

## STUDIES ON PLANKTON DIVERSITY AND WATER QUALITY OF AMBATTUR LAKE, TAMIL NADU

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### ABSTRACT

Ambattur Lake is situated in Ambattur of Thiruvallur District of the state Tamilnadu. It is one of the biggest lake acts as reservoir in Chennai, located in Thirumullaivayil, Tamilnadu. Surface water samples were collected from five different locations at regular interval during October 2010 to March 2011. Physico-chemical parameters and biological parameters were investigated. A total of 22 species of plankton consisting phytoplankton and zooplankton were recorded and fluctuations among physico-chemical parameters during the investigation were also noticed. *Centropyxis spinosa*, *Arcella discoides*, *Euglypha acanthophora* among protozoa; *Lecane curvicornis* of rotifer and cyclopoid nauplii were found to be dominant during the study.

**Keywords:** Ambattur Lake, Phytoplankton, Zooplankton, Protozoa.

### INTRODUCTION

Water quality of the freshwater habitats provides substantial information about the existing resources which depends on the influences of physico-chemical parameter and biological features. The prominence on the plankton productivity in relation to physical and chemical variables of aquatic structure is being increased since the productivity to the human resources from the freshwater bodies adding their necessity (Sivakumar and Karuppasamy, 2008). The diversity, distribution, abundance of plankton and the variation according to the abiotic factors afford information of energy turnover in the aquatic ecosystem (Forsberg, 1982). Damodharan *et al.* (2010) stated that it also offers an important food source for larval fishes and other crustaceans in natural waters. It is therefore important to investigate on plankton resources in freshwater ecosystem. Present investigation has made an attempt to study on the distribution and abundance of the zooplankton and the physico-chemical parameters of Ambattur Lake, Tamilnadu. Since the lack of

studies on the zooplankton from this lake, reports firsthand information on zooplankton.

### MATERIALS AND METHODS

Ambattur Lake is situated in Ambattur of Thiruvallur District. Ambattur Lake is one of the biggest lake located in Thirumullaivayil coordinates at 13.10° N; 80.14'E. It has a chain to Korattur Lake and Madhavaram Lake. This lake receives water from catchment, and the total area registered is 914.98 hectares and covers the length of 3,018 meters. It supplies to irrigation and also receives various anthropogenic inputs from the industries around. Domestic activities were also engaged by the locals and present scenario of the lake is subjected to inundation due to encroachment.

Regular surface water samples were collected from October 2010 to March 2011 at five different locations at regular interval. The surface water samples were collected in a precleaned polypropylene container for physical and chemical analysis. Samples were fixed with Manganese Sulphate and Alkaline iodide in 250

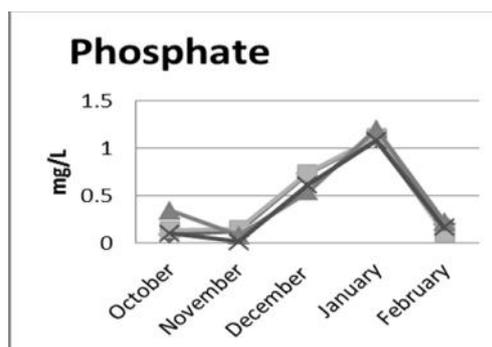
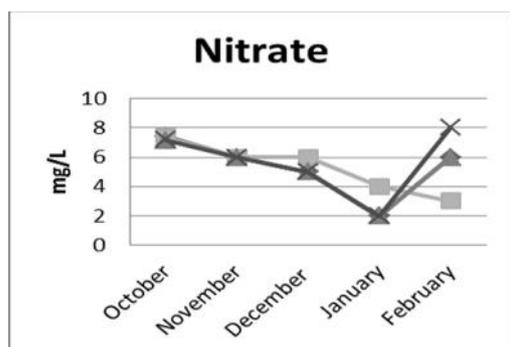
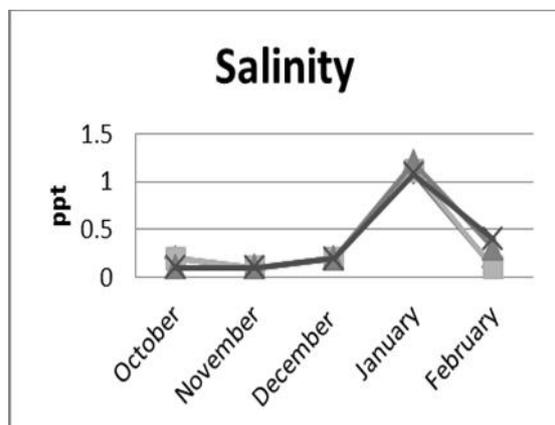
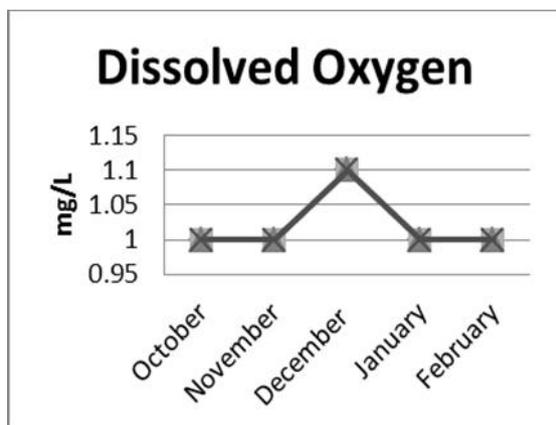
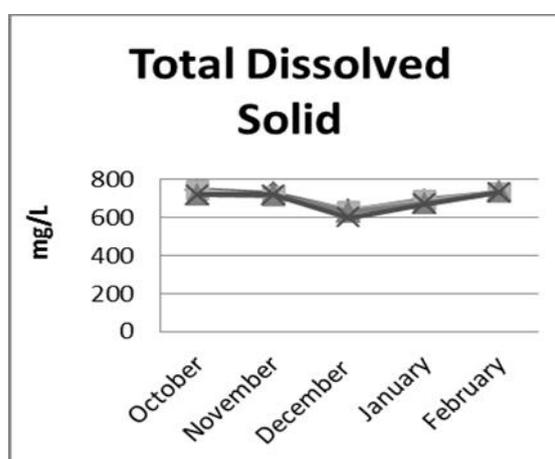
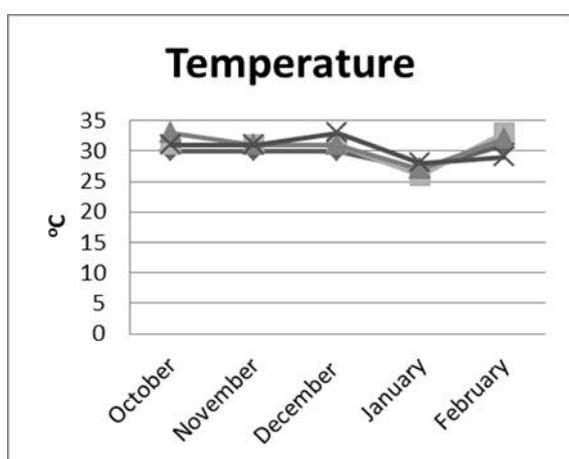
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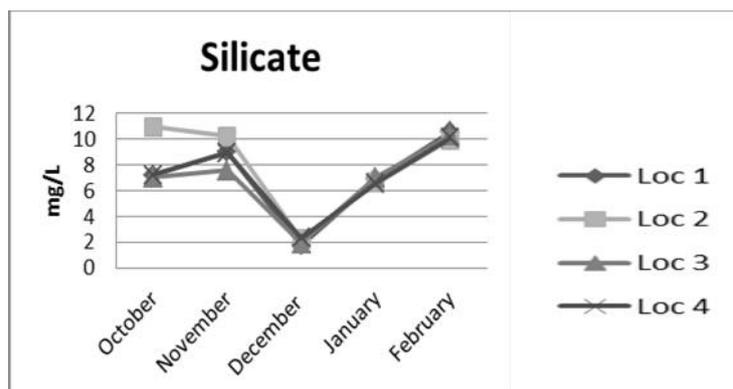
ml BOD bottles to analyze the dissolved oxygen in field. Water quality parameters like Temperature, Total Dissolved Solids, Dissolved Oxygen, Salinity, Nitrate, and Silicate were estimated by adopting the method following APHA (2005).

**RESULTS**

From the investigation, surface water was appeared colourless, odourless and pH showed within normal range from 7.46 conc. to 7.85 conc. throughout the study period. Surface water temperature level was recorded from 26°C to 33°C. Turbidity varied from 0.1 NTU to 9.6

NTU. The highest concentration was noticed during December and lowest concentration noticed during January. Dissolved oxygen values were fluctuated between 1mg/L to 1.1 mg/L. Salinity does not shown much variation which was below the range between 0.1 ppt to 1.2 ppt during January. Nitrate varied between 2 mg/L in January and 7.42 mg/L in October. Phosphate values were also shown minimal variations between 0.012 mg/L and 1.12 mg/L. Silicate value were increased in October (10.94 mg/L) and decreased (1.76 mg/ L) in December showed wide fluctuation (Figure 1).





**Figure 1.** Physico-chemical parameters of Ambattur Lake during the study period.

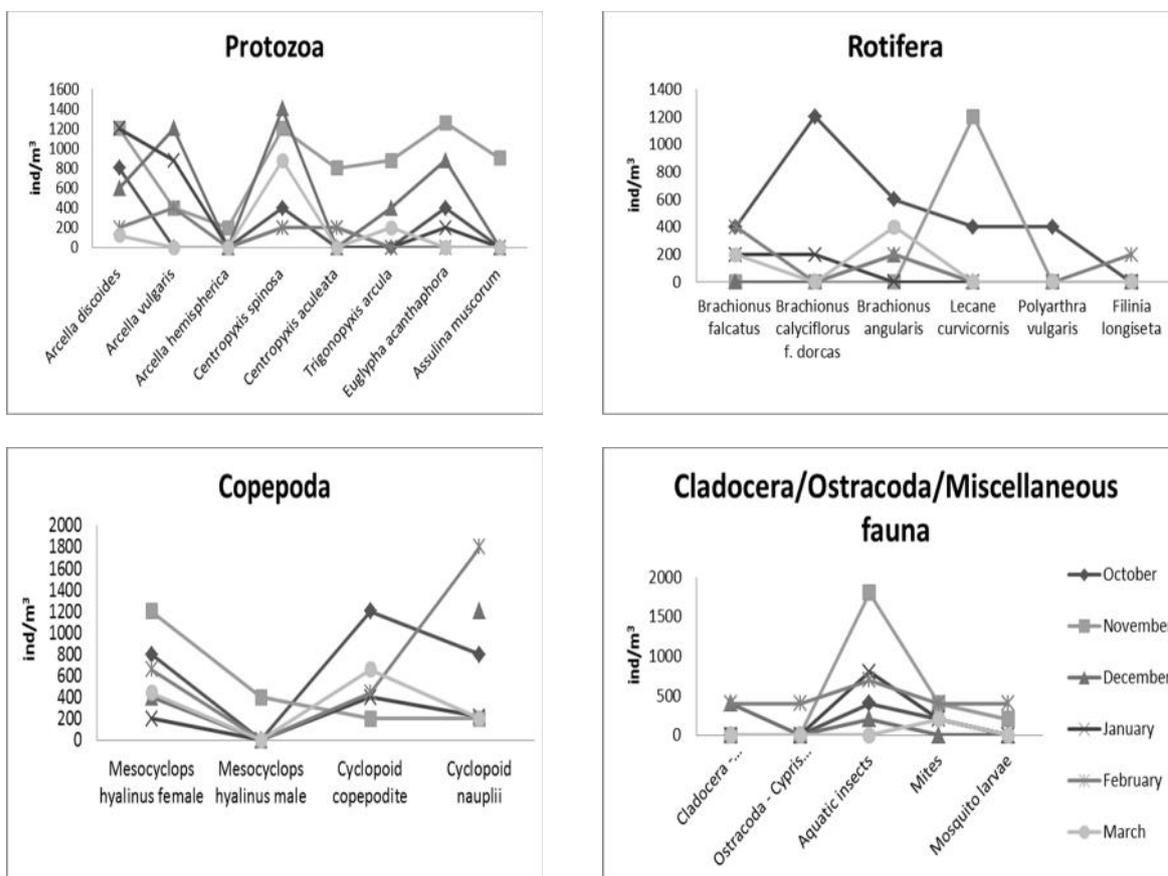
A total of 22 species of plankton were identified from the collections during the study period (Table 1). 5 species of phytoplankton were occurred throughout the study period. Among zooplankton, protozoa, rotifera, copepoda, cladocera and ostracoda were found and categorized (Figure 2). From the investigations, protozoa represented 8 species viz., *Arcella discooides* and *Centropyxis spinosa* occurred throughout the study period. *Arcella discooides* and *Euglypha acanthophora* holds 1,200 ind/ m<sup>3</sup> abundant during November and *Centropyxis spinosa* were maximum abundant (1350 ind/ m<sup>3</sup>) during December. Rotifera contributed 6 species and *Filinia longiseta* and

*Polyarthra vulgaris* present rarely during February month and *Lecane curvicornis* represented higher in abundance (1200 ind/m<sup>3</sup>). Among copepoda, *Mesocyclops hyalinus* registered all over the study. Similarly cyclopoid nauplii of copepoda were observed to be common and were abundant (1800 ind/m<sup>3</sup>) during March. *Chydorus sphaericus* of cladocera and *Cypris subglobosa* of ostracoda were occurred during the study. Cladocera and ostracoda were noticed to be dominant during January to March. Few aquatic insects, mosquito larvae and mites were also observed in the plankton samples.

**Table 1.** List of species occurrence encountered from Ambattur Lake from October 2010 to March 2010.

S. No.	SPECIES ENCOUNTERED	Oct	Nov	Dec	Jan	Feb	Mar
<b>PHYTOPLANKTON</b>							
1.	<i>Oscillatoria subbrevis</i> Schmidle	+	+	-	+	+	+
2.	<i>Pediastrum duplex</i> Meyen 1929	+	-	+	+	+	+
3.	<i>Spirogyra</i> sp.	+	+	+	+	+	+
4.	<i>Navicula rhynchocephala</i> Kutzing 1844	+	+	+	+	+	+
5.	<i>Microcystis aeruginosa</i> Kutzing 1846	-	+	-	-	-	-
<b>ZOOPLANKTON</b>							
<b>Protozoa</b>							
6	<i>Arcella discooides</i> Ehrenberg, 1843	+	+	+	+	+	+
7	<i>Arcella vulgaris</i> Ehrenberg, 1830 (Ehrenberg, 1832)	-	+	+	+	+	-
8	<i>Arcella hemispherica</i> Perty, 1809	-	+	-	-	-	+
9	<i>Centropyxis spinosa</i> (Cash & Hopkinson, 1905) Deflandre, 1929	+	+	+	+	+	-
10	<i>Centropyxis aculeata</i> (Ehrenberg, 1832) Stein, 1857	-	+	-	+	+	+
11	<i>Trigonopyxis arcula</i> (Leidy, 1879) Penard, 1912	-	+	+	-	-	-
12	<i>Euglypha acanthophora</i> (Ehrenberg, 1842) Perty, 1849	+	+	+	+	-	-

13	<i>Assulina muscorum</i> Greef 1888	-	+	+	-	-	-
<b>Rotifera</b>							
14	<i>Brachionus falcatus</i> Zacharias 1898	+	-	-	+	+	+
15	<i>Brachionus calyciflorus f. dorcas</i> (Gosse 1851)	+	-	-	+	-	-
16	<i>Brachionus angularis</i> Gosse, 1851	+	-	-	-	+	-
17	<i>Lecane curvicornis</i> (Murray, 1913)	+	+	+	-	-	+
18	<i>Polyarthra vulgaris</i> Carlin, 1943						+
19	<i>Filinia longiseta</i> (Ehrenberg, 1834)						+
<b>Copepoda</b>							
20	<i>Mesocyclops hyalinus</i> (Rehberg, 1880) female	+	+	+	+	+	+
21	<i>Mesocyclops hyalinus</i> (Rehberg, 1880) male		+				
22	Cyclopoid copepodite	+	+		+	+	+
23	Cyclopoid nauplii	+	+	+	+	+	+
<b>Cladocera</b>							
24	<i>Chydorus sphaericus</i> (Muller, 1776)	-	-	+	-	+	-
25	Ostracoda	-	-	-	-	-	-
26	<i>Cypris subglobosa</i> Sowerby, 1840	-	-	-	-	+	-
27	Miscellaneous - Aquatic insects	+	+	+	-	+	-
28	Mites	+	+	-	+	+	+
29	Mosquito larvae	-	+	-	+	+	-



**Figure 2.** Total abundance of zooplankton (Protozoa, Rotifera, Copepoda, Cladocera and Ostracoda) during the study at Ambattur lake.

## DISCUSSION

Temperature is basically important for its effect on the chemical and biological reaction of the organisms in water. It affects many chemical and biological parameters (Gupta, 2004). Higher levels of total dissolved solids can often indicate pollution by an extraneous source (Aboo and Mandal, 1967). Most dissolved inorganic substances present in the water are in ionized form and contribute electrical conductivity (Swarnalatha *et al.*, 2009). pH regulates most of the biological processes and biochemical reactions (Sculthorpe, 1967). Due to high temperature the water has less oxygen holding capacity and surplus amount of oxygen might be lost to the atmosphere and catabolic rate of aquatic organisms has increased (Gupta, 1989). Highest values of dissolved oxygen coincides with the highest temperature. Dissolved oxygen has immense relation with pH value supported by Bagde and Verma (1985). Sengupta and Dalwani (2008) also commented high salinity may be due to variation in temperature and other environment factors. Malini and Santoshi (2009) reported the nutrients such as silicate, phosphate and nitrate exists in the natural water as suspended particles in a colloidal or polymeric state. The fluctuation of the physico-chemical factors were influenced by the environment and other anthropogenic inputs whereas the study area faces lot of challenges towards the industrial wastes which creates water pollution.

Jayabhaye (2010) reported 11 species of rotifera; 6 species of copepoda, 5 species of cladocera and 3 species of ostracoda from river Kayadhu. Similarly Datta (2011) reported 42 species from two lakes of West Bengal. Studies on the plankton diversity assessment on freshwater system are very essential to know the status of the water quality since it supports fish and other higher crustaceans like crab and prawn are farming practices by local people. Most of the zooplankton are being used to main integral bioindicators of aquatic system. The population of zooplankton in aquatic system attribute to favourable temperature and nutrient availability which coordinates a food chain between the fishes and phytoplankton. The physic-chemical variables recorded at Ambattur Lake does not showed much variation and also within the normal range. The phytoplankton and zooplankton registered the diversity and abundance needs intense research by adopting

various mesh size of plankton net and also to investigate seasonally.

## CONCLUSION

This preliminary study on Ambattur Lake pasteurizes the water quality and the aquatic zooplankton which is important organisms in food web which in turn increases the fish and higher crustacean production. To ensure Ambattur Lake as an important aquatic system in Tamilnadu, more intense studies on aquatic fauna along with ecological parameters should also be under taken to make conservation measures effectively.

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