A study of some physical, chemical and biological parameters of an abandoned water filled quarry at Dehiwala zoo, Sri Lanka.

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Abstract

This study focuses on the water quality of an abandoned water filled quarry (reservoir) in the National Zoological Gardens, Dehiwala, Sri Lanka with a view to effectively use and manage it as part of the Zoo Development Programme. This reservoir daily receives animal wastes from cage washings and from droppings of roosting birds.

Selected Physical (turbidity, temperature, total suspended solids), Chemical (conductivity, pH, dissolved oxygen, BOD_5, NH_3-N, NO_2-N, NO_3-N, PO_4^{-3} and K) and Biological Parameters (Chlorophyll content in terms of Chlorophyll 'a', diversity and abundance of zooplankton and fish and birds living in association with the Zoo reservoir) were analysed fortnightly for a period of four months. Water samples were analysed from six selected sampling stations, which included three inlets and one outlet.

During the study period the minimum and maximum values observed were turbidity 25 – 4184 mgl^{-1}; temperature 25 – 31 ° C; Total Suspended Solids 20 – 844.1 mgl^{-1}; conductivity 295 - 1450 μscm^{-1}: pH 6.1 – 6.9: dissolved oxygen 0 – 7.9 mgl^{-1}; BOD_5 25 - 45 mgl^{-1}; NH_3-N 3 – 45 mgl^{-1}; NO_2-N 1.06 -126.7 mgl^{-1}; NO3-N 3.43 – 54.19 mgl^{-1}; $PO4^{-3}$ 35 -36.18 mgl^{-1}; K 9.557 – 15.252 mgl^{-1} and Chlorophyll content 0 – 5.119 mgl^{-1}.

The DO content, chlorophyll content and temperature reduced where as NH_3–N, NO_2-N, PO^{-3}_4, conductivity, total suspended solids and turbidity increased towards the bottom. BOD_5, pH, NO_3–N, K showed a uniform distribution within the reservoir. Zooplankton were represented by eight species of rotifers(*Asplanchnopus multiceps, Asplanchna brightwelli, Brachionus angularis, Brachionus clayciflorus, Brachionus*

falcatus, Filinia longiseta, Sinantherina semibullata, Polyarthra species), one species of calanoid copepod and one species of cladoceran (*Moina micrura)*. Rotifers were the most abundant group of zooplankton. Eight species of fish were recorded of which four species are indigenous (*Anabas testudineus, Anguilla bicolar, Channa gachua* and *Heteropneustes fossilis*) and four are introduced (*Poecilia reticulata, Oreochromis mossambicus, Osphronemus goramy* and *Trichogaster pectoralis*). *Oreochromis mossambicus* (tilapia) and *Poecilia reticulata* (guppy) were the most abundant. Fourteen species of aquatic birds were associated with the reservoir.

A Chemical Water Quality Index (CI) using eight parameters (temperature, conductivity, pH, % dissolved oxygen, BOD_5, NH_3-N, NO_3-N and PO_4^{-3}) was computed using the method of Batch (1980) to assess the level of pollution of the reservoir. The mean value of this Index obtained for the reservoir was 10.7545, which falls into the water quality class 1V, indicating that the reservoir is highly polluted.

Based on this information it is evident that the water cannot be used for human or animal consumption and for the purpose of washing the cages without treatment. However since the cost of treatment would be prohibitive it is recommended to use this water in barrier moats of animal enclosures and recreational ponds. The quality of the water could be improved by the use of simple bio filtration techniques such as introduction of aquatic plants, detritivorous fish and mussels. The aesthetic value of the reservoir itself would be enhanced by the presence of aquatic plants.