Studies on abiotic components of Upper Wardha Dam Amravati, with reference to plankton diversity

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ABSTRACT
Studies on physico-chemical parameters of Upper Wardha Project Dam were carried out to assess the potability of water and for its planktonic diversity. Some abiotic components like water temperature, transparency, DO, and nutrients like nitrates and phosphates were studied during the study period. Water temperature exhibited feeble positive correlation with zooplankton. Transparency played an important role in flourishing population of phytoplankton as it established a positive correlation at 1% level of significance (r=0.729). The dissolved oxygen in water of the dam ranged from 5.00 mg/l to 9.10 mg/l at stations II and III characterized as good level of water body. Nutrients like nitrate and phosphate present in the water body were found below the permissible limits, which confirms that the water is unpolluted and safe for drinking purposes. At present the Upper Wardha project dam is of mesotrophic nature.

Key words: Physico-chemical parameters, Zooplankton, Phytoplankton, Upper Wardha dam, Mesotrophic.

INTRODUCTION
Influence of physico-chemical parameters with fluctuation of Zooplankton are of great importance and basically essential for fish culture. The water of Upper Wardha Project is utilized for drinking, Irrigation and for fishery activities. It is necessary that the quality of water should be checked periodically because due to use of contaminated water pollution may suffer from a variety of water born diseases. Sunkud and Patil (2004) in the Fort lake of Belgaun. In many areas, the ecological impacts from human activities will far exceed the impacts from climate change. Scholze, et al.,(2006), have worked on a climate-change risk analysis for world ecosystems, Islam (2007) in a pond of Rajshahi University, has investigated the effects of abiotic parameters on the variations of zooplankton population. Nelson et al., (2009) carried out a detailed study on the combined effects of urbanization and climate change on stream ecosystems: from impacts to management options. Similarly, Durance and Ormerod (2009) have investigated existing trends in water quality and the consequent discharge confound long-term warming effects on river macro-invertebrates. The present study was aimed to evaluate water quality and occurrence of zooplankton and phytoplankton with reference to physico-chemical parameters in a large dam of Upper Wardha Project, Amravati (M.S).

MATERIALS AND METHODS
Upper Wardha Project dam of Simbhora, known as “NAL DAMYANTI SAGAR” is situated at the border of Amravati and Wardha district. It is at 78 0-03'-27" E longitude and 21 0-16'-18" N latitude. Total catchment area spread is over 4302 Km² with the total height 39.90 meter. Gross storage capacity of the reservoir is about 678.27 Mm³. Station wise water samples from five different sampling stations were collected regularly on monthly basis in between 8 a.m to 10 a.m. Water temperature, pH, DO and TDS observed at sampling site using water analysis kit (Systronic Make) while other abiotic components were analyzed at laboratory condition using the method prescribed by APHA (1998).

RESULTS AND DISCUSSION
Station wise mean values of physico-chemical parameters are given in Table-1. Water Temperature (WT) :- Observed WT from five different sampling stations was in the range of 19°C to 31°C with the mean values 26.11°C Water temperature remain high during summer months due to lower down water level and clear atmosphere. Salve (2006) also reported similar trends in Wan Prakalp reservoir, Nagpur, pH value ranged from minimum 6.05 to maximum 7.48 at sampling station- II. The pH of water tends towards alkaline nature. Minimum pH was found in the month of April (summer) and reached to the maxima in the month of December (winter).This is in agreement with the findings of Manjare et al., (2010) who studied the Vagdaon tank of Kolhapur. Mean and range pH value of all the five stations observed was
6.98± 0.10.

Transparency: - Fresh water body in the present investigation showed no typical trend. Average mean value of water transparency evaluated is 47.68 cm. It was found higher in the summer season which might be due to suspended particles accumulated during summer months or may be attributed to human activity like washing and bathing. Jaybhaye (2009) also reported similar trends in Parola dam of Hingoli district. TDS: - At station-II the total dissolved solid was found higher 400mg/L with the mean value considering all the five stations was 315.71mg/L. It is in the range of permissible limit. Higher TDS attributes to high dissolved and suspended particles in to the water. Turbidity: The water was less turbid as observed during study period. Monsoon months particularly showed turbid water which is attributed to the surface runoff in the rainy season from the catchment area; recently Manjare et al., (2010) have reported higher turbidity in summer season. Average mean turbidity values of the entire sampling site calculated to 39.95 NTU.

Alkalinity : Total alkalinity was in the ranged from 106 mg/L to 330 mg/L at sampling station – III and sampling station –I (Table-1)respectively. The maximum value recorded in the month of January (winter) and minimum in the month of August (monsoon). The alkaline water was found productive. Dissolved Oxygen (DO) : It is one of the important parameters in the water quality assessment and reflects the physical and biological processes prevailing in water. D.O varied from 5.00mg/L to the maximum 9.10 mg/L. The level of DO was found less during the month of May (summer). This is because of the low solubility of gases at high temperature (Hynes, 1978); similarly during summer water volume also decreased and became more concentrated with the pollutants. Decreased DO in summer correlates with the higher solubility of oxygen at lower temperature.

This is in agreement with the recent findings of Garg et al., (2010) who found that dissolved oxygens less during summer season. Average DO in the preset study also exceeded the limit of 5 mg/L as per European Environmental Commission (Chapman,1997) and mean value observed in the present investigation was 7.91 mg/L. Therefore, it can be concluded that water is safe for human consumption.Total hardness: mean value of total hardness of five different stations was observed as 127.17mg/L, the minimum and maximum evaluated was 86 mg/L and 226 mg/L respectively. It was found in the permissible limit. Nitrates : In the fresh water nitrate content is meager. In the present study the average values of nitrate of all the sampling stations were observed to be 0.48 mg/L. There was no seasonal trend in the concentration of nitrates and minimum concentration was found 0.19 mg/L at station-II, while maximum 0.87 mg/L at station-V. nitrates were estimated more in winter season, this is in agreement with the findings of Islam (2007).

Sulphate: - Occurrence of sulphate in the water is due to influx of runoff and leaching process. The average mean of water sulphate content was found to be 12.46 mg/L which is in the permissible limit. Bhagat et al., (2008) have also observed minimum sulphate content in Ambadi dam, near Akot Dt. Akola. Phosphate: - The lower and higher values fluctuated from 0.02 mg/L to 0.60 mg/L at station-I and III respectively. Average mean of all the five stations calculated 0.25 mg/L Winter months contribute higher concentration as compared to monsoon and summer seasons. Higher values may be due to accumulation of surface agricultural runoff and washing activities that contributed to the inorganic phosphate content.

The pollution indicators phytoplankton and zooplankton were less in number at all the stations similarly abiotic components are found in the safe limit which confirms that the water is safe for drinking and also for healthy fish culture. The present status of water body is mesotrophic and unpolluted hence, the water can be utilized for irrigation, drinking and fishery activities.
Table 1: Showing station wise mean values of Upper Wardha Project during April 2008 - May 2009

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Sampling stations – I to V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Water temperature (°C)</td>
<td>25.76</td>
</tr>
<tr>
<td>Transparency (cm)</td>
<td>25.76</td>
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<tr>
<td>pH</td>
<td>7.05</td>
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<tr>
<td>Turbidity (NTU)</td>
<td>43.20</td>
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<tr>
<td>Total Dissolved Solid</td>
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<tr>
<td>Alkalinity (mg/L)</td>
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<tr>
<td>DO (mg/L)</td>
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<tr>
<td>Total Hardness (mg/L)</td>
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<td>Nitrate (mg/L)</td>
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<tr>
<td>Sulphate (mg/L)</td>
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<tr>
<td>Phosphate (mg/L)</td>
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</tr>
</tbody>
</table>

REFERENCES


