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# Seasonal Variations in the Composition and Distribution of Planktonic Fauna in the Eastern Lagos Lagoon, Nigeria

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**ABSTRACT:** The composition and distribution of planktonic fauna (adult form of zooplankton and planktonic juvenile forms of higher animals) within the eastern part of the Lagos Lagoon were investigated in July, 2008 and March, 2009 representing rainy and dry season respectively. Samples of water and planktonic fauna were collected from twelve stations within the eastern axis of the Lagoon and analyzed using standard methods. The study area had brackish water characteristics with fresh water condition (0‰ salinity across the 12 stations) in the rainy season whereas the salinity ranged from 11.4‰ to 30.5‰ in the dry season. The adult forms zooplankton recorded in the rainy season were mainly Crustaceans, Chaetognathans and Rotifers while those collected during dry season belonged to Crustacean, Cnidaria and Chordata. Crustaceans dominate both adult zooplankton and planktonic juvenile fauna in the two seasons. The rainy season adult zooplankton count (515) was lower than that of dry season (580) but the reverse was the case for the juvenile stages count (520 and 325 in rainy and dry season respectively). Higher species abundance was recorded for both adult zooplankton (20) and juvenile stages (10) in rainy than dry season when 14 and 8 were recorded for the two groups respectively. Higher values were also of community structure indices (Margalef species richness and Shannon-Wiener species diversity) were recorded in the rainy than dry season for the two groups of planktonic fauna. The findings show the influence of salinity gradients on distribution of planktonic fauna of the Lagos Lagoon. @JASEM

*Keywords:* Zooplankton, Juvenile stages, Abundance, Diversity, Salinity

Planktonic fauna often referred to as zooplankton are feebly floating microscopic animals in aquatic environment. Majority of this group of animals are entirely planktonic through out their lifetime especially those that belong to the Classes Crustacea and Rotifera (Yakub, 2004; Ayodele and Adeniyi, 2006; Okogwu and Ugwumba, 2006; Lawal-Are *et al.*, 2010). Meanwhile, many higher aquatic animals have developmental stages that are planktonic. These include the eggs, larvae and other developmental stages of higher invertebrates such as shrimps and oyster and vertebrates especially fish. These developmental life stages are often collected when samples of zooplankton are taken from the natural water bodies (Lawal-Are *et al.*, 2010).

The zooplankton play an important ecological role especially in transferring energy from the primary producers (phytoplankton) to higher consumers particularly fish and other socio-economically important animals. Thus, abundance of fish highly depends on the density and distribution of the zooplankton. Available information is relatively little on zooplankton characteristics of coastal/brackish waters in the western Nigeria compared to that of the inland fresh waters. Recent studies on planktonic fauna of western Nigerian coastal waters include those of Okogwu and Ugwumba (2006) in Ologe Lagoon and Lawal-*Are et al*. (2010) in Iyagbe Lagoon.

Lagos Lagoon provides necessary ecological habitats such as breeding and nursery grounds for a vast number of both freshwater and marine macro-fauna species especially fin fishes and shell fishes. It thus supports tremendous artisanal fishing activities. However, the water body has continued to receive increasing levels of anthropogenic activities which have led to habitat modification and pollution stress (Ajao, 1990; Edokpayi and Nkwoji, 2007; Onyema and Nkwoji, 2009; Emmanuel *et al*., 2010). This has put the fish and other resources in the Lagos Lagoon under serious threat.

For effective and sustainable management of the fisheries and other resources, the need to regularly assess the health status and ecological conditions of the Lagos Lagoon is therefore imperative especially through the process of bio-assessment. Recent studies in the Lagos Lagoon using bio-assessment approach include those of Nkwoji *et al* (2010) on macro-benthic fauna and Yakub *et al*. (2011) on phytoplankton composition and distribution. Zooplankton community is also a good bio-monitoring candidate because it is strongly affected by environmental conditions and responds quickly to changes in environmental quality (Ayodele and Adeniyi, 2006; Okogwu and Ugwumba, 2006).

This work was carried out to investigate the spatial and seasonal distributions of planktonic fauna in

relation to some physico-chemical parameters in some parts of the Lagos Lagoon.

## MATERIALS AND METHODS

*Study area:* The study area is located within the eastern axis of the Lagos Lagoon (Figure 1) in Lagos State, which is one of the ten lagoons in south-western Nigeria. Lagos Lagoon is an open, shallow and tidal lagoon, with a surface area of 208km$^2$ (FAO, 1969) and an average depth of about 2m. It provides the only opening to the sea for the ten lagoons of south-western Nigeria through the Lagos Harbor. Owing to the dynamics of river inflow and seawater incursion, the lagoon experiences brackish condition that is more discernable in the dry season. In the rainy season, the increased river inflow creates freshwater and low brackish conditions in various parts of the lagoon.

Twelve study stations (A - L) were selected and fixed with the aid of Global Positioning System kit (IEC – 529 IPX7 Model) within the eastern part of the metropolitan segment of Lagos Lagoon for the study. The stations cut across Majidun (station A) at the mouth of Ogun River through Oreta (station F) to Queen's Drive (station L) towards the Lagos Harbor (Fig. 1). The twelve stations were within the latitude $6^0$ 12''N and $6^0$ 22''N and longitude $3^0$ 16''E and $3^0$ 30''E (Fig. 1). Sampling was carried out at each station in the rainy season month of July 2008 and dry season month of March 2009.

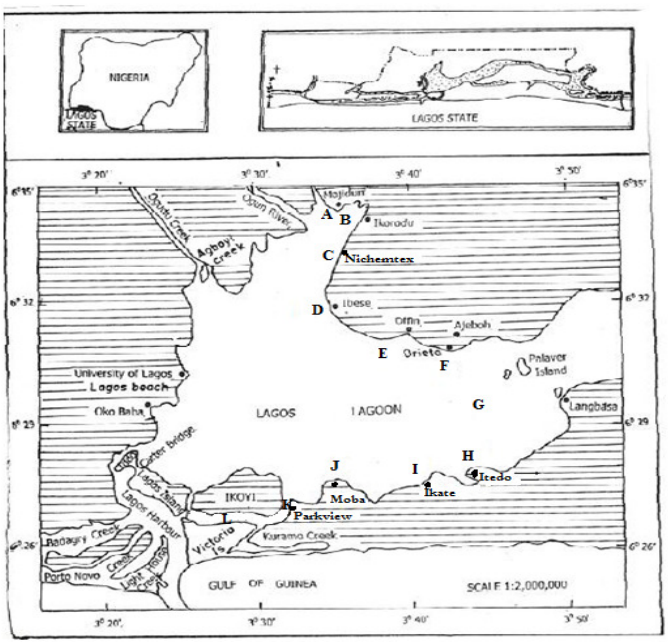


**Fig. 1**: Map of Lagos Lagoon Showing Sampling Stations (In Alphabet (A – L)

*Collection of Water and Plankton Sample:* Surface water samples were collected with 1dm$^3$ water samplers at each study station and stored in 1litre water bottles for water quality parameters. Similarly, separate water samples were collected in 250ml dissolved oxygen bottles for dissolved oxygen estimation. Zooplankton sample was collected on each occasion by vertical hauling of 55µm mesh size standard plankton net. The sample was transferred to a 250 ml well labelled plastic container with screw cap each time. Samples were then preserved with 4% unbuffered formalin and stored in the laboratory prior to microscopic analysis.

*Analysis of Water and Plankton Samples:* Water samples were analysed in the laboratory for pH, conductivity, salinity and turbidity using a multi-meter water checker (Horiba U-12). Dissolved oxygen and Alkalinity were estimated using iodometric Winkler's method and method described in APHA (1998) for water analysis respectively. Air and surface water temperature were measured *in situ* using mercury-in-glass thermometers.

Three drops of each zooplankton samples were investigated in the laboratory after concentration to 10 ml at different magnifications (100X, 400X) using a Wild M11 binocular microscope with a calibrated eyepiece. Appropriate texts were consulted to aid identification (Newell and Newell, 1966; Wimpenny,

1966; Olaniyan, 1975; Barnes *et al*., 1993; Waife and Frid, 2001). The number of each taxa occurring in each field (adults and juvenile stages alike) and the total number of taxa per group were recorded as number of organisms per ml.

*Data Analysis:* All statistical methods used were adapted from Ogbeibu (2005). Macrobenthic community structure was determined using the Margalef's species richness index (d) and Shannon-Weiner diversity index (H) as described by Ogbeibu (2005)

## RESULTS

*Physico-chemical Parameters:* The physicochemical parameters recorded at the twelve study stations during rainy and dry seasons are presented in Table 1. While zero salinity level was recorded at every station during rainy season, dry season had salinity range of 11.40 $^{o}/_{oo}$ at station B to 30.50 $^{o}/_{oo}$ at station K (Table 1). In the same vein, generally low conductivity levels were recorded from all stations during rainy season, whereas relatively high levels, which ranged from 19.50 $mScm^{-1}$ at station B to 46.50 $mScm^{-1}$ at station K were obtained in the dry season (Table 1). On the other hand, every station had higher turbidity, pH and DO levels during rainy than dry season (Table 1).

*Adult Zooplankton:* Adult zooplankton collected during rainy season belonged to Crustacea, Chaetognatha and Rotifera while during the dry season members of Crustacea, Cnidaria and Chordata were encountered. The spatial and seasonal compositions, distributions, abundance and diversity of zooplankton are presented in Table 2. The two seasons had Crustaceans (Arthropoda) as the dominant class for the adult Zooplankton (Table 2). *Acartia* a Calanoid was the most abundant during rainy season with a relatively wide distribution across the stations whereas dry season had *Cyclopina* a Cyclopoid as the most abundant and widely distributed (Table 2). The rotifers were distributed only towards the river mouth (stations A-D).

Lower total adult Zooplankton count (510) but higher species abundance (20), were recorded in the rainy than dry (515 and 14 respectively) season (Table 2). Also, Margalef species richness (d) and Shannon and Weaver diversity (H) values for the entire study area were higher during rainy than dry season.

During rainy season, the highest total zooplankton abundance (120) was recorded at station L while zero was recorded at station C (Table 2). Station D had the highest total abundance (190) while zero was recorded at station (H) in the dry season (Table 2). Species richness index (d) for the adult zooplankton was highest in stations J (Moba) and D (Ibese) in wet and dry season respectively (Table 2). Stations B (Ikorodu Port) and (Ibese) had the highest diversity index (H) values in wet and dry season respectively (Table 2).

*Juvenile Stages:* Crustaceans also dominated planktonic juvenile fauna. Table 3 presents spatial and seasonal compositions, distributions, abundance and diversity of the planktonic juvenile fauna. Other phyla of the juvenile planktonic fauna recorded were Chordata (fish eggs and larvae), Mollusca (gastropod and bivalve larvae) and Annelid eggs (Table 3). Rainy season had higher total planktonic juvenile stages count (572) and species abundance (11) than dry season (346 and 9 respectively) (Table 3). Higher species richness (d) and diversity (H) values were also recorded in the rainy than dry season (Table 3).

The highest total juvenile stages count (110) was recorded at station C in the dry season when no juvenile stage was encountered at stations D, F, H and L. In rainy season, station K had highest total juvenile stages count (90) while the lowest (5) count was recorded at station C (Table 3). In the rainy season, species richness index (d) level for the juveniles was highest at station K (Parkview) while station C (Nichemtex) had the lowest value (Table 3). The station C (Nichemtex) however had the highest 'd' value in the dry season. Shannon-Wiener Index (H) followed the same trend (Table 3).

## DISCUSSION

The temperature levels across the stations were typical of tropical natural water bodies (Ajibola *et. al,* 2005, Nkwoji *et. al,* 2010, Balogun and Ladigbolu 2010). The freshwater condition recorded at every station during rainy season while relatively high salinity was recorded during dry season shows the effect of rainfall on the salinity profile of the Lagos Lagoon. The decreasing trend in salinity towards the mouth of Ogun River observed during dry season shows that saline water intrusion from the Atlantic Ocean was responsible for the relatively high salinity of the Lagos Lagoon during the season. The relatively high turbidity recorded during the rainy season is attributable to high level of particulate matters brought into the lagoon from surface run-offs byrains.

Table 1: Spatial and Seasonal variation of Physico-Chemical Parameters in the study areas

| | | STATIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameters | Season | A | B | C | D | E | F | G | H | I | J | K | L |
| AT, 0C | RS | 31 | 30 | 30 | 30.5 | 30 | 30 | 30 | 30 | 28 | 26 | 27.5 | 28 |
| | DS | 30.5 | 30 | 30.5 | 30.5 | 29 | 29.5 | 29.5 | 30 | 29.5 | 29 | 28 | 28.5 |
| WT 0c | RS | 28 | 28 | 28 | 29.5 | 29 | 29 | 29 | 28.9 | 28 | 28 | 29 | 29 |
| | DS | 29.5 | 29.5 | 28.5 | 29 | 29 | 29 | 29.5 | 29 | 28.5 | 28.5 | 27 | 28 |
| pH | RS | 9.1 | 8.8 | 9 | 9 | 8.9 | 9.2 | 8.8 | 8.9 | 9.1 | 9 | 8.9 | 9.1 |
| | DS | 6.71 | 6.56 | 6.6 | 7.5 | 6.73 | 6.76 | 6.75 | 7.48 | 7.9 | 8.1 | 8.02 | 8.08 |
| Cond. (mScm-1) | RS | 0.61 | 0.18 | 0.54 | 0.24 | 0.3 | 0.19 | 0.12 | 0.61 | 0.67 | 0.64 | 1 | 0.84 |
| | DS | 19.8 | 19.5 | 22.4 | 28.9 | 29 | 29 | 32.5 | 32.2 | 34.7 | 45.8 | 46.5 | 46 |
| Turb. (NTU) | RS | 276 | 346 | 256 | 248 | 386 | 86 | 226 | 208 | 108 | 126 | 366 | 78 |
| | DS | 10 | 109 | 107 | 101 | 100 | 10 | 135 | 147 | 10 | 10 | 10 | 10 |
| Salinity (PSU) | RS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | DS | 11.7 | 11.4 | 13.4 | 17.8 | 17.9 | 17.8 | 20.4 | 20 | 22 | 29.8 | 30.5 | 29.9 |
| DO, (mg-1) | RS | 8.4 | 10.4 | 9.6 | 13.2 | 12.4 | 12.4 | 11.2 | 12 | 15.6 | 18.4 | 13.6 | 11.2 |
| | DS | 5.6 | 8 | 9.2 | 12.8 | 10.4 | 8.4 | 11.6 | 7.2 | 14.8 | 10 | 13.2 | 8 |

(Station A – Majidun, B – Ikorodu Port, C – Nichemtex, D – Ibese, E – Ofin, F – Oreta, G – Mid-Lagoon, H – Itedo, I – Ikate, J – Moba, K – Parkview, L – Queen's Drive, RS: Rainy Season, DS: Dry Season. AT = Air Temperature; WT = Water Temperature; DO = Dissolved Oxygen, Cond. = Conductivity,Turb = Turbidity

**Table 2:** Spatial and seasonal Composition and Distribution of Zooplankton in the study areas

| | Seasons | STATIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J | K | L | TOTAL |
| Taxa | | | | | | | | | | | | | | |
| Phylum-Crustacea | RS | | | | | | | | | | | | | |
| | DS | | | | | | | | | | | | | |
| Class Copepoda | | | | | | | | | | | | | | |
| Order Calanoida | | | | | | | | | | | | | | |
| *Acartia clausii* Giesbrecht | RS | - | - | | 10 | - | - | 5 | - | 5 | 15 | 10 | 25 | 70 |
| | DS | - | - | - | 5 | - | - | - | - | 5 | - | - | - | 10 |
| *Acartia discaudata* Giesbrecht | RS | - | - | - | - | - | - | - | - | - | 5 | - | 15 | 20 |
| | DS | - | - | - | - | - | - | - | - | | - | - | 5 | 5 |
| *Acartia tonsa* Giesbrecht | RS | - | - | - | - | - | - | - | - | - | 5 | 10 | - | 15 |
| | DS | - | - | - | - | - | - | - | - | 5 | - | - | - | 5 |
| *Calanus finmarchicus* (Gunn.) | RS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| | DS | - | - | - | - | 15 | 10 | 10 | - | - | - | - | - | 35 |
| *Centropage typicus* Dana | RS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| | DS | - | - | - | 55 | - | - | - | - | 15 | - | - | - | 70 |
| *Microcalanus pusillus* Geisbrecht | RS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| | DS | - | - | - | 5 | - | - | - | - | - | - | - | - | 5 |
| *Paracalanus parvus* (Claus) | RS | - | 10 | - | 5 | 10 | - | 15 | - | - | 10 | 5 | 5 | 60 |
| | DS | - | - | 40 | 20 | 10 | 5 | 20 | - | 5 | - | - | - | 100 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Pseudocalanus elongates* (Boeck) | RS | - | - | - | - | - | - | - | - | - | 5 | 5 | 10 | 20 |
| | DS | - | - | - | 10 | | 5 | - | - | - | - | - | - | 15 |
| ORDER CYCLOPOIDA | | | | | | | | | | | | | | |
| *Corycaeeus anglicus* Lub | RS | - | - | - | - | - | - | - | 5 | 5 | - | 5 | 10 | 25 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| *Cyclopina longicornis* Boeck | RS | - | - | - | - | - | - | - | - | - | - | - | 5 | 5 |
| | DS | 15 | 25 | 15 | 55 | - | - | 5 | - | - | 10 | 15 | - | 140 |
| *Cyclops strenus* Fish | RS | 25 | 10 | - | 5 | - | 5 | - | - | - | - | - | - | 45 |
| | DS | | | | | | | | | | | | | 0 |
| *Cyclops Spp.* | RS | 5 | 5 | - | - | - | - | - | - | - | - | - | - | 10 |
| | DS | | | | | | | | | | | | | 0 |
| *Oithona helgolandica* Claus | RS | | | | | | | | | | | | | 0 |
| | DS | 10 | 10 | - | - | 5 | - | - | - | 10 | 10 | 5 | - | 50 |
| *Oithona nana* (Grisbrecht) | RS | | | | | | | | | | | | | 0 |
| | DS | - | - | 10 | 20 | - | - | 5 | - | 5 | - | - | 5 | 45 |
| *Oithona plumifera* Baird | RS | - | - | - | - | - | - | - | - | - | 5 | 5 | 15 | 25 |
| | DS | - | - | 5 | - | - | - | - | - | - | - | - | - | 5 |
| Order Harpaticoida | | | | | | | | | | | | | | |
| *Enterpina acutifrons* Dana | RS | - | - | - | - | - | - | - | - | - | 5 | 5 | - | 10 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Order Cladocera | | | | | | | | | | | | | | |
| *Bosmina sp.* | RS | 5 | 5 | - | 5 | - | - | - | - | - | - | - | - | 15 |
| | DS | | | | | | | | | | | | | 0 |
| *Diaphanosoma excisum* (sar.) | RS | 15 | 5 | - | - | - | - | - | - | - | - | - | - | 20 |
| | DS | | | | | | | | | | | | | 0 |
| *Diaphria spp.* | RS | 10 | 5 | - | - | - | - | - | - | - | - | - | - | 15 |
| | DS | | | | | | | | | | | | | 0 |
| *Penilia avirostris* Dana | RS | - | - | - | - | - | - | - | - | - | 5 | 15 | 25 | 45 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Phylum – cnidaria | | | | | | | | | | | | | | |
| Class hydrozoa | | | | | | | | | | | | | | |
| *Obelia sp* | RS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| | DS | - | - | - | 20 | - | - | - | - | - | - | - | - | 20 |
| Phylum – chordata | | | | | | | | | | | | | | |
| Class – larvacea | | | | | | | | | | | | | | |
| *Oikopleura dioica* Vogt. | RS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| | DS | - | - | - | - | - | - | 65 | - | - | - | - | 10 | 75 |
| Phylum– Chaetognatha | | | | | | | | | | | | | | |
| TAXA CRUSTACEA PHYLUM: | | A | B | C | D | E | F | G | H | I | J | K | L | Total |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARTHROPODA | | | | | | | | | | | | | | |
| CLASS: | | | | | | | | | | | | | | |
| *Sagitta enflata* Vogt. | RS | - | - | - | - | - | - | - | - | - | 5 | - | 10 | 15 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Phylum – rotifera | | | | | | | | | | | | | | |
| Order – ploima | | | | | | | | | | | | | | |
| *Brachiorus plicatitlis* Muller | RS | 15 | 10 | - | 5 | - | - | - | - | - | - | - | - | 30 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| *Keratella spp.* | RS | 20 | - | - | - | - | - | - | - | - | - | - | - | 20 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| *Lecane bulla* Gosse | RS | 15 | 10 | - | 5 | - | - | - | - | - | - | - | - | 30 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| *Tetrasiphon hydrocoral* Ehrenberg | RS | 5 | 5 | - | 5 | - | - | - | - | - | - | - | - | 15 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Total species diversity (S) | RS | 9 | 9 | 0 | 7 | 1 | 1 | 3 | 1 | 2 | 9 | 9 | 9 | 20 |
| | DS | 2 | 2 | 4 | 8 | 3 | 3 | 5 | 0 | 6 | 2 | 2 | 3 | 14 |
| Total zooplankton abundance (N) | RS | 115 | 70 | 0 | 40 | 10 | 5 | 20 | 5 | 10 | 60 | 60 | 120 | 510 |
| | DS | 25 | 35 | 70 | 190 | 30 | 20 | 105 | 0 | 45 | 20 | 20 | 20 | 580 |
| Percentage Abundance | RS | 22.3 | 12.6 | 0 | 8 | 1.9 | 0.9 | 4.85 | 0.9 | 1.94 | 11.65 | 11.65 | 23.30 | |
| | DS | 4.31 | 6.03 | 12.07 | 33 | 5.17 | 3.45 | 18.10 | 0 | 7.76 | 3.45 | 3.45 | 3.45 | |
| Margalef Index (d) | RS | 1.69 | 1.92 | 0 | 1.63 | 0 | 0 | 0.62 | 0 | 0.43 | 1.95 | 1.71 | 1.67 | 3.05 |
| | DS | 0.31 | 0.28 | 0.71 | 1.33 | 0.59 | 0.67 | 0.86 | 0 | 1.31 | 0.33 | 0.33 | 0.67 | 2.04 |
| Shannon-Wiener Index (Hs) | RS | 0.89 | 0.93 | 0 | 0.83 | 0 | 0 | 0.41 | 0 | 0.3 | 0.91 | 0.86 | 0.89 | 2.81 |
| | DS | 0.29 | 0.26 | 0.48 | 0.77 | 0.44 | 0.45 | 0.49 | 0 | 0.73 | 0.3 | 0.24 | 0.45 | 2.19 |

Table 3: Spatial and seasonal variation in the juvenile stages composition and abundance in the study areas

| | | STATIONS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J | K | L | TOTAL |
| Barnacle nauplii larva | RS | 15 | 10 | - | 5 | 5 | 15 | - | 5 | 15 | 20 | 35 | 15 | 140 |
| | DS | 5 | - | 30 | - | 15 | - | 15 | - | - | 5 | - | - | 70 |
| Copepod eggs | RS | - | - | - | - | - | - | 5 | - | 5 | - | 10 | 10 | 30 |
| | DS | - | - | 5 | - | | - | - | - | - | - | | - | 5 |
| Copepods nauplii larva | RS | 15 | 10 | 5 | 15 | 10 | 5 | - | - | 5 | 10 | 15 | 25 | 115 |
| | DS | - | 5 | 15 | - | 15 | - | 10 | - | - | 10 | 5 | - | 60 |
| Megalop larva | RS | - | - | - | 5 | - | - | 10 | - | - | - | 5 | - | 20 |
| | DS | - | - | 40 | - | - | - | - | - | - | - | - | - | 40 |
| Zoea larva of crab | RS | 15 | 5 | - | 10 | - | 5 | 5 | 10 | 5 | 5 | 10 | 15 | 85 |
| | DS | 5 | - | 5 | - | - | - | - | - | - | - | - | - | 10 |
| PHYLUM: CHORDATA | | | | | | | | | | | | | | |
| Fish eggs | RS | - | - | - | - | - | - | - | 5 | - | - | 5 | 10 | 20 |
| | DS | - | - | - | - | - | - | - | - | - | 5 | - | - | 5 |
| Fish larva | RS | - | - | - | - | 5 | - | 5 | - | - | 5 | - | - | 15 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| PHYLUM: MOLLUSCA | | | | | | | | | | | | | | |
| Gastropod larva | RS | - | - | - | 5 | 10 | 5 | 15 | - | 10 | - | - | - | 45 |
| | DS | - | - | 15 | - | - | - | - | - | 5 | - | - | - | 20 |
| Bivalve larva | RS | - | - | - | 5 | 5 | - | 15 | - | - | - | 5 | 10 | 40 |
| | DS | - | 35 | - | - | - | - | - | - | 5 | - | 75 | - | 115 |
| PHYLUM: ANNELIDA | | | | | | | | | | | | | | |
| Annelid larva | RS | - | - | - | - | - | - | - | - | - | 5 | 5 | - | 10 |
| | DS | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Forms of juvenile stages | RS | 3 | 3 | 1 | 6 | 5 | 4 | 6 | 3 | 5 | 5 | 8 | 6 | 52 |
| | DS | 2 | 2 | 6 | 0 | 2 | 0 | 2 | 0 | 2 | 3 | 2 | 0 | 21 |
| Juvenile stage abundance | RS | 45 | 25 | 5 | 45 | 35 | 30 | 55 | 20 | 40 | 45 | 90 | 85 | 572 |
| | DS | 10 | 40 | 110 | 0 | 30 | 0 | 25 | 0 | 10 | 20 | 80 | 0 | 346 |
| Percentage number | RS | 9% | 5% | 0.96% | 8.65% | 6.73% | 5.77% | 11% | 3.85% | 7.69% | 8.65% | 17% | 16% | |
| | DS | 3% | 12% | 34% | 0% | 9% | 0% | 8% | 0% | 3% | 6% | 25% | 0% | |
| Total species diversity (S) | RS | 3 | 3 | 1 | 6 | 5 | 4 | 6 | 3 | 5 | 5 | 8 | 6 | 11 |
| | DS | 2 | 2 | 5 | 0 | 2 | 0 | 2 | 0 | 2 | 3 | 2 | 0 | 9 |
| Margalef diversity | RS | 0.45 | 0.6 | 0.45 | 0.89 | 0.85 | 0.73 | 0.81 | 0.67 | 0.79 | 0.75 | 0.84 | 0.65 | 1.58 |
| | DS | 0.63 | 0.32 | 0.57 | 0 | 0.37 | 0 | 0.4 | 0 | 0.63 | 0.67 | 0.22 | 0 | 1.37 |
| Shannon-Wiener Index (Hs) | RS | 0.48 | 0.46 | 0 | 0.73 | 0.67 | 0.54 | 0.73 | 0.45 | 0.65 | 0.62 | 0.78 | 0.75 | 2.11 |
| | DS | 0.3 | 0.16 | 0.67 | 0 | 0.3 | 0 | 0.29 | 0.45 | 0.3 | 0.45 | 0.1 | 0 | 1.80 |

The dominance of zooplankton by the Copepods (Crustacean) especially in the stations close to the harbor while the Rotifers were restricted to stations close to river mouth indicate the influence of salinity gradient on the composition and distribution of the planktonic fauna of the coastal water bodies. This is in line with earlier findings in the coastal/brackish waters in south-western Nigeria such as Olaniyan (1975) and Onyema *et al*. (2007) in Lagos Lagoon and Harbor and Lawal-Are *et al*. (2010) in Iyagbe Lagoon. According to the authors, crustaceans especially the Copepods constitute the dominant zooplankton taxa in areas of Lagos Lagoon close to the harbor. Olaniyan (1975) recorded seasonal variations in the zooplankton spectrum and observed that recruitment of Copepoid zooplankton in the Lagos Harbor was mainly from the sea.

The presence of the Rotifers only in the rainy season and in the stations close to the river mouth indicates that this group of zooplankton has more or less freshwater distributions. Earlier reports of dominance of zooplankton fauna by Rotifers in freshwater bodies in southwestern Nigerian include Yakub (2004) in Awba Stream and Reservoir, Ibadan; Ayodele and Adeniyi (2006) in Osun River and Okogwu and Ugwumba (2006) in Ologe Lagoon.

The relatively high abundance of rotifers compare to that of the crustaceans in the stations close to the river mouth is also attributable to the blue-green algae, which was reported as the dominant phytoplankton in these stations by Yakub *et al*. (2011). According to Okogwu and Ugwumba, (2006), the blue-green algae interfere with the filter feeding mechanisms of the crustaceans. Moreover, the stations are prone to have high level of silts and particulate matters held in suspension which also could affect the feeding mechanism and reproduction of the crustaceans (Okogwu and Ugwumba, 2006).

The higher species richness and diversity of both adult zooplankton and planktonic juvenile fauna recorded during rainy than dry season could be could be as a result of influx of allochtonous nutrients as the rivers drain into the lagoon. Yakub *et al*. (2011) recorded higher phytoplankton abundance and diversity in the rainy than dry season in the area of present study and attributed it to high level of allochtonous nutrients during the rainy season.

The relatively high total abundance, species richness and diversity of planktonic juvenile stages of higher fauna during rainy season are in line with the findings of Bankole (1990), Allison *et al*., (2007), Iorchor *et al*. (2007) and Yakub (2010). According to the authors, reproductive and breeding activities of most aquatic higher animals take place mostly in the rainy season.

Lower abundance and diversity recorded in the planktonic juvenile stages than those of adult zooplankton is a manifestation of predator-prey population relationship. The adult zooplankton constitutes a major group of food organisms for the juvenile stages of higher animals in aquatic environment. The higher abundance and diversity levels recorded for adult zooplankton than planktonic juvenile animals are therefore expected.

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