

Phytoplanktonic diversity and status of water quality of Omkareshwar reservoir of Narmada river

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Introduction

Rivers are open systems with interaction of various abiotic and biotic processes such as weathering, erosion and sedimentation, evaporation, biological activity, adsorption and desorption, flushing etc. as well as human interferences determining the aquatic composition and ecological character. These water bodies are continually subjected to relatively discrete physical events, which disrupt many levels of biological organization and alter the habitability of an environment in terms of resources, space or physical – chemical factors. Various physico-chemical and biological factors determine the quality of water¹. Determination of the water quality is important not only because of its link to the availability of water for various uses but also due to its impact on the human health both directly and indirectly. The study of plankton plays an important role in the assessment of productivity, trophic relationship and understanding of organic pollution. Their qualitative and quantitative estimation has been used in monitoring water quality of rivers.

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Materials and Methods

Narmada the largest West flowing river of the Indian peninsula, originates from Eastern Madhya Pradesh at Amarkantak situated at 20°40', 80°45' E, flows towards West and joins Arabian sea at Bharuch situated at 21°43', 72°57' E. The methods used for the analysis of various physico-chemical parameters are as given in standard method for the examination of water and wastewater.² Planktons were collected along with water samples. For qualitative studies plankton samples were collected by standard plankton net made of bolting number 14(120m) and 25 (63 m)³. The plankton samples were preserved in 5% Formalin and also in Lugol's solution for further processing in the laboratory⁴.

Result and Discussion

Physico-chemical River Water Quality

The result of the physicochemical analysis of Omkareshwar reservoir is shown in Table 1. The recorded values of physicochemical parameters of Conductivity, Total Dissolved Solids, Total Suspended Solids, Dissolved Oxygen, Total Alkalinity, Carbonate Alkalinity, Bicarbonate Alkalinity, Total Hardness, Calcium Hardness, Magnesium Hardness, Chloride and pH are slightly high due to impounding of river⁵. And Phosphate, Sulphate, Sodium, Potassium are in safe limit of BIS⁶.

Biological River Water Quality

In the present study at Omkareshwar reservoir of Narmada river 66 species of phytoplankton were recorded during May 2004 to April 2005. Out of which 12 species belongs to Cyanophyceae, 27 species of Chlorophyceae, 3 species of Dinophyceae and 24 species of Euglenophyceae.

Table 1 : Monthly fluctuations in physicochemical parameters at Omkareshwar dam site of the western zone of Narmada river during May 2004 - April 2005.

S.No.	Parameters	May'04	June'04	July'04	Aug'04	Sept'04	Oct'04	Nov'04	Dec'04	Jan'05	Feb'05	Mar'05	Apr'05
1.	Conductivity μ mhos/cm	355.33	358.00	362.33	297.67	294.33	276.00	270.00	266.67	269.33	275.00	290.00	320.67
2.	pH	8.55	8.57	8.69	8.63	8.56	8.33	8.25	8.20	8.10	8.30	8.40	8.50
3.	Total Dissolved Solids mg/l	279.33	283.00	300.67	295.67	294.33	266.33	258.67	258.33	258.00	263.33	272.00	277.33
4.	Total Suspended Solids mg/l	173.33	182.67	187.67	200.33	185.67	169.00	164.33	159.00	122.00	139.33	150.00	168.00
5.	Dissolved Oxygen mg/l	7.47	7.27	7.07	6.60	6.93	8.07	8.47	9.13	8.87	8.40	8.40	7.60
6.	Total Alkalinity mg/l	132.67	134.00	142.67	129.33	131.33	126.00	126.67	121.33	126.67	128.67	132.67	136.00
7.	Carbonate Alkalinity mg/l	19.33	8.40	8.75	8.03	8.27	8.07	7.97	7.13	7.33	7.13	8.08	8.40
8.	Bicarbonate Alkalinity mg/l	113.33	125.60	133.92	121.30	123.07	117.93	118.70	114.20	119.33	121.53	124.58	127.60
9.	Total Hardness mg/l	160.00	164.67	171.33	166.00	156.33	147.67	144.00	145.33	148.00	150.67	154.00	154.00
10.	Calcium Hardness mg/l	24.04	26.85	28.25	27.18	24.57	23.24	22.57	22.44	22.37	22.17	22.71	22.24
11.	Magnesium Hardness mg/l	24.28	23.99	24.48	23.83	23.07	21.76	21.28	21.69	22.38	23.15	23.63	23.91
12.	Chloride mg/l	22.80	23.47	24.47	23.47	22.47	19.64	18.97	18.80	18.47	18.80	18.97	18.47
13.	Phosphate mg/l	0.12	0.13	0.17	0.16	0.12	0.09	0.09	0.08	0.09	0.10	0.11	0.11
14.	Sulphate mg/l	1.95	1.98	2.05	1.97	1.81	1.77	1.75	1.81	1.87	1.91	1.93	1.92
15.	Sodium mg/l	18.27	18.63	19.01	17.06	16.80	15.99	15.57	15.78	14.47	15.15	16.62	17.57
16.	Potassium mg/l	12.30	12.76	13.81	11.09	9.35	9.20	8.10	7.53	7.75	8.53	9.75	10.50

Cyanophyceae group was represented by its 12 species viz. *Anabaena* spp., *Heterohormogonium*, *Lyngbya* spp., *Merismopedia* spp., *Microcystis aeruginosa*, *Nostoc* spp., *Oscillatoria curviceps*, *Oscillatoria subbrevis*, *Phormidium* spp., *Rivularia minutula*, *Spirulina laxa* and *Spirulina major*. Among the Cyanophyceae group *Spirulina* spp. occurred throughout the study period and represents the most dominant species.

Chlorophyceae consisted as most dominant group of phytoplanktonic population in western zone of Narmada river and it was represented by 27 species viz. *Ankistrodesmus convolutus*, *Ankistrodesmus falcatus*, *Chlamydomonas* spp., *Chlorella* spp., *Closterium* spp., *Coelastrum* spp., *Cosmarium portianua*, *Cosmarium* spp., *Crucigenia* spp., *Dictyosphaerium* spp., *Euastrum* spp., *Hydrodictyon reticulatum*, *Netrium* spp., *Pediastrum duplex*, *Pediastrum integrum*, *Pediastrum simplex*, *Scenedesmus quadricauda*, *Scenedesmus* spp., *Sphaerocystis* spp., *Spirogyra communis*, *Spirogyra pratensis*, *Spirotaenia* spp., *Staurastrum* spp., *Ulothrix tenuissima*, *Volvox* spp. and *Zygnema pectinatum*. In this group *Pediastrum* spp. was the most dominant species.

Dinophyceae group was represented its 3 species viz., *Ceratium hirundinella*, *Gonyaulax* spp. and *Peridinium* spp. This group was not observed from July to November months in western zone of Narmada river.

Bacillariophyceae consisted as second most dominant group of phytoplanktonic population in western zone of Narmada river and it was represented by 24 species viz. *Achnanthes* spp., *Amphora* spp., *Asterionella formosa*, *Caloneis* spp., *Cymbella naviculiformis*, *Cymbella* spp., *Diatoma* spp., *Diploneis* spp., *Fragilaria* spp., *Frustulla* spp., *Gomphonema* spp., *Gyrosigma* spp., *Melosira granulata*, *Navicula cincta*, *Navicula cuspedata*, *Navicula halophila*, *Navicula*

sps., *Nitzschia sps.*, *Pinnularia sps.*, *Protococcus sps.*, *Surirella sps.*, *Synedra ulna*, *Synedra sps.* and *Tabellaria sps.*

Conclusion

The findings of the present study based on physicochemical study clearly reveal that the Omkareshwar reservoir has been showing moderate pollution condition due to accumulation of various cationic and anionic elements in the river site and also mixing of tributary water, discharge of Indira sagar dam water discharge and sewage of some villages near the river. The high diversity of phytoplankton is good sign but some of the species belong to pollution indicator groups.

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