrates the cause and effect, will provide more insight into the present exclusive distributions in the fish community and conservation in endangered farm ponds in Japan (Mori *et al*. 1984; Kadono, 1998; Yuma *et al*. 1998).

The study seems to be commercially important to the farmers or unemployed youths living in Annassery, Thalakkulathoor Panchayath. The recorded result will help utilize the ponds for commercial purposes such as pisciculture. Conservation of freshwater ichthyo-diversity is essential for attaining objectives of food, nutrition, and economic security. Proper scientific management practices are essential for the protection and conservation of dwindling fish resources. Traditional ponds in the study area should be protected from faecal contamination, disposal of sewage, bathing of cattle, decaying of aquatic plants, etc. Renovation of the ponds by de-siltation, retaining concrete wall construction, weeding out of aquatic plants, etc. is also essential. Public awareness has to be created and efforts should be made to prevent or eliminate faecal pollution by integrated and coordinated regulatory action.

CONCLUSION

In Kerala, there are about 2,26,274 hectors of freshwater resources and about 1,30,000 hectors are ideally suited for freshwater fish culture. Out of the total area of freshwaters, 24,789 hectors are contributed by various kinds of ponds. Of the total inland fish production estimated at 2.85 million tons, about 60% is contributed by the pond aquaculture in 2001-2002. The available information on the freshwater fishes of Kerala is mostly on systematics, distribution, and abundance. The study was conducted to determine the occurrence of fish in the Annassery pond. A total of 8 species of fish were recorded from the pond. All 8 species including 6 families found during the survey at Annassery are shown in the table along with the common name, English name, scientific name, and also taxonomic positions. According to IUCN status, about 6 species were the least concern and 1 species were not evaluated and 1 species were vulnerable. The study seems to be commercially important to the farmers or unemployed youths living in Annassery, Thalakkulathoor Panchayath. The recorded result will help utilize the ponds for commercial purposes such as pisciculture also revealed that the physical habitat variables play a leading role in the distribution of fishes in streams and the habitat alteration brought about contributes significantly to the endangerment of the freshwater pond of Kerala.

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