LIMNOLOGICAL ASPECTS AND TRACE ELEMENT ANALYSIS OF SOME SELECTED KENYAN NATURAL INLAND WATERS

BY

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This thesis reports the study of trace elements: Ag, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sn and Zn, and some limnological factors in surface water and sediments in some selected natural inland waters in Kenya. The observed levels are compared with those that are reported in literature to cause interference in biological processes in aquatic environments and human beings. There are little previous data and none that are coherent. These data allow for a preliminary assessment of the significance of each element and limnological parameters in the long term stability of the environments in which they occur.

XRFA and AAS have been used in the trace elements analysis and the former proved superior in the sediment (solid) samples analysis due to better accuracy and precision of less than 10%. Trace metals concentration (ppb) in the surface inland waters (rivers and lakes) ranged as follows: Ag (1-75), Cd (2-8), Co (6-23.2), Cr (25-50), Cu (5-57.6), Mn (50-3276±450), Ni (13-34.1), Pb (7-93.6), Sn (300-500) and Zn (25 - 124.8). Lake sediments had the following concentration (ppm) ranges: Ag (0.098-20.58), Cd (0.188-1.345), Co (0.166-1.632),
Cr (1.462-57.310), Cu (1.949-44.350), Mn (667.670-4713), Ni (11.694-56.710), Pb (10.920-192), Sn (17.210-234) and Zn (76.210-229.60). Results show that, a part from the Rift Valley saline lakes, Kenyan natural inland waters meet the WHO (1971) drinking water standards, and standards related to the aquatic living environments. Concentrations of some trace metals: Ag, Cd, Cu, Mn and Zn change upon raw water treatments.

Preconcentration techniques have been attempted in which preconcentration by evaporation followed by lyophilization of the liquid (water) samples was found more suitable. Bioavailable (total exchangeable) metal concentrations compared very well with the concentrations in the fish muscles.

Comparison with the analysis made by earlier investigators indicated a remarkable constancy over time in the chemistry of Lake Victoria and its affluent rivers. Kenyan natural inland waters have been divided limnologically into dilute (with conductivities less than 1000μS cm⁻¹) and saline (with conductivities more than 12500 μS cm⁻¹) groups on the basis of the amounts of dissolved salts (electrical conductivities). The true status of
biologically valuable electrolytes in the lakes has been found much lower than it might first appear from electrical conductivity measurements. Diel changes of some limnological parameters are also reported.