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PHYTOPLANKTON DIVERSITY OF ATARITAL DAM AT MAUGANJ, REWA MADHYA PRADESH, INDIA

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ABSTRACT: - Plankton is a word derived from Greek for "drifters". It refers to all the plants and animals that drift with the ocean currents as inhabitants of the open waters of the sea (and also fresh waters; but our concern here is with marine environments). Phytoplanktons are the chief primary producers and are of prime importance in aquatic ecosystem as the productivity of aquatic ecosystem is totally dependent on these. They form the basic link of food chain for all aquatic organisms. The diversity of phytoplankton components in the aquatic ecosystem serve as a reliable index for monitoring a water body. Therefore, in the present investigation preliminary observations of phytoplankton diversity were carried out in the Atarital Dam of Mauganj Rewa (M.P.). In the present investigation results reveal the occurrence of 67 species of phytoplankton belonging to 49 genera were recorded from present water bulk was found to persist of four major group namely, Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae. The Chlorophyceae (24 species of 19 genera) were noted to be most dominating group among phytoplankton with a wide range of their distribution, habitats. Climate of local environment factors are likely to have major impact on phytoplankton diversity of fresh water.

***KEYWORDS*:** Phytoplankton diversity, Atarital Dam

INTRODUCTION

Phytoplanktons are photoautotrophic, microscopic, organism containing chlorophyll within their cells that inhabit the upper sunlit layer of almost all bodies of water. Phytoplankton obtains energy through the process of photosynthesis and must therefore live in the euphotic zone of water body. Phytoplanktons are the primary producer. They produce organic compounds and oxygen from carbon dioxide and water which sustain the aquatic food chain. Phytoplanktons are responsible for much of the oxygen present in the atmosphere. Phytoplanktons are extremely varying from photosynthesizing bacteria (Cyanobacteria) to diatoms and green algae. In terms of numbers, the most important algal group of phytoplankton includes Chlorphyceae, Bacillariophyceae and Cyanophyceae.

The plankton which play a role of converting into food, suitable for fish and aquatic animals have acquired importance in fishery research. The planktons can also play an important role in indicating the presence or absence of certain species of fishes on in determining the population densities. Phytoplankton plays major role in the food web of an aquatic ecosystem and forms an intermediate link between primary and tertiary production. Study of plankton diversity and their ecology greatly contribute to an understanding of the basic nature and general economy of an aquatic habitat. Phytoplanktons are capable of concentrating large quantities of heavy metals from water bodies. These metals may be passed on and concentrated at higher trophic levels through the food chain. Thus it is necessary to understand whether the mortality is due to bio- magnifications of heavy metals or pollutants. The fishery potential is fully related to the presence of plankton (Dubey et.al 2006). Nutrients mainly nitrogen and phosphorus act as bio-stimulants causing eutrophication or enhancement of the growth of zooplankton and phytoplankton. This can lead to luxuriant growth of unusual plankton blooms, that may or may not be toxic, but which on decay use up oxygen from the water which also cause deoxygenation. Phytoplanktons are representing the microscopic algal communities at primary level, whereas zooplankton at secondary level. They react quickly to limnological change of aquatic environment. They can be listed and used as pollution indicators (Telkhade et.al. 2008). Uncontrolled domestic wastewater discharge into the pond has resulted in the eutrophication of the pond as evidenced by substantial algal blooms, dissolved oxygen depletion in the subsurface waters, large fish kill and malodour generation. These conditions continued unabated and give rise to monoculture of water hyacinth (Eichhornia crassipes) which covered almost the entire pond area.

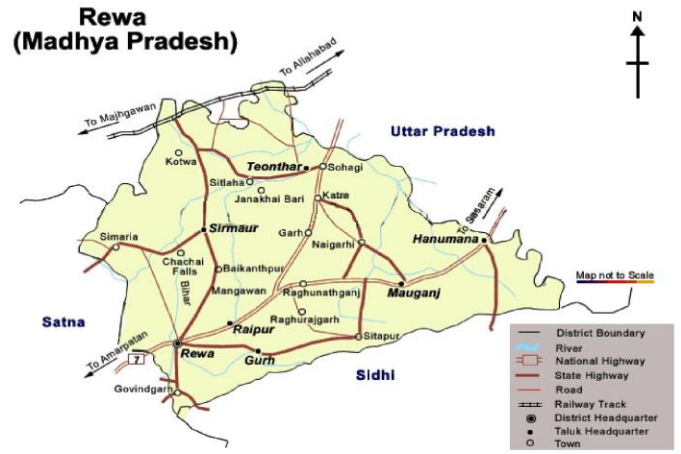
STUDY AREA:

Atrital Dam (stop dam) is an anthropogenic construction on the confluence of two small nallahas Garha and Atari on the right hand side of N.H.7 in Mauganj tahsil of

Rewa district at 24 ^{0}43' 13" N and 80^{0}2'53"S. Rewa has 7495 sq. Km of territory and occupies about 2.5% of total geographical area of the state. It stretches about 150 Km from north to south and 83 Km. from east to west. The Dam harbors a wide variety of fish resources.

Rewa district comprises of seven tahsil namely Sirmaur, Teonthar, Mauganj, Hanumana Raipur karchuliyan, Gurh and Huzur. Hanumana tahsil is surrounded by the boundaries of Allahabad district of U.P. on the north, Mirzapur district on the east, Sidhi and Shahdol on the south and district Satna on the west side.

Mauganj, Rewa (M.P.) is very unique tahsil of Rewa district is very rich in its natural resources, beautiful fauna and flora including many rivers, lakes pond dams' pools tanks and water falls. The Mauganj tahsil which has chosen for the present study is situated on Rewa Mirzapur N.H.7 road..



Map of District Rewa showing the site of Research work

MATERIALS AND METHODS:

The study was carried out for a growth period of twelve months from November 2010 to October 2011. The water samples for biological studies were collected from the subsurface in plastic bottles on monthly basis.

Preservation:

The water sample for planktons study were preserved by using 4% Formaline solution (Battish 1992) and examined under a microscope using 10X ocular and 10X and 40X objectives.

Identification:

The identification of phytoplankton and zooplanktons upto generic level were done with the help of following literature (Ward and Whipple 1959, APHA 1989, Battish 1992). Relative abundance and frequency of occurrence were calculated.

Diversity index of planktons during each month was calculated by using the following formula:

Diversity Index = H = S-1 / ln N

where

S = No. of genera of phyto and zooplanktons.
N = Total No. of phyto and zooplanktons
ln = Natural logarithm

Satellite Map View of Atarital Dam

RESULT:

A number of 67 species of phytoplankton belonging to 49 genera were recorded from present water bulk was found to persist of four major group namely, Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae.

The Chlorophyceae (24 species of 19 genera) were noted to be most dominating group among phytoplankton with a wide range of their distribution, habitats. The phytoplankton compositions noted from present water Body (Atarital Dam) have shown the following dominating trend; as their number of species and degree of biodiversity concerned.

Chlorophyceae > Bacillariophyyceae > Cyanophyceae > Euglenophyceae

Number of species of major group of phytoplanktons

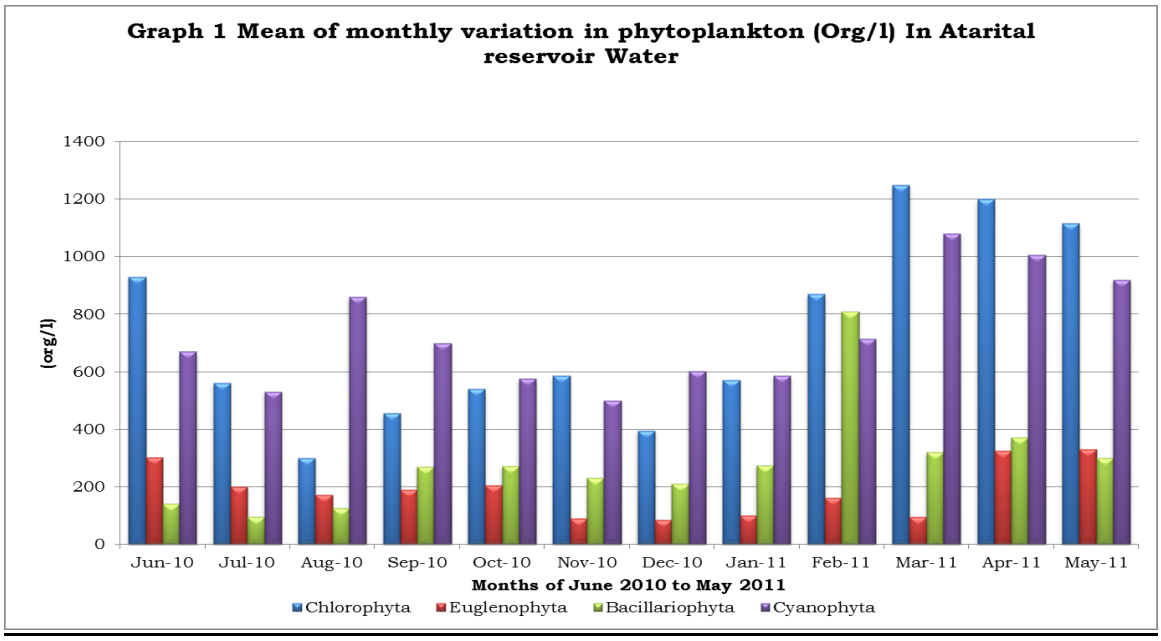
Group	Genera	Species
Bacillariophyyceae	14	20
Chlorophyceae	19	24
Cyanophyceae	12	15
Euglenophyceae	04	08

The member of class - Chlorophyceae (24), class Bacillariphyceae (20), class Cyanophyceae (15) and Euglenophyceae (8) in total 67 species were recorded during the present investigation in Atarital dam water. The Chlorophyceae was recorded as a dominant group in Dam.

Table No. 1 Showing the composition of phytoplankton species at Atarital Dam:-

S. No.	Group	Name of species
1.	Bacillariphyceae	1. *Amphora ovalis* 2. *Anomoeoneis sp* 3. *Asterionella formosa* 4. *Bacillaria sps* 5. *Cyclotella sps* 6. *Cymbella cistula* 7. *Cymbella aequalis* 8. *Cymbella naviculiformis* 9. *Cymbella cysta* 10. *Fragillaria sp.* 11. *Fragillaria intermedia* 12. *Gamphonema gracile* 13. *Melosira granulate* 14. *Navicula mutica* 15. *Navicula indica* 16. *Nitzschia sp.* 17. *Synedra ascus* 18. *Pinnularia braunni* 19. *P. taballaria* 20. *Tobellaria sps.*
2.	Chlorophyceae	1. *Actinastrum hantzschii* 2. *Ankistrodesmus sp.* 3. *Cladophora fracta* 4. *Chaetophora elegans* 5. *Coleochate irregularis* 6. *Closterium acerosum* 7. *Closterium dianae* 8. *Cosmarium simplex* 9. *Costeridium sps* 10. *Chlorella sps.* 11. *Euastrum sp.* 12. *Mougeotia sp.* 13. *Oocystis sp.* 14. *Oedogonium sps.* 15. *Pediastrum simplex* 16. *Scenedessmus sps.* 17. *S. armatus* 18. *Spirogyra brunea* 19. *S. microspora* 20. *S. hylina* 21. *Sphaerocystis sps.* 22. *Ulothrix zonata* 23. *Volvox globater* 24. *Zygnema majus*
3.	Cyanophyceae	1. *Anabaena oryzae* 2. *Anabaena spiroides* 3. *Arthospira platensis* 4. *Arthrospira massartiia* 5. *Chroococcus sp.* 6. *Cylindrospermum sp.*

S. No.	Group	Name of species
		7. *Gloeocapsa sp.* 8. *Lyngbya sp.* 9. *Microcystis aeruginosa* 10. *Merismospedia sps.* 11. *Nostoc sps* 12. *Oscillatoria sps.* 13. *Spirulina major* 14. *Spirulina sps.* 15. *Scytonema hofmanni*
4.	Euglenophyceae	1. *Euglena viridis* 2. *Euglena acus* 3. *Euglenomorpha sp.* 4. *Phacus curvicauda* 5. *Phacus orbicularius* 6. *Trachelomonas armata* 7. *Trachelomonas playfairii* 8. *Trachelomonas sp.*



The monthly fluctuation of total phytoplankton are presented in table no. 1. (Graph.no.1.). The Atarital Dam (lentic system) for the period of study June 2010 to May 2011 were found Chlorophyceae species monthly mean value have been ranged between 300 org/l in the month of August 2010 and 1250 org/l in the month of March 2011, Euglenophyceae species mean value have been ranged between 85 org/l in the month of December 2010 and 330 org/l in the month of May 2010, Bacillariphyceae species have been ranged between 95 org/l in the month July 2010 and 810 org/l in the month of February 2011 and Cyanophyceae species have been ranged between 500 org/l in the month of November 2010 and 1080 org/l in the month of March 2011.

Phytoplankton Density

The presence of Phytoplanktons in Atarital Dam water for the total species, their units, percentage in various months have been presented Table no.1 and 1 and Four major group of Phytoplanktons species have been taken in notice as Chlorophyta total unit counting is 8770 org/l, its amounting 37.83%, Euglenophyta 2255 org/l with the

percentage of 9.73%, Bacillariophyta species 3417 org/l with the percentage of 14.74% and Cyanophyta 8742 org/l with the percentage of 37.70%. In this way the total unit of Phytoplankton in Atarital dam water is 23184 in the 100% organisms/liter.

DISCUSSION:

In the present study phytoplankton were most abundant as compared to zooplanktons. Among the phytoplanktons, the members of Euglenophyta, Cyanophyta, Chlorophyta and Bacillariophyta were present throughout the study period. Among algae cyanophyta were the most abundant throughout the study period. The autotrophic phytoplankton comprising the major portion in ponds and lakes acts as a basic food material in the food chain of aquatic situations. The low level of phytoplankton may be due to grazing by zooplanktons and fishes. The investigation is also in accordance with Sharma and Capoor (2010). The observation also shows close conformity with the findings of Mary Kensa (2011) who carried out a study on the diversity of phytoplankton in relation to physicochemical parameters in two perennial ponds of Kulasekharam area, Kanyakumari district, Tamil Nadu. They identified forty eight species belonging to Bacillariophyceae, Euglenophyceae, Cyanophyceae, Chlorophyceae and Dinophyceae. High value of physicochemical parameters and low phytoplankton diversity were recorded in the Undichalkulam, whereas low value of physico-chemical parameters and high phytoplankton diversity were recorded in Eraddaikulam. Among these forty eight species, Chlorella vulgaris, Cladophora glomerata and Peridinum aciculiferum were recorded throughout the year. Sunita Kumari et al (2007) reported that the local and regional climatic variations has a great influence on plankton's species composition, diversity and density variation in freshwater pond ecosystem along with dispersal and grazing pressure. Ali et al (2005) suggested that diversity of plankton life were used as a measure of water quality of a brackish water aquaculture pond. While making a study on monthly variations in biological and Physico-chemical parameters of brackish water fish Pond, muzaffargarh, Pakistan they reported that Phytoplanktons were abundant as compared to zooplanktons.

Hastler (1947) observed that the constant addition of even low levels of nitrogen and phosphorus to an aquatic environment could greatly stimulate algal growth and high level of total nitrogen was followed with the growth of Chlorophycean, Eugleninean and Cyanophycean forms. Prescott, (1948) discussed the importance of temperature in the growth and periodicity of blue green algae. Zafar (1964) reported that phosphates were observed in traces during winter season, and Cyanophyceae were in peak when the phosphate content is very low or even undetectable. Nazneen (1974) found that maximum bloom of phytoplankton occurred during summer due to high growth of Myxophyceae, while in Bacillariophyceae growth was greater than Chlorophyceae. A decrease in the abundance of total phytoplankton observed in May and in November was attributed to the disappearance of Microcystis aeruginosa.

CONCLUSION:

It is concluded from the present investigation that the quality of the Atarital dam water system is continuously degrading. The Biotic community of the dam reveals that it is tending, fast towards 'eutrophism' particularly at all sampling station. The quality of water is deteriorating day by day due to inflow of domestic sewage, municipal waste, agricultural runoff and effluents of organic waste of animal and human origin into the lake. Deterioration of water quality and eutrophication are assuming alarming state in Muaganj, due to casual attitude of people concerned with development of urban population. Therefore, there is an urgent need of regular monitoring of water quality to govern the status and diverting the city sewage away from the lake to preserve the flora and fauna of this ecosystem. If waste input is not checked then it will severely impair water dynamics and will cause eutrophication of the entire system. Overall, coordinated efforts of various stakeholders and proper community involvement are the primary needs to restore the ecological subsystem of the lake and to make it useful for further social and economic exploration.

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REFERENCES:

1. Ali Muhammad, Salam Abdus, Iram Sumayya, Bokhari Tasveer Zahra and Qureshi Kamran Ali (2005). STUDIES ON MONTHLY VARIATIONS IN BIOLOGICAL AND PHYSICO-CHEMICAL PARAMETERS OF BRACKISH WATER FISH POND, MUZAFFAR GARH, PAKISTAN. Journal of Research (Science), BahauddinZakariya University, Multan, Pakistan. Vol.16, No.1, pp. 27-38.
2. APHA (1989): Standard methods for the examination of the water and waste water. 20th addition. American Public Health Association. *Washington Aquaculture Engineering*, **19**, 119-131.
3. Battish, S.K. (1992). Freshwater Zooplankton of India. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, i-iv, pp, 233.

4. Kesharwani Sadhna, Mandloi, A. K. and Dube, K. K.(2006) "Diversity of zooplankton in Amkhera pond of Jabalpur (M. P.)" India. Natural Journal of Life Sciences, 3:359-364.
5. Hastler, A.D (1947). Eutrophication of lakes by domestic drainage.J. Ecology., 28: 383- 395.
6. Mary Kensa, V (2011) Inter–Relationship between Physico-Chemical Parameters and Phytoplankton Diversity of two perennial ponds of Kulasekharam Area, Kanyakumari District, Tamil Nadu, Plant Sciences Feed 1 (8): 147-154.
7. Nazneen, S 1974. Seasonal distribution of phytoplankton in Keenjharlake. Pakistan J. Bot., 6: 69-82.
8. Prescott, G. W 1948.Objectionable algae with reference to the killing of fish and other animals.Hydrobiol.,1: 1-13.
9. Sharma R and Capoor A.(2010) "Seasonal Variations in Physical, Chemical and Biological Parameters of Lake Water of Patna Bird Sanctuary in Relation to Fish Productivity". World Applied Sciences Journal 8 (1): 129-132.
10. Sunita Kumari, Ghosh, C, and Jayaraman G (2007) Phytoplankton Composition, Community Structure and Regional Climatic Variations in Two Tropical Model Ponds in India Asian Journal of Water, Environment and Pollution, 4(2) 123-128.
11. Telkhade, P. M., Dahegaonkar, N. R., Zade, S. B. and Lonkar, A. N.(2008) "Quantitative analysis of phytoplankton and zooplankton of Masala Lake, Masala, Distt. Chandrapur, Maharashtra." Environment Conservation Journal, 9:37-40.
12. WARD AND WHIPPLE's (1959). FRESH-WATER BiologY. Second Edition. Edited by W. T. Edmondson. New York; Chapman & Hall, xxii + 1248 pp.; ill.
13. Zafar, A.R. 1964-b.On the ecology of algae in certain fish ponds of Hyderabad, India-II. Distribution of unicellular and colonial forms .Hydrobiologia, 24:556-566.