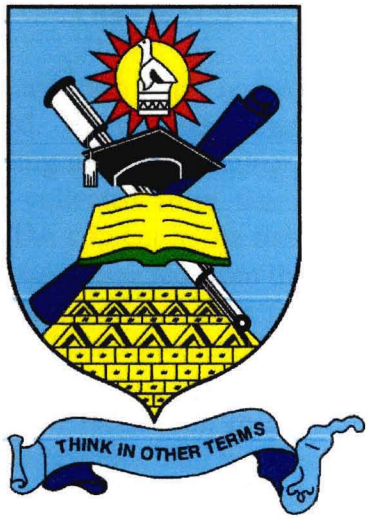

SOME ECOTOXICOLOGICAL ASPECTS OF SELECTED FRESHWATER BODIES AROUND BULAWAYO

BY

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ABSTRACT

Between December 2000 and January 2001 active and passive biomonitoring of four dams around Bulawayo were performed. Heavy metal and pesticide residue content were measured in sediment, water, floating and non floating plants and two species of fish, *C. gariepinus* and *O. mossambicus*, collected from the four dams. Also measured were antioxidant enzyme activity and MDA content in the fish, *C. gariepinus*, a benthic species, and *O. mossambicus,* a pelagic species, collected from the dams. The dams were chosen to include Umguza Dam - a traditionally polluted dam fed by domestic effluent, industrial effluent and sewage works effluent; Umzingwane Dam - one of the sources of drinking water for Bulawayo City; Wright Dam - a privately owned dam on a private farm and Matopo Dam - a dam used mainly for recreation. In general, it was found that sediment contained higher metal and pesticide residues than water and non-floating plants contained higher levels of metal and pesticide residues than floating plants. *O. mossambicus* bioaccumulated higher metal and pesticide levels when compared to *C. gariepinus*. There was occasional gender dependence of metal accumulation with females accumulating more metals than males. Except for Cd, the levels of metals in the fish were within the maximum residue limits recommended for human consumption. The relatively high levels of Cd however, were within the daily intake levels recommended by WHO hence do not pose a risk for human health. The antioxidant enzymes, CAT and Se-GPX as well as MDA concentrations were consistently higher in gills of *O. mossambicus* compared to *C. gariepinus.* The higher oxidative challenge caused by the higher metal body burden in *O. mossambicus* resulted in higher antioxidant enzyme activities and in higher MDA - an indication that the fish were in danger of lipid peroxidation. In other experiments, snails, *Lymnaea natalensis,* were exposed to sediment and water collected from four different sites in each of the four dams for 30 days. Heavy metals, pesticides and antioxidant enzyme activities were determined in tissues of the snails. No pattern could be established in terms of the order of metal bioaccumulation in the snails exposed to sediment and water collected from different sites in the dams. However, Fe was the most bioaccumulated metal in snails exposed to sediment and water collected from Umguza Dam and Umzingwane Dam whilst Ni and Cu were the most abundant in those snails exposed to sediment and water collected from Matopo Dam and Wright Dam respectively. The high levels of Cu in snails exposed to sediment and water collected coincided with highest mortality of snail (59%) in Wright Dam. Ni was the most bioaccumulated metal in snails exposed to Matopo Dam and this coincided with the lowest mortality rate of 7% indicating that Ni might have limited toxicity in snails. Cd was the least bioconcentrated metal in snail tissue in all dams other than in snails exposed to Wright Dam sediment and water. Bioaccumulatiom of metals by non-floating plants was greater than that of floating plants. There were occasional but not consistent site-related differences in the antioxidant enzyme activities (catalase, glutathione peroxidase and DT-diaphorase) in snails exposed to different sites of the dams. In one dam (Umzingwane) no differences in the antioxidant enzyme activities could be found in snails exposed to the four different sampling sites. Overall, this study confirmed some laboratory based observations whilst also showing that a simple relationship between pollution and antioxidant enzyme activity in different tissues of fish in the field may not be possible.