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Seasonal Variation of Metal Concentrations in Catfish, Blue Crab and Crayfish from Warri Coastal Water of Delta State, Nigeria

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Abstract: The concentrations of Pb, Ni, Fe and Cd were determined using Atomic Absorption Spectrophotometer-Varian Spectral AA220 in catfish, blue crab and crayfish from Warri coastal water of Delta state. Of all the heavy metals examined, the line charts presented in Fig. 2, 3 and 4 indicate that Cd and Pb have the highest concentration while Fe and Ni have the least concentration in the three fauna considered for the experiment at both dry and wet seasons of 2008. The mean concentration values for catfish are: 0.002-2.52 mg/kg, 0.22-3.50 mg/kg, 0.002-1.48 mg/kg and 0.009-18.13 mg/kg; blue crab: 0.82-3.40 mg/kg, 0.35-2.50 mg/kg, 0.06-1.61 mg/kg and 1.62-12.88 mg/kg and crayfish: 0.22-8.00 mg/kg, 0.01-2.25 mg/kg, 0.004-0.55 mg/kg and 0.038-18.13 mg/kg for heavy metals of Pb, Ni, Fe and Cd respectively. The concentrations of the metals determined varied from one location to another and from one specie to another. Hence, Egbokodo location has the highest Cd content in catfish while Jeddo and Ughoton locations have highest Cd content in crayfish and blue crab respectively. Lastly, the order of increasing in concentration of the metals is Fe<Ni<Pb<Cd.

Key words: Heavy metals, coastal water, fauna, dry and wet seasons, atomic absorption spectrophotometer

INTRODUCTION

Studies on the pollution status of catfish, blue crab and crayfish in some parts of Nigeria and around Niger Delta area have been reported (Chindah and Braide, 2003; Davies *et al*., 2006).

Several factors such as size, nature of the environment, seasonal variation and variability in species have been identified as important independent variable influencing metal levels in marine organisms (Lueng and Furness, 1999). The variation in metal levels within biota (fauna) is part of an indicative of the degree to which particular specie picks up particulate matter from the surrounding water and in particular sediment while feeding.

This type of critical information is good in making accurate risk assessment for seafood safety purposes. Also, the increase in metal content at some locations can be informative sub lethal response indicating increased metal availability and potential mental stress on the biota. Thus the ability to regulate the internal metal levels is impaired. This might be sufficient to cause chronic toxicity or mortality during early development (Ololade *et al*., 2007).

Finally, in the natural aquatic ecosystems, metals occur normally in nanogram and microgram levels. However, some of these metals occurring at low concentrations in surface water are found in high concentrations in the corresponding sediments and fishes in the aquatic environments (Kakulu and Osibanjo, 1986; Asaolu *et al*., 1997) Therefore, this present work is aimed at providing information on the levels of some heavy metal concentration in some biota (fauna) from warri coastal water Delta axis of Niger Delta region of Nigeria.

MATERIALS AND METHODS

Sampling: Three different types of biota namely Catfish, crayfish and blue crab used for the analysis were bought from fishermen fishing along the Warri coastal river in ten (10) different locations. The samples were thoroughly washed with the sea water, placed in labeled cellophane bags and preserved in ice-cooled box. The samples were later transferred into the laboratory and stored in the freezer at -4^{o}C prior to laboratory analysis.

Sample treatment: The soft parts of the crayfish were obtained by removing the shells. The mean soft body weight for each sample was determined after drying at 80^{o}C for 24 h for catfish and crayfish and at 80^{o}C for 48 h for crab based on literature (Leung and Furness, 1999).

Some metals namely Pb, Ni, Fe and Cd were determined with 2.0 g of finely ground tissue samples homogenized with 25 ml of de-ionized water after 10 ml of concentrated HCL and 2 ml of HNO_3 in succession. The mixture was heated and boiled off to near dryness, given a thick yellow liquid. However, for samples of blue crab, additional 25 ml of 95% H_2O_2 was added before digestion was completed. This was probably due to the

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physiological nature of the hard shell cover, Metals concentrations were analyzed using flame atomic absorption spectrophotometer-Varian model spectral AA 220. The results obtained from this analysis were the average of duplicate determinations and the analysis was carried out during dry and wet seasons.

RESULTS AND DISCUSSION

Figure 1 presents the map of sample locations while the line charts in Fig. 2, 3 and 4 present heavy metal concentrations in Catfish, Blue crab and Crayfish respectively at various locations along Warri coastal water for both dry and wet seasons.

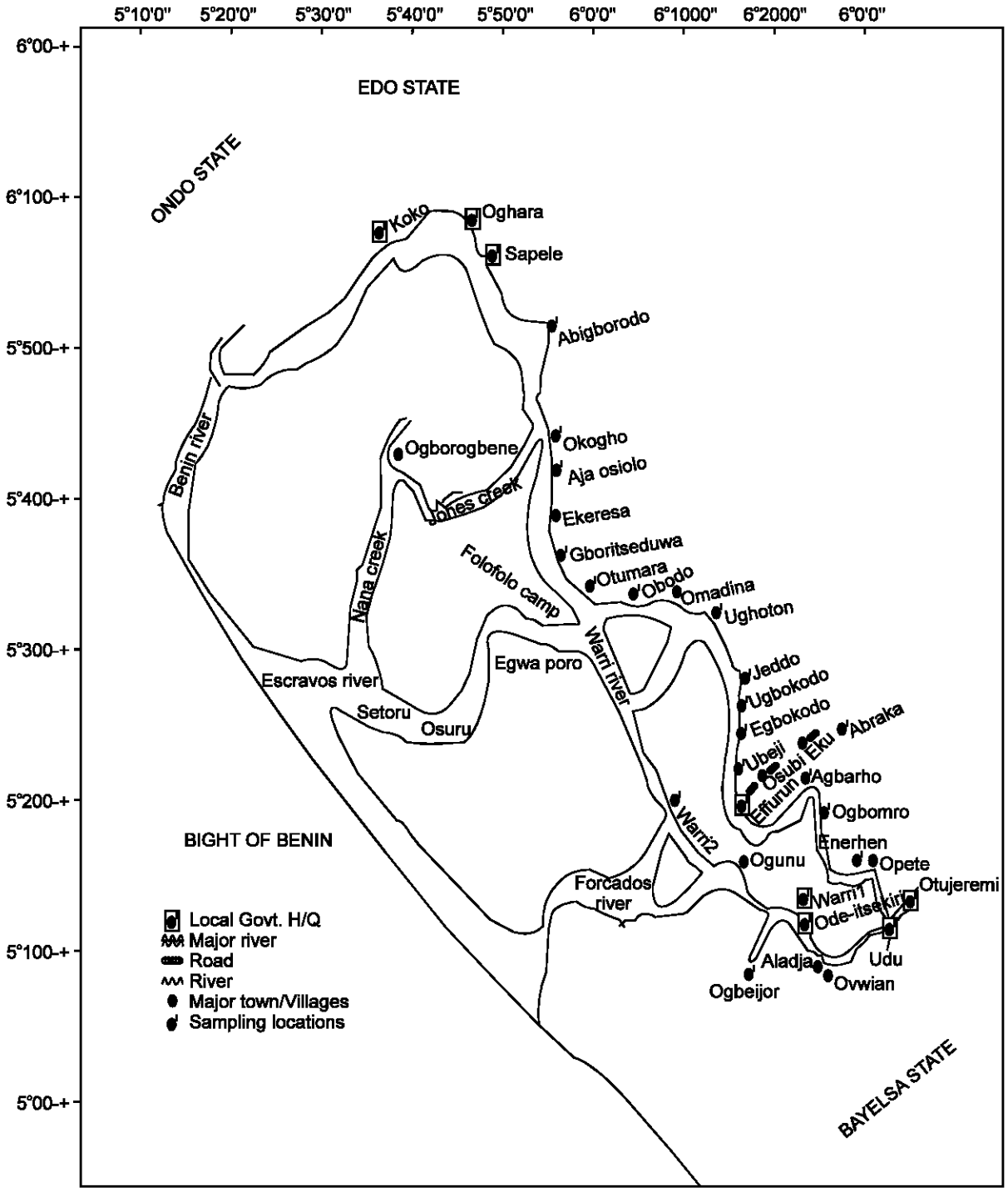

Fig. 1: Map of Delta State showing sampling locations along warri-sapele-koko coastal river route

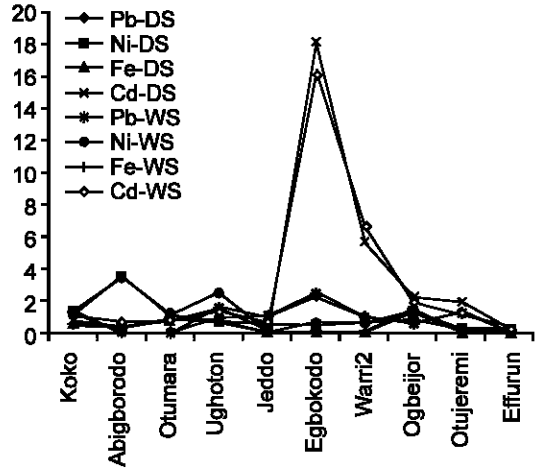

Fig. 2: Heavy metal concentration (mg/kg) in catfish during dry and wet seasons

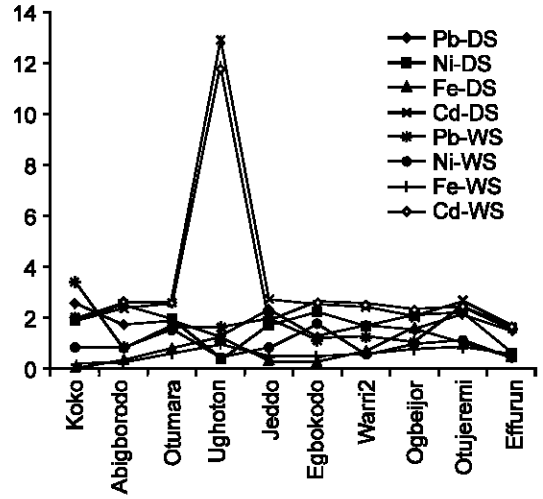

Fig. 3: Heavy metal concentration (mg/kg) in blue crab during dry and wet seasons

The concentrations of heavy metals determined in fauna fluctuated from one location to another location and from one season to another season. In catfish, the heavy metal concentrations ranged between 0.002-2.52 mg/kg, 0.22-3.50 mg/kg, 0.002-1.48 mg/kg and 0.009-18.13 mg/kg for Pb, Ni, Fe and Cd respectively at both dry and wet seasons (Fig. 2), while concentrations of heavy metals in blue crab ranged between 0.82-3.4 mg/kg, 0.35-2.5 mg/kg, 0.06-1.61 mg/kg and 1.62-12.88 mg/kg for the same heavy metals above and in the same order (Fig. 3). The heavy metal concentrations in crayfish also ranged between 0.22-8.00 mg/kg, 0.01-2.25 mg/kg, 0.004-0.55 mg/kg and 0.038-18.13 mg/kg for Pb, Ni, Fe and Cd respectively (Fig. 4). In all heavy metals investigated, Cd has the highest concentration especially in catfish and crayfish while that of blue crab was slightly lower in concentration. This may be due to

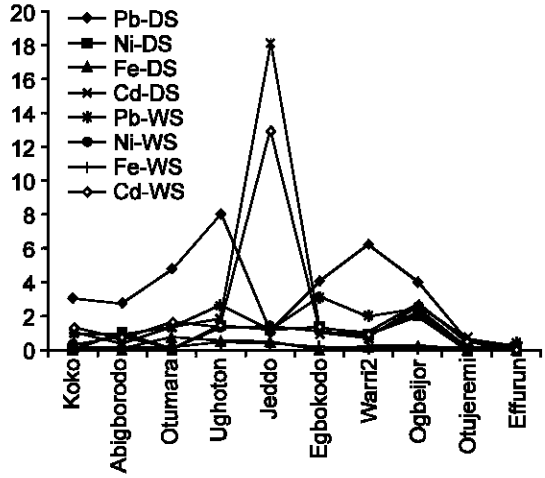

Fig. 4: Heavy metal concentration (mg/kg) in crayfish during dry and wet seasons

logging and milling activities along the coast of Warri river since trace metals such as Cd is known to be found in woody and herbaceous materials which will settle down to be part of sediments (Clarke and Sloss, 1992). Also, the level of bio-concentration of Cd into catfish, blue crab and crayfish could be due to their being bottom feeders (Kakulu *et al*., 1987). However, the concentrations of Ni and Fe are the least in the three fauna determined while crayfish seems to contain higher concentrations of Pb compared to catfish and blue crab. Egbokodo location has the highest concentration of Cd in catfish while Jeddo and Ughoton locations had the highest in crayfish and blue crab respectively.

Conclusion: The high values of Cd and Pb may be due to logging, milling and oil operational activities that are common in the area.

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