PLANKTONIC COMPOSITION OF DADIN KOWA DAM, GOMBE STATE, NIGERIA

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ABSTRACT

Planktons are small plants or animals that float, drift, or weakly swim in the water column. The organisms that constitutes this group are; phytoplanktons and zooplanktons. This paper presents the results of the variability in species composition and abundance of plankton in Dadin-Kowa Reservoir, Gombe State, Nigeria. Plankton was collected from three sites; sites A, B and C, these sites were water entry point, middle of the reservoir and the exiting point respectively, this was done to reduce bias in sampling. At each site a well labeled plastic bottles of 750 ml with full details of site of the sample and date of collection. Identification and counting of the phytoplankton and zooplankton sample was done using a compound microscope. The results showed a total of 16 species of phytoplankton belonging to four (4) different groups or classes which are *Chlorophyceae*, *Cyanophycea*, *Bacillaroophycea*, and *Desmidiacea*. The results showed a total of 10 species of zooplankton belonging to four (4) different groups or classes which are *Protozoa*, *Rotifers*, *Copepodac* and *Cladorerans*. In conclusion, the following phytoplanktons; *Spirogyra Spp* and *Cyclotella Spp*, and zooplanktons; *Copepod Spp*, *Chlamydemonas Spp*, *Phacus Spp* and *Bosmina Spp* were found to be dominant in Dadin-Kowa Dam.

Keywords: Plankton, zooplanktons, phytoplankton, Dadin-kowa, Gombe.

INTRODUCTION

The water world is another ecosystem with different habitats occupied with a wide range of organisms. These organisms thrive at different water column, among these organisms are a group of organisms called the planktons. Planktons are small plants or animals that float, drift, or weakly swim in the water column. The word 'Plankton' is originated from the Greek word 'Planktos' which means drifting about in water under the action of water movement (Sharma *et al.*, 2013). The organisms that constitutes this group are; phytoplanktons and zooplanktons.

Phytoplanktons are assemblage of heterogenous microscopic algal forms, they are situated at the lowest level of production and correspond with the most important part of the primary production of the oceans (Kudela and Peterson 2009). They influence the concentration of dissolved oxygen and light penetration in our marine environment. Aside from the vital role they play in the aquatic food webs, phytoplankton community also acts as indicators of water quality (Abuzer and

Okan 2007). They also provide information concerning the ecosystem condition or health. Among the phytoplankton groups, the *bacillariophyceaen* members can specifically be used as suitable bio-indicators for water quality assessments due to their short generation time and many species have a specific sensitivity to ecological characteristics (Goma *et al*., 2005). Zooplanktons are animal that drift in water column. They graze on primary producers and organic debris in the water column and thereby play an important role in the integration of energy budget of the ecosystem (Anene, 2003). Zooplanktons abundance is usually closely related to phytoplankton concentration and species composition and increases with increasing nutrients concentrations. Zooplanktons occupy an important trophic niche in the aquatic ecosystem as they constitute the most important link in energy transfer between phytoplankton and higher aquatic fauna (Salomoni *et al*., 2006). Zooplankton organisms are important component of aquatic ecosystems which help in regulating algal microbial productivity through grazing and in the transfer of primary productivity to fish and other consumers. Zooplankton community structure can be affected by within-lake and by watershed ecological factors, including water chemistry (related to landscape position), lake morphology and human activity in the watershed (Dodson *et al*., 2009). This paper presents the results of the variability in species composition and abundance of plankton in Dadin-Kowa Reservoir, Gombe State, Nigeria

MATERIALS AND METHODS

Study area

Dadin Kowa Dam is located 5km North of DadinKowa village (about 37 km from Gombe town, along Gombe-Biu road) in Yamaltu Deba Local Government Area of Gombe State. The area lies within longitude 11^0 30' E and 11^0 32' E, and Latitude 10 ^{0} 17' and 10o 18' N of the equator (UBRDA, 1980). The reservoir has an active capacity of 1770 million cubic meters of water, at a height of 42.0 meters and a surface area of 300 square kilometers, and has potential as a source of fish. The dam was completed in 1988, its objectives are for irrigation and hydropower (Okoye and Achakpa, 2007).

Plankton collection

Plankton was collected from three sites; sites A, B and C, these sites were water entry point, middle of the reservoir and the exiting point respectively, this was done to reduce bias in sampling. At each site a well labeled plastic bottles of 750 ml with full details of site of the sample and date of collection was used as described by Indabawa, (2012), the sampling bottles was sterilized in the laboratory. On the field, for each sampling site, the bottle was rinsed several times with the water to be sampled. Each bottle was open at a depth of 30cm from the surface in the direction of water current to be filled with the water. The resultant concentrated plankton sample was preserved with 4% formalin and Lugols iodine solutions according to the method of Baloloy *et al*. (2016), in the field. The sample was transported to Zoology laboratory of Gombe State University, Gombe, Gombe State, in a sampling box.

Plankton analysis

Plankton sample was concentrated to 50ml volume before the analysis of organisms. Identification and counting of the phytoplankton and zooplankton sample was done using a compound microscope. The concentrated sample was agitated to homogenize before placing a drop of the sample on slide, covered with a cover slip and examined with compound microscope at a magnification of x4, x10 and x40 objective lenses as described by Ahmed and Indabawa, (2015). The planktons (phytoplankton and zooplanktons) was identified and total number of species recorded using keys for species identifications provided by the standard work of Emi and Catlin, (2007); Umar *et al*. (2013). Count was made and expressed as total number and percentage abundance of plankton.

RESULTS

Phytoplanktons composition

The results showed a total of 16 species of phytoplankton belonging to four (4) different groups or classes which are *Chlorophyceae*, *Cyanophycea*, *Bacillaroophycea*, and *Desmidiacea*. In term of number of species; *Chlorophyceae* (green algae) and *cyanophycae* (blue green algae) had the highest with 5 species each, followed by *Bacillariophyceae* (diatom) with 4 species, while *Desmidiaceae* (desmids) had only 2 species (Table 1).

Table 1: Phytoplankton composition in Dadin Kowa Reservoir

Major classes	***Chlorophyceae***	***Cyanophycea***	***Bacillaroophycea***	***Desmidiacea***
Phytoplankton species	*Spirogyra Spp*	*Anabaena Spp*	*Fitagiria Spp*	*Tubellaria*
	Characium Spp	*Cladophora Spp*	*Cyclotella Spp*	*Closterium Spp*
	Scendesmus Spp	*Oscillatoria Spp*	*Navicular Spp*	-
	Coelastrum Spp	*Nostoc Spp*	*Diatoma Spp*	-
	Volvox Spp	*Apharizomena Spp*	-	-

The relative abundance of the various phytoplankton species identified revealed that *Spirogyra* species had the highest with 16.3%, followed by *cyclotella* species with 13.8% *Characium, Navicular* and *Diatoms* had 6.9% each. *Cladophora* and *Anabena* species had 5.9%. *Closterium* species had 5.4%, Aphanizomenon and coelastrum species had 4.4% each, Scenedesmus, Fragilaria and Tubellaria species had 3.9% each, while *Volvox* and *Nostoc* 3.0% and 2.5% respectively. The relative abundance revealed that there was high relative abundance in the month of December with 59, followed by November with 40, while, October, September and August had 34, 30 and 21 respectively, the least was in the month of July with 20 (Table 2).

Table 2: Relative Abundance of Phytoplankton Species in Dadin Kowa Reservoir

S/No	Phytoplankton Species	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total	%
1.	*Spirogyra Spp*	3	5	5	2	9	9	33	16.3
2.	*Fragilaria Spp*	2	-	-	1	2	3	8	3.9
3.	*Characium Spp*	-	-	4	3	2	5	14	6.9
4.	*Scenedesmus Spp*	2	-	3	-	2	1	8	3.9
5.	*Volvox Spp*	1	-	-	2	2	1	6	3.0
6.	*Aphanizomenon Spp*	2	3	-	1	2	1	9	4.4
7.	*Cyclotella Spp*	2	4	5	6	4	7	28	13.8
8	*Navicular Spp*	2	-	1	2	3	6	14	6.9
9	*Cladophora Spp*	-	1	2	3	2	4	12	5.9
10	*Tubellaria Spp*	1	-	1	2	1	3	8	3.9
11	*Coelastrum Spp*	-	2	1	-	2	4	9	4.4
12	*Oscillatoria Spp*	-	1	3	3	2	3	12	5.9
13	*Diatoma Spp*	1	2	2	3	2	4	14	6.9
14	*Anabena*	2	2	1	2	3	2	12	5.9
15	*Closterium Spp*	2	1	1	2	2	3	11	5.4
16	*Nostoc Spp*	-	-	1	2	-	2	5	2.4
	Total	20	21	30	34	40	59	203	100

Zooplanktons composition

The results showed a total of 10 species of zooplankton belonging to four (4) different groups or classes which are *Protozoa, Rotifers, Copepodac* and *Cladorerans*. In term of number of species; *Protozoa* had 4 species, followed by *Rotifers*, *Copepodac* and *Cladorerans* with only 2 species each (Table 3).

The relative abundance of various zooplankton species with *CIamydomonas* species, *Copepod*, *Phacus* and *Bosmina* species recording the highest with 11.6% each. *Dapnia* and *Rotaria* species had 10.1% each. *Euglena*, *Paramecium* and *Limnoclanus* species had 8.7% each, while *Keratella* species had the least with 7.2 %. The highest relative abundance was recorded in the month of July with 22, followed by September with 14, while, December and August had 9 each, November and October had 8 and 7 respectively (Table 4).

Table 3: Zooplankton composition in Dadin-kowa Reservoir

Major classes	***Protozoa***	***Rotifers***	***Copepodac***	***Cladorerans***
Zooplankton species	*Euglena Spp*	*Keratella Spp*	*Limnoclanus Spp*	*DapniaSpp*
	Chlamydomonas Spp	*RotariaSpp*	*Copepod Spp*	*DapniaSpp*
	PhacusSpp			
	Paramecium Spp			

Table 4: Relative Abundance of Zooplanktons Species

S/No	Zooplankton Species	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total	%
1.	*Euglena Spp*	2	-	-	1	2	1	6	8.7
2.	*Paramecium*	3	2	-	-	1	-	6	8.7
3.	*Keratella Spp*	2	1	1	-	-	1	5	7.2
4.	*Limnoclanus Spp*	-	2	1	2	1	-	6	8.7
5.	*Copepod Spp*	3	1	-	2	1	1	8	11.6
6.	*Chlamydemonas Spp*	2	1	2	1	-	2	8	11.6
7.	*Phacus Spp*	2	1	3	-	1	1	8	11.6
8.	*Dapnia Spp*	3	-	2	-	1	1	7	10.1
9.	*Rotaria Spp*	2	1	2	-	1	1	7	10.1
10.	*Bosmina Spp*	3	-	3	1	-	1	8	11.6
	Total	22	9	14	7	8	9	69	100

DISCUSSION

Phytoplanktons

The study revealed that the Reservoir is rich in phytoplankton flora. The observation showed slight seasonal variations of phytoplankton, according to the report of Kadiri, (1993), this is a known trend in tropical West Africa. This dynamic of phytoplankton could result from a combination of alteration in the nutrient level as well as change in the predator or grazer populations (Renolds and Descy, 1996). Due to the fact that they are primary producers. The numbers of phytoplankton groups identified in the present study is slightly lower than the report of Baloloy *et al.* (2016), who recorded that the identified species in Lake Buhi, Camarines Sur, Philippines belonged to five major plankton groups: diatoms, green algae, cyanobacteria, eustigmatophytes and dinoflagellates. The dominance of *Chlorophyceae* in the present study is typical to most African waters and agrees with the findings of Awanda, (1987), in River Kaduna and Abubakar *et al.* (2006), in Lake Geriyo, they observed that *chlorophyceae* was the dominant phytoplankton. The order of dominance of the groups in the present study is however in contrast with the report of Kola, (1996), where the order was *bacillariophyceae* > *cyanophyceae* > *desmidiaceae.* The relative abundance of individual phytoplankton species in the present study contradict the report of Baloloy *et al.* (2016), who reported that the abundance of phytoplankton in Lake

Buhi, Camarines Sur, Philippines showed that Diatoms were the most abundant (50.5%); followed by the green algae (40.5%), cyanobacteria (7.4%), dinoflagellates (1.5%) and the least abundant eustigmatophytes (0.1%). The slightly high abundance of phytoplankton in the dry season is ascribable to increase in nutrient and or the concentration of phytoplankton in reduced volume of Dam water as well as undoubtedly the high flows. Conversely, low abundance of phytoplankton in the rainy season as attributed to the diluting effect of flood as well as unfavorable photosynthetic conditions such as high turbidity and low light intensity prevailing during rainy season. Kiss and Genkal, (1993), observed a seasonal change in phytoplankton composition in River Danube, Hungary.

Zooplankton

The groups of zooplankton identified in the present study if far lower than the number reported by James *et al.* (2003), who reported twenty-seven major zooplankton groups identified in Mida Creek, Kenya, they reported that the dominant groups were Decapoda, Brachyuran zoea and megalopae, Siphonophora, Euphausiscea, Mysiidacea, Stomatopoda, Amphipoda, Isopoda, Ostracoda, Appendicularia, Sergestidae, Cumacea, Polychaeta, Cirripaedia, Bryozoa, Nematoda, Arachnida and Salpa. The order of dominance of zooplankton was; *Protozoa* > *Rotifer* > *Copepod* > *Cladocerans.* This also agrees with Abubakar *et al*. (2006) who reported the same trend in Lake Geriyo. The abundance of individual species of zooplankton in the present study is slightly diferent from the report of James *et al.* (2003), who recorded that Copepoda dominated zooplankton in abundance throughout the year, forming 35–60% of total zooplankton composition. Other dominant zooplankton groups, in order of abundance, were Brachyuran zoea (forming between 10–40%), Mollusca larvae, Medusae, Chaetognatha, Foraminifera, Caridea larvae and Pisces (fish eggs and larvae). This is because the ecosystem of a creek differ largely from that of a lake, as such, this difference cut across both the species and abundance in these environments

In conclusion, the following phytoplanktons; *Spirogyra Spp* and *Cyclotella Spp*, and zooplanktons; *Copepod Spp*, *Chlamydemonas Spp, Phacus Spp* and *Bosmina Spp* were found to be dominant in Dadin-Kowa Dam. There is limited information about plankton diversity in such environment in Gombe state. Thus, more studies are needed to understand and compare the structure and ecology of the plankton systems.

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