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Horizontal and Vertical Variations in Dissolved Oxygen in a Subtropical Lake, Mansar

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ABSTRACT

Dissolved oxygen is an important factor associated with the productivity and utility of an aquatic ecosystem. The level of dissolved oxygen in an aquatic ecosystem, depends upon morphometry, climate and various biotic and abiotic components. Present communication deals with the seasonal variations in dissolved oxygen along the horizontal and vertical profiles in a subtropical lake, Mansar. Vertical profiles showed well marked difference in dissolved oxygen as compared to variations among littoral and limnetic zones.

Keywords : Variations, dissolved oxygen, Mansar Lake.

INTRODUCTION

Oxygen is a fundamental parameter required for sustaining the aerobic organism. It is an important and essential component required for the smooth and normal metabolic conduct of living organisms. Aquatic aerobes are dependent on the oxygen concentration, which also limits the distribution, behaviour and ultimately the growth of organisms and of the water body as a whole. The presence and concentration of oxygen varies among waterbodies and these variations have been well studied by various limnologists while conducting their studies (Qadri and Yousuf, 1978; Zutshi and Vass, 1978; Vasisht and Sra, 1979; Adebisi, 1980; Sehgal, 1980; Sehgal and Jyoti, 1987; Kant and Raina, 1990; Sharma, 2001; Sharma, 2002.).

As oxygen plays a vital role in sustaining aerobic life and its concentration is under multifactoral influence ,the present communication embodies a record of seasonal variations in distribution of dissolved oxygen along the predetermined horizontal and vertical stations in lake Mansar.

MATERIAL AND METHODS

Lake Mansar, with 3.294kms circumference lies at an attitude of 710 meters above M.S.L. The collection of data was for a period of 12 months using sodium azide modification of Wrinklers method. For the horizontal estimation 4 study stations were established along the lake (H_1, H_2, H_3, H_4), with H_1 and H_3 at littoral ends and H_2 and H_4 in limnetic zone. For the vertical analysis, 8 sampling stations were established along the vertical profile at the depth difference of 4 meters starting from V_0 at surface upto V_7 at 28 meters depth. Water samples, along vertical stations were collected using Myere's vertical glass sampler.

RESULTS AND DISCUSSION

Horizontal Variations

Perusal of Table 1, Fig. 1 reveals no significant differences in the dissolved oxygen level between the littoral and limnetic zones of a lake for each month although, well marked seasonal variations in the dissolved oxygen level have been recorded from the study conducted for

Table 1. Seasonal variations in dissolved oxygen (mg/l) along horizontal profiles of Lake Mansar from May, 2001 to April, 2002

Month	Stations				Mean
	H1	H2	H3	H4	Value
May	6.8	6.4	6.4	8.2	6.95
June	5.6	6.4	6.8	6.8	6.4
July	5.2	6.8	6	6.8	6.20
August	6	5.2	6.8	6	6.0
September	5.4	5.6	5.6	5.8	5.6
October	5.6	4.8	4.8	7.6	5.7
November	7.2	6.4	6.8	7.6	7.0
Decęmber	4	4	4.4	4.4	4.2
January	4.8	4	4	5.2	4.5
February	5.9	5.2	5.2	6.1	5.6
March	7.6	8.8	8	9.2	8.4
April	6.4	6	6	8.2	6.65

Table 2. Seasonal variations in dissolved oxygen (mg/l) along vertical profiles of Lake Mansar from May, 2001 to April, 2002

Station	Depth (m)	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April
V0	0	6.4	6.8	6	6.8	5.6	4.8	6.8	4.4	4	5.2	8	6
V1	4	6.2	6.8	5.2	6	4.8	6	8	4	3.6	5	7.2	5.4
V2	8	5.8	4	6.4	4.8	4.4	8	6	4.4	3.6	5	5.6	5.4
V3	12	5.8	3.6	3.6	4.8	4.8	4.4	6.4	6	3.2	4.6	5.2	4
V4	16	4.2	5.2	6.3	4.4	3.6	3.6	4	4.8	3.2	4	5.3	4.2
V5	20	4.4	3.2	4.8	3.6	4.8	3.6	4.4	2.8	2	4.2	5.2	3.6
V6	24	3.8	3.2	4.8	3.6	3.6	4	5.6	2.8	2	3	4	3.2
V7	28	3.6	3.6	3.6	3.6	4.8	3.8	4.8	2.8	1.2	2.7	3.2	2.8
SV_7D=		2.8	3.2	2.4	3.2	0.8	1.0	2.0	1.6	2.8	2.5	4.8	3.2

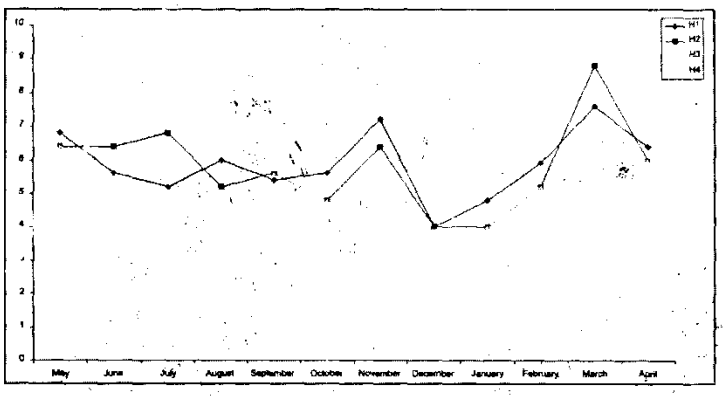

Fig 1. Line graph showing seasonal variations in dissolved oxygen along horizontal profiles

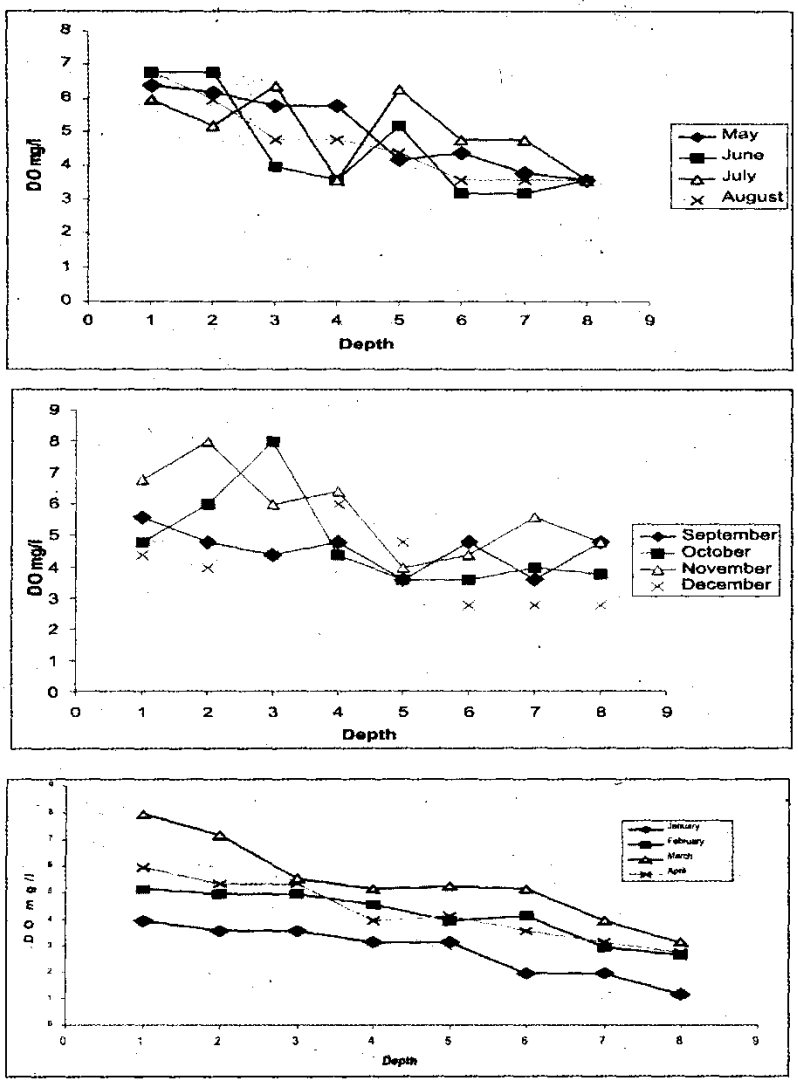

Fig 2. Line graphs showing seasonal variations in Dissolved Oxygen along vertical profiles.

period of 12 months in this lake. A comparative study among littoral and limnetic zones highlights slightly higher dissolved oxygen level at littoral ends of the lake which may be due to the presence of primary producers at these stations.

Perusal of Table 2 also reveals winter minima in dissolved oxygen level in this lake, which may be attributed to the.

(i) mixing of lake water,
(ii) reduction in autochthonous oxygen supply,
(iii) decay and decomposition and
(iv) use in respiration.

The increment in dissolved oxygen level in warmer months may be because of.

(i) the improvement in temperature and light condition,
(ii) increase insulation period and
(iii) increased photosynthetic process.

Vertical Variations

A look at Table 2, and Fig. 2 reveals well marked differences in dissolved oxygen concentration from surface to bottom. There appears a clinograde condition in lake with less dissolved oxygen in hypolimnion during thermal stratification. This low concentration at hypolimnion may be due to.

(i) decay and decomposition
(ii) consumption by bentic organism and
(iii) absorption by sediments.

Even during the months of mixing no well marked homogenous distribution of dissolved oxygen from bottom to surface of lake was observed.

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