Composition and Abundance of Macrobenthos in the Lagos Lagoon

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Abstract

The composition and Abundance of Macrobenthos in the Lagos Lagoon was investigated from June, 2012 to March, 2013 in Eleven (11) study stations in the Lagos Lagoon. A total of 1861 Macrobenthos belonging to three phyla; Mollusca, Arthropoda and Annelida were encountered. The Gastropod Pachymelina aurita was the most dominant species with a percentage composition of 23.5% while the Polychaete worm Nereis indica closely followed with a percentage composition of 21.5%, Anadara senilis and Crassoterea tulipa had the least representative (1.1%). All the stations studied had relatively low species diversity. The Shanon – Weiner index of diversity (H) ranged from 0.38 to 0.8. Margalef index (d) ranged from 0.91 to 2.41. The overall Macrobenthos diversity of the stations studied in the Lagos lagoon was relatively low.

Keywords: Macrobenthos, Species diversity, Lagos Lagoon.

Introduction

Benthic macro organisms are animals without backbone that live on or in the sediments of water bodies, attached to rocks or debris at the bottom. (Idowu and Ugwumba, 2005) they are usually retained by mesh size greater than 200*u*m but less than 50*u*m. Benthos include several species of organisms which cut across different phyla, they include; arthropods, molluscs, annelids, etc. these group of organisms play a vital role in the circulation and re-circulation of nutrients in aquatic ecosystems. They also serve as food for economically important fish and shellfishes in most aquatic environment where they are major secondary producers (Ajao and Fagade, 2002), they accelerate the breakdown of decaying organic matter into smaller inorganic forms such as nitrates and phosphates (George *et al*., 2009). They are also useful bio-indicators, providing a more accurate understanding of transition in the aquatic systems (Ikomi *et al*., 2005; Woodcock and Huryn, 2007).Macrobenthic organisms are also effective tools for assessing organic pollution. Their sedentary nature makes it possible for them to be highly impacted by any xenobiotic compounds and other anthropogenic stressors released in the water (Esenowo and Ugwumba, 2010).Several research works in the lagoon have reported composition, abundance and distribution of the commonest species, they include; Ajao and fagade (1990) on the seasonal and spatial distribution of the benthic macro invertebrate *Capitella capitata*; among dominant speciesreported, the Gastropod *Pachymelina* , *Alloidis truncata* , the polychaete *Capitella capitata* are most dorminant (Ajao and Fagade 2002).Edokpayi and Nkworji (2007) also worked on the physico – chemical and macrobenthic invertebrate characteristics of a sewage dumpsite on the western part of the Lagos lagoon and recorded high abundance of the polychaete *Capitella capitata*.
The objective of this study is to determine the current composition, abundance and species diversity of macrobenthos in the Lagos lagoon.

Materials And Methods

Study Area

The Lagos lagoon is a part of a continuous system of lagoons and creeks found along the coast of the south-western part of Nigeria from the boarder within the republic of Benin to Ondo state. The lagoon is bordered by the forest belt and receives input from a number of important large rivers, (Ajao,1996). The lagoon is located between latitude 6º26 and 6º38′ N longitude 3º 23 and 3º 43′ E. the lagoon covers an area of about 208km^2 (FAO, 1969), it is generally between 0.5 – 2m deep. Eleven (11) stations were selected on the basis of human activities across the lagoon from June 2012 to March 2013.

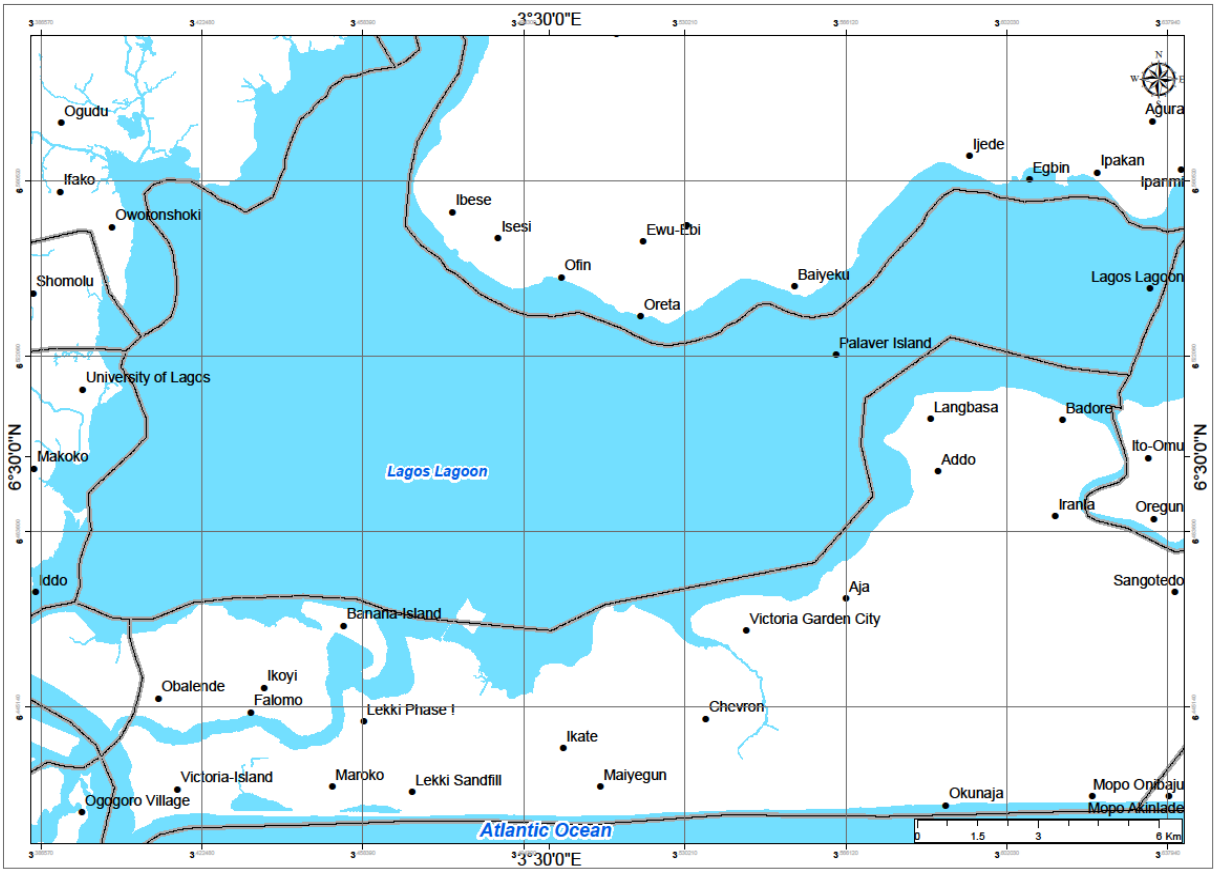

Fig.1: Map of the Lagos lagoon showing the study stations.

Table 1: study stations and coordinates.

Station	GPS coordinates (N)	(E)
1 (1004 estate area)	06º 26 28.1	003º2546.6
2 (Osbourne)	06º 2736.2	003º2802.3
3 (Badore)	06º 3023.1	003º3415.8
4 (oreta)	06 º 3334.0	003º2462.1
5 (Bayeiku)	06º 3202.3	003º3322.7
6. (Ibese)	06 º 3371.0	003º2564.1
7 (Majidun)	06º 3620.7	003º2848.7
8 (Ajegunle)	06º 3441.5	003º2649.2
9 (Oworo)	06º 3322.0	003º2554.4
10 (Unilag waterfront)	06º 3115.6	003º2416.1
11 (Okobaba)	06º 2845.5	003º2336.0

At each sampling station, two replicate samples of benthos sediments were collected monthly using a $0.1m^2$ van veen grab from June 2012 to March 2013. The sediment collected was sieved through a 0.5mm mesh sieve. The residue was preserved in 10% formalin to which Rose Bengal stain was added. The residue was then poured in plastic containers and labeled and later transported to the marine biology laboratory for further examination. In the laboratory, each sediment sample was washed through 0.5mm and 0.2 mm mesh size sieve. The macrobenthos retained were poured into a white enamel tray and sorted out into their various groups using forceps and hand lens. Further Identification was done with the aid of Pennak 1978, Edmunds, 1978. Macrobenthos diversity was estimated using Shannon- weiner index of diversity (H) Shannon and Weaver (1963). The species richness was determined using Margalef's index, (Valiela, 1995) and Evenness index (E).

Results

The composition, abundance and distribution of the macrobenthos in the study areas are shown in Table2. A total of 1861 Macrobenthos belonging to three phyla; Mollusca, Arthropoda and Annelida were recorded. Phylum Mollusca was represented by gastropoda and bivalva; the phylum Annelida was represented by polychaete worms while Arthropoda was represented by Chironomid larva and Decapoda was represented by prawns and crabs. The gastropoda, *Pachymelina aurita* was the most dominant species accounting for about 23.5% closely followed by *Nereis indica* with 21.5% and the least was *Anadara senilis* with 1%, of the total macrobenthos (Fig 2). The Shannon- weiner diversity index (H) showed the highest mean of (0.81) recorded in station 3 and station 9. The lowest mean was recorded in station 7 with a mean of (0.37). Margalef index (d) was lowest in station 7 (0.91) and highest in station 11 (2.41) as seen in fig 3. Evenness index (E) ranged from (0.62) in station 8 to (0.85) in station 3. The highest number of species (15) was recorded in station 11 while station 7 had the least number (6) species (Table2).

Table 2. Composition and abundance of Macrobenthos in Lagos lagoon.

Macrobenthos taxa	**Station 1**	**Station 2**	**Station 3**	**Station 4**	**Station 5**	**Station 6**	**Station 7**	**Station 8**	**Station 9**	**Station 10**	**Station 11**
Gastropoda											
Pachymelina aurita	79	42	25	100	*	10	27	11	43	50	149
Tympanotomus fuscatus	15	10	15	25	*	33	*	*	25	22	51
Cerithium atriatum	*	4	5	*	52	5	25	21	*	*	35
Bulinus sp	*	2	*	12	8	*	*	*	24	3	23
Bivalva											
Pitaria tumens	*	12	10	20	13	*	*	1	5	11	33
Crassoterea tulipa	8	*	*	*	7	*	*	2	*	*	5
Graphaea gasar	1	*	*	14	*	4	*	*	7	1	1
Anadara senilis	2	*	*	*	11	*	2	*	*	*	3
Mytilus perna	10	*	*	*	10	*	*	2	*	*	1
Worms											
Nereis indica	*	21	45	11	25	25	140	103	11	17	1
Capitella capitata	5	2	10	2	*	7	53	10	1	51	1
Arthropoda											
Chironomid larva	*	*	4	2	3	5	25	53	5	*	*

Decapoda											
Callinectes amnicola	5	*	10	12	*	2	*	*	10	3	10
Sersama angolense	*	2	*	1	*	*	*	*	*	*	21
Macrobachion macrobachion	10	*	3	4	*	2	*	1	*	*	1
S	**9**	**8**	**9**	**11**	**8**	**9**	**6**	**9**	**10**	**9**	**15**
N	**135**	**95**	**127**	**203**	**129**	**93**	**249**	**204**	**132**	**159**	**355**

*Where S= total taxa, N= no. of species, *= no species represented.*

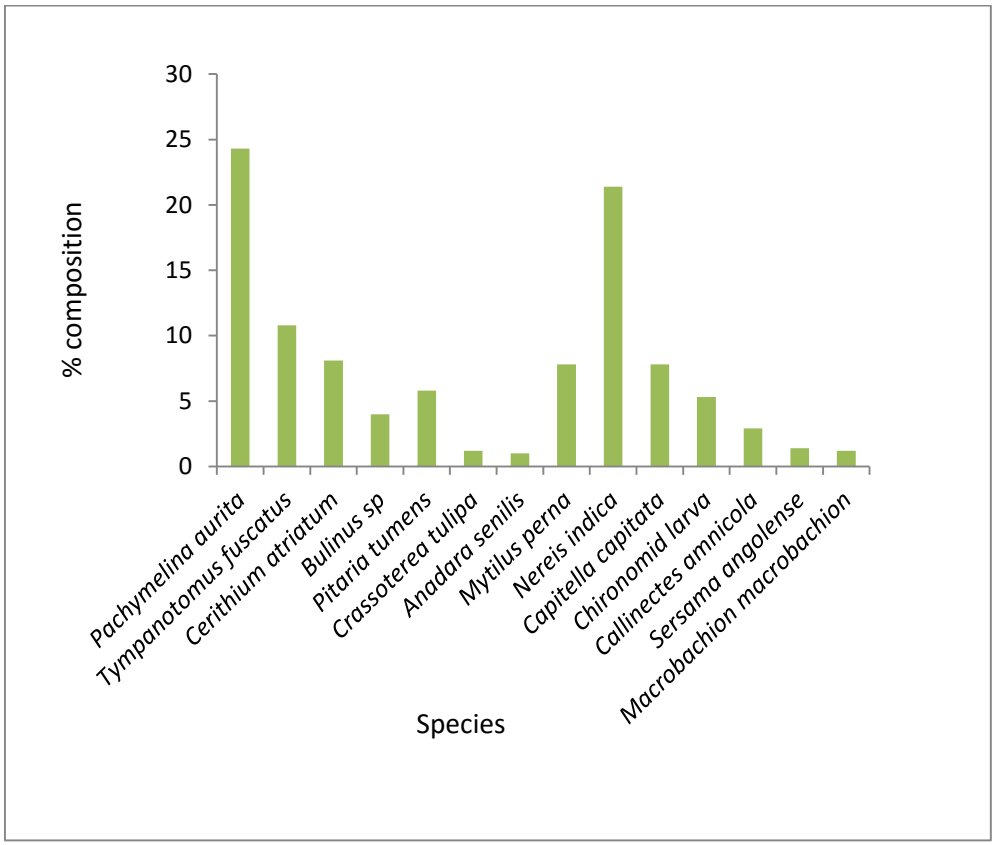

Fig. 2: percentage (number) of Macrobenthos in Lagos lagoon.

Table 3. Diversity index of Macrobenthos in the sampling stations of Lagos lagoon

Factors	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Station 9	Station 10	Station 11
No of Individuals (N)	135	95	127	203	129	93	249	204	132	159	335
No of Species (S)	9	8	9	11	8	9	6	9	10	9	15
Shannon-weiner diversity (H)	0.63	0.68	0.81	0.74	0.76	0.77	0.38	0.59	0.81	0.71	0.77
Margalef index (d)	1.63	1.54	1.65	1.88	1.44	1.44	0.91	1.5	1.84	1.58	2.41
Evenness index E	0.66	0.76	0.85	0.71	0.84	0.84	0.45	0.62	0.81	0.75	0.65

Discussion

The result of the eleven stations studied showed a benthic community comprising of Mollusc; which consists of gastropods and bivalve, the Annelids comprised (mostly the polychaete worms), Arthropods comprised of Chironomid larva and the Decapods comprised of prawns and blue crabs. The relative abundance of gastropods and bivalves across the stations shows how tolerant they are to physical and chemical variations in the environment. They are usually found in a wide range of habitats that favors their growth and distribution. (Ajao and Fagade (2002) documented the gastropods as the most dominant benthic fauna in the Lagos lagoon. From this study, the gastropod *Pachymelina aurita, Tympanotomus fusca*tus was highly abundant across the stations this shows that this species is tolerant and proliferates with favorable conditions (Egonmwon, 2008). The polychaete worms *Capitella capitata* and *Nereis indica* were abundantly distributed in stations 7 and 8 (Majidun, Ajegunle) grossly polluted with organic matter. These species are pollution tolerant and proliferates in the western industrialized portions of the Lagos lagoon that receives effluents from industrial establishments and domestic waste as well as sewage deposit from the shore(Ajao and fagade 1990); Williams,(1999). The Chironomid larvae were also in abundance in Majidun, okobaba and Ajegunle indicating a stressed environment. On the other hand, the absence of Ephemeropterans, Placopterans and Tricopterans across the stations indicates a deteriorated environment, since these organisms thrive mostly in clean waters and are sensitive to pollution (Emere and Nasiru 2007). The shanon weiner diversity and Evenness values were relatively high across the stations with exception in stations 7 and 8 (Majidun and Ajegunle) this could also be attributed to the high level of organic pollution in these stations. The polychaete worms were mostly dominant. The diversity and abundance of Macrobenthos in Majidun have also been reported low due to the sand mining activities and industrial pollution (Esenowo and Ugwumba 2010). The overall composition and diversity of Macrobenthos recorded from the selected study area of the Lagos lagoon was relatively low as compared to other less disturbed waterbodies in the tropics (Edema *et al.*, 2002; Adakole and Anunne, 2003; Ikomi *et al*., 2005). This could be as a result of poor environmental condition like water quality, substrate instability, salinity fluctuations etc. Odum (1971) reported that species diversity tends to be low in physically disturbed ecosystem. It is only the opportunistic species that proliferates in such environment.

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