

“ Periodical Ecological Study of Deliya Lake of Visnagar.” At. Visnagar. Ta.Visnagar, Gujarat, India.

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Abstract : Visnagar city is located in north Gujarat (72 30 n and 73 30 n 23 0 e and 23 35 e). Visnagar taluka is popularly known as ‘*Shikshan Nagari*’ and also known as Copper city. The climate of visnagar is tropical arid to marginal semi-arid. It is strongly periodic and seasonal. There are many fresh water bodies are situated at and arou Deliya lake is natural fresh water body having 19 hector area & circular in shape. It is located between latitude 23^o 41’ 60’’N longitude 72^o 32’ 60’’ E. it is oldest lake of visnagar. It is also known as hanuman temple talav. Constructed before 10th century.nd Visnagar taluka. The present study deals with the physico-chemical status of deliya lake. This water bodies has dense growth of algae and planktons in its. Physico-chemical status of lakes belongs to Visnagar Taluka were studied in year 2011. The physico- 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. 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. An isolated area of the lake is totally infested with eicchornia Spe. The migratory and local bird like plegadis falcinellus, Ardea parpurea, Egretta intermediate. Ardeola grayli, Dendrocygna, jaranica (and many more have been observed). If the sewage and other waste are diverted to some appropriate area other than the lake water quality and ecology of the pond can be restored and will be used in drinking and agriculture by the people.

Keywords : Water characteristics, Physico-chemical status, sewage pollution, biotic stress.

I.INTRODUCTION

The water quality of small water bodies, particular in the urban area of India is under the influence of the growing population and development. Development results in migration of rural population to urban area. It is easy for these migrants to settle on the open areas nearby ponds, lakes, canals, etc. where solid and fecal waste is being dumped in to wast body. Added to this the other sources of pollution of small water bodies are agricultural runoff, industrial waste vehicle washing cloth washing, cattle and people bathing and garbage etc. this waste increase pollutants in terms of nutrients, organic matter and toxic substanece in the water bodies and disturb its ecosystem.

The lake was natural freshwater bodyan circural in shape.The lake is surrounded by temple, agricultural fields and human settlements.There is a solid water dumping site on fring of the Lake. The upper catchment area of the lake includes rural and agricultural area. The inlet and outlet of the lake are open. The runoff in the monsoon, sewage from the area are disposed into the lake is there is no proper sewage collection and disposal system gone time to time Intel a water of Dharoi Dam water by the Pipe line system, purpose of used a water in by water pump and pipe line by construction of building by the water tanker the overflow from the La flow into nearby canal by open channel and is ultimately disposed into water earigratation in earth without any treatment.

Since, Lake are favorable habitants for a variety of flora-fauna and anthropogenic society, so its regular monitoring is necessary for control recently, lot of work has been done on changing ecological behavior of ponds (mahananda et al. 2005), Kanungo et al., 2006; Gupta et al.,2008;) in the present study, the impact of biotic activities on physico-chemical characteristics of lake water. The study was performed during 2011.

II. STUDY AREA MAP



Maps showing Visnagar city area

Plate:1

Deliya lake



← **Photo:1**

Photo:2 →



← **Photo:3**



Photo:4 →



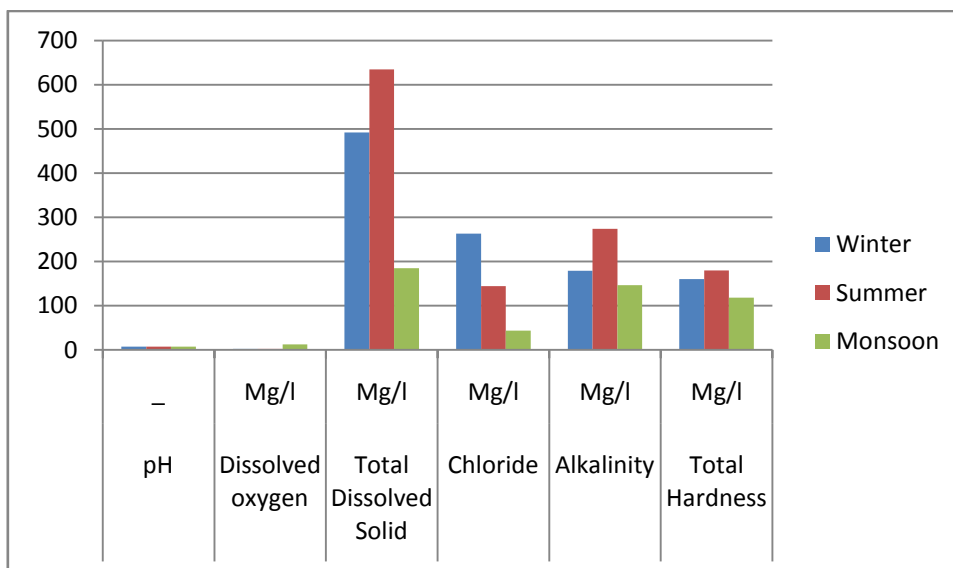
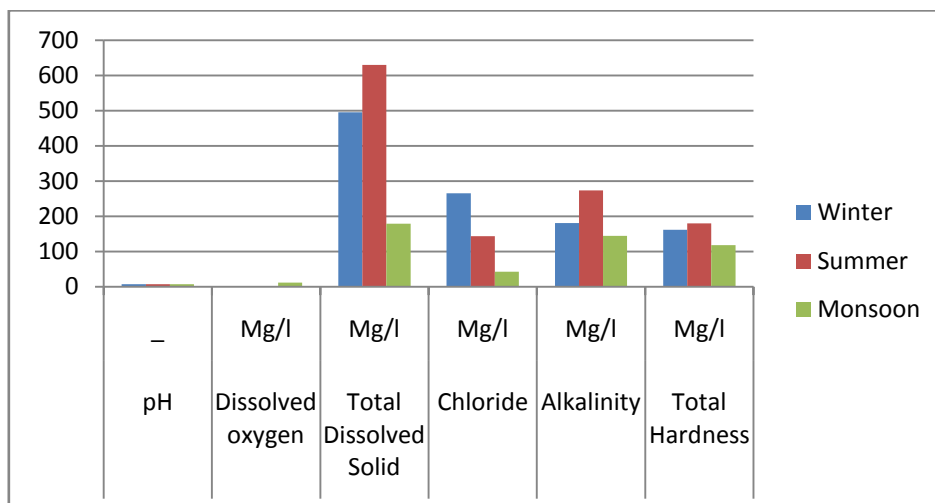
III. MATERIAL AND METHOD

The lake was monitored seasonally in the year of 2011. Two sample sites were collected from part A and part B in each season. Total two samples were collected in one season like Winter, summer and monsoon. Parameters. In the sampling period of one year total six samples were collected and analyzed per parameter. The samples were collected in the Year of 2011 representing winter, summer and monsoon season respectively. The samples were collected in the morning between 8-00 to 10-00 am. Collection, preservation and analysis of water samples were carried out following standard reference (APHA, 2005). The water samples were analyzed for various physico-chemical parameters, biological parameters and bacterial density as well as diversity. The physico-chemical parameters include pH, dissolved Oxygen, total dissolved solid, Electric conductivity, chloride, Alkalinity, total hardness calcium, calcium hardness, magnesium, magnesium hardness, fluoride, nitrate, COD and BOD the biological parameters include chlorophyll, phytoplankton, zooplankton and bird diversity. Microbiological parameters include total bacterial count, coliforms and enumeration of various bacterial species,

Atmosphere and water temperature were measured using standard mercury thermometers. The pH was measured immediately after collection by using a pre-calibrated cyberscan 100 digital pH meter. The conductivity of the water was measured by using a pre-calibrated digital conductivity meter. In the microbiological analysis the total bacterial count (TBC) and test for coliforms were done according to standard methods for the examination of water and waste water (APHA 2005). The bio-chemical tests for identification of bacterial species were done according to manual of systematic bacteriology (Bergey's Manual). Plankton includes both phytoplankton as well as zooplankton. Plankton samples were collected from the surface water from pre-decided locations. The sampling stations were located as near as possible to those selected for chemical sampling to ensure maximum correlation and concentration to 250 ml by filtering 20 (mew) mesh size plankton net. The concentrated samples were immediately preserved by addition of 5 ml of 4% formalin, plankton samples were identified up to species level under binocular compound microscope following standard monograph (Edmondson, 1963).

Spot counting was used for recording the number of water birds. Counting was done during early morning hours. The identification was done using an identification manual of Indian sub continental birds. (Grimmett R, 1991).

Sr.Nos.	Test Parameter	Part A			Part B		
		2011 Winter	2011 Summer	2011 Monsoon	2011 Winter	2011 Summer	2011 Monsoon
Time	Am.	9.45	8.00	9.40	10.05	8.25	9.55
Ambient Temp.	C	22	33	31	21.5	33	31
Water Temp.	C	21	31.8	30.4	20.5	31.8	30.2
pH	-	7.3	7.7	7.2	7.2	7.5	7.1
Dissolved oxygen	Mg/l	2.0	2.2	11.7	2.0	2.2	12.1
Total Dissolved Solid	Mg/l	495	630	179	492	635	185
Electric conductivity	Mg/l	879	913	277	877	915	279
Chloride	Mg/l	265.3	143.3	42.8	263.2	144.1	43.2
Alkalinity	Mg/l	181	273.7	144.5	179	274	146.2
Total Hardness	Mg/l	161.5	180	118	160.2	180	118.2
Calcium	Mg/l	51	42.8	31.6	50	42.3	32.00
Calcium Hardness	Mg/l	127	106.5	78.7	126	105.2	78.6
Magnesium	Mg/l	64.5	72	39.2	164.1	73	39.1
MagnesiumHardness	Mg/l	268	299.5	163.6	266	302.2	163
Fluoride	Mg/l	1.85	2.25	1.62	1.84	2.26	1.60
Nitrate	Mg/l	Nd	Nd	Nd	Nd	Nd	Nd
C.O.D.	Mg/l	61.95	76.5	3.7	61.90	76.4	3.6
B.O.D. (3 day,27 c)	Mg/l	1.25	0.67	Nd	1.23	0.67	Nd
Chlorophyll	Mg/l	0.51	0.64	0.87	0.58	0.69	1.6
T.B.C.	Nos/ml	95x 10 ²	110x10 ³	11x10 ²	143x10 ²	28x10 ³	90x10 ²
ColiForms	-	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve



IV.RESULT & DISCUSSION

The result of two sampling from part A and Part B were averaged out and presented as one sampling per season from part A and Part B. the analysis results are listed in Table 1. The ambient and water temperature were almost same expect some difference in winter season. The pH values of part A ranges from 7.7 (Summer), 7.2 (Monsoon) and part B ranges from 7.5 (Summer) & 7.1 (Monsoon). The higher range in monsoon may be due to in flow of nutrients with flow of monsoon water according to shanthi K et al. (2002), the higher range of pH indicates higher productivity of water. This statement supported by finding of present study as the productivity in terms of chlorophyll was higher in both the part A and B. Recorded as 0.87 mg/l and 1.6 mg/l respectively in monsoon. But in this lake Higher pH of summer and monsoon season are same because in this time The sardar sarovar water have input in this lake by pipe line perpose of agriculture uses.

The TDS results were gradually increasing from monsoon to summer from 1719 mg/l to 630 mg/l respectively, at part A and from 185 mg/l to 635 mg/l respectively, at part B. the lower values in monsoon may be due to dilution if rainy water. But in this cash the Higher value of TDS in summer season because the dharoi dam project water in flow in a this lake by pipe line in summer season purpose of agriculture used. 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 mg/l (monsoon), 180 mg/l (summer) & at part A and from 118.2 mg/l (monsoon), 180 mg/l (Summer) & at Part B. According to with standard (100-500 mg/l) the value found in summer very high because some time inflow of sewage without any dilution by rain water. Water hardness up to 60 mg/l consider as soft water. 61- 120 mg/l consider is moderately hard water from 121-180 mg/l as hard water and above 180 mg/l as very hard water (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 at both side A & B. which a moderately hard water and very hard water water which is not used for drinking purpose. The alkalinity values ranged from 114.5 mg/l (monsoon), & 273.7 mg/l (summer) at part A and from 146.2 mg/l (monsoon) 274 mg/l (Summer) at Part B. The values in monsoon may be in to dilution. A similar view has been expressed by bishop 1973 and Jain et all; 1996. But those case this monsoon season rain was very low unless. The alkalinity value is a lower in a winter season. Oxygen is an important parameter of any water body and an essential to the metabolism of all the aquatic organisms that process aerobic respiration (Wetzel, 1975). Concentration of D.O. indicates water quality in term of various macro as well as microphytes. In the present study at part A and part B the maximum d 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 2.0 mg/l (winter) & 2.2 (Summer) at part A and from 2.0mg/l (winter) & 12.1 mg/l (monsoon) at part B. At the 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	Pediastram sp.	6	Polyarthra sp.
7	scendesmus sp.	7	Bosmina sp.
8	Staurastrum 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 pond water remains green in water in all the season. The presence of cyanophyceae members like anacystis sp. and spirulina sp. may be responsible for green colour of the pond water. The green colour of the pond water can be seen in the photograph of the pond water. fig.2. 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 pond bottom. The higher nutrient level in the pond, the more algae you will have. Also, the older a pond gets the more nutrients it will have accumulated and the more susceptible at will be to algae problem. The runoff from lawns and garden fields pastures, septic tank and leach fields will accelerate algae growth in the pond (Bioremediate.Com).

The aquatic birds observed are listed table – 3 migratory birds like gull billed term, yellow billed tern, Yellow wagtail and wooded sand piper were recorded in the month of January. The water quality of the pond 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 pond. Fig. : 3 The microbial analysis results are presented in table 4 . Coliforms showed positive results for all the samples. The bacterial species found are listed table 4. 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.	Comman name	Scientific Name
1	Lesser Whistiling Duck	Dendrocygna javanica
2	Little Cormorant	Phalacrocorax niger
3	Little Egret	Egretta grazetta
4	Little Grebe	Tachybaptus ruficollis
5	Purple Swampphen	Porphyrio porphyo
6	White Breasted Waterhen	Amauornis phoenicurus
7	Wood Sandpiper	Tringa ochropus
8	White Wagtail	Motacilla alba
9	white Throated Kingfisher	Halcyon smyrnensis
10	Pied kingfisher	ceryle rudis
11	Common Kingfisher	Alcedo atthis
12	Red wattlend lapwing	Vanellus indicus
13	Black headed Ibis	Threskiornis melanocephalus
14	Cattle Egret	Bubulcus ibis
15	Common Coot	Fulica atra
16	Common Moorhen	Gallinula chloropus
17	Darter	Anhinga melanogaster
18	Grey Heron	Ardea cinerea
19	gullbilled tern	Gelochelidon nilotica
20	indian cormorant	phalacrocorax fuscicollis
21	Indian Pond heron	Ardeola grayii
22	Intermediate Egret	Mesophoyx intermedia

Table : 4

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

VI.CONCLUSION

The physico-chemical parameters of the lake were analyzed from whole year season wise like winter, summer and monsoon. Low content of dissolved oxygen assign of organic pollution, it's also due to inorganic reductants like hydrogen bisulphate, ammonia, nitrate, ferrous ions and other such oxidisable substances (Ara et al, 2003). The high alkalinity is a function of ion exchange that is calcium ions are replaced by sodium ions and later contributed to alkalinity (Sharma and John 2009). Alkalinity may also cause due to evolution of Co2 during decomposition of organic matter. The chloride is one of the important indicators of pollution (khare et al; 2007) the main source of nitrate is the runoff and decomposition of organic matter. The higher inflow of water and consequent land drainage cause high value of nitrate (Thi langa et al.2005). Calcium is linked with the carbon dioxide and is an important conditions of the skeletal stricture of organisms calcium form the most abundant in fresh water (Thilaga et al.2005).

This lake are polluted fresh water bodied due to the continuous discharge of domestic used like sewage, drainage, cleaning, clothes, cattle and vehicle washing and run off high amount of nutrients lead of eutrophication. Because of presence of various pathogenic bacteria and toxic cyanobacteria like anacystis sp. the pond is not useful for any purpose like drinking, washing and bathing by proper treatment and management of like pond. This area can be converted in to recreation center. The adjacent pond with controlled growth of eicchornia sp. has a potential for development ad habitation for many bird as it has already dense canopies of trees in the center of the pond. The area need appropriate drainage system so that the sewage can be disposed at a place other than the pond this will help in restoring the natural aquatic ecosystem of the lake. The good pond 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 pond fishing rights should be given for effective management of the pond.

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