

ROTIFERS ABUNDANCE AND THEIR RELATIONSHIP TO WATER QUALITY IN THE PANDU LAKE, BODHAN, TELANGANA, INDIA

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Abstract: In the present study an attempt has been made to evaluate water quality and related density of rotifers for a period of two years, August 2002 to July 2004. A few water quality parameters such as dissolved Oxygen, biological oxygen demand, phosphates, and nitrates are presented here to relate with the abundance or cessation of rotifers. The present study has given an understanding that lake is transforming into nutrient rich water body.

Keywords: Rotifers, Correlation, Water quality, Pandu Lake, Telangana.

INTRODUCTION

The presence and dominance of zooplankton species play very significant role in the functioning of fresh water ecosystems. Zooplanktons are heterotrophic planktonic animals floating in water. They constitute an important component of secondary production in aquatic ecosystems that play a key role in energy transfer from primary to higher level in the ecosystem. Zooplankton, formulate the base of food chains and food web in all aquatic ecosystems. They also play a major role in recycling nutrients as well as cycling energy within their respective environments. They serve as good indicators of changes in water quality as they respond quickly to aquatic environmental changes such as pH, colour, odour and taste etc. (Vima patel et al 2013). The dominant zooplanktons in freshwater ecosystems are rotifers and micro crustaceans made up of cladocerans and copepods. (John Leju Celestino Ladu et al 2012). Species of Rotifer and Cladocerans are suggested as indicators that can be used to identify different physical and chemical gradients (Ahangar et al. 2012). Edmonson (1993) indicated that eutrophication has been, and will perhaps continue to be, the most widespread type of environmental pollution in freshwater systems. Some rotifer species have been reported as bioindicators of eutrophic condition (Frutos, SM.et al 2009).

Phosphates and nitrates occur in small amounts in all aquatic environments and are required to maintain the growth and metabolism of plants and animals. However, in excess amounts,

these minerals can prove to be quite harmful. Through the process of eutrophication, dissolved minerals and nutrients flow into streams, lakes, and other bodies of water. A good portion of these dissolved minerals consists of phosphates and nitrates. Levels of phosphates and nitrates that are intolerable to local organisms have been known to deplete dissolved oxygen levels by causing algae blooms. Eutrophication, bringing with it high amounts of phosphates and nitrates, is a main cause in the destruction of lake ecosystems around the world. (Ansar & Khad, 2005) Several scientists have studied mineral levels in different bodies of water, and have found that the levels of phosphates and nitrates heavily impact the overall health of the water and its inhabitants (Yanamadala, 2005). In the present study an attempt has been made to assess the impact of water quality on rotifers abundance.

MATERIAL AND METHODS

Bodhan town is spread 21.36 km². The town Bodhan is located at latitude 18°39' 36" N and longitude 77°52' 47" E. The present lake Pandu is located on the north side of Bodhan town near residential localities. Free catchment area of the lake is 1.65 square miles. The total capacity of Pandu Lake is 9.44 Mcft. Total spreading area of Pandu Lake is 109.22 ha. The depth of Pandu Lake is 7 ft (Figs. 1 and 2).

Sampling and physicochemical investigation was carried out according to standard methods. Dissolved oxygen in water was determined by the Winkler's iodometric method and biological oxygen demand determined by 5-day biochemical oxygen demand (BOD) test method. Phosphates in water were determined by the molybdophosphoric acid method and nitrate determined by Brucine method APHA (1989).

Zooplankton samples were obtained by passing 50 l water through plankton net in each depth. Zooplankton samples were preserved in 4% formalin. Identification of Rotifers was done with the help of fresh water biology Edmondson (1965). Counting of organisms was done using Sedgwick- Rafter counter and the dilution technique and the population density of rotifers is represented per liter of water.



Fig1. Satellite view of Pandu Lake



Fig2. Toposheet of Bodhan showing Pandu Lake

RESULTS AND DISCUSSION

Dissolved oxygen (D.O.)

Dissolved oxygen in the present study of Pandu Lake varied from 2.80 to 7.60 mg/l with an average of 4.37 ± 0.23 mg/l (Graph 1). The depletion of dissolved oxygen by the organic matter that accumulates in the lake during dry season resulted in the low level of dissolved oxygen. i.e. 2.8 ppm. The decrease in oxygen may be the result of the high load of organic substances in the inflow from sharbathi canal of Bellal tank, Bodhan. The lack of oxygen is a good indicator of the trophic state of the lake, which is overloaded with inorganic and organic matter and transforming into eutrophic Lake. In the present study the rotifer abundance showed a decrease with increase in dissolved oxygen level (Graph 4)

Biological Oxygen Demand (BOD)

Biological oxygen demand is the amount of oxygen utilized by micro organisms in stabilizing the organic matter. On an average basis, the demand for oxygen is proportional to the amount of organic waste to be degraded aerobically. During the study period BOD in Pandu Lake varied from 49.40 to 82.40 mg/l (Graph 1) with an average of 28.82 ± 4.12 . In the present observation rotifers were found to be abundant at permissible limit of BOD (Graph 5).

Phosphates

In the present study the phosphate values are 0.23 to 0.94 mg/l (Graph 1). Variations in phosphate content of two year study exhibited high peak in March 2004. It was found minimum in July 2003. Rotifers flourished well during high concentration of phosphates (Graph 2).

Nitrates

In Pandu lake the amount of nitrates recorded in monthly samples varied from 0.74mg/l to 1.89mg/l (Graph 1) with an average value 44.53 ± 12.17 mg/l. The values obtained during the present study were enough to cause eutrophication and weed growth. The increased levels of nitrates prevented the growth of Rotifers (Graph 3). The important source of nitrates in the Pandu lake is due to domestic runoff, agricultural, industrial wastes and rapid urbanization in the surrounding areas.

Conclusion

The results of our study showed that higher levels of phosphates, low levels of dissolved oxygen promoted rotifer growth while the high concentration of nitrates resulted in the cessation of rotifers. Rotifers population indicates pollution due to the direct entry of untreated domestic sewage and industrial effluents into the lake. Water quality parameters estimated reflect the eutrophic condition of the Pandu lake.

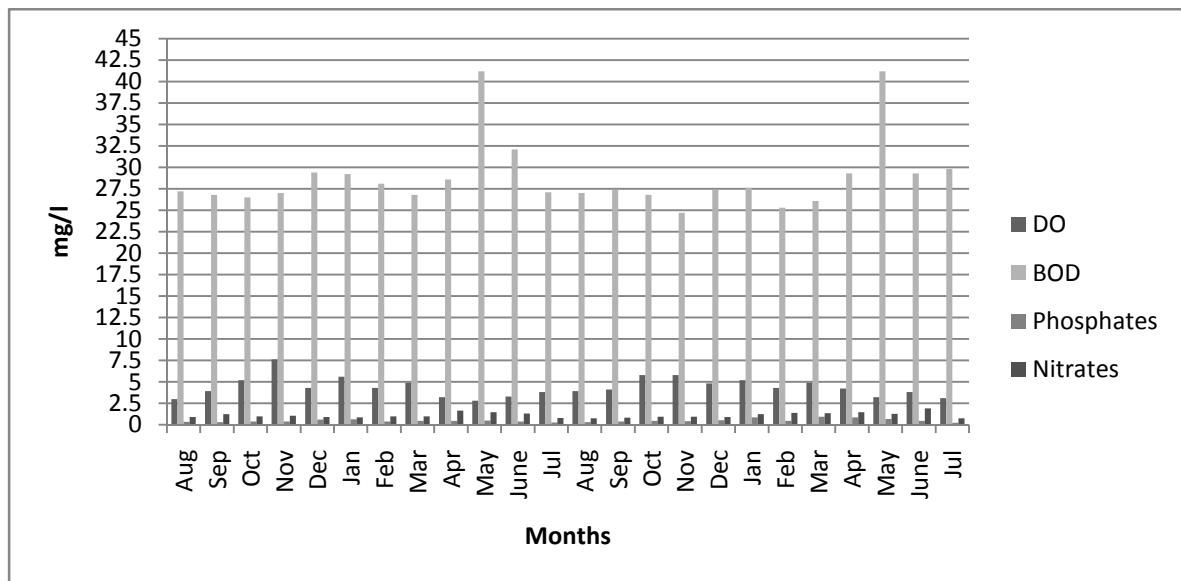
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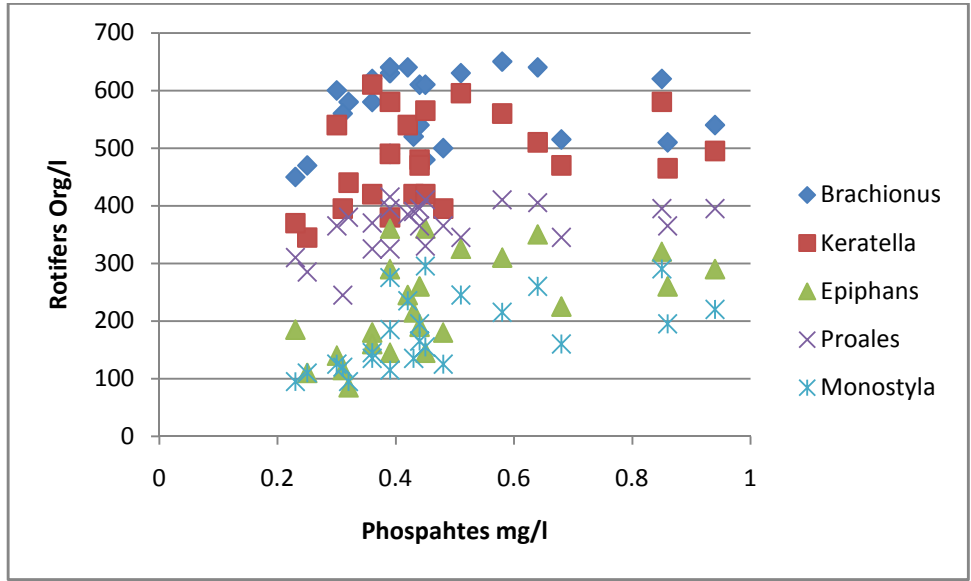
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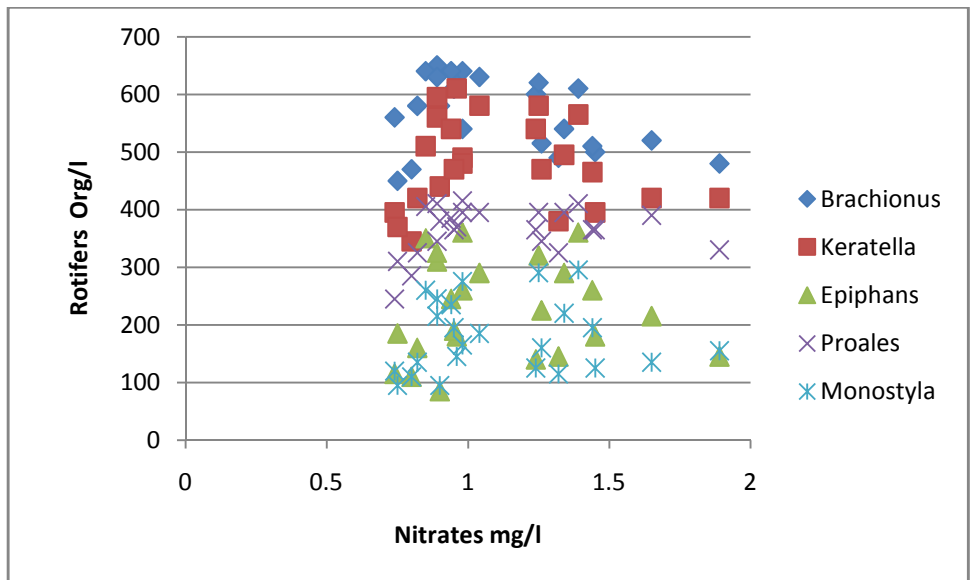
GRAPHS



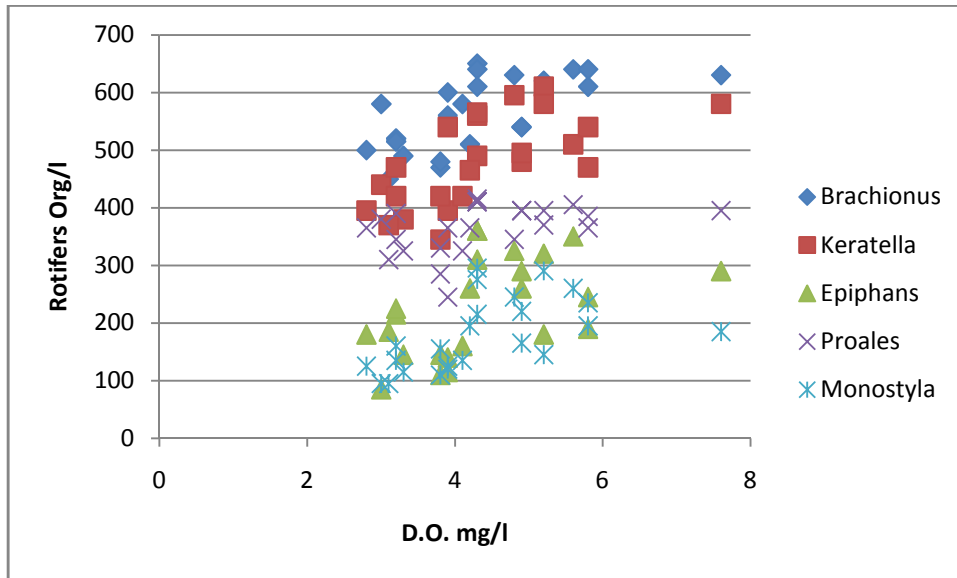
Graph 1. Monthly variations of D.O, B.O.D, NO₂ and PO₄ (mg/l) of Pandu Lake



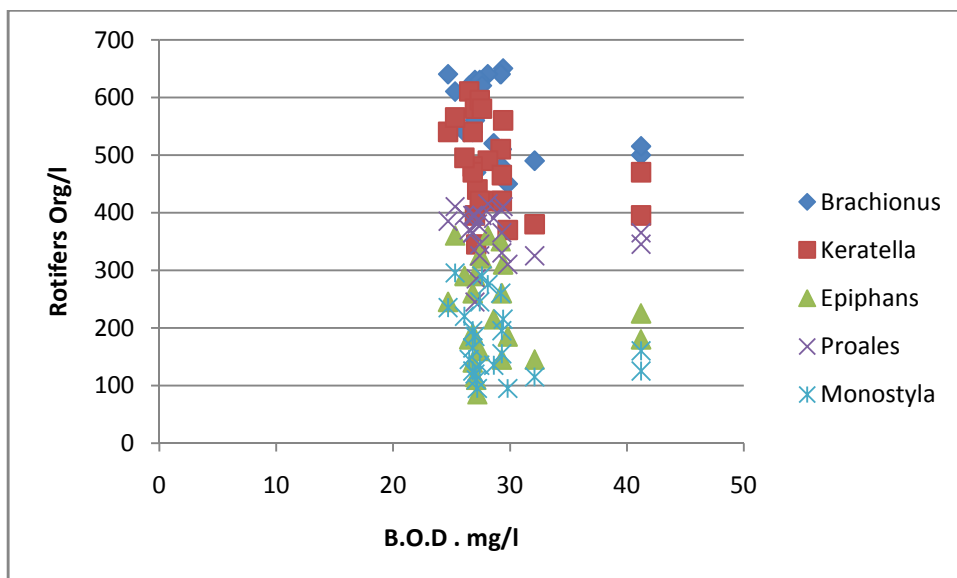
Graph 2. Correlation between rotifers and Phospahtes



Graph 3. Correlation between rotifers and Nitrates



Graph 4. Correlation between rotifers and Dissolved Oxygen



Graph 5. Correlation between rotifers and BOD