Scholars Journal of Engineering and Technology (SJET) **ISSN 2321-435X (Online)**
Sch. J. Eng. Tech., 2014; 2(4A):523-526 **ISSN 2347-9523 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

Research Article

Determination of Heavy Metal Levels in *Eutropius niloticus* and *Citharinus citharus* from Polaku River Near The Liquefied Natural Gas Plant in Bayelsa State

Ere, D[1*], Fenesai S.[1], Eboh, A.S[2]
[1]Department of Chemical Sciences, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria
[2]Department of Biochemistry, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria

***Corresponding author**
Diepreye Ere
Email: diepreyeere@yahoo.co.uk

Abstract: Heavy metal effluents from industries have continued to be a major source of concern due to the effect on the environment and the living organisms around the vicinity. Heavy metal concentrations were determined in fish parts (gills, tissues, head and bones) of *Eutropius niloticus* and *Citharinus citharus* from Polaku River near the Liquefied Natural Gas (LNG) plant in Bayelsa State using atomic absorption spectrophotometer. The results obtained indicated that the heavy metal concentrations in *Eutropius niloticus* follow the trend: bones>head > gills > tissue, while that of the heavy metal concentrations in *Citharinus citharus* is head > bones > tissue > gills. The trend of heavy metal concentrations can be represented as: Pb>Ni>Cd for *Eutropius niloticus*, while that of *Citharinus citharus* was Pb>Cd>Ni. *Citharinus citharus* showed bioaccumulation factors of 3.91, 1.35 and 0.83 for Cd, Ni and Pb respectively. *Eutropius niloticus* showed 3.43, 2.96 and 3.20 for Pb, Ni and Cd respectively. The values of concentrations of these metals in parts per million (ppm) were below the FAO/WHO recommended maximum limits in the fish samples (0.5 ppm for lead (Pb) and cadmium (Cd)). This suggests that the heavy metal concentrations may not be up to the hazardous limit in aquatic habitat and therefore maybe safe for consumers to eat from the stream.
Keywords: Bioaccumulation, Heavy metals, *Citharinus citharus*, *Eutropius niloticus*, Polaku River

INTRODUCTION

Heavy metals are natural components of the earth crust and are commonly found in natural waters [1, 2]. Some heavy metals are essential to living organisms, but they may become highly poisonous when present in high concentrations [3, 4]. These heavy metals are introduced into aquatic system as a result of washing away of soils, rocks and also through human activities involving mining, processing, or use of metals and substances that contain metal pollutants [2]. As heavy metals cannot be degraded or destroyed, they are deposited, assimilated in water and aquatic organisms and thus, causing heavy metal pollution in water bodies [5, 6]. Heavy metals are dangerous because they tend to bioaccumulate, and aquatic animals including fish tend to ingest these heavy metals in considerable amounts and may stay over a long period [7]. They are finally transferred to other animals including humans through the food chain [8]. Abdel-Baki *et al*. [9] revealed that heavy metals (Cd and Pb) were more concentrated in fish than in the water. The discharge of industrial wastes containing toxic heavy metals into water bodies may have significant effect on fish and other aquatic organisms, which may endanger public health. The Liquefied Natural Gas (LNG) project situated around Polaku in Gbarain clan has made use of various chemicals containing heavy metals for both mud logging and other oil and Gas processing activities and there is the possibility of accumulation of these heavy metals in aquatic organisms (fish) in the immediate environment. This possibility has prompted this study for the determination of the concentration of some heavy metals (lead, cadmium and nickel) in *Eutropius niloticus* and *Citharinus citharus* from polaku river in Bayelsa state.

MATERIALS AND METHODS

A total of 10 matured fish samples, Four (4) of *Citharinus citharus* (230 - 250 g X 23 - 250 cm) and six (6) fish samples of *Eutropius niloticus* (66.93 g X 20-22 cm) were obtained freshly from a local fisherman in the morning hours. The fish samples were immediately placed in ice in a plastic container and were transported to the laboratory and then washed with distilled water and oven dried at a temperature setting of 70^0C for 24 hours. The dried fish samples were weighed and the various parts (gills, tissue, head and bones) were removed and sectionalised. Each of these sections, the

tissue, gills, head and bones were grounded separately using a plastic mortar and pestle to achieve homogeneity. FAO/SIDA [10] procedure was adopted and various sample portions were digested. This involved adding freshly prepared mixture of HNO_3/H_2O_2 (1:1) (15 ml) to each sample portion, stirred and covered with wash glass to allow the initial effervescence to subside. Then, the reaction mixture were heated slowly on a hot plate with continuous stirring for 20 minutes in a fume cupboard. After digestion, the beakers and its contents were then allowed to cool, filtered anddistilled water was added to the 100 ml mark of the volumetric flask and heavy metal analysis using atomic absorption spectrophotometer was determined.

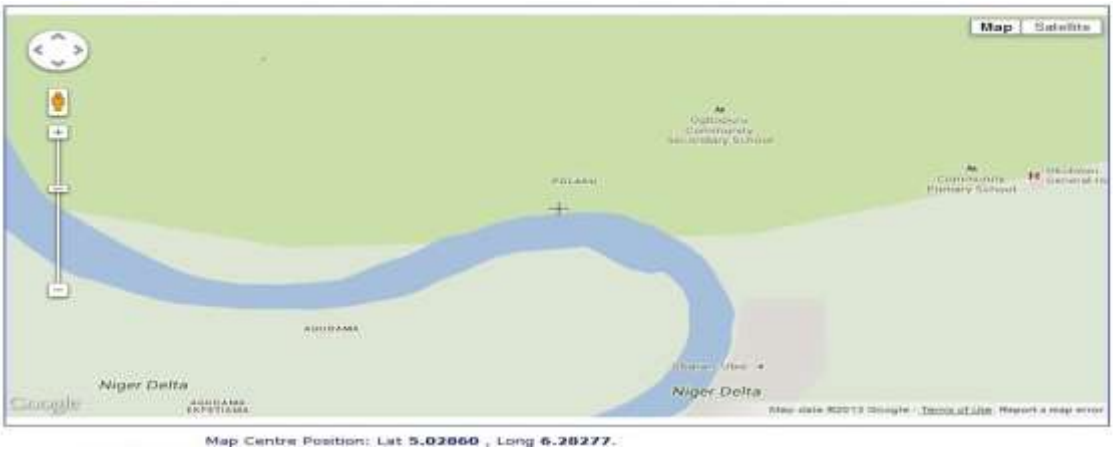

Fig. 1. map showing the location of Polaku River in Bayelsa State, Nigeria

RESULT AND DISCUSSION

The results of the present work shows that different metals were accumulated at different concentrations in various fish parts (Table 1). This difference can be attributed to the differences in the roles of each part of the fish and the feeding habits which may play a significant role in the accumulation differences in the different parts [11].

Table 1: Concentrations (ppm) of heavy metals in fish species from Polaku River

Metal	*Eutropius niloticus*				*Citharinus citharus*			
	Gills	**Tissue**	**Head**	**Bones**	**Gills**	**Tissue**	**Head**	**Bones**
Ni	0.078	0.029	0.307	0.279	0.033	0.021	0.119	0.118
Cd	0.056	0.019	0.081	0.114	0.010	0.021	0.286	0.041
Pb	0.327	0.193	0.867	1.124	0.058	0.073	0.329	0.145

The result was in agreement with previous investigations on similar fishes from the Niger Delta Area which shows concentrations of Pb, Cd and Ni as 0.480, 0.030 and 0.173 [12].

Fig. 2 present the concentration of heavy metals in the Polaku River. The *Eutropius niloticus*bones contained the highest concentration (43.68 %), followed by the head (36.13 %), gills (13.27 %), while the tissue (6.94 %) appeared to be the least preferred site for bioaccumulation (Fig. 3).

In the *Citharinus citharus*, the head contained the highest concentration (58.53 %), followed by the bones (24.24 %), tissue (9.17 %), while the gills (8.05 %) was the lowest (Fig. 4).

The order of heavy metal concentration in various sections of *Eutropius niloticus* in this research can be represented as : Bones> Head> Gills>Tissue, while that of the heavy metal concentration in *Citharinus citharus*was Head> Bones> Tissue> Gills.

The pattern of metal concentration in *Eutropius niloticus* was Pb>Ni>Cd, while that of *Citharinus Citharus* was Pb>Cd>Ni. The patterns of metal concentrations of both fish species were almost the same except that Ni and Cd interchanged their trend at positions 2 and 3 respectively. The order of heavy metal concentration in Polaku River was Pb>Ni>Cd.

The metal concentrations in the fish species are higher than that of the abiotic environment (water), thereby incurring bioaccumulation as reported by Olaifa *et al*. [13]. The difference in heavy metal bioaccumulation in the fish species could be linked to difference in feeding habits and behavior of the species [14].

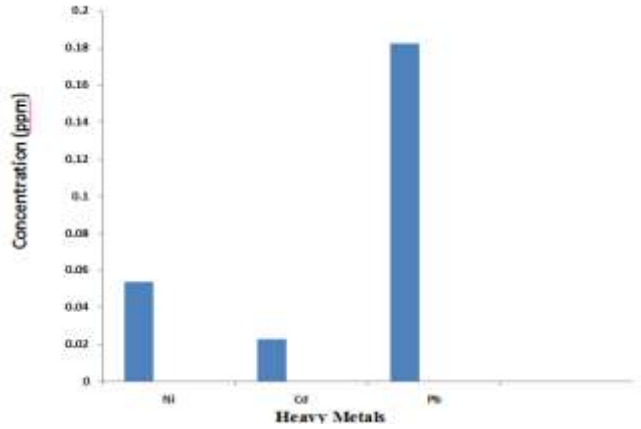

Fig. 2: Mean concentration of heavy metals in water sample (Polaku River)

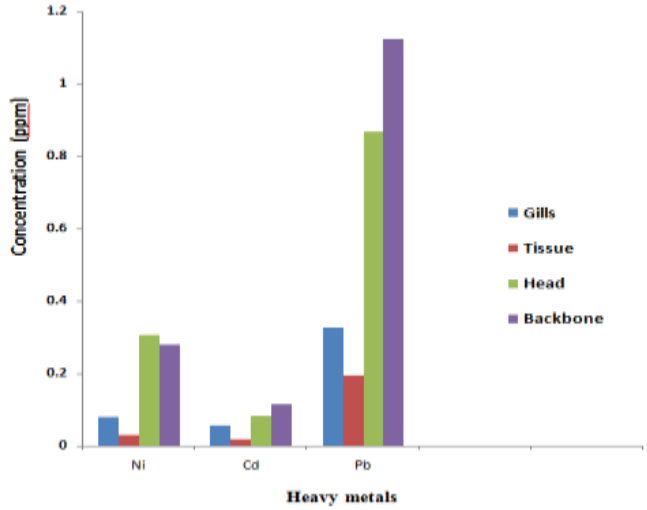

Fig. 3*:* Concentration of heavy metals in parts of *Eutropius niloticus*

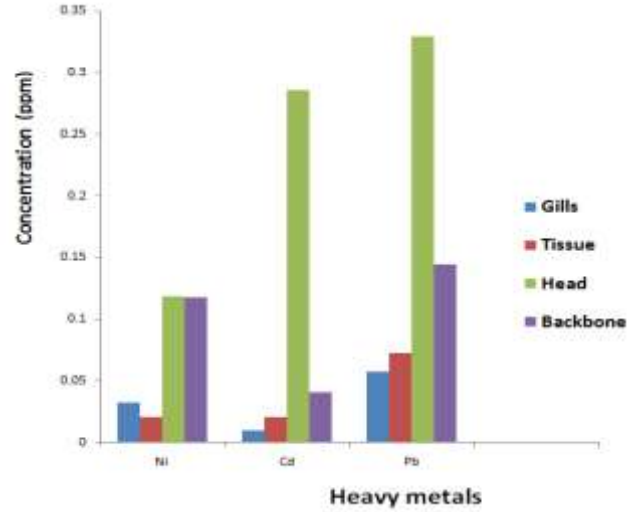

Fig. 4: Concentration of heavy metals in parts of *Citharinus citharus* from Polaku River

Heavy metals such as cadmium and lead are non-essential and have no biological function, but are rather detrimental to fish and human existence even at very low concentration. Toxicity of cadmium may lead to high blood pressure, red blood cells destruction and malfunction of kidney, while toxicity of lead can delay motor development, impair memory and cause hearing problems [15].

CONCLUSION

The heavy metals in this study showed an uneven distribution in the different sections in the fish species, with the metals being more concentrated in the bones and head. They had their concentrations below the FAO/WHO maximum permissible levels. With these findings, one may admit that it maybe safe for consumers to eat from the stream.

REFERENCES

1. Heavy Metals. Available from http://www.lenntech.com/processes/heavy/heavy-metals/heavy-metals.htm
2. Heavy Metals. Available from http://www.inno-vita.com/pdf/training%20pdf/HM-english%20screen.pdf
3. Linnik PM, Zubenko IB; Role of bottom sediments in the secondary pollution of aquatic environments by heavy metal compounds. Lakes and Reservoirs Res Manage., 2000; 5(1):11-21.
4. Malik N, Biswas AK, Qureshi TA, Borana K, Virha R; Bioaccumulation of heavy metals in fish tissues of a freshwater lake of Bhopal. Environ Monit Assess., 2010; 160: 267-267.
5. Ipinmoroti KO, Oshodi AA; Determination of trace Metals in fish, associated wanted and Soil Sediments fresh fish ponds. Discovery Innovate, 1993; 5: 138.
6. Adeyeye EI; Determination of heavy metals in Illisha Africana, associated water, soil sediments form some fish ponds. Int J Environ Stud., 1994; 45: 231-240.
7. King RP, Jonathan GE; Aquatic environment perturbations and monitory. Afrian Experience, USA, 2003: 166.
8. Eneji IS, Ato RS, Annune PA; Bioaccumulation of heavy metals in fish (Tilapia zilli and Clarias gariepinus) orans from river benue , North –Central Nigeria. Pak J Anal Environ Chem., 2011; 12(1 & 2). Available from http://www.ceacsu.edu.pk/PDF%20file/Journal%20Vol%2012%20No%201%20 &% 202/PJAEC-19072010-25.pdf
9. Abdel-Baki AS, Dkhil MA, Al-Quraishy S; Bioaccumulation of some heavy metals in fish relevant to their concentrations in water. African J Biotech., 2011; 10(13): 2541-2547.
10. FAO/SIDA; Manual of methods in Aquatic Environmental Research. Part 9. Analyses of Metals and Organochlorines in Fish. FAO Fisheries Technical Paper, 212, Federal Environmental Protection Agency. Guidelines and Standards for Environmental Pollution Control in Nigeria, 1983: 1-238
11. Marzouk M; The role of fish organs. J Vet Med., 1994; 42:51
12. Kakulu SE, Osibanjo O; Trace heavy metal pollutional status in sediments of the Niger Delta Area of Nigeria. J Chem Soc Nigeria, 1988; 13: 9-15.
13. Olaifa FE, Olaifa AK, Adelaja AA, Omolabi AG; Heavy metal contamination of Clarias gariepinus from a Lake and Fish farm in Ibadan, Nigeria. Afr J Biomed Res., 2004; 7: 145-148.
14. Akinola AO; The Food and Feeding Habits of Eutropius nilotius (Rupell). J Hydrobiologia., 1978; 57(3): 197-207.
15. Sharma JL, Garg NK, Buldini PL; Condensed Chemical Dictionary. CBS Publishers, New Delhi, India, 2008.