BENTHIC MACRO-FAUNA SPECIES COMPOSITION AND ABUNDANCE IN THE LOWER SOMBREIRO RIVER, NIGER DELTA, NIGERIA

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ABSTRACT: *The present study was designed to determine the species composition and abundance of the benthic community along the brackish water axis of the Sombreiro River, for a period of 24 – months from April, 2012 to March, 2014. Sub-sea sediment samples were collected on monthly basis in 10 sites and analyzed for macro-benthic organisms. The benthic macro-faunal community was represented by 8 species from 4 different phyla and 6 classes.Polychaetes were the most dominant class with 3 species and the others - Crustacea, Insecta, Gastropoda, Bivalvia and Pisces were represented by 1species each. While polychaetes and gastropods were observed in all stations others were found in only one site each. Polychaetes were the most abundant with 104 individuals representing 70.27%, followed by Gastropoda with 39 individuals (26.35%), Insecta is next with 2 individuals (1.35%) and others (Crustacea, Bivalvia and Pisces) contributed 1 individual each (0.67%).*

KEYWORDS: Polychaete, Sub-sea sediment, Benthic macro-fauna, Gastropoda, Erkman Grab

INTRODUCTION

Organisms that live inor on the sediment are referred to as benthic organisms. All substances (pollutants) that enter the aquatic environment either sink or settle down to the bottom/sediment with time, meaning that the sediment and or organisms that live there keep the longest and best account of activities both natural and anthropogenic(Wokoma and Mgbomo, 2013).Benthic macro in-fauna are particularly suitable as ecological indicators because their habitat preference and relatively low mobility cause them to be directly affected by substances that enter the environment. There has been a great deal of work on the effects of organic pollution on macro invertebrate communities (Umesi&Daka, 2004).

Environmental stress is an action agent or condition that impair the structure and, or function of the biological system. The responses of organisms to an environmental stress or stressors are either structural (e.g. describing the number and kinds of the biotic components) or functional (e.g. describing performance or flux). Systematists and taxonomists were mostly responsible for the initial studies into the response of organisms to pollution stress. Species composition and abundance were far more common than functional changes, such as nutrient cycling and energy flow (Simon, 2003). In addition to differences in type (i.e. structure or function), response to environmental stress also differ by hierarchical scale. Example of environmental stresses include natural disasters such as hurricanes, floods, droughts, volcanic eruption, climate change, invasion of exotic species, as well as anthropogenic sources such as eutrophication and pollution (Cairns, 2001). Key species indicator taxa have long been important indicators of biological recovery. Some of the earliest biological

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response indicators were specific organisms or were based on simple indices e.g. saprobic index (Davis, 1995, cited in Simon, 2003). Umesi, Dirisu, Nwogbidi and Wokoma (2013) used littoral benthos as sentinel organisms to detect effects of organic carbon and dissolved oxygen in sites around the Rumueme Creek, in the Upper Bonny estuary. They concluded that their abundance and species diversity leave behind ecological signatures that are indicative of impacts of human activities.

In terms of selecting a biological component for assessment of sediment contamination, benthic invertebrates have proved to be very useful. Canfield et al, (1994) reported that field surveys of invertebrates (and vertebrates) provide an essential component of biological assessments of toxicity associated with contaminated sediments.

Because of their tremendous diversity, longevity, sensitivity, and critical roles in ecosystem function, benthic fauna provide excellent model systems for examining the effects of anthropogenic disturbances on aquatic ecosystems.

MATERIALS AND METHODS

Description of the Study Area

The study area- Sombreiro River is located in Rivers State in the Niger Delta region of Nigeria, and lies between Latitude 6^0 30^1 to 7^0 0^1 E and Longitude 4^0 12^1 to 6^0 17^1N (Ezekiel *et al.*,2011). It is a tidal dominated river, with possible fresh water input. The climate is classified as humid tropical of the semi hot equatorial type. The area experiences heavy rainfall from April to October with a mean rainfall estimated over 2000mm and mean annual temperature of about 29^OC (UNEP, 2011). Recently heavy rains tend to begin by May, and even in the dry season months of November to March, sporadic heavy downpours are not uncommon. The vegetation of the river is predominantly mangrove with *Rhizophoraracemosa*, *Rhizophora mangle*Gaertin and *Rhizophoraharosanii*Leechman, as the dominant species (Abowei, Davies &Tawari., 2008).

In order to obtain samples for this investigation, ten (10) stations were established along the River. The stations as well as their location and global positioning system (GPS) coordinates are as shown in Table 1.

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Table 1: Sampling stations and their GPS Coordinates

S/No	Station	Location	GPS Coordinates	
			N	E
1	STN 1	SikakaKiri (Abandoned Fishing settlement)	4˚ 34.692'	6˚ 48.037'
2	STN 2	BilleBoko (Gateway to Bille Town)	4˚ 36.126'	6˚ 50.418'
3	STN 3	Minjudu-Kiri (Fishing settlement)	4˚ 36.423'	6˚ 50.264'
4	STN 4	Chevron Jokka Well Head 1 & 1D	4˚ 38.132'	6˚ 49.552'
5	STN 5	Idama Flow Station	4˚ 37.703'	6˚ 48.849'
6	STN 6	Idama Junction	4˚ 38.077'	6˚ 48.498'
7	STN 7	Da- obuKiri (Fishing Settlement)	4˚ 39.353'	6˚ 48.185'
8	STN 8	LeleKiri (Fishing Settlement)	4˚ 39.884'	6˚ 46.630'
9	STN 9	EriseKiri (Fishing Settlement)	4˚ 40.796'	6˚ 46.899'
10	STN 10	Abonnema Urban	4˚ 43.329'	6˚ 46.476'

Field Methods

Prior to actual sampling, a reconnaissance survey of the stretch of River Sombreiro was carried out, during which, 10 sampling stations were established. Sampling stations were selected to capture all the "environmental action spots" on both sides along the coastline. An initial sampling was carried out during the reconnaissance visit, this is with the view to master field methods, get used to the sampling stations as well as equipment's and above all eliminate likely sampling/ handling errors. Standard methods were adopted for sampling for all parameters and the sampling duration was 24 months (from April, 2012 to March, 2014).

Sub-sea sediment samples were collected in triplicates using Erkman Grab, and poured through a sieve of 1mm x 1mm mesh size (Ekweozor, 1985), and washed/ sieved thoroughly. The filtrate (retained on the 1mm mesh sieve) was collected for the benthic study, and stored in 1 litre large- mouthed plastic containers. The samples were preserved in sea water containing a few drops of 10% formalin solution (Canfield *et. al.*, 1994) after which a few drops of eosin was also added and covered tightly. The addition of eosin has the overall effect of staining tissues of the organisms to make for easy identification and enumeration.

Laboratory Methods

Benthic samples were processed by first washing it through a sieve of fine mesh size made of silk material, in order to wash off formalin and excess silt or mud (Canfield *et. al.*, 1994). Benthic samples were then transferred to a shallow white tray with water for sorting. Sorting was done using forceps and a hand lens. The macro- benthic fauna was sorted into separate vials, and preserved in 70% ethanol (APHA, 2005) and labeled with name of sample, location and date of collection. Taxonomic identification was carried out as far as possible, to identify organisms to the highest practicable level.

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RESULTS AND DISCUSSION

The benthic macro-faunal community of the study area was represented by individuals from 4 different phyla and six (6) major macro-faunal groups (classes) – Arthropoda – (Crustacea and Insecta), Annelida (Polychaeta), Mollusca – (Gastropoda and Bivalvia) and Chordata – (Pisces). A total of eight (8) species were recorded in the survey out of which 3 species (accounting for 37.5%) were polychaetes and the other 5 groups were represented by 1 species (12.5%) each.

The most occurring taxonomic group is the polychaeta with 3 species, while all other groups had 1 species each. Table 2 shows the distribution and variation of species among the different taxonomic groups and indicates that the highest numbers of species (5) were gotten in Stations 1, 3 and 9; all other Stations had 4 species each except Station 5 which had only 3 species. Two taxanomic groups – Polychaeta and Gastropoda were recorded in all the sampling stations while the other groups were observed in only 1(one)station respectively.

TABLE 2: CHECKLIST OF BENTHIC MACRO-FAUNA FOUND IN THE WATERS OF SOMBREIRO RIVER FROM APRIL, 2012 TO MARCH, 2014.

+ (PRESENT) - (ABSENT)

SPECIES	STATIONS									
	1	2	3	4	5	6	7	8	9	10
CRUSTACEA										
Alpheops monody	-	-	-	+	-	-	-	-	-	-
POLYCHAETA										
Nephthys caeca	+	+	+	-	-	+	+	+	+	+
Nereisdiversicolor	+	+	+	+	+	+	+	+	+	+
Notomatuslatericeus	+	+	+	+	+	+	+	+	+	+
GASTROPODA										
Tympanotonusfuscatus	+	+	+	+	+	+	+	+	+	+
BIVALVIA										
Crassostreagasar (Larva)	+	-	-	-	-	-	-	-	-	-
PISCES										
Gobionellassp (Larva)	-	-	-	-	-	+	-	-	-	-
INSECTA										
Chironomus larva	-	-	-	-	-	-	-	-	+	-
Total	**5**	**4**	**4**	**4**	**3**	**5**	**4**	**4**	**5**	**4**

Benthic macro – fauna class abundance observed in this investigation from April, 2012 to March, 2014 is respectively shown in Table 3. In terms of class abundance, Polychaeta dominated the benthic community with 70.27% (104 individuals) of the total number of individuals enumerated. This was followed by Gastropoda and Insecta which accounted for 26.35% (39 individuals) and 1.35% (2 individuals) respectively. OthersCrustacea, Bivalvia and Pisces contributed 0.676% (1 individual) each of the total macro-fauna of the study area.

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Table 3: TOTAL ABUNDANCE OF BENTHIC MACRO-FAUNA FOUND IN THE SEDIMENT OF SOMBREIRO RIVER FROM APRIL, 2012 TO MARCH, 2014.

SPECIES	STATIONS										
	1	2	3	4	5	6	7	8	9	10	**T0TAL**
CRUSTACEA											
Alpheops monody	0	0	0	1	0	0	0	0	0	0	1
POLYCHAETA											
Nephthys caeca	5	2	5	0	0	4	4	9	2	3	34
Nereisdiversicolor	3	1	9	1	2	6	3	7	1	3	36
Notomatuslatericeus	4	2	9	2	1	3	4	4	1	4	34
GASTROPODA											
Tympanotonusfuscatus	6	1	6	3	1	5	8	4	1	4	39
BIVALVIA											
Crassostreagasar (Larva)	1	0	0	0	0	0	0	0	0	0	1
PISCES											
Gobionellassp (Larva)	0	0	0	0	0	1	0	0	0	0	1
INSECTA											
Chironomus larva	0	0	0	0	0	0	0	0	2	0	2
TOTAL	**19**	**6**	**29**	**8**	**4**	**19**	**19**	**24**	**7**	**14**	**148**

Eight (8) species of benthic macro-fauna were found in the brackish water axis of Sombreiro River which cut across four phyla, six classes and eight genera. The composition of benthic macro-fauna in terms of representative phyla in the study area is closely related to the five phyla observed by Ansa (2005) and Hart (1994) in the Andoni flats and Eagle Island (both in the Niger Delta) respectively. The only additional phyla being Coelenterata, and is indicative of ecological similarities.

It is equally related to the three phyla (Arthropoda, Annelida and Mullusca) reported by Ezekiel, Hart and Abowei (2011) in the Sombreiro River, the only missing phyla being Chordata. They recorded six classes of benthic macro-fauna as in this study, but with Oligochaeta replacing Pisces that was observed in this study.

The 8 species observed in this study is analogous to the 9 species recorded by Victor and Dicson (1985) in the Ikpoba River, but lower than the 28 species reported by Ezekiel, Hart and Abowei, (2011). Hart and Zabbey (2005) reported 30 species, while Ansa(2005) also recorded 30 species. In studies conducted in mangrove swamps in Port Harcourt, Hart (1994) recorded 51 while Edokpayi and Osimen (2001) reported 84 species from Ibiekuma River. Species abundance values as high as 122 species (Lagos Lagoon) and 414 species (Seamounts on the Northwest Chatham Rise) were also reportedOnyenekan (1987) andRowden*et al.*, (2002) respectively.

The differences in species composition and abundance may be attributed to a number of ecological factors including differences of the different habitat locations and period of investigation, water quality, and substrate for occupation and food availability, (Dance & Hynes, 1980).

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Polychaetes dominated the benthic community of Sombreiro River with three species and were near evenly distributed across the ten stations, while all other classes of benthos had only one representative each and were observed in one station only except the class Gastropoda which was recorded in all the stations. Similarly, class Polychaeta contributed 70.27% of all the benthic macro-fauna enumerated in this study, followed by Gastropoda with 26.35% contribution.The class Insecta contributed 1.35% and Bivalvia, Pisces and Crustacea contributed 0.68% each.

The dominance of Polychaeta as shown in this study is in agreement with the report of Ezekiel, Hart and Abowei, (2011), George *et al*, (2010) and Hart and Zabbey, (2005), this may be attributable to the similarity in the study areas and their high level of pollution tolerance (Edokpayi&Nkwoji, 2007). The very low number of species and individual members enumerated in this study is indicative of sediment pollution.

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