

Levels and Distribution of Heavy Metals in Weija Reservoir, Accra, Ghana

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Abstract

Reservoirs are normally subjected to various forms of degradation due to pollution arising from anthropogenic activities. Heavy metals are of particular concern because of their potential toxic effect and ability to bio-accumulate in aquatic ecosystems. Agricultural activities around the Weija reservoir and municipal waste leachate intrusion have been reported. Investigations were therefore conducted to determine the levels and distribution of heavy metals in the Weija reservoir. Specific heavy metals were determined in water, suspended particles, sediments and fish species using Flame Atomic Absorption Spectrophotometry. Mercury was analysed with a mercury analyser, which uses cold vapour. The result showed that the concentrations of metals were greater in sediment than the suspended particles and reservoir water; Cd, Cu, Ni, Pb and Zn were all below the chronic freshwater quality criteria for aquatic life. Iron (Fe) and Mn were the most abundant elements associated with the suspended solids, while Cd was the least. With the exception of Cu and Cd that were not detected in the fish species, the other metals were found at varying concentrations, but within acceptable thresholds. The concentrations of heavy metals in the various fish and prawn species were ranked in the following order: *Parachanna obscura* > *Macrobrachium rosenbergii* > *Chrysichthys nigrodigitatus* > *Clarias batracus* > *Clarias gariepinus* > *Hemichromis fasciatus* > *Sarotherodon melantheron*. There were significant positive correlation between the following metals in water; Pb and Zn ($r=0.66$), Cr and As ($r=0.52$). Evidence from principal component analysis (PCA) suggested that two key source factors, characterised as related to mining and municipal solid wastes, underpinned heavy metal contamination in the Weija reservoir. Thus, illegal small-scale mining along the tributaries feeding the Weija reservoir affected the quality of water received in the reservoir.