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Ichthyofaunal diversity of Mallasandra Lake of Tumakuru, Karnataka State, India

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Abstract
The exploitation of the aquatic resources either for social, economical or nutritive purposes is called fisheries. This includes the capture fisheries and culture fisheries as well. In Indian lakes the fish yield levels may not exceeds 0.2% of gross production and energy fixation rate range from 0.0 to 0.68% from available light energy. The Mallasandra Lake is situated 13.6km from centre of Tumakuru city. It lies at 13°19'40"N latitude and 77°1'35"E longitude. This lake is rain fed during monsoon period. Mallasandra lake is comparatively larger with limited catchments with an average rain fall is 630mm and soil in the catchment area is black clay/loamy. At present in the lake fish productivity is considerably low. No much reports are available on this lake. Hence, present study was carried out to assess the fish diversity status. Fish samples were collected during May 2016 to May 2017. Observation reveled that there are 10 different fish species are present, among these *Oreochromis mossambica*, *Oreochromis nilotica* are the major contributory species and family *Cyprinidae* is most dominant group. Water temperature (24ºC to 26ºC) and rainfall was found as major influential factors for species distribution.

Keywords: fish diversity, ecology, environment, Mallasandra Lake

1. Introduction
Rivers, lakes and wells are important sources of water in a region. Water is an essential component of an eco-system. It sustains life on earth. A community depends on water for its domestic, agriculture and industrial needs. The structure of fish communities in continental aquatic ecosystems, especially in man-made reservoirs, can be affected by several biotic and abiotic ecological factors. Among them, Lake has the greatest impact. In Lake Ecosystem modifies the relationships involving the distribution pattern, composition of fish communities and environmental factors, in function of the space and time scales. This is evidenced by the abundant in the ichthyofaunal diversity when a formerly lentic environment (Lake) compared to lotic zone (Edmir Daniel Carvalho, 1998) [4]. In the management of reservoirs, knowledge of the environment and the concept of ecotone should be considered (Tundisi, 1993) [25].

The Fish populations is about half of the total number of vertebrates in the world. Total 21,730 species of fishes have been recorded in the world among only 11.7% are found in Indian water (murugan, A.S. 2012). In Indian aquatic media have 2500 fish species are available among these freshwater bodies contain only 930 species (Jayaram, 1999) [6] and marine water bodies have 1570 species (Kar, 2003) [8] are available. Fresh water fishes are very much useful for the assessment of water quality as bio indicators, river network connectivity or flow regime (Chovane *et al*. 2003) [2] fish being rich source of proteins and have high nutritive and economic value. The economic importance and scope of fish and fisheries especially in Karnataka, but it is natural to study the availability and distribution of fish from fresh water. Present investigation was undertaken to study the ichthyofaunal diversity from Mallasandra Lake, Tumakuru. However, there are no recent scientific records of ichthyofaunal diversity in Tumakuru District. The objective of the study was collect the available fish data and observes its abundance, aiming to contribute a better knowledge of fish diversity in Mallasandra Lake. The same observation observed in Mallasandra lake (Shivaraju *et al.*, 2017) [22] and Durgadahalli lake (Shivaraju *et al.*, 2018) [23]. The work will provide future strategies for development of fish species conservation and it is the first effort in this direction.

2. Materials and Methods
2.1. Study Area
Karnataka is the largest state in India is situated in Deccan plateau. The climate and physiography of the region make the state one of the most important in the country with regard to water resources. Karnataka state has wide range of water spread area under various Lakes, Rivers and different man-made impoundments. A large number of studies covering a wide variety of ecosystems and organisms suggest that species richness tends to vary strongly with ecosystem production and habitat heterogeneity. As the Karnataka is rich in productive and heterogeneous fresh water habitats, it supports a great ichthyofaunal diversity. The Mallasandra lake of Tumakuru district, Karnataka, India, is water body situated 13.6km from centre of Tumakuru city towards north east. It lies at 13°19'40"N latitude and 77°1'35"E longitude. The Lake is rain fed during monsoon period. The water mainly used for drinking purpose and also to cultivate paddy crops in and around the lake area. Besides, washing activity is commonly seen and many aquatic weeds are present.

Table 1: Morphometric features of Mallasandra Lake, Tumakuru, and Karnataka, India

SL. No	Attribute	Value
1	**Location of the Reservoir**	**13°19'40''N and 77°1'35''E Mallasandra village**
2	Nearest city	Tumakuru
3	District	Tumakuru
4	State	Karnataka
5	Size	Large sized lake in Tumakuru
6	Purpose	Irrigation and Drinking
7	Water source	Monsoon run-off
8	Average Rain fall (mm)	630mm
9	Temperature of Water (ºC)	24ºC to 26ºC
10	Soil type	black clay/loamy

2.2. Methodology

Water samples were collected from five sites in the months of May 2016 to May-2017. The sampling was usually carried out at 8:00 am to 11:00 am. The water samples were collected directly from the surface layer in plastic canes as possible avoiding the unpredictable changes. The physicochemical analysis of samples was done according to the procedure prescribed by APHA (1998) [3] and Adoni (1985) [1].

The fishes were collected mainly by using gill nets of different mesh sizes which varied from 10 to 100 mm with the assistance of local fishermen. Immediately photographs were taken prior to preservation for the identification of fishes. The collected specimens were preserved in 5-10% formalin according to the size. Plastic jars were used to collect and preserve the fishes. 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 collected and fixed were labeled by giving serial numbers, exact locality from where collected and the date of the collection. The common local name of fish used in this region was labeled in each jar containing the fish. The fishes were identified in laboratory with exports using taxonomic keys of Jayaram (1981) [5], Jhingran (1991) [7] and Qureshi and Qureshi (1983) [16]. The identification of the species was done mainly on the basis of the colour pattern, specific spots or marks on the surface of the body, shape of the body, structure of various fins, mouth shapes etc.

3. Results and Discussion

During the present study a total of 10 species of freshwater fishes belonging to 5 families were recorded from the study sites of Mallasandra Lake. On the basis of percentage composition and species richness, order *Cypriniformes* was dominant (5 species) followed by *Perciformes* (3 species), *Siluriformes* (2 species), (Table 2).

The ichthyofaunal diversity of Mallasandra Lake comprises of 5 families namely Cyprinidae, Cichlidae, *Channidae*, *Heteropneustidae*, Siluridae (Table 2). The family *Cyprinidae* was the largest, most dominating and was represented by 05 species, *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Labeo fimbriatus*, *Cyprinus carpio*. Among these *Cyprinids Catla catla* and *Labeo rohita* were abundant. The family Cichlidae was represented by 2 species, *Oreochromis nilotica*, *Oreochromis mossambica*, and these two species have more abundance compared to other families and heavy competitor here for Indian major carps. In every 100 catches it constitutes about 50-65%. This may be due to the over exploitation of Indian Major Carps (IMC) and its prolific feeding and breeding behaviour. *Oreochromis mossambica*, which was given the Near Threatened (NT) status by the IUCN. The family *Channidae*, *Heteropneustidae*, Siluridae was represented by single species in each family's, they are *Channa orientalis*, *Heteropneustes fossilis*, *Ompok bimaculatus* respectively. Thus, the Mallasandra Lake has good potential for fish fauna and significant in respect of its fish diversity.

Table 2: Ichthyofaunal diversity of Mallasandra Lake in Tumakuru

SL. No	Species	Local Name	Order	Family
1	Catla catla (Hamilton,1822)	Cotla	*Cypriniformes*	*Cyprinidae*
2	*Labeo rohita* (Hamilton 1822)	Rohu	*Cypriniformes*	*Cyprinidae*
3	*Cirrhinus mrigala* (Hamilton,1822)	Mrigala	*Cypriniformes*	*Cyprinidae*
4	*Labeo fimbriatus* (Bloch 1795)	Fimbriatus	*Cypriniformes*	*Cyprinidae*
5	*Cyprinus carpio* (Linnaeus, 1758)	Common carp	*Cypriniformes*	*Cyprinidae*
6	*Oreochromis nilotica* (Linnaeus,1758)	Nile tilapia	*Perciformes*	*Cichlidae*
7	*Oreochromis mossambica* (Peters,1852)	Tilapia	*Perciformes*	*Cichlidae*
8	*Channa orientalis* (Bloch & J. G. Schneider, 1801)	Asiatic snake head	*Perciformes*	*Channidae*
9	*Heteropneustes fossilis* (Bloch,1794)	Singhi	*Siluriformes*	*Heteropneustidae*
10	*Ompok bimaculatus* (Bloch, 1794)	Butter fish	*Siluriformes*	*Siluridae*

4. Conclusion

The fish community in Lake includes the native and alien species, introduced for the purpose of fish production. The present study is the first ever documentation of ichthyofauna in the Mallasandra Lake of Tumakuru, Karnataka. Invasive species like Tilapia are becoming a threat to the native Indian major carps here, this must be checked out. Over exploitation must be prevented by following a fishing holiday of about three months during the breeding season from July to September in order to allow the proper growth of fishes and

mesh regulation in fishing is also an important factor. Sustainable fish production by taking appropriate steps for sustaining diversity is necessary to conserve these resources.

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