International Journal of Biochemistry and Biotechnology ISSN 2169-3048 Vol. 11 (8), pp. 001-002, August, 2022. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Short Communication

Cadmium and lead levels in some fish species from Azuabie creek in the Bonny Esturary, Nigeria

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Accepted 14 May, 2022

The concentrations of cadmium and lead were determined in seven fish species from the Azuabie creek in the upper Bonny estuary of the Niger Delta, which is associated with industrial and abattoir discharges. Cadmium concentrations ranged from 0.01 to 0.06 mg/kg and show no significant difference between species. The concentrations of lead (ranging from 0.104 to 0.310 mg/kg) were significantly higher in *Chrysichthys nigrodigitatus* and *Gobius niger* than other species examined. Also, lead was significantly higher than cadmium. The metal concentrations obtained were within values that may be considered safe for human consumption.

Key words: Fish, cadmium, lead, estuary, Niger Delta.

INTRODUCTION

Global population increase and industrial development have led to an increase in the contamination of the marine environment by metals over the last three decades (Franca et al., 2005). This has increased the concerns about the accumulation of metals in sediments, biota and ultimately humans (Gibbs and Miskiewicz, 1995). Metals tend to accumulate in sediment, which acts as a sink (Förstner and Wittmann, 1979; Daka et al., 2003), but may be released under certain physico-chemical conditions, moving up through the food chain (Bryan and Langston, 1992). Fish from estuaries and coastal waters associated with industrial and sewage discharges have been found to be contaminated with heavy metals (Tariq et al. 2003; Chan 1995; Gibbs and Miskiewicz, 1995)

In this study we examine the concentrations of heavy metals (cadmium and lead) in some food fishes from Azuabie creek in the upper Bonny Estuary of the Niger Delta. The Azuabie Creeks is located in the eastern flank of Port Harcourt, and receives drainage inputs from an industrial layout in addition to wastes from an abattoir and a high density settlement, and the concentrations of some heavy metals (including cadmium and lead) in sediment are higher in this creek than the adjoining Obufe Creek (Daka et al., 2007). Seven fish species (*Liza falcipinnis, Sardinella madenensis, Tilapia mariae, Pomadasys jubelini, Gobius niger, Cynoglossus sp, Chrysichtyses nigodigitatus*) were assayed for their tissue cadmium and lead burdens.

MATERIALS AND METHOD

Fish samples were collected using a cast net from the Azuabie creek in the upper Bonny estuary. The fish caught were placed in ice-cooled boxes for transportation to the laboratory where they were frozen until further processed. Subsequently, the fish were dissected and the muscle tissue was dried and digested using HCl/HNO_3 following the method of the American Society for Testing and Materials (ASTM, 1986). The concentrations of cadmium and lead were determined using an Atomic Absorption Spectrophotometer (AAS) - Unicam 969 with UNICAM SOLAR Data station V6.15. The concentrations were blank-corrected and expressed as mg/kg dry weight of fish. The analytical procedure was checked by the digestion and analysis of dogfish liver certified reference material (DOLT-3); measured values were within ±10% of certified values. Significant differences in metal concentrations between species were tested by Analysis of Variance (ANOVA) of log (x+1) transformed concentrations; Tukey tests were used for post-hoc pair-wise comparisons. Analyses were performed using MINITAB R14.

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Table 1. Range, mean (and standard deviation) of cadmium and lead concentrations (mg/kg) in fish species from the Azuabie creek, upper Bonny Estuary.

Fish Species	Cadmium			Lead		
	Range (n = 2)	Mean	SD	Range (n = 2)	Mean	SD
Liza falcipinnis	0.045 - 0.055	0.050	0.007	0.083 - 0.125	0.104^{b}	0.030
Sardinella madenensis	0.025 - 0.027	0.026	0.001	0.103 - 0.124	0.114^{b}	0.015
Tilapia mariae	0.054 - 0.056	0.055	0.001	0.165 - 0.206	0.186^{b}	0.029
Pomadasys jubelini	0.010 - 0.047	0.029	0.026	0.124 - 1.144	0.134^{b}	0.014
Gobius niger	0.045 - 0.052	0.049	0.005	0.227 - 0.268	0.248^{a}	0.029
Cynoglossus sp	0.010 - 0.012	0.011	0.001	0.144 - 0.206	0.175^{b}	0.044
Chrysichtyses nigodigitatus	0.043 - 0.079	0.061	0.025	0.289 - 0.330	0.310^{a}	0.029
ANOVA*	$F_{6,7} = 3.36$, $p = 0.069$			$F_{6,7} = 13.36$, $p = 0.002$		

*F values and significance levels for single factor ANOVA for differences in metal concentrations between species. Superscripts with different alphabets in a vertical column are significantly different (Tukey tests, $p < 0.05$).

RESULTS AND DISCUSSION

The concentrations of cadmium ranged from 0.010 to 0.079 mg/kg, with means of 0.011 (± 0.001) mg/kg in *Cynoglossus* sp. to 0.055 (± 0.001) mg/kg in *C. nigrodigitatus* (Table 1) There were no significant differences in cadmium concentrations between species (F6,7 = 3.32, p = 0.071). The lowest value of lead was found in *L. falcipinnis* (0.104 ± 0.030 mg/kg) while the highest value was found in *C. nigrodigitatus* (0.310 ± 0.029 mg/kg);

lead burdens were significantly different between species ($F_{6,7}$ = p<0.01). Tukey tests show that *C. nigrodigitatus* and *G. niger* had significantly higher concentrations of lead than other fish species analyzed. The mean concentration of lead in the fishes was significantly higher than that of cadmium ($t_6 = 5.53$, $p < 0.01$). This implies that of all the species examined, the likelihood of obtaining high lead dosage from eating fish from the study area is more apparent than that of cadmium. Lead is known to cause serious concern to health on land, but the contamination of the sea and marine products does not appear to be a matter for serious concern (Clark, 1997).

The safe limits for heavy metals in seafood vary from region to region (Ashraf, 2006). The concentrations of cadmium and lead found in the fish from the upper Bonny estuary appear to indicate that they are suitable for human consumption. Ekweozor et al. (2003) have similarly reported that oysters from the lower Bonny estuary had cadmium concentrations in their tissue that did not suggest any hazards to human health but cautioned on the need for continuous monitoring.

ACKNOWLEDGEMENT

We wish to express our gratitude to Eng. S. Okonkwo of Jack Petroanalytical laboratories for help with the analysis.

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