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Assessment of Benthic Invertebrate and Planktonic Communities in Agba-Ndele and Ikiri Rivers, Rivers State, Nigeria

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Abstract*:* *This study was to determine the heavy metal pollution study of fresh water Ecosystem in parts of Sombriore and Orashi River catchement area at Agba-Ndele and Ikiri River, Rivers State. Field sampling was conducted across several locations along the Rivers, with laboratory analysis carried out to measure water quality parameters, sediment characteristics, and heavy metal concentrations. Twenty-five species of benthic macro-invertebrates belonging to Seven (7) classes were identified in Agba- Ndele River, while twenty-nine (29) species were also recorded in Ikiri River, with the class insect having the highest percentage of 44.0% in Agba-Ndele followed by Gastropoda and Olgochaeta with (6.0%) each, Hirudinea and Crustacea (8.0%) each, and Chetellata and Arachnida (4.0%). Ikiri recorded percentage composition of (48.3%) in Insecta, followed by Oligochaeta and Gastropoda (13.8%) each, Crustacea (10.3%), Hirudinea (6.9%), while Chitellata and Arachnida recorded the same percentage of (3.4%) each. In terms of abundance, Agba-Ndele recorded (60.0%) of Oligochaeta, followed by Insecta (24.9%), Gastropoda (5.9%), Crustacea (4.5%), Hirudinea (2.5%), Chitellata (1.3%) and Arachnida had the least of (0.8%). Bacillariophyceae dominated the planktonic community, making up (83.9%) in Ndele River and (50.9%) in Ikiri River, zooplankton populations were represented by protozoa, copopoda and Nematoda. The diversity index were to assess species richness which recorded 1.029 in Agba-Ndele and 0.032 in Ikiri River. This search contributes significant to the understanding of aquatic biodiversity and the ecological impacts of pollution in the Niger Delta region.*

Keywords: assessment, benthic invertebrate, planktonic communities, Agba-Ndele, Ikiri Rivers, Rivers state, Nigeria

INTRODUCTION

The Nigeria Niger Delta, characterized by its network of rivers, unique ecosystems, and rich biodiversity, faces significant environmental challenges stemming from anthropogenic activities, particularly hydrocarbon exploration and extraction. Biodiversity plays a crucial role in maintaining ecosystem stability, resilience, and functionality. The Agba-Ndele and Ikiri Rivers, are part of the Sombrero and Orashi Rivers, respectively, and serve as vital ecosystems that support diverse aquatic life and contribute to the livelihoods of local communities. However, the consequences of industrial activities, including the release of heavy metals and other pollutants, pose severe risks to these water bodies and their inhabitants (Ebegba et al., 2021; Abowei et al., 2020).

Planktonic organisms, including phytoplankton and zooplankton, play essential roles in aquatic ecosystems as primary producers and vital components of the food web. Benthic invertebrates, on the other hand, contribute to nutrient cycling and serve as indicators of ecological health (Resh & Jackson 2019). Understanding the composition and abundance of these communities is crucial for assessing the ecological integrity of the Agba-Ndele and Ikiri Rivers, the continuous extraction of oil has led to severe environmental degradation, affecting the health of local ecosystems and communities (Davis et al., 2020; Ugochukwu et al., 2023).

With the rapid industrialization and urbanization in the region, there has been a notable increase in environmental pollution in various rivers in the Niger Delta (Bubu-Davies et al. 2022) and the level of heavy metal contamination in these rivers and its effects on the ecology and human populations are not well understood because the pollution has not been thoroughly examined (Izah, 2018; Isukul et al. 2023a; Amararu et al. 2023). Our preliminary observations suggest that the levels of heavy metals in the Agba-Ndele and Ikiri rivers may exceed safe limits, potentially leading to bioaccumulation in aquatic organisms and adverse health effects in humans who consume contaminated water or aquatic life.

Healthy aquatic ecosystems provide essential services, including water purification, nutrient cycling, and habitat provision for various species. The loss of biodiversity can disrupt these functions, leading to cascading effects on ecosystem health and the livelihoods of communities dependent on these resources (Duffy et al., 2021; Adeshina et al., 2023; Ugochukwu et al., 2023). In the context of Agba-Ndele and Ikiri rivers, the lack of comprehensive data and effective monitoring strategies further exacerbates the problem, making it challenging to implement appropriate remediation and management measures. Thus the present study was aimed at providing preliminary information on the benthic invertebrates and Planktonic

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organisms in Sombrero (Agba-Ndele) and Orashi River (Ikiri) in the lower Niger Delta basin of Rivers State, Nigeria.

Study Area

Agba-Ndele River, part of the Sombrero River system (Figure 1.1), is characterized by its meandering channels and a diversity of aquatic habitats. The river is situated in an area with extensive oil drilling activities, leading to significant ecological stress. The surrounding land is predominantly agricultural, with many local communities relying on the river for fishing, irrigation, and domestic use. This dependence heightens the vulnerability of the river to pollution, as effluents from agricultural runoff and oil-related activities contaminate its waters (Ogban et al., 2022).

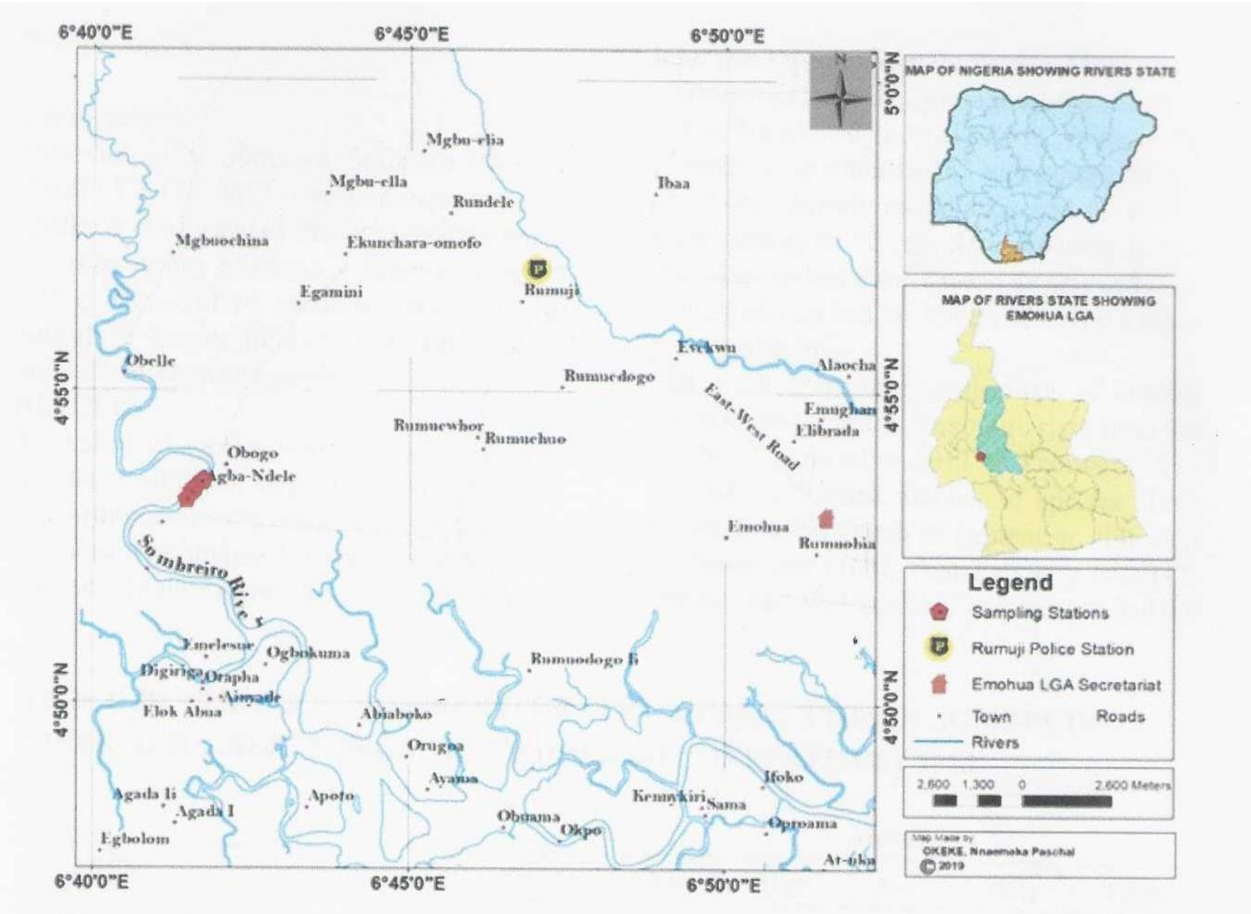

Figure 1: Sombrero River along Agba-Ndele, Niger Delta

Ikiri River, forms part of the Orashi River system (Figure 1.2), is known for its wetland ecosystems that provide critical habitats for numerous aquatic organisms. Like Agba-Ndele, Ikiri River is subjected to environmental pressures from hydrocarbon extraction and associated activities. The river's biodiversity is essential for maintaining local fish populations, which are primary food source for communities.

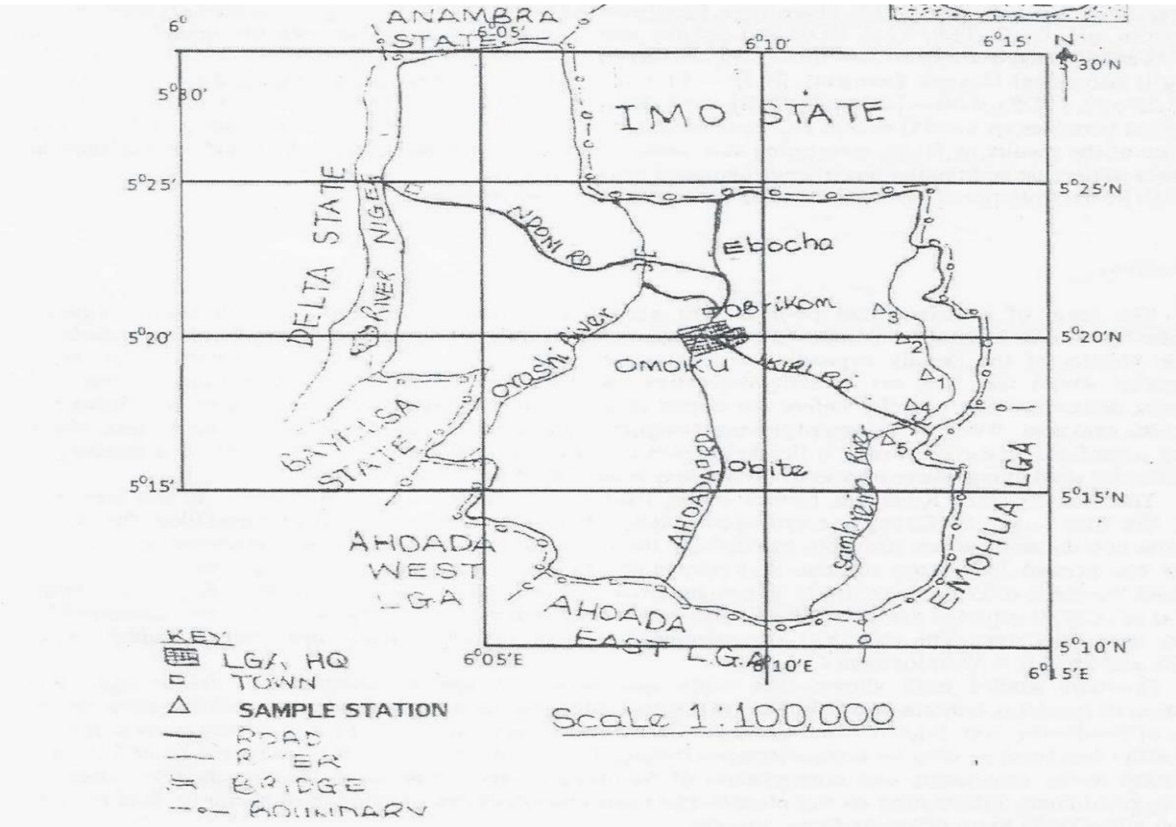

Figure 2: Ikiri River, Cross section of Orashi River, Niger Delta

MATERIALS AND METHODS

Sampling Sites and Collection Methods

Sampling was conducted at multiple locations along both rivers to assess biodiversity comprehensively. Benthic invertebrates were sorted by transferring successive quantities of preserved residue into a white plastic tray. A moderate volume of water was added to improve visibility. Large benthic organisms were picked with forceps while smaller ones were pipetted out. Sorted macroinvertebrates were then preserved in 10% formalin for further identification and counting. Benthic macroinvertebrates for Agba-Ndele (Table 1), and Ikiri river shown in Table 2, were identified to their lowest possible taxonomic level under light and stereo dissecting microscopes using the keys of Day (1967), Mellanby (1975), Fauchald (1979), Merrit and Cummins (1967) and Hart (1994). The number of each identified species or taxon was counted and recorded. The abundance and density of macrofauna were estimated using the formula.

$$\text{Density} = \frac{\text{Total number of animals}}{\text{Area of Sample Unit}}$$ (Shannon – Wiener, 1963)

Diversity index analysis was calculated using all the identified infaunal organisms. The number of individuals of each of the identified groups in the replicates during each sampling period was summed up by species to obtain the total number of each species samples at each station. The diversity index was calculated as follows:

(i) Shannon – Wiener Diversity Index or Dominance Diversity

$H = -\sum Pi \log2 Pi$

$H = ({}^{n1}/_{n}) \log2 ({}^{n1}/_{n})$ (Shannon – Wiener, 1963)

$P = {}^{n1}/_{n}$

Pi = Proportion of Individuals of each species in the station

N = Total number of individuals (sample size)

S = Total number of species observed

The Shannon–Wiener information function measures the importance of each species in the community.

(ii) Equability index (j) also called the Evenness index (Krebs, 1978), measures the distribution of individuals and is defined as:

$$J = \frac{H}{H(max)}$$ (Krebs 1978)

Where

H = Shannon Wiener Diversity Index

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H(max) = Log2 S

S = Total number of species

(iii) The species richness index of Margalet (Margalef, 1967) is defined as the ratio of the number of species to the number of individuals.

$$D = \frac{S-I}{InN} \quad \text{(Margalef, 1967)}$$

Where D = Diversity

S = Number of species collected

N = Total number of individuals

The diversity on the species richness and distribution analysis were carried out on the benthos to obtain information about the infaunal species abundance and distribution in the studied ecosystem.

Plankton samples were collected with plankton nets of a mesh size of 55 micro diameters from each stream. To filter effectively, the plankton net was towed slowly not faster than about 1-5knots, samples were collected in three streams for 3 months, (down, mid, and upstream) given a total of six samples. After towing, the collecting bottle was unscrewed and the materials in it emptied in a plastic container and preserved with 5% formation to which rose-bengal has been added. The plankton sample was thoroughly mixed and 1ml of the sample drawn out with a dropping pipette into a Sedgwick rafter counting chamber. This was examined under the electrical Nikon biological microscope with a magnification of 5000. Plankton were identified and the total number per species was counted and recorded. The following identification keys were used, Hart (1994), Eze (2001), and Woke, 2017.

Sampling of Plankton

Prior to the actual sampling date, a survey visit of the stretch of the rivers was carried out during which three stations were selected to capture all the activities. Plankton net of mesh size 22µm and towing technique were used for the collection of plankton. The plankton net was towed horizontally at the surface for five minutes over a distance of about 5meters using a locally constructed plankton net with long wooden handle and 50cl plastic bottles as collector containers.

Laboratory Analysis of plankton Sample

The planktonic samples were allowed to settle on the laboratory bench for about 30-45 minutes and subsequently filtered, and about 0.8ml was pipetted with 2ml plastic pipette on microscope glass slide for examination and identification of the micro-crustacean.

Microscopy and Identification of plankton Sample

The preserved samples were allowed to stand for about 10 minutes then, it was shaken before examination. A clean grease free glass slide and a plastic pipette of 3ml used, about 0.5mls of the sample was poured on the slide and examined with x10 and x40 objective of the microscope to determine the composition of phytoplankton and zooplankton at genus and species level. Identification and classification of the plankton species was based on the descriptive keys (Sarah, 2003; Lynne, 2004; Steve and Candace, 2006; Durand and Leveque 1980, Balcer, *et al.,*1984). The plankton was identified based on their sizes, shapes, morphological features with references to descriptions and photographs for confirmation (Edward *et al*., 2010).

Macro-benthic Invertebrate Sampling

Ekman Grab was used to collect sediment samples from three stations each of the two studied water bodies. The samples were transferred to a linen seize net material, and the excess fine sediment was washed while the residue sediment was immediately transferred into a wide-mouth plastic container. A small quantity of water was added to each of the sediment samples; 10% formalin and stained was used with Euson stain to enable coloration of the organisms in the sediment for easy sorting and identification. The preserved samples were transported to the Department of Animal and Environmental Biology, at the University of Port Harcourt, Hydrobiology Research Laboratory for further analysis.

Statistical Analysis

Data analysis included calculating species richness, diversity indices (Shannon-Wiener and Simpson's index), and evenness. Using SPSS, statistical tests, including ANOVA, were employed to compare biodiversity between the two rivers, with significance set at $p < 0.05$. The relationship between environmental parameters and species diversity was explored through correlation analyses to understand how pollution affects community structure (Bergström et al., 2022).

RESULTS AND DISCUSSION

Results

The results revealed significant differences in the diversity and abundance of benthic organisms between Agba-Ndele and Ikiri Rivers. The organisms in various sampling stations, percentage composition, abundance of both benthic macro-invertebrates and planktonic organisms, are shown in Table 1-8.

Table 1: Benthic Organisms Percentage Composition (%) of Families and Species in each Class of the Benthic Invertebrates in Agba-Ndele River

Class	Total No of Families	Total No of Species	% Species Composition
Oligochaeta	3	4	16.0
Chitellata	1	1	4.0
Hirudinea	1	2	8.0
Gastropoda	4	4	16.0
Crustacea	2	2	8.0
Insecta	6	11	44.0
Arachnida	1	1	4.0
Total	**18**	**25**	**100**

Table 2: Percentage Composition (%) of Families and Species in each Class of the Benthic Invertebrates in Ikiri River

Class	Total No of Families	Total No of Species	% Species Composition
Oligochaeta	3	4	13.8
Chitellata	1	1	3.4
Hirudinea	1	2	6.9
Gastropoda	4	4	13.8
Crustacea	2	3	10.3
Insecta	6	14	48.3
Arachnida	1	1	3.4
Total	**18**	**29**	**99.9**

Table 3: Percentage Abundance of each Class of Individual Benthic Organism in Agba-Ndele River

Class	Total No of Individuals	Mean Total No of Individuals	% Abundance
Oligochaeta	308	154	60.3
Chitellata	6	3	1.3
Hirudinea	13	7	2.5
Gastropoda	30	15	5.9
Crustacea	23	12	4.5
Insecta	127	64	24.9
Arachnida	4	2	0.8
Total	**511**	**257**	**100**

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Table 4: Percentage Abundance of each Class of Individual Benthic Organism in Ikiri River

Class	Total No of Individuals	Mean Total No of Individuals	% Abundance
Oligochaeta	308	154	58.9
Chitellata	6	3	1.2
Hirudinea	13	7	2.5
Gastropoda	30	15	5.7
Crustacea	23	12	4.4
Insecta	14	7	26.6
Arachnida	4	2	0.8
Total	**398**	**200**	**100**

Table 5: No of Individual Species Phytoplankton in each Class of Agba-Ndele River

Class	Total No of Species	% Species Composition
Bacillariophycae	52	83.9
Chlorophyceae	6	9.7
Dinophyceae	3	4.8
Cyanophyceae	1	1.6
Total	**62**	**100**

Table 6: No of Individual Species Zooplankton in each Class of Agba-Ndele River

Class	Total No of Species	% Species Composition
Protozoa	2	33.3
Copepoda	1	16.7
Nematode	2	33.3
Rotifera	1	16.7
Total	**6**	**100**

Table 7: Percentage Abundance of each Class of Individual Planktonic Organism in Agba-Ndele River

Class	Total No of Individuals	Mean Total No of Individuals	% Abundance
Bacillariophyceae	1000	500	53.5
Chlorophyceae	500	250	26.7
Dinophyceae	100	50	5.3
Cyanophyceae	80	40	4.2
Protozoa	70	35	3.7
Copepoda	40	20	2.1
Nematode	50	25	2.7
Rolifera	30	15	1.6
Total	**1,870**	**935**	**99.8**

Table 8: Percentage Abundance of each Class of Individual Planktonic Organism in Ikiri River

Class	Total No of Individuals	Mean Total No of Individuals	% Abundance
Bacillariophyceae	1500	750	42.4
Chlorophyceae	1000	500	28.3
Dinophyceae	700	350	19.8
Cyanophyceae	100	50	2.8
Protozoa	80	40	2.3
Copepoda	70	35	2.0
Nematode	50	25	1.4
Rolifera	35	175	1.0
Total	**3,535**	**1,925**	**100**

Benthic Organisms

The results of benthic invertebrates in Agba-Ndele River reveal that the class Insecta has the highest proportion of species, accounting for 44% of the total species recorded. This underscores the ecological significance of this category in the benthic ecology of the river. Further, showed that Oligochaeta and Gastropoda had equal contribution of (16) species. The species composition of classes such as Chitellata, Crustacea, and Arachnida is greatly reduced, with each class contributing a mere 4% to 8%. The observed distribution implies a quite heterogeneous benthic population, with significant presence of Insecta, which indicates their ability to adapt to different environmental circumstances in the river. (Table 2). Ikiri River exhibits a comparable trend, with the class Insecta accounting for the highest percentage of 48.3% species, somewhat surpassing the proportion in Agba-Ndele River. Oligochaeta and Gastropoda also exhibit substantial representation, accounting for 13.8% of the total species numbers each. Nevertheless, Crustacea maintains a somewhat greater proportion of 10.3%, in contrast to 8% in Agba-Ndele.

In Agba-Ndele River, as shown in (Table 3) the Oligochaeta class is the predominant biological group, comprising 60.3% of the total population. While, insecta constitute a significant percentage of the benthic population, accounting for 24.9% of the individuals. Followed by class, Gastropoda (5.9%) and Crustacea (4.5%). Similarly Ikiri River, Oligochaeta accounted for 58.9% of the total number of individuals. Nevertheless, the Insecta class is more prevalent in Ikiri River, comprising 26.6% of the total population.

Planktonic Communities

The composition of planktonic organisms, particularly phytoplankton and zooplankton, reflects the water quality and nutrient dynamics within the rivers (Bergström et al., 2022; Osagie et al., 2023). The high percentage of Bacillariophyceae in Agba-Ndele River suggests a favorable environment for primary productivity, potentially indicating good water quality and nutrient availability (O'Reilly et al., 2023; Ezeokoli et al., 2024).

The predominant species in the phytoplankton community of Agba-Ndele River is Bacillariophycae, accounting for 83.9% of the total species. This is followed by the percentage contribution of Chlorophyceae is 9.7%, Dinophyceae 4.8% and Cyanophyceae 1.6%. Protozoa and Nematode dominate the zooplankton population, each accounting for 33.3%, while Rotifera and Copepoda had 16.7% each as their species compostion.

Bacillariophycae remains the predominant class of phytoplankton in Ikiri River, accounting for (50.9%) followed by Chlorophyceae (24.7%) and Dinophyceae (8.8%). The zooplankton population in Ikiri River exhibits greater diversity, with the class Insecta accounting for the highest percentage at 39.4%, followed by Rotifer at 24.2% and Protozoa at 18.2%. These findings suggest a zooplankton community that is more intricate and varied in comparison to the Agba-Ndele River.

In Agba-Ndele River, the prevalence of planktonic organisms is significantly biassed towards Bacillariophyceae, representing 53.5% of the whole biomass, while chlorophyceae make a substantial contribution of 26.7%, indicating that green algae are highly suited to the specific conditions of the river and others such as Protozoa (3.7%) and Nematode (2.7%), while other classes such as Copepoda and Rotifera make up minor proportions. The dominance of Bacillariophyceae in Ikiri River had (42.4%), and Chlorophyceae family recorded 28.3%. Significantly, the Dinophyceae family had (19.8%) than in Agba-Ndele, indicating that this order flourishes more effectively in this particular habitat.

Although Protozoa and Nematode dominate the zooplankton community, their abundance is somewhat lower than in Agba-Ndele, indicating the distinct biological dynamics of the rivers.

The overall lower diversity of zooplankton in Agba-Ndele River may indicate an imbalance in the ecosystem, possibly linked to pollution impacts.A comparison of species composition, abundance, and diversity indices between the benthic and planktonic populations of Agba-Ndele River and Ikiri River shows notable disparities.

DISCUSSION

The most important class of species in the infauna were Arachnida, Oligochaeta, Chitellate, Hirudinea, Crustaea, Gastropoda and Insecta. The data revealed that Oligochaeta population was abundant in both river, followed by Insecta, Gastropoda, Crustacea, Hirudinea, Chitellata and Arachnida populations in order of prevalence (Woke & Wokoma, 2006). In general, the downstream of both river (Agba-Ndele and Orashi) had the highest member of benthic annual in the sampling stations, while the upstream of both river recorded the lowest number of 31 and 32 species occurring in the different stream.

Furthermore, the data show that more organisms were identified in Orash river in the various sampling stream. Downstream (150), Midstream (62), Upstream(56), Downstream (62), Midstream (39), Upstream (41), Downstream (55), Midstream (30) and Upstream (32) respectively, as compared to that of Agba-Ndele that had the following: downstream (144) midstream (61) upstream (53) downstream (60), midstream (36), upstream (29), downstream (55), midstream (59) and upstream (31) respectively.

The low diversity of benthic fauna recorded in this study is not unusual in tropical water for instance, in lake George, Uganda, the bottom fauna was poor in species (Burgis *et al.,* 2023, Darlington, 2020). However, the significantly lower density of organisms during rainy season was partly attributed to the in-direct effect of the rains on the substrate.

It was pointed out that during this period, the substrate is unable being either mashed off or submerged, especially during the flood season (June-July). The substrate in the sampled area was found to be modified during this period. During the dry season, the substrate stabilized and the populations build up. The low diversity of the macro benthic intertebrate fauna represented in this study is not different from other studies that has been carried out in the Niger Delta.

Woke (2004) reported a total of 14 taxa of benthic macro invertebrates belonging to 12 families and five classes from Nga-Wogba stream, Port Harcourt, Ezekiel *et.al.,* (2011) reported 28 species belonging to 14 families, six classes and three Phyla from the Sombreiro River, Umeozor (1995) also recorded 23 groups from New Calabar River, Hart and Zabbey (2005) reported 30 groups belonging to 20 families and five classes and Ansa (2005) recorded 28 families six classes and five Phyla. These similarities could be caused by closeness in their locations, time, food availability and factors that influence the physical and chemical characteristics of the water bodies. Organisms need adequate food for their survival and growth (Ibemenuga and Inyang, 2006).

The benthic macro invertebrates composition result of this study is also similar to the results of other studies from other water bodies in Nigeria. John *et al.,* (2013) have also recorded low distribution from the Agba-Ndele flood plain. The differences that occur in species distribution could be caused by ecological differences in their environment and period of investigation of the water quality. Immediate substrate for occupation and food availability may also affect the distribution of the macro-invertebrate communities (Dance and Hynes, 2020). The dominance of tubificid and Chironomus Larvae in both river 60.0% in Agba- Ndele and 58.9% in Orashi river in this work corresponds with report of Andem *et al.,* (2012), Woke and Umesi, (2018) and Abed –Nego *et al.,* (2016).

The dominance of Chronomus Larvae in the Sombreiro River (Agba-Ndele) may be based on the ability of insects to thrive in populated environments probably due to the presence of haemoglobim a pigment that transports and stores dissolved oxygen (Tyokumbe *et al.,* 2002).

The study found limited diversity in the bottom ecology of tropical lakes such as Elechi Creek, which is in consistent with the previous research that has shown how the texture and stability of the substrate affect the horizontal dispersion of benthic organisms. Therefore, the differences observed in the distribution of species indicated the dependence on prevailing environmental conditions and the ability of each organisms to exploit and tolerate varied biotope. Analysis of the differences

Southwood (2002) also observed that the density of the benthic fauna was considered low as indicated by the monthly sample mean (Table 2). Under such a condition, a random distribution could be expected but distribution was contagious. This indicate that the low density of benthic fauna observed in this study could not override the inference of substrate in causing a contagious distribution of the population.

In terms of planktonic organisms a total number of 88 species in Agba-Ndele river and 54 species in Orashi rivers (Table 1) were recorded. The Phytoplankton community was dominated by the Bacillariophyceal having 52 species with 83.9%, followed by Chlorophyceae 6(9.7%), Dinophyceae 3(4.8%) and Cyanophyceae 1(1.6%) Table 4:6 a&b) and Orashi rivers, Bacillariophyceae 29(50.9%), Chlorophyceae 14(24.7%) Cyanophyceae 6(10.5%) Dinophyceae 5(8.8%) Chrysophyceae 2(3.5%) and Cryptophyceae 1(1.8%) respectively.

The result of this study compare favourably with the report of some studies carried out in the Niger Delta rivers. Yakubu *et al.,* (2000) recorded 17 species from River Nun and he also recorded 20 and 34 species in Orashi river. The result of this study is lower than the reported 103 species recorded by Zabbey *et al.,* (2008) from Imo River the 43 species recorded by Ezekiel *et al.,* (2011) in Sombreiro River and the 39 species recorded by Abowi *et al.,* (2008) in Lubara Creek.

The dominance of Bacillariophyceae in this study is not unusual occurrence because they have the potentials to withstand unstable conditions. The low occurrence of Cyanophyceae is as a result of the flowing nature of the water body. They seldom occur in rivers unless the water is slow flowing. Also, due to lack of flagella, they find it difficult to move away or escape from harsh conditions in the water caused by anthropogenic activities. Nkwoji *et al.,* (2010) reported that species that are dominant in both brackish and fresh water have the highest self-sustaining natural mechanisms.

Southwood (2020), reported that both the qualitative and quantitative results on species indicate that organic enrichment, depth and thermal conditions are the most important factors that structure plankton along the stream. Thus, phytoplankton numbers are low when the water is at the highest level. In the dry season, nutrient level rise and phytoplankton numbers increase (Dirisu et al 2019). Odokuma and Okpokwasili (2000) reported the same seasonal pattern in the Blue Bile, low phytoplankton numbers during flood season, followed by an increase, the current slows and transparency increases, thus creating conditions for increased Phytoplankton production (Merit and Cumins, (2001).

CONCLUSION

In summary, the result indicates that Ikiri River displays greater biodiversity, species evenness, and a more equitable ecological structure in comparison to Agba-Ndele River, which is characterised by a greater prevalence of a small number of dominant species. The findings underscore the importance of continuous monitoring and assessment of these aquatic ecosystems to identify changes and implement necessary conservation strategies (Ezeokoli et al., 2024; Osagie et al., 2023).

With a total downstream count of 261 organisms, the Agba-Ndele River has a higher total than the Ikiri River, which has 267 organisms. Although these high populations further downstream imply that the lower sections of these rivers are more favourable to supporting species, it is important to note that this does not necessarily indicate that the ecosystem is in good health. Due to the prevalence of taxa such as *Tubifex tubifex*, which is able to flourish in habitats with low oxygen levels and high levels of pollution, it can be inferred that the regions farther downstream are likely to be susceptible to high levels of organic pollution. *Tubifex tubifex* is a species that is known to be tolerant of pollution, and the fact that it is so abundant indicates that the water quality in the downstream areas may be impaired as a result of the accumulation of garbage, runoff, and other organic pollutants.

The organism counts in the parts of both rivers that are located upstream and midstream are much lower than those found in the sections that are located downstream: 125 organisms were found in the midstream of the Agba-Ndele River. Upstream of the Agba-Ndele River, a total of 125 different organisms. The total number of organisms found in the Ikiri River Midstream is 131. There were 129 organisms found in the Ikiri River upstream. It appears that the water quality has improved, as seen by the decreased number of organisms found in these parts. The water is also clearer, has fewer nutrients, and has less pollution.

The fact that pollution-resistant species are more prevalent further downstream, such as *Tubifex tubifex*, brings to light the necessity of water quality management in both rivers. It is possible that variables such as industrial discharge, agricultural runoff, or untreated wastewater entering rivers are the causes of the accumulation of organic matter and contaminants further downstream. In the event that this pollution is not addressed, it has the potential to cause additional degradation of water quality, a reduction in biodiversity, and the potential to cause harm to aquatic ecosystems as well as human communities that rely on rivers for water.

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