PLANKTON DIVERSITY OF VARALA LAKE, BHIWANDI, DIST. THANE

NISAR SHAIKH
Department of Zoology,G. M. Momin Women's College, Bhiwandi-421302
Received on: 10.12.2014 and Accepted Revised on :17.04.2015

Abstract: In order to understand the Plankton quality of Varala Lake, Bhiwandi, a study was carried out on qualitative plankton diversity for the period of one year i.e. April 2014 to March 2015. A total of four classes of phytoplankton and four classes of zooplankton were recorded which contained 17 phytoplankton and 16 zooplankton species. It is observed that the said lake is rich in phytoplankton.

Keywords: Plankton diversity, Phytoplankton, Zooplankton, VaralaLake.

INTRODUCTION:

The standing shallow water bodies such as lakes and ponds are generally rich in plankton biodiversity (Williams et al., 2004).Plankton are small organisms that drift on the currents, and are found not just in oceans but in bays, lakes, and even small ponds. They are an important source of food for larger animals.The plankton community is comprised of the primary producers or phytoplankton and the secondary producers or zooplankton (Battish, 1992). There are even some single-celled organisms, having characteristics of both plants and animals. Almost all aquatic invertebrates and most fish (except sharks) are planktonic in their early stages. All aquatic plants have a planktonic stage.

Plankton are of interest to ecologists because they are the base of the food web. Almost all aquatic life depends upon the plankton, so an appreciation of this microscopic diversity is important to understanding why little things are such a big deal. Phytoplankton is the major primary producers in many aquatic systems and is important food source for other organisms (Gupta & Dey, 2012). Phytoplankton not only serves as food for aquatic animal, but also plays an important role in maintaining the biological balance and quality of water (Benarjee & Narasimha, 2013).

Zooplankton constitutes important food item of many fishes. The larva of carps feed mostly on zooplankton (Jhingran, 1985). Zooplankton also plays an important role in the food chain, as they are second in trophic level as primary consumers and also contributes to the next trophic level (Aarti et al., 2013). The pH, dissolved oxygen, alkalinity, hardness, turbidity and the dissolved nutrients are important for the plankton production (Banerjea, 1967).

These, in turn, become food for larger organisms such as bivalves, crustaceans and fish. The fish and other animals then become food for animals near the top of the food chain, such as harbor man.Zooplankton are the intermediate link that transfers energy captured by phytoplankton to these animals. Since the phytoplankton are the primary link, they must be produced in great quantities to support the food web. If the plankton disappear, the chain is broken and the animals will suffer. On the other hand, some phytoplankton produce chemicals that are harmful to humans and aquatic life. These species are not abundant but in some cases are causes for concern in some lakes.

The city of Bhiwandi, known for its textile industry, has the largest number of power looms in the country and is sometimes dubbed as 'The Manchester of India'. The Varala Lake of Bhiwandi mainly receives the water from rain. The volume of lake water increases after the onset of monsoon due to the inflow of rain water. It attains the maximum water level during the middle of monsoon, thereafter it starts decreasing due to utilization of water for domestic purpose and by evaporation.

Sewage from the neighboring settlements occasionally flows into the lake. The water of this lake is utilized for drinking, fish culture and domestic purpose. The People, staying nearby use Lake Water to wash their cloths, take bath, sanitation; etc.The lake was slightly muddy during summer and monsoon and was clear during winter. At times it was slightly greenish (August and October). Although occasionally there was fishy or foul smell in late summer (May), the lake was not emanating any distinctive odour during rest of the year.

MATERIALS AND METHODS:

The study was conducted during April 2013 to March 2014 on Varala Lake of Bhiwandi. The standard methods suggested in APHA are used for collection and identification of phytoplankton and zooplankton. Plankton samples were collected once in every month between 8:00-10:00 am from 5 randomly selected sites of the lake at a depth of 20 cm below the surface (Hossain et al., 2007). Plankton samples for this study were collected with plankton net made of boltingsilk cloth no.25 with mesh size: 0.03-0.04mm (APHA, 2005). Phytoplanktonsamples were preserved in 0.3% Lugol's iodine, while zooplanktonsamples were preserved in 4% formalin solution andthen transported to laboratory for plankton analysis (Lackey, 1938). Theidentification of plankton species was done with the aid of planktonidentification key and monographs by Needham and Needham (1962),Tonapi (1980), Battish (1992) and Bellinger (1992).

RESULTS AND DISCUSSIONS :

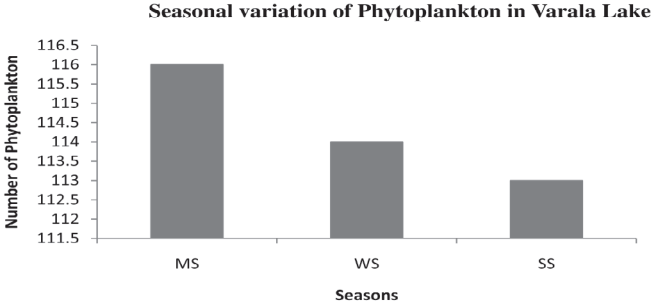
Photosynthesis by the phytoplankton accounts for up to half of global primary production. They also provide the primary food source for the zooplankton, and together form the base of the aquatic food chain. The plankton are used as indicator of water quality. Because of their short life spans, they respond quickly to environmental changes. Changes in

climate can affect the timing of the seasonal plankton blooms, with effects on food chain. Longer term changes in climate may even change the plankton species composition, changing the feeding environment of the larval fish.They flourish both in highly eutrophic waters while a few others are very sensitive to organic and/or chemical wastes. Some species have also been associated with noxious blooms sometimes creating offensive tastes and odours or toxic conditions. The standing crop and species composition indicate the quality of the water mass in which they are found.For any scientific utilization of water resources plankton study is of primary interest (Jhingran, 1985). Phytoplankton forms the vital source of energy as primary producers and serves as a direct source of food to the other aquatic plant s and animals (Battish, 1992).

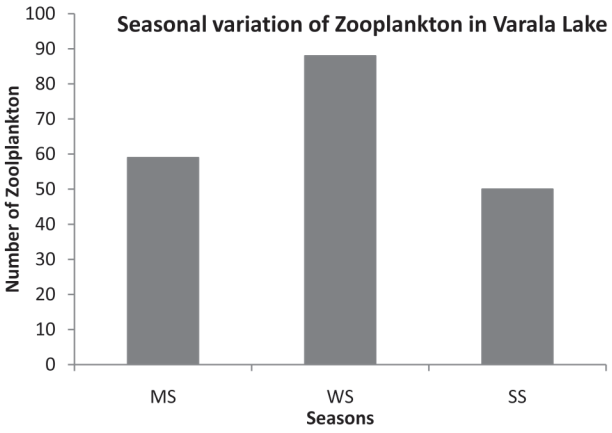
Table shows Seasonal variation of plankton in Varala Lake

Phytoplankton					Zooplankton				
Class	Genera	MS	WS	SS	Group	Genera	MS	WS	SS
Chlorophyceae	*Osedogonium sp.*	7	9	0	Ciliata	*Pleuronema sp.*	2	6	0
	Coelastrum sp.	8	0	0		*Strombidium Sp.*	2	0	0
	Closterium sp.	0	11	7		Total	4	6	0
	Pandorina sp.	4	0	0	Cladocera	*Alona sp.*	0	0	6
	Desmidium sp.	3	0	2		*Daphnia sp.*	1	3	3
	Spirogyra sp.	9	12	8		*Monia sp.*	4	5	2
	Tetraedron sp.	6	0	8		*Ceriodaphnia sp.*	9	12	9
	Total	37	32	25		Total	14	20	20
Cyanophyceae	*Nostoc Sp.*	3	4	1	Copepoda	*Cyclops sp.*	8	6	2
	Oscillatoria Sp.	12	18	2		*Dicyclops sp.*	0	7	2
	Spirulina Sp.	3	5	6		*Mesocyclop sp.*	6	5	5
	Total	18	27	9		*Diaptomus sp.*	2	7	1
Bacillariophyceae	*Diatoma sp.*	4	2	1		*Eucyclops sp.*	4	8	0
	Cyclotella sp.	2	0	2		*Tropocyclops sp.*	4	9	6
	Gyrosigma sp.	9	9	13		Total	24	42	16
	Navicula Sp.	17	13	19	Rotifera	*Brachionus sp.*	8	4	6
	Nitzschia sp.	18	15	17		*Platyias sp.*	2	10	4
	Total	50	39	52		*Keretella sp.*	3	3	0
Euglenophyceae	*Euglena Sp.*	9	13	22		*Fillinia sp.*	4	3	4
	Phacus sp.	2	3	5		Total	17	20	14
	Total	11	16	27					
Total Phytoplankton Count/ml		116	114	113	Total Zooplankton count/ml		59	88	50

MS – Monsoon Season WS – Winter Season SS – Summer Season



Plankton are obviously the most sensitive indicators of biological health because they are subject to instant changes of the immediate environment. Ecologically zooplankton are one of the most important biotic components influencing all the functional aspects of an aquatic system, i.e. food chains, food webs, energy flow and cycling of water with their selective feeding habits or mechanisms



Correct identification of freshwater organisms is essential to understanding their ecology. Aquatic organisms interact with environment to alter water quality and perform ecology "services" such as decomposition and nutrient cycling. Identification of zooplankton species in food webs is essential part of managing aquatic bodies. Diversity of zooplankton can be used to indicate chronic water pollution problem. Zooplankton plays an important food item of omnivorous and carnivorous fishes. Zooplankton supports the economically important fish populations. The study of zooplanktonic composition abundance and seasonal variation is helpful in planning and successful fishery management (Jhingran) the physico – chemical factors and nutrient status of water play the most important role in governing the production of planktonic biomass. A number of workers such as Das (1956), Dhanapathi (2000), Gopal (1984),Sugunan (2000) and Zafar (1964) have reported on different aspect of zooplankton inhabiting Indian fresh waters.

In the present study seven different genera of chlorophyceae class were recorded in the Varala Lake. They were *Osedogonium sp., Coelastrum sp., Closterium sp., Pandorina sp., Desmidium sp., Spirogyra sp*. and *Tetraedron sp.* The minimum value of algae was recorded during summer season whereas maximum was in monsoon season. The *Closterium sp.* and *Spirogyra sp*. observed maximum in winter season, while *Coelastrum sp., Pandorina sp., Desmidium sp.* and *Tetraedron sp.* were not found in the sample during winter season.

Three different genera of cyanophyceae class were recorded from the Varala Lake. They were *Nostoc sp., Oscillatoria sp*., and *Spirulina sp*. The minimum algal units were recorded during summer season where as maximum in winter season. *Oscillatoria sp*. were found maximum both in monsoon and winter season.

The class bacillariophycea was represented by the genera *Diatomasp*. *Cyclotella sp.,Gyrosigma sp.,Navicula sp., and Nitzschia sp.,* The minimum algae were recorded during winter season whereas maximum during summer season. Among all the recorded genera *Nitzschia sp.*were found abundantly in all the season.

Two genera of Euglenophyceae were recorded form the Varala Lake. They were *Euglena sp.* and *Phacus sp.* They were recorded during maximum while minimum in monsoon season.

Two genera of class ciliata were recorded from the Varal Lake during the investing period. They were *Pleuronema sp.* and *Strombidium sp.*Among these two *Pleuronema sp.*is found maximum during winter season *Strombidium sp.* observed in monsoon season only.

The group cladocera was represented by four genera as *Alona sp*. *Daphnia sp. Monia sp.*and *Ceriodaphnia sp*. The minimum cladocerans were recorded during monsoon season whereas maximum during winter season and summer season. Among all the recorded genera *Ceriodaphnia sp*.were found abundantly in all the season.

Six generaof copepod*, Cyclops sp., Diacyclops sp., Mesocyclop sp., Diaptomus sp., Eucyclops sp.,*and *Tropocyclops sp.* were recorded. The minimum number of copepods was recorded during summer season whereas maximum during winter season.

In the Varala Lake four genera of rotifer were recorded. They were *Brachionus sp.,Platyias sp. Keretellasp* and *Fillinia sp.* The minimum of rotifers were recorded during summer season whereas maximum during monsoon season. Among all the rotifers found in Varala Lake, *Brachionus sp.,*and *Platyias sp.* were found through the year.

Conclusions

Our knowledge of the consumption of plankton by fish is still fragmentary. Trophic links between fish and plankton are often losing because plankton is a changing assemblage of pelagic organisms of valuable nutritional value. The objectives of the study were to determine the distribution and diversity of plankton in the fish ponds.

A marked seasonal variation in Phytoplankton population was recorded during the present investigation. In general, the maximum density was observed in monsoon season (116 species), winter season (114 species) and summer season (113species). The monsoon season is most favorable period for the growth and multiplication of Phytoplankton species.

Similarly a marked seasonal variation in zooplankton population was recorded during the present investigation. In general, the maximum density was observed in winter season (88 species) and summer season (50 species) and monsoon season (59 species). The winter season is most favorable period for the growth and multiplication of zooplankton species. The period of August to November is the most favorable for growth of zooplankton population and this may be due to increase of phytoplankton population. The same finding has been also reported by Abdus and Altaff, (1995) and Kumar, (2001). Less zooplankton population during monsoon season in on account of high turbidity which restricts growth of the planktonic population.

REFERENCES

Aarti, D., Sharma, K.K., Sharma, A. & Antal, N. (2013) Zooplankton Diversity and Physico- Chemical Conditions of a Temple Pond in Birpur (J&K, India). International Research Journal of Environment Sciences 2(5): 25-30.

Abdus, Saboor.,& Altaff, K (1995)Qualitative and Quantitative analysis of zooplankton population of tropical pond during summer and rainy season. J Eco Biol, 7(4), pp 269–275.

APHA, (2005) Standard method for the examination of water and waste water. 21st edition, APHA, AWWA, WPCF Washington DC, USA.

Banerjea, S.M. (1967). Water quality and soil condition of fish ponds in some states of India in relation to fish production. Indian journal of Fisheries 14: 115-144.

Battish S.K 1992 .Freshwater zooplankton of India oxford and IBH publication co. edition Newyork U.S.A.

Bellinger, E.G. (1992) A key to common Algae. The institute of water and environmental management, London.

Benarjee, G. & Narasimha, R. K. (2013).Physico-chemical factors influenced plankton biodiversity and fish abundance- a case study of Nagaram tank of Warangal, Andhra Pradesh. International Journal of Life Sciences Biotechnology and Pharma Research 2(2): 248-260.

Das S.M and V.K Srivastava(1956) some new observation on plankton from fresh water ponds and lakes of Lukhnow. Sci. & cull 21 466 – 467.

Dhanpathi M.V.SS (2000) toxonomic notes on the rotifers from India (1989- 2000) IAAB Hyderabad.

Gopal B.R.K Trivedi and P.K Goel (1984) influence of water hyacinth cover on the physicochemical characteristics of water and phytoplankton in a reservoir 'near jaipur India int Review Hydrobiol ‘

Gupta, T.&Dey, M. (2012) Hydro biological Characteristics of Some Semi-intensive fish culture ponds of Lumding town of Nagaon district, Assam. Current World Environment 8 : (1).

Hossain, Md. Y., Jasmine, S. & Ibrahim, A.H. (2007) A preliminary observation on water Quality and plankton of an earthern fish pond in Bangladesh: Recommendations for future studies. Pak. J. Biol. Sci., 10(6), 868-873.

Jningram V.G (1974) Freshwater fishery of India. Hindustan Publishing crop

Jhingran, V.G. (1985) Fish and Fisheries of India. Hindustan Publishing Corporation (India), Delhi

Kumar, K. S (2001), the fresh water zooplankton of some lakes in Dharmapuri district Tamilnadu. J. Aqua. Biol., 16, pp 5-10.

Lackey, J.B. (1938) The Manipulation of counting of river plankton and changes in some organisms due to formalin preservation. US Public Health Report 53, 2080-2093pp.

Needham, J. G. and Needham, R. P (1972), a guide to the study of freshwater biology. Holden-day, INC Cali 94 (III), U.S.A.

Sugunan V.V et al (2000) ecology and fisheries of west Bengal CIFRI report (ICAR New Delhi)

Tonapi G.T (1980) freshwater animals of India an ecological approach oxford and IBH publishing co.

Williams, P. & Biggs, M. (2004).Comparative biodiversity of rivers, streams, ditches and ponds in an agricultural landscape. Biological Conservation 115, 329–341.

Zafar A.R (1964). on the ecology of algae in certain fish ponds of Hydrabad India. Hydrobiogia 23 – 179 – 195.