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Bioaccumulation of aluminium and iron in the food chain of Lake Loskop, South Africa.

Oberholster PJ, Myburgh JG, Ashton PJ, Coetzee JJ, Botha AM.

CSIR Natural Resources and the Environment, Stellenbosch, South Africa. poberholster@csir.co.za

Abstract

Concentrations of total aluminium (Al) and iron (Fe) were determined in Lake Loskop over a period of four months in 2009 in samples of phytobenthos, phytoplankton, macroinvertebrates, amphibians and fish. The highest concentrations of Al and Fe were measured in the filamentous algae Spirogyra fluviatilis (Hillse) and Spirogyra adanata (Kütz), (Al=18,997.5mgkg(-1) dry weight and Fe=22,054.2mgkg(-1) dry weight) in the riverine zone of the lake with a near-neutral water average pH of 7.3. However, a negative correlation exists between the Al and Fe concentrations measured in the filamentous algae in comparison with the corresponding concentrations of these elements in the water column of the riverine zone. The Al concentrations in the macroinvertebrate families collected ranged from 140.6 to 385.7mgkg(-1) dry weight, with the highest values measured for Al and Fe in the family Gomphidae (385.7 and 1710.0mgkg(-1) dry weight, respectively) in comparison to other macroinvertebrate families sampled. Al and Fe concentrations (2580 and 10,697mgkg(-1) dry weight) in the stomach contents of adult Oreochromis mossambicus fishes were much higher in comparison with adult Micropterus salmoides fishes (98.5 and 439.6mgkg(-1) dry weight), respectively. In all cases of dissected fish species either white or yellow body fat was observed, thus in none of the samples both type of body fats occurred simultaneously. The concentrations of total Al and Fe in the different organs of O. mossambicus were along a mean sequence of intestine>yellow body fat>brain>gills>liver>heart>white body fat, while the mean sequence of total Al and Fe in M. salmoides was: intestine>gills>liver>heart>brain>white body fat. From the levels of Al detected in the yellow body fat of the studied fish species O. mossambicus, we suggest that this phenomenon may be related to the feeding habits of this species. Furthermore, the intake of certain species of phytobenthos by O. mossambicus could have played a role in the bioaccumulation of Al in the food chain and the possible development of pansteatitis in predators at higher trophic levels.

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