Ecological Study of Selected Lentic Water Bodies of Ahmadabad, Gujarat India

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0253

The Asian Conference on Sustainability, Energy & the Environment 2013

Official Conference Proceedings 2013

Abstract

In ecology the environment of lakes is referred to as *lacustrine*. The lakes are quiet large bodies of fresh water usually deep enough that their beds lay much beyond the photosynthetic zone. Fluctuations in the lake level are because of climatic conditions and human water requirements. Lentic limnology refers specifically to still waters. For the present study four lakes were selected, which are located at Thaltej, Ambli, Makarba and Sola villages. Physical parameters include (air and water temperature and TDS) chemical parameters (pH, Do, BOD, COD, CL-, Ca+2, Mg+2) were analyzed during January 2010 to December -2010. During drought period the water level decreased and concentration of the most physico-chemical parameters were increased. Finely concluded that lakes water is not suitable for Drinking as well as irrigation purpose.

Key words: Ecological Study, Physico-chemical characteristics, Lentic water bodies, Ahmedabad

INTRODUCTION

Limnology is the study of fresh waters and their ecology. Lentic limnology refers specifically to still waters. Limnology is obviously a considerable and complex field that we won't pretend to cover in this manual. Rather, we will cover a few concepts necessary for a basic understanding of how lakes work and respond to pollution. With a grasp of these concepts you should be in a position to design a better monitoring program. If you are interested in learning more about lake ecology, there are several sources of good information for lay people. People often visualize a lake as a uniform mass of water, almost like a full bathtub that is evenly mixed from top to bottom, side to side and front to back. In fact, lakes are extremely heterogeneous, or patchy. The physical, chemical, and biological characteristics of lakes are extremely variable. Lakes vary physically in terms of light levels, temperature, and water currents. Lakes vary chemically in terms of nutrients, major ions, and contaminants. Lakes vary biologically in terms of structure and function as well as static versus dynamic variables, such as biomass, population numbers, and growth rates.
Ahmadabad city is located at 23^0.03' N 72^0.58' E in western India at an elevation of 53 meters (174 ft). The city sits on the banks of the river Sabarmati, in north-central Gujarat. Theltej lake is located at Tahltej village. Its total storage capacity is 32.2 crore liters and circumference is 1617 M.. Ambli lake is located at Ambli village near national highway no.8, Ahmedabad.its total storage capacity is 11.1 crore liters. Lake circumference is 662 M. Makarba lake is located at Makerba village near famous Sarkhej Rosa mosque, Ahmedabad. Its total storage capacity is 26.5 crore liters. Lake Circumference is 1461M. Sola Lake is located at Sola village. Its total storage capacity is 24.6crore liters and lake circumference is 1364 M. The lakes are large or considerable body of water within land (Wetzel, 1983). The maintenance of a healthy aquatic ecosystem is dependent on the physico-chemical properties of water and the Biological diversity.

METHDOLOGY

Water samples were collected monthly January2010 to December 2010 from the lentic water bodies

Physicochemical analysis :

Water samples were collected and preserved (IS: 3025 (part I), (1987)) in clean, transparent and double corked plastic bottles. Physical parameters include (air and water temperature and TDS) chemical parameters (pH, DO, BOD, COD, CL^-, Ca^{+2}, Mg^{+2}) were analyzed during January 2010 to December -2010. Physico-chemical parameters were studied using standard methods given by APHA (1998).

RESULTS AND DISCUSSION

The present study of the parameters calculated for January-2010 to December -2010.in Table-1 to 4. The parameters are considered as the most important principles in the identification of the nature, quality and type of the water (fresh, brackish or saline) for any aquatic ecosystem (Abdo-2005).

Table-1 Water Analysis of Thaltej Lake during the year 2010.

Parameter	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10
Temperature	25.1	26.2	31.3	32.2	34.9	36.5	37.2	27.8	29.2	31.3	25.4	22.2
TDS(ppm)	824	903	833	820	984	902	820	219	302	342	381	589
pH	6.4	6.8	6.6	6.9	6.3	6.8	6.8	6.7	7.3	7.1	7.4	7.1
DO(mg/l)	3.5	1.6	1	2.5	0.7	0.5	0.8	1.5	1.8	1.1	1.6	3
BOD(mg/l)	55	48	68	22	38	23	25	11	8.2	7	6.8	30
COD(mg/l)	126	106	156	104	280	180	157	50	41	12	39	55
Cl^-(mg/l)	414.9	453.91	474.89	412.2	524.83	114.55	602.96	109.96	168.9	149.96	170.9	254.94
Ca^+(mg/l)	150	140	150	150	110	40	50	70	60	60	90	60
Mg^+(mg/l)	160	160	190	171	180	60	60	70	110	110	100	220

Table-2 Water Analysis of Ambli Lake during the year 2010.

Parameter	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10
Temperature	26.3	27.3	31.2	36.2	35.9	36.7	37.4	27.8	28.4	30.1	25.3	22.2
TDS(ppm)	382	503	418	512	720	666	660	81	98	182	198	254
pH	6.9	6.5	7.3	6.9	6.8	6.7	6.7	7.1	7.5	6.6	6.4	7.1
DO(mg/l)	2.1	3.5	3	3	0.5	0.5	0.7	1.4	1.9	2.1	1.8	2.5
BOD(mg/l)	7	3.6	9	5	3.6	1.5	2.6	4.7	6.5	51	10.1	27
COD(mg/l)	15	10	28	18	21	20	21	4	9.5	131	12.6	44
Cl^-(mg/l)	364.92	299.96	320.93	332.91	749.76	890	524.2	24.99	63.91	44.98	62.93	64.98
Ca^+(mg/l)	190	160	170	170	50	170	60	40	60	60	90	80
Mg^+(mg/l)	120	140	130	180	70	150	90	50	70	110	100	140

Table-3 Water Analysis of Makarba Lake during the year 2010.

Parameter	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10
Temperature	26.4	29	36	36.5	36.2	36.8	37.4	28	29.1	31.7	25.6	22.5
TDS(ppm)	913	978	1050	1080	1390	1288	1020	966	512	192	303	418
pH	6.8	7.3	7.7	7.1	8.4	7.9	7.5	6.7	7.7	8.0	7.6	7.9
DO(mg/l)	2.2	3.2	3.3	2.9	0.8	0.5	0.5	1.7	1.9	1.3	1.1	2.2
BOD(mg/l)	32	40	36	27	17	12	10	4.1	6.9	11	6.1	7
COD(mg/l)	150	106	202	121	51	25	23	27	6.3	2	0	0
Cl^-(mg/l)	469.89	528.89	599.86	456.87	544.83	441.99	322.99	58.9	48.92	64.98	188.91	234.94
Ca^+(mg/l)	110	130	100	150	100	60	50	40	50	60	60	50
Mg^+(mg/l)	140	160	200	158	120	110	50	50	50	40	80	70

Table-4 Water Analysis of Sola Lake during the year 2010.

Parameter	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10
Temperature	24.6	26.3	31	36.2	34.9	36.1	37.2	27.8	28.9	30.6	25.3	22.6
TDS(ppm)	792	908	1050	938	763	623	723	123	158	233	280	477
pH	6.5	7	7.2	7.7	7.1	7.2	7.1	6.8	7.2	7.5	7.5	7
DO(mg/l)	1.6	1.5	0.8	1.8	0.6	0.5	0.4	1.6	1.2	0.75	2.9	2.6
BOD(mg/l)	5	17	11	5	27	21	11	4	9	5	24	27
COD(mg/l)	5	27	2	2	89	58	30	10	14	7	38	258
Cl^-(mg/l)	394.91	413.2	464.9	412.8	395.88	255.96	148.99	64.97	68.91	89.97	158.91	174.96
Ca^+(mg/l)	160	210	150	220	130	70	50	50	70	60	80	60
Mg^+(mg/l)	200	190	260	236	180	80	140	60	80	100	100	190

Temperature of water is one of the most important factors in an aquatic environment. During January -2010 to December-2010, the temperature varied from 37.4 ^{0}C July -2010 in Ambli and Makarba lakes (Table-2 and 3) and lowest value from 22.2^{0}C December -2010 in Thaltej and Ambli lakes (Table-1 and 2).

Total Dissolved Solids are simply the sum of cations and anions concentration expressed in mg/l. A high content of dissolved Solids elevates the density of water, fresh water organisms residue solubility of gases (like O_2) residuces utility of water for drinking purpose and result into eutrophication of the aquatic ecosystem. TDS in this lake fluctuated between highest range of 1399ppm May-2010in Makarba lake and lowest ranged from 81ppm in Ambli lake (Table-3 and 2). The highest value was recorded at March to May-2010 day of Holi to mass bathing, offering food, flowers, coconut and other religious matter etc.

pH regulates most of the biological processes and bio-chemical reactions. (Sculthorpe-1967) reported that pH, free CO_2 and ammonia are more critical factors in the survival of aquatic plants and fishes than the oxygen supply. Fluctuations in pH values mostly depend upon ingredient input in the water bodies. The pH varied from 8.4 May-2010 in Makarba Lake and Lowest concentration form 6.2 May-2010 in Thaltej lake.

Dissolved oxygen (DO): The presence of dissolved oxygen is required to prevent odor and is suitable for use by aquatic plants and other life forms. The dissolved oxygen was found within 0.4(mg/l) Jul- 2010 in Sola Lake and highest range of 3.5 mg/l in Thaltej lake January-2010 and Ambli lake February-2010 (Table-4, 1 and 2). Low oxygen contents were observed in January-2009 Table No-2. Because dissolved oxygen decreases with increases in temperature and Biochemical oxygen Demand.

BOD is important parameters and indicates contamination with water. The values of BOD were found in the highest range 68.0 mg/L in Thaltej Lake March-2010, and 1.5 mg/L in Ambli lake June-2010(Table-1 and 2) respectively. Slightly higher values of COD warn about the pollution content caused by anthropogenic activities. The minimum value of BOD was recorded at the surface layer during the functioning period of the aeration units. BOD indicates the presence of microbial activities and dead organic matter on which microbes can feed. BOD is directly linked with decomposition of dead organic matter present in the lake and hence the higher values of BOD can be directly related with pollution status of the lake (WQM-1999). An inverse relationship was found between the dissolved oxygen concentration and biological oxygen demand values (*Coscun et. al.* 1987).

Chemical oxygen demand (COD): COD indicates the pollution level of a water body as it is related to the organic matter present in the lake (WQM-1999). COD concentrations in the Lowest range of 0.0 mg/l in Makarba Lake November-December -2010 and Higher range of 280.0 mg/l in thaltej lake May-2010 Respectively (Table -1 and 3). The increase in COD concentration was found in the bottom water where organic matter is more (Prasad, 1976).

Chloride is found widely distributed in nature in the form of salts of sodium, potassium and calcium. The chloride status in lake water is indicative of pollution, especially of animal origin. In the present study chloride concentration in lake water

was found raining between minimum range of 24.99 mg/l August-2010 and maximum range of 890 mg/l during June-2010.

During the period under study the **Calcium Hardness** of lake water varied from **lowest** level 40 mg/l in Thaltej June-2010, Ambli and Makarba lake August-2010 and highest concentration 220 mg/l in Sola lake April-2010(Table-1, 2,3 and 4). The highest value of **Magnesium Hardness** recorded at 260 mg/l Mar-2010 in Sola lake and Lowest value was recorded at the Makarba lake 40.0 mg/l October-2010 (Table-4 and 3) respectively. The source of hardness in lake water is mainly due to the addition of calcium and magnesium through surface area run-off from agricultural and other catchments areas during period.

CONCLUSION:

The Water samples were collected from Different Point of Thaltej, Ambli, Makarba and Sola Lake. The higher ranged of TDS and COD were above BSI and WHO Standards .The Concentration of parameters like D.O>pH> Temperature > BOD > Ca>Mg>COD>Cl and >TDS Were studied comparatively during January-2010 to December-2010. The results suggested that water was not suitable for drinking Purpose.

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