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Levels of Heavy Metals and Arsenic in Sediment and in Clarias Gariepinus, of Lake Ngami

Authors : Nashaat Mazrui, Oarabile Mogobe, Barbara Ngwenya, Ketlhatlogile Mosepele, Mangaliso Gondwe

Abstract : Over the last several decades, the world has seen a rapid increase in activities such as deforestation, agriculture, and energy use. Subsequently, trace elements are being deposited into our water bodies, where they can accumulate to toxic levels in aquatic organisms and can be transferred to humans through fish consumption. Thus, though fish is a good source of essential minerals and omega-3 fatty acids, it can also be a source of toxic elements. Monitoring trace elements in fish is important for the proper management of aquatic systems and the protection of human health. The aim of this study was to determine concentrations of trace elements in sediment and muscle tissues of Clarias gariepinus at Lake Ngami, in the Okavango Delta in northern Botswana, during low floods. The fish were bought from local fishermen, and samples of muscle tissue were acid-digested and analyzed for iron, zinc, copper, manganese, molybdenum, nickel, chromium, cadmium, lead, and arsenic using inductively coupled plasma optical emission spectroscopy (ICP-OES). Sediment samples were also collected and analyzed for the elements and for organic matter content. Results show that in all samples, iron was found in the greatest amount while cadmium was below the detection limit. Generally, the concentrations of elements in sediment were higher than in fish except for zinc and arsenic. While the concentration of zinc was similar in the two media, arsenic was almost 3 times higher in fish than sediment. To evaluate the risk to human health from fish consumption, the target hazard quotient (THQ) and cancer risk for an average adult in Botswana, sub-Saharan Africa, and riparian communities in the Okavango Delta was calculated for each element. All elements were found to be well below regulatory limits and do not pose a threat to human health except arsenic. The results suggest that other benthic feeding fish species could potentially have high arsenic levels too. This has serious implications for human health, especially riparian households to whom fish is a key component of food and nutrition security.

Keywords : Arsenic, African sharp tooth cat fish, Okavango delta, trace elements
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