

# Studies on Phytoplankton diversity of Barehalla tank, Shivamogga, Karnataka, India

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(Received 6 October, 2021; Accepted 20 November, 2021)

## ABSTRACT

Phytoplankton serve as the base of the aquatic food web, providing an essential ecological function for all aquatic life. The quantitative analysis of phytoplankton helps in understanding the basis of primary productivity of freshwater ecosystem. The study was carried out in Barehalla tank of Shivamogga for a period of twelve months from January to December 2018. A total of 49 species belonging to 21 genera of phytoplankton were recorded, of which Chlorophyceae and diatoms were found to be dominant among four classes. Relative abundance of phytoplankton in Barehalla tank showed maximum of Chlorophyceae (34.69%), followed by Bacillariophyceae (30.61%), Cynophyceae (20.40%) and Euglenophyceae (14.28%). Pollution tolerant species like *Scenedesmus quadricauda*, *Tetraedon muticum*, *Microcystis aeruginosa*, *Phacus* sp. and *Euglena* sp. were observed in the tank.

**Key words :** Phytoplankton, Barehalla tank, Karnataka

## Introduction

Phytoplankton are photosynthesizing microorganisms that inhabit the upper sunlit layer of almost all oceans and bodies of freshwater (Sayeswara *et al.*, 2012). Their density, species diversity, and succession have been largely influenced by a number of abiotic factors, like morphology of water body, sewage discharge and anthropogenic activities. The phytoplankton are sensitive to environmental changes and their spatial and temporal distribution is governed by a number of environmental factors (Imran and Dahegaonkar, 2020). Phytoplankton plays a major bulk of food material for all aquatic organisms directly and to human beings indirectly (Purushothama *et al.*, 2011). Some phytoplankton also act as biological indicators of water quality (Patrick, 1971). The planktonic study is very useful tool for the assessment of water quality in any type of water body also contributes to understanding of

the basic nature and general economy of the lake (Pawar *et al.*, 2006).

## Study area

Barehalla tank is located between 13° 55' N latitude and 75° 18' E longitude situated at Purdal village, 7 km away from Shivamogga city. It is annual water body receiving water from Barehalla river and Krishna basin, surrounded by thick forest in all directions. The total area of tank is about 282 acres with an average depth of 240 cm. The water has undergone moderate changes in the physico-chemical properties due to overflowing of water from adjacent forest and Barehalla river during the monsoon.

The literature revealed that there is no scientific study carried out with respect to phytoplankton diversity of this tank. For the present study, Barehalla tank has been selected in order to ascertain the diversity of phytoplankton, since it is the drinking

water source for the people around the tank.

## Materials and Methods

The study was carried out during January to December, 2018. The samples were collected in the morning hours between 7.30 to 9.30 am. 50 l of water sample was filtered through the plankton net made of bolting silk number 25 with mesh size 50 $\mu$ . The collected samples were allowed to settle down by adding Lugol's iodine. Sample was concentrated up to 50 ml depending on the number of plankton and preserved in 5% formalin. Identifications of Phytoplankton were made with the help of Deshikachary (1959), Gandhi (1961), Welch (1952) and Prescott (1882).

## Results and Discussion

Many studies have been documented on the diversity of Phytoplankton in India. Imran Mithani and Dahegaonkar (2010) made detailed survey of diversity of phytoplankton of river Wardha of Ballarpur of Maharashtra and recorded nearly 51 species. Vasantha Naik *et al.* (2012) reported 79 species of phytoplankton in Ganikere tank of Sagara of Karnataka. Sayeswara *et al.* (2012) recorded 60 species of phytoplankton in Hosahalli pond of Shivamogga of Karnataka. Kumar *et al.* (2012) 48 species of phytoplankton in Sabarmati river at Ahmadabad, among which 21 species of Chlorophyceae, 13 species of Bacillariophyceae, 11 species of Cynophyceae and 3 species of Euglenophyceae. Peruswamy and Thangamani

(2004) recorded 43 species of phytoplankton in perennial ponds of Tamil Nadu, of these 11 species belonging to Bacillariophyceae, 18 species to Chlorophyceae, 11 species to Cynophyceae and 3 species to Charohyceae. Nagi *et al.* (2012) reported 53 genera in Ganga river at Garhwal region of Uttarakhand with dominance of Chlorophyceae (26), followed by Bacillariophyceae (12),

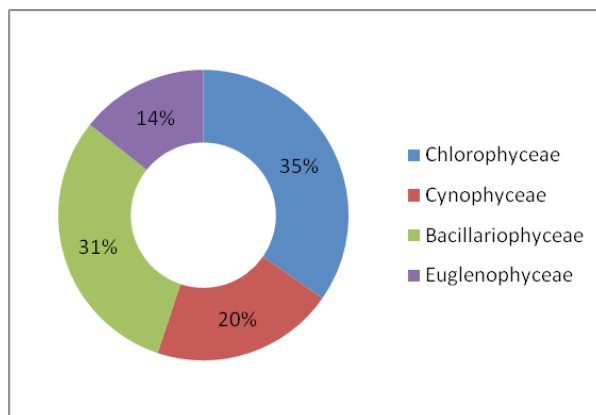


Fig. 1. Diversity of Phytoplankton in Barehalla tank

Cynophyceae (10), Euglenophyceae (4) and Xanthophyceae (1).

In the present investigation, a total of 49 phytoplankton species representing four groups namely Chlorophyceae, Cynophyceae, Euglenophyceae and Bacillariophyceae were reported (Table 1 and Figure 1). Phytoplankton showed a dominant position of Chlorophyceae (34.69%), followed by Bacillariophyceae (30.61%), Cynophyceae (20.40%) and Euglenophyceae (14.28%).

Chlorophyceae was the most dominant group

Table 1. List of phytoplankton in Barehalla tank water.

### Chlorophyceae

*Ankistrodesmus spiralis*, *Ankistrodesmus gracilis*, *Coelastrum microsporum*, *Coelastrum reticulatum*, *Crucigenia crucifera*, *Dimorphococcus lunatus*, *Kirshikoviella limnetica*, *Pediastrum simplex*, *Pediastrum duplex*, *Scenedesmus indicus*, *Scenedesmus quadricauda*, *Selanastrum abundance*, *Selanastrum acuminatus*, *Selanastrum westii*, *Tetraedon caudatum*, *Tetraedon muticum*, *Tetraedon trigonum*

### Cynophyceae

*Aphanocapsa banarensis*, *Anabaena aphinizimenoides*, *Merismopedia glauca*, *Merismopedia tenuissima*, *Microcystis aeruginosa*, *Nostoc microscopium*, *Oscillatoria formosa*, *Phormidium sp.*, *Rivuliera sp.*, *Spirulina spiroides*

### Euglenophyceae

*Euglena acus*, *Euglena elastia*, *Euglena gracile*, *Phacus curvicauda*, *Phacus pleuronectes*, *Phacus truqueter*, *Trachelomonas giradiana*

### Bacillariophyceae

*Cymbella affinis*, *Cymbella tumida*, *Diatoma vulgare*, *Fragillaria intermedia*, *Fragillaria rumens*, *Gomphonema abbreviatum*, *Gomphonema lanceolatum*, *Gomphonema tenellum*, *Melosira granulate*, *Naviculata angulatum*, *Naviculata palea*, *Pinnularia gibba*, *Pinnularia major*, *Synedra ulna*, *Tabularia flocculosa*

among all the phytoplankton. The tank comprises of 9 genera and 17 species of Chlorophyceae. Species diversity showed that genus *Selanastrum* and *Tetraedon* was represented by three species each. *Ankistrodesmus*, *Coelastrum*, *Pediastrum* and *Scendesmus* were represented by two species each. *Crucigenia*, *Dimorphococcus*, *Kirshikoviella* was represented by a single species. The dominance of Chlorophyceae was also recorded by Dahegaonkar et al. (2010) in river Erai near Chandrapur. Somashekar (1980) reported the dominance of Chlorophyceae at unpolluted stations of river Cauvery and Kapila while the dominance of Cyanophyceae at polluted stations.

Cynophyceae is one of the most abundant and significant algal group among phytoplankton. The blue green algae exist either as a unicellular individual or as chain or filaments called trichon. The freshwater blue greens occurring in clean or polluted water body generally exhibits a characteristic cyclic growth. Barehalla tank supported 9 genera and 10 species of blue greens. Species diversity showed that genera *Merismopedia* was represented by two species. *Aphanocapsa*, *Anabaena*, *Microcystis*, *Nostoc*, *Oscillatoria*, *Phormodium*, *Rivuliera* and *Spirulina* were represented by a single species.

Bacillariophyceae or diatoms are wide spread and occur in abundance. Basically they are autotrophs but can also utilize organic substance as nutrients. The water quality in terms of levels of organic matter, dissolved oxygen, pH, and physical factors play an important role in the ecological distribution of Bacillariophyceae (Sabata and Nair, 1987). Bacillariophyceae are represented by 9 genera and 15 species. Species diversity showed that *Gomphonema* was represented by three species. *Cymbella*, *Fragillaria*, *Naviculata* and *Pinnularia* were represented by two species each. *Diatoma*, *Melosira*, *Synedra* and *Tabularia* were represented by a single species. Bacillariophyceae as indicators of contamination recorded by Naz et al. (2014) in river Padma in Bangladesh. Lowe and Gale (1980) opined that diatoms are the most important colonizers of rivers in the species composition, depending upon temperature, current pattern, substrate type and water quality.

Euglenoids are represented by 3 genera and 7 species. *Euglena* and *Phacus* were represented by three species each. *Trachelomonas* was represented by a single species. Rai (1978) also recorded only two species i.e. *Euglena* and *Phacus* from river

Ganga at Varanasi and found that the polluted water of Rajghat sustain the growth of these forms. A relatively high prevalence of Euglenophyceae from originally polluted habitat has also been reported by Munawar (1972). In the present investigation less appearance of Euglenophyceae may be due to less pollution load in the Barehalla tank.

## Conclusion

The water samples from Barehalla tank was collected and analyzed for planktonic composition. The ecological status of the tank was found to be impoverished in terms of species composition and density. A rich algal flora with 17 species of Chlorococcales, 15 species of diatoms, 10 species of blue greens and 7 species of Euglenoids were reported.

## Acknowledgement

The authors express their gratitude to Prof. K.R. Shashirekha, Principal, Sahyadri Science College, Shivamogga for providing facilities and encouragement.

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