

**VARIATION IN ZOOPLANKTON DIVERSITY AND ITS RELATIONSHIP WITH ABIOTIC ENVIRONMENT OF A VANDIYUR POND TAMILNADU INDIA****Umamaheswari, K.,<sup>1</sup> M. Chandran<sup>2\*</sup>, K. Rajendran<sup>3</sup> and G. Chandrn<sup>4</sup>**<sup>1</sup>Department of Zoology, Thiagarajar College Madurai – 625009.<sup>2</sup>Department of Zoology, Thiruvalluvar University, Vellore.<sup>3</sup>Department of Botany, Thiagarajar College Madurai – 625009<sup>4</sup>PG Department of Zoology, Madura College, Madurai - 625011

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**ABSTRACT**

Ponds, Lakes and Reservoir are most significant water resources with multiple human utilization and ecological relevance in which Zooplankton diversity is one of the most important ecological parameters in water quality assessment. It is good indicator of the changes in water quality because they are strongly affected by environmental conditions. In the present study an attempt has been made to study the seasonal variations in the Zooplankton community, its diversity and hydrological parameters of this water body. In the present study, a total of 24 species of Zooplankton were identified from different classes during August 2014 to January 2015. Among the identified species, Zooplankton showed the complete dominance, especially, zooplankton belonging to four major groups i.e. 9 species of Rotifera, 6 species each of Cladocera, 4 Copepoda and five species of Ostracoda.

**Keywords:** Zooplankton, Bioindicator, water quality.**1. INTRODUCTION**

Studies on fresh water bodies, natural or manmade have gained much importance in recent years mainly because of their multiple uses. Several workers have attempted to study the hydrobiological profile of varied water bodies with intent of assessing the quality of water zooplankton play a very important role in increasing photosynthesis in some algae which pass through their nutrient rich elementary canal in viable condition. Zooplankton acts as bio-indicator of water quality as well as quantification of primary energy transfer from producer to primary consumer (Dulic *et al.*, 2006). Kolhe *et al.*, 2013 also observed the zooplankton communities respond more quickly to environment variations. Therefore the water quality is a major factor in determining the welfare of the society (Dwivedi and Pathak, 2000). It also plays a vital role in governing the production of planktonic biomass. The management of any aquatic ecosystem is a means of conservation of fresh water habitat with an aim to maintain the water quality or to rehabilitate the physico-chemical and biological settling of water (Ravi Kumar *et al.*, 2005). Based on the above mentioned facts, it is suggested to make an inventory of the physicochemical parameters and zooplankton diversity of vandiyur pond, located in Madurai.

**2. MATERIALS AND METHODS***2.1 Study Area*

Vandiyur pond was selected for my research work actually; it is a small aquatic pond with a minimum depth of pond about 25 feet. It is located just east zone of Madurai town. In which possess the common fishes like Catlacatla, Rohu and kendai. This pond water is used only for the agriculture and fish farm.

*2.2 Sample Collection*

The water sample was collected from the pond surface once in the early hours of the day from August 2014 to January 2015. The water samples were collected using one litre container for the estimation of water quality parameters. The collected samples were immediately taken to the laboratory for analysis. The estimation was done by using the standard book of Kumar and Kakrani (2000).

*2.3 Biological Analysis*

Zooplankton samples were collected by filtering 300 litres of water from the surface of the water body through plankton net (40 µm mesh size) and which was fixed immediately with 4% ormalin. The systematic identification of zooplankton was made by using standard keys of Dhanapathi (2000)

and Altaff (2004). The quantitative analysis of planktonic organisms was carried out using Sedgwick Rafter's plankton counting chamber.

### 3. RESULTS AND DISCUSSION

The seasonal fluctuations of pond water quality parameters have a marked influence on the numerical abundance of zooplankton. Jeppesen *et al.* (2002) has stated that the enormous diversity of zooplankton vary according to limnological features and the trophic state of freshwater bodies.

#### 3.1 Biological parameters

##### 3.1.1 Qualitative study of zooplankton in vadiyur pond

In a pond system, a total of 24 species of zooplankton have been exposed that belong to four major groups. They were included as follows,

Rotifera- 9, species Cladocera- 6, species Copepoda - 4 and species Ostracoda - 5 species.

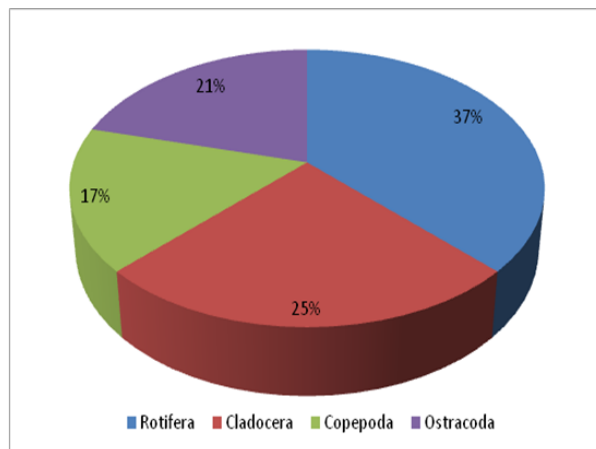


Fig. 1. Zooplankton abundance in vadiyur pond

Table 1. Monthly Variations in the Physico-chemical parameters of the Vadiyur Pond.

Parameter	August 2014	September 2014	October 2014	November 2014	December 2014	January 2015
Temperature (°C)	27	28	27	27	29	30
Air water pH	7.2	7.6	7.8	8.1	7.8	8.0
Total Hardness (ppm)	132.12	142.27	98.56	67.12	58.49	62.10
Dissolved Oxygen (mg/l)	6.2	5.8	6.2	4.2	5.8	6.9
Free carbon dioxide (mg/l)	4.5	3.4	4.9	2.9	3.5	4.1
Total Alkalinity (ppm)	198.00	212.16	196.14	168.12	182.00	89.17
Salinity (ppm)	222.03	196.15	165.13	145.22	156.28	102.36
Chlorinity (ppm)	121.10	98.27	89.23	123.00	131.00	89.12
Phosphate (mg/l)	0.06	0.04	0.03	0.05	0.03	0.01

##### 3.1.2 Quantitative study of zooplankton in vadiyur pond

In the present work was assessed, *B. calyciflorus* was found to be more in number during the month of August 2014 and *B. forficulain* the month of November 2014 (3units/ml). The other species were recorded in low number. *B. rubens* was observed only during August 2014. The enormous of

rotifers and their community characteristics are used as effective indicators of environmental changes, such as, acidity, food level and humidity *etc.* (Attayde and Bozelli, 1998). The number of *cladocerans* recorded was minimum during the study period. *Ceriodaphnia cornuta* was recorded during the entire period of study. Their presence indicates the health of the ecosystem, as it forms the basic food item for fishes. *Mesocyclops aspericornis* was

observed maximum in the month of November 2014 (20 units/ml) and minimum in January 2015 (5 units/ml). Kumar (1999) reported that *cyclops* as the most suitable pollution tolerant indicator. *Heliodiaptomus viduus* was found in range from 2 units/ml in August 2014 to 10 units/ml in December 2014. *Diaptomus nauplius* showed variations from 3 units/ml in December to 10 units/ml in January 2015. The ostracod was represented by only one species, *Stenocypris major* was observed in all the months (1 unit/ml) except November 2014.

In the air temperature was ranged from 27 to 30°C and water temperature from 25 to 29°C. Kumar and Kakrani (2000) opined that the rise in temperature of water elevates the metabolic activity of an organisms. It also influences the growth and distribution of plankton. Welch (1952) has observed that smaller the water body, more quickly to react the changes in atmospheric temperature. The pH of the water body showed alkaline in nature i.e. 7.2 to 8.0. This range is good for growth of aquatic organisms (Lendhe and Yeragi, 2004). Bell (1971) has stated the pH ranges between 6.5 to 9.0 provides an adequate protection to the life of fresh water organisms. Jhingran (1991) reported that pH ranges between 6.0 to 8.5 indicates medium productivity, more than 8.5 highly productive and less than 6.0 low productive nature of water body. Total hardness ranged between 58 ppm in December 2014 and 142.27 ppm in August 2014. Fishes have been found to susceptible to diseases when hardness is below 20 ppm. If it ranged more than 300 ppm, it affects fish production due to more pH as reported by Das (1996). Dissolved oxygen content in the water sample ranged from 4.2 to 6.09 mg/l. Mustafa and Ahmad (1985) opined the partial of O<sub>2</sub> dissolved in water depends upon the partial pressure of gas in the air close to water, rate of photosynthesis and oxygen holding capacity of water. Tarzwell (1957) reported that for supporting life, minimum of 3mg/l DO is required. Free CO<sub>2</sub> ranged from 2.9 to 4.9 mg/l during the study period. In morning sample, there is an accumulation of free CO<sub>2</sub> due to overnight community respiration. Salasker and Yeragi (2003) noted that slightly increased CO<sub>2</sub> in winter season. Free CO<sub>2</sub> is essential for photosynthesis and its concentration affects the aquatic fauna and its productivity. The total alkalinity was ranged from 89.17 to 212.16 ppm. In the water body, the alkalinity is imparted by number of bases viz., carbonates, bicarbonates, hydroxides, phosphates, nitrates, silicates, borates etc., (Kumar and Kakrani, 2000). The fluctuation in salinity is probably due to fluctuation in total solids (Boyd and Tucker, 1998).

The minimum value of chlorides (89.12 ppm) was found in the month of January 2015 and the maximum value of 131.00 ppm during the month of December 2014 was recorded. Chloride content above 250 ppm makes water salty in taste; however a level upto 1000 ppm is safe for human consumption (Kumar and Kakrani, 2000). The phosphate content of water sample showed 0.01 to 0.06 mg/l. It is an essential nutrient, play a vital role in biological activities of aquatic organisms. Lendhe and Yeragi (2004) reported the range of phosphates from 1.20 mg/l to 3.70 mg/l in Phirangekharbav lake.

#### 4. CONCLUSION

An inverse relationship was observed zooplankton abundance. The managed fish culture pond which was periodically limed, manured and fertilised showed greater zooplankton being the dominant group. Whereas the unmanaged village pond showed a less diverse and eutrophic condition, zooplankton being the dominant group. It implies that large amount of ecological niches are remaining void and unutilized in village ponds. Whereas all the available ecological niches are being effectively utilized by the stocked fishes and periodically replenished by fertilization in the managed fish culture pond. Therefore selective stocking with appropriate species at low densities and extensive fish culture practices in the village ponds has ample scope. Adoption and transformation of such village ponds by scientific management practices into semi-intensive fish culture ponds may prove to be an ecologically efficient, financially feasible and socially viable venture.

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