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COMPARATIVE STUDY ON ECOLOGY AND ICHTHYOFAUNAL DIVERSITY OF MYDALA AND DURGADAHALLI LAKES OF TUMAKURU, KARNATAKA STATE, INDIA.

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ABSTRACT
The fish diversity is represents the balanced ecosystem and good indicator of health of aquatic ecosystem. The Mydala and Durgadahalli Lakes are situated 20km and 15km from centre of Tumakuru city towards north east. They lies at 13°18'46"N latitude, 77°11'37"E longitude and 13° 13' 56" N latitude, 77° 25' 30" E longitude. Water spread area is 370 hectares and 15.60 hectares, the average depth is 3.0 to 4.4 meters and 1.8 to 2.0 meters respectively along the bund. These lakes are rain fed during monsoon period. The total catchment area of the selected lakes is 62.96sq.km and 17.25sq.km, height is about 13 to 14.8m and 10.4 to 10.6m, average rain fall is about 640.27mm and 620mm respectively. This water is mainly used for cultivation in and around the lakes area and Mydala lake is comparatively larger with limited catchments. At present the fish productivity is considerably low. Not much report is available on fish productivity of these lakes. Keeping all these views, we have selected Mydala and Durgadahalli lakes to study on ecology and fish diversity. During the study from the period of October-2016 to January-2019, in Mydala lake observations reveled that there are 15 different fish species are present, among them, *Oreochromis nilotica*, *Oreochromis mossambica*, *Ctenopharyngodom idella* are the major contributory species and family *Cyprinidae* is most dominant group. In Durgadahalli lake have 10 different species of fishes among them, *Ctenopharyngodom idella*, *Oreochromis mossambicus* are major contributory species and family *Cyprinidae* is most dominant group. Hence the protection of these lakes is mandatory for sustainable fishery. Along with ichthyofaunal diversity, the physiochemical parameter of water is carried out but there is no unpredictable change in these two lakes of water.

KEYWORDS: Durgadahalli Lake, Fish diversity, Habitat, Mydala Lake, Physiochemical parameters.

INTRODUCTION

Fishes exhibit enormous diversity in their morphology, in the habitats they occupy like ponds, lakes, rivers, etc. Unlike the other recognized vertebrates, fishes are heterogeneous assemblage (Forese and Pauly, 1998). Fishes often have major impacts on distribution and abundance of other organisms in water, they inhabits and display the characteristics of the ecosystem of water body. India is one of the 17 mega biodiversity hot spots contributing 60-70 % of the world's biological resources. Being home for about 11.72% of total global fish biodiversity, the country ranks third in the world in total fish production (Lakra and Sarkar, 2009). India is occupies the ninth position in terms of freshwater mega biodiversity (Mittermeier, et al., 1997). There are 450 families of freshwater fishes globally, out of which 40 families are represented from India (Keshave et al., 2013). In India there are 2,500 species of fishes of which 930 live in freshwater (Jayaram 1999) and 1,570 are marine (Kar et al., 2003). Fish are most abundant in water bodies. They can be found in nearly all aquatic environments, from high mountain streams to deepest oceans. Fishes are the most important source of food and also play an important role in health and commercial values as many countries have been staple items of diet of many people in the world. The fishes are one of the main exploitable resources of the aquatic ecosystems that fresh fish flesh excellent source of protein for human diet. Fish proteins comprise all the ten essential amino acids desirable for human consumption. Biodiversity is essential for stabilization of ecosystem, protection of overall environmental quality for understanding intrinsic worth of all species on the earth.

The objective of the study was to give recent data regarding fish diversity, aiming to contribute fish diversity of the Mydala and Durgadahalli lakes of Tumakuru, Karnataka. These lakes naturally deserve a leading position because these lakes are prime aquatic resources of Tumakuru district supporting a rich aquatic biodiversity and Mydala Lake is comparatively larger than the Durgadahalli lake. In the present study an attempt have been made to record the

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freshwater fish diversity from Mydala and Durgadahalli Lakes of Tumakuru, Karnataka. The water is used mainly domestic purposes, irrigation and fishing purposes.

MATERIAL AND METHODS

STUDY AREA

The Mydala lake (13°18'46"N latitude, 77°11'37"E longitude) is situated at about 20km away from the city (Fig 1) and Durgadahalli lake (13° 13' 56" N latitude, 77° 25' 30" E longitude) is situated at about 15km away from the city (Fig 2). These lakes are perennial water body having an area of about 370 hectares and 15.60 hectares, depth about 3.0 to 4.4 meters and 1.8 to 2.0 meters along the bund, the total catchment area is 62.96sq.km and 17.25sq.km. Height is about 13 to 14.8m with an average rain fall is 640.27mm and 10.4 to 10.6m with an average rain fall is 620mm respectively (Table 1). These lakes are rain fed during monsoon period.

Table 1: Morphometric features of Mydala and Durgadahalli Lakes, Tumakuru, Karnataka, India

SL. No	Attribute	Mydala Lake	Durgadahalli Lake
1	Location of the Reservoir	13°18'46"N and 77°11'37"E At Mydala village	13° 13' 56" N, 77° 25' 30" E At Durgadahalli village
2	Nearest city and District	Tumakuru	Tumakuru
3	State	Karnataka	Karnataka
4	Size	Large sized lake in Tumakuru	Small sized lake in Tumakuru
5	Purpose	Irrigation and Drinking	Irrigation and Drinking
6	Year of completion	1906	1980-81
7	Total Catchment area (Sq.Km)	62.96sq.km	17.25sq.km
8	Total Water Spread Area (WSA) (Ha)	370 hectares	15.60 hectares
9	Water source	Monsoon run-off	Monsoon run-off and
10	Average Rain fall (mm)	640.27mm	620mm
11	Soil type	black clay/loamy	sand/gravel

Fig 1: Satellite image and water body of Mydala Lake

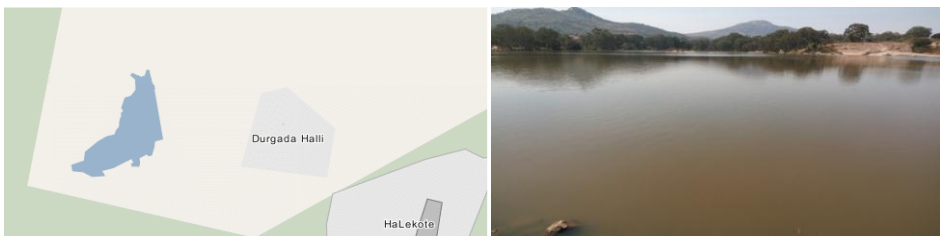

Fig 2: Satellite image and water body of Durgadahalli Lake

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METHODOLOGY

a) Water Analysis: Water samples were collected from selected sites of the each lake. The sampling was usually carried out during 8:00 am to 10:00 am. The water samples were collected directly from the surface layer in plastic can to avoid the unpredictable changes. The physicochemical analysis of samples (Table 4) was done in the lab according to the procedure prescribed by APHA (1998) and Adoni (1985).

b) Fish Diversity: The fishes were collected with the assistance of local fishermen mainly by using gill nets of different mesh sizes which varied from 10 to 100 mm. immediately photographs were taken prior to preservation for the identification of fishes. The collected few specimens were preserved in 4-6% formalin. Plastic jars were used to preserve the fishes. Smaller fishes were directly placed in the formalin solution, while larger fishes were injected 4% formalin 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 on each jar of the fish. The fishes were identified in laboratory with using taxonomic keys of Jayaram (2010), Jhingran (1991) and Qureshi and Qureshi (1983). 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.

RESULTS AND DISCUSSION

MYDALA LAKE

During the study in the study area like Mydala lake we could find total 15 species of freshwater fishes (Fig 5) belonging to 6 families and 13 genera were recorded. On the basis of percentage composition and species richness, order *Cypriniformes* was dominant (10 species, 66.66%) followed by *Perciformes* (3 species, 20%) and *Siluriformes* (2 species, 13.33%), (Table 2; Fig 3). The ichthyofaunal diversity of Mydala lake comprises of 6 families namely *Cyprinidae, Nemacheilidae, Cichlidae, Channidae, Heteropneustidae, Siluridae* (Table 2; Fig. 4).

The sequence of dominance of encountered families is *Cyprinidae* (60.00%) > *Cichlidae* (13.33%) > *Nemacheilidae* (6.66%) = *Channidae* (6.66%) = *Heteropneustidae* (6.66%) = *Siluridae* (6.66%) (Table 2; Fig 4). The family *Cyprinidae* is the largest, most dominating and is represented by 09 species, *Catla catla, Labeo rohita, Cirrhinus mrigala, Labeo fimbriatus, Cyprinus carpio, Hypophthalmichthys molitrix, Rasbora daniconius, Ctenopharyngodon idellus, Puntius chola*. Among these *Cyprinids, Catla catla, Labeo rohita* and *Ctenopharyngodon idellus* were abundant. The family *Cichlidae* is represented by 2 species, *Oreochromis nilotica, Oreochromis mossambica*, and these two species have more abundance compared to other family and heavy competitor here for Indian major carps. In every 100 catches it constitutes about 60-65%.

This may be due to the over exploitation of Indian Major Carps (IMC) and its prolific feeding and breeding behavior. *Oreochromis mossambica*, which was given the near threatened (NT) status by the IUCN. The family *Nemacheilidae, Channidae, Heteropneustidae, Siluridae* was represented by single species in each family, they are *Schistura denisoni, Channa orientalis, Heteropneustes fossilis, Ompok bimaculatus* respectively. Thus, Mydala Lake has good potential for fish fauna and significant in respect of its fish diversity too (Fig 5). The physicochemical parameters of Mydala lake were analyzed once in a three month. The lake is fresh water body, there is no detectable change and water condition is good. This lake water is well suitable for growth of aquatic organisms (Table 4).

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Table 2: Ichthyofaunal diversity of Mydala Lake in Tumakuru

SL.No	Species	Vernacular name	common Name	Order	Family
1	*Catla catla* (Hamilton,1822)	Dodda Gende	Cotla	*Cypriniformes*	*Cyprinidae*
2	*Labeo rohita* (Hamilton, 1822)	Rohu	Rohu	*Cypriniformes*	*Cyprinidae*
3	*Cirrhinus mrigala* (Hamilton,1822)	Mrigal	Mrigala	*Cypriniformes*	*Cyprinidae*
4	*Labeo fimbriatus* (Bloch, 1795)	Kem-meenu	Fimbriatus	*Cypriniformes*	*Cyprinidae*
5	*Cyprinus carpio* (Linnaeus, 1758)	Samanya Gende	Common carp	*Cypriniformes*	*Cyprinidae*
6	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	Silver Carp	Silver carp	*Cypriniformes*	*Cyprinidae*
7	*Rasbora daniconius* (F. Hamilton, 1822)	Saslu	Rasbora	*Cypriniformes*	*Cyprinidae*
8	*Puntius chola* (Hamilton,1822)	Hongekaie Meenu	Sawmpy barb	*Cypriniformes*	*Cyprinidae*
9	*Ctenopharyngodon idella* (Valenciennes,1844)	Grass Carp or Hullu Gende	Grass carp	*Cypriniformes*	*Cyprinidae*
10	*Schistura denisoni* (F. Day, 1867)	Malli menu	Loach	*Cypriniformes*	*Nemacheilidae*
11	*Oreochromis nilotica* (Linnaeus,1758)	Tiger Jilebi	Nile tilapia	*Perciformes*	*Cichlidae*
12	*Oreochromis mossambica* (Peters,1852)	Nate Jilebi	Tilapia	*Perciformes*	*Cichlidae*
13	*Channa orientalis* (Bloch & J. G. Schneider, 1801)	Korava	Asiatic snake head	*Perciformes*	*Channidae*
14	*Heteropneustes fossilis* (Bloch,1794)	Chelu Meenu	Singhi	*Siluriformes*	*Heteropneustidae*
15	*Ompok bimaculatus* (Bloch, 1794)	Godle	Butter fish	*Siluriformes*	*Siluridae*

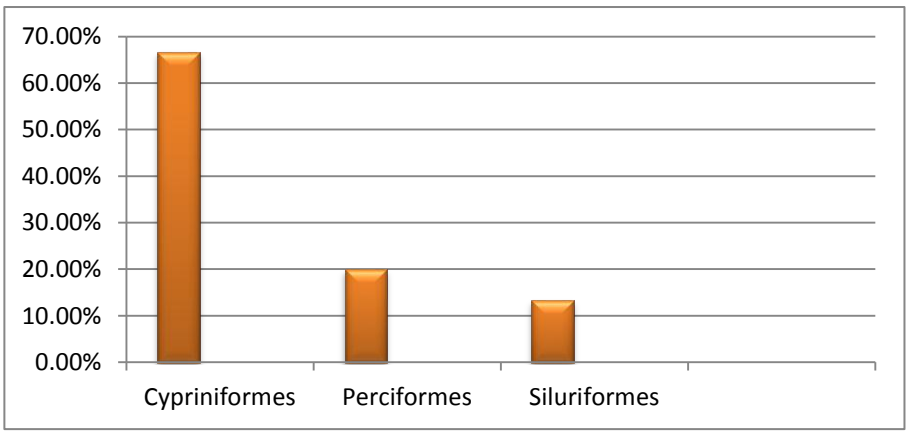

Fig 3: Order – wise fish species abundance in Mydala Lake

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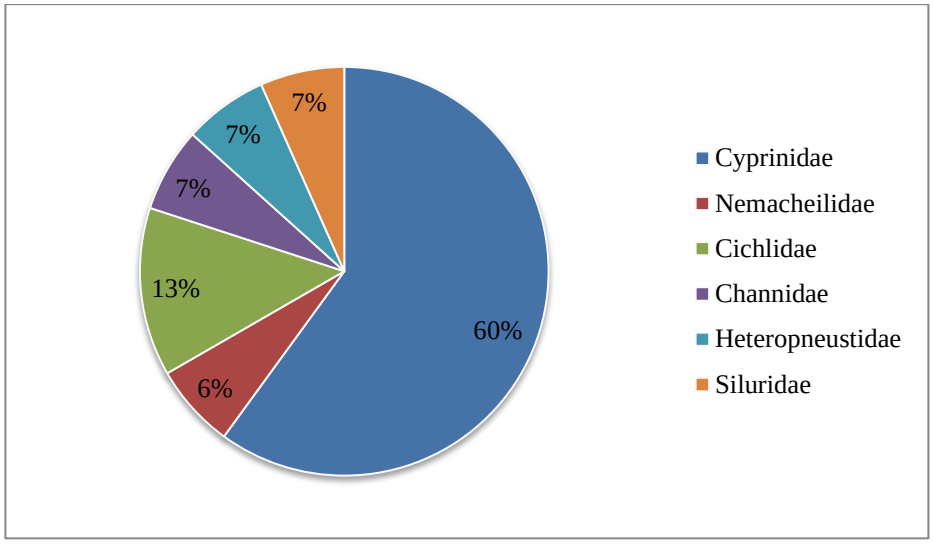

Fig 4: Family-wise fish species dominance in Mydala Lake.

About 10 species of fishes were recorded during the present study (Table 3 and Fig 8). Fishes belong to 2 orders, 3 families, 9 genera and 10 species. The fishes belonging to order *Cypriniformes* were found to be abundant then *Perciformes* (Fig 6). The ichthyofaunal diversity of Durgadahalli lake comprises of 3 families namely *Cyprinidae*, *Cichlidae*, *Ambassidae* (Table 3; Fig. 7). The sequence of dominance of encountered families is *Cyprinidae* (80.00%) > *Cichlidae* (10.00%) = *Ambassidae* (10.00%) (Table 3; Fig 7). The study as shown that presence of both native and exotic fishs in Durgadahalli lake. The abundance of fish species viz., Tilapia, Grass carp, Catla and Mrigala were observed more abundant than other species respectively.

The study highlights that invasive species like Tilapia and Grass carp may be the threatening factors for species reduction in this lake. Other factors like over fishing and anthropogenic activities must be maintained in order to save the fish diversity of this lake for sustainable development more ever, it is recommended that the fishing should be banned during breeding season (July to September) and mesh sizes be regulated for proper growth and size of fishes. Hence, by adopting such measures we can save this deterioration as it plays an important role in generating the economy of Karnataka state.

The physicochemical parameters of Durgadahalli lake were analyzed once in a three month. The lake is fresh water body, there is no detectable change and water condition is good. This lake water is well suitable for growth of aquatic organisms (Table 4).

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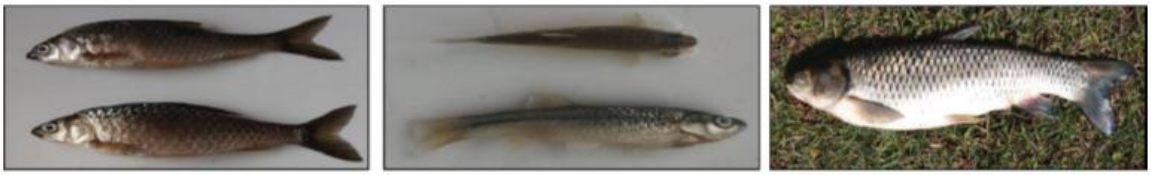
Fig 5: Showing Fish diversity of Mydala lake, Tumakuru

Catla catla *Labeo rohita* *Cirrhinus mrigala*

Labeo fimbriatus *Cyprinus carpio* *Hypophthalmichthys molitrix*



Puntius chola *Rasbora daniconius* *Ctenopharyngodon idella*

Schistura denisoni *Oreochromis nilotica* *Oreochromis mossambica*

Heteropneustes fossilis *Channa orientalis* *Ompok bimaculatus*

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Table .3- List of lake fish species of Durgadahalli lake.

SL.No	Species	Vernacular name	common Name	Order	Family
1	*Garra gotyla* (J.E. Gray, 1830)	Kallu korava	Nilgiris garra	*Cypriniformes*	*Cyprinidae*
2	*Labeo fimbriatus* (Bloch 1795)	Kem menu	Fimbriatus	*Cypriniformes*	*Cyprinidae*
3	*Ctenopharyngodon idella* (Valenciennes,1844)	Grass Carp or Hullu Gende	Grass carp	*Cypriniformes*	*Cyprinidae*
4	*Cirrhinus mrigala* (Hamilton,1822)	Mrigal	Mrigal	*Cypriniformes*	*Cyprinidae*
5	*Amblypharyngodon mola* (Hamilton, 1822)	Enapu Pakke	Mola carplet	*Cypriniformes*	*Cyprinidae*
6	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	Silver carp	Silver carp	*Cypriniformes*	*Cyprinidae*
7	*Catla catla* (Hamilton,1822)	Dodda Gende	Catla	*Cypriniformes*	*Cyprinidae*
8	*Labeo rohita* (Hamilton 1822)	Rohu	Rohu	*Cypriniformes*	*Cyprinidae*
9	*Oreochromis mossambica* (Peters,1852)	Nate Jilebi	Tilapia	*Perciformes*	*Cichlidae*
10	*Parambassis ranga* (F. Hamilton, 1822)	Gajina Meenu	Glass fish	*Perciformes*	*Ambassidae*

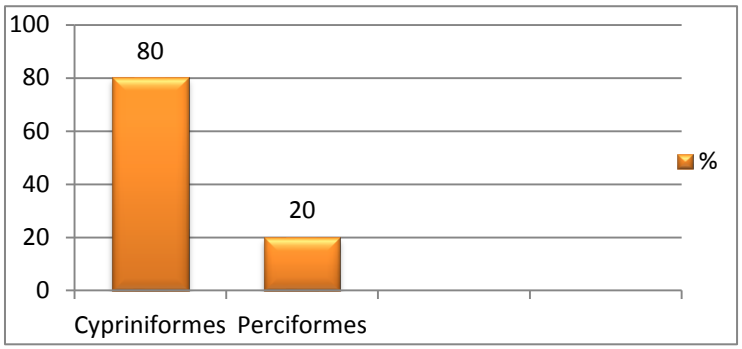

Fig-6: Order – wise fish species abundance in Durgadahalli lake.

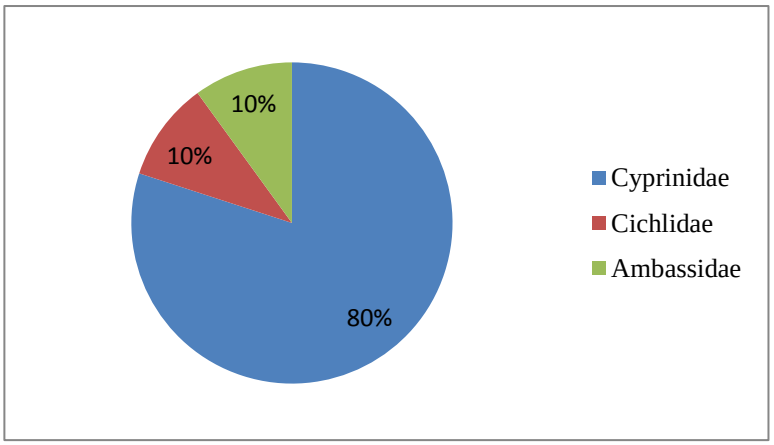

Fig-7: Family– wise fish species abundance in Durgadahalli lake.

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Fig 8: Showing Fish diversity of Durgadahalli lake, Tumakuru

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Table 4: Physico-chemical parameters of Mydala and Durgadahalli Lakes of Tumakuru.

SL.No	Water parameters	Unit	Mydala Lake	Durgadahalli Lake
1	pH	pH unit	7.27	7.07
2	Biological Oxygen Demand (BOD) (3days @27^{o}C)	mg/l	3.0	3.0
3	Dissolved Oxygen (DO)	mg/l	5.325	7.5
4	Chemical Oxygen Demand (COD)	mg/l	35	29.5
5	Conductivity		427	242.25
6	Nitrate Nitrogen	mg/l	0.765	0.922
7	Ammonical Nitrogen	mg/l	0.37	0.2375
8	Turbidity	NTU	2.65	8
9	Total Hardness	mg/l	81.5	40
10	Calcium ($CaCO_3$)	mg/l	45.5	22.5
11	Chloride (Cl)	mg/l	27.5	15
12	Sodium (Na)	mg/l	53.5	27
13	Potassium (K)	mg/l	10.25	6.5
14	Sulphate (SO_4)	mg/l	16.5	9.5
15	Total Suspended Solids (TSS)	mg/l	10.5	14.5
16	Total Dissolved Solids (TDS)	mg/l	272	167
17	Dissolved Phosphate (PO_4)	mg/l	0.032	BDL
18	Fluoride (F)	mg/l	0.165	0.155
19	Boron (B)	mg/l	BDL	BDL
20	Total solids	mg/l	307.5	181.5
21	Nickel (Ni)	mg/l	BDL	BDL
22	Total chromium (Cr)	mg/l	BDL	BDL
23	Carbonate (CO_3)	mg/l	0.8	0.3
24	Bicarbonate (HCO_3)	mg/l	4.5	4.0
25	Arsanic	mg/l	BDL	BDL
26	Lead	mg/l	BDL	BDL
27	Cadmium	mg/l	BDL	BDL
28	Zinc	mg/l	BDL	BDL
29	Iron	mg/l	BDL	BDL
30	Manganeous	mg/l	BDL	BDL
31	Copper	mg/l	BDL	BDL
32	Colour		Clear	Little bit muddy
33	Odour		None	Slight Fishy
34	Temperature	^{o}C	25	25.5

CONCLUSION

The fish community in Lakes includes the native and alien species, introduced for the purpose of fish production and increase the economy. The present study is the first ever documentation of Ichthyofaunal diversity in the Mydala and Durgadahalli Lakes of Tumakuru, Karnataka. In Mydala lake we find 15 different fish species, among them, *Oreochromis nilotica, Oreochromis mossambica, Ctenopharyngodom idella* are the major contributory species and family *Cyprinidae* is most dominant group. In Durgadahalli lake have 10 different species of fishes were recorded, among them, *Ctenopharyngodom idella, Oreochromis mossambicus* are major contributory species and here also family *Cyprinidae* is most dominant group. The Mydala lake were found to be more abundance of fishes compare to Durgadahalli lake, its due to presence to more nutrient less anthropogenic activity of humans and domestic animals and Mydala lake is comparatively larger and have rich sources of floral vegetation. 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 regulating the mesh size in fishing is also an important factor. Sustainable fish production by taking appropriate steps for sustaining diversity is necessary to conserve these resources. Hence the protection of these lakes is mandatory for sustainable fishery. Along with ichthyofaunal diversity, the physiochemical water parameter is carried out but there is no unpredictable change in these two lakes of water. The condition of water is comparatively good in both the lake for growth of aquatic organisms.

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