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Chapter 3

Comparative Study of Phytoplankton Diversity in a Lentic and Lotic Water Body of Haliyal Taluk, Uttar Kannada District, Karnataka State

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ABSTRACT

Haliyal Taluk is located in Uttar Kannada District, Karnataka State. This taluk has numerous water bodies. Comparative Phytoplankton study was made on Sambrani (Lentic) and Bommanahalli (Lotic) water bodies.

In this present study 31 genera belonging to 5 groups of Phytoplanktons were identified in the Sambrani water body and 25 genera belonging to 5 groups of Phytoplanktons were identified in the Bommanahalli water body.

Relative Phytoplankton diversity assessed by Index of Biototal Diversity was found to be 21.73 per cent for both lentic and lotic water bodies. The status of Organic Pollution based on Palmer's Algal Genus Index for

Sambrani and Bommanahalli water bodies were 22 and 19 respectively, which indicated high organic pollution in Sambrani when compared to Bommanahalli water body.

Keywords: *Phytoplankton, Diversity, Lentic, Lotic, Organic pollution.*

Introduction

Biological monitoring is a valuable method used in conservation studies to protect and preserve the biological integrity of natural ecosystem, which includes preventive measures. Bioindicators of pollutants are useful in predicting the level and degree of pollutants before the effects of the pollutants start, which form large proportions (Pai 2002, Verma 2002, Ward and Whipple 1966).

Qualitative and Quantitative analysis of different groups of organisms have led to the establishment of Bio-indicators, Indices and Systems which can be used to assess the Comparative Diversity and Organic Pollution of water bodies. Different indices have been developed to know the comparative diversity and status of organic pollution. Presently Biomonitoring (Mahadev *et al.*, 2005) and Indices (Kannel *et al.*, 2007) have become an integral part of water quality assessment and forms part of many water pollution studies.

Haliyal Taluk is located in Uttara Kannada District. This Taluk has number of water bodies. Minor Irrigation Division of Haliyal has recognized 36 water bodies. The present study was undertaken on 2 water bodies of Sambrani and Bommanahalli which are Lentic and Lotic respectively to assess the Comparative Phytoplankton Diversity and status of Organic Pollution.

Materials and Methods

Sampling Areas (Figure 3.1)

In this present study, 2 sampling areas were selected

- ☆ *Lentic Water Body:* Sambrani Tank is a perennial pond and has an area of 47.67(Ha).
- ☆ *Lotic Water Body:* Bommanahalli stream is the Backwaters of Bommanahalli Pick Up Dam.

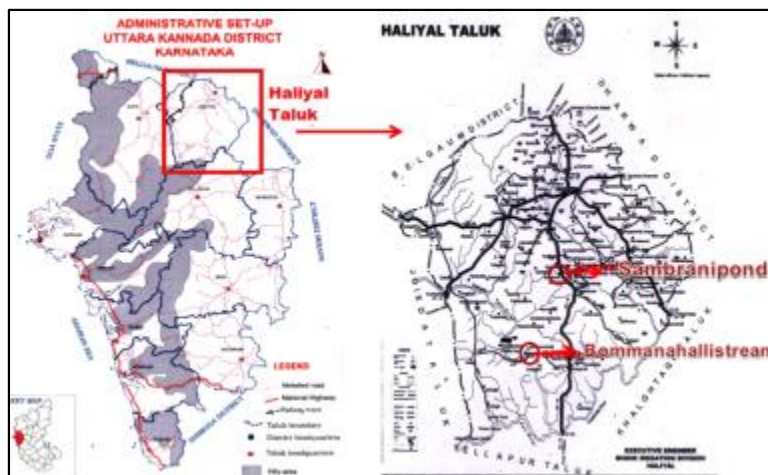


Figure 3.1: Map Showing Sampling Areas

Sampling Method

Grab Sampling method APHA, AWWA, WPCF, 1986) was adopted during collection of water samples. The samples were collected during August 2011.

Phytoplankton Observation

Preparation of sample for Phytoplankton observation was according to Standard methods (APHA, AWWA, WPCF, 1986). Bright Field Microscope was used for Observation and Photography of Phytoplankton Diversity.

Phytoplankton Identification

Phytoplankton in the collected samples were identified according (Leela *et al.*, 2010), (Prescott, 1951), (Smith, 1950), (Philipose, 1967).

Indices

The Comparative Phytoplankton Diversity was assessed by Index of Biotal Dispersity(Koch *et al.*, 1957) and status of Organic Pollution by Palmer's Algal Genus Index (Palmer, 1969).

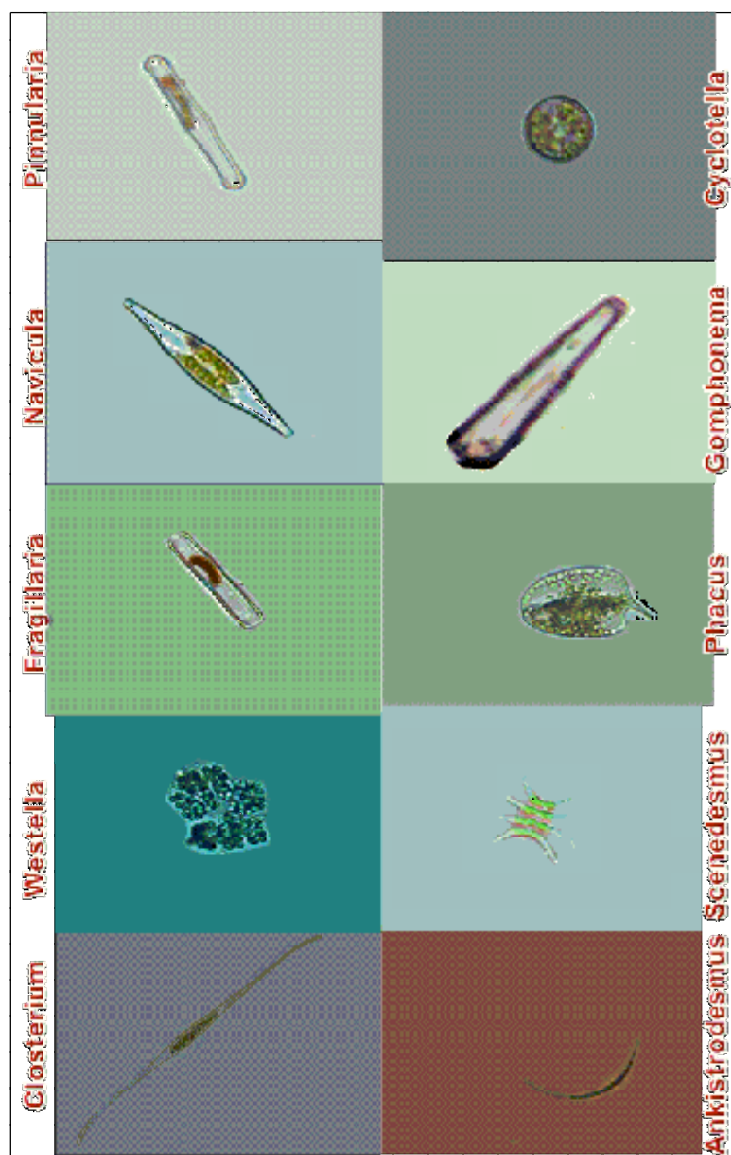


Plate 3.1: Common Genera of Phytoplanktons Found in Both the Water Bodies

Results

In the present study, a total of 56 Genera were observed in the sampling areas of Sambrani Pond and Bommanahalli stream. In which 31 genera were observed in Sambrani Pond and 25 in Bommanahalli stream, as shown in Table 3.1. 11 Genera were common in both the water bodies, as shown in Plate 3.1. In the study, 45 genera were recorded in the sampling areas, out of which 18 genera belonged to Chlorophyta, 2 to Euglenophyta, 21 to Chrysophyta, 2 to Pyrophyta and 2 to Cyanophyta, as depicted in Table 3.2. The Comparative phytoplankton diversity in the sampling areas was found to be 21.73 per cent.

Table 3.1: Phytoplankton Diversity in the Sampling Areas

Name of the Water Body	Phytoplankton Groups					Total No. of Genera
	Chloro-phyta	Eugleno-phyta	Chryso-phyta	Cyano-phyta	Pyro-phyta	
Bommanahalli	9	1	13	1	1	25
Sambrani	13	2	14	1	1	31

Table 3.2: List of Phytoplankton Genera and their Occurrence in the Study Areas

Sl No. Phyla	Genera	Bommanahalli (Lotic)	Sambrani (Lentic)
1. Chlorophyta	Nannochloris	—	+
	Chaetosphaeridium	—	+
	Chlorococcum	—	+
	Golenkinia	+	—
	Schroedira	+	—
	Pediastrum	—	+
	Westella	+	+
	Oocystis	—	+
	Ankistrodesmus	+	+
	Scenedesmus	+	+
	Gonatozygon	+	—
	Sphaerosoma	+	—

Contd...

Table 3.2–Contd...

<i>Sl. No. Phyla</i>	<i>Genera</i>	<i>Bommanahalli (Lotic)</i>	<i>Sambrani (Lentic)</i>
	Staurostrum	–	+
	Cosmarium	–	+
	Tetrastrum	+	–
	Closterium	+	+
	Pandorina	–	+
	Tetrallanthos	–	+
2. Euglenophyta	Euglena	–	+
	Phacus	+	+
3. Chrysophyta	Chorallanthus	–	+
	Melosira	–	+
	Merdion	–	+
	Biddulphia	–	+
	Cyclotella	+	+
	Diatoma	+	–
	Ophephora	+	–
	Fragillaria	+	+
	Synedra	+	–
	Rhoicosephenia	+	–
	Cocconeis	–	+
	Diploneis	+	–
	Navicula	+	+
	Pinnularia	+	+
	Stauroneis	+	–
	Frustulia	+	+
	Gomphonema	+	+
	Cymbella	–	+
	Amphora	–	+
	Rhopalodia	–	+
	Nitzschia	+	–
4. Pyrophyta	Peridinium	–	+
	Ceratium	+	–
5. Cyanophyta	Anabaena	+	–
	Microcystis	–	+

+: Present –: Absent

Out of total 56 genera, 9 genera occurred as pollution indicators in the Bommanahalli stream and 11 in Sambrani Pond. Based on Palmer's Algal Genus Index, the status of Organic Pollution was found to be 19 in Bommanahalli stream and 22 in Sambrani Pond.

Table 3.3: Indicators of Organic Pollution

<i>Name of the Water Body</i>	<i>Total No. of Genera</i>	<i>Palmer's Algal Genus Index</i>
Bommanahalli	9	19
Sambrani	11	22

Discussion

According to Tables 3.1 and 3.2, the Chrysophyta group of Phytoplankton dominated in both the water bodies, however in Sambrani pond, members of Chrysophyta were dominant followed by members of Chlorophyta. In both the waterbodies there was low diversity of Euglenophyta, Cyanophyta and Pyrophyta members. The comparative phytoplankton diversity was found to be 21.73 per cent., indicating the difference in habitat and location of sample areas where in one is lentic and the other is lentic. The lentic water body (Sambrani) is located in the vicinity of Village, therefore there is in the anthropogenic activities and the number of Phytoplankton genera recorded is high.

The result clearly reveals that according to Palmer's Algal Genus Index, in the Lentic water body (Bommanahalli), since it is present in the forest area, probably indicates less organic pollution. Therefore an increase in the number of Phytoplankton genera obtained is comparatively low in comparison to Sambrani Pond.

According to Table 3.3, 9 genera occurred as organic pollution indicators in Bommanahalli stream, whereas 11 genera in Sambrani Pond. Based on Palmer's Algal Genus Index, the status of Organic pollution was high in Sambrani pond, because of sewage load and garbage Dumping. Intermediate levels of organic pollution occurred in Bommanahalli stream, due to minimal Human activities. A similar result on Organic Pollution has been indicated by Vaishali and Madhuri (2007).

Conclusion

Sambrani (Lentic) and Bomannahalli (Lotic) has a rich diversity of Phytoplankton and the comparative diversity was 21.73 per cent. The Level of Organic pollution based on Palmer's Algal Genus Index was comparatively higher in Sambrani (22) than Bomannahalli (19). The results of present studies indicate that the Lentic and Lotic water body is threatened ecologically due to various anthropogenic activities, which has led to organic pollution.

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References

- Anonymous, 1986. *Standard Methods for the Examination of Water and Wastewater*, 16th Edn. APHA, AWWA and WPCF, New York. 1044 pp.
- Gilbert, M. Smith, 1950. *The Freshwater Algae of the United States*. McGraw-Hill Publications, Inc., New York, Toronto, London.
- Kannel, P.R., Lee, S., Lee, Y.S., Kannel, S.R. and Khan. S.R, 2007. Application of water quality indices and dissolved oxygen as indicators of river water classification and urban impact assessment. *Environ. Monit. Assess*, 132: 1–3.
- Koch and Leo Francis, 1957. Index of biotal dispersity. *Ecology*, 38: 145–148.
- Leela, J.B., Surekha, N.D. and Anjali, B.S., 2010. Phytoplankton diversity of in four lakes of Satara district, Maharashtra state. *The Bioscan*, 5(3): 449–454.
- Mahadev, J. and Hosmani, S.P, 2005. Algae for biomonitoring of organic pollution in two lakes of Mysore city. *Nat. Environ. Pollut. Technol.*, 4: 97–99.
- Pai, I.K., 2002. *Ecology of Polluted Water*, (Ed.) Arvind Kumar. A.P.H. Publishing Corporation, New Delhi.
- Palmer, C.M., 1969. A composite rating of algae tolerating organic pollution. *J. Phycol.*, 5: 78–72.
- Philipose, M.T., 1967. *Chlorococcales*. Indian Council of Agricultural Research, New Delhi.

-
- Prescott, G.W., 1951. *Algae of the Western Great Lakes*. Cranbrook Institute of Science, London.
- Vaishali, S. and Madhuri, P., 2007. Evaluation of pollution in the Lake Masunda, Thane (Maharashtra). *J. Ecobiol.*, 20(2): 163–166.
- Verma, J.P., 2002. *Ecology and Ethology of Aquatic Biota*, Vol. 1. (Ed.) Arvind Kumar, Daya Publishing House, New Delhi.
- Ward, H.B. and Whipple, G.C., 1966. *Freshwater Biology*, 2nd edn. (Ed.) W.T. Edmondson. John Wiley and Sons, Inc., New York.