Recent Research in Science and Technology 2011, 3(8): 01-05
ISSN: 2076-5061
www.scholarjournals.org

www.recent-science.com

RRST-Environmental Sciences

Seasonal Periodicity, Composition and Distribution of Phytoplankton and Zooplankton with Reference to Physicochemical Characteristics in Lake Ambona near Umarkhed at Yavatmal District

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Article Info

Article History

Received : 08-01-2011
Revised : 22-03-2011
Accepted : 22-03-2011

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Abstract

The world's lakes and rivers are the most important freshwater resources for the human being. But the amount of fresh water on earth is very small covers 2.53% of earth's water compared to sea water. The present article deals with planktonic Distribution of Ambona Lake. Ambona Lake is one of the ancient Lake present in the Maharashtra region. The main object of this study is to check the quality of water because the water in this lake used for agriculture purpose, domestic animals and fisheries. Samples were collected from the lake at four sampling stations. The work was carried out for a period of two years (i.e.June2008 - May2010) with physicochemical parameters was studied with planktonic productivity.

Key Words: Physicochemical parameters, Biodiversity, Phytoplankton, Zooplankton, Ambona Lake

Introduction

Biodiversity is the very foundation for all Earth's essential goods and services. The air we, breath, water we drink and the food we eat all depend upon the Earth's rich biodiversity. Plants keep the air pure by absorbing CO_2 and give us oxygen. All living things which are present on earth cannot live without oxygen, food and the most important water. Therefore it is more essential to keep the water resources very clean and potable. Water intended for human consumption should be safe and free from bacteria viruses and harmful chemicals, usable for domestic purpose.

With the continuous increase in human population and its constant demand of the freshwater aquatic resources of the globe, there has been a "Compounding of the interrelationships between algae and man" [8]. Phytoplankton is the base of most lake food chains. These are also called as producers. Indirectly fish production is linked with Phytoplankton, Primary producers.

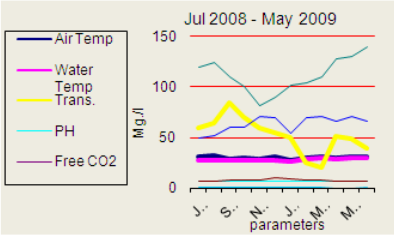
Phytoplankton produces the food and oxygen with the help of carbon dioxide, water and sunlight. Oxygen and phytoplankton are then consumed by zooplankton which are tiny microscopic aquatic organisms. Phytoplankton's being very small in size, they are microscopic plants, they respond quickly to the environmental changes. Changes in the chemistry of water will alter the change in abundance, growth and composition of species. Zooplanktons occupy a second position between the phytoplankton's and fishes (Primary producers and consumers). The occurrence of zooplankton depends upon its productivity, which is influenced by physico-chemical parameters and the level of nutrients in water. The freshwater zooplankton form an important group as most of them feed upon primary produces and make them to available to higher organisms in food chain [9]. The zooplankton can also play an important role in indicating the presence of some species of fishes. Some important physical and chemical factors influencing the aquatic environment are temperature, pH, dissolved oxygen, turbidity, free CO_2, nitrates and chloride alkalinity, sand other dissolved gases. Temperature is very important in waters because it determines the rate of metabolism of aquatic organisms. The concentrations of dissolved gases and their solubility in water also depend on the prevailing air temperature. The amount of dissolved oxygen in water is very important for aquatic organisms. At low temperature more oxygen diffuses into water because the partial pressure is reduced, while at high temperature oxygen diffuses out of the water. Surface agitation of water helps to increase the solubility of dissolved oxygen in water [4]. The hydrogen ion concentration of waters is usually measured in terms of pH, which is defined as the negative logarithm of hydrogen ion concentration [3]. pH higher than 7 indicates the increasing salinity and basicity while pH values lower than 7 tend towards acidity. WHO has recommended maximum permissible limit of pH from 6.5 to 9.2 [7]. The high pH values during summer may be due to high photosynthesis of micro and macro vegetation resulting in high production of free CO_2, shifting the equilibrium towards the alkaline side [15]. Alkalinity of water is of three type namely carbonate, alkalinity (Caused

by carbonates and bicarbonates), phenolphthalein alkalinity (due to hydroxyl ions) and total alkalinity. Boyd [4] observed that water with total alkalinities between 20 and 50 mg/L permit plankton production for fish culture. Nitrogen is present in various forms in natural water, molecular nitrogen (N_2), ammonia as NH_3, ammonium and ammonic hydroxide (NH_4 and NH_4OH) and nitrate as NO_2. The sources of nitrates in water include human and animal wastes, weathering of rocks. The nitrogen is released and becomes available for subsequent growth of aquatic biota [13]. Water is considered to be of improved quality when it contains turbidity value of 1 NTU or below.

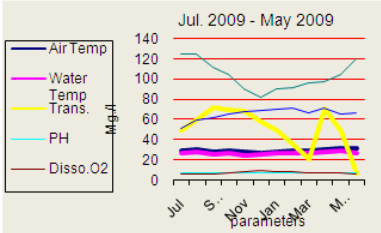
Materials and Methods

For study both phytoplankton and zooplankton with the study of physico-chemical parameters have been taken into consideration. The main object of this paper was to study the distribution of aquatic micro flora and fauna. The samples were collected from four sampling stations of the lakes. The present study was conducted in Ambona lake during the period of two years i.e. July 2008 to May 2010. Surface water was collected as sample in a plastic container from each sampling stations. Before collecting sample, the plastic container was rinsed thoroughly by sampling water and the container was sealed after collecting the sample. Analysis of some parameters such as temperature. pH, turbidity were measured with the help of thermometer, pH meter and sacchi disc respectively. Other parameters like DO, Alkalinity, Free CO_2, Nitrate and chloride were by titration methods. The analysis of water samples was followed by standard methods of APHA [1]

The water samples for phytoplankton population 10L of water was filtered through plankton net made up of bolting silk cloth [16] Filtered samples were fixed and preserved by adding lugol's iodine and formalin solution for phytoplankton and zooplankton respectively. For counting planktons a Sedgwick Raftor Plankton Counting Cell was used. The population data was expressed as No / ml.

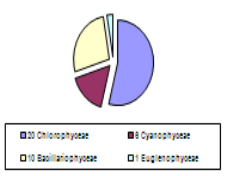


Variation in phytoplankton in the year2008 – 09

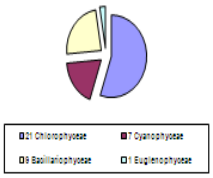


Variation in phytoplankton in the year 2009 -10

The above graph showing the range of different physicochemical parameters during period of two years i. e. (July 2008 – May 2010).



At Station I



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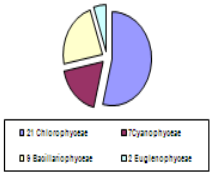
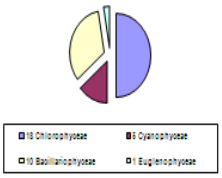


At Station II



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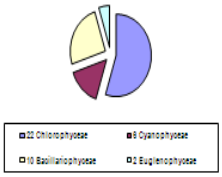

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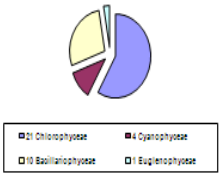

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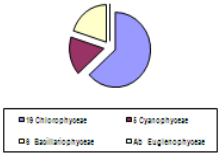
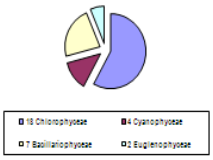
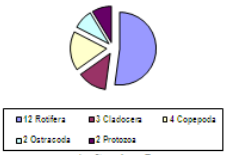


At Station IV



At Station IV

Zooplankton Species in different Stations of Ambona Lake during the period of July 2008 – May 2010



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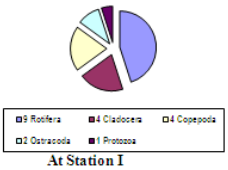

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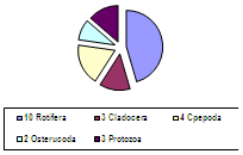

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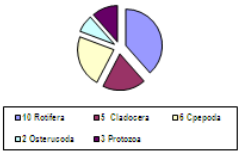

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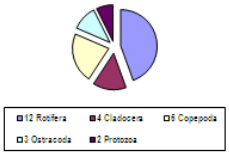

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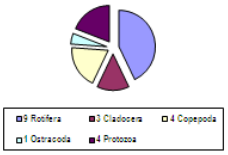

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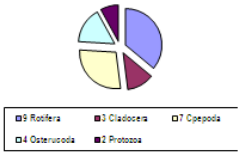
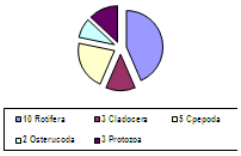


At Station IV



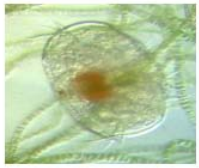
At Station I

Some pictures of Phytoplankton & Zooplankton taken during the investigation

Rotifers (Plate 1)

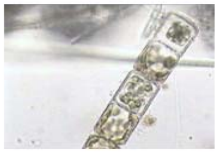
Copepods (Plate 2)

Cladocera (Plate 4)

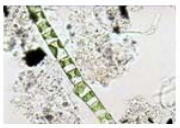


Ostracoda (Plate 3)

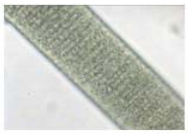
Anabena sp



Melosira sp



Oedogonium sp.



Oscillatoria sp.

Results and Discussions

In the present investigations, all the data of selected parameters (i.e. temperature, pH, DO, Free CO_2, Tubridity, Alkalinity, Chloride and Nitrates) obtained from monthly analysis of water. Water samples from four predermined sampling stations of the lake, are summarized in table 1 and 2. During the study period water temperature was ranged from a minimum 25^0C (January) to a maximum of 30^0C (June) in the year 2008 - 2009. In the year 2009 - 2010 the water temperature ranged from a minimum of 25^0C (December) to a maximum of 30^0C (June). Surface water temperature was found to increase from February to June and decreases from August to January. Temperature affects all chemical and biological processes. Chattopadhyaya [5] observed by same abrupt fluctuation patterns in temperature in lake Krishna sayer in Burdwan. The lake water shows alkaline condition throughout the study period. The pH Value was highest in August (7.45) and lowest in January (7.1) in the year 2008 - 2009. For the year 2009 - 2010, the pH value was highest in August (7.45) and lowest in July (7.2). Bell (1971) in his findings stated that pH range between 6.5 to9 provides adequate protection to the life of freshwater fish and bottom dwelling invertebrates.

The DO content in water is most important parameter in water quality assessment and reflects the physical and biological process prevailing water quality. The DO content of water varied between 7.5 mg/l. (May) to 10 (December) for the year 2009. In the year 2009 – 2010 DO, varied between 6.8 (July) to 10(February). High DO Content is an indication of healthy system in water body [2]. The present study showed that water in all sites possessed a high DO Content and is sufficient to maintain aquatic life forms. Sakhare and Joshi [12] have reported DO range between 2.3 to 10.8mg/l in Palas Nilegaon reservoir in Osmanabad District Maharashtra. The free CO_2 detected in present study was found to be least in amount About 99% of the CO_2 absorbed from air by water is converted to bicarbonate or carbonate and stays in these forms [14]. Thus there is not much build up of CO_2 gas in water.Alkalanity in the present study was found in the range of 82 to 140 mg/l. It was minimum 82mgl in the month of December and maximum in the month of June (140 mg/l) for the year 2008 - 2009. In the year 2009 - 2010 the minimum alkalinity in the month January and maximum was found in the month of July (125 mg/l). The present results are quite similar with that of Chavan [6] found alkalinity values varied from 128 to 261 (mg./l) in Manjara Project, Reservoir in District Beed Maharashtra. The chlorides value fluctuates from 50 mg/L to 71 mg/l for both the years. The chloride values in the present investigation, was within the permissible limits for living aquatic organisms. The concentration of nitrates of the lake water were very low. Nitrate value ranged from 0.30 mg/l (May) to 0.5 mg/l (July) in 2008 - 2009 for the year 2009 - 2010 Nitrate value ranged from Nitrate is a plant nutrient and is generally nontoxic to aquatic organisms.

The highest transparency occurs in the month of May (75cm) and lowest in the month of August (29cm), in the year 2008 - 2009. In the year 2009 - 2010 the highest transparency occurs in the month of May (78cm) and lowest in the month of August (30cm). The results are little similar with the finding of Sakhare and Joshi [12] observed the transparency value varied from 73 to 117 cm from Nilegaon reservoir in Osmanabad District Maharashtra.

Distribution of phytoplankton species at 4 different stations in Ambona lake during the study period shown in fig. 1.1. At station I during 2008 - 2009, total 37 species were recorded in which 20 species belong to chlorophyceae, 10 species belong to Bacillarophyleae, 6 species cyanophyceae and only four species of Euglenophyceae. In the year 2009 - 2010 total 38 species were recorded in which 21 species belong to chlorophyceae, a species Bacillarophyceae, 7 species cyanophyceae and one Euglenophyceae.

At station I during 2009 - 2010, total 39 species were recorded of which 22 species belong to chlorophyceae, a species belong to Bacillarophyceae, 7-cyanophycea & two species of Euglenophyceae. In the year 2010, total 39 species were recorded of which 18 species belong to chlorophyceae, 12 species belong to Bacillarophyceae and one species belong to Euglenophyceae.

At station III during 2008 - 2009, total 40 species were recorded, of which 22 species belong to chlorophyceae, 10 species belong to Bacillarophyceae, 6 species belong to cyanophyceae and 2 species Euglenophyceae. In the year 2009 - 2010, total 36 species were recorded of which 21 species were recorded of which 21 species belong to chlorophyceae, 10 speices Bacillarophyceae, 4 to cyanophyceae and one species belong to Euglenophyceae.At station IV during 2009, total 30 species were recorded, of which 19 species belong to chlorophyceae, a species belong to Bacillanophyceae, 5 species belong to cyanophyceae. In the year 2009 - 2010, total 29 species were recorded, of which 18 species belong to chlorophyceae, 7 species belong to Bacillarophyceae, 4 species belong to cyanophyceae, Euglenophyceae absent.Chlorophyceae population was the most abundant group in both year followed by

Bacillarophyceae, Cyanophyceae and Euglenophyceae. Thus chlorophyceae formed the largest group and was followed by other groups. Ven Den Hoeck et al [17] reported that higher chlorophyceae are a larger and important group of freshwater algae. The Bacillarophyceae groups represented the second most dominant group in the phytoplankonic community. The Cyanophyceae groups are characteristic of entropic environments which have high concentrations of nutrients. Euglenophyceae group was represented by few species.

Distribution of zooplankton species at different sampling station in Ambona Lake during study period shown in fig. 2.1. At station I during 2008 - 2009, total 23 species were recorded, of which 12 species belong to Rotifera, 4 species belong to copepod, 3 species to cladocera and 2 species belong to Ostracoda and 2 species belongs to Protozoa. In the year 2010, total 20 species were recorded of which a species belong to Rotifera, 4-copepoda, 4 species to cladocera and 2 ostracoda and 1 species belong to Protozoa.

At station II, during 2009 - 2010 total 22 species were recorded of which 10 species belong to Rotifera, 4 species belong to copepoda, 3 species belong to cladocera and 2 species belong to ostracoda and 2 species belong to Protozoa. In the year 2009 - 2010, total 26 species were recorded of which 10 species belong to Rotifera, 5 species belong to copepod, 5 species belong to dadocera and 2 ostracoda and 3 species belong to Protozoa.

At station III, during 2008 - 2009, total 27 species were recorded, of which 12 species Rotifera, 6 species belong to copepoda, 4 species belong to cladocera, and 3 species belong to ostracoda and 2 species belong to Protozoa. In the year 2009 - 2010, total 18 species were recorded of which 9 species belong to Rotifera, 4 species belong to copepoda, 3 species belong to cladocera, 1 species belong to Ostrucoda and 2 species belong to Protozoa.

At station IV during 2008 - 2009, total 25 species were recorded of which 9 species belong to Rotifera, 7 species belong to copepoda, 4 species belong to ostracoda and 2 species belong to Protozoa, 3 species belong to cladocera. In the year 2009 - 2010, total 23 species were recorded of which 10 species belong to Rotifera, 5 species belong to copepod, 3 species belong to cladocera and 2 species belong to orstacoda and 3 species belong to Protozoa.In aquatic ecosystems zooplankton plays a critical role not only in converting plant food to animal food but also themselves serve as source of food for higher organisms. Zooplankton provide the main food for fishes and can be used as indicates or tropic status of water bodies [18]. In the present study Rotifers were prominent group among the zooplankton of a water body. The densities of various zooplankton thus, in the order Rotifera > Cladocera > Copepoda > Ostracoda. Zooplanktons is ubiquitous in all lakes and quickly and easily sampled in the field Pani et al [11]

Acknowledgements

The authors are sincerely thankful to Principal of G.S.G. College, Umarkhed 445206.Yavatmal District (M.S) India

References

[1] APHA, 1998. Standard methods for the examination of water and waste water (20th edition). Amarican Public health Association. 1998. 10-161 pp.

[2] Bilgrami, K.S. and Datta Munshi. 1979. Limnological survey and impact of human activities on the river Ganges (Barauni to Farakka range). A technical report. Post-graduate Dept of Botany, Bhagalpur University, Bhagalpur.

[3] Boyd. 1979. Water Quality in Warm Water Fish Ponds, University Press, Alabama, USA, PP59.

[4] Boyd, C. E. 1982.Water quality management of Lake fish Wltare Elsiver Sci. Pub.Co. Amsterdam Oxford, New York 318 PP

[5] Chattopadhyay, C. 2007. Physicochemical parameters, biotic community and species diversity of autotrophic netplankto hesis, University of Burdwan. n in a fresh water lake at Barddhaman, West Bengal. Ph.D. t

[6] Chavan,R. J., R. J. Sawant, C. J. Hiware and M. B. Tat 2004. Studies on water quality of manjra project in district Beed, Maharashtra. J. Aqua. Biol. 19 (2)..73-76

[7] De, A.K. 2002. Environmental Chemistry, 4th Edition, New Age International Publishers, New Delhi, 245-252.

[8] Jackson, D. F. 1964. Algae and Man, Plenum Press New York

[9] Michael, R. G. 1973. A guide to the study of freshwater organism likes *Rotifera sp.*J.Madurai Unv.Suppl.1:23-56.

[10] Nema, P., S. Rajgopalan and C. G. Mehta. 1984. Quality and treatment of Sabarmati river water Ahmedabad. J.I. W.W.A. 16(I), 99-107. Vollenweider R.A. (1976) : Advances in defining critical loading levels for phosphorus in lake eutrophication. Hydrobi. 33, 53-83.

[11] Pani, S., A. K., Bajpai, A., Dubey,and S. M. Misra. 2000. Evaluation of water quality of Bhoj Wetland through matrics determination. In: Proceedings, National workshop on biodiversity & conservation of aqatic resources with reference to threatened fish Mahseer, Bhopal P.P. 96-108.

[12] Sakhare, V. B. and P. K. Joshi. 2002. “Ecology of Palas-Nilegaon reservoir in Osmanabad District Maharashtra”. J. Aqua. Biol., 18(2) 17-22.

[13] Singh, R. and I. Mahajan. 1987. Phytoplankton and water chemistry of Rawalsar and Renuka lake. H.P. India. J.Ecol. 14(2), 273-277.

[14] Tabinda, A. B., M. A. Khan, O. M. Ayub, M. Hussain, A. Yasar, and M. A. Khan 2003. Relative abundance of planktonic life in relation to water quality parameters in non-polluted zone of Deg nullah. One line J.Biol. Sci., 3:635-642.

[15] Trivedi, R. K. 1989. Limnologyof three fresh water ponds in Manglore, National Symp. On Advances in Limnology conservation of endangered fish species. Oct. 23-25, Srinagar.

[16] Trivedi, R. K. and P. K. Goel 1986. Chemical and Biological methods for water pollution studies 209 pp. Enviromedia publications, Karad

[17] Ven, Den Hoeck, D.G. Mann and H. M. Jahns Algae. 1995. An introduction to phycology Cambridge University Press, Cambridge s

[18] Verma, P. K. & Munshi D. 1987 Tropical Ecology 28, 200-207]