

## Studies on physico-chemical and biological parameters of Chorgaon Lake Distt. Chandrapur, India

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### Abstract

Chorgaon lake is a man made fresh water reservoir at Chorgaon village, in Distt. Chandrapur. The present study has been made to investigate the physico-chemical and biological status of the lake. The study involves the physico-chemical analysis like DO, COD, BOD, Alkalinity, Total Hardness, Chloride, Sulphate and Phosphate along with other parameters and quantitative and qualitative analysis of phytoplankton and zooplankton in biological parameters. Samples were collected from four sampling stations of the lake. The results revealed that site S<sub>2</sub> and S<sub>3</sub> shows more Nitrogen and Phosphate, which favoured the growth of phytoplankton and zooplankton. Phytoplankton shows dominance of Bacillariophyceae. In zooplankton abundance of Rotifers, Cladocera & Copepods were observed. The average value revealed that Diptomus shows dominance in zooplankton and Diatoms in phytoplankton. At other sites parameters remained in constant range showing no much variation thus indicating better quality of water, which was free from pollution.

**Keywords:** *Quantitative, Phytoplankton, Zooplankton*

### Introduction

Water in its various forms is a major element of all the components of biosphere and one of the most needed factor for the existence of living organisms. Besides studying the physico-chemical parameters of lake water, the study of biological parameters also have equal importance. Chorgaon lake is a man made reservoir situated in the North-Eastern part of Distt. Chandrapur. The lake water is used for irrigation, aquaculture as well as for domestic purposes.

The present work was carried out during Aug. 2006 to July 2007 in which focus was given on the study of water quality in terms of physico-chemical parameters and biological diversity of the lake.

### Materials and Method

The water samples were collected from Chorgaon lake from four location sites S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub> and S<sub>4</sub>. The water samples were collected in pre cleaned 5 liters plastic can. The sample collection was usually completed during morning hrs. between 8.00 AM to 10.00 AM. The parameters like DO, Temp., pH were analyzed on the spot while Total solids, Total alkalinity, BOD, COD, were analyzed in the laboratory by standard methods given in APHA (1998). The plankton were collected by plankton net and were preserved in 4% formaline.

Table 1.1: Physico- Chemical parameter of Chorgaon lake during August 2006 to January 2007

Sr. No.	Mon/ Para	AUGUST				SEPTEMBER				OCTOBER				NOVEMBER				DECEMBER				JANUARY			
		S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>
1.	Temp	29.1	29.2	29.1	29.1	28.9	28.6	28.8	29.1	28.2	28.4	28.2	28.2	27.1	27.1	27.2	27.1	26.0	26.2	26.3	26.0	25.6	25.7	25.7	25.7
2.	pH	7.2	7.4	7.3	7.1	8.1	8.2	8.0	7.9	7.9	7.9	7.9	7.9	7.7	7.7	7.6	7.7	7.2	7.8	7.6	7.7	7.9	7.8	7.9	7.9
3.	Alkalinity	158	172	165	156	169	175	167	167	174	184	186	179	187	168	182	179	182	189	187	190	198	197	199	189
4.	D. O.	3.8	4.1	4.0	3.9	4.0	3.6	3.8	3.8	4.1	4.6	4.2	4.1	5.1	4.9	4.7	4.8	5.7	5.4	5.5	5.4	6.4	6.1	6.2	6.4
5.	CO <sub>2</sub>	4.52	4.89	4.81	4.4	2.15	2.23	2.27	2.11	2.64	2.67	2.71	2.59	2.42	2.67	2.86	2.41	3.08	3.09	3.10	3.02	2.89	2.69	2.71	2.88
6.	Tot Hard.	268	279	271	262	252	284	276	256	212	217	229	240	196	203	210	168	106	157	168	42	217	219	225	154
7.	Ca-Hard.	189	180	198	181	160	201	189	179	158	171	162	158	154	149	153	142	82	120	123	111	164	172	173	122
8.	Mg-Hard.	79	99	73	81	92	83	87	79	54	46	67	82	42	54	5	46	24	37	45	31	53	47	52	32
9.	Chlorides	20.21	19.31	21.23	19.96	19.20	20.41	20.89	20.21	18.89	18.80	19.01	18.90	16.12	17.02	17.89	16.09	14.99	15.03	15.72	14.05	17.02	17.86	17.46	17.01
10.	I.D.S.	1630	1612	1590	1628	1487	1510	1521	1450	1300	1350	1372	12.89	1287	1350	13.64	1288	1265	1298	1290	279	1120	1210	1219	1189
11.	Sulphates	160	140	178	158	110	115	125	149	102	120	138	110	89	113	113	0.92	0.90	1.02	1.14	0.98	0.98	1.06	1.08	0.99
12.	Phosphates	2.80	2.89	2.87	2.71	2.20	2.33	2.39	2.58	2.01	2.14	2.17	2.05	1.92	2.01	2.03	1.99	1.88	1.99	2.01	2.10	1.80	2.03	2.06	2.15
13.	Nitrogen	7.10	8.12	8.15	7.12	7.13	8.01	8.04	7.13	6.15	6.23	6.27	6.69	5.02	5.01	5.98	5.12	4.20	4.65	4.93	4.18	3.53	3.89	3.60	3.93

\*All parameters are in mg/l except pH and Temp. (°C)



Table 1.2: Physico-chemical parameter of Chorgaon lake during February 2007 to July 2007

S.N.	Mon/Para	FEBRUARY				MARCH				APRIL				MAY				JUNE				JULY			
	sites	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>
1	Temp.	27.00	27.3	27.8	27.4	29.00	28.8	28.9	29.4	32.00	31.6	32.4	32.6	33.00	32.8	33.1	33.6	31.00	31.4	31.6	31.4	30.00	30.4	30.4	30.1
2	pH	8.1	7.9	8.1	8.3	7.9	7.9	7.6	7.7	8.3	8.1	8.4	8.3	7.7	7.3	7.9	7.9	7.6	7.5	7.3	7.3	7.4	7.5	7.6	
3	Alkalinity	178	187	186	172	209	204	211	214	213	210	212	236	231	242	236	241	189	160	179	180	168	169	170	165
4	D. O.	6.17	6.12	5.9	6.1	6.95	6.90	6.80	6.70	5.70	5.2	5.5	5.2	4.1	3.9	4.3	4.1	3.9	3.6	3.8	3.9	4.1	4.2	4.6	4.5
5	Free CO <sub>2</sub>	2.20	2.50	2.40	2.44	3.74	3.60	3.71	3.50	3.9	4.11	4.18	4.12	3.50	3.12	3.5	3.25	3.40	3.39	3.33	4.20	4.41	4.42	4.32	4.19
6	Total Hard.	235	240	242	229	260	270	278	265	275	285	291	278	289	290	298	281	260	278	279	255	266	288	281	272
7	Ca- Hard.	162	166	166	160	182	176	186	187	176	189	204	177	186	206	195	175	172	174	169	124	163	176	172	165
8	Mg - Hard.	73	74	76	69	78	94	92	88	99	96	87	101	103	84	103	106	88	104	110	131	103	112	109	107
9	Chlorides	18.8	17.2	17.5	17.1	20.2	20.6	20.8	20.5	22.9	22.98	23.1	22.8	23.6	23.5	23.7	23.6	21.2	21.3	21.3	21.3	19.3	19.4	19.5	19.2
10	T.D.S.	1060	1068	1073	1058	1102	1112	1129	1128	1199	1193	1197	1192	1220	1223	1224	1223	1600	1664	1684	1634	1650	1658	1647	1638
11	Sulphates	1.10	1.12	1.11	1.09	1.23	1.24	1.24	1.23	1.61	1.69	1.67	1.59	2.12	2.12	2.12	2.10	1.90	1.95	1.96	1.95	1.98	1.98	1.98	1.96
12	Phosphates	1.95	1.96	1.96	1.95	2.01	2.12	2.12	2.03	2.35	2.37	2.33	2.39	2.80	2.88	2.92	2.78	2.65	2.68	2.68	2.66	2.99	2.99	3.01	2.99
13	Nitrogen	2.9	3.01	3.04	3.00	3.02	3.11	3.8	3.02	4.01	3.9	3.74	3.81	4.80	4.98	4.1	4.5	4.6	4.3	5.2	5.8	5.01	5.6	5.4	5.10

\*All parameters are in mg/l except pH and Temp. (°C)

## Results and Discussion

In an aquatic ecosystem physico-chemical environment has profound influence on its biotic components. They exert their influence both individually and collectively. The values of physico-chemical parameters of water samples collected from various sites are shown in Table 1.1 and 1.2.

During the study, the temperature of water ranged between 25.6 °C to 33.6 °C minimum temperature i.e. 25.6 °C was observed in month of Jan at Site S<sub>1</sub> and maximum temperature was recorded 33.6 °C in month of May at site S<sub>4</sub>. Temperature variation is due to depth and inflow of water in catchment area. The permissible limit of pH for potable water ranges within 6.0 to 8.5. In the present investigation the pH value noted down minimum 7.1 in August at site S<sub>4</sub> and maximum 8.4 at site S<sub>4</sub> in April.

Total Alkalinity of water is a measure of weak acid present in it and of the cations balanced against them. The highest concentration is 24.2 mg/l in month of May at site S<sub>2</sub> and the lowest concentration i.e. 156 mg/l was noted down in month of Aug at site S<sub>4</sub>. Throughout the investigation period, it was noted that the total Dissolved Oxygen ranges between 3.6 to 6.95 mg/l. Similar variation in oxygen was reported by Khatavkar *et al.* (1989) and Bhosle *et al.* (1994). Free CO<sub>2</sub> value was observed maximum 4.89 mg/l at site S<sub>2</sub> in month of Aug, this may be due higher turbidity. Minimum value 2.11 mg/l was noted down in month of Sept at site S<sub>4</sub>. In winter season turbidity was lowest.

The value of Total hardness was maximum in month of May at site S<sub>3</sub> i.e.. 298 mg/l and minimum 106 mg/l at site S<sub>1</sub> in month of Dec. This may be due to presence of high content of Ca & Mg in addition to sulphates & nitrates. The maximum value of TDS was noted down 1684 mg/l in month of June at site S<sub>3</sub> and minimum value was 1058 mg/l in month of Feb at site S<sub>4</sub>. Chloride concentration was recorded maximum 23.7 mg/l in month of May at site S<sub>3</sub> while the minimum was observed 14.05 mg/l in month of Dec at site S<sub>4</sub>. The value are within permissible limit with respect to DIS, ICMR. Sulphate varied from minimum 0.89 mg/l to maximum 2.12 mg/l during the investigation period. It's value increased during month of May. Phosphate value was maximum in month of July at site S<sub>3</sub> i.e. 3.01 mg/l and minimum value recorded in month of Dec at site S<sub>1</sub> i.e. 1.88 mg/l. The Nitrate shows the range of 8.15 mg/l to 2.9 mg/l. The Nitrate level was max. in the month of Aug at site S<sub>3</sub> & minimum was recorded in month of Feb at site S<sub>1</sub>.

The phytoplankton communities were represented mainly by four groups. Chlorophyceae, Cyanophyceae, Bacillariophyceae & Charophyceae. Chlorophyceae was represented by Spirogyra, Clostridium, Cosmarium etc. showed its maximum value during the month of April & minimum during the month of Aug. Bacillariophyceae was represented by Navicula, Cymbella, Diatoma vulgare etc. Its maximum value was noted down during April and May and minimum was in Aug. Cyanophyceae was a significant group, this group includes Anabaena, Oscillatoria, Nostoc, Microcystis etc. It shows higher appearance during the month of Jan and minimum in month of June. Charophyceae was represented by Chara and Nitella during present investigation. They stand fourth in their dominance. Kumar (1990) estimated that density of phytoplankton is greater during summer, post monsoon and winter and is lowest in monsoon. In the present study also peak of the phytoplankton was observed during summer and lowest during monsoon. Verma & Mohanty (1995) recorded three peaks March, July and Jan for phytoplankton at Danmukundpur pond. In present study the phytoplankton shows their dominance as follows:

Bacillariophyceae > Chlorophyceae > Cyanophyceae > Charophyceae



The zooplankton communities were represented mainly by four groups Rotifers, Ostracoda, Copepoda & Cladocera. In the present observation Rotifer were found maximum in the month of April and May and minimum was in the month of Sept. They are represented by Asplanchnopus, Brachionus, Licanes etc. The Cladocera represented by Moinodaphnia, Bosmina, Moina etc. They showed maximum value during the month of January and minimum in month of July. Copepoda was represented by Diaptomus, Cyclops etc. They showed their maximum value during month of December and minimum during month of August. Ostracoda represented by Cypris showed its maximum value during month of August and minimum during month of May.

In present investigation zooplankton showed their dominance as follows:

Rotifers > Cladocera > Copepoda > Ostracoda.

The average value revealed that the physico-chemical and biological parameters were in permissible range showing no much variation, indicates better quality of water.

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