



Study of Corelation of Plankton Diversity with Physico-Chemical Parameters of Kankaria Lake, Ahmedabad City

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Abstract: *The present study was carried out on Kankaria lake. It is situated in Ahmadabad city, Gujarat State (India). The planktons were collected, counted and were identified by using the various method suggested by Prescott (1970), APHA (1995), Freshwater Zooplankton of India (Battish, 1992) and Fresh Water Biology (Edmondson, 1959). The planktons were counted by using Sedgwick Rafter Counting Cell method. Different classes such as cyanophyceae, Chlorophyceae, Bascillariophyceae, Copepoda, flagellate, Rotifera were identified during the study. Among all these classes the listed phytoplankton such as Anabena sp., Ankistrodesmus sp., Navicula sp., Nitzschia sp, and zooplankton such as Euglena sp., Rotifera sp. and Brachionus sp. were recorded as a dominant genera in Kankaria lake. The study was carried out monthly From the listed data the quality of water was concluded.*

Keywords: *Kankaria lake, Phytoplankton , Zooplankton, Correlation.*

I. INTRODUCTION

Water is the most important parameter for all living forms. Without water life is almost impossible. Whatever the total water available in the environment, only 3% of the water is found as fresh water. Of this only 1% or less than 1% is being in the form which can be utilized by organisms. Urbanization, industrialization are the main threats to the fresh water bodies. There are lots of anthropogenic activities carried out by human community which may cause its pollution. The polluted water is one of the main issue and a case of worry for the current scenario. There for its conservation is one of the important duties of the mankind.

Water quality can be determined by analyzing physico-chemical properties of water and some biological factors. Amongst biological parameter, plankton are one of the pioneer species in aquatic food chain. They are very sensitive to their environment. Density, and quantity as well as quality can be telling us about water quality. Because some of the plankton species develop only in some sort of polluted water, while the others in pure (non-polluted). Thus the plankton community can be an ecological indicator to predict what kind of changes are going to take place in a particular freshwater body in nearby future.

Kankaria lake is located to the south eastern side of the city. It is basically multisided artificial lake. It covers an area of 2,51,709m² and its latitude and longitude are 23000'15.53" N and 72036'11.46" E respectively.

The lake is mainly used for recreation purpose. Thousands of people visited every day. In the centre of the lake there is a Nagina wadi (a garden). Boating and other water sports activities are going on in the lake. Nearby area of the lake there are textile mills and railway yard is located. Generally assessment of water quality includes analysis of physical, chemical as well as biological parameters, which shows the status of abiotic and biotic factors of the water reservoir. This in turn, helps in planning conservation strategies.

II. MATERIALS AND METHODS

Data collection

There are two types of data collection is required. These are referred as Secondary and the primary data collection methods. The primary data is collected directly during the process of investigation, while the secondary data refers to the data sets which already exist. It is important to collect secondary data before going into field investigations. It may give useful information about the investigation and serve as the basis. The data may be qualitative, quantitative or spatial.

Collection of water sample

Water samples were collected during morning hours (i.e. 7.00 am to 9.00am) on 2nd Sunday of every month throughout the study period from the selected sites to determine physico-chemical and biological parameters.

**Handling of water sample and analysis of physico – chemical parameters**

Analysis of some of the parameters such as pH and water temp., were performed on the site by using pocket meters and glass thermometer. To estimate DO, water sample is separately collected in DO bottle as mentioned earlier and then fixation of the same is performed by adding alkaline KI, MnSO₄ and H₂SO₄ at the site and later on analysis being carried out in the laboratory along with other parameters by using standard methods suggested by APHA (1998); Kumar and Ravindranath (1998); Trivedy and Goel (1984). Seven physico -chemical parameters such as temperature, pH, EC, Turbidity, TDS, DO, BOD were analyzed.

The standard method suggested in APHA used for assessing water quality includes collection, counting and identification of phyto and zooplankton. Plankton net number 25 of mesh size 20 µm was used for collecting samples. 50 liters of water was measured in a graduated bucket and filtered through the net and concentrated in a 100 ml bottle. Samples were collected as close to the water surface as possible in the morning hours. Plankton is preserved by using 4% formalin. The sample was allowed to settle for 24-48 hours and was further concentrated to approximately 30 ml by decanting. Sedgwick Rafter counting cell is used to count the plankton. The total volume of the cell is 1 ml. A binocular compound microscope is used to count the plankton with different eyepieces such as 10X and 40X. Formula to convert unit/ml of plankton into unit/liter is

$$n = \frac{(a \times 1000) c}{l}$$

Where,

n = Number of plankton / liter of water.

a = Average no. of plankton in one small counting chamber of S-R cell.

c = ml of plankton concentrate.

l = Volume of original water filtered in liter.

The graphic method indicates the existence of a correlation. But it is not possible to calculate the extent or degree of relationship using these graphs. To find out correlation between two variables is calculated by following formula of Karl Pearson's.

$$r = \frac{\sum (dx \cdot dy)}{\sqrt{\sum (dx)^2 \cdot \sum (dy)^2}}$$

Where, r is the correlation coefficient, x and y are the two variable dx is the deviation from the x-mean of the x variable, dy is the deviation from the y mean of the y variable, $\sum (dx \cdot dy)$ is the sum of the products of the deviations, $\sum (dx)^2$ is the sum of the squares of the deviations of the x variable, $\sum (dy)^2$ is the sum of the squares of the deviations of the y variable, The degree or the intensity of relationship between two variables was ascertained by computing the value of coefficient of correlation. Karl Pearson's has given a formula for measuring correlation. The result of this formula varies between +1 and -1. The following table shows degrees of correlation according to Karl Pearson's formula, which is used time to time in different chapter

Degree of correlation	Positive	Negative
Perfect correlation	+1	-1
Very high degree of correlation	+0.9 or more	-0.9 or more
Fairly high degree of Correlation	From +0.75 to +0.9	From -0.75 to -0.9
Moderate degree of correlation	From +0.50 to +0.75	From -0.50 to -0.75
Low degree of correlation	From +0.25 to +0.50	From -0.25 to -0.50
Very low degree of correlation	Less than +0.25	Less than -0.25
Absence of correlation	0	0

(Ref.: D. C. Sancheti and V. K. Kapoor, (1998): Statistic (Theory, methods and Applications), S. Chand & Sons.)

III. RESULT AND DISCUSSION

During the data analysis period, *Navicula sp* (r = +0.568), *Branchionus sp* (r = +0.602), *Navicula sp* (r = +0.583) *Cyclops sp* (r = +0.635) shows moderate positive correlation with Temperature, Turbidity, EC and DO respectively. *Cyclostella sp* (r = +0.408), *Gleocapsa sp* (r = +0.327) and *rotifer sp* (r = +0.326) shows positive low degree correlation with pH, TDS and BOD respectively. *Cylindrospermum sp*. And *Calothrix sp*. (r = -0.538), *Cladophora sp*., (r = -0.638), *Closterium sp*. (r = -0.561) shows moderate negative correlation with pH, Turbidity, EC and TDS respectively. *Oscillataria sp*. (r = -0.338), *Gomphonema sp*. (r = -0.496) and *Cladophora sp*. (r = -0.285) shows negative low degree correlation with Temperature, DO and BOD respectively.



Table: 1, Table shows correlation of plankton with physico-chemical parameters at Kankaria

Plankton sp.	Temp.	pH	Turbidity	EC	TDS	DO	BOD
<i>Anabaena</i>	0.014	-0.482	0.5	0.136	-0.324	0.027	0.069
<i>Oscillatoriasp.</i>	-0.338	-0.469	0.117	-0.141	-0.299	-0.209	-0.126
<i>Gloeocapsa sp.</i>	-0.287	0.272	-0.33	-0.356	0.327	0.215	-0.027
<i>Spirulina sp.</i>	0.131	-0.271	0.176	0.379	-0.513	-0.245	0.188
<i>Calothrix sp.</i>	0.094	-0.538	0.531	0.341	-0.368	-0.021	0.037
<i>Cylindrospermum sp.</i>	0.094	-0.538	0.531	0.341	-0.368	-0.021	0.037
<i>Navicula sp.</i>	0.568	0.228	-0.32	0.583	-0.025	-0.413	0.089
<i>Nitzschia sp.</i>	0.189	0.348	0.04	0.392	-0.421	0.399	0.14
<i>Cymbella sp.</i>	-0.101	0.185	-0.22	0.23	-0.426	0.091	-0.159
<i>Amphiplura sp.</i>	0.159	0.104	-0.161	0.151	-0.209	-0.249	0.142
<i>Gomphonema sp.</i>	0.453	0.054	-0.428	0.312	0.228	-0.496	-0.061
<i>Cyclostella sp.</i>	0.239	0.408	-0.086	0.153	-0.312	0.12	-0.117
<i>Synedra sp.</i>	0.06	0.169	0.127	-0.172	-0.346	0.236	0.269
<i>Closterium sp.</i>	0.018	-0.305	0.541	0.533	-0.561	0.08	-0.116
<i>Scenedesmus sp.</i>	0.274	-0.24	0.248	0.421	-0.249	-0.286	0.192
<i>Spirogyra sp.</i>	-0.256	0.266	-0.199	-0.638	0.019	-0.068	0.117
<i>Cladophora sp.</i>	-0.082	0.087	-0.595	-0.095	0.289	-0.481	-0.285
<i>Cosmarium</i>	-0.189	-0.275	-0.267	0.078	0.255	-0.077	-0.21
<i>Ankistrodesmus sp.</i>	0.171	0.076	0.141	0.12	-0.322	-0.031	0.217
<i>Pediastrum sp.</i>	0.18	0.072	-0.109	-0.476	0.194	-0.333	0.118
<i>DiaCyclops sp.</i>	-0.197	-0.433	0.435	-0.149	-0.347	-0.142	-0.067
<i>Cyclops sp.</i>	-0.052	0.011	0.401	0.528	-0.53	0.635	0.122
<i>Branchionus sp.</i>	-0.005	-0.365	0.602	0.026	-0.464	-0.062	0.155
<i>Rotifera sp.</i>	0.258	-0.375	0.445	0.19	-0.215	-0.038	0.326
<i>Euglena sp.</i>	0.384	0.252	-0.014	-0.036	0.179	-0.129	0.109

IV. CONCLUSION

The physico-chemical and the biological parameter were analyzed by using standard methods. Physico –chemical parameters such as Temperature, pH, Turbidity, EC, TDS, DO and BOD were analyzed and most of them were found in their desired limit.

Among biological parameters phytoplankton and zooplankton were counted by using Sedwitsch Rafter chamber. The total count per ml and per liter was recorded for all the four sites. There are total 25 plankton species were recorded. Out of this 19 were phytoplankton while rest zooplankton species. Among phytoplankton Chlorophyceae was dominant class over rest of the two throughout the study period. The Chlorophyceae was more abundant during study period while Bacillariophyceae were recorded maximum. Chlorophyceae was much dominant. Amongst zooplankton Rotifers were dominant. The second dominant group was Copepods. flagellate were also less abundant at site. Plankton (both phytoplankton and zooplankton) shows correlation either positive or negative with physico-chemical parameters especially against temperature, pH, Turbidity, DO, BOD.

REFERENCES

1. Amabsht, R. S., (1971). Ecosystem study of tropical pond in relation to primary production of different vegetation zones Bocharesi. Hydrobiologia, 12: 57-61.
2. APHA (1995). Standard methods for the examination of water and waste water. 19th Edition, American Public Health Association, American Water Work Association and Water Pollut. Contl. Federation, Washington, D.C., NewYork.
3. Aykulu G., (1978). A comparative study of the phytoplankton of the river Avon, Bristol. Phycol, J. 13: 91-102.
4. Battish S. K. (1992). Fresh water zooplankton of India. Oxford and IBH Pub. Co. New Delhi.
5. BIS (1992): Indian Standards for drinking water specification, Bureau of Indian Standarda, New Delhi. BIS- 10500: 2-4.



7. Chandrasekar, S. A., (1996). Ecological studies on Sarrornagar lake Hyderabad with special reference to zooplankton communities. Ph.D. Thesis, Osmania Univ. Hyderabad (AP).
8. D. C. Sancheti and V. K. Kapoor, (1998). *Statistic : Theory, Methods and Applications*, Sultan Chand & Sons
9. D. R. Khanna and R. Bhutiani (2008) *Laboratory manual of water and wastewater analysis*, Daya publication house Delhi – 110035.
10. Dhembare, Anant J. (2011). Statistical approaches for computing diversity and density of zooplankton with water factors in Mula Dam, Rahuri, MS, India. *European Journal of Experimental Biology*, 2011, 1 (2):68-76
11. Dr. Arvindkumar (2005). *Ecology of Plankton*, Daya publication house Delhi – 110035
12. Dr. S. C. Santra (2005). *Environmental science*, New central Book Agency (p Ltd. (London) Kolkata – 700009
13. Edmondson, W. T. 1959. *Fresh Water Biology*. 2nd ed. Jhon wiley and sons. New York. New York 1248pp.
14. ISI (Indian standards Institution), (1982). *Indian standard tolerance, limits for inland surface water subject to pollution*. Second revision, IS: 2296.
15. Kulshreshtra, S. K. and Joshi, M., (1999). Periphyton community of lower lake of Bhopal in relation to sewage pollution. In: *Aquatic Science in India* (Ed. Gopal B and Asthana V) Indian Asso. Limno. and Oceano.
16. Mary Kensa, V., (2011). Inter-relationship between physico-chemical parameters and phytoplankton diversity of two perennial ponds of kulasekharam area, kanyakumari district, tamil nadu. *Plant Sciences Feed*, 1 (8): 147-154
17. Oemke, D.V. and Burtan T. M., (1986). Diatom colonization dynamics in a lotic system. *Hydrobiologia*.139: 153-166.
18. Pahwa D. V. and Mehrotra S. N., (1966). Observation of fluctuation in the abundance of plankton in relation to certain hydrological condition of river Ganga. *Proc. Nat., Acad. Sci. India.B*, 36(2): 157-189.
19. Prescott G.W. 1970. *Algae of the western great Lakes areas*. Pub Cranbrook Institute of science Bulletin. 33: 1-496.
20. Subrahmanyam N. S. and A. V. S. Sambamurty. (2004): *Ecology*. Narosa Publication.
21. Trivedy, R.K. 1993. *Biomonitoring of water pollution in R.K. Trivedy edited, Encyclopedia of Environmental Pollution and Control*. Vol 1 and 2. Environ Media, Karad, India.
22. Dr. Tahilali and Mr. Sumati Narayan (2009). *Manual of soil, plant and water analysis*, Daya publication house Delhi.