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Comparative Assessment of Meiofauna Abundance and Diversity on Sediment and Mangrove Roots in Buguma Forest, Rivers State, Nigeria

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ABSTRACT

Meiofauna abundance on sediment and mangrove roots in Buguma forest was studied for three Months between January and March, 2021. Sediment and mangrove prop roots segment samples were collected from various sites and analysed in the Laboratory following standard method of APHA. The organisms were identified up to the species level. The obtained results were subjected to descriptive inferential statistics using Statistical Packages for Social Sciences (SPSS) version 25. Results showed higher abundance of meiofauna on the sediment (213) than the mangrove roots (154) which belonged to two (2) phyla, five (5) families and thirteen species on both sediment and the mangrove roots. On the sediment the phylum arthropods with the class crustacean dominated (43.66%) the surface followed by the annelid (polychate) consisting of 37.56% while the polychacte having the highest composition (73.38%) followed by anthropod with crustacean consisting 18.83%. Temporally, all the species of polychaete were absent during the high tide on the sediment (station 1) in January but 3 of the species were present in the mangrove roots. Some of the species observed in this study include *Nematode* species, *Marphysa scanguine, Sythic* species, *Gammarus locusta* etc. Marg alef index for the sediment surface ranged between 2.498 (station 2) and 3.052 (station 3) while that of mangrove root ranged between 2.659 (station 1) and 2.896 (station 2). Menhink indices for the surfaces varied within the same ranges. Shannon diversity index ranged between 1.988 (station 2) land 2.996 (station 3) and 2.279 (station2). Sediment meiofauna abundance was higher than the mangrove root and that the abundance is influenced by tide. It is therefore recommended that anthropogenic activities be checkmated to avoid further increase of these organisms.

Keywords: Meiofauna, Sediment, Mangrove roots, *Gammarus locusta*, *Marphysa scanguine*, Buguma Forest, Nigeria.

Introduction

Meiofauna comprise all sediment-dwelling metazoans which are retained on a 38μm sieve (Vincx, 1996). They are ubiquitous in most marine ecosystems, from estuaries to the hydrothermal vents in the deep sea floor (Giere, 1993). According to Giere (2009), meiofauna are small benthic invertebrates that live in the interstices of marine and freshwater sediments. They are generally defined as metazoan organisms that can pass through a 500-μm mesh size sieve but are retained on a 42-μm mesh (Giere, 2009). Their abundance and species composition are controlled by several physical factors, including sediment particle size, temperature and salinity, as well as biochemical conditions, fluxes of organic matter and oxygen (Giere, 1993).

The role of meiofauna in carbon flows through benthic food webs in marine biotopes, including tidal mud flats and estuaries, is still a matter of debate Urban-Malinga and Moens, 2006).

Meiofauna (invertebrate < 1 mm) can be found at the bed floor and in the sediment of the mangrove forest. Most active meiofauna are found within 2cm layer of the mangrove sediment (Sasekumar, 1994). The type of meiofauna most commonly found at the mangrove bed floor are nematodes, ostracism and harpacticoid copepods although their structure is similar possibly due to similarity between habitats. Besides, the meiofauna density is highly associated with the organic content as well as the reduction of particle size and the pH values of the mangrove sediment (Rosa and Bemvenuti, 2005).

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The diverse composition of meiofauna species in the sediment are generally measured by some aspects such as food availability, organic matter and tidal exposure. A higher content of organic matter in the sediment would initiate a high oxygen demand in that particular area. There are more detritus accumulating in the sediment and thus contributing to more fauna organisms in the area (Mirto *et al*., 2014).

The meiofauna feed on bacteria to maintain their existence. Moreover, their likelihood of choice is more towards protozoa which can be found in the roots of Rhizophere and act as their preferred food source (El-Serehy *et al*., 2016). Nevertheless, there is no report of research that has been conducted in this area on the mangrove flora and meiofauna diversity near these coastal shorelines.

This study was done to document the information about mangrove flora and meiofauna species distribution at Buguma mangrove forest coastal line, in Rivers State, Nigeria.

Materials and Methods

Study Area

The study was carried out in the mangrove forest of Buguma, in Asari-Toru Local Government Area. It is situated at 4.73 North Latitude, 6.86 East Longitude and 378 meters education above the sea level. Buguma is a big town in Nigeria, having about 135, 404 inhabitants, it is the Headquarter of the Asari Toru Local Government Area, (RVSG, 1983). The map of the study area is shown in Figure 1.

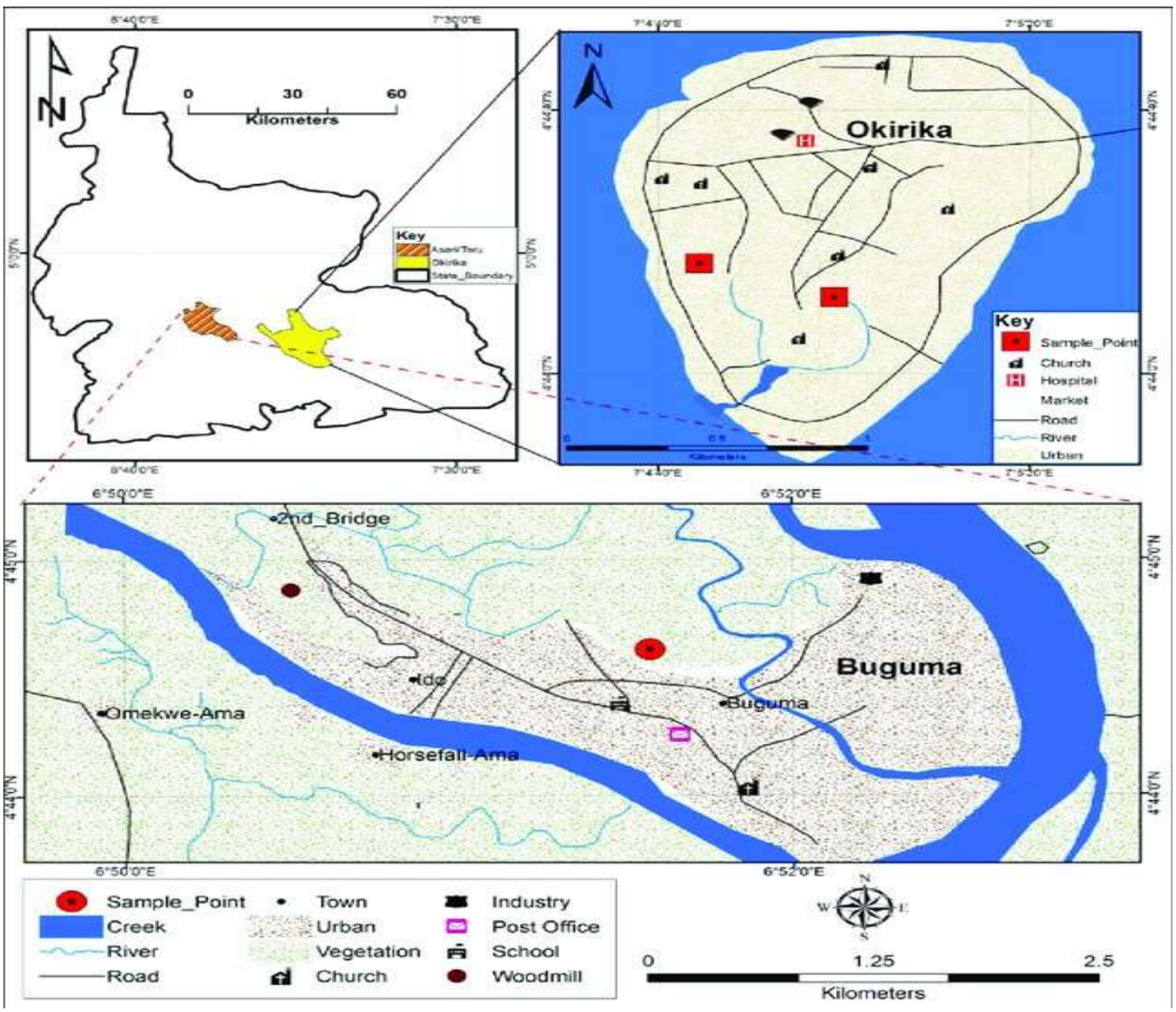

Fig. 1 Map of the study area showing the sample points in the Buguma Forest

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Sample Collection and Preservation

Three representative sites were selected along the mangrove forest regions of the Buguma River to capture the environmental gradients and habitat heterogeneity of the region. At each site, sediment cores were collected using a hand-operated corer (10 cm diameter, 15 cm depth). The cores were carefully extracted to maintain the sediment-water interface. The same three sites used for sediment sampling were selected for mangrove root collection. Sampling focused on the prop roots of the dominant mangrove species, *Rhizophora mangle*. Prop root segments, approximately 15-20 cm in length, were carefully cut using pruning shears. Three replicate root samples were collected from each site.

The sediment cores and mangrove root samples were immediately fixed in 4% formaldehyde solution. The root samples were placed in sealable plastic bags and transported to the laboratory. The samples were appropriately labeled with the site, date, and depth information and transported to the laboratory for further processing.

On arrival in the laboratory, the fixed root samples were gently rinsed over a 500-µm mesh sieve to remove sediment and detritus. The material retained on the sieve, containing the larger meiofauna, was collected.Further extraction of meiofauna from the root material was performed using decantation and elutriation techniques.

Laboratory Processing and Analysis

The fixed sediment and root samples were processed using standard meiofauna extraction techniques, such as density gradient centrifugation and sieving. Meiofaunal organisms were identified to the lowest possible taxonomic level using microscopy. Abundance and community composition of meiofauna were analyzed for both sediment and mangrove root habitats. The abundance of meiofauna taxa will be assessed by isolating and examining the various taxa macroscopically using the needle method. A wet mount slide will be made by transferring a small amount of the culture with a dissecting needle to a drop of lactophelnol cotton blue stain on grease free examined under low power objective. These isolate will be identified and used according to Malloch Methods (1981) and Devi (2012).

Measurement of Species Diversity

The fish diversity was estimated for each sampling point and it included: Simpson's dominance index (D), Simpson index of diversity (1-D), Simpson's reciprocal index (1/D), Shannon diversity index (H'), evenness index (E1), Brillouin (HB), Menhinick's Index of Species Abundance, Margalef's index of species richness (S), equitability (J), fisher alpha and Berger-parker (d).

Fish species richness in the sites was evaluated using two indices; menhinick's and margalef's indices.
These indices were used to obtain estimation of species diversity, species richness and species evenness.
1. Species richness (R1 and R2) obtained using the equations:

R1 = (Margalef, 1958) $\frac{S-1}{N}$= S – 1/ LogeN

R2 = (Menhinick, 1964) $\frac{S}{\sqrt{\Sigma ini}}$

Where,
R = Index of species richness
S = Total number of species
N = Total number of individuals
Ln= Natural logarithm

3. Shannon and Wiener (1949) and Simpson (1949) as in Otene, *et al*. (2021) diversity index values were obtained by using the following equation:

(Shannon's index) $-\sum_{i=1}^{n}\left(S\frac{ni}{N} - log2\left(\frac{ni}{N}\right)\right)$

n:Number of species in the community
ni: Number of individuals of species i.
N: Total number of individuals in the community.
S: Total number of species.
log2: Logarithm base 2.

Simpson's Diversity Index (D)

This is a measure of diversity used to quantify the biodiversity of a habitat. It takes into account the number of species present as well as abundance of each species. It measures the probability that two individuals randomly selected from a sample will belong to the same species (or some category other than species).

(Simpson index) $\frac{\Sigma ini(ni-1)}{N(N-1)}$

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Where ni = the number of individuals in the ith species
N = the total number of individuals
S = the total number of species
The value of D ranges between 0 and 1.

Simpson's indices of diversity (1-D) and reciprocal (1/D) are obtained from Simpson's dominance index by subtracting dominance index from 1 and dividing 1 by dominance index respectively.

Species Equitability or Evenness (J) Jaccard

This is a measure of how evenly individuals are distributed among the species present in a sample. It ranges between 0 and 1, the maximum value. One represents a situation where individuals are spread evenly among the species present Jaccard (1912). It was calculated as follows:

$J=H^1/\ln(S)$ (Pieolu, 1966).

Where H^1 is the Shannon-wiener index, **ln** is Natural logarithm and S is the number of distinct species,

Dominance index

Dominance index is used to characterize most conspicuous and abundant species with its relative importance related to degree of influence it has on ecosystem components. It is represented by the formular:

$$\text{Dominance index} = 1 - \left(\frac{\Sigma ni(ni-1)}{N(N-1)}\right)$$

Where ni = the number of individuals in the ith species
N = the total number of individuals,
1=unitys

Statistical Analysis

The data obtained were subjected to SPSS (Statistical Package for Social Sciences) version 20 for descriptive and inferential statistics such as mean, standard deviation, percentage etc. The effects of the experimental factors were tested by means of Analysis of Variance (ANOVA) using the Randomized Complete Block Design (RCBD) with three replicates while Dunkan Multiple Range Test (DMRT) was used to separate the means.

Results

The monthly and spatial values of sediment and mangrove root are as presented in Table 1. Table 1 shows that there was higher abundance of meiofauna on the sediment (213) than the mangrove roofs (154) giving a total of 367 individuals. There were two (2) phyla, five (5) family and thirteen species of organisms on the surfaces of both sediment and the mangrove roots. On the sediment the phylum arthropods with the class crustacean dominated (43.66%) the surface followed by the annelid (polychate) consisting 37.56% while the polychacte having the highest composition (73.38%) followed by anthropod with crustacean consisting 18.83%. Temporally, all the species of polychaete were absent during the high tide (station 1.) on the sediment in January but 3 of the species were present in the mangrove roof during the high tide.

Table 2 shows that Arthropod species were consistently absent from the sediment and mangrove roof between January and March spatially, meiofauna abundance was observed to be highest in station 2 on both sediment and mangrove roots (Table 2). There was a total of thirteen species of meiofouna comprises of the four (4) phulaannelida (1), polychaete (5), arthropoda (4), taraudea (2) and upogehta (1). Some of the species observed in this study include *Nemetod species, marphysa scanguine, sythic species, Gammarus locusta* etc.

Table 3 shows the diversity indices of meiofauna on the sediment and mangrove roots. Margalef indices for the two surface varied within the same ranged. Marg alef index for the sediment surface ranged between 2.498 (station 2) and 3.052 (station 3) while that of mangrove root ranged between 2.659 (station 1) and 2.896 (station 2). Menhink indices for the surfaces varied within the same ranges. Shannon diversity index ranged between 1.988 (station 2) land 2.996 (station 3) and 2.279 (station2). Evenness index also varied within the same range for bath sediment and mangrove roofs. Evenness index ranged between 0.867 (station 1 & 2) and 0.888 (station 2). Simpson dominance index ranged between 0.161 (station 1 & 2) and 0.126 (station 3) for the sediment while that mangrove roof ranged between 0.121 (station 2) and 0.194 (Station 3).

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Table 1: Monthly and spatial values of sediment and mangrove root

Phyla	Species	Sediment									Mangrove Root								
		January			February			March			January			February			March		
		HT	MT	LT	HT	MT	LT	HT	MT	LT	HT	MT	LT	HT	MT	LT	HT	MT	LT
Annaelida	***1***.*Nematode* species	2	8	4	3	11	4	4	7	5	0	2	6	1	4	5	6	3	6
Polychaete	*1. Marphysa scanguine*	0	2	4	1	0	0	1	2	1	4	1	0	6	3	1	4	3	1
	2.Marphysa bellii	0	1	2	0	0	0	0	1	0	2	6	2	3	3	2	4	2	1
	3.Sythii	0	1	2	1	2	1	1	2	2	1	4	3	2	5	4	0	4	3
	4.Capitela capitata	0	0	0	1	6	0	0	7	1	0	0	0	0	3	1	2	4	1
	5.Notomastus latericieus	0	0	0	1	0	0	2	1	1	0	0	0	1	1	0	1	1	0
Arthropoda	*1.Gammarus locusta*	5	23	2	0	0	0	6	20	5	0	0	0	1	1	0	2	0	1
	2.Nototropis swamidami	2	5	0	0	0	0	3	6	2	0	0	0	0	1	2	0	3	1
	3.Orchomenella nana	0	2	0	0	0	0	0	0	3	0	0	0	1	0	1	1	2	1
	4.Hyperia galba	1	2	1	0	0	0	1	4	1	0	0	0	1	3	1	1	3	1
Tanaidaa																			
	1.Tanais cavolini	2	0	1	0	0	0	0	3	1	0	0	0	1	0	1	1	2	1
	2.Callianassa turnerana	0	0	2	0	0	0	0	2	1	0	0	0	0	0	0	0	1	1
Upogehdae	*1.Upogebia deltaura*	0	1	2	0	0	0	0	0	2	0	0	0	1	0	1	1	1	0
	Total	**12**	**45**	**20**	**7**	**19**	**5**	**19**	**57**	**25**	**7**	**13**	**6**	**18**	**24**	**19**	**25**	**29**	**18**

Key: HT=High Tide, MT=Medium Tide, LT=Low Tide, 1,2,3=Stations 1-3 respectively

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Table 2: Meiofauna values in sediment and mangrove root in the study area

Indices/Station		Sediment					Mangrove Root				
Family	**Species**	**HT(1)**	**MT(2)**	**LT(3)**	**TT**	**%**	**HT(1)**	**MT(2)**	**LT(3)**	**TT**	**%**
Annelida	*1.Nematod species*	9	26	13	48	22.57	1	9	17	27	17.53
		9	**26**	**13**	**48**		**1**	**9**	**17**	**27**	17.53
Polychaeta	*1. Marphysa scanguine*	2	4	5	11	5.16	14	7	2	23	14.94
	2.Marphysa bellii	2	2	2	6	2.82	9	8	5	22	14.29
	3.Sythii species	2	5	5	12	5.63	3	13	10	26	16.88
	4.Capitela capitata	1	13	1	15	7.04	2	7	2	11	7.14
	5.Notomastus latericieus	3	1	1	5	2.35	2	2	0	4	2.60
		10	**35**	**14**	**80**	**37.56**	**30**	**37**	**19**	**113**	73.38
Arthropoda	*1.Gammarus locusta*	11	43	7	61		3	1	1	5	3.25
	2.Nototropis swamidami	5	11	2	18		0	4	3	7	4.55
	3.Orchomenella nana	0	2	3	5		2	2	2	6	3.90
	4.Hyperia galba	2	6	2	10		3	6	2	11	7.14
		18	**62**	**14**	**93**	**43.66**	**8**	**13**	**8**	**29**	18.83
Tanaidae	*1.Tanais cavolini*	2	4	2	8		2	2	2	6	3.90
	2.Callianassa turnerana	1	2	3	7		0	1	1	2	1.30
		3	**6**	**5**	**15**		**2**	**3**	**3**	**8**	5.19
Pogehdae	*1.Upogebia deltaura*	0	3	5	8		2	1	1	4	2.60
	Total	**40**	**122**	**51**	**213**		**43**	**63**	**48**	**154**	
	Percentage	**18.78**	**57.28**	**23.94**	**100**		**29.92**	**40.91**	**31.17**	**100**	

Key: HT=High Tide, MT=Medium Tide, LT=Low Tide, 1,2,3 =Stations 1-3 respectively.

Table 3: Diversity Indices of Meiofauna in Sediment and Mangrove root in the Study Area

Indices/Station	**Sediment**			**Mangrove Root**		
	HT(1)	**MT(2)**	**LT(3)**	**HT(1)**	**MT(2)**	**LT(3)**
Margalef Index	2.711	2.498	3.052	2.659	2.896	2.841
Menhinick Index	5.727	5.981	6.556	5.672	6.387	6.099
Shannon Diversity Index	2.078	1.988	2.996	2.051	2.279	2.007
Shannon Wiener index	0.903	0.903	0.999	0.891	0.990	0.822
Evenness/Equitability Index	0.867	0.867	0.897	0.855	0.888	0,808
Simpson Dominance Index	0.161	0.161	0.126	0.176	0.121	0.194

Key: HT=High Tide, MT=Medium Tide, LT=Low Tide, 1,2,3 =Stations 1-3 respectively

Discussion

Meiofauna are important organisms in any aquatic ecosystem since they form a link between producer and consumer and are also considered as metabolically important members of benthic ecosystem (Gertack, 1971, Heip *et al* 1992). According to Zeppilli *et al*. (2015) and Pusceddu *et al*, (2014), meiofauna activities are known to modify series of physical chemical are biological properties of sediment.

The thirteen species of meiofauna observed in this study is in line with the sixteen specie from 6 families reported by Iderima *et al.* (2017) from the lower Bonny estuary Rivers State but contrary to the twenty (20) reported from the Tombia segment of the New Calabar river by Beula (2023). The observed higher abundance of meiofauna on the sediment than the mangrove roofs in this study is contrary to the study by Akpan and Ofem (2018) in the Calabar estuary of the Niger Delta, Essien *et al.* (2020) in the Andoni flats of the Niger Delta and Nseabasi *et al.* (2021) in the Qua Iboe estuary of the Niger Delta.

Essien-Ibok *et al.* (2019) and Ekpo and Essien (2016) reported significantly higher meiofaunal abundance on mangrove roofs (1,520 to 2,060 individuals per $10cm^2$ compared to the 1,452 ind/$10cm^3$ meiofauna reported in the same study by Ugwumba *et al.* (2022), Essien-Ibok *et al.* (2015) and Owolabi and Akintola (2013).

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The dominance of the sediment surface by the arthropod and mangrove roofs by annelid in this study is contrary to that reported by Essien-Ibok *et al.* (2019) who reported nematodes to be the most dominating meiofauna group on both sediment and mangrove roofs. This difference could be attributed to variation in environmental factors across the surfaces. The variation in abundance of meiofauna could be attributed to the assertion by Essien-Ibok *et al.* (2019) and Ekpo and Essien (2016) that variation in meiofauna abundance on different surfaces attributed to increased organic matter and detrital food sources, structural complexity and habited predation pressure and enhanced oxygen availability. The complete absence of meiofauna group in the month of January, February and March could be attributed to environmental factor within the period and the location as well. Hence, the spatio-temporal variation with high abundance of meiofuana in station 2 than other stations could be attributed to favourable environmental condition in the area.

According to De-Hog *et al.* (2000) and Otene *et al.* (2020) diversity index is seen to be a quantitative measure reflecting how many different species in a data set can be simultaneously taken into account how evenly the basic entities (such as individual) are distributed among the inadequate environment to assess ecosystem health (Chiu *et al.,* 2011). The observed slight variations in diversity in this study between the surfaces (sediment and mangrove roots) as well as the locations could be attributed to the nature of anthropogenic activities in the respective locations and surfaces.

Ecological indices such as Margalef and Menhinick measure the richness of species in an ecosystem while Shannon wiener index measures entropy. Fluctuation in values of indices such as Margalef, Menhinick and Shannon across the stations on both surfaces within the same range could be attributed to fluctuation in number of species as confirmed by Ravera (2001) and Otene and Alfred-Ockiya (2019). The consistently higher values of Margalef and Menhinick indices or both surfaces (Sediment and mangrove roots) in stations 3 and 2 in this study is attributed to high level of meiofauna population and pollution resulting from degradation from anthropogenic activities in the area. Shannon diversity index in this study showed characteristics of moderate pollution as opined by William and Doris (1968) in Otene *et al* (2020) that values of Shannon diversity index greater than 3 indicates clean water, range of 1-3 are characterized by moderate pollution while values less than one (< 1) are characterized as heavily polluted.

It could be concluded based on the results that the sediment meiofauna abundance was higher than the mangrove roots group and that the abundance was influenced by the effect of tide. It was recommended that anthropogenic activities be checkmated to avoid further increase of these organisms in the forest.

References

Akpan, E. R., & Ofem, B. O. (2018). Meiofaunal composition and distribution in the NewCalabar River, Niger Delta, Nigeria. *International Journal of Aquatic Biology*, 6(2), 97-103.

Beula, E (2023). Diversity of Meiofauna as Bioindicator of Water Quality of Tombia Segment of New Calabar River, Port Harcourt. A project submitted to the Department of Fisheries and Aquatic Environment, Rivers State University, Port Harcourt (Unpublished) 60.

Chiu, G.S, Guttorp P, Westveld, A.H, Khan, S.A & Jun L (2011). Latent health factor index: a statistical 841 modeling approach for ecological health assessment. *Environmetrics, 22(3),* 243-255.

De-Hoog, G.S., Guarru, J, Gene J & Figueras, M.J (2000) Atlas of Clinical Fungi. Central Bureau Voor Schimmel Cultures, Mycopathologia. *Journal of Mycological Research*, *110*, 1003-1010.

Ekpo, I. E & Essien, J. P. (2016). Spatial distribution of meiofauna in the mangrove sediments of the Qua Iboe estuary, southern Nigeria. *Nigerian Journal of Ecology, 15(1),* 72-81.

El-Serehy, H.A., Al-Rasheid, K.A., Al-Misned, F.A., Al-Talasat, A.A.R & Gewik, M.M. (2016). Microbial-meiofaunal interrelationships in coastal sediments of the Red Sea. *Saudi Journal of Biological Sciences*, *23(3),* 327-334.

Essien-Ibok, M. A., Ekpo, I. E. & Bassey, H. E (2015). Studies on the aspect of the biology of Mochokidae in the lower Cross River, Akwa Ibom State, *Nigeria Direct Research Journal of Agriculture and Food Science, (11),* 193-205.

Essien-Ibok, M. A., Ntekim, E. E., & Effiong, G. S. (2019). Distribution and abundance of meiofauna in mangrove sediments of Akwa Ibom State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, *15(3),* 103-110.

Gerlach, S. A. (1971). On the importance of marine meiofauna for benthos communities. *Oecologia*, *6,* 176-190.

Gerlach, S.A., (1978). Food-chain relationships in subtidal silty sand marine sediments and the role of meiofauna in stimulating bacterial productivity. *Oecologia*, *I,* 55-69.

Giere, O. (2009). *Meiobenthology: the microscopic fauna in aquatic sediments. Springer Verlag*, Heidelberg, Berlin.

Giere, O., Windoffer, R & Southward, E.C., (1993). The bacterial endosymbiosis of the gutless nematode, Astomonema southwardorum - ultrastructural aspects. *Journal of the Marine Biological Association of the United Kingdom, 75(1)*, 153-164.

Heip, C. H. R., Huys, R & Alkemade, R. (1992). Community structure and functional role of meiofauna in the North Sea. *Netherland J. Aquat. Ecol., 26*, 31–41.

Iderima, S.T, Alagoa K.J & Ngodigha S.A (2017). Analyses of Community Attributes of Meiofauna Under A Pollution Regime in the Lower Bonny Estuary, Rivers State, Nigeria. International *Journal of Environmental & Agriculture Research, 21(5),* 5-11.

Malloch, D. (1981). The Plectomycete Centrum. In "Ascomycete Systematics: The Luttrellian Concept". D.R. Reynolds, ed. New York: Springer-Verlag.

Margalef, R. (1958). Information theory in ecology. *Gen Syst., 3*, 36–71.

Margalef, R. (1967). Diversity and stability: A practical proposal and a model of meiofaunal biodiversity and prokaryotic heterotrophic production in different tropical habitats and oceanic regions. PLoS One, *9(3),* e91056.

Menhinick, E.F (1964). A comparison of some species-individuals diversity indices applied to samples of field insects. *Ecology*, *45*,859.

Mirto, S., Rosa, T.L.A., Mocciaro, G. & Costa, K (2014). Meiofauna and benthic microbial biomass in a semi-enclosed Mediterranean Marine system (Stagnone of Marsala, Italy). *Chemistry and Ecology, 20(1),* 387-396.

Nseabasi, N. S., Emmanuel, B. E & Idung, J. U. (2021). Meiofaunal Community Structure in the Andoni Flats, Niger Delta, *Nigeria. Journal of Research in Forestry, Wildlife and Environment*, *13(1*), 32-43.

Otene, B.B, Alfred-Ockiya, J.F & Ejiko, E.O (2020) Bio-Indices of Bacteria Loads in Water and Mangrove Oyster (Crassostrea Gasar) of Woji/ Trans-Amadi Creek, Port Harcourt, Nigeria. *International Journal of Research and Innovation in Applied Science*, *5(3),*104-110.

Otene, B.B., Alfred-Ockiya, J.F & Amadi, F (2019) Physicochemical Properties and Zooplankton Community Structure of Okamini Stream, Port Harcourt, Nigeria. *International Journal of Research and Innovation in Applied Science, 4(6),* 100-107.

Owolabi, O. D. & Akintola, S. L. (2013). Abundance and community structure of meiofauna in the Lagos Lagoon, Nigeria. *Zoologia (Curitiba*), *30(2),* 187-196.

Pielou, E. C. (1966). The Measurement of Diversity in different type of Biological Collections. *Journal of theoretical biology*, *13*,131-144.

Pusceddu, A., Gambi, C., Corinaldesi, C., Scopa, M. & Danovaro, R. (2014). Relationships between meiofaunal biodiversity and prokaryotic heterotrophic production in different tropical habitats and oceanic regions. PloS one, *9(3),* e91056.

Ravera O (2001). A comparison between diversity, similarity and biotic indices applied to the macroinvertebrate community of a small stream: The Ravella River (Como Province, Northern Italy). *Aquatic Ecol*., *35*, 97-107.

Rivers State Government (RVSG). (1983). Law on Local Government of Rivers State. Rivers State, Nigeria.

Rosa, L.C. & Bemvenuti, C.E. (2005). Meiofauna in the soft-bottom habitats of the Patos Lagoon estuary (south Brazil*). Acta Limnologica Brasiliensia, 17(2),*115-122.

Sasekumar, A. (1994). Meiofauna of a mangrove shore on the west coast of peninsular Malaysia. Raffles *Bulletin of Zoology*, 42(4), 901-915.

Ugwumba, A. A. A., Ugwumba, O. A. & Nwachukwu, M. U. (2022). Meiofauna community structure and diversity in a tropical lagoon, Lagos, Nigeria. *Biologia, 77(2),* 457-467.

Urban-Malinga, B. & Moens, T. (2006). Fate of organic matter in Arctic intertidal sediments: Is utilization by meiofauna important? *Journal of Sea Research*, *56(3),* 239-248.

Vincx, M. (1996). Meiofauna in marine and freshwater sediments, in: Hall, G.S. (Ed.) *Methods for the examination of organismal diversity in soils and sediments,* 187-195

Zeppilli, D., Sarrazin, J., Leduc, D., Martinez Arbizu, P., Fontaneto, D & Fontanier, C. (2015). Is the meiofauna a good indicator for climate change and anthropogenic impacts? *Mar. Biodivers. 45*, 505–535.

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