

## Distribution and Abundance of Zooplankton in Ayyanakere Lake, Chikmagalur district, Karnataka

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**Abstract:** In the present study water quality status of Ayyanakere lake near Chikmagalur district of Karnataka was assessed by zooplankton analysis during April 2008 to March 2009. A total of 17 species and 15 genera of zooplankton were recorded and represented by 4 main groups namely Rotifera, Cladocera, Copepoda and protozoa. Among zooplankton Cladocera was dominant with 6 species followed by Copepoda and Rotifera with 04 species each and protozoa with 3 species. Abundance status and population density of the zooplankton groups were also recorded. Cladocera was dominant group among zooplankton community constituting 33.33% of the zooplankton population. In the present study, as per water quality recommended by WHO and BIS standards, the lake water is suitable for human consumption.

**Key Words:** Ayyanakere lake, Zooplankton, Abundance, Diversity, Chikmagalur.

### Introduction:

Zooplanktons are heterogeneous assemblage of minute floating animal forms found in water. They may bear some locomotory structures but are not capable of propelling against the water currents. They usually act as primary consumers and constitute an important link between primary producers (phytoplankton) and higher consumers like carnivore fish in aquatic food chain. The zooplankton mainly consume primary producer and form the major food source for tertiary consumers. Certain species of zooplanktons are used as bio indicators of water quality. The estimation of plankton analysis helps in explaining the cause of color, turbidity, presence of odor, taste and visible particles in water (Pradhan, 2014).

Various works on zooplankton of freshwater bodies of different parts are being reported from India but in Chikmagalur district, Karnataka there is very scarcity of report on zooplankton diversity. So, the present study was an attempt for investigating Zooplankton diversity of Ayyanakere lake, Karnataka.

### Materials and Method:

#### Study area:

Ayyanakere is an Anicut lake constructed by Rukumanda Raya, chief of Sakharayapatna and renovated later in 1156 A.D. during the Hoysalas period. The large lake situated at the eastern base of Dattapeetha (Baba Budan) range, 18 kms northeast of Chikmagalur town provides irrigation facilities to more than 1574 hectares of registered land on a hillock adjacent to the lake.

Figure 1 shows location of the study area. The geographical location of this lake is 13°41'42" north latitude and 75°04'46" eastern longitude. This lake constructed to the upper Veda river. The water from this lake along with some other small tributaries forms river Veda and joins the river Avathi at Yagatipura to form Vedavathi. The Vedavathi joins to Krishna river which ultimately joins Bay of Bengal. Many hillocks surrounded to the lake which forms the natural reservoirs. It is a shallow lake has an area of 15 sq. kms. The catchment area of 116.59 sq. kms water spread area 118.54 ha. The bund forms from the natural hills and stones with length of 450 m and height 4.80 m. The maximum depth of the lake is 30 m and an average depth is 20 m.

#### Water Quality Parameters:

The sampling was carried out during morning between 8.00 AM to 9.00 AM. For physico-chemical analysis samples were collected weekly during April 2008 to March 2009. Water samples were collected in 2 litre capacity plastic cans. The water and air temperature were recorded at the sampling site itself by mercury thermometer. Dissolved oxygen was fixed on the spot itself in BOD bottles. The parameters like free CO<sub>2</sub>,

alkalinity, total hardness, total dissolved solids, Calcium, magnesium, phosphates and chlorides were estimated as per the standard methods ( APHA ,1998; Trivedy and Goel, 1986).

### **Zooplankton sampling:**

Zooplankton samples were collected on a monthly basis. The plankton net is made by the bolting nylon silk (meshsize 50 $\mu$ m) is used for collection of zooplankton and which is conical shape and reducing cone with the bottle at its end. For a precise collection, the plankton net is towed horizontally and obliquely (for Qualitative) in surface water of the study area. After collection, Zooplankton were filtered, placed in Tarson (100 ml) container and subsequently fixed in Lugol's solution and stored in cool and dark place. For studying the diversity of Zooplankton, sample were taken in a Sedgwick-Rafter counting chamber and observed under a light microscope under required magnification (X 10 intially , followed X 40) and the specimens were identified following Edmondson (1959), Needham and Needham (1962), Pennak (1978), Tonapi (1980) and APHA (1998) were utilized and results were expressed in No./L.

### **Results and Discussion:**

#### **Water quality:**

Seasonal variations in the physico-chemical parameters of water of the Ayyanakere lake is summarized in Table 1. Seasonal analysis of water temperature showed that it was highest in summer and relatively lower in monsoon and winter (Table 1). pH is considered as important chemical parameter in waterbody since most of the aquatic organisms are adapted to an average pH and do not withstand abrupt changes. The maximum pH was recorded in pre-monsoon it may due to leaching of soil followed by the decomposition of plankton (Swarnalatha and Narasinga Rao, 1993) and minimum in monsoon. The present study shows the acceptable range of pH for fish culture.

Maximum CO<sub>2</sub> recorded during post-monsoon and low during monsoon season (Table 1). It has been found that CO<sub>2</sub> content is inversely proportional to the oxygen content due to photosynthesis and respiratory activities (Deshmukh *et al.*, 1964; Wetzel, 2001).

The present investigation showed that maximum dissolved oxygen recorded during monsoon because of increased phytoplankton high primary productivity and low metabolic activity of organisms, DO is high due to photosynthetic activity, minimum in pre-monsoon. These observations are in agreement with earlier work of Kumar and Singh (2000), Munwar (1970), Honneshappa (2008) and Rajashekar and Vijaykumar (2008). The present study also reveals that the total DO is suitable for fish growth.

The seasonal variation of calcium concentration is maximum in monsoon, but less in pre-monsoon. Similar observation was recorded by Kamran Tasaduque *et al.* (2003). The seasonal variation of magnesium concentration is maximum value in post-monsoon and slightly less in monsoon. The minimum value recorded during pre-monsoon. This is in conformity with the findings of Janardhana Rao (1982), Zutshi and Khan (1988), Shardendu and Ambasht (1991) which have concluded that normally natural water contains magnesium concentration lower than the concentration of calcium.

Regarding TDS seasonal analysis states that low in pre-monsoon and maximum value was recorded in post-monsoon (Table 1). The higher values may be due to lower water level and perhaps various kinds of ions present in the waterbody. Similar, observations were found by Rajashekar *et al.* (2003) in the river Umshyripi as Shillong Meghalaya. In the present study also reveals that the total dissolved solids is suitable for fish growth.

The seasonal values of chloride was recorded maximum in post-monsoon and low in pre-monsoon (Table 1). This in close agreement with that of the observation made by Patil *et al.* (1986), Swarnalatha and Narasinga Rao (1993) and Sinha (1995). The reduced concentration of chloride content recorded during monsoon season when compared to pre-monsoon season and may be due to dilution, caused by rain water. Similar opinion has been given by Orborne *et al.* (1980) and Lowe (1980).

Highest total alkalinity recorded during post-monsoon and lowest in the monsoon (Table 1). The present study the total hardness is 92, 96 and 108 mg/l during the period of pre-monsoon, monsoon and post-monsoon respectively. Highest total hardness recorded during post-monsoon and lowest in the pre-monsoon (Table 1). Values for the total hardness in the present investigation falls in the range of moderately hard category (Mitra, 1982; Birsal *et al.*, 1985).

The phosphate level minimum during monsoon and maximum in post-monsoon period (Table 1). Many researchers such as Venkateshwarlu (1969a), Sampath Kumar (1977) and Nirmal Kumari (1984) have observed

an increase in phosphate concentration in such water bodies they may receive domestic waste. This was contributed by the surface runoff draining the agricultural fields and mixing with the influent water of the pond.

### **Zooplankton Diversity:**

The zooplankton diversity was shown in Table 2 and 3. The four major zooplankton groups were recorded viz., Copepoda, Cladocera, Rotifera and Protozoa.

Knowledge of the zooplankton communities and their population dynamics is a major requirement for better understanding of life processes in a fresh water body since eutrophication influences both the composition and productivity of zooplanktons (Bhora and Kumar, 2004; Pradhan, 2014). Zooplankton communities are very sensitive to environmental changes and thus are of considerable potential value as water quality indicators (Gannon and Stemberger, 1978; Pradhan, 2014).

In this study, cladocerans dominated the other groups in Ayyanakere lake. Zooplankton diversity was found in the order of Cladocerans > Rotifer > Copepoda > Protozoa. The maintenance of a healthy aquatic ecosystem depends on the abiotic properties of water and the biological diversity of the ecosystem (Nafeesa Begum and Narayana, 2006). The variation of population of different zooplankton groups at different seasons of the year could be attributed to the availability of food material and preference towards the food in order to avoid competition (Singh, 2000).

The percentage composition of zooplankton is shown in Table 3 and Fig. 2. The four groups Copepod, Rotifers, Cladocerans and Protozoa are 33.33%, 27.77%, 22.22% and 16.66% respectively.

Kedar and Patil (2006) investigated zooplankton population in Rishi lake, Karanja District Wahsim (M.S.). Pradhan (2014) reported rotifera, cladocera and copepoda zooplankton population of Wunna Lake, Maharashtra. The Rotifera dominated the zooplankton population. The cladocerans were comparatively in low profile in annual cycle and as such no definite pattern of their variation was observed.

Kar and Kar (2016) studied the zooplankton diversity of the Narsingtola pond in Cachar district of Assam. They recorded 42 genera of zooplankton of which 13 genera belongs to Cladocera, 4 genera belongs to Copepoda and 25 genera belongs to Rotifera. Abundance status and population density of the zooplankton groups were also recorded.

### **Conclusion:**

Zooplankton diversity of the Ayyanakere lake confirm the habitat for zooplankton population and suitable for aquaculture, as zooplankton are known to be the best food for fish larvae in aquaculture. In the present study, Rotifera, Cladocera, Copepoda and protozoans formed the zooplankton population of Ayyanakere Lake. The Cladocerans dominated the zooplankton population. The abundance and distribution of zooplankton indicating that there was very less or no pollution in Ayyanakere lake making the water potable.

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**Table 1. Seasonal variations in Physico-chemical parameters of water of Ayyanakere lake during 2008-09**

Parameters	Pre-monsoon	Monsoon	Post-monsoon
Air temp.	32	27	22
Water temp.	29.5	25	21
pH	7.5	7	7.2
DO	6.4	12.2	9.75
Free CO <sub>2</sub>	6.83	5.06	7.05
Total hardness	92	96	108
Calcium	16.03	19.63	18.83
Magnesium	12.67	13.20	15.10
TDS	100.31	127.13	134.70
Chlorides	24	23.90	28.4
Total alkalinity	63.18	50.65	66.25
Phosphates	0.45	0.28	0.59

All the parameters are in mg/l except air and water temperature (°C), pH

**Table 3. Zooplankton diversity recorded during the study period**

Groups	Nos.	Percentage
Cladocerans	6	33.33
Copepods	4	22.22
Rotifers	5	27.77
Protozoans	3	16.66

**Table 2. Distribution and abundance of zooplankton in Ayyanakere lake**

Cladocerans	
1	<i>Alona pulchella</i>
2	<i>Ceriodaphnia cornata</i>
3	<i>Moina brachiata</i>
4	<i>Diaphanosoma excisum</i>
5	<i>Daphnia carinata</i>
6	<i>Diaphanosoma sarsi</i>
Copepods	
1	<i>Heliodyptomus vidus</i>
2	<i>Nauplius larva</i>
3	<i>Neodyptomus stregilipes</i>
4	<i>Mesocyclops leukarti</i>
Rotifers	
1	<i>Keratella tropica</i>
2	<i>Asplanchna</i>
3	<i>Brachionus falcatus</i>
4	<i>Brachionus calyciflorus</i>
Protozoan	
1	<i>Paramecium</i>
2	<i>Vorticella</i>
3	<i>Diffusia</i>



Figure 1: Location of the Ayyanakere lake (Source: www.mapsofindia.com)

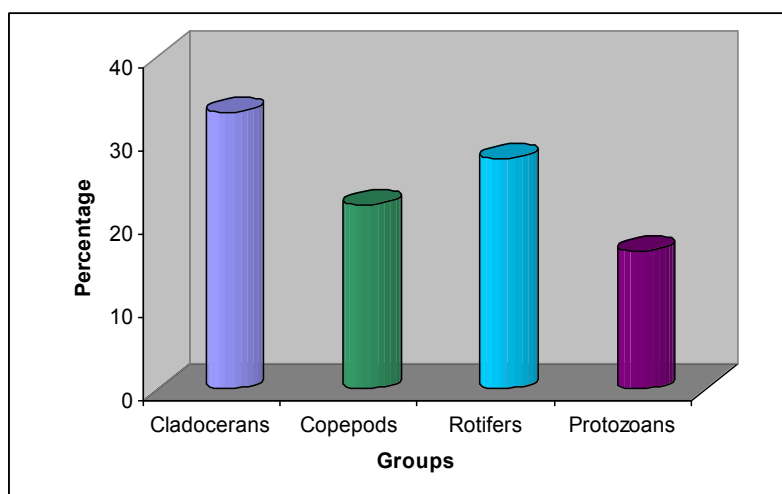


Figure 2: Zooplankton diversity percentage of different groups