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Fish fauna diversity in relation to water quality of the two fresh water bodies in Warangal district (T.G)

P. Gowri
Department of Zoology,
Government Degree College,
Bhupalpally

Abstract

The present study has been carried out to find out the Comparative account on the Fish Biodiversity and their abundance to the physico-chemical parameters of the water body in the two selected freshwater bodies located in Warangal District. The study has been carried out for a period of one year i.e. from Jan 2022 to Dec 2023. The findings of the present investigation reveal that the fish fauna of Thimmapur Lake consists of 28 species belonging to 19 genera of 13 families. Wherein, The fish fauna of Upparapalle Lake consists of 31 species belonging to 21 genera of 13 families. Among fish families Cyprinidae was dominant in both the water bodies. Numerically among the collections of fish species the Cypriniformes has of 10 species *belonging to family* Cyprinidae, whereas only one species of Cypriniformes belonging to family Cobitidae namely *Lepidocephalus guntea* was found. The Order Siluriformes consists of 6 species belonging to four families, Order Osteoglossiformes consists of one speices *Notopterus notopterus* belongs to family Notopteridae. Order Channiformesconsists of 3 species belongs to Channidae family. Perciformes consists of 5 species belonging to 4 families and order Atheriniformes consists of one species *Xenentodon cancilla* belongs to family Belonidae. While, The fish fauna of Upparapalle Lake consists of 31 species belonging to 21 genera of 12 families. Among the fish collections the species of Cypriniformes 13 species belonging to family Cyprinidae, Order Siluriformes consists of 6 species belonging to 4 families, Order Osteoglossiformes consists of one speices *Notopterus notopterus* belongs to family Notopteridae. Order Channiformes consists of 3 species belongs to family Channidae. Perciformes consists of 5 species belonging to 4 families and order Atheriniformes consists of one species *Xenentodon cancilla* belongs to family Belonidae. This shows that both the lakes have shown rich biodiversity of fish fauna. The present data was compared to the previously investigated data it showed that the overall diversity is still conserved but there is massive decrease in the number of some of the fish species. Therefore it is suggested that the proper scientific management of the aquatic bodies and curbing of illegal fishing can some extent facilitates to revive the fish biodiversity in these water bodies, it is observed. However further study regarding the activities affecting the diversity of fish fauna and the protocols for their sustainable conservation has to be undertaken.

Keywords: Diversity of Fish Fauna, Water Quality Indicators, Freshwater bodies

Introduction

Biodiversity is essential for stabilization of ecosystems, protection of overall environmental quality, for understanding intrinsic worth of all species on the earth (Ehrlich and Wilson, 1991).Faunal composition is distinct to geographic regions because the diversity and distribution of animals across a landscape can be interpreted in terms of their responses to the habitat characteristics (Belanger and Rodriguez, 2002). Under mounting pressure from urbanization, this aquatic systems and their existence is being threatened in a number of ways. Fish communities despite their high degree of natural variability, are indicators of ecosystem health (Moyle, 1994) and hence the occurrence and abundance of fish species can be associated to water chemistry, physical habitat, and land-use activities to provide a more complete picture of quality of water and habitat across a river basin (Deacon and Mize, 1997). Fish responses to environmental disturbances, including hydro-morphological factors are different in time and space in comparison to simpler organisms, as they tend to be integrated over larger intervals. Fish has been identified as suitable for biological assessment due to its easy identification and economic value (Siligato & Bohmer. 2001). Fish assemblages have widely been used as ecological indicators to assess and evaluate the level of degradation and health of water bodies at various spatial scales (Zampella et al., 2006; Vijaylaxmi et al., 2010). Plafkin et al (1989) observed that there are many advantages of using fish assemblage as biological indicator. Many fish species have become highly endangered, particularly in rivers where heavy demand is placed on freshwater. However, the impact of the anthropogenic activities, habitat degradation, exotic species introduction, water diversions, pollution and global climate change are the main causative agents for the aquatic species rapid decline. The objective of present investigation was to give recent data regarding fish diversity in relation to Physico chemical parameters, aiming to contribute a better knowledge of the fish diversity profile of two freshwater bodies in Warangal Ditrict and a tool for conservation planning of aquatic environments in this region.

Materials and Methods

Study Area:

Most of the water bodies in Warangal and around the city such as ponds, lakes, tanks and streams have become polluted as a consequence of increasing industrialization, urbanization and other developmental activities for the last ten years. I have concentrated on Thimmapur and Upparapalle lakes selected for the present study. The Ayacut of the Thimmapur Lake is 42.48 Hectors (109 Acres). It has GodavariBasin and a Submergence area of 16 Acres. The Ayacut of the Upparapalle lake is 52.19 Hectares (127.62 Acres). It has KrishnaBasin and a Submergence area of 19 Acres.

Table 1: Details of the Water Bodies

	Thimmapur Lake	Upparapalle Lake
Area	16 Acres.	19 Acres
Ayakat	42.48 Hectors (109 Acres).	52.19 Hectares (127.62 Acres).
Purpose	FishCulture, Agriculture	FishCulture,Agriculture,Irrigation& Drinking

Collection of Fish & Water Samples :

The present study was carried out for a period of one year from January 2022 - December 2023 and fishes were collected with the help of fisherman by using gill nets of varying mesh sizes. The fishes were identified as per Jayaram (1999), Talwar and Jhingran (1991) and Dutta Munshi and Shrivastava (1988). The physico-chemical parameters were recorded at regular intervals and analysis was done by following standard procedures of APHA (1998) and Trivedi et al.(1998).

Discussion

Fish is one of the major components of the aquatic ecosystem and fish also form food for a variety of animals and human beings. Warangal district contains large freshwater bodies such as canals, reservoirs, Lakes and ponds etc., the vast stretches of these freshwater bodies offer good score for fisheries. It is the highest fish producing center in Telangana region. This district has rich fish fauna, however some species found in this region have started disappearing. The district has rich fish fauna and there is a need to contemplate measures to protect the genetic resources. The main threat for the decline of various fish fauna may be due to over fishing of juveniles. Industrialization, urbanization and destruction of natural environment, further deteorating the situation. Therefore in the present study emphasis is given to verify the fish germplasm. The evaluation of fish genetic resources found here in the two Lakes of Warangal districts reveals that there are 30 species belongs to 20 genera available and they belong to 6 orders of 13 families.

The fish fauna of Thimmapur Lake (Table No.2) consists of 28 species belonging to 19 genera of 13 families. Among the collections of species of Cypriniformes i.e. *Catla cattla, Cyprinus carpio, Cirrhinus mrigala, Amblypharyngodon, Labeo calbasu, Labeo rohita, Labeo pongusia, Salmostoma bacaila, Punctius chola,* and *Punctius ticto ticto belonging to family* Cyprinidae,only one species of Cypriniformes belonging to family Cobitidae namely *Lepidocephalus guntea*. Order Siluriformes consists of 6 species belonging to four families, Heteropneustes fossilis belongs family *Heteropneustidae. Clarius batrachus* belongs to family Claridae. *Mystus vittatus, Mystus bleeker and Mystus cavasius* species belongs to Bagridae, *Wallogo attu* species belongs to Siluridae. Order Osteoglossiformes consists of one speices *Notopterus notopterus* belongs to family Notopteridae. Perciformes consists of four species *Anabas testudineus* belongs to family Anabantidae, *Nandus nandus* belongs to family Nandidae, *Glossogobius giuris giuris* belongs Gobiidae, *Mastacembelus pancalus* and *Mastacembelus pancalus* belongs to Mastacembelidae, Order Channiformes consists of three species *Channa punctatus, Channa striatus* and *Channa orientalis* belongs to family Channidae. and order Atheriniformes consists of one species *Xenentodon cancilla* belongs to family Belonidae.

The fish fauna of Upparapalle Lake (Table No.3) consists of 31 species belonging to 21 genera of 13 families. Among the collections of species of Cypriniformes i.e. *Catla cattla, Cyprinus carpio, Cirrhinus mrigala, Amblypharyngodon, Labeo calbasu, Labeo rohita, Labeo pongusia, Salmostoma bacaila, Punctius chola, Punctius ticto ticto, Esomus danricus and Rasobora elanga* belonging to family Cyprinidae, only one species of Cypriniformes belonging to family Cobitidae namely *Lepidocephalus guntea*. Order Siluriformes consists of 6 species belonging to four families, *Heteropneustes fossilis* belongs family Heteropneustidae. *Clarius batrachus* belongs to family Claridae. *Mystus vittatus, Mystus bleeker* and *Mystus cavasius* species belongs to Bagridae, *Wallogo attu* species belongs to Siluridae. Order Osteoglossiformes consists of one speices *Notopterus notopterus* belongs to family Notopteridae. Perciformes consists of four species *Anabas testudineus* belongs to family Anabantidae, *Nandus nandus* belongs to family Nandidae, *Glossogobius giuris giuris* belongs Gobiidae, *Mastacembelus pancalus* and *Mastacembelus pancalus* belongs to Mastacembelidae, Order Channiformes consists

Table No. 2 : Shows list of fish genetic resources in Thimmapur lake

Sl. No	Order	Family	Genus	Species
1	Cypriniformes	Cyprinidae	***Cattla (valenciennes)***	*Catla cattla (Hamilton-Buchanan)*
			Cyprinus (Linnaeus)	*Cyprinus carpio carpio(Hamilton-Buchanan)*
			Cirrhinus (Oken)	*Cirrhinus mrigala (Hamilton-Buchanan)*
			Amblypharyngodon (Bleeker)	*Amblypharyngodon mola (Hamilton)*
			Labeo (cuvier)	*Labeo calbasu (Hamilton – Buchanan)*
				Labeo rohita (Hamilton-Buchanan)
				Labeo pongusia (Hamilton - Buchanan)
			Salmostoma (swainson)	*Salmostoma bacaila (Hamilton)*
				Punctius chola (Hamilton – Buchanan)
			Puntius (Hamilton)	*Punctius ticto ticto (Hamilton – Buchanan)*
		Cotibidae	***Lepidocephalus (Bleeker)***	*Lepidocephalus guntea (Hamilton)*
2	Siluriformes	Heteropneustidae	***Heteropneustes (Muller)***	*Heteropneustes fossilis (Bloch)*
		Clariidae	***Clarias (Scopoli)***	*Calrias batrachus (Linnaeus)*
		Bagridae	***Mystus (Scopoli)***	*Mystus vittatus (Bloch)*
				Mystus cavasius (Hamilton)
				Mystus bleeker (Day)
		Siluridae	***Wallogo (Bleeker)***	*Wallogo attu (Schneider)*
3	Osteoglossiformes	Notopteridae	***Notopterus (Lacepede)***	*Notopterus notopterus (Pallas)*
4	Channiformes	Channidae	***Channa (Scopoli)***	*Channa punctatus (Bloch)*
				Channa Striatus (Bloch)
				Channa orientalis (Hamilton)

5	**Perciformes**	**Anabantidae** **Nandidae** **Gobiidae** **Mastacernbelidae**	***Anabus (Cuvier)*** ***Nandus (Valenciennes)*** ***Glosogobius (Gill)*** ***Mastacembelus (gronovius)***	*Anabas testudineus (Bloch)* *Nandus nandus (Hamilton)* *Glosogobius giuris giuris (Hamilton)* *Mastacembelus armatus (Lacepede)* *Mastacembelus puncalus (Hamilto*
6	**Antheriniformes**	**Belondae**	***Xenentodon (Ragan)***	*Xenentodon cancila (Hamilton)*

Table No. 3: Shows list of fish genetic resources in Upparapalle lake

S.No	Order	Family	Genus	Species
1	**Cypriniformes**	**Cyprinidae**	***Catla (valenciennes)***	*Catla cattla (Hamilton-Buchanan)*
			Cyprinus (Linnaeus)	*Cyprinus carpio carpio(Hamilton-Buchanan)*
			Cirrhinus (Oken)	*Cirrhinus mrigala (Hamilton-Buchanan)*
			Amblypharyngodon (Bleeker)	*Amblypharyngodon mola (Hamilton)*
			Labeo (cuvier)	*Labeo calbasu (Hamilton – Buchanan)*
				Labeo rohita (Hamilton-Buchanan)
				Labeo pongusia (Hamilton - Buchanan)
			Salmostoma (swainson)	*Salmostoma bacaila (Hamilton)*
			Puntius (Hamilton)	*Punctius chola (Hamilton – Buchanan)*
				Punctius ticto ticto (Hamilton – Buchanan)
			Esomus (Swainson)	*Esomus danricus(Hamilton)*
			Rasobora (Bleeker)	*Rasobora elanga (Hamilton)*
		Cotibidae **Heteropneustidae**	***Lepidocephalus(Bleeker)*** ***Heteropneustes (Muller)***	*Lepidocephalus guntea (Hamilton)* *Heteropneustes fossilis (Bloch)*
	Siluriformes	**Clariidae**	***Clarias (Scopoli)***	*Calrias batrachus (Linnaeus)*
		Bagridae	***Mystus (Scopoli)***	*Mystus vittatus (Bloch)* *Mystus cavasius (Hamilton)* *Mystus bleeker (Day)*
		Siluridae	***Wallogo (Bleeker)***	*Wallogo attu (Schneider)*

3	**Osteoglossiformes**	**Notopteridae**	***Notopterus (Lacepede)***	*Notopterus notopterus (Pallas)*
4	**Channiformes**	**Channidae**	***Channa (Scopoli)***	*Channa punctatus (Bloch)* *Channa Striatus (Bloch)* *Channa orientalis (Hamilton)* *Channa marulius (Hamilton)*
5	**Perciformes**	**Anabantidae** **Nandidae** **Gobiidae** **Mastacernbelidae**	***Anabus (Cuvier)*** ***Nandus (Valenciennes)*** ***Glosogobius (Gill)*** ***Mastacembelus (gronovius)***	*Anabas testudineus (Bloch)* *Nandus nandus (Hamilton)* *Glosogobius giuris giuris (Hamilton)* *Mastacembelus armatus (Lacepede)* *Mastacembelus puncalus (Hamilto*
6	**Antheriformes**	**Belondae**	***Xenentodon (Ragan)***	*Xenentodon cancila (Hamilton)*

of three species *Channa punctatus, Channa striatus, Channa orientalis and Channa marulius* belongs to family Channidae and order Atheriniformes consists of one species *Xenentodon cancilla* belongs to family Belonidae.

With recent scientific advances and new strategies can conserve aquatic resources and ensure its genetic diversity. The fishery scientist, have to promote fishery and endeavour to enhance the fish production to improve the socio-economic conditions of traditional fish farmers. According to vision 2020 document (1999) even after 50 years of independence still there is a lot to be done in fishery sector and what has been done so far in this sector is only a drop in the ocean. Therefore there is a need to take measures, which have to be initiated to protect and preserve the fish genetic resource and few of them or also at the verge of extinction in this region. The fish germplasm resource of this region exhibits a combination of both torrential and plain water forms. They occupy diverse ecological regime in their distribution. In this context the present study has been undertaken which is a bid to demonstrate the need of this agro-industry to improve the living standards of fishery folk, to enhance food security and also to promote the fishery sector in Warangal district of Telangana State. The present study elucidates the ecological significance of water body to increase fish growth and production. Because the physico-chemical parameters, primary productivity of the Lakes directly influence the fish growth and production, the diversity and distribution of zooplankton also might have influence on fish fauna found in these waters. Therefore keeping this vital ecological factor in view, two major water bodies have been choosen and an attempt has been made to study the physico-chemical, biological status and also the fish fauna diversity of these two Lakes which are the major water bodies in this area. The data thus obtained has been taken as basic criteria to suggest a remedy to enhance the fish growth and fish production not only in these two water bodies but also in other water bodies too.

Water Quality Indicators

The parameters studied were Water Temperature, pH, Water Transparency, Electrical Conductivity, Dissolved Oxygen, Biological Oxygen Demand, Free Carbondioxide, Total Alkalinity, Chlorides, Total Hardness, Total Dissolved Solids, Ammonia, Phosphates, Nitrates, Sodium, Potassium. In the present investigation, the

maximum water temperature was recorded in pre monsoon season and minimum during post monsoon season. In the present study, the high pH was recorded during premonsoon and monsoon season due to high temperature in the lakes and low was in post monsoon season. The low transparency was observed in monsoon season particularly in the month of August due to high inflow of water from catchment area, with resultant increased turbidity. The high conductivity was recorded in pre monsoon season and low in post monsoon. Dissolved Oxygen was high during monsoon and post monsoon season as low temperature favored dissolution of dissolved oxygen. Low DO during pre monsoon season. The free CO_2 was observed high in pre monsoon season and low in post monsoon season. BOD values were higher during post monsoon season and low during pre monsoon season. The total alkalinity was recorded high in post monsoon season and low in monsoon season. The high Chloride content was found in pre monsoon season and low in monsoon season. High Nitrates found during monsoon and low during winter season. The high phosphates were found in monsoon and low in pre monsoon and post monsoon season. Seasonally high Sodium and Potassium were recorded during monsoon season and low during pre monsoon season.

Conclusion

The study was carried out for a period of one year (January, 2022 to December, 2023) at four selected stations in each lake. The investigation of the physico-chemical parameters of these two Lakes of Thimmapur and Upparapalle Lake revealed that most of the water quality parameters are under tolerable limits. Both the water bodies contains economically important and cultivable fishes as well as some ornamental fishes. However, in recent days the water holding capacities of these tanks are decreasing, which might affect the survival of fish fauna. In addition, human anthropogenic activity and surface run off might also influence the fish diversity in the water bodies. Nevertheless, it is suggested to monitor the water regularly in these tanks and appropriate control measures are required to conserve the fish diversity. The findings observed in the present study were discussed with an emphasis on their significance and interrelationship with fish diversity and also their adverse effect if any to enhance fish production.

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