

Study of Physical and Chemical Parameters Deliya Lake Visnagar North Gujarat, India

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Abstract- Visnagar is a taluka of north Gujarat which is known as Shikshan Nagari as well as Copper city. The climate condition of visnagar is tropical arid with marginal semi-arid strongly periodic and seasonal. Deliya lake, the oldest lake of visnagar is natural water body having approximately 20 hector area having in shape and there are many fresh water bodies situated at and around. It is located between latitude 23.041' 60"N longitude 72.032' 60" E. It is near Hanuman temple so is also known as hanuman temple Lake and is constructed before 10th century.

The present study is a Physio-chemical study of deliya lake belongs to Visnagar Taluka in in the year 2012. The physio- chemical parameters show pH, Dissolve Oxygen, total dissolved Solid, E.C., Chloride, Alkalinity, Total Hardness, Calcium, Calcium Hardness, Magnesium, Magnesium Hardness, Fluoride, Nitrate, COD, BOD, etc and water is essential for living organisms especially like flora and fauna observed through various field trips. This water bodies has dense growth of algae and planktons in its showing abundance of analytic species and spirulina species with many other members of chlorophyceae, Euglenophyceae, Bacillariophyceae and cyanophyceae. Microbiological analysis shows positive results for E.Coli, Vibro sp. and many other pathogenic. The migratory and local bird like plegadis falcinellus, Ardea parpurea, Egretta intermedia. Ardeola grayli, jaranica, Dendrocygna, and many more have been observed. If the sewage water and other waste water is properly treated and is used for agriculture and other purpose other than thrown in the lake, the water quality and ecology of the lake can be restored.

Index Terms- Chlorophyceae pathogenic, Physio-chemical, sewage, migratory.

I. INTRODUCTION

The quality of small water bodies, in the urban area of India is under the influence of the population growth and industrial development. Due to Industrial development there is a migration of rural population to urban area. These migrants settle near the open areas like lakes, lakes, canals etc where solid and chemical waste is being dumped into the water

bodies. Agricultural runoff, industrial waste, washing of vehicles and cloths, cattle and people bathing and garbage are other sources of pollution of small water bodies. Due to this waste there is an increase of pollutants in terms of nutrients, organic matter and toxic elements in the water bodies and it disturbs the ecosystem. This circular lake is surrounded by Hanuman temple, agricultural fields and human settlements. There is a solid water dumping site on near the Lake. The inlet and outlet of the lake are open. The upper catchment area of the lake includes rural and agricultural area. The monsoon water runoff, sewage from the surrounding areas are disposed into the lake and there is no proper sewage collection and disposal system. The water coming from Dharoi Dam by the Pipe line system, which is used for the purpose of drinking and building construction. During this the used water is disposed into the lake without any treatment. The Lakes are favourable habitats for a variety of flora-fauna and anthropogenic society and so there would be a regular monitoring periodic study is necessary. Lot of work has been done on changing ecological behaviour of lakes and lakes (mahananda et al. 2005, Kanungo et al., 2006; Gupta et al., 2008). In the present study, the impact of biotic activities on physio-chemical characteristics of lake water are done. The study is done in the year 2012.

MAATERIAL AND METHOD

The regular monitoring of the lake was done seasonally in the year of 2012. Two samples were collected from two sides part A and part B in each season. Total six samples were collected in one year for three seasons winter, summer and monsoon. The samples were collected in early morning between 6-00 to 8-00 am. The collection, preservation and analysis of water sample were carried out following the standard reference (APHA, 2005). These samples were analysed for different physio-chemical

parameters, biological parameters and bacterial density and diversity. The physio-chemical study include measurement of pH, total dissolved solid, dissolved Oxygen, Alkalinity, total hardness calcium, calcium hardness, magnesium, magnesium hardness, Electric conductivity, chloride, fluoride, nitrate, COD and BOD and the biological study includes the parameters like induce chlorophyll, phytoplankton, zooplankton and bird diversity and microbiological study includes parameter like total bacterial count, coliforms and enumeration of various bacterial species. Atmospheric and water temperature were measured using standard mercury thermometers. The pH of was measured using a pre-calibrated cyberscan 100 digital pH meter immediately after collection. The conductivity of the water was measured using a pre-calibrated digital conductivity meter. The microbiological analysis is done by the total bacterial count (TBC) and test for coli-forms were done according of standard methods for the examination of water and waste water (APHA 2005). The biochemical tests for identification of bacterial species were done according to manual of systematic bacteriology (Bergey's Manual). The samples of Plankton which includes both phytoplankton and zooplankton were collected from the surface water from pre-decided locations. The sampling sites were decided as near as possible to those selected for chemical sampling to ensure maximum. Correlation and concentrated to 250 ml by filtering 20 (mew) mesh size plankton net. The concentrated sample were immediately preserved by addition of 5 ml of 4% formalin, plankton sample were identified up to species level under binocular compound microscope following standard monograph (Edmondson, 1693). For recording the number of water birds Spot counting was used and it was done during early morning time. The identification was done using an identification manual of Indian sub continental birds.

Table No: 1

Sr.Nos.	Test Parameter	Part A			Part B		
		2012	2012	2012	2012	2012	2012
		Winter	Summer	Monsoon	Winter	Summer	Monsoon
Time	Am.	7.45	7.30	7.30	7.45	7.30	7.30
Ambient Temp.	C 22	21	32	30	21.5	32	30
Water	C	20	31	29.6	20.	31	29.6

Temp.					5		
pH	-	7.2	7.6	7.2	7.2	7.3	7.5
Dissolved oxygen	Mg/l	1.9	2.2	11.7	1.9	2.2	11.6
Total Dissolved Solid	Mg/l	493	632	181	495	635	185
Electric conductivity	Mg/l	881	914	281	878	916	279
Chloride	Mg/l	264.3	143.6	43.4	264.7	144.4	43.2
Alkalinity	Mg/l	183	272.7	145.5	178	273.2	146.3
Total Hardness	Mg/l	161.2	181	118.4	160.4	180	118.2
Calcium	Mg/l	52	42.6	31.4	51	42.4	31.9
Calcium Hardness	Mg/l	128	106.3	78.4	127	105.6	78.6
Magnesium	Mg/l	67.5	73	39.3	64.7	74	39.1
Magnesium Hardness	Mg/l	266	298.7	163.4	269	302.4	163.2
Fluoride	Mg/l	1.83	2.24	1.61	1.84	2.25	1.62
Nitrate	Mg/l	Nd	Nd	Nd	Nd	Nd	Nd
C.O.D.	Mg/l	61.92	76.2	3.8	61.85	76.5	3.6
B.O.D. (3 day, 27 c)	Mg/l	1.24	0.66	Nd	1.24	0.67	Nd
Chlorophyll	Mg/l	0.51	0.66	0.93	0.56	0.68	1.5
T.B.C.	Nos/ml	92x10 ²	110x10 ³	11x10 ²	28x10 ³	143x10 ²	90x10 ²
Coliforms	-	+V	+V	+Ve	+V	+V	+Ve

RESULT & DISCUSSION

The average of the results of the two samples A and B calculated and presented as one sample per season. All the measurements are listed in Table. The ambient and water temperature was almost same except some difference in winter season. The pH values ranges from 7.2 to 7.6 for part A and part B it ranges from 7.2 to 7.5. The higher value of pH in monsoon may be due to the flow of nutrients with flow of monsoon water according to shanthi K et al. (2002) and higher range of pH indicates higher

chlorophyll in both the part A and B. Recorded as 0.93 mg/l and 1.5 mg/l respectively in monsoon. But in this lake Higher pH of summer and monsoon season are same because in this time. The input in this lake is provided by Dharoi dam project pipe line for the purpose of agriculture uses. The TDS results were gradually increasing from monsoon to summer from 181 mg/l to 632 mg/l respectively for part A and from 185 mg/l to 635 mg/l for respectively. The lower values in monsoon may be due to dilution by rain water, but the higher value of TDS in summer season may be due the inflow of dharoi dam project water coming by pipeline in summer season for agriculture purpose. The higher values in the following season may be due to continuous inflow of sewage without any dilution by rain water. The total hardness values ranged from 118.4 mg/l (monsoon), 181 mg/l (summer) for part A and from 118.2 mg/l (monsoon), 180 mg/l (Summer) for part B according to standard (100-500 mg/l). The higher value found in summer because some time inflow of sewage without any dilution by rain water. Water hardness upto 60 mg/l is considered as soft water, 61- 120 mg/l considered as moderate hard water and from 121-180 mg/l as hard water and above 180 mg/l as very hard water which is not used for drinking purpose. (Kannan, 1991). The values found in the present study are in the range is low is 118 mg/l to 118.2 mg/l High for both part A and part B which a moderately hard water. The alkalinity values ranged from 145.5 mg/l (monsoon), & 272.7 mg/l (summer) for part A and from 146.3 mg/l (monsoon) 278 mg/l (Summer) at Part B. The values in monsoon may be due to dilution. The alkalinity value is a lower in a winter season. Oxygen is an important parameter of any water body and an essential for metabolism of all the aquatic organisms that process aerobic respiration (Wetzel, 1975). Concentration of D.O. indicates water quality in term of various macro and microphytes. In the present study at part A and part B the maximum D.O. value of 11.7 mg/l was observed in monsoon. Where as in winter and summer it was almost same in the range of 1.9 mg/l (winter) & 2.22 (Summer) at part A and from 1.9mg/l (winter) & 2.22 mg/l (monsoon) for part B. Sometimes the BOD values did not showed much difference of D.O. parameter. But some reason may be possible at monsoon season at not indicate the value of BOD, The algal production is correlated to the levels and

rations of nitrogen (N) and phosphorous (P) in the winter. Generally a phosphate concentration will support plankton. The higher values may be due to presence of detergents in sewage waste dumped in the lake, which is also supported by prasannakumari (2000). The phosphate values go parallel to chlorophyll values, which indicate the direct co-relation between phosphates and chlorophyll. The nitrate values as observed in only monsoon season from 0.069 mg/l at part A and from 0.061 mg/l at part B. Kodarkar 1995 mentioned that high concentration of nitrate in may be due to higher decaying of macrophytes.

The biological parameters include plankton analysis and observation of aquatic birds. The plankton analysis results include zooplankton and phytoplankton, which presented in table – 2.

TABLE – 2

	Phytoplankton		Zooplankton
1	Actinastrum sp.	1	Brachinous sp.
2	Closterium sp.	2	Filinia sp.
3	Chlorella sp.	3	Keratella sp.
4	Chlorococcum sp.	4	Lecane
5	Cosmarium sp.	5	Monostylus sp.
6	Pediastrum sp.	6	Polyarthra sp.
7	scendesmus sp.	7	Bosmina sp.
8	Staurostrum sp.	8	Daphnia sp.
	Euglenophyceae	9	Moina sp.
1	Euglena sp.	10	Cyclops sp.
2	Phacus sp.	11	Nauplius
	Bacillariophyceae		
1	Caloneis sp.		
2	Gomphonema sp.		
3	navicula sp.		
4	Nitzschia sp.		
5	Synedra sp.		
	Cyanophyceae		
1	Anacystis sp.		
2	Anabaena sp.		
3	Lyngbya sp.		
4	Merismopedia sp.		
5	Oscillatoria sp.		
6	Spirulina sp.		

The lake water looks green in all the season. Due to the presence of cyanophyceae members like anacystis sp. and spirulina sp. the colour of the lake water looks green. The chlorophyceae and Euglenophyceae group indicate slightly polluting condition and the cyanophyceae group indicates the eukaryotic condition of the aquatic system (K.sankaran unni, 1996). Like all plants, algae require nutrients to grow

and reproduce tree floating algae must get their nutrients from the water. They do not have the ability to obtain nutrients from the bottom of the lake. The higher nutrient level in the lake, the more algae you will have. Also, the older a lake gets the more nutrients it will have accumulated and the more susceptible it will be to algae problem. The runoff from lawns and garden fields pastures, septic tank and leach fields will accelerate algae growth in the lake (Bioremediate.Com). The aquatic birds observed are listed table – 3 migratory birds like Yellow wagtail and wooded sand piper gull billed tern, yellow billed tern, were recorded in the month of January. The water quality of the lake is in eutrophic condition but the presence of rich bank vegetation attracts the birds for roosting, further the thick vegetation of eichornia sp. provides hiding place for water birds the little grebes were found in the main lake.

In the microbial analysis presented in table 4, Coliforms showed positive results for all the samples. The bacterial species found are listed in the table. The majority of the organisms are pathogenic in nature. The area faces breakouts of cholera and dysentery some time to time

Table: 3

Sr. No.	List of water birds recorded. Common name
1	Little Egret
2	Little Grebe
3	Purple Swamphen
4	Lesser Whistling Duck
5	Little Cormorant
6	White Breasted Waterhen
7	white Throated Kingfisher
8	Pied kingfisher
9	Common Kingfisher
10	Wood Sandpiper
11	White Wagtail
12	Red wattlend lapwing
13	Darter
14	Grey Heron
15	Gullbilled tern
16	Indian cormorant
17	Indian Lake heron
18	Intermediate Egret
19	Black headed Ibis
20	Cattle Egret
21	Common Coot
22	Common Moorhen

Table: 4

Sr. No.	List of Microbes recorded Organism
1	Miocrococcus sp.
2	Bacillus sp.
3	Vibrio sp.
4	Straptococci sp.
5	Enterobacter sp.
6	Staphylococcus sp.
7	Pseudomonas sp.
8	Escherichia coli

CONCLUSION

In the physico-chemical parameters analysis of the lake water low content of dissolved oxygen is a sign of organic pollution. It is also due to the presence of in-organic reductants like hydrogen bisulphate, ammonia, nitrate, ferrous ions and other oxidisable substances. The high alkalinity is a function of ion exchange that is calcium ions are replaced by sodium ions and later contributed to alkalinity. It may cause due to evolution of CO₂ during decomposition of organic matter. The chloride is one of the important indicators of pollution. The main nitrate source is the runoff and decomposition of organic matter. The higher inflow of water and consequent land drainage cause high value of nitrate. Calcium is linked with the carbon dioxide and is an important condition of the skeletal structure of organisms calcium form the most abundant in fresh water (Thilaga et al.2005). This lake is polluted due to the continuous discharge of domestic used like sewage, cleaning, clothes, cattle and vehicle washing drainage and run off high amount of nutrients. due to the presence of various pathogenic bacteria and toxic cyanobacteria like anacystis sp. the lake is not useful for purpose like drinking, washing and bathing. By proper treatment and management of the lake, this area can be converted into recreation centre. The adjacent lake with controlled growth of eicchornia sp. has a potential for development and habitation for many bird as it has already dense canopies of trees in the centre of the lake. the appropriate drainage system of this are can helpful in restoring the natural aquatic ecosystem of the lake. The good ecosystem will reduce the health hazards like epidemic of cholera and dysentery. Dredging has to be carried out to remove the organic wastes settling at the bottom of

the lake fishing rights should be given for effective management of the lake.

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