Biolife 3(4):854-858
AN INTERNATIONAL QUARTERLY JOURNAL OF BIOLOGY & LIFE SCIENCES
ISSN (online): 2320-4257
www.biolifejournals.com
BIOLIFE RESEARCH ARTICLE

Status of phytoplankton diversity at Vadgaon freshwater tank of Maharashtra, India

S. A. Manjare

Department of Zoology, Jaysingpur College, Jaysingpur

**Email: manjaresir@rediffmail.com*

ABSTRACT

Present investigation deals with the qualitative and quantitative analysis of phytoplankton from Vadgaon freshwater tank situated in the Hatkanangle tahsil of Kolhapur district, Maharashtra, India. The study revealed that total 11 species of phytoplankton resides in the tank. Out of 11 species, 4 were belonging to chlorophyceae, 3 were belonging to Bascillariophyceae, 3 were belonging to Myxophyceae while Dianophyceae was presented by 1 member. Based on the qualitative analysis, Chlorophyceae was dominant group among all. Quantitative analysis of phytoplankton showed monthly variation in the total number of organisms. However, the highest number was noted during the months of winter season while lowest during monsoon season. The percent composition of phytoplankton revealed that Myxophyceae members were dominant over both the years.

Keywords: Phytoplankton, diversity, quality, quantitiy, Vadgaon, freshwater tank

INTRODUCTION

Phytoplankton is an important base of freshwater ecosystem and also performs a major role in the production of organic matter. The presence of phytoplankton in any water body can lead to productive and sustainability of that water body. The assemblage in the form of composition and distribution is dependent on the physical, chemical and biological properties of water (Patil et al., 2015). The presence of phytoplankton in water body ecosystems includes its use in estimating potential fish yield (Descy et al. 2005), productivity (Likens, 1975), energy flow (Simciv, 2005), water quality (Walsh et al., 2001), tropic status (Reynolds, 1999) and management (Beyruth and Tanaka, 2000). Plankton is the most sensitive floating community which is being the first target of water pollution, thus any undesirable change in aquatic ecosystem affects diversity as well as biomass of this community. Phytoplankton are Autotrophs and belonging to first trophic level (Mondal et al., 2014). Population dynamics of these phytoplankton get influenced by many physico-chemical parameters of water. Now-a-days, anthropogenic activities exerting a great pressure on these freshwater sources to fulfill the need of water for drinking, agricultural and industrial use. Indeed, these water reservoirs become the site of drainage and sewage release, due to which physical and chemical parameters get altered, ultimately leading to decline in the floral and faunal diversity. Present attempt was made to know the phytoplankton diversity from Vadgaon freshwater tank. Various workers made an attempt to study the planktonic diversity over this area are Bhosale et al. (2010 a) and Bhosale et al. (2010 b).

How to cite this article:
S. A. Manjare. (2015). Status of phytoplankton diversity at Vadgaon freshwater tank of Maharashtra, India. Biolife, 3(4), pp 854-858.

Material and Methods

Study Area:

Vadgaon tank was constructed in year 1980 (Zilla Parishad, Kolhapur) It is situated at 6 km North-East to Shiroli and Nagaon village. It is basically used as sources of drinking water and secondarily for fishery purpose. It is perennial tank covering maximum area of about 106 ha, with an average water spread area of about 12.5 ha. Vadgaon tank was characterized by presence of submerged vegetation, in this tank little anthropogenic activities and little fluctuating trend in its water level were noticed during the study period. For fishery purpose the tank is auctioned on lease for the period of 3-5 years to local fishermen communities. The fishing activities including release of seedling and harvesting were conducted by private parties or stake holders.

Phytoplankton Analysis:

Present investigation is made between January 2011 and December 2012. The plankton samples were collected from four different sites of each tank fortnightly by using plankton net having mesh size of 50µ. The 100 liter water sample was filtered through the plankton net in 100ml sampling bottle attached to the plankton net. The collected plankton sample was preserved in 4% formalin. The qualitative and quantitative analysis of Phytoplankton was carried out in the laboratory with the help of Sedgwick-Rafter cell counting chamber. The samples were kept for setting for a period of 48 hrs. The phytoplankton and were identified as described by Needham and Needham (1962), Adoni et al. (1985), Michael (1984), Tonapi (1980), Trivedy and Goel (1987).

Result and Discussion

The seasonal variations in phytoplankton density were observed as maximum in winter season and minimum in monsoon. Comparatively, higher density of phytoplankton was recorded in winter and summer than the monsoon season. The qualitative analysis of phytoplankton belonging to four major groups such as Chlorophyceae, Bascillariophyceae, Myxophyceae and Euglenophyceae were identified.

Total eleven species of phytoplankton, belonging to four orders and five families were recorded. During the study period 4 Chlorophyceae members, 3 members were belonging to Bascillariophyceae, 3 species were Myxophyceae and one species was of Dinophyceae. The Chlorophyceae member includes Spirogyra, Oedogonium, Pediastrum and Ankistrodesmus. The Bascillariophyceae comprises Navicula, Cyclotella and Surirella, among these former three were noted dominant. The Myxophyceae members were represented by Nostoc, Anabaena, and Microcystis. Among these Nostoc and Anabaena were observed as abundant in the plankton samples of these tanks. The only Dianophyceae member represented during study period was Ceratium.

The quantitative results for total number of phytoplankton during the year 2011 and 2012 are given in Figure 1. The total phytoplankton during 2011 were fluctuated from 1244 Unit/l to 2098 Unit/l. The numbers of planktons were lower in the month of March while higher in the month of October. The total number of planktons during 2012 were ranged between 1347 Units/l and 2669 Units/l. There was decline in the number of phytoplankton during March while incline in the month of October. The study

Figure 1: Monthly variation of phytoplankton in Vadgaon tank

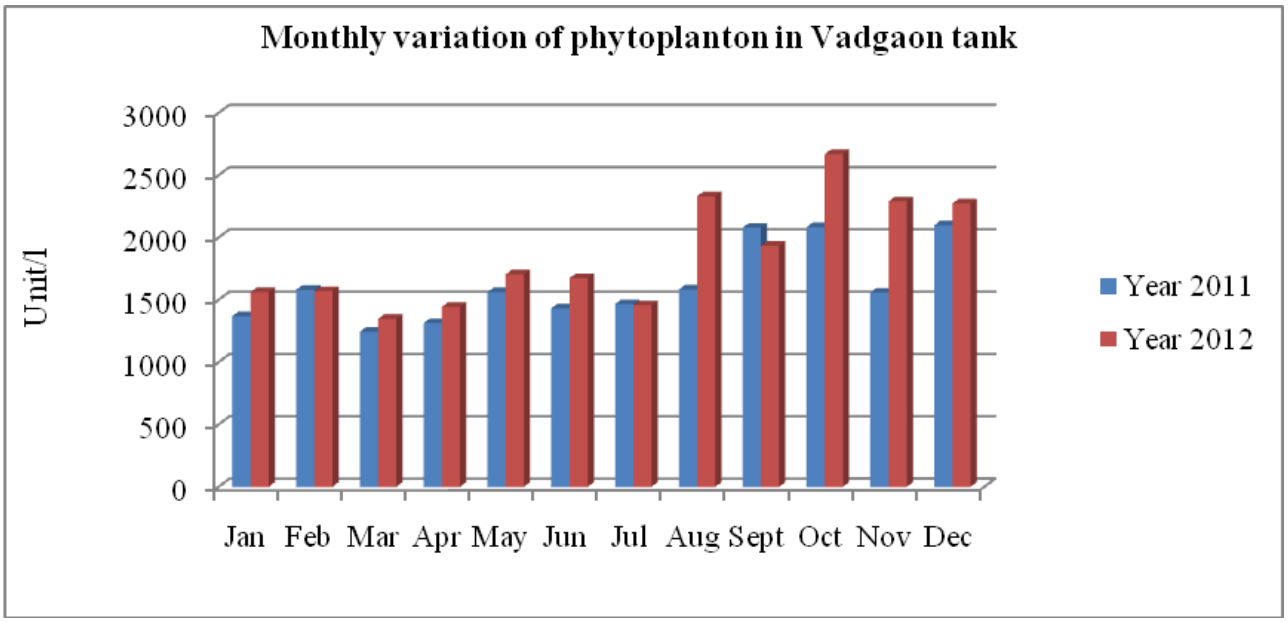


Figure 2: Population dynamics of phytoplankton with reference to groups in Vadgoan tank during 2012

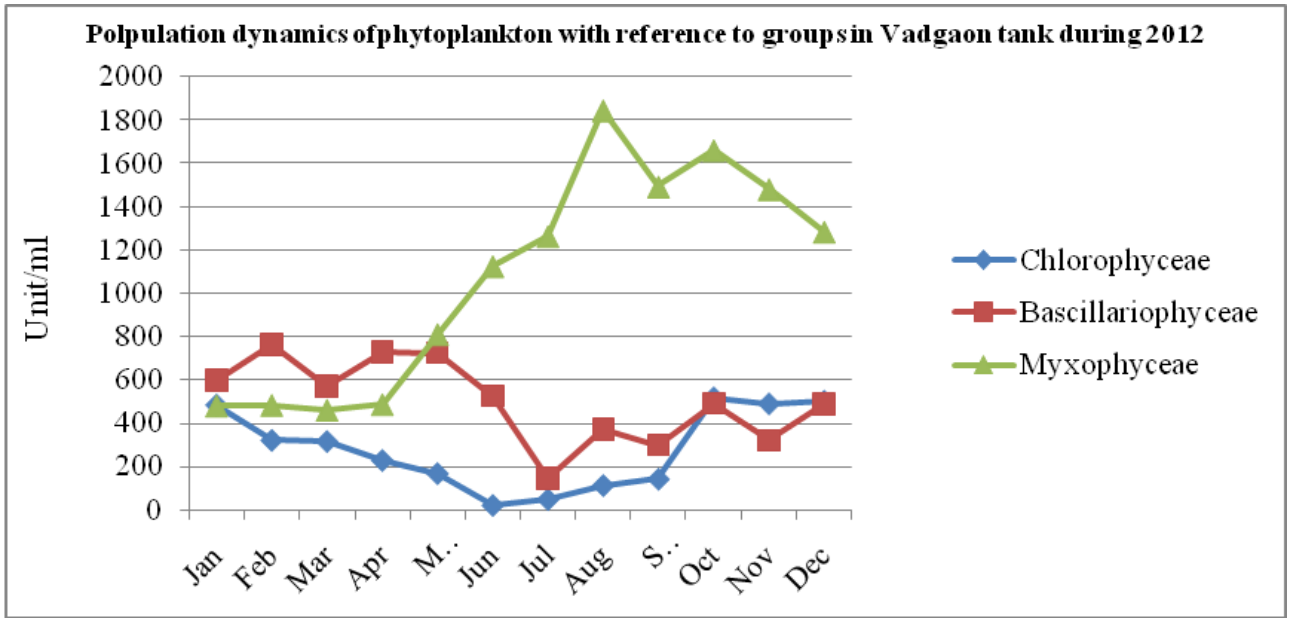
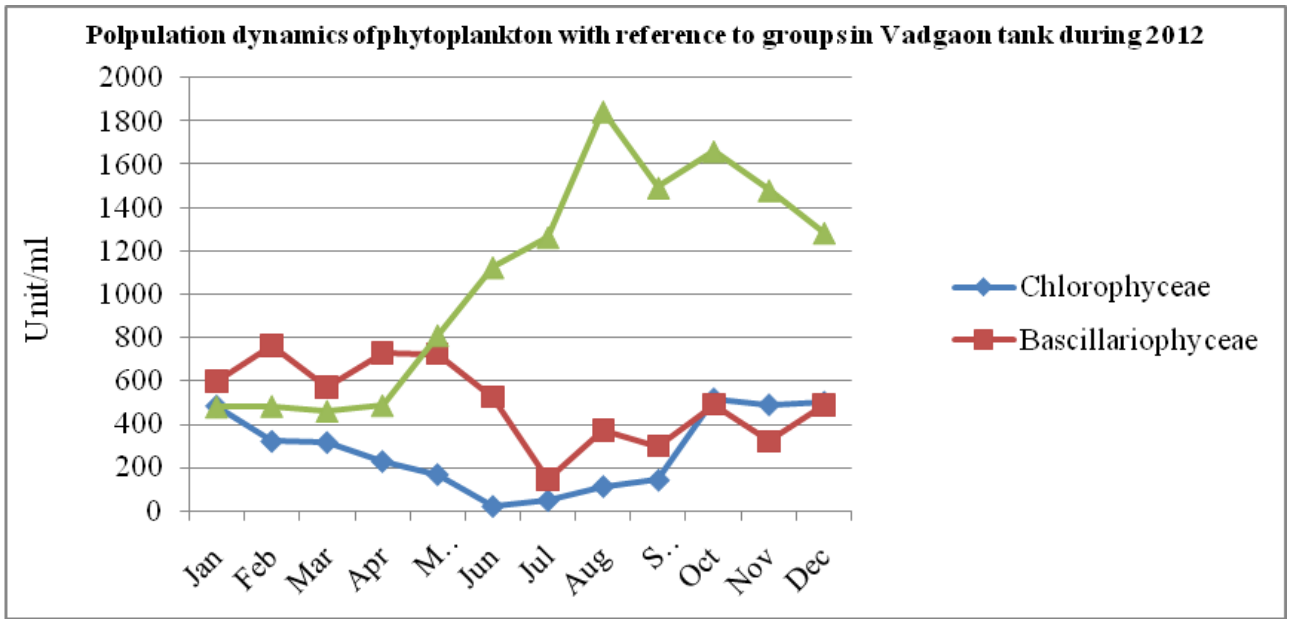


Figure 3: Population dynamics of phytoplankton with reference to groups in Vadgaon tank during 2012



revealed that the total numbers of phytoplankton were declined in the months of summer due to increased water temperature. There was incline in the number of phytoplankton during the months of winter season might be due to clear water transparency, intense sunlight and increased light penetration.

Monthly variation of plankton with reference to classes in noted in the Figure 2 and Figure 3. The numbers of Chlorophyceae members were fluctuated from 16 Units/l to 466 Units/l during the year 2011 while during 2012, members of Chlorophyceae were fluctuated from 22 Units/l to 505 Units/l. There was decline of Chlorophyceae members in the month of June during both the years while the maximum Chlorophyceae members were noted in the month of December and October during the year 2011 and 2012 respectively.

Monthly variation of plankton with reference to classes in noted in the Figure 2 and Figure 3. The numbers of Bascillarophyceae members were fluctuated from 128 Units/l to 741 Units/l during the

Figure 4: Percent composition of phytoplankton in Vadgaon tank during 2011

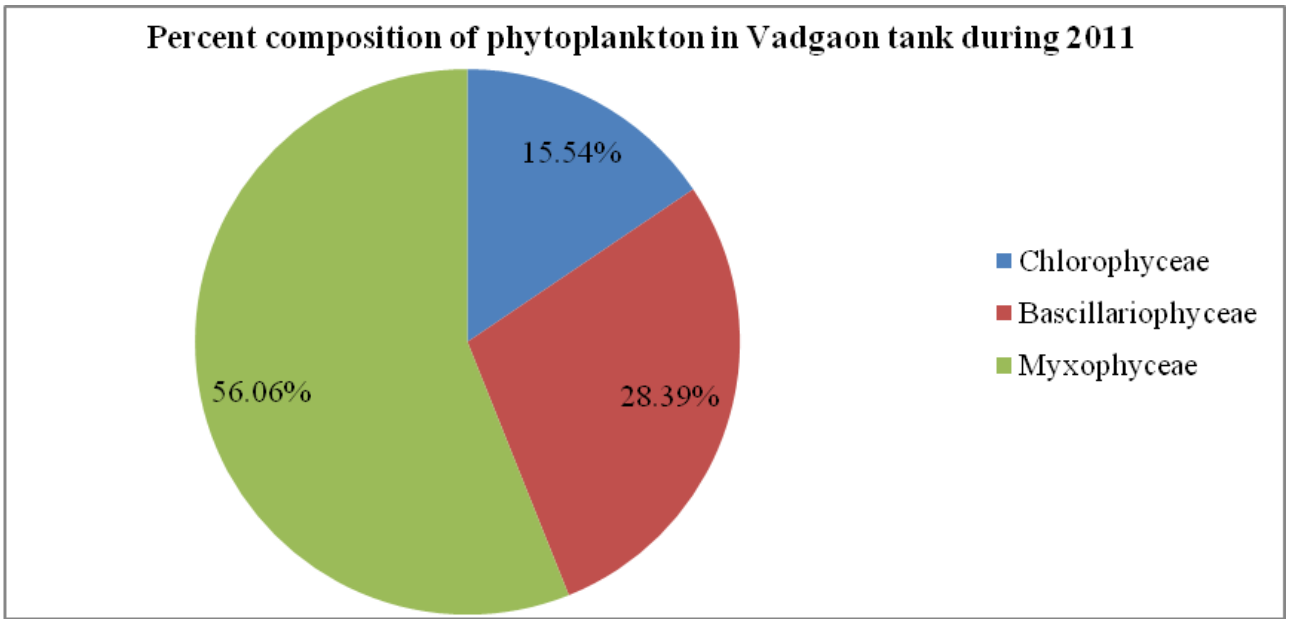
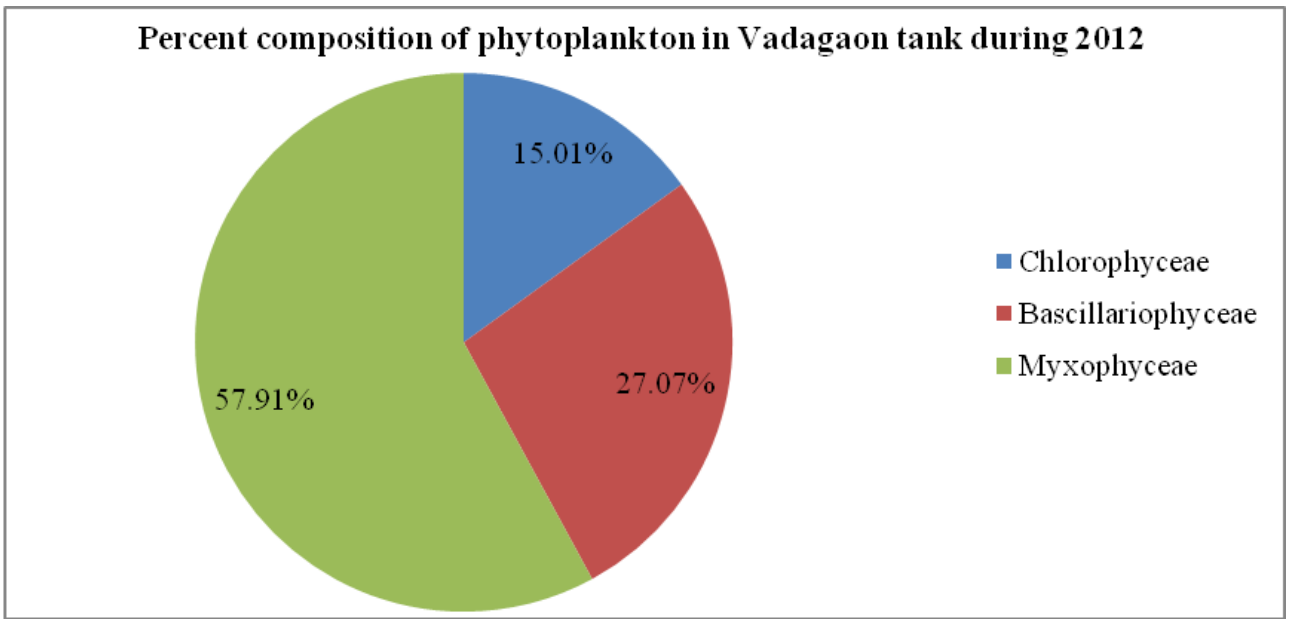


Figure 5: Percent composition of phytoplankton in Vadgaon tank during 2012



year 2011 while during 2012, members of Bascillarophyceae were fluctuated from 143 Units/l to 765 Units/l. There was decline of Bascillarophyceae members in the month of February during both the years while the maximum Bascillarophyceae members were noted in the month of August and July during 2011 and 2012 respectively.

Monthly variation of plankton with reference to classes in noted is the Figure 2 and Figure 3. The numbers of Myxophyceae members were fluctuated from 380 Units/l to 1497 Units/l during the year 2011 while during 2012, members of Myxophyceae were fluctuated from 462 Units/l to 1846 Units/l. There was decrease of Myxophyceae members in the month of March during both the years while the maximum Myxophyceae members were noted in the month of September and August during 2011 and 2012 respectively.

The total composition of planktons includes the members of Chlorophyceae, Bascillarophyceae and Myxophyceae. The total composition of the planktons (Figure 4 and 5) revealed that Myxophyceae was a noted dominant during both the years with holding percentage of 56.06% and 57.91% during 2011 and 2012 respectively. The Myxophyceae was followed by Bascillarophyceae and the total composition of

this group indicated by 28.39% and 27.07% during 2011 and 2012 respectively. The percent composition of Chlorophyceae is lower among other groups and it holds 15.54% during the year 2011 and 15.01% during the year 2012.

Anitha and Singara (2007) found phytoplanktons belonging from classes Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae during July 1999 to June 2001 from Lower Manar Dam and Kakatiya canal, Karimnagar, Andhra Pradesh, India.

The population condition was stable during the months of April and May. The density slowly declined during June and the lowest value was observed during the month of July 2011 and 2012. In the present study, the phytoplankton production was coinciding with the optimum water depth of 1 m. This is an agreement with the earlier works of Sukumaran and Das (2001) in some freshwater reservoir of Karnataka.

Conclusion

The present study can be concluded that the qualitative status of phytoplankton was medium rich while the quantitatively it is rich. Seasonal variations in total number of planktons were noted and found that the winter season was favourable season for the growth and development of phytoplankton.

Conflict of Interests:

The authors declare that there is no conflict of interests regarding the publication of this paper.

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DOI: https://dx.doi.org/10.5281/zenodo.7306676
Received: 4 October 2015;
Accepted; 22 November 2015;
Available online : 7 December 2015