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DIVERSITY OF FRESHWATER ROTIFER IN VEINTHANKULAM POND, TIRUNELVELI, TAMILNADU

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Abstract:
The Veinthankulam pond is selected for present-day study and it is the only lentic freshwater in Tirunelveli District. Qualitative collections were done by towing surface water column, quantitative zooplankton samples were collected by filtering 50 lots of water through a zooplankton net made bolting silk 100 microns mesh size. were observed. *Filinia longiseta, Keratella sp. Brachionus calyciflorus, Brachionus caudatus, Keratella valga, Conochilus, Brachionus forficula, Lecanelunaris, Dipleuchlanis propatula , Philodina sp.*and *Rotaria neptunia*

Index terms **- Veinthankulam pond , Tirunelveli District, Water quality parameters, Dissolved Oxygen, Zooplankton.**

I. INTRODUCTION

Aquatic ecosystems are known to support work for range of the organism. Among these, zooplankton is the free-floating and microscopic animal found in an aquatic ecosystem. The zooplankton is important for fish as they are used as the source of food. Zooplankton are playing important role in biomonitoring of water pollution (Tyor et al; 2014). Rotifers exhibit complex patterns of diversity and distribution in freshwater because many species are cosmopolitan and endemism is very low (Segers, 2008). Rotifera is jelly plankton (gelato) with no Exo or endoskeleton and water content of 92% to 98% that is usually more or less transparent (Dumont, 2007). The Zooplankton are classified into various groups viz. Cladocera, Copepoda, Rotifer and Ostracoda etc. The Zooplankton community fluctuates according to the physicochemical parameter of the environment, especially Rotifer species change with biotic factors. Karuthapandi et al.,(2013). Zooplankton is heterotrophic and play important role in the food web by linking primary producers to higher trophic level Jafariet al.,(2011). Zooplankton is important in nutritive level, temperature and pollution used to determine the health of an ecosystem Purushothama (2011). Zooplanktons play an integral role and may serve as bio-indicator and it is a well-suited tool for understanding water pollution status Kushwaha and Agrahari(2014). The distribution and diversity of zooplankton in an aquatic ecosystem are mostly guided by the limnological properties of water, Jeelani(2014) .

II. MATERIALS AND METHODS

STUDY AREA

The Veinthankulam pond is selected for present-day study and it is the only lentic freshwater in Tirunelveli District. The pond occupies a five-acre area. It's surrounded by macrophytes like Eichornia pistia, Lemna , Hydrilla and microphytes like algae, volvox, chlorella were present. The average temperature from December to February ranges from 290C to 410 C so the water level of the pond is decreased to 1to 2 feet.

ZOOPLANKTON COLLECTION

Zooplankton collections were made from the littoral surface water column in different stations of freshwater habitats. Qualitative collections were done by towing surface water column, quantitative zooplankton samples were collected by filtering 50 liters of water through a zooplankton net made bolting silk 100 microns mesh size. The collected water samples were transferred to a clean plastic container which is about 1 l capacity.

ZOOPLANKTON IDENTIFICATION

Sorted individual samples were placed on a clean glass slide with the help of a fine camel hair brush. Identification of Zooplankton species was done under the light microscope.

WATER QUALITY ANALYSIS

Water samples were collected in the chosen study areas in clean iodine-treated polyvinyl chloride containers. There were collected between 11:00 to 12:00 noon during January to before the collection, the plastic bottles were rinsed once with distilled water and thrice with the respective water sample. During collection, care was taken to avoid the trapping of air within the bottle, by completely immersing the bottle with the respective water samples, until the bottle is filled. The collected water samples were immediately transported to TWAD laboratory, Shanthinagar, Palayamkottai, for analyzing the physical and chemical parameters.

The following are various physical and chemical parameters such as turbidity, pH, total dissolved oxygen, electro conductivity, total alkalinity, total hardness, calcium, magnesium, sodium, chloride, sulphate, potassium, iron, free ammonia, and phosphate have been analyzed using standard methods.

DIVERSITY INDICES

The collected rotifer species were subjected to diversity analysis using different indices like Shanon – Weiner index (H') was calculated by using the following method.

Shannon diversity index (Shannon,1948)

H'=-å(pi In pi)

III. RESULTS AND DISCUSSION

Considering the data of the present investigation and analysing the data of the present study from two sampling stations. Out of which 11 genera of Rotifers have been recorded from Veinthankulam pond and Palayam canal from December 2018 to February 2019. Among these frequently occurred genera was Brachionus. The species recorded in the present study were found to be commonly encountered in freshwater ecosystems of India (Sharma, 1978a; Sharma, 1978b). Of the 31 species, identified, Brachionus, Lecane, and Keratella together accounted for the highest richness of species. Keratella with Brachionus is indicative of the nutrient-rich status of the water body (Berzins & Pejler, 1987).

TABLE-1

ROTIFER SPECIES OBTAINED FROM VEINTHANKULAM POND DURING JAN 2020 – MARCH 2020

SPECIES	JANUARY		FEBRUARY		MARCH	
	First FN	Second FN	First FN	Second FN	First FN	Second FN
Filinia longiseta	11	10	6	2		
Keratella sp.	17	4	11	12	5	3
Brachionus calyciflorus	5	7	3	5	5	7
Brachionus caudatus	7	9	-	-	-	-
Keratella valga	8	11	-	-	-	-
Conochilus	4	2	2	-	-	
Brachionus forficula	6	8	4	3	2	5
Lecanelunaris	-	-	3	2	-	-
Dipleuchlanis propatula	-	-	3	1	-	-
Rotaria neptunia	-	-	-	-	1	2
Philodina sp.	-	-	-	-	3	-

TABLE – 2

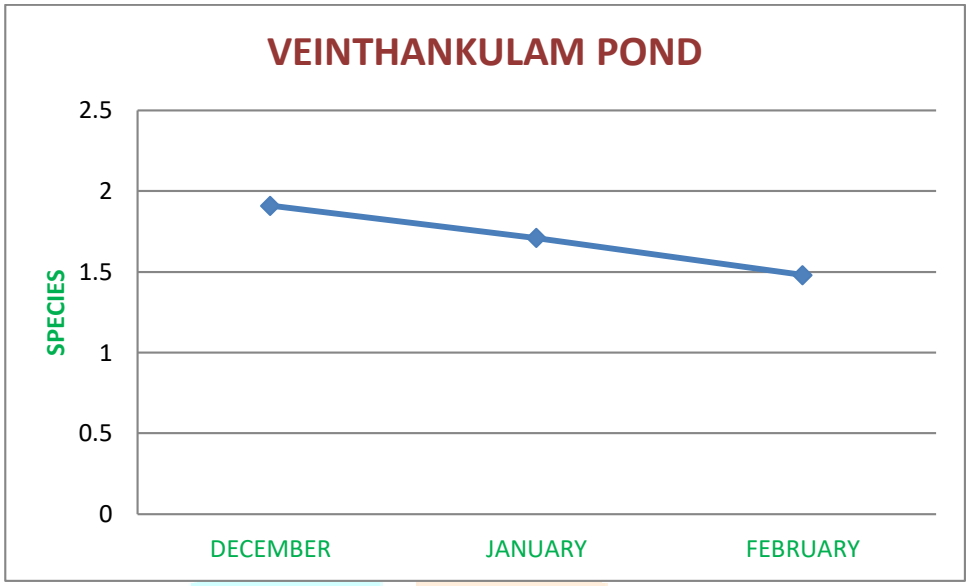
PHYSICO – CHEMICAL PARAMETER ANALYSIS OF THE VEINTHANKULAM POND DURING JAN 2020 – MARCH 2020

S.NO	PARAMETER	JANUARY		FEBRUARY		MARCH	
		1stFN	2ndFN	1stFN	2ndFN	1stFN	2ndFN
1.	PH	6.68	6.60	7.8	7.7	6.5	7.1
2	TEMPERATURE	28.64	28.20	30	30.5	31	31.2
3	OXYGEN LEVEL(mg/lit)	7.35	7	7.35	7.30	8.53	8.51
4	CHLORINITY (ppt)	0.48	0.42	0.48	0.45	0.20	0.24
5	SALINITY(ppt)	0.53	0.53	0.59	0.55	0.41	0.47
6	AMMONIA (ppm)	0.5	0.48	0.45	0.49	0.49	O.53

A high concentration of rotifera Brachionus species in the waterbody may be dueto the alkaline nature of water. According to Dhanapathi (2000) many species of rotifers are having a preference for more alkaline water. The species like Brachionus build a higher population during study period when alkalinity is high. Brachionus calyciflorus in particular is considered to be a good indicator of eutrophication (Sampaio *et al*., 2002).The richness of Brachionus and Lecane is well documented for tropical water (Dumont, 1983). The species belonging to the genus Brachionus largely dominated the rotifer community, reflecting a wide tolerance limit towards environmental changes (Shah *et al*., 2015). While studying the wetland, during the study period, species belonging to the genus Brachionus and Keratella accounted for more than 70% of the total rotifer density. Pandit and Qadri (1990) opined that rotifer (Brachionus sp. and Keratella sp.) abundance increased during a flood. While an abundance of species belonging to the genus Lecane was recorded highest when the water temperature was maximum followed by winter, can be categorized as eurythermal (Yousuf and Qadri, 1981). The most abundant species recorded from the Veinthankulam pond, such as Brachionus calyciflorus, B. forficula, B. caudatus,, are known for their high tolerance to organic enrichment (Grajner and Gladysz, 2010; Chitra, 2013) indicating the pond as organically polluted. The influence of micro-habitats on the abundance of rotifers, such as the zone of macro-vegetation was discernible in the present study.

The composition of the rotifer community responds to environmental factors and therefore rotifers can be used as a biological indicator of an aquatic ecosystem(Sladecek,1983; Pontin and Langeley 1993). Changes in environmental conditions (Jayakumar et al., 2009; Singh et al., 2010), including nutrients and pollutants, are known to influence the composition and structure of the zooplankton community (Jha and Barat, 2003). Several studies are available on the effect of biotic and abiotic factors on rotifer abundance and diversity, such as water depth (Bini et al., 2007), nutrient resources (Branco et al., 2002); transparency (Angeler et al., 2010), and temperature (Ji et al., 2013). Earlier works have indicated species successions and seasonal distributions of zooplankton community resulted from the differences in ecological tolerance to various abiotic and biotic environmental parameters, making rotifers as useful indicators of environmental changes (May and O'Hare, 2005; Wen et al., 2011).

FIGURE -1 AVERAGE SHANNON – WEINER INDEX VALUES OF ROTIFER SPECIES DURING STUDY PERIOD

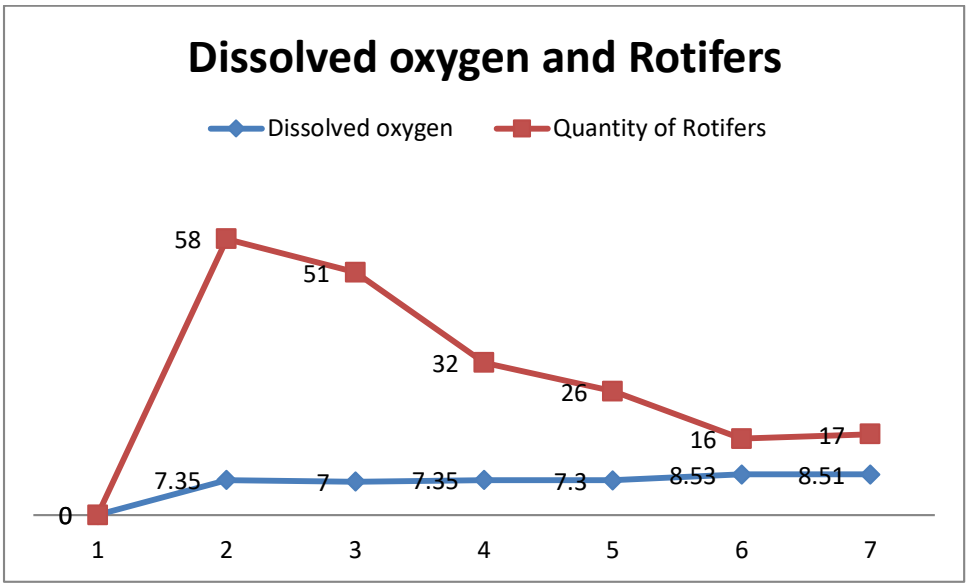


In the sampling site –Veinthankulam pond because of the fertile nature of the pond it would take very lesser time to reach abundance.Despite its fertile nature, the number of rotifers observed was very low, because of the presence of an enormous number of Zooplankton other than rotifers. They might perform predation of rotifers was the reason for the lower number of Brachionous genera observed.

Since the Veinthankulam pond is highly eutrophicated, easily the dissolved oxygen got depletion. This was also one of the reasons for the lower number of rotifers. Moreover, industrial effluents were also entered through pipes. Other wastes were also dumped into the pond. Because of these unhygienic irresponsive actions of our public, the environment of Veinthankulam pond got drastically affected.

The influence of other environmental parameters such as alkalinity, pH, dissolved oxygen, and nutrients (nitrate and phosphate) on rotifer abundance were found positively correlated but not significant ($p>0.05$). These parameters influence rotifer abundance through an intricate network of direct or indirect interactions between bio-physical components of the ecosystem. Several earlier studies also confirmed that abiotic factors such as temperature, transparency, nutrients (N and P), pH, and ionic concentrations directly or indirectly influenced the seasonal dynamics of zooplankton species assemblages (Wanganeoet al., 2008; Arora and Mehra, 2009).

FIGURE:2 COMPARISON OF OBSERVED DISSOLVED OXYGEN AND OBTAINED ROTIFERS



As the pH increases above neutral, gradually affected the rotifer population as observed by Santhakumari. R (2014). Rotifers were found to be independent of the change in pH values within the observed range (6.2 – 8.6 mg/lit) our pH distribution during this study period coincided with her findings (6.5- 7.8 mg /lit). The moderate alkalinity (75-200mg/l) and pH (7-8.3) influence on primary production might influence rotifer abundance. The pH of the pond was found to be predominantly alkaline that exerted a positive influence on rotifer abundance without discerning any trend. Yin Nui (2008) stated that there could be an optimum pH range for the growth and development of particular species, corroborating with our present observation.

The influence of transparency on rotifer distribution studied by Telesh (1995) and Keppeler and Hardy (2004) also reported a higher abundance of rotifer with reduced transparency.Galkovskaja (1987) stated that it is difficult to determine the direct effect of temperature on rotifer abundance as temperature influences many other direct and indirect processes, which affect rotifer abundance. Temperature also sometimes plays a vital role in the occurrence of rotifers as the temperature increases the number of rotifers decreases. This is corroborative of our findings. (table 3&4).

Another limnological parameter that affects the rotifer population is chlorinity. As it increases the number of rotifers individual decreases it is indirectly proportional to rotifers(0.20-0.48ppt)(Fontaneto et al; 2004).

IV. CONCLUSION

There was a contrasting observation on the influence of dissolved oxygen on the distribution and abundance of the rotifer community. The present study revealed little or no direct influence on rotifer distribution. Dissolved oxygen is directly proportional to the rotifers. If dissolved oxygen increases the rotifers' number also increases (table 1 & 2). Our distributing range of dissolved oxygen is 7-8.53 mg /l. The decreasing oxygen may be the result of a high load of organic substances, domestic waste, industrial effluents, anthropogenic activities, etc..The lack of oxygen is indicated by the lower number of Rotifers and eutrophication.

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