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HEAVY METAL CONCENTRATION IN SOFT SEDIMENTS OF RIVER-NUN AT AMASSOMA AXIS

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ABSTRACT

The concentration levels of the heavy metals Chromium (Cr), Lead (Pb), Nickel (Ni) and Cadmium (Cd) in the sediments of River-nun at Amassoma, axis was investigated in a bid to assess how land based activities adjacent to the river affect its general health and productivity. Sediment samples were collected at different locations along the river catchment representing different land use patterns. Heavy metal characteristics were then measured using standard procedures. Result of the study show that Cr and Cd did not significantly vary (P>0.05) between sample stations. There were significant differences (P<0.05) in Ni and Pb concentrations between stations. All metal parameters were lower than the World Health Organization (WHO) suggested limit for heavy metals in fresh waters. Except Pb which was negligibly higher than the recommended limit. It can be deduced that human activities in the river catchment will not in the immediate pose a challenge on the river and its ecology

1.0 INTRODUCTION

The River-nun is an extensive body of water that traverses the entire womb of Bayelsa state in the Niger Delta. It is for most part of its of length fresh water with some intrusion of salt water thus producing a brackish presentation. It provides a major source of sustenance and livelihood for people and communities living on the fringes of the river. In fact, the people are so intricately associated with the river that life without it may seem impossible. The river serves as a source of food (fishing), drinking water, means of water for irrigation of plants and source for transportation. In addition, the water serves as a sink for domestic waste and sewage disposal. Sadly, the river is not a limitless sink for waste disposal and therefore the consequences are evident in distorted water quality, modification of sediment composition and characteristics and the ultimate price of fish kills and destruction of the ecosystem. In Amassoma, the River-nun serves a myriad of purposes for the people. These range from mining of sand, transportation jetties, waste dumping spots, fish landing areas, public toilets and bathing area. All these activities add pollutants into the river such as heavy metals and other organic/inorganic substances. The consequences of pollutants to aquatic life can better be imagined. This study therefore undertakes to measure heavy metal content in the soft sediments of the river at Amassoma axis in other determine the enormity of the pollution threat to the ecosystem.

2.0 MATERIALS AND METHODS

2.1 Study Area

The study stations in Amassoma are captured in Table 1 below

Table 1: Station Locations, labels and coordinates

STATIONS	LOCATION	COORDINATES
A	NDU waterside	$4^0$58’8.14’’N & $6^0$6’22.49’’E
B	Efeke-Ama waterside	$4^0$58’4.79’’N & $6^0$6’11.11E
C	Okoloba-Ama waterside	$4^0$58’9.87’’N &$6^0$6’29.11E
D	Okoki-Ama waterside	$4^0$58’9.95’’N & $6^0$6’34.7’’E

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2.2 Collection of Samples

Soft sediment samples were collected by using an Eckman grab. This was done in the river close to the shore in areas far removed from debris and plant growth. The grab was dropped into the river and samples taken as soon as the grab makes contact with the sediment. Sediment samples were collected in triplicates in all sampling station.

The extracted sampled are poured into polythene bags from where each sample was examined for the investigated heavy metals using Atomic Absorption Spectrophotometer model 205 and the results expressed in mg/l of light penetrance.

2.3 Statistical Analysis

Means were computed for the entire measured variables. Analysis of variance (ANOVA) was conducted to determine the relatedness between means at the 95% (P= 0.05) confidence limit. Turkey HSD Post Hoc test was used to separate means in order to determine the level of similarities between the various means. SPSS® software version 20.0 aided the data analysis.

3.0 RESULT AND DISCUSSION

3.1 Result

Table 2 and Figures 1 – 5. show the result of this study.

Table 2: Mean Heavy metal concentration in River-nun

Heavy Metals (mg/l)	STATIONS A	B	C	D	WHO
Pb	$0.0153^{a}\pm0.002$*	$0.070^{b}\pm0.001$	$0.011^{ab}\pm0.0010$	$0.015^{a}\pm0.001$	0.01
Cd	$0.0013^{a}\pm0.00058$	$-0.0010^{a}\pm0.001$	$0.003^{a}\pm0.0010$	$-0.0077^{b}\pm0.0025$	0.05
Cr	$-0.027^{a}\pm0.00153$	$0.0003^{a}\pm0.00058$	$0.0007^{a}\pm0.00153$	$0.000^{a}\pm0.0173$	0.02
Ni	$0.0011^{a}\pm0.00010$	$0.0009^{ac}\pm0.0001$	$0.0005^{bc}\pm0.00012$	$0.0011^{a}\pm0.00012$	0.02

***Mean ± Standard deviation. Same letter superscript along the same row are not significantly different. WHO, 2004**

Table 2 shows the means of the heavy metals in the different study stations. It also highlights the separation of means as a result of the ANOVA and Post Hoc (Turkey HSD) test applied to it.

Table 2 shows that the concentrations throughout the study stations followed a pattern which reveal that Pb> Ni> Cd > Cr. Pb has the highest concentration (0.070±0.001mg/l) while Cr has the lowest concentration (-0.027±0.0015mg/l).

Means are separated based on level of significance by the use of superscripts labeled a, b and c. From Table 2 above, there is no significant difference between stations A (NDU, waterside), D (Okoki-Ama waterside) and C (Okoloba-Ama waterside) in Pb concentration but there is a significant difference (P<0.05) between stations B (Efeke-Ama waterside) and C (Okoloba-Ama waterside).

There is no significant difference between stations A, B and C except station D in the cadmium (Cd) concentration in the study stations.

Cr concentration showed no significant difference in all study stations

There is no significant (P>0.05) difference between stations A, D and B but there is a significant difference between stations B and C in Ni concentration.

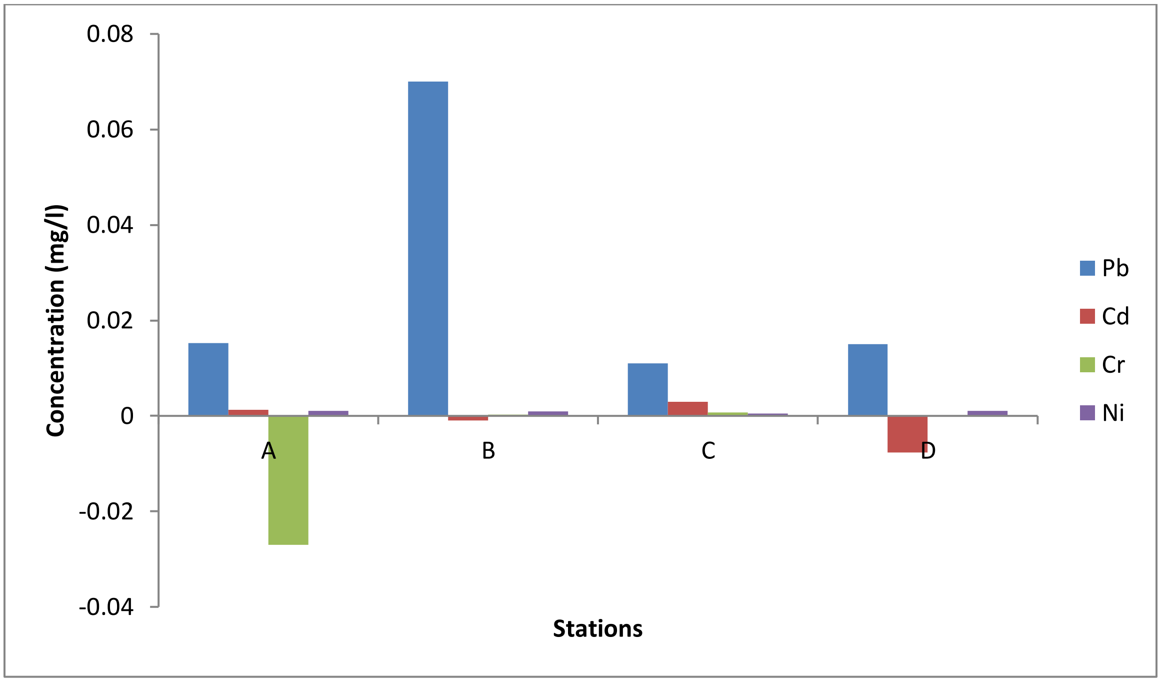

Figure 1: Heavy metal levels in sediments of River nun Amassoma axis.

Figure 1 show that Pb has the highest concentration while Cr has the lowest concentration.

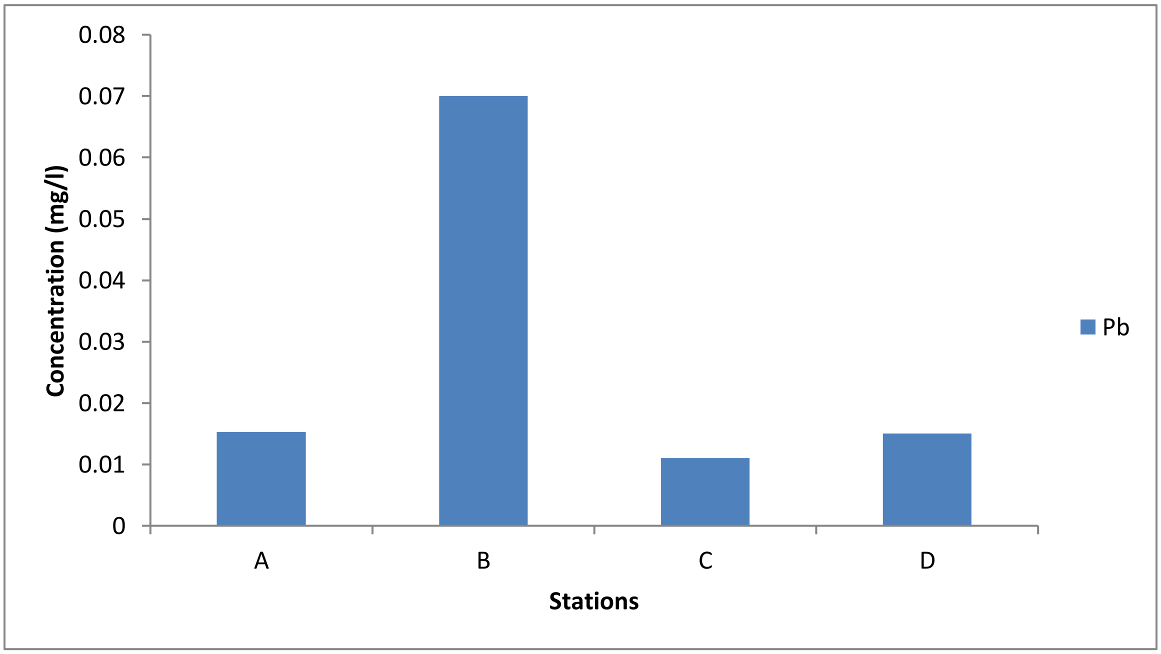

Figure 2: Levels of Pb in sediments of River nun, Amassoma axis

Pb concentration was highest in station B, followed by Stations A, D and C

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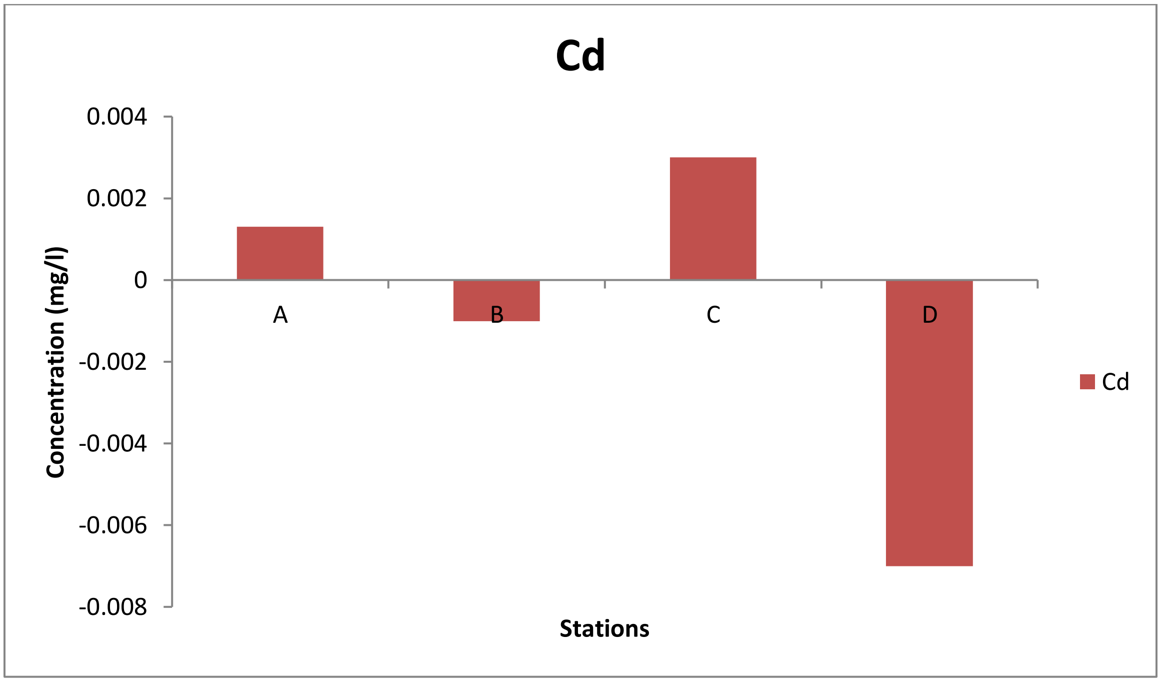

Figure 3: levels of Cd in sediments of River nun, Amassoma axis.

Cd was highest in station C followed by stations A, B and D respectively

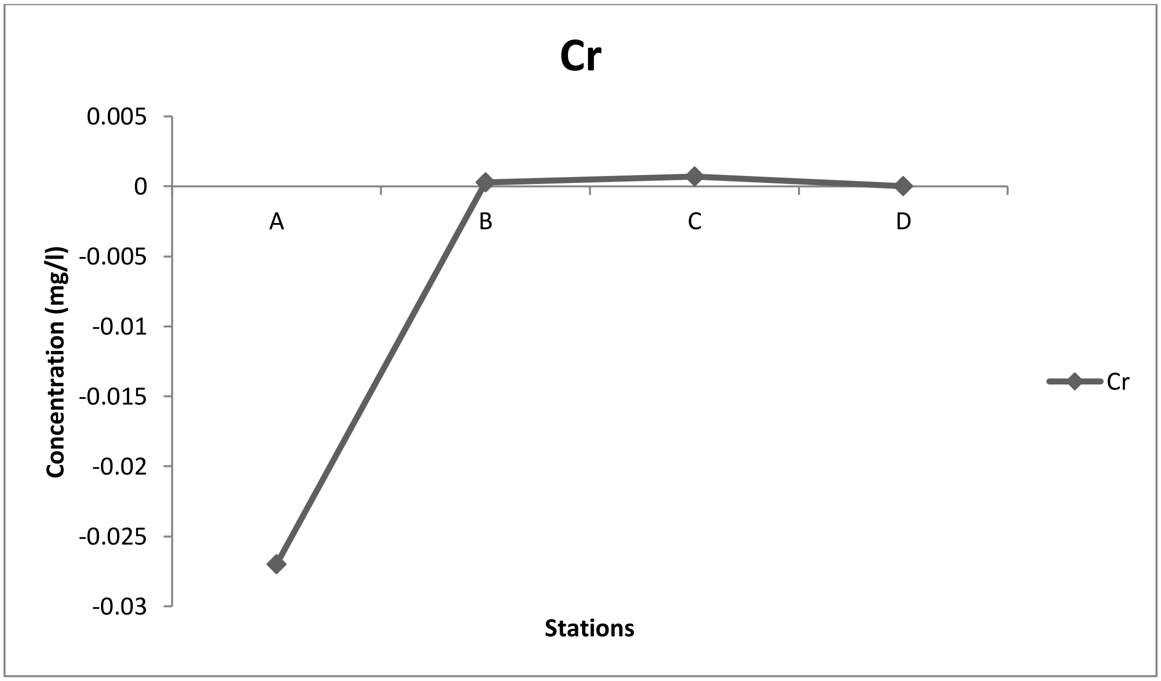

Figure 4: Levels of Cr in sediments of River nun Amassoma, axis.

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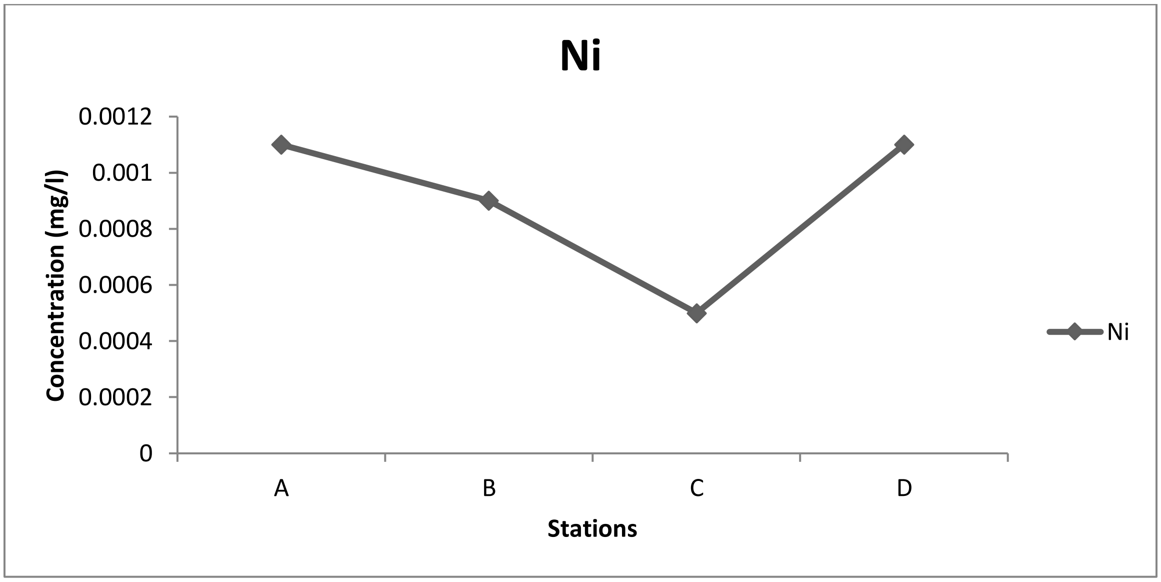

Figure 5: Levels of Ni in sediments of River nun,n, Amassoma axis.

3.2 DISCUSSION

In all the metals sampled, Pb show the highest levels in concentration. The high levels in River-nun could be attributed to high amounts of petroleum products used by boats and river crafts traversing the river and for household transported from illicit refineries by sea to Amassoma (Arah, 1985, Lolomari, 1993).

Ni showed the second highest prevalence in the sediments in the study stations. One reason for the appreciable concentration of Ni in the sediments may be as a result of the fact that Ni is widely available to aquatic ecosystem through a variety of anthropogenic sources such as household waste waters and other inputs (Agbozu et al, 2007, Alagoa, 2019).

The presence of Cd in this study is due to the fact that Cd is a Sulphur seeking metal that tends to effectuate in sediments void of adequate oxygen due high waste decomposition in the River-nun (Abel, 1989). Finally, the levels of Cr were particularly low or non-detectable in the study stations. The low concentration of Cr in the sediments can be explained by the fact that Cr is considered as a metal with low transfer-ability between living tissues, the atmosphere and the earth's crust which reduces its availability and toxicity potentials (Abel, 1989).

4.0 CONCLUSION

This study assessed some select heavy metal levels in River-nun at Amassoma axis. This was done because soft sediments are very vital to the sustenance of aquatic life and the entire ecosystem. The result of the investigation reveal that all the select heavy metal levels were below the WHO suggested safe limit for heavy metals except Pb which was slightly above the recommended safe limits. All the heavy metals did not show significant disparity between stations. The outcome of this study imply that the River-nun at Amassoma axis is not under an immediate threat from heavy metal pollution to its fishery and ecosystem.

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