



SEASONAL TEMPERATURE CHANGES AND THEIR INFLUENCE ON FREE CARBONDIOXIDE, DISSOLVED OXYGEN(DO) AND PH IN ASHTI LAKE OF WARDHA DISTRICT, MAHARASHTRA.

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Abstract:

Temperature is one of the most abiotic parameters that regulates the self purification of rivers and reservoirs. Hence the measurement of water temperature is of vital importance in the fields of limnology and oceanography. Increase in environmental temperature increases the rate of degradation of organic matter leading to further buildup of carbon-dioxide in water. On the other hand, the dissolved oxygen decreases and pH increases. In the present study of Ashti lake one year of observation from December-2012 to November-2013 were recorded. The surface temperature, free carbon dioxide, dissolved oxygen and pH were recorded 24.4 to 31.7⁰ C, 1.48 to 5.32 mg/L, 4.9 to 11.9 mg/L and 7.02 to 8.59 respectively.

Keywords:

Water quality parameters, Ashti Lake of Wardha district (M.S.)

Introduction:

Many researchers have done studies on physicochemical and biological characteristics of river and lake water (Panda and Sahu,2002;Bharati and Ramnibai,2002; Khatavkar et. al., 2004; Jakher and Rawat, 2003; Nisar Shaikh and Yeragi,2004; Thirupathaiiah et. al.,2010; Polestya et. al.,2008). The present study was carried out in the area comprising of station-I (South), station -II(North), station -II(East), station -IV(West), station -V(Center) of Ashti lake. The samples from these were collected every month during the period between Dec-2012 to Nov-2013 and analyzed for a number of water quality parameters.





Material and Method:

Water samples from each stations were collected during the study period as per the procedure in A. P.H.A. (1985). Water temperature was recorded with the help of centigrade thermometer in $^{\circ}$ C, while free carbon-dioxide and dissolved oxygen were estimated titrometrically . pH of water sample was determined by pH meter in the laboratory.

Result and Discussion:

Temperature: Environmental temperature fluctuates both daily and seasonally . It is responsible for heating and cooling of lake water. The atmospheric temperature depends upon radiation from the sun, as well as on evaporation, relative humidity , wind, length of the day and cloud cover.The temperature of water was were found to be in the range between 24.4 to 31.7. The temperature of water was maximum in the summer season and minimum in the winter season at all stations. It is in the agreement with the works of Kumar (1984), Ramesh (1989) and Borse and Bhave (2000). The temperature of water is one of the important physical parameter which directly influence some chemical reactions in aquatic ecosystem. A significant correlation between ambient temperature and water temperature in present study was also supported by Kato (1941), Ganpati (1962) and Verma (1967).

Free carbon-dioxide: Though carbon-dioxide is readily soluble in water, very little carbon-dioxide occur in solution because of small amount of it being present in the atmosphere . Apart from this decomposition of organic matter and the respiration of aquatic plants and animals contribute to free carbon-dioxide present. It accumulates in large quantities at the bottom of plants, lakes and rivers due to decomposition of organic matter. Such excess of gas rises to the surface as mass of bubbles and the gas is lost in to the air. In summer with an increase in atmospheric temperature there was corresponding rise in water temperature and consequent increase in biological oxidation of organic matter that might have caused an elevation in the level of carbon-





dioxide (Singh and Srivastava, 1988 ; Micheal, 1968). Increase in atmospheric temperature causes an increase in dissolution of carbon-dioxide. Vyas(1968) and Bandela(1998) showed a direct relationship of free carbon-dioxide with transparency , temperature and pH, while an inverse relation with dissolved oxygen. According to Bohra and Bhargava (1977), high concentration of carbondioxide results in to low pH and high carbonate values. In the present study high and low free carbon-dioxide values were recorded in summer and winter respectively. Dissolved Oxygen : It is the most important factor in any aquatic system. Its main sources are the atmosphere and photosynthetic process of green plants. It is removed from the natural waters by respiration of the biota, deomposition of organic matter, inflow of oxygen, deficient subterranean waters and rise in temperature. Vyas(1968), Deshmukh (1964), Prakash (1982) and Lohar and Patel(1998), Hutchinson (1957), Reid (1961), Ruttner (1963) showed an inverse relationship of free carbon-dioxide with dissolved oxygen. Sreenivasan (1972),Bhave and Borse (2001) and Bahura (1998) reported an inverse relationship of dissolved oxygen with temperature. In the present study of Ashti lake dissolved oxygen was observed inversely to the temperature, free carbon-dioxide and pH. The low oxygen values coincide with high temperature during the summer months (Mazhersultan and Dawood Sharief,2004). In summer it was observed that due to an increase in atmospheric temperature,water temperature rises and dissolved oxygen decreases, while in winter due to low temperature,the dissolved oxygen increases which ultimately decreases the pH of Ashti lake. The dissolved oxygen varied between 4.9 to 11.9 in Ashti lake. pH It is a negative logarithm of hydrogen ion concentration. It is affected by environmental factors such as temperature, salinity, free carbon-dioxide and dissolved oxygen. At great depths, lowering of the pH due to the high pressure the solution of calcium carbonate is formed. Sreenivasan (1968) recorded a marked pH variation of 2.2 units between surface water and deeper water in Sandyhulla reservoir in Nilgiris. Biological factors such as respiration and photosynthesis influence pH





changes. In the present study , the high pH range was recorded in summer season when free carbon –dioxide level was mg/L and dissolved oxygen mg/L. The low range of pH was observed during winter season when free carbon-dioxide level was mg/L and dissolved oxygen mg/L. Thus a close correlation between four parameters is evident in Ashti lake. Increased temperature increases the dissolution of atmospheric carbon- dioxide, which in turn affects pH and dissolved oxygen. Higher pH in summer may also be a result of utilization of dissolved carbon- dioxide in primary production (Blum, 1953).

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Table 1. Seasonal Range of Temperature, free Carbon-dioxide, dissolved oxygen and pH

Seasons	Parameters	Station-I	Station-II	Station-III	Station-IV
Summer	Temperature	27.7 to 30.5 C	27.2 to 30.7 C	27.5 to 31.0 C	27.8 to 31.7 C
	Free CO ₂	2.30 to 4.84 mg/L	2.30 to 5.07 mg/L	2.60 to 4.90 mg/L	2.60 to 5.32 mg/L
	Dissolved O ₂	5.3 to 9.0 mg/L	4.9 to 9.8 mg/L	5.8 to 11.3 mg/L	5.2 to 10.4 mg/L
	pH	8.03 to 8.43	7.82 to 8.39	7.68 to 8.39	7.83 to 8.59
Monsoon	Temperature	26.0 to 30.0 C	26.0 to 30.3 C	26.0 to 30.2 C	26.2 to 30.4 C
	Free CO ₂	1.60 to 4.90 mg/L	1.40 to 5.10 mg/L	1.60 to 5.08 mg/L	1.80 to 5.30 mg/L
	Dissolved O ₂	5.7 to 9.2 mg/L	5.2 to 8.6 mg/L	5.4 to 10.5 mg/L	5.9 to 11.5 mg/L
	pH	7.51 to 8.01	7.39 to 8.00	7.46 to 8.00	7.23 to 8.01
Winter	Temperature	24.4 to 26.8 C	24.7 to 26.7 C	25.0 to 26.9 C	25.0 to 26.8 C
	Free CO ₂	1.48 to 2.90 mg/L	1.70 to 3.08 mg/L	1.70 to 2.81 mg/L	1.71 to 2.85 mg/L
	Dissolved O ₂	7.8 to 10.6 mg/L	7.8 to 10.2 mg/L	8.3 to 11.8 mg/L	9.6 to 11.9 mg/L
	pH	7.15 to 7.68	7.09 to 7.32	7.08 to 7.31	7.02 to 7.48

