CHECKLIST OF ZOOPLANKTON OF MKPUME STREAM IN AGULU, ANAMBRA STATE, NIGERIA

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ABSTRACT

The abundance and composition of zooplankton species in the Mkpume Stream was studied from March – October 2017 using plankton net of 60 µm mesh size. Zooplankton samples collected were preserved with 10 % formalin and transported to laboratory for analysis. With the aid of a compound microscope the zooplankton were identified to species level using the relevant taxonomic keys. Twenty species of zooplankton belonging to four taxonomic groups namely Digononta, Crustacea, Sarcodina and Ciliata were recorded in the study. Digononta (50 %) was the dominant taxonomic group, while Ciliata (5 %) was the least taxonomic group recorded in the study.

Keywords: Zooplankton, Abundance, Composition, Stream, Nigeria

INTRODUCTION

Zooplanktons are microscopic heterotrophic planktonic animals floating in water. Zooplanktons graze on primary producers and on organic debris in the water column and thereby play an important role in the integration of energy budget to the aquatic ecosystem (Anene, 2003). They are important in the aquatic food web as they are food sources for many aquatic organisms. They are useful indicators of the future of the fisheries and fish health (Davies *et al*., 2009) as fishes are nutritionally dependent on them. Zooplankton are useful as bioindicators to help us detect pollution load, but are also helpful for ameliorating polluted waters (Mukhopadhyay *et al*., 2007; Eyo *et al*., 2013). Although some works have been conducted on zooplankton composition and abundance of some Nigeria waters such works are still limited in scope. Ansa *et al.* (2015) made a checklist of the plankton composition of Forcados River and recorded two main groups of zooplankton namely Rotifera and Cladocera. Ezekiel *et al*. (2011) in their studies in Sombreiro River observed six groups of zooplankton composed of 17 species and 13 genera. However, no such work has been conducted in Mkpume Stream. Such information will be useful in the management of the stream fishery resources as well as serve as baseline information for evaluating zooplankton composition, abundance and distribution. Therefore the present study investigates the checklist of zooplankton, its composition, abundance and distribution to help in planning a successful management of the stream fishery resources as well as contribution valuable information to existing checklists of zooplankton composition of Nigeria waters.

MATERIALS AND METHODS

Study Area: The study was carried out in Mkpume Stream, in Agulu town Anaocha Local Government Area, Anambra State Nigeria for a period of eight months (March – October, 2017). Mkpume Stream lies between latitudes 06° 04' 10" and 06° 9′ 10" N and longitudes 07° 01' 40" and 07° 09'35" E (Figure 1). Two distinct seasons' namely wet season (April to September) and dry season (October to February) operate in the area.

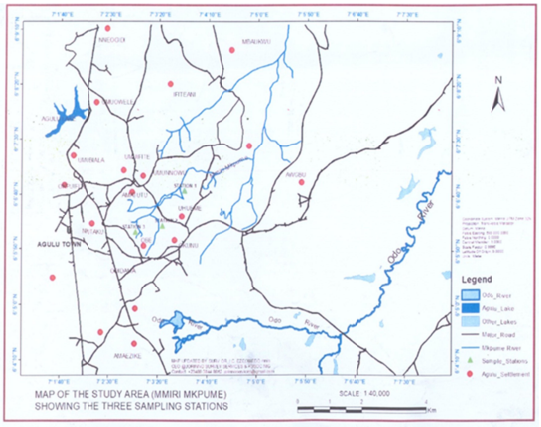

Figure 1: Map of the study area showing Mkpume Stream in Agulu, Anambra State, Nigeria

The dry season is dominated with harmattan usually characterized by cool and dusty winds. Agricultural activities go on within the catchment area.

Three study stations were selected along the stream stretch based on factors such as human activities and accessibility. Station 1 is the upstream. This station is sandy and the water channel is narrow. Plants growing along the banks include *Elaeis guineensis* (Oil palm), *Pentaclathera macrophyla* (Oil bean) and *Gmelina arborae* (Gmelina). Bathing, washing and swimming were among human activities occurring in this station. Station 2 lies midstream with reduced human activities such as fetching of water for drinking and cooking. Macrophytes in this station include *Eicchornia crassipes* (Water hyacinth) and *Saggiteria* spp. (Fern). Station 3 is located downstream with over hanging vegetation which cut off most of the light penetrating into it. *Eicchornia crassipes* and *Costus afar (*Ginger lily), are among the aquatic macrophytes found in this station.

Collection, Preservation and Identification of Zooplankton: Zooplankton samples were collected from three sampling stations using composite method. At each station, a 10 litre bucket of water was fetched diagonally from different points and filtered. This was repeated 10 times making 100 litre volume filtered. The net content was emptied into labeled plastic containers with screw cap and preserved with 10% formalin. The samples were transported to the laboratory where they were kept for a period of 24 hours to allow zooplankton settle at the bottom of the containers. The supernatant was decanted to concentrate the samples. Prior to zooplankton observation, the concentrated samples were shaken for the purpose of homogenization. 1 ml sub-sample was pipetted into a sedge Wick-Rafter plankton counting chamber and examined under a compound microscope. Identification of zooplankton samples were done by reference to Pennak (1978), Egborge (1993) and Thorp and Rogers (2011).

Data Analysis

Data was analysed using descriptive statistics. Shannon's index (H') was used to evaluate zooplankton abundance in the study stations as follows: $H' = -\sum_{i=1}^{s} pi\ In\ pi$, where s = number of species, pi = proportional abundance of the i^{th} species.

RESULTS

The check list of zooplankton in Mkpume Stream is presented in Table 1. Twenty species belonging to four classes, five orders and fourteen families were recorded. Digononta, the most species diversified taxonomic group was represented by ten species belonging to seven families. Conochilidae of the order Monimotrocha was the most species diversified family being represented by three species namely *Gastropus stylifer, Conochilus unicornis* and *Conochilus* spp. Ciliata; the least species diversified taxonomic group was represented by one species, *Trichodina* spp. The relative percentage composition of the various classes of zooplankton in Mkpume Stream revealed that Digononta (50 %) was dominant, followed by Crustacea (25 %) (Table 2). Ciliata had the least percentage composition of 5 %. The abundance and distribution of zooplankton in Mkpume Stream is shown in Table 3. The total number of species per station varied from 12 – 20.

Table 1: List of zooplankton found in Mkpume Stream in Agulu, Anambra State, Nigeria

Class	Order	Family	Genus/Species
Digononta	Monimotrocha	Conochilidae	*Gastrophus stylifer*
			Conochilus unicornis
			Conochilus spp.
		Flossulariidae	*Simantherina* spp.
			Trichocerca stylaria
			Trichocerca spp.
			Brachionus patulus
			Ascomorpha spp.
			Vorticella spp.
			Euchlanis dilatata
Sarcodina	Amoebina	Arcellidae	*Arcella discoides*
		Amoebilla	*Amoeba proteus*
			Difflugia corona
		Difflugiidae	*Difflugia* spp.
Crustacea	Cladocera	Bosminidae	*Bosmina longirostris*
		Chydoridae	*Graptoleberis testudinaria*
	Cyclopoida	Cyclopoidae	*Alona davidi*
			Chydorus spp.
			Halicyclops spp.
Ciliata	Mobilidae	Trichodinidae	*Trichodina* spp.

Table 2: Number of species in each taxonomic group of zooplankton in Mkpume Stream in Agulu, Anambra State, Nigeria

Taxonomic group	Total number of species	Species composition (%)
Digononta	10	50.0
Sarcodina	4	20.0
Crustacea	5	25.0
Ciliata	1	5.0
Total	20	100

Station 2 had the highest number of species (20), while Station 1 had the least number of species (12). Figure 2 showed that Station 2 had the highest Zooplankton abundance (100%). This was followed by Station 3 (75.0 %). The least zooplankton was recorded in Station 1 (60.0 %). All the classes of zooplankton encountered during the study were ubiquitous in distribution. Zooplankton abundance in Mkpume Stream was in the order Digononta > Sarcodina > Crustacea > Ciliata. Shannon Wiener's index (H^{1}) was highest in Station 2 (1.166) and least in Station 1 (1.099). The order of diversity was Station 2 > Station 3 > Station 1 (Table 2). All the species of Digononta with the exception of *Gastrophus stylifer, Conochilus* spp., *Simantherina* spp., *Trichocerca stylaria, Brachionus patulus*, *Vorticella* spp. and *Euchalanis dilatata* which were absent in Station 1, were recorded in all other stations. The four species of Sarcodina recorded in this study were encountered in all the stations.

DISCUSSION

The twenty species of zooplankton recorded in this study are common in Nigerian waters. This result though lower than sixty seven species Okogwu (2010) obtained in Eboma Lake, was higher than seventeen species Ezekiel *et al*. (2011) encountered in Sombreiro River. However, it compared favourably with twenty species recorded by Yakubu *et al*. (2000) in Orashi River, twenty three species reported by Ansa *et al*. (2015) in Forcados River and 24 species reported by Zabbey *et al*. (2008) in Imo River. The difference in the abundance of zooplankton recorded in this study and other studies may be due to changes in the chemical properties of aquatic environments. Azma and Siti (2015) reported other factors to include differences in terms of sampling frequency, sampling methods and physical parameter measurements during the sampling periods. The zooplankton community varies in its composition, and abundance in relation to changes in physical, chemical and biological characteristics (Lansac-Toha *et al*., 1997; Garcia *et al*., 1998).

Table 3: Checklist of species abundance and distribution of zooplankton in Mkpume Stream in Agulu, Anambra State, Nigeria

Class	Order	Family	Species	Stations		
				1	2	3
Digononta	Monimotrocha	Conochilidae	*Gastropus stylifer*	-	X	X
			Conochilus unicornis	x	X	X
			Conochilus spp.	-	X	X
		Flossulariidae	*Simantherina* spp.	-	X	X
		Trichocercidae	*Trichocerca stylaria*	-	X	X
			Trichocerca spp.	x	X	X
		Brachionidae	*Brachionus patulus*	-	X	X
		Gastropodidae	*Ascomorpha* spp.	x	X	X
		Vorticellidae	*Vorticella* spp.	-	X	-
		Euchlanidae	*Euchlanis dilatata*	-	X	-
Sub total			*10*	3	10	8
Sarcodina	Amoebina	Arcellidae	*Arcella discoides*	x	X	X
		Amoebidae	*Amoeba proteus*	x	X	X
		Difflugiidae	*Difflugia corona*	x	X	X
			Difflugia spp.	x	X	X
Sub total			*4*	4	4	4
Crustacea	Cladocera	Bosminidae	*Bosmina longirostris*	x	X	X
		Chydoridae	*Graptoleberis testudinaria*	x	X	-
			Alona david	x	X	-
			Chydorus spp.	-	X	-
	Cyclopoida	Cyclopoidae	*Halicyclops* spp.	x	X	X
Sub total			*5*	4	5	2
Ciliata	Mobilida	Trichodinidae	*Trichodina* spp.	x	X	X
Sub-total			1	1	1	1
Grand total of Number of species in station			20	12	20	15
Shannon Wiener index (H^1)				1.099	1.166	1.37

Key: - = absent, x = present

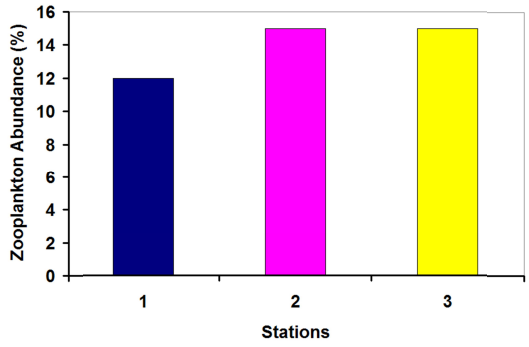

Figure 2: Percentage abundance of zooplankton in the studied stations of Mkpume Stream in Agulu, Anambra State, Nigeria

Distributions of zooplankton vary from place to place and year to year due to the dynamic nature of aquatic ecosystems (Petr, 2000; Ezekiel *et al*., 2011). Turbid effluents and high suspended material load (Nwankwo, 1998) reduce zooplankton species diversity. The dominance of the rotiferan digononts in the study may be attributed to their having asexual and sexual phases.

This group shows a typical geographic distribution in basins, influenced by its opportunistic form of occupation (Keppeler and Hardy, 2004). The relatively high Shannon-Wiener species diversity index recorded in station depicts its ecological stability.

Conclusion: Twenty species of zooplankton was obtained in this study. Digononta was the most species diversified. The zooplankton species recorded in this study are common in Nigeria waters. A further study should be conducted all year round to obtain more comprehensive information on the structure and seasonal variation of zooplankton in Mkpume Stream.

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