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A Preliminary Checklists on Planktons Dynamics of Calabar River, Southern Nigeria

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Abstract:
A preliminary Checklist on plankton's dynamics of Calabar River, Southern Nigeria was investigated from July, 2013 to December, 2013. Three sampling stations (1-3) were chosen along the river course. The choices of sampling stations of the river were based on the ecological settings; vegetation's and human activities in the area. Plankton's species were collected by filtering 60 litres of the water sample through 55µm plankton net at each station. The planktons were immediately fixed in a 5% formalin solution and transported to the Institute of Oceanography laboratory, University of Calabar, Nigeria, for analysis and identification. This study recorded a total of (45) plankton's species, (21) for zooplankton and (24) for phytoplankton belonging to 13 taxonomic groups, (7) for zooplankton and (5) for phytoplankton following the order of dominance; for zooplankton's, Calanoida > Cladocera > Chaetognaths > Copepoda > Decapoda > Protozoan > Rotifera; for Phytoplankton's, Bacillariophyceae > Cyanophyceae > Chlorophyceae > Euglenophyceae > Dinophyceae. These findings indicate the unpolluted nature of the Calabar River and also provide useful information on the checklists and ecology of plankton's species which could be potentially used as bio-indicators for assessing and monitoring the River.

Key words: *Checklists; Plankton Dynamic; Calabar River; Southern; Nigeria*

1. Introduction

Plankton's of an aquatic ecosystem is central to its normal functioning. While they constitute the starting point of energy transfer, they are highly sensitive to allochthonously imposed changes in the environment (Eletta *et al*., 2005). Thus the species composition, biomass, relative abundance, spatial and temporal distribution and checklists of this aquatic biota are an expression of the environmental health. Checklists of phytoplankton species in Nigeria have been documented by different workers even from the last century (George *et al*., 2012 and Okorafor *et al*., 2013). More recently, a checklist of algae in the plankton from the Bonny River have received attention from Chinda and Pudo (1991) while Kadiri (1999) presented a list of phytoplankton species in some coastal waters of Nigeria and Opute (1991) presented a similar list for the plankton of Warri/Forcados estuary. In the last 50 years or so, there has been increasing interest in phytoplankton studies of Lagos lagoon complex (Nwankwo *et al.,* 2003a). Nwankwo *et al*. (2003a, b) published an additional list of 126 taxa to the already existing checklist for the Lagos lagoon (Nwankwo, 1988) after 15 years of additional investigations in the Lagos lagoon. A first list of chrysophytes has also been documented by Wujek *et al.* (2004) for the Epe lagoon. In a pioneering report of phytoplankton species in off shore waters of Nigeria, Nwankwo and Onyema (2004) published a list of 63 species from offshore Lagos. In the aquatic ecosystem, the plankton is the foundation of the food web, in providing a nutritional base for both Phytoplankton and zooplankton and subsequently to other invertebrates, shell fish and finfish (Emmanuel and Onyema, 2007) presently, there is no published work on the Checklists of plankton's dynamic of Calabar River. These species form the primary foundation of this environment hence their dire importance to trophic relationship in the River. The aim of this study was to investigate the preliminary checklists of plankton's dynamics of Calabar River and also provide systematic lists that will therefore be useful in measuring our knowledge of the River plankton's in the region.

2. Materials and Methods

2.1. Description of the Study Area

Calabar River is located approximately at latitude $5^{o}301$N and Longitude $8^{o}181$E southeast of Nigeria (Okorafor *et al*., 2013). The climate in the area is characterized by a long wet season from April to October and a dry season from November to March; mean

annual rainfall is about 2000mm (Akpan and Offem, 1993). A short period of drought occurs in the wet season around August/September which is called the August drought. There is usually a cold, dry and dusty period between December and January referred to as the harmattan season (George *et al*., 2012). Vegetation in this area is basically rain forest close to mangrove belt. Mangrove species such as *Rhizophora cemosa, Avecinia africana* are present. *Nypa fruticans* is the main Nypa palm. Pandamus species is the mix forest of the area (Holzlohner *et al*., 2002). Activities of the people living in the study area include fishing and sand minning (Okorafor *et al*., 2013 and Andem *et al*., 2013). Calabar River is located approximately at latitude $5^{o}301$N and Longitude $8^{o}181$E southeast of Nigeria (Okorafor *et al*., 2013). The climate in the area is characterized by a long wet season from April to October and a dry season from November to March; mean annual rainfall is about 2000mm (Akpan and Offem, 1993). A short period of drought occurs in the wet season around August/September which is called the August drought. There is usually a cold, dry and dusty period between December and January referred to as the harmattan season (George *et al*., 2012). Vegetation in this area is basically rain forest close to mangrove belt. Mangrove species such as *Rhizophora cemosa*, *Avecinia africana* are present. *Nypa fruticans* is the main Nypa palm. Pandamus species is the mix forest of the area (Holzlohner *et al*., 2002). Activities of the people living in the study area include fishing and sand minning (Okorafor *et al*., 2013 and Andem *et al*., 2013).

2.2. Sampling Stations

Three sampling stations (1-3) were chosen along the river course. The choices of sampling stations of the river were based on the ecological settings, vegetation's and human activities in the area. Station one formed the starting point where other locations began. The water is very high and transparent in this station and no farm lands are seen here. In Station two river drains over a sandy substratum and contaminated with human waste during downpour which makes the water in this part of the river very dark with very low transparency and station three has a head bridge of the river. This is also landing site of fishermen canoes and where aquatic life like fishes, shrimps, crayfish etc are sold. The water in this part of the river is moderately transparent. Also no vegetation was found here.

2.3. Collection and Preservation of Samples

Samples were collected monthly for six (6) months, from July to December, 2013. Plankton's species were collected by filtering 60 litres of the water sample through 55µm plankton net at each station. The planktons were immediately fixed in a 5% formalin solution and transported to the Institute of Oceanography laboratory, University of Calabar, Nigeria, for analysis and identification. The samples were preserved in plastic samples bottles.

2.4. Analysis of Plankton Species

In the laboratory, each sample fixed in 5% formalin solution was concentrated to 10mls to enable analysis using the drop count method described by Onyema *et* al., 2007. One drop at ten different times for each sample after adjusting to 10mls was studied at different magnification (x40, x100, x400) using a light microscope.

2.5. Identification of Plankton Species

Zooplankton and Phytoplankton species were identified and sorted into different taxonomical groups with the aid of appropriate identification schemes of Newell and Newell (1977) pictures of zooplankton and phytoplankton species were also taken with the aid of Amcap Digital Microscope Camera.

3. Results

For the 6 months survey, a total of Forty five (45) species of zooplankton and phytoplankton of Calabar River were recorded as shown in Table 1and 3. Table 2 displayed the summary of the composition of zooplankton while that of phytoplankton is seen in Table 4. Majority of the zooplankton were the *Calanoida* (23.52%) with the genus having the highest number (4). The *Cladocera*, *Chaetognaths*, *Decapoda* and *Rotifera* (17.65%) emerged as second dominant division after *Calanoida,* follow by *Protozoan* (5.88%) and *Copepoda* which was the least. The highest phytoplankton were the *Bacillariophyceae* (38.01%) with the genus having the highest number (9), follow by *Cyanophyceae* with (23.80%), follow by *Chlorophyceae* and *Euglenophyceae* having (19.05%) and *Dinophyceae* which were the least.

Taxanomic	Species
Calanoida	*Eurytemora hirundoides*
	Calanoides carinatus
	Pseudocalamus elongatus
	Paracalanus parvus
Cladocera	*Podon polyphemides*
	Evadue nordmanii
	Conchoecia elegans
Chaetognaths	*Sagitta elegans*
	Sagitta decipens
	Sagitta griderica
Copepoda	*Cyclop species*
	Mescillna species
Decapoda	*Pasiphaea tarda*
	Caaridion gordonii
	Nauplius larva
Protozoan	*Ameoba species*
	Colacium cyclopicola
	Paronama species
Rotifera	*Keratella cochlearis*
	Atlonella excise
	Rotifer species
	Lepadella pellela

Table 1: A checklist of Zooplankton species of the Calabar River

Taxanomic	Genera	Species	% taxa composition of the fauna
Calanoida	4	4	23.52
Cladocera	3	3	17.65
Chaetognaths	3	3	17.65
Decapoda	3	3	17.65
Copepoda	2	0	0
Protozoan	2	1	5.88
Rotifera	4	3	17.65
Total	21	17	100

Table 2: Summary of Zooplankton community according to Taxanomic group

Taxanomic	Species
Bacillariophyceae	Actinoptycus undulate
	Actinocylus species
	Bacilaria paradoxa
	*Cydotella comta
	Melosira granulate
	*Surirella oblonga
	*Surirella striatula
	Skiletonema costatum
	Nitzetria sigmoidae
Chlorophyceae	Staurastrum rotula
	Staurastrum apiculatus
	Eudorina elegama
	Clostenum gracile
Cyanophyceae	Anabaena affinis
	Anacystis cyanea
	Oscillatoria sancta
	Phormidium ambigium
	Phormidium Cincinnati
Dinophyceae	Gymnodinium species
	Girodinium species
Euglenophyceae	Euglena acus
	Euglena gracilis
	Phacus caudate
	Phacus longicaudata

Table 3: A checklist of Phytoplankton species of the Calabar River
**Pollution indicator species*

Taxanomic	Genera	Species	% taxa composition of the fauna
Bacillariophyceae	9	8	38.01
Chlorophyceae	4	4	19.05
Cyanophyceae	5	5	23.80
Dinophyceae	2	0	0
Euglenophyceae	4	4	19.05
Total	24	21	100

Table 4: Summary of phytoplankton community according to Taxanomic group

4. Discussion

From the study, there is relatively more phytoplankton than zooplankton. The zooplankton groups during the study period consisted *Calanoida, Cladocera*, *Chaetognaths*, *Decapoda, Protozoans and Rotifera*. Similar findings were also observed by (Okorafor *et al*., 2012). The Checklists of Zooplankton species give an insight about the characteristics and quality of the water (Uka *et al*., 2006). According to (Kibria *et al*., 1997), Crustaceans are free-living filter feeder zooplankton and this account for their use in bio-monitoring of pollution. The percentage composition of *Calanoida* and *Cladocera* observed in this study agrees with the report of (Tackx *et al*., 2004) from Schelde estuary in Belgium that *Calanoida* and several *Cladocera* dominated the freshwater and lower brackish water transect of the estuaries. Also, this findings supports (Okorafor *et al*., 2013) who reported *Cladocera, Copepoda* and *Calanoida* were dominance in Calabar River. Zooplankton contributes largely to the economy of the ecosystem (Umoren and Edokpayi, 2006). It is a well-established fact that phytoplankton respond to seasonal influences of way of rearranging themselves to the constant variation in the physical and chemical structure of the environment (Prasad, 2000), coupled with the grazing stress exerted by the zooplankton (Prasad, 2000). This fact observed from the above might result to one of the factor affecting zooplankton such as reduction of zooplankton population over one another (Castro and Huber, 2005). The occurrence of an algal species depends on whether it can tolerant the water and flourishes in the system. A good number of the species observed during this study have been documented elsewhere in Nigerian freshwaters (Okorafor *et al*., 2013). The observation of more *Bacillariophyceae* than *Cyanophyceae* for the phytoplankton agreed with similar report of (Eyo *et al*., 2013), who attribute *Bacillariophyceae* dominance over *Cyanophyceae* that most diatoms are capable of surviving in the any environment and growth of diatoms depends on the presence of silicate which is evident in the siliceous cell wall found in diatom and is an indication that the water body is relatively clean (Kadiri, 2010). Generally, therefore, the continuous movement of water in Calabar River allows regular mixing resulting in high diversity of diatoms. Results obtained from this study were similar to that of Onuoba *et al*., 2010; George *et al*., 2012 and Okorafor *et al*., 2013, which attributes their findings on plankton's community as

good ecological condition arising from important factor governing the checklists of both phytoplankton and zooplankton communities such as food availability.

5. Conclusion

This study recorded a total of (45) plankton's species, (21) for zooplankton and (24) for phytoplankton belonging to 13 taxonomic groups, (7) for zooplankton and (5) for phytoplankton following the order of dominance; for zooplankton's, *Calanoida* > *Cladocera* > *Chaetognaths* > *Copepoda* > *Decapoda* > *Protozoan* > Rotifera; for Phytoplankton's, *Bacillariophyceae* > *Cyanophyceae* > *Chlorophyceae* > *Euglenophyceae* > *Dinophyceae*. These findings indicate the unpolluted nature of the Calabar River and also provide useful information on the checklists and ecology of both zooplankton and phytoplankton species which could be potentially used as bio-indicators for assessing and monitoring the River.

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