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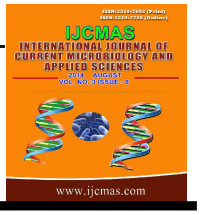

Original Research Article

Phytoplankton diversity of reservoirs in Parbhani District, Maharashtra, India

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Phyto-planktons diversity, Masooli reservoir, Yeldari reservoir, Parbhani.

A B S T R A C T

Sporadic research is available on hydrobiological studies of reservoirs in relation to phytoplankton in Marathwada region of Maharashtra. However, the knowledge regarding ecological aspects of phytoplankton is scanty and to fill this gap present investigation was carried out in Masooli and Yeldari reservoirs in Parbhani district. Phytoplanktons are an important component of aquatic flora. They serve as food for many aquatic animals especially fishes and play a key role in maintaining proper equilibrium between abiotic and biotic components of the aquatic ecosystem. In the present investigation an account of occurrence of phytoplankton, their nature, number and seasonal periodicity have been studied to assess the state of the nature of water. The present study was undertaken to observe the seasonal changes in plankton population. The data on plankton in reservoir was collected seasonally during 2012. In plankton flora, the green algae dominated over the other groups. The phytoplanktons identified are members of *Chlorophycae, Bacillariophyceae, Cynophyceae, Euglenophyceae, Dinophyceae, filamentous algae, Oedogonium species, Cladophora glomerata, and Spirogyra*.

Introduction

The reservoirs have played a significant role in the India's social and economic progress during the past five decades. Without the dams and reservoirs India would have been a thirsty, hungry dark land ravaged with floods and draughts every year. These reservoirs store precious rainwater to irrigate farmlands, generate electricity, supply drinking water and save land from floods and draughts. Reservoir fishery in India is also important from socio-economic point of view as it has the potential of providing employment to about two million people and caters the food demand of millions of people.

Two reservoirs taken in to consideration for the present study are Masooli and Yeldari reservoirs. The Masooli reservoir, is medium sized reservoir (with total catchment area 281.07 Sq. Km) constructed on the Masooli River near village Isad,

Gangakhed Tahsil in Parbhani district. It is located at the latitude of $18^0$54”10’ N and longitude of $76^0$45”05’ E. The Yeldari reservoir, is major reservoir (with total catchment area 101540 Sq. Km) constructed on the Purna River near village Yeldari, Jintur Tahsil in Parbhani district. It is located at the latitude of $19^0$43”11’ N and longitude of $76^0$43”57’ E. 19°43'11"N 76°43'57"E

The areas receive average annual rainfall 788 mm. The reservoirs are rich in flora and fauna in and around, as there is no industry on both sides as well as in catchment area of the reservoir; hence it is totally free from pollution load. The production of phytoplankton can be directly correlated with phosphate, silicates as well as nitrogen[5]. These three elements are essential for the bloom of phytoplankton.

The phytoplankton and zooplankton are always inversely proportional in an aquatic environment because the zooplankton feed on the phytoplankton. Thus density of phytoplankton is directly correlated with fishery potentiality of an aquatic ecosystem (Qasim, 1973). In the present study main focus has been on the species composition of phytoplankton of Masooli and Yeldari reservoir.

For the present investigation water samples were collected from two reservoirs in airtight and opaque plastic containers. The phytoplanktons are collected from the reservoir separately.

Phytoplanktons are kept in sedimentation columns after adding 10 ml Lugol’s iodine solution and the quantitative and qualitative analysis of phytoplanktons was done by drop count method (Welch, 1952). Identifications were made by standard methods (Adoni, 1985, Philipose, 1959 and Prescott, 1970).

Results and Discussion

The main objective of the present paper is to determine the nutrient status of the reservoir. As the water content dissolved and suspended constituents in varying proportions, they have different physico-chemical properties along with biological variations. Distribution of phytoplankton and their variation at different zones of a water body can be influenced by the physico-chemical parameters of water (Yeragi et al, 2003). Environmental condition is the main controlling factor for the formation of the phytoplanktons. Phytoplankton study provides relevant and convenient point of focus for research on the mechanism of eutrophication and its adverse impacts on an aquatic ecosystem. Phytoplanktons are found to be temperature dependent particularly during summer and winter months.

Phytoplanktons encountered in the water body reflect the average ecological conditions and therefore, they may be used as indicator of water quality. The metabolic activities of the organisms depend on the physicochemical factors of their aquatic environment and these factors in turn play an important role in qualitative distribution of phytoplankton during different seasons (Joshi et al 1981, Munawar, 1970, Qadri and Yousuf, 1980, Ramanibai and Ravichandran 1987 and Sharma and Renu Sharma 1992). In Masooli and Yeldari reservoir, species belonging to *chlorophyceae, Cynophycae Bacillariophyceae, Euglenophyceae and Dinophyceae* represented as true planktonic forms whereas the diatoms exhibited a mixed population consisting mostly the benthos species that are detached from substratum. The blue green algae also show a similar picture like diatoms. The green algae *Chlorophyceae* are found in varying number at all the three stations. In the

temperate region, high temperature and bright sunlight have been reported favourable factors for their development. The presence of blue green algae is one of the most important factors in controlling the fluctuation in green algae population. The abundance of green algae at comparatively high temperature is found in tropical water (Venkateswarlu et al, 1990 and Zafar 1967). Water temperature also plays an important role in the periodicity of green algae (Munawar 1970). *Bacillariophyceae* or the diatoms form an important part of the total phytoplanktons, the diatoms are microscopic and usually 2 mm to 100 mm in size they are found in fresh water, brackish water and also in seawater, they are found to be more dominant in the sea as compared to fresh water.

In fresh water, phytoplanktons are found in river, streams reservoir and ponds, the diatoms are characteristics in having silicon in their cell wall. In the present investigation blue-green algae were found to be in abundance in summer months in both the reservoirs. This shows that temperature due to light intensity stimulated the growth of blue-green algae. Generally, it is found that the high temperature, organic matter and low dissolved oxygen are favourable to the growth of blue-green algae [30]. *Cynophyceae* or blue-green algae were found to be in abundance in summer months in both the reservoirs. This shows that temperature due to light intensity stimulated the growth of blue-green algae. *Cynophyceae* is the significant group having a contribution of 36.24% to the annual production and exhibited the highest density during the month of April, May and December (Pandey et al, 1993a), the maximum density of *Cynophyceae* is reported during summer and minimum during monsoon season. *Cynophyceae* and *Chlorohyceae* also flourished in warm water with high pH and dissolved oxygen. The high temperature, stagnation of water, high alkaline condition of water and high concentration of phoshphate and nitrates exhibit the stimulating factor in blue green algae (Pandey et al, 1993a).

The members of *Euglenophyceae* show tolerance of organic pollution and species belonging to this group can be used as biological indicator of organic pollution (Munawar 1970). Very little information is available regarding the ecology of *Euglenophyceae* in fresh water. The temperature range 28^0C to 35^0C, low pH and high iron content are ideal for the growth of members of *Euglenophyceae (*Venkateswarlu et al 1990*)*. It has been reported that *Euglenophyceae* preferred high organic content and lower oxygen. In the present investigation different species of *Euglena* formed the bulk of this group with phacus. This group was represented at all stations. In the present data *Dinophyceae* is represented by *Gymnodonium aeruginosum, Gummondinium, Glenodinium.* These were recorded in winter and summer.

In the present study, the species composition of phytoplankton revealed a total number of 129 species in two reservoirs (Table-2). The planktonic study is a very useful tool for the assessment of water quality in any type of water body and also contributes to understanding of the basic nature and general economy of the lake (Munawar 1970 and Pawar et al 2006). In the present study the species of phytoplanktons identified are chlorophyceae (total 37 sp. out of which 36 found in Masooli reservoir and 32 in Yeldari reservoir), Cynophyceae (47 sp. out of which 45 found in Masooli reservoir and 41 in Yeldari reservoir), Bacillariophyceae (34 sp. out of which 33 found in Masooli reservoir and 29 in Yeldari reservoir), Euglenophyceae (total 7 sp. and same

number of species are found in both Masooli and Yeldari reservoirs) and Dinophyceae (4 sp. and same number of species are found in both Masooli and Yeldari reservoirs). The blue green algae were predominant during warmer months. The high temperature is the principal factor for the growth (Pandey et al 1993b). The maximum diatoms were obtained in the months of September and October.

Table.1 Phytoplankton algal count per ml in the area

Phytoplankton algal	**Masooli Reservoir**			**Yeldari Reservoir**		
	Summer	**Monsoon**	**Winter**	**Summer**	**Monsoon**	**Winter**
Chlorophyceae	1400	1200	1100	1635	1342	1125
Bacillariophyceae	1500	850	700	1325	974	812
Cynophyceae	650	550	500	755	605	534
Euglenophyceae	800	450	250	721	456	345
Dinophyceae	700	350	200	678	373	235

Table.2 Phytoplankton diversity and abundance at two stations

Sr. No.	**Taxa**	**Masooli Reservoir**	**Yeldari Reservoir**
I Chlorophyceae			
1	*Chlamydomona conferta*	+	-
2	*Scenedesmus armatus*	+	+
3	*Sc. acuminatus*	+	+
4	*Sc. carinatus*	+	+
5	*Sc. obliquus*	+	+
6	*Sc. quadricauda var, bicaudatus*	+	+
7	*Sc. quadricauda var. maximum*	+	+
8	*Sc. quadricanda var. longispina*	+	+
9	*Ankistrodesmus falcatus*	+	+
10	*Chlorella canglomerata*	+	+
11	*C. vulgaris*	+	-
12	*Closterium limnetium*	+	+
13	*Cl. parvulum*	+	+
14	*Cl. moniliferum*	+	+
15	*Pediastrum duplex*	+	+
16	*P. boryanum*	+	+
17	*P. tetras*	+	+
18	*P. simplex*	+	+
19	*Spirogyra purvula*	+	+
20	*Pandorina morum*	+	-
21	*Steigeoclonium aestivale*	+	+
22	*S. tenue*	+	+
23	*Chlorococcum infusionum*	+	+
24	*Actinastrum lantzschii*	+	+
25	*Ulothrix gonata*	+	+

26	*Coelastrum microporum*		+			+		
27	*Cosmarium contractum*		+			+		
28	*C. Pseudobirumum*		+			+		
29	*C. brachypleunum*		-			+		
30	*C. tenue*		+			+		
31	*Oedogonium patulum*	+			+			
32	*O. lautumniarum Var. tenuis*		+			-		
33	*Solenastrum gracile*		+			+		
34	*Tetradan incusforma*		+			+		
35	*Tetradon minimum*		+			+		
36	*T. maticum*		+			-		
37	*Microspora floccosa*		+			+		
II	***Cyanophyceae***							
1	*Oscillatoria tenuis*		+			+		
2	*O. limnetica*		+			+		
3	*O. princyps*		+			+		
4	*O. subuliftormis*		+			+		
5	*O. sanata*		+			+		
6	*O. shlorina*		+			+		
7	*O. curviceps*		+			-		
8	*O. cortiana*		+			+		
9	*O. omoena var. non granulata*		+			+		
10	*O. limosa*		-			+		
11	*O. irriguda*			+			+	
12	*O. formosa*		+			-		
13	*O. gloiophila*		+			+		
14	*O. foreaui*		+			+		
15	*Phormidium bohneri*		+			+		
16	*P. Corium*		-			+		
17	*P. inundatum*		+			+		
18	*P. valderianum*		+			+		
19	*P. luridum*		+			+		
20	*P. subincrustaum*		+			+		
21	*P. retzii*		+			+		
22	*P. jenkelianum*		+			-		
23	*P. tenue*		+			+		
24	*Anthrospira platensis*		+			+		
25	*Lyngbya aerugineocoerulea*		+			-		
26	*L. kuetzingii*		+			+		
27	*Spirulina laxirsima*		+			+		
28	*S. major*		+			+		
29	*S. subtitlissina*		+			+		
30	*S. subsala*		+			+		
31	*Anabaena beckii*		+			-		
32	*A. constricta*		+			+		

33	*A. flosaquae*	+	+
34	*Aphanocapsa koordersi*	+	+
35	*A. pulchra*	+	+
36	*A. roscana*	+	+
37	*Aphanotheca microscopia*	+	+
38	*A. pallida*	+	+
39	*A. saxicola*	+	+
40	*Microcystis aeruginosa*	+	+
41	*M. pulvarea var. Incertes*	+	+
42	*M. flor-aquae*	+	+
43	*M. protocystis*	+	+
44	*Chlorococcus minutus*	+	+
45	*Chlorococcus tenax*	+	+
46	*Merismopedia glauca*	+	+
47	*M. punctata*	+	-
III *Bacillariophyceae*			
1	*Nitzschia denticula*	+	+
2	*N. Vermicularis*	+	+
3	*N. recta*	+	+
4	*N. subtilis*	+	-
5	*N. sublinearis*	+	+
6	*N. gandersheimensis*	+	+
7	*Navicula accomoda*	+	+
8	*N. viridula*	+	+
9	*N. fluens*	+	+
10	*N. simplex*	-	+
11	*N. rostellata*	+	+
12	*N. densestriata*	+	+
13	*N. shonfeldii*	+	+
14	*N. cincta*	+	-
15	*N. krasskei*	+	+
16	*N. cocconaformis*	+	-
17	*N.cryptocephala*	+	+
18	*N. bacilloids*	+	+
19	*N. complanatula*	+	+
20	*N. radiosa var. tenella*	+	+
21	*N. pulpula var. capitata*	+	+
22	*N. cuspidata var. ambigua*	+	+
23	*Sunodera ulng*	+	+
24	*N. affinis*	+	+
25	*Achanthes exigua*	+	+
26	*A. lanceolata*	+	+
27	*A. exilis*	+	+
28	*A. hungarica*	+	+
29	*A. coaretata var. elliptica*	+	+
30	*Cyclotella operaculata*	+	-

31	*C. stelligera*	+	+
32	*Fragilaria intermedia var. robusta*	+	+
33	*Stouroneis partagarhensis*	+	+
34	*Cymbella var. Ventricosa*	+	-
IV Euglenophyceae			
1	*Euglena acus*	+	+
2	*E. granulata*	+	+
3	*E. viridis*	+	+
4	*E. pisciformis*	+	+
5	*E. stellata*	+	+
6	*E. anabaena var. minima*	+	+
7	*E. axyuris var. chakowiensis*	+	+
V Dinophyceae			
1	*Gymnodonium aeruginosum*	+	+
2	*Gymnodinale*	+	+
3	*Gymnodiniaceae*	+	+
4	*Gymnodinium stein*	+	+

It is concluded that the variations in physico-chemical parameters are responsible for the fluctuations in the species diversity of the phytoplankton of Masooli and Yeldari reservoir. Dominant species are reported to be the most important indicators, as they receive the full impact of the habitat and are effective tools in environment monitoring, required to assess the changes caused by anthropogenic activities. In Masooli and Yeldari reservoirs, species belonging to *chlorophyceae, Cynophycae Bacillariophyceae, Euglenophyceae and Dinophyceae* represented as phytoplanktonic forms. Total number of 129 species in two reservoirs is found.

References

Adoni, A.D. 1985. Work book on limnology. Indian MAB committee, Department of Environment, govt. of India, Pratibha Publishers, Sagar, pp. 216.

Joshi, A., A.P. Sharma and M.C. Pant 1996. Limnological studies in a subtropical system (Lake Sattal, India), Acta Hydrochim et. hydrobiol, 9 (4), 407-425.

Munawar, M. 1970. Limnological studies of freshwater ponds of Hyderabad. India I – The biotope hydrobiologia 35 (1) : 127-162.

Pandey B.N., A.K. Jha and P.K. L. Das 1993a. Hydrobiolgical study of a swamp at Purnia, Bihar in relation to its phytoplankton fauna. Palani Paramount Publications.

Pandey B.N., K. Kumar, A.K. Lal and P.K. L. Das 1993b. A preliminary study on the physico chemical quality of water of the river Koshi at Purnia. J. Ecobiol. 5 (3) 237-239.

Pawar, S. K., J. S. Pulle and K. M. Shendge 2006. The study on Phytoplankton of Pethwadaj dam, Taluka Kandhar, District Nanded, Maharashtra, J. Aqua. BioI. 21(1):1-6.

Philipose, M.T. 1959. Freshwater plankton of Inland fisheries. *Proc. Symp. Algal. ICAR* New Delhi, 272-291.

Prescott, G. W. 1970. Biological disturbance resulting from algal population in standing water the ecology of algae, publ. 2 Prematuring Lab., of field biology, Univ. Pittsburg, 22- 37.

Qadri, M.Y. and A.R. Yousuf 1980. Limnological studies on lake Malpur. *Geobios 7:* 117-119.

Qasim, S.Z. 1973. Experimental Ecology of tropical marine plankton. Mar. Biol. Asso. India, spl. Publ. dedicated to Dr. N.K. Panikkar, 80-86.

Ramanibai, P.S. and S. Ravichandran 1987. Limnology of an urban pond at Madra, India Poll. res. 6, (2), 77-81.

Sharma K. C. and Renu Sharma 1992. Algal diversity in the littoral zone of a polluted shallow lake at Ajmer, Rajasthan. International journal of Ecology and Environmental Sciences *18:* 139-146.

Venkateswarlu V., P.T. SampathKumar and J. Nirmala Kumari 1990. Ecology of algae in the river Moosi, Hyderabad a comprehensive study. J. Environ. Biol. 11 (1), 79-91.

Welch, P. S. 1952. Limnological methods, McGraw Hill Book Company.

Yeragi S. Aarati, S. G. Yeragi and S.S. Yeragi 2003. Seasonal fluctuations of plankton population correlated with physico-chemical factors in Powai lake, Mumbai, Maharashtra. *J Aquat Bio*, 18(1), 19-22

Zafar, A. R. 1967. Algo-logical evaluation of water pollution. Biological indicator and Indices of Environmental Pollution, *Hyd, Osma. Univ.* 67-76.