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A Case Study :

Qualitative study of phytoplankton and zooplankton in upper lake, Bhopal

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Qualitative study of phytoplankton and zooplankton in the upper lake of Bhopal during July 2004 to June 2005, was studied. Phytoplankton composed of 9 species of Chlorophyceae, 5 species of Bacillariophyceaei, 6 species of Cynaphyceae, Euglnophycae, Charophyceae and Zooplankton composed of 3 species of protozoas, 5 species of Rotifers, 8 species of Crustaceae and Meroplankton organisms mainly consisting of insects. The major phytoplankton and zooplankton species which created problem in the water treatment as observed were *Spirogyra*, *Ulothrix*, *Cyclotella*, *Syndera*, *Microspora* etc. Zooplanktons as indications of eutrophication as observed were *Daphnia, Amoeba, Euglena, Mesocyclops, Dapharosoma*. Meroplanktonic organisms decreased from upstream to down stream regions.

Key words : Phytoplankton, Zooplankton, Meroplanktonic, Upper lake, Ulothrix, Cyclops.

INTRODUCTION

The upper lake of Bhopal which is the largest reservoir is illmanaged, a large number of houses and slum dwellers are located on the lake site. Number of activities such as agriculture, sewage disposal, religious emmersion etc. are going on which result in accumulation of residual fertilizers, pesticides, waste water along with clay, paper wood, heavy metal etc.

The negligence of lake management results in its nutrient enrichment consequently blooming of algae and aquatic vegetations as well as eutrophication often interfere with the treatment procedures in the fourteen work units. Different organisms are retained in the sedimentation tanks creating its logging thereby increasing the cost of water treatment (Tamot and Bhatnagar, 1988). The phytoplanktonic forms of algae from different water bodies of M.P. have been described by various workers (Agarkar, 1967a,b; 1969; Desikachary, 1959; Mahajan 1987; Singh 1997, 1999; Singh and Singh, 2002). But still a lot remains to be done with respect to phytoplankton of water bodies located in far off places. Zooplankton is the intermediate link between phytoplankton and fish which are secondary producers in aquatic environment. It contains both herbivores and carnivores, the latter belonging to the tertiary producers, or even to some higher level of production. A knowledge of their abundance, composition and seasonal variation, therefore, is an essential prerequisite for any successful aqua culture programme. Among the zooplankton, rotifers are apparently the most sensitive indications of water quality reported by (Sheeba *et al.*, 2004). Hence, qualitative study of phytoplankton and zooplankton is of great importance in the present contest of Bhopal, upper lake because this may help to assess the environmental degradation.

MATERIALS AND METHODS

One litre of water sample was collected from surface and kept for sedimentation in glass bottle. The algae samples were preserved in formaline and brought to the laboratory for study. Identification of phytoplankton and zooplanktons was mainly based on standard recent publication, standard books and mongraphs (Prescott, 1951; Desikachary, 1959; Adoni *et al.*, 1985; Palmer, 1980; APHA, 1985 and Battish, 1992.)

RESULTS AND DISCUSSION

Qualitative analysis of phytoplanktons and zooplanktons was made and members of Chlorophyceae, Cyanophyceae, Bacillariophyceae, Euglenophyceae, Charophyceae, Protozoas, Rotifera, Crustacea, and Meroplankton were identified.

Chlorophyceaes :

A. tinastrum, Chlamydomonas, Closteridium, Cusmarium, Micropsora, Spirogyra, Ulothrix, Oedogonium, Volvox.

Cyanophyceae :
Microcystis, Lynbya, Nostoc, Anabaena, Spirulina, Rivularia, Syndera.
Charophyceae :
Chara, Nitella.

Bacillariophyceae :
Cymbella, Diatoms, Cyclotella, Navicula, Melosira.

Euglenophyceae :
Euglena.

Protozoas:
Verticilla, Diffugia, Arcella.

Rotifera :
Notholca, Monostyla, M. quaridentata, Mytilina, Lecane, Philodina.

Crustacea :
Daphina, Cypris, Streblocerus, Cyclops, Diaptomus, Bosmia, Dapharosoma, Nauplisus larva

Phytoplanktons are common in habitats of the surface layers of water bodies exposed to the sunlight. The composition of algae population is influenced by a large number of factors (Palmer, 1980) e.g. the size, shape, depth, extents of shore areas, characters of sediments physicography and soil of water shed, amount and rate of precepitation, sunlight and quality of water as reported by Mishra (2004). Basu and Pick (1996) pointed out that zooplankton biomass in river is much lower in lakes and population in lake is dominated by Rotifera and small crastaceans and zooplanktons in lake may be regulated by water resident time (Pourriot *et al.*, 1997). The dominance of small organisms such as Rotifers in river plankton is assumed to be the result of fish predation on large zooplanktons as well as of a short generation time which allow their *in situ* reproduction in spite of a short residence time of the water. The studies done by Ramanurajan (1994) showed that Crustaceans were the dominant forms followed by Rotifera and the present study also confirmed this view.

Cyanophyceae and Bacillariophyceae were shown to be correlated with the intensity of pollution by Palharya and Turech (1988). They reported that *Spirogya, Scendesmum, Closteridium, Oscillatoria, Anacystis, Anabaena, Synedra, Navicula, Melosiry* and *Cymbella* can be considered as pollution tolerant forms. Cooke and Tursch (1958) also observed that *Spirogyra* and *Oscillatoria* showed abundant growth in the summer season. Similar observations were found in upper lake of Bhopal, where *Anacystis* spp. formed algal blooms. Some algae also play an important role in self-purification, because of this dual role phytoplanktons is important as blue green algae, such as *Nostoc*, secrete antibiotics called bacteriocins, that kill related strains of the algae. These antibiotics probably play an active role in the survival of the producing organisms by inhibiting growth of competing organisms (Ranga, 1999).

In general, quantity of zooplanktons was comparatively very low from August to December. During July to September, the phytoplanktons were also low because of the heavy rains. In flush the rain water causes strong current which run away the phytoplanktons. The depletion of phytoplanktons naturally affects the population of Zooplankton. Ramanurajan (1994) and Marneffe *et al.* (1996) also made the similar observations. The biological data revealed high algae blooms indicating eutrophication, by dominent species being *Anacystis, Microsystic, Navicule etc*. The dominance of Microsystis indicated toxic subproduction by giving bad odour. A shift from rotifers to larger zooplanktons such as *Cladocerams* was noticed with emergence of *Bosmia*, therefore, the lake was found to be biomanupulated.

It may be summarized that temperature affect the growth of algae, as low temperature favoured the growth of *Euglenophyceae* and high temperature that of *Chlorophyceae*. The major algal species which created problem in the water treatment as observed from the raw water of the sampling stations were *Melsoria, Anacystis, Navicula, Syndera, Spirogya, Ulothrix* etc. During the study period, change in species dominance was observed with change in seasons as *Chlorophytaceae* was maximum in February and minimum in March. *Euglenophytaceae* appeared maximum in January and February *Bacillariophytaceae* was maximum in March and minimum in February, Cynophyceae was maximum in January and minimum in February. The major zooplankton which were responsible for creating problems in water treatment as observed were *Bosmia, Daphnia, Mesocyclops, Amoeba, Euglena, Ceridophria, Monia* etc.

Phytoplaktons and zooplanktons depletion will adversely affect the normal food web pattern and this inturn will lead to the destruction of the natural ecology of the lake. So, the conservation and maintenance of the lake is very essential for future generations.

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