

Chemical and ecological studies on *Tilapia nilotica*

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Abstract

Atomic absorption spectrophotometry was utilised for the determination of Ag, Au, Ca, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sr and Zn in 42 *Tilapia nilotica* fish samples collected from the Nile River at Aswan (15 samples from the point between the conservation area of Aswan and Gebel Tagoug, and 27 samples from the main stream; 15 of the latter samples were placed in the middle of the Kima Drain and the remainder in the Nile River just north of where Kima Drain enters the Nile). The average length ranged from 13 to 26 cm, mass ranged from 98 to 400 g and water content equaled 74.37 to 75.40%. The results showed that trace element concentrations were clearly proportional to the size of the fish species (length and mass); in particular, relatively large sizes of fish contained higher concentrations of Na, Mn, K, Cu, Cr, Sr, and Zn. In addition, contaminated Kima Drain water may not reflect any change in the metal concentrations in the fish. The trace element concentrations in the investigated fish samples were within the safety baseline levels for man. Statistical relative errors equaled 4.8 to 8.5% and standard deviation was 0.026 to 303.557.

Introduction

Tilapia nilotica (locally known as Bolti) has a wide distribution, ranging from Lake Galilee and the Jordan River southwards to the Great Lake and East Africa, and westwards through the Chad Basin in Chad to Senegal, Niger and Ubanghi (Middle Africa). *Tilapia nilotica* is very common and of economic importance in the High Dam Lake and in the Nile River and is notable because it appeared in the well-done graphic representations of the ancient Egyptians. The oldest known representation, before 500 BC, is a glazed pottery model of Hierakopolis. Numerous figures of this fish are recognisable for instance in the mural paintings in the Tomb of Ti (Sakkara, Giza), and the Tomb and Chapel of Ptah Hotep (Latif, 1974).

Many trace elements play an important role in the metabolism of living cells. Their importance is very pronounced on the vitality or ill health of living organisms which depend on e.g., soil, fertilisers and water for their necessary trace elements. The latter are also important as indicators and guide elements for plants, mineral resources and geochemical and biogeochemical reactions (Valkovic, 1973).

Further to our earlier studies on water (Sherif *et al.*, 1978; 1980; Awadallah, 1984; 1990); sediments (Sherif *et al.*, 1981); crops (Sherif *et al.*, 1978; 1979; 1980; Awadallah *et al.*, 1986); Egyptian cane sugar (Awadallah *et al.*, 1984; 1985; 1986); Egyptian molasses (Mohamed *et al.*, 1989); and on fish (Awadallah *et al.*, 1985; Awadallah, 1986; Horris and Lake, 1984), this paper assesses the value of determining and studying trace element concentrations in 42 *Tilapia nilotica* samples in the Nile River on the basis of the results of chemical analyses and to indicate the relationship between the ecology and the distribution of trace metal pollution. A further aim is to provide information on trace metal concentrations in *Tilapia nilotica*.

Experimental

Sample collection

Forty-two different specimens of *Tilapia nilotica* (locally called

Bolti), of varying mass (98 to 400 g) were collected from the Nile River at Aswan City in April 1988. The localities are shown on Fig. 1. Fifteen fish samples (numbers 1 to 15) weighing 98, 101, 105, 120, 135, 142, 151, 170, 172, 183, 190, 195, 198, 202 and 210 g respectively, were collected from the point between Gebel Tagoug (closer to Kalabsha Hotel) and Awada conservation area (an island in the Nile River and in front of Aswan Nassr City), the other samples (27) were collected from the main stream of the Nile River. From these, 12 samples (numbers 16 to 27) weighing 116, 121, 127, 138, 160, 185, 196, 206, 212, 216, 224 and 230 g, respectively, were held in a cage in the Kima Drain (Kima Company manufactures nitrate fertilisers and the Kima Drain runs from

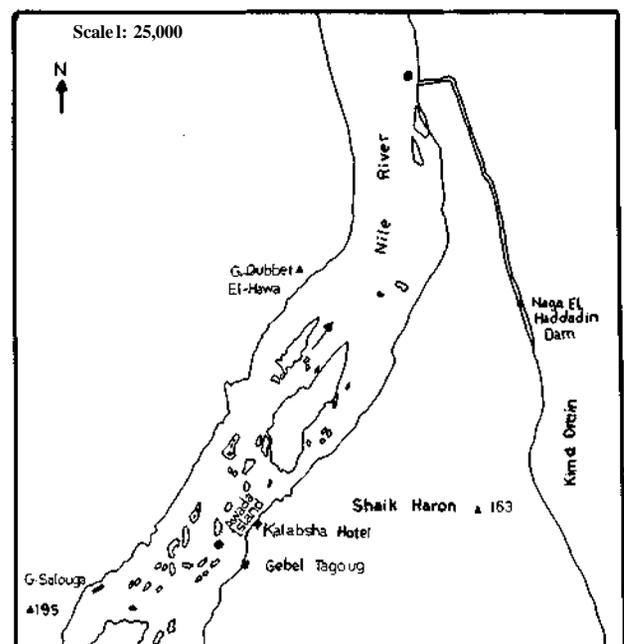


Figure 1
Map showing the sampling localities in the Nile River and the Kima Drain.

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