

Microbes in Wastewater and Waste Treatment, Bioremediation and Energy Production (MWT 2011)

JANUARY 24 -27 2011

Organized by



**International
Water Association**



ABSTRACT BOOK

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**DEUTSCHE GESSELLSCHAFT FUR INTERNATIONALE
ZUSAMMANARBEIT NEW DELHI, INDIA**

Water treatment potential and phytoplankton dynamics of tropical sewage-fed urban water bodies

Durga Madhab Mahapatra¹, HN Chanakya^{1,2,3} and TV Ramachandra^{1,2,4}

1-Centre for Sustainable Technologies,

2-Centre for Infrastructure, Sustainable Transport and Urban Planning

3-Centre for Contemporary Studies

4-Centre for Ecological Sciences

Indian Institute of Science, Bangalore 560 012, India

Increasingly large number of urban water bodies now receives sewage and water levels in such water bodies are sustained by daily inputs of inadequately treated sewage, especially in most developing country situations. In many instances these water bodies function as “variable-zone” anaerobic-aerobic lagoons suffering several macrophyte, biotic and abiotic stresses. We studied two such lakes in Bangalore (Bellandur-500ha and Varthur-300ha) to understand if such an occurrence could be turned to a benefit where water levels in them are maintained constant while water discharged undergoes effective treatment and the overall functions and aesthetics of such hypertrophic water bodies are still maintained. Sewage is received at 180-250mg/L and discharged at 25-80mg/L COD/BOD in different seasons. In this paper we studied the role of seasons, phytoplankton dynamics and macrophyte cover on the function of the lake to remove organic loads and render the discharge water capable of being re-used. The water quality, nutrient status (N&P), trophic status, algal species composition, algal biomass and photosynthetic activity (primary productivity), macrophyte cover and interference etc. were studied at monthly intervals for two years 2009-2010. Spatial-temporal fluctuations of selected physical and chemical variables, associated with biological variables such as phytoplankton species composition, phytoplankton biomass, community analysis, phytoplankton primary production and chlorophyll-a were analyzed. The water transparency was low and rarely exceeded 20 cm in sewage-fed Varthur and Bellandur lake compared to 1.5 m at TG Halli (control). Conductivity values showed a clear cut gradation between the lakes with the highest values in Varthur (~1200 $\mu\text{S}/\text{cm}$, TG Halli ~ 430 $\mu\text{S}/\text{cm}$). The oxygen deficiency, and sometimes anoxia, recorded from surface samples resulted in high quantities of $\text{NH}_4\text{-N}$ (30-40mg/L) and phosphate (0.5-3 mg/L) - characteristics of anoxic hypertrophic urban lakes. The fecundity favoured high phytoplanktonic community characterized by small cells (<10 μ ; *Chlorella* and *Anacystis*- highest numbers). Euglenophyta (>30 μ), were concentrated mostly at stagnant zones. Chlorophyll-a concentrations are among the highest reported for the Bellandur and Varthur lake which is a outcome of high proportions of Chlorophyta and Euglenophyta due to eutrophied conditions. The water quality parameters were studied and represented in a grid to show that the lake could be clearly demarcated into an initial anaerobic zone (40% area), a facultative zone (20%) and a 40% aerobic zone using various GIS /bathymetric techniques. During summer this pattern is covered by floating macrophytes converting the lake into an anoxic/ anaerobic water pool subduing the water purification function as well as aesthetics. We conclude that with minimal maintenance, even such sewage-fed water bodies could be used to treat urban wastewater, maintain water balance in these semi-arid ecosystems, provide aesthetics and finally pave way for water reuse in the vicinity.