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Ecology of Bannerghatta Kavalkere Pond in Relation to Bacterial Population

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Abstract:
The population of bacterial community in water of Kavalkere pond, Bannerghatta National Park was studied. Their abundance largely depend on the physico-chemical conditions prevailing in the water of the pond. The coliforms were found to be higher. The study shows the importance of heterotrophic food chain in the trophic characteristics of a lentic water system.

Keywords*: Bannerghatta, Bacteria, Coliforms, population, physic-chemical, trophic, food chain*

1. Introduction

Kavalkere pond is in Bannerghatta Biological Park which is part of Bannerghatta National Park located 22km south of Bangalore. It was declared as National Park in 1971 by Government of Karnataka for the conservation of wildlife. National Pars play an important role in educating the public about the conservation of wildlife along with providing recreation.

Bannerghatta National Park has several perennial water bodies, amongst them Kavalkere which is situated in the Zoo area was selected for the present study. Bacteria act as decomposers in a heterotrophic food chain of an aquatic system. Therefore it is important to study different bacterial population of a water body to understand the ecological status of the water body. Several workers have studied bacterial characteristics of drinking water bodies. Few like Ayyappan, Manoharachary have contributed to bacteriological analysis of ponds and lakes in India. This is a rare study as it involves habitat of a National Park or a Wildlife spot contributing a bit in developing strategies for the proper management of National Parks and conservation of wildlife in the country.

2. Materials and Methods

Water samples were collected in sterilized glass bottles at monthly intervals for one year. Physico-chemical analysis and bacterial enumeration were undertaken following standard methods of APHA. Bacterial enumeration was done by 'serial dilution and plating technique' and 'most probable number (MPN)' method. Dilutions of water samples used were 10^{-1} and 10^{-2}. Sterile petri plates with respective agar media for different types of bacteria inoculated with diluted water samples were incubated in a bacteriological incubator at 37°C for 24 hr and then colony forming units were counted. For MPN method sterile tubes containing liquid broth media inoculated with diluted samples were incubated in incubator for 48hr to 72hr and MPN were estimated using standard MPN table.

3. Observations and Discussion

The findings of physico-chemical characteristics of water are given in Table 1 in the form of ranges of parameters.

Parameters	Values (range)
Water temperature(°C)	20.0 – 27.2
pH	7.4 – 8.6
Free CO_2 (mg l^{-1})	0.0 – 8.2
Conductivity (µ mho cm^{-1})	115.28 – 426.39
Total alkalinity (mg $CaCO_3$ l^{-1})	48 – 152
Nitrate-nitrogen (mg l^{-1})	Traces – 0.26
Phosphate (mg l^{-1})	Traces to 0.29
Silica (mg l^{-1})	0.01 – 1.3
Total iron (mg l^{-1})	0.02 Traces to 0.9

Dissolved O_2 (mg l^{-1})	6.8 – 10.83
Dissolved organic matter	2.3 – 8.9

Table 1: Physico-chemical characteristics

3.1. Physico-chemical analysis reveals that water of the pond is not polluted.
The bacterial properties are given in Tbale 2 in the form of range of values and discussed in detail below

Sl. No.	Type of Bacteria	Counts (No. ml^{-1}) - range
1	Total Coliforrms	65 – 250 (950)
2	Aerobic heterotrophic bacteria	250 – 630 (2000)
3	Nitrogen fixing bacteria – Aerobic	18 – 93
	Anaerobic	10 – 45
4	Ammonifying bacteria	220 – 450 (1240)
5	Nitrifying bacteria	8 – 30 (140)
6	Ureolytic bacteria	130 – 360 (850)
7	Phospholytic bacteria	6 – 36 (185)
8	Methanogenic bacteria	3 – 32
9	Iron bacteria	3 - 28

Table 2: Bacteriological properties (No. in the bracket indicate maximum)

3.2. Total coliforms
Coliforms are generally estimated from a water body to check its potability as it is an indiator of contamination of water by faecal matter. Water of Kavalkere pond Colifirms in the range between 65 – 250 per ml of water with a maximum of 950 in July. It is higher due to the washings of Zoo area that is lead to the pond contain animal faecal matter. Further in the rainy season it is maximum.

3.3. Aerobic heterotrophic bacteria
Aerobic heterotrophic bacteria numbers varied in a range of 250 – 630 per ml. During rainy season hetrotrophic bacteria number increased with a maximum 2000 per ml in August. This may be due to more dissolved oxygen content of water during rainy season.

3.4. Nitrogen fixing bacteria
Water contained aerobic nitrogen fixing bacteria in the range of 18 - 93 per ml and anaerobic nitrogen fixing bacteria in the range of 10 – 45 per ml and their numbers were more in summer than in winter and rainy season. The study showed the contribution of these bacteria in nitrogen fixation.

3.5. Ammonifying bacteria
Ammonifying bacterial counts 220 – 450 per ml was higher due to washings of zoo area bringing in more organic matter which probably provides substrate for these bacteria.

3.6. Nitrifying bacteria
The counts of nitrifying Nitrobacter were varied from 8 – 30 per ml with a maximum of 140 per ml during July-December. These counts were slightly higher due to high counts of ammonifying bacteria which make the required substrate for Nitrobacter available.

3.7. Ureolytic bacteria
Number varied from 130 – 360 per ml with a maximum 850 per ml observed in June. The number was higher during summer season when water temperature was high. The higher number of ureolytic bacteria were also coinciding with the higher number of ammonifying bacteria , both actively engaged in decomposing activity.

3.8. Phospholytic bacteria
They varied between 6 – 36 per ml with a maximum of 122 noticed in July. These are the bacteria that are responsible for solubilising inorganic phosphate. Their presence also corresponds to the phosphate content of water.

3.9. Iron bacteria
The number of iron bacteria were low, ranging from 3 – 28 per ml.

3.10. Methanogenic bacteria
Methanogenic bacteria numbers range from3 – 32 per ml. Their presence may be due to animal faecal matter coming with washings from zoo area, which provide substrate for their activity.

4. Conclusion

The physico- chemical analysis of water showed that water of Kavalkere is not polluted even though washings of Zoo area carry animal faecal matter adding to the organic content in the pond. This is mainly because of the activities of ammonifying bacteria, ureolytic bacteria and methanogenic bacteria which cause the decomposition of organic matter leading to satisfactorily good water quality. From this it also evident that most of the coliforms present in the water are not of faecal origin.
If the release of Zoo are washings to the pond is avoided the water can be used to feed the animals.

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