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Seasonal Variation of Heavy Metals in Selected Sea Foods from Buguma and Ekerekana Creeks Niger Delta

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Abstract: *Levels of some heavy metals: Iron (Fe); Copper (Cu); Cadmium (Cd); Nickel (Ni) and Lead (Pb) in some edible marine species namely: Periwinkle (Tympanotonus fuscatus); Oyster (Crasssostrea gasar); Mudskipper (Periophthalmus papilio) and grey mullet (Liza falcipinnis) were assessed during wet and dry seasons from Ekerekana and Buguma Creeks, Niger Delta, Nigeria. Generally, the following trend in decreasing order of the heavy metals in all the sea foods occurred: Fe>Cu>Cd>Ni>Pb. An overall elevated concentration of these metals was recorded during the wet season, particularly in periwinkle (T. fuscatus) from Ekerekana creek. Conversely, higher levels (P>0.05) of these metals were observed in sea foods sampled from Ekerekana creek when compared to Buguma creek, which was more pronounced during the wet season than dry season months.*

Keywords: *Aquatic environment, Pollution, Heavy metals, Marine food.*

1. INTRODUCTION

The rate of industrial growth within the last few years in the Niger Delta region of Nigeria was generally rapid, diverse and enormous. Also, the region was equally subjected to the exponential population increase; these developmental achievements were accompanied by some distressing environmental concerns (Godwin *et al*., 2011) Among the most alarming types of potential pollutants, generated as a direct outcome of industrial and domestic waste disposal are toxic and heavy metal pollutants (Rauf *et al*., 2009).Heavy metals occur naturally in aquatic ecosystem, but deposits of anthropogenic origin increase their levels and creating environmental problems in coaster zones and rivers (Dural *et al*., 2007). Environmental contaminations generally result from untreated industrial release and sewage discharge. Similar sources of contamination can also be contributed by the power thermal desalination, water treatment industries and leakages from oil wells that is characteristic of Niger delta region (Asonye *et al*., 2007).

Moreover, bioconcentration and biomagnifications could lead to toxic levels of these metals in organisms, even when the exposure level is low. The proven toxicity of high concentrations of heavy metals in water to fish and other aquatic life, poses the problem of an ultimate dis-equilibrium in the natural ecological balance (Javed, 2003). Under such conditions, the toxicity of a moderately toxic metal could be enhanced by synergism of the environment and other toxicants (Javed, 2005). Apart from destabilizing the ecosystem, the accumulation of these toxic metals in aquatic food is a potential threat to public health (Chinda *et al*., 2008). Consequent upon the dangers associated with toxic metals in food, several agencies and organizations throughout the world such as the United State Food and Drug Administration (US FDA) and the World Health Organization (WHO) have provided guidelines and recommendations concerning the risk for the intake of trace elements from food (Neff, 2002).

Fin and shell fishes are good bio indicators of trace elements contamination in the marine environment, since they occupy different tropic levels and can display large bio accumulation (Okafor and Opuene, 2000). The accumulation of trace metals in aquatic organisms is a function of several independent variables, such as the environmental concentrations of metals in water column, sediments, and the species of organisms (Azim *et al* ., 2006). Phyto and zooplanktons are microorganisms at the first and second lower tropic levels which are capable of extracting, and bio-concentrating heavy metals inside their cellular tissues. Fish, as an accumulator being predators on these microorganisms, accumulate higher levels of these metals than their preys. Eventually, man at the apex of the food pyramid, being a seafood consumer, is susceptible to the potentials harm of toxic metals pollution, resulting from metal enrichment in edible marine species, at the higher tropic levels (Eze ,2005).

The shell fishes which include Periwinkle (*T.fuscatus)* a mollusk, and Oyster (*C.gasar)* a bivalve, while fin fishes such as mudskipper (*P.papilio)* and mullet (*L.Falcipinnis)* are sea food of high economic value in Niger Delta region of Nigeria (Akinrotimi *et al*.,2009). They are deposit and filter feeders, which can serve as bio indicator of heavy metal in the marine environment. It is of vital importance therefore that studies are conducted on regular basis to ascertain the level and concentrations of the contaminant in these species. It is on this basis that the present study examines seasonal variations in the level of accumulation of metals such as Cu, Fe, Cd, Pb, and Ni in periwinkle, Mudskipper, Oyster, and Mullets in Ekerekana and Buguma creek.

2. MATERIALS AND METHODS

2.1. Study Area

Ekerekana creek is located in Okrika Local Government Area of Rivers State, Nigeria and lies between longitude 7^0 and 60^1E and latitudes 4^0 and 50^1 N. the creek receives fecal matter, domestic wastes and industrial wastes on continuous basis, while the Buguma creek is located in Asari Toru Local Government Area of Rivers State, Nigeria. It is situated between longitude $6^0 47^1$E and latitude $4^0 59^1$N (Figure 1). It consists of the main creek and associated inter connecting creeks, which interconnect and surround Buguma city and other communities (Orhibahabor and Ogbeibu, 2009).

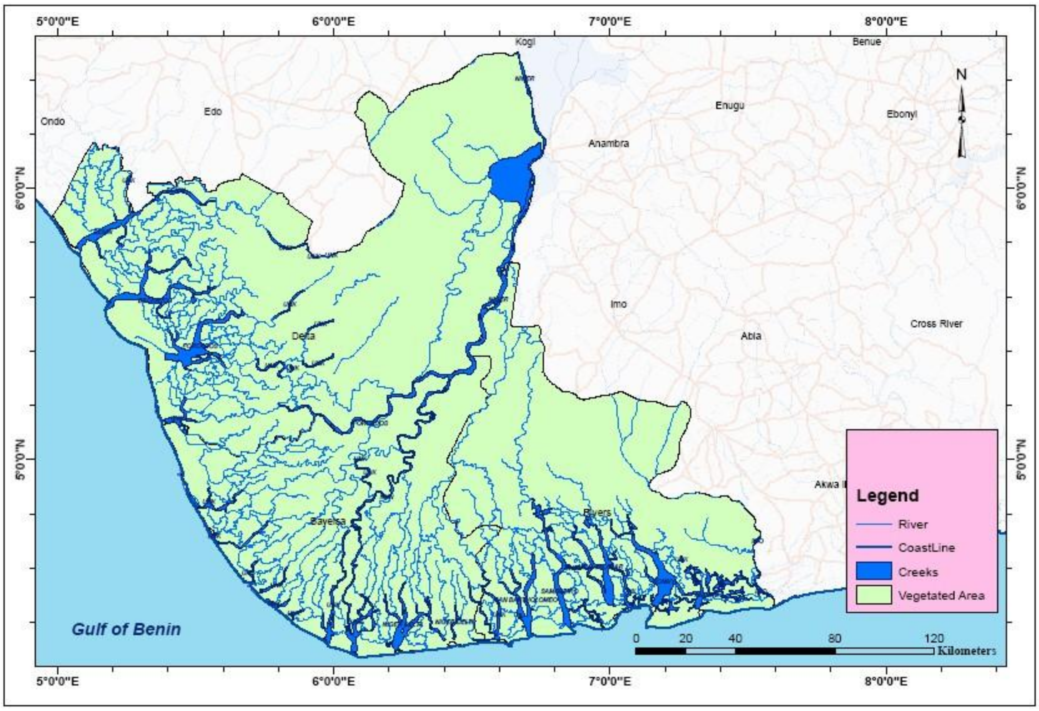

Figure1. *Map of Niger Delta, Nigeria*

2.2. Sampling Period

The sampling was carried out bi-monthly between July 2012 and Feburary 2013; consisting of four wet season months (July – October) and four dry season months (November- February).

2.3. Collection of Samples

The four different species used in this study were sampled from the creeks based on their life cycle, feeding and behavioural pattern. The periwinkle (*T.fuscatus),* were handpicked from the sediment of the creeks at low tide. Also the Oyster (*C. gasar)* was collected from the roots of the mangroves, during low tide. Specially designed traps were used in the collection of mudskipper, *P.papilio*, while mullets *Liza Falcipinnis* were equally collected from the creeks using seine nets.

2.4. Digestion of Sample

The tissues of *T.fuscatus* and *C.gasar* were removed from their shell, the extracted tissues and the flesh of *P.papilio* and *L. falcipinnis* were rinsed with distilled water to remove debris, plankton and other external adherents. They were then dried in an oven at 105^0c. They were later homogenized using mortar and pestle. 10g of the homogenate was digested as described by APHA (1998). The sample was digested using 1:5:1 mixture of 70% perchloric acid, concentrated nitric acid and sulphuric acid at 80^0c in a fume chamber until a colourless liquid was obtained. The metal concentrations were determined by Atomic Absorption spectro photometry buck scientific 200A model.Levels of heavy metals were expressed in mg/L dry weight.

3. Results

The concentrations of heavy metals in various seafood under consideration were highlighted in tables 1-8. In mudskipper, *P. papilio*, the metal levels in the wet season were consistently higher than that of dry season, with the levels in Ekerekana sampling station, significantly ($P<0.05$) higher, compare to Buguma station (Tables 1and2). The metal bioaccumulation in periwinkle, *T. fuscatus* indicated a significant ($p<0.05$) elevation in wet season, comparable to dry season, with the metal levels in Ekerekana higher than that of Buguma sampling stations (Tables 3 and 4). Similar trends were observed in Oyster, (*Crassostrca gasar*) and mullet (*Liza falcipinnis*) sea foods, with the metal bioaccumulation higher in wet season and Ekerekana creek than the dry season and Buguma creek respectively (Tables 5-8). Seasonally the levels of copper (Cu) in the sea foods from Ekerekana and Buguma creeks, revealed that the highest levels (2.51 ±0.02) was recorded in periwinkle and the lowest (0.56 ± 0.01) in mullets (Figure 2). The level of iron (Fe) in the sea foods indicated that the highest level (3.52 ±0.04) was recorded in periwinkle and the lowest (1.02 ±0.01) in mullets (Figure 3). For cadmium (Cd), the highest level (2.02 ±0.02) was in periwinkle, while the lowest (0.57 ± 0.02) in the mullet fish (Figure 4). Lead (Pb) concentration in the sea foods revealed that the highest concentration (0.90 ± 0.01) was observed in mudskipper which was closely followed by periwinkle (0.81 ±0.01) and the lowest (0.11 ±0.01) in mullets (Figure 5). The nickel (Ni) had the highest level (2.15 ± 0.02) in periwinkle and the lowest (0.54 ±0.02) in mullet fish (Figure 6). In all, a consistent distribution of the heavy metals in the sea foods had a sequence order: periwinkle > mudskipper > Oyster > mullets.

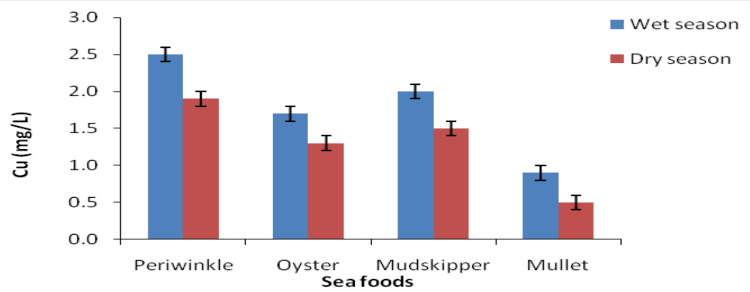

Figure. 2: *Seasonal variations in the level of Cu in some sea foods from Ekerekana ad Buguma creeks*

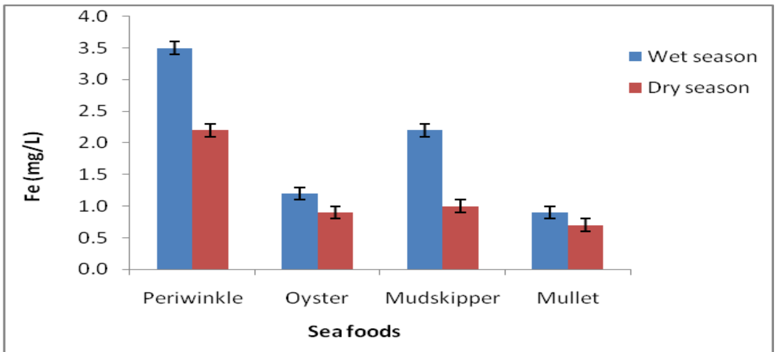

Figure 3: *Seasonal variations in the level of Fe in some sea foods from Ekerekana and Buguma creeks*

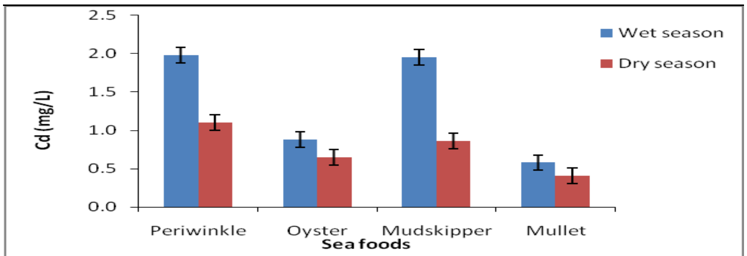

Figure 4: *Seasonal variations in the level of Cd in some sea foods from Ekerekana and Buguma creeks*

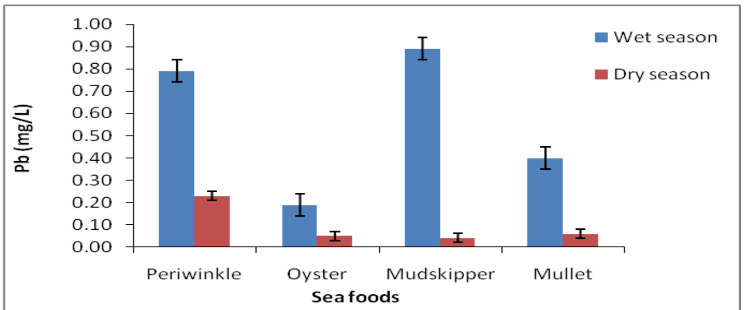

Figure 5: *Seasonal variations in the level of Pb in some sea foods from Ekerekana and Buguma creeks*

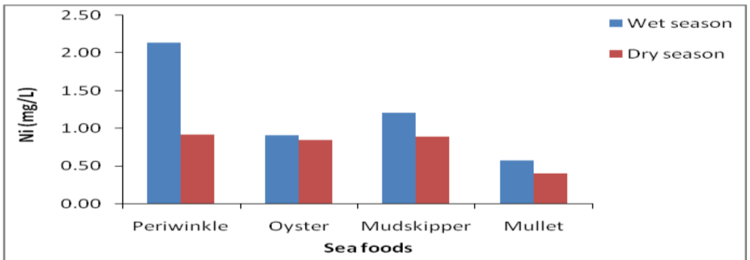

Figure6: *Seasonal variations in the levels of Ni in some sea foods from Ekerekana and Buguma creeks*

4. DISCUSSION

The use of fin and shell fishes as monitoring agents in aquatic pollution and toxicity studies is well documented (Ekweozor, 1996; Dambo, 2000; Davies *et al*., 2006 Egomwan, 2007). The heavy metals in marine sea foods from both Ekerekana and Buguma creeks show seasonal as well as spatial fluctuations. Spatially, each of the metals had different distribution from the others in the sea foods in both creeks. In the present study, fish samples from Ekerekana displayed the highest metal concentrations in their tissues, than the ones sampled in Buguma creek. The result confirms the previous studies of many authors who report that Ekerekana is highly polluted because it receives large amounts of sewage, and industrial wastes (Marcus *et al*., 2013; Marcus and Ekpete, 2014). These authors reiterated that fish surviving at high polluted areas accumulate higher levels of heavy metals than those living at less polluted areas of the same water body.

The phenomena that different metals are accumulated at different concentrations in various species of fish were observed in this study. The highest concentrations occurred in periwinkle (*T. Fucatus) and* mudskipper *(P. papilio)* while, the lowest in mullet,(*L. falcipinnis).* This result agrees with the findings of Ololade *et al*. (2008) during investigation of heavy metals contamination of some edible marine sea foods from coastal areas of Ondo state in Nigeria. The difference in the levels of accumulation in different species of fish can primarily be attributed to the life cycle, behavioral patterns, feeding habits and regulatory ability of the species (Bayode *et al*., 2011). These variations according to Ololade *et al*. (2008), Is also an indication of the ability of the species to pick up particulate matter from the water column and sediments during feeding. Both periwinkle and mudskipper are bottom feeders and are expected to accumulate more metals in their bodies than surface feeders like mullet.

Moreover, metal accumulations in fish bodies appear as site specific, as observed in this study. The heavy metals in sea food from Ekerekana creek were consistently higher than that of Buguma creek. This may be attributed to the discharge of wastes from industries, domestic activities and emissions from automobile such as speed boats that sail predominantly on the water body in the area (Ikejimba and Sakpa, 2014). Wastes entering aquatic environment goes into the ecosystem, and the response of aquatic system to waste input depends largely on the type of waste, mode of waste release, rate of water exchange, volume of water, aeration capacity and biochemical interactions within the aquatic system (EPA, 1976; Marcus and Nwoke, 2014).

In the present study, seasonal differences were observed, with the higher concentrations of heavy metals recorded in wet season than dry season months. This trend has been reported by other authors from similar studies (Beg *et al*., 2003; Chattopadhyay *et al.*, 2008). The seasonal dependent variation in concentration of heavy metal in these marine sea foods may be associated with factors such as nature of sediment, type of runoff, water quality and prevailing climatic conditions (Don-Pedro *et al*., 2004). Conversely, higher levels of metals recorded in all the sea foods in both creeks may be due to increased productivity that is more prevalent in the wet season months. This has been reported to influence an increase in heavy metal concentration in sea water, which results in organic complexities and subsequent changes in metal bioavailability (Fabris *et al*., 1994).

5. CONCLUSION

The levels of heavy metals in periwinkle (*T. fucatus,), Oyster, (C. gasar)* mudskippe*r, (P. papilio) and Mullet (L. falcipinnis)* have been assessed. The five investigated metals namely, Cu, Fe, Cd, Pb, and Ni were found to be selectively distributed in different species under consideration. The study equally revealed that the bottom dwellers such as periwinkle and mudskipper pose a risk, consequent of metal burden in their soft tissues through bioaccumulation. Moreover, the heavy metal concentrations were higher in wet season months than the dry season. The work also provided data and information that may be useful in aquatic toxicology and safety assessments of marine sea food, which may be helpful to environmental studies that will enhance safety and sustainability of aquatic environment.

Table1. *Metal Bioaccumulation (mean± SD) in P.papilio (wet season) in Ekerekana and Buguma creeks*

Metal	Sampling Stations	
	Ekerekana	**Buguma**
Cu	2.02 ± 0.01^{b}	1.87 ± 0.02^{a}
Fe	2.14 ± 0.02^{b}	1.21 ± 0.014^{a}
Cd	1.18 ± 0.01^{b}	0.91 ± 0.12^{a}
Pb	0.89 ± 0.02^{b}	0.74 ± 0.01^{a}
Ni	1.21 ± 0.03^{b}	0.18 ± 0.01^{a}

Mean within the row with different superscripts are significantly different (p<0.05)

Table2. *Metal Bioaccumulation (mean± SD) in Mudskipper P.papilio (Dry season) In Ekerekana and Buguma creeks*

Metal	Sampling Stations	
	Ekerekana	**Buguma**
Cu	1.90 ± 0.12^{b}	1.28 ± 0.11^{a}
Fe	0.99 ± 0.04^{b}	0.08 ± 0.02^{a}
Cd	0.81 ± 0.02^{b}	0.12 ± 0.01^{a}
Pb	0.40 ± 0.03^{b}	0.26 ± 0.02^{a}
Ni	0.89 ± 0.01^{b}	0.21 ± 0.01a

Mean within the row with different superscripts are significantly different (p<0.05)

Table3. *Metal Bioaccumulation (mean± SD) in Mudskipper P.papilio (Wet season) In Ekerekana and Buguma creeks*

Metal	Sampling Stations	
	Ekerekana	**Buguma**
Cu	2.41 ± 0.17^{b}	1.98 ± 0.18^{a}
Fe	3.22 ± 0.16^{b}	2.17 ± 0.11^{a}
Cd	1.78 ± 0.11^{b}	099 ± 0.21^{a}
Pb	0.79 ± 0.12^{b}	0.41 ± 0.12^{a}
Ni	2.14 ± 0.18^{b}	1.92 ± 0.17^{a}

Mean within the row with different superscripts are significantly different (p<0.05)

Table4. *Metal Bioaccumulation (mean± SD) in Mudskipper P.papilio (Dry season) In Ekerekana and Buguma creeks*

Metal	Sampling Stations	
	Ekerekana	**Buguma**
Cu	1.13 ± 0.01[b]	0.81 ± 0.02[a]
Fe	182 ± 0.21[b]	0.68 ± 0.02[a]
Cd	0.98 ± 0.01[b]	0.62 ± 0.01[a]
Pb	0.18 ± 0.01[b]	0.06 ±0.02[a]
Ni	0.91 ± 0.01[b]	0.46 ± 0.01[a]

Mean within the row with different superscripts are significantly different (p<0.05)

Table5. *Metal Bioaccumulation (mean± SD) in Oyster Crassostrea gasar (West season) In Ekerekana and Buguma creeks.*

Metal	Sampling Stations	
	Ekerekana	**Buguma**
Cu	1.08 ± 0.01[b]	0.58 ± 0.02[a]
Fe	1.14 ± 0.01[b]	0.62 ± 0.01[a]
Cd	0.97 ± 0.01[b]	0.84 ±0.01[a]
Pb	0.19 ±0.02[b]	0.02 ± 0.02[a]
Ni	0.96 ± 0.12[b]	0.69 ± 0.02[a]

Mean within the row with different superscripts are significantly different (p<0.05)

Table6. *Metal Bioaccumulation (mean± SD) in Oyster Crassostrea gasar (Dry season) In Ekerekana and Buguma creeks.*

Metal	Sampling Stations	
	Ekerekana	**Buguma**
Cu	1.04 ±0.01[b]	0.42 ± 0.01[a]
Fe	0.99 ± 0.02[b]	0.52 ± 0.01[a]
Cd	0.84 ± 0.02[b]	0.84 ± 0.01[a]
Pb	0.92 ± 0.01[b]	0.04 ± 0.01[a]
Ni	0.81 ± 0.01[b]	0.42 ± 0.02[a]

Mean within the row with different superscripts are significantly different (p<0.05)

Table7. *Metal Bioaccumulation (mean± SD) in Grey In L. falcipinnis (Wet season) Ekerekana and Buguma creeks.*

Metal	Sampling Stations	
	Ekerekana	**Buguma**
Cu	1.02 ±0.01[b]	0.94 ± 0.02[a]
Fe	0.86 ± 0.01[b]	0.71 ± 0.02[a]
Cd	0.78 ±0.02[b]	0.64 ± 0.01[a]
Pb	0.04 ± 0.01[b]	0.02 ± 0.02[a]
Ni	0.58 ± 0.1[b]	0.40 ± 0.01[a]

Mean within the row with different superscripts are significantly different (p<0.05)

Table8. *Metal Bioaccumulation (mean± SD) in Grey In L. falcipinnis (Dry season) Ekerekana and Buguma creeks.*

Metal	Sampling Stations	
	Ekerekana	**Buguma**
Cu	0.99 ± 0.02[b]	0.82 ± 0.01[a]
Fe	0.81 ± 0.02[b]	0.62 ± 0.02[a]
Cd	0.64 ± 0.01[b]	0.59 ± 0.01[a]
Pb	0.03 ± 0.02[b]	0.01 ± 0.02[a]
Ni	0.1 ± 0.02[b]	0.32 ± 0.01[a]

Mean within the row with different superscripts are significantly different (p<0.05)

REFERENCES

[1]. Akinrotimi, O.A, Abu, O.M.G, Ibemere, I.P and Opara. C.A. 2009. Economic viability and marketing strategies of Periwinkle *Tympanotonus fuscatus* in Rivers State, Nigeria, *International Journal of Tropical Agriculture and Food systems* 3(3), 238-244.

[2]. APHA, 1998. Standard Methods for the Examination of Water and wastewater. 20^{th} Ed., American Public Health Association, New York, USA.

[3]. Asonye, C.C Okolie, N.P, Okenwa, E.E and Iwuayanwu, U.G 2007. "Some Physicochemical Characteristics and Heavy Metal Profiles of Nigeria Rivers. *African Journal of Biotechnology* 6 (5), 617-24.

[4]. Azim, A.A., Daneshmad, T.N. and Pardakhti A.2006. Cadmium absorption and accumulation in different parts of kidney beans, radishes. And pumpkins. *International Journal of Environment Science and Technology I3 (2), 177-180.*

[5]. Bayode, O.J.A, Adewunmi, E.A and Odunwole S 2011. Environmental Implication of Oil Exploration and Exploitation in the Waster region of Ondo State, Nigeria: A Regional Planning Appraisal: *Journal of Geography and Regional planning.* 4(3), 110-121.

[6]. Beg, M.U; Saeed, T; Al-Muzaini, S; Beg, K.R and Al-Bahloul, M 2003. distribution of petroleum hydrocarbon in sediment from coastal area receiving industrial effluent in Kuwait. *Ecotoxicol Environ Saf.* 54, 47-55.

[7]. Chattopadhyay, B., A Chatterjee and S.K Chattopadhyay, 2002. bioaccumulation of metals in the East Calcutta wetland ecosystem. Aquat. Ecosys. Health Manag., 5(2),191-203.

[8]. Chindah, A.C., Braide, S.A., and Nduaguibe, S.A 2008. Tolerance of periwinkle *Tympanotonus fuscatus* and shrimp to waste water from bonny light crude oil tank farm. *Polish Journal Environmnet* 21,61-72.

[9]. Dambo, W.B. 2000. Ecotoxicology of heavy metals and petroleum related compounds on the mangrove oyster (*Crassostrea gasar*) from the lower Bonny Estuary, Nigeria. Ph.D. river State University of Science and Technology, Port Harcourt, Nigeria, 259pp.

[10]. Davies, O.A., Allison, M.E. and Uyi A.S. 2006. Bioaccumulation of heavy metals in waters, sediment and periwinkle from Elechi Creel Niger Delta. *African Journal of Biotechnology* 5(10), 968-983.

[11]. Don-pedro, K.N., Oyewo, E.O. and Otitoloju, A.A (2004). Trend of heavy metal concentration in Logos Logoo-ecosystem, Nigeria. *West African Journal of Applied ecology 5, 103-114.*

[12]. Dural, M., M.Z.L. Goksu and A.A. Ozak, 2007. investigation of heavy metal levels in economically important fish species captured from the Tuzla Lagoon. *Food Chem*,102,415-421.

[13]. Egonmwan, R.I. 2007. Thermal tolerance and evaporative water loss of the mangrove proso branch. *Tympanotorus fuscatus*. Pakistan *Journal of Biological Science*, 100, 163-166.

[14]. Ekweozor, I.K.E. 1996. The Impact of Chronic discharges of petroleum hydrocarbons on the littoral macrofauna of Elechi Creek, Nigeria. *Niger Delta Biologia* 1(1),55-66.

[15]. EPA (1976). Quality criteria from waste water US. EPA, 440/9-76-023. environmental protection Agency, Washington DC, USA.

[16]. Eze, V.C. 2005. Aspects of the Ecosynamices of a Niger Delta river receiving industry effluents. Ph .D. Thesis, University of Port Harcourt. 256pp.

[17]. Fabris J.G, Richardson B.J. O'Sullivan J.E Brown F.C. 1994. Estimation of cadmium, lead and mercury concentration in estuarine waters using the mussel *mytilus edulis plamulatus I. Environ Toxicol water Qual 9, 183-92.*

[18]. Goodwin, T.H., A.R. Young, M.G.R. Holmes, G.H. Old, N. Hewitt, G.J.L. Leeks, J.C. Packman and B.P.G. Smith, 2011. The temporal and spatial variability of sediment transport and yields within the Bradford Beck catchments, West yorshire, *Sci. Total Environ*., 314-316,475-494.

[19]. Ikejimba, C.C. and Sakpa, S. 2014. Comparative study of some heavy metal concentration in water and *Tympanotorus fuscatus* Var radula samples of bf Egbokodu River, Warri, Nigeria. *International Journal of Modern Biologist Research*, 2, 7-15.

[20]. Javed, M. 2005. Heavy metal contamination of freshwater fish and bed sediments in the river Ravi stretch and related tributaries. *Pakistan J. Biol. Sci.*, 8(10), 1337-1341.

[21]. Javed, M. 2003. Relationships among water sediments and plankton for the uptake and accumulation of metals in the rive Ravi. *Indian J. Plant Sci. 2(4), 326-331.*

[22]. Marcus, A., and Ekpete, O.N. 2014. Impact of discharged process waste water from on oil refiney on the physicochemical waster body in Rivers State, Nigeria *Journal of Appli. Chem,* 12(1), 1-8

[23]. Marcus, A.C and Nwoke, I.B. 2014. Seasonal changes in trace metals levels of a brackish water system in the Niger delta, Nigeria. *Journal of Environment Science, Toxicology and Technology* 8(12), 715.

[24]. Marcus, A.C., Okoye, C.O. B and Ibeto, C.N 2013. Organic matter and trace metals levels in sediment of Bonny river and creeks around Okrika in River State Nigeria, *International Journal Phys. Sci* 8(15), 652-656.

[25]. Neff, J. M. 2002. Bioaccumulation in marine organisms: Effect of contaminants from oil well produced water. Elsevier. Amsterdam/Boston: 2002.

[26]. Okafor,, E. C. and Opoene, K. 2000. Correlations, partitioning and bioaccumulation between different segments of Taylor creek Southern, Nigeria. *International Journal of Environment Science and Technology* 3(4), 381-389.

[27]. Ololade, I. A., Lajide, L., Amoo I.A and Oladoja, N.F. 2008. Investigation of heavy metals contamination of edible marine sea food *African Journal of pure and Applied chemistry,* 2(12), 121-131.

[28]. Orhibhabor, B.J. and Ogbeibu, A.E. 2009. Concentrations of heavy metals in a Niger Delta mangrove creek, Nigeria *Global Journal of Environmental Science* 8(2), 1-10.

[29]. Rauf, A., Javed, M. and Ubaidullah M. (2009). Heavy metals levels in three major carps from the River Ravi, Pakistan. *Pakistan Vertrinay Journal* 29(1), 24-2

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