Status of Wetlands of Urban Coimbatore, Tamil Nadu and Their Characterization

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Abstract
The urban wetlands of Coimbatore, Tamil Nadu are fed by the Noyyal River that originates from the Western Ghats of India. Many of these wetlands support rich flora and fauna which will be greatly affected by degradation of water quality. Water samples were drawn periodically and analyzed for the pollution parameters (DO, BOD, COD, TDS etc.). The results showed that the Singanallur Lake recorded high nitrates (21.52 mg/l) which is above the WHO standards. Likewise, the heavy metal content in the water samples was found to be higher than the WHO standards for drinking water quality. Of the ten lakes studied, Valankulam Lake registered highest pathogenic bacteria population. *Eichhornia crassipes* and *Pistia sp.*, the aquatic weed was found to grow under contaminated condition. About 125 species of birds have been spotted during the study period.

Keywords: Birds, Characterization, *E. crassipes,* Pollution, Wetlands

Introduction

Coimbatore, the textile capital of South India, is rich with 10 wetlands (1.Sulur 2.Singanallur 3. Valankulam 4.Kuruchi 5.Periyakulam (also known as Ukkadam big tank) 6.Krishnampathy 7.Narasampathy 8.Kumaraswamy (Muthannankulam) 9.Selvachinthamani and 10. Perur), mostly fed by the Noyyal River. These 10 lakes are within the Coimbatore Corporation limit. The Noyyal's canals feed the lakes; most of them are inter-connected and fill one after the other by natural (Due to topographical nature of the soil and also Coimbatore lies at the foot of the Western Ghats) gradient . The lakes cover an area of 2000 acres, thousands of which are within the city limit itself. These interconnected tanks, their canals and rivulets also form an active flood buffer for the river. Over a period of time, these wetlands came to house a lot many species of birds, fish and other life forms in pristine glory. The main industries in the city comprise of textile mills, foundries, and manufacturing industries. The city lacks proper drainage system and the facilities for treatment of industrial, municipal, domestic and hospital wastes. No integrated sewage system has been designed yet. The existing drainage and sewage systems are of open type and discharge wastes into lakes, wetlands and Noyyal River without proper treatment. Wetlands are being lost and the population of migratory birds visiting the wetlands has reduced tremendously. Proper measures need to be taken in order to protect the wetlands. Collaboration of the government with villagers, a structured action plan for those violating the law, declaring wetland sites as community reserve will save both the wetlands as well as the birds related to them. Lack of proper attention and action can lead to the loss of wetlands forever (Bharani *et al.,* 2012).

Most of these wetlands get dried in summer and serve as dumping land for garbage and industrial wastes. The bunds of many wetlands are used for open defecation by humans as well as animals. The quality of wetlands is so degraded that they are not suitable for drinking purposes. Many of these wetlands support rich flora and fauna, the flora and fauna will be greatly affected by degradation of water quality (MacKenzie and Banner, 2000). In addition, the degradation of surface water poses more stress on groundwater and results in over-exploitation of ground water for domestic and agricultural purposes. In 1980's UNDP warned that Coimbatore district has the record of fastest depleting groundwater level in the world.

The expanding city, the need for water and basic amenities increased and has reached to such a level that the city is dependent on the water primarily from 3 dams constructed at the foothills of Western Ghats (Siruvani Dam, Athikadavu and Pillur). People forgot about these huge networks of lakes and the locals dump trash into these lakes. These lakes, which were the source of sweet water a century ago, are filled with dark water clogged with all sort of industrial wastes, which is the source of foul smell around. The lakes have become an integral part of the city drainage system. Encroachment is another serious trouble faced by these lakes, many of the people living nearby, are extending their cultivation lands and houses in the fertile flood plains of these shrinking lakes. Water

hyacinth is another major problem in many of these lakes.

Materials and Methods

Survey was undertaken to collect water samples from the ten lakes in and around Coimbatore city at different periods (The water samples from the lakes were collected starting from June 2011 to January 2013 summer, winter and monsoons of NE and South West). Water samples were collected from each lake at ten different locations covering the total area of the lakes in pre-cleaned containers of 1L capacity. The samples were transferred to the laboratory and analyzed for various physico-chemical parameters by standard methods. The parameters analyzed include pH, EC, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), chlorides (Cl), sulphates (SO_4), nitrates (NO_3), phosphates (PO_4), Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), carbonates (CO_3) and bicarbonates (HCO_3), salinity, alkalinity and heavy metals (Pb, Cd, Cr and Ni). The water samples were also assessed for the presence of pathogenic bacteria *viz.,* Coliforms.

As these lakes attract migratory birds, the arrival of different birds during the sampling period was assessed and the birds were identified. Some of the lakes were found to be contaminated to the maximum. Screening was done using a few aquatic plants to decontaminate the lake waters.

Results and Discussion

Observations reveal that a few lakes namely Perur, Selvachinthamani and Narasampathy lakes were dry during the months of June, July and August 2011 and 2012. On analysis the lake waters showed higher concentration of phosphate, nitrate, chloride and sulphates. Based on the Ca, Mg and Na combining with carbonates, bicarbonates and chlorides, the lakes can be categorized as either magnesium chloride type or sodium carbonate type. Ukkadam and Sulur Lake can be classified as NaCl type. The reasons for the contamination of lake the water is mainly due to agricultural run-off, mixing of industrial effluents and also anthropogenic activities. These practices have led to the degradation of water quality and it becomes evident that the water from these wetlands does not fulfill the requirements of drinking water standards. The water from these wetlands is used for irrigation purpose in the nearby areas. Perur and Selvachinthamani Lake comes under Mg (HCO_3) type while all the other lakes come under MgCl type.

The heavy metal concentrations (Cd, Ni, Pb and Cr) in all the lakes were found to be high (WHO standard 0.05mg/l) (Table 1). It indicates that water is unfit for drinking (all these lakes were once drinking water sources for the people). There is possibility of accumulation of metals in the tissues of fishes grown in these lakes.

Nitrates in the water samples ranged from 4.2mg/L to 22.4mg/L, the highest value was found to be in the Singanallur wetland sample followed by Kumaraswamy Lake (21.52mg/L) during the month of August 2012 (Fig.1). High values of nitrates more that 45mg/L may lead to Methaemoglobinaemia or Blue baby syndrome in infants. Nitrate concentration reduced drastically in the month of January 2013 invariably in all the lakes. The Total Dissolved Solids content was high in all the lakes (above the WHO standard of 500 mg/l prescribed for drinking water). Different aquatic plants were screened for their suitability in removing the pollutants showed that *Pistia* and *Eichhornia* were able to withstand the polluted waters. Prasad and Freitas, (2003) showed that *Alternanthera philoxeroides* was best used for removal of Pb and Hg from wetlands contaminated with metals.

Migratory birds spotted during the study period

The Coimbatore urban wetlands harbor more than 125 species of resident and migratory birds, with August to October being the peak season. Spot-billed Pelican, Painted Stork, Open Billed Stork, Ibis, Spot-billed Duck, Teal, Black Winged Stilt are a few species of the migratory birds that visit these lakes.

Conclusions

Urban lakes of Coimbatore can be classified based on the high quantity of Ca, Mg and Na ions in combination with carbonates, bicarbonates and chlorides. Ukkadam and Sulur Lake can be classified as NaCl type. Perur and Selvachinthamani Lake comes under Mg (HCO_3) type while all the other lakes come under $MgCl_2$ type. Nitrates concentration was recorded high in Singanallur Lake while phosphate was found to be high in Ukkadam and Kuruchi lakes. The Total Dissolved Solids content was high in all the lakes (above the WHO standard of 500 mg/l prescribed for drinking water). The heavy metal concentration (Cd, Ni, Pb and Cr) in all the lakes was found to be high (WHO standard 0.05mg/l).

Table 1: Concentration of Heavy metals in the lake waters

No.	Lakes	Heavy metals (mg/l)			
		Cd	Pb	Cr	Ni
1.	Sulur	0.185	0.93	0.01	0.18
2.	Singanallur	0.190	0.955	0.07	0.25
3.	Valankulam	-	2.29	0.10	0.08
4.	Kuruchi	0.22	1.766	0.08 µg	0.12
5.	Ukkadam	0.190	0.966	0.27	0.72
6.	Krishnampathy	0.21	1.76	0.17	0.83 µg
7.	Kumaraswamy	0.185	1.22	0.22	0.20
8.	Narasampathy	0.235	1.61	0.10	0.05
9.	Selvachinthamani	0.23	1.06	0.30	0.19
10.	Perur	0.34	2.26	0.21	0.07

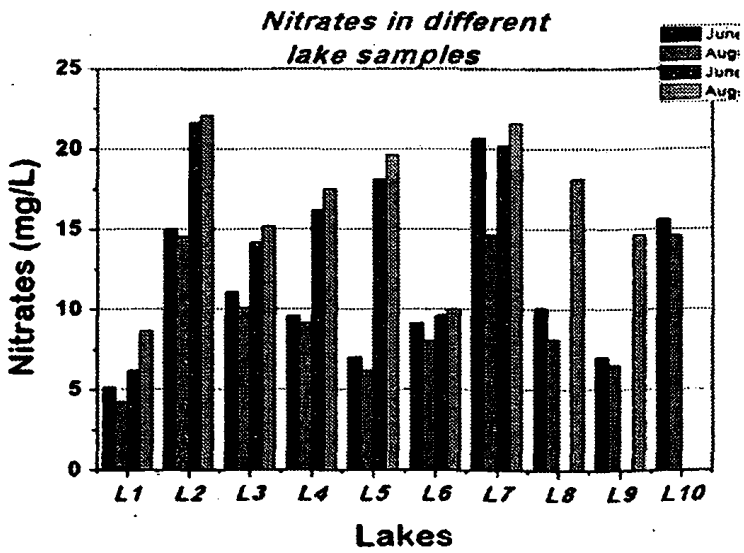

Figure 1: Nitrate content in different lakes

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