

Composition, Distribution and Abundance of Aquatic Insect of Ologe Lagoon in Lagos, Nigeria.

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ABSTRACT. The community structure, diversity and seasonal variation in abundance of the aquatic insects in Ologe lagoon were studied during the dry and wet seasons of 2003. The insect community included 15 species in the Orders Coleoptera, Diptera, Ephemeroptera and Odonata. The dry season collection across four sampling stations had more species (15) and more insects (65) than the rainy season collection with 13 species and 47 insects. However, the differences were not significant ($P>0.05$). The ephemeropterans and dipterans dominated the community, accounting for 68.8% of the total population collected. The diversity was highest at the 4th Station (Elete Creek) followed by the 3rd, 1st and 2nd in that order. There was no significant difference ($P>0.05$) in the number of species across the four stations.

INTRODUCTION

Aquatic insects constitute a major component of the macro-invertebrate communities in waterbodies, especially those that have floating macrophytes, where they are food resource for fish and other aquatic fauna (Towns, 1979). Aquatic insects have also been used as reliable bio-indicators of aquatic pollution and related perturbations (Persoone and De Pauw, 1979). The earliest investigations on the benthic macro-invertebrate carried out in the Lagos lagoon and harbour sediments have either been strictly on the molluscs, polychaetes, crustaceans and foraminiferans or at best a generalized treatment of the benthic fauna including the insects (Ajao, 1985; Ajao and Fagade, 2002; Akpati, 1985; Egborge, 1988; Oyeneke, 1983). With the West African Gas Pipeline (WAGP) Project on stream and the Right of Way (ROW) traversing the Ologe lagoon headwaters and influent streams, notably the Owo river system, there is the possibility that the lagoon can become a sink for any discharge into any of the headwaters. In this paper, information about the diversity, community structure and seasonal variation in the abundance of the aquatic insects in Ologe lagoon is documented and the necessary baseline data provided since no previous detailed investigation on aquatic insect fauna of the area is available.

MATERIALS AND METHOD

Study Area

Ologe lagoon is part of the Badagry Creek system located within latitudes $6^{\circ} 26'$ and $6^{\circ} 30'N$ and longitude $003^{\circ} 02'$ and $003^{\circ} 08' E$ (Fig. 1) in the west of Lagos lagoon. The entire area is low-lying and generally less than 10 m above the mean sea level. The lagoon is drained by rivers, notably the Owo river system which enters into it at Agbara.

Information on the water quality of the lagoon and of the coastal waters in the study area in general is scanty. The water is generally acidic (pH 5.65-6.90) and fresh throughout the year with electrical conductivity values in the range of 48 – 162 $\mu S cm^{-1}$; levels of dissolved oxygen concentrations and percentage oxygen saturation are moderate. The rainy season is from Feb. to Oct., and the dry season Nov. to Jan.

Four sampling stations were designated, three of them along the main course of the lagoon and the fourth along Elete Creek. Widths of the lagoon at locations 1 (north), 2 (middle) and 3 (south) were 2.5, 1.5 and 1.0 km, respectively. Interspace between locations in the lagoon was 3km. Artisanal fishing and water hyacinth (*Eichhornia crassipes*, Mart. Solms) were noticed in the lagoon.

Collection of Samples

Dry and rainy season sediment samples were collected in Jan. and Aug. 2003, respectively using a 0.1 m² Van Veen grab. Three grab samples were collected from each station and inspected after retrieval for disturbance such as washout. The sample was discarded when significant disturbance was observed. Sediment from the entire grab was collected into a bucket, spread carefully and washed through a set of sieves of mesh sizes 0.5 and 1.0mm and the different stages of insects collected were preserved in labeled bottles containing 10% buffered formalin solution. At each Station, floating water hyacinth within an area demarcated by a 0.1 m² quadrat, were also collected from the water surface. The roots were vigorously shaken in a bucket containing 10% formalin and the content filtered through the same sieve and stored separately.

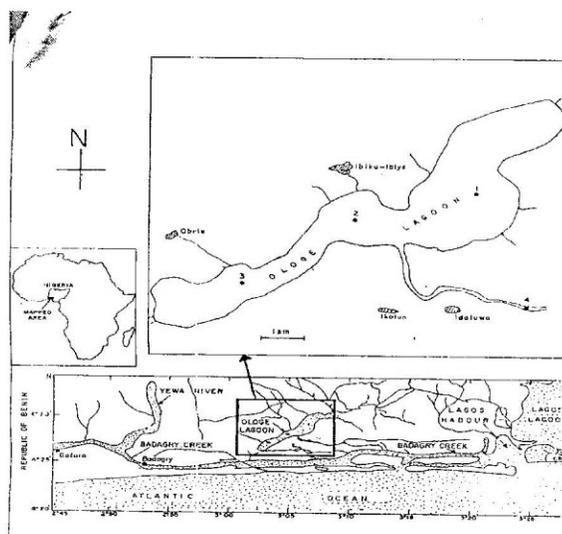


Fig. 1: Map of the Badagry Creek system showing location of Ologe Lagoon and the sampling stations.

In the laboratory, the samples were stained with Rose Bengal and sorted under a binocular dissecting microscope (American Optical Corporation, Model 570). The insects were identified based on taxonomic features of adults and/or larvae using keys provided by Gillies (1980), Ogbelibe (1991), and Ward and Whipple (1959). Since changes in the environment are reflected in the types and number of organisms present, diversity indices provide a tool for monitoring temporal and spatial changes. Therefore, to characterise the macrobenthic community structure, the taxa richness was investigated using Margalef's index. The general species diversity was studied using Shannon-Wiener index. To assess the distribution pattern, Evenness index was used. Inter-station comparisons were carried out to test for significant differences in the abundance of insect fauna using one-way analysis of variance (ANOVA) (Zar, 1984). T- test was used to compare the faunal abundance during the dry and rainy seasons.

RESULTS

Community Structure, Distribution and Abundance

A total of 112 aquatic insects classified into 15 species in four Orders (Table 1) were collected from Ologe lagoon. Mean number of insects / 0.1m² (16.25) was numerically but not significantly higher ($\alpha > 0.05$) in the dry season than in the rainy season 11.75 (Fig. 2). Two of the 15 species were absent from rainy season collections. The number of insect larvae per Station during the dry season ranged from 10-24 compared to a range from 7-16 in the rainy season. During both seasons, Elete Creek (Station 4) had the highest number; however, it was not significantly different ($P > 0.05$) from the numbers

Table 1. Taxonomic composition of aquatic insects collected from Ologe lagoon in the dry and rainy seasons of 2003.

Taxa	Season ^a	
	Dry	Wet
COLEOPTERA		
<i>Copelatus</i> sp.	+	+
<i>Hydroporus</i> sp.	+	+
DIPTERA		
<i>Chaoborus anomalus</i> Edwards	+	+
<i>Clinotanytus maculatus</i> Freeman	+	+
<i>Corynoneura</i> sp.	+	+
<i>Cricotopus</i> sp.	+	+
EPEHEMEROPTERA		
<i>Adenophlebiodes</i> sp.	+	+
<i>Baetis rhodani</i> Leach	+	+
<i>Caenis moesta</i> Stephens	+	+
<i>Cloeon cylindroculum</i> Kimmins	+	+
<i>Pseudocloeon</i> sp.	+	+
ODONATA		
<i>Coenagrion scitulum</i> Rambur	+	+
<i>Lestes dryas</i> Kirby	+	+
<i>Ophiogomphus</i> sp.	+	+
<i>Oxygaster curtisii</i> Dale	+	+
^a + = Present		
- = Absent		

found in Stations 1, 3 and 2 in decreasing order of abundance.

Fig. 3 shows the relative abundance of the major groups of insects. Ephemeropterans accounted for 42.9% of the collections followed by dipterans (25.9%), coleopterans (16.1%) and the odonates (15.2%). Coleopterans were absent from Station 2 during both wet and dry seasons.

Diversity

The diversity indices for the four Stations are summarized in Table 2. Differences in the number of species collected at the four Stations were due to random variation though Station 2 tended to have the lowest number in both dry and rainy season. During the dry season, Margalef's species richness was between 3.79 and 2.61, while general diversity (Shannon-Wiener index) was between 2.34 and 1.89. The range of Margalef's species richness indices during the wet season was between 3.34 and 2.06, while general diversity ranged between 2.14 and 1.55. Evenness index was generally high at all the Stations during both seasons (0.91 -0.98). Station 3 had the highest diversity irrespective of season.

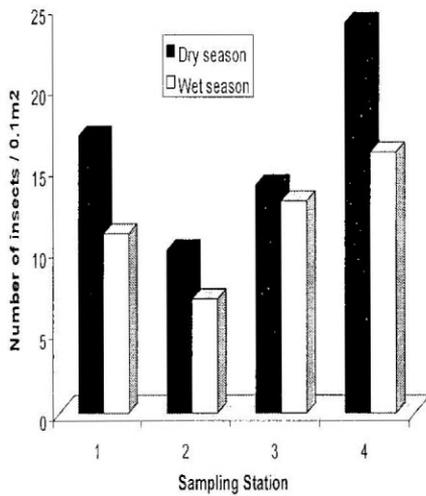


Fig. 2: Relative abundance of insects in Ologe lagoon

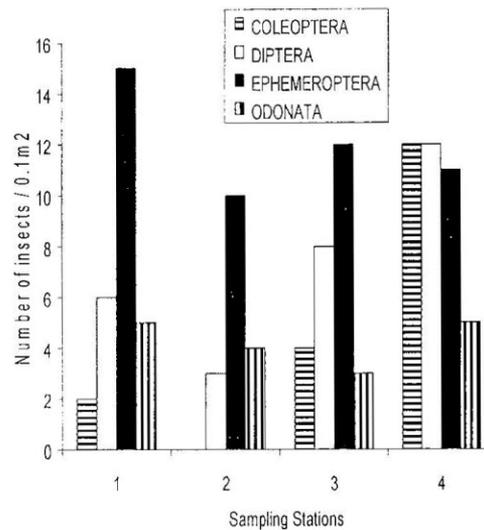


FIG. 3: The relative abundance of insect Orders in Ologe lagoon

DISCUSSION

The insect taxa collected from Ologe lagoon were similar to those of other freshwater ecosystems in Nigeria and other African countries (Bidwell and Clarke, 1977; Ogbeibu and Egborge 1995; Ogbeibu and Oribhabor, 2002; Petr, 1972; Rotimi and Iloba 2002). The dominant fauna recorded were, however, the ephemeropterans and the dipterans. The community structure differed from that of the nearby Lagos lagoon (Ajao and Fagade, 2002) which had preponderance of brackish species of molluscs, polychaetes and crustaceans basically because of the marked difference in the physical and chemical conditions of the two environments. While the Lagos lagoon is a brackishwater environment, the Ologe lagoon is a freshwater habitat. The preponderance of the ephemeropterans indicates the clean nature of the water (Campbell, 1939). Brooker and Sweeting (1991) had listed Ephemeroptera and Odonata, among others, as macro-invertebrate Orders that indicate high water quality and richness of aquatic ecosystem.

The relatively high number of the dipterans in the water body is also a reflection of the right conditions provided by the presence of macrophytes and the decomposition of accumulated plant materials. Association between chironomid larvae and organic matter and particle size have been demonstrated by Wene (1940) and reviewed by Cummins and Lauf (1969), as the macrophytes serve as refuge and, more critically, as a source of food. Water quality and food availability have also been identified as some of the important factors that govern the abundance and distribution of benthic organisms (Dance and Hynes 1980).

In conclusion, the insect community structure in Ologe lagoon was typical of what is found in freshwater bodies, the dominant groups which were the ephemeropterans and dipterans indicate the high water quality of the aquatic ecosystem as well as the accumulation of decomposing plant materials.

Table 2. Species diversity indices of insects collected from Ologe lagoon during the dry and rainy seasons of 2003.

Station	Dry season				Wet season ^a			
	D	H'	E	S	D	H'	E	S
1	3.18	2.15	0.93	10	3.34	2.10	0.96	9
2	2.61	1.89	0.97	7	2.06	1.55	0.96	5
3	3.79	2.34	0.98	11	3.12	2.14	0.97	9
4	3.46	2.26	0.91	12	2.89	2.08	0.95	9

^a D = Margalef's species richness index;
 H' = General diversity (Shannon-Wiener index);
 E = Evenness index;
 S = Species number.

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