

Water Quality Assessment of a Polluted Urban Lake with respect to Zooplankton

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Abstract

The plankton community is a heterogeneous group of tiny plants and animals adapted to suspension in the water bodies of the entire globe. The movements of plankton are so feeble that they essentially remain at the mercy of water currents i.e. waves and tides. The producers of the aquatic ecosystems are the plant plankton i.e. phytoplanktons while consumers are the animal plankton i.e. zooplankton. The phyto & zooplankton constitute a dynamic chain on which fish fauna sustains & grows to be useful for the benefit of mankind. The pollution of water bodies is increasing day by day and a large number of water bodies are progressing towards eutrophication. The status of a water body is known from the presence of various kinds of species in it. The organic enrichment favours growth of a large number of species in a water body which results in its growth and development. Keeping these points in view assessment of water quality of a urban water body (Sonagaon lake) situated in the Nagpur city is done during monsoon and post monsoon months to know the exact status of zooplankton species prevailing in lake water. The lake water is polluted due to Ganesh idol immersion, garland immersion as well as load of detergents from washing and other activities. The lake is slowly progressing towards eutrophication as evident from the present studies on zooplankton.

Keywords : *Zooplankton, Water quality.*

Introduction

Today the freshwater lakes of the world are undergoing fast degradation subsequently leading to eutrophication (Rao & Durve, 1989). The anthropogenic sources viz. activities of man are mainly responsible for polluting the freshwater resources all over India. The freshwater lakes are closed ecosystems in which zooplankton hold a key position in the metabolism of water bodies, trophic levels, food chains & energy flow. The occurrence & abundance of zooplankton in freshwater lakes depends on its productivity, which in turn is influenced by physico-chemical parameters & available nutrients. The organically enriched water bodies sustain a large variety of zooplankton species throughout the year. Keeping these points in view a freshwater lake of Nagpur city is investigated with respect to biodiversity of zooplankton during monsoon & post monsoon months.

In India studies on freshwater zooplankton were carried out by many prominent investigators like Babu Rao (1997), Chandrasekhar (1996), Rai (1982), Sharma & Hussain (2001), Verma & Dutta Munshi (1987), Dhanpathi (2000), Rao & Durve (1989), Dutta *et al.*, (1987), Somani & Pejaver (2004) and Kodarkar (1994).

Materials & Method

The Sonagaon lake is a old lake situated on Southern side of Nagpur city. Previously the habitation was very sparse, near the lake. But due to rapid progress of Nagpur city the localities expand & now at present the lake is covered from all the sides by residential colonies. Some part on Western bank of lake is encroached by localities & built houses therein. Previously the lake was surrounded by fields & the water

was abundantly available but now due to encroachment on banks the water seeping into the lake basin has reduced to a large extent, the effect is that during extreme Summer months the volume of water shrinks to a size of very small pond in the center. Two old temples are situated on eastern bank of this beautiful lake which is visited by many devotees. During "Ganesh idol immersion programme" a lot of garlands & other pooja material are dumped into the basin thereby enriching the lake waters. Some local residents also utilize the lake for washing and bathing activities daily thereby adding detergent load to waters polluting it. The lake base is shallowed down and water table is hardly four feet in the lake due to siltation of banks. During winter months lots of migratory birds are frequently observed in the lake water. In order to study the zooplankton biodiversity in this beautiful lake. Zooplankton samples were collected from littoral zone of surface water during monsoon and post monsoon months by filtering 50 litres of Sonagaon lake water through plankton net made of silk bolting cloth (mesh size 45 μ m) in early morning hours twice a month. The zooplankton samples were immediately preserved in 4% formalin solution for further analysis & kept in laboratory till further analysis. The samples were observed under "Sedgwick Rafter Counting Cell" (S R Cell) having dimensions 50 mm x 20 mm x 1 mm, under light microscope. The identification of zooplankton was done using standard literature (Battish 1992, Edmondson 1992, Dhanpathi 2000, Ward & Whipple 1958). The different forms were observed and recorded individually.

Results and Discussion

The Zooplankton of Sonagaon Lake is represented by five different groups viz. protozoa, cladocera, copepoda, ostracoda & rotifera (Table I). The ostracoda group is represented by 2 species rotifers by 12 species cladocera by 8 species, copepoda by 3 species & protozoa by 2 Species during monsoon & post monsoon season in general. During monsoon months the ostracoda group is represented by 2 species while in post monsoon it is represented by *Cypris species* alone. Tonapi (1980) has reported higher population of ostracoda during monsoon months due to abundance of fine detritus available during this period of the year on which ostracods feed vigorously & develop.

The most abundant species during monsoon months were rotifers represented by about 12 different forms; while in post monsoon it is represented by about 8 different Species. The pollution indicator sps. *Rotaria rotatoria* was observed in post monsoon months indicating that after rain, pollution level of nutrients & organics has slowly increased in lake water. The most abundant species observed in lake water was *Brachionus calyciflorus* from rotifera group. The occurrence of indicator species such as *Brachionus forficula* (Rao & Durve, 1989) and *Filinia longiseta* (Schindler & Noven 1971, Mishra & Saksena, 1998) indicates that slowly the lake water is progressing towards eutrophication stage.

The freshwater zooplankton form an important group which in turn is consumed by variety of secondary consumers including commercially important groups of crustaceans such as prawns & fishes. Thus zooplankton community constitute an important component of aquatic ecosystem & many species are suitable for aquaculture practices.

Rotifers play an important role as grazers & suspension feeders within the zooplankton community. The difference in periodicity & population density of different rotifer species is due to biotic interactions & nutritional content of the lakes. Rotifers exhibit marked differences in their tolerance & adaptability to changes in physico-chemical & biological parameters. Such changes are dramatic & sudden in the case of

urban ecosystems. Chandrasekhar (1996) observed that in summer & monsoon months the factors like water temperature, turbidity, transparency & dissolved oxygen play an important role in controlling the diversity & density of rotifers.

Most of the cladocera species are primary consumers and feed on microscopic algae & fine particulate matter in the detritus thus influencing cycling of matter & energy in benthic food chain. The factors like turbidity, materials in suspension, transparency, dissolved oxygen of the water play a key role in controlling the diversity & density of cladocera. According to Datta & Munshi (1995) abundance of cladocera can be attributed to thick deposit of organic matter in an aquatic ecosystem. In the present investigation it is noticed that during monsoon months due to turbulence in water a large amount of organic detritus is made available to cladocera on which about 8 different forms thrived which were reduced to about 4 types in post monsoon months.

So it can be inferred from the present study that the aquatic ecosystem of the urban polluted lake has abundant biodiversity represented by various forms during monsoon & post monsoon seasons. The lake water is slowly progressing towards eutrophication as indicated by the presence of indicator species.

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Table - I: Zooplankton Species Observed in Sonegaon Tank

| | <u>Group</u> | Species | Time Monsoon | Post Monsoon |
|----|-------------------------|--|---|---|
| 1) | <u>Ostracoda</u> | 1. <i>Cypris Species</i> 2. <i>Stenocypris</i> | + + | + - |
| 2) | <u>Rotifera</u> | 1. <i>Asplanchna Species</i> 2. <i>Asplanchna intermedia</i> 3. <i>Brachionus forficula</i> 4. <i>Brachionus caudatus</i> 5. <i>Keratella tropica</i> 6. <i>Philodina</i> 7. <i>Testudinella</i> 8. <i>Filinia longiseta</i> 9. <i>Brachionus rubens</i> 10. <i>Epiphanes</i> 11. <i>Monostyla bulla</i> 12. <i>Rotaria rotatoria</i> 13. <i>Brachionus calyciflorus</i> | + + + + + + + + + + + + + | + - + + + - - - + - + + + |
| 3) | <u>Cladocera</u> | 1. <i>Simocephalus</i> 2. <i>Macrothrix</i> 3. <i>Chydorus</i> 4. <i>Alona Species</i> 5. <i>Bosmina longirostris</i> 6. <i>Diphanosoma Species</i> 7. <i>Pleuroxus Species</i> 8. <i>Sida Species</i> | + + + + + + + + | - + + + + - - - |
| 4) | <u>Copepoda</u> | 1. <i>Cyclops Species</i> 2. <i>Diaptomus Species</i> 3. <i>Copepod nauplius</i> | + + + | + + - |
| 5) | <u>Protozoa</u> | 1. <i>Diffugia Species</i> 2. <i>Arcella</i> | + + | + - |