COMPOSITION AND RELATIVE ABUNDANCE OF PLANKTONS ACROSS THE NAFADA CORRIDOR OF RIVER GONGOLA, GOMBE STATE NIGERIA

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ABSTRACT
Planktonic composition and distribution across the Almakashi corridor of river Gongola, Gombe state was studied for eighteen months (January, 2020 to June, 2021). Plankton samples were collected in the morning before 9.00am once in a month for a period of eighteen months using 20µm mesh size net and transferred into two 250ml well labelled plastic containers with screw cap and stored with 5% formalin in the laboratory for analysis. Data collected was analyzed using descriptive statistics. Phytoplankton composition and diversity indicated 142 individuals and a total of 14 species comprising of four taxa namely; Chloropyceacae, Cyanophyceae, Baccilariophyceae and Desmidaceae. The taxon; Chlorophyceae had the highest value (74), while the least value (3) was recorded in Desmidacae. Analysis on individual species indicated that Spirogyra spp of the family Chlorophyceae had the highest value (28), while least value (3) was recorded from both Pediastrum spp of the family Chlorophyceae and Closterum spp of the family Desmidiacea. Zooplankton composition and diversity indicated a total of 48 individual and a total of 8 species comprising of 3 taxa namely; Protozoa, Rotifers and Copepoda. The taxon; Protozoa had the highest value (25). while the least value (9) was observed in Copepoda. Individual species analysis shows that Rotaria spp of the family Rotifers had the highest value (9), while least value (4) was recorded from both Phacus spp of the family Protozoa and Daphnia spp of the family Copepoda. Phytoplankton family and species were more divers in terms of abundance and distribution within the Almakashi corridor of river Gongola than zooplankton. The abundance high abundance of Spirogyra spp might be that, bloom episodes occurred during the time of the day.
KEYWORDS: Filamentous, Floating, Microscopic, Phytoplankton, Zooplankton.

INTRODUCTION

Plankton are microscopic organisms that can be defined as the heterogeneous assemblage of organisms, which float and move at the will of the waves and other water movements (Nababa *et al*., 2022a; Malik and Bharti, 2012). Plankton are often used as indicator of environmental and aquatic health because of their high sensitivity to changes such as eutrophication and pollution with their short life span and categorized into two main groups, the phytoplankton and the zooplankton (Alok *et al*., 2017). Phytoplankton are microscopic aquatic plants, occurring as unicellular, colonial or filamentous forms that occur as free-floating or suspended organisms in open or pelagic waters and is the principal primary producers of the aquatic environment. Their size ranges from 0.2mm to 2.0mm. Phytoplankton contains primary pigments and accessory pigments such as chlorophyll and carotenoids etc. which strongly absorbs the blue and red light of the visible spectra. These are the autotrophic organisms bearing chlorophyll capable of fixing solar energy by photosynthesis to produce organic matter as their food -and hence are the major primary producers in the aquatic ecosystems (Makeche and Nyendwa, 2020). Zooplankton are minute organisms which float in the water surface along with water current and they occupy an intermediate position in the food web (Olele *et al.*, 2019). All the animal components of the plankton are called zooplankton. Zooplankton (Greek: Zoon, animal; plankton, wandering) are myriads of diverse floating of locomotion (Nababa et al., 2019). It includes microscopic, unicellular or multi-cellular invertebrate animals with size ranging from a few microns to a milli meter or more (Nababa et al., 2022b). Zooplankton are of great importance in fresh and marine aquatic ecosystem. This study was carried out to determine the composition and relative abundance of plankton across the Nafada corridor of river Gongola, Gombe State Nigeria.

MATERIALS AND METHODS

Study Area

River Gongola is located at the northeastern region of Nigeria and its one of the principal tributaries of river Benue. The river rises on the eastern slopes of the Jos plateau and falls to the Gongola basin, running northeastern into Nafada local government ($11^0$00, $11^0$15'N and $11^0$15'E, $11^0$30'E), Gombe state. The river continued from Nafada in the northeast direction to lake Chad. It turns south from Nafada passing through the corridors of Ashaka ($10^0$45',$11^0$00'N and $11^0$30' and $11^0$45'E), Almakashi ($10^0$44', 40.584'N, and 11030', 32.574'E) and Kupto where it continued to Dadin - Kowa reservoir at Yamaltu - Deba Local Government Area of Gombe State.

Plankton Collection
Plankton samples were collected using 20µm mesh size net from the Nafada corridor of river Gongola complex once in a month for eighteen (18) months. January, 2020 to June, 2021. Sampling was done in the morning before 9.00am. The 20µm mesh size net was hauled in and the sample transferred into two (2) 250ml well labelled plastic containers with screw cap and stored with 5% formalin to the laboratory for analysis.

Laboratory Analysis
One millilitre (1ml) of preserved sample was taken as sub sample with the aid of a pipette and placed on the Sedgewick rafter counting chamber and viewed under a light binocular microscope (Nikon 400 Binocular Light Microscope) by applying a low magnification of 10 x. However, a duplicate specimen was collected and analyzed for comparison and double checking. The observed planktons were identified using micro plant identification guide.

Statistical Analysis
Data collected was analyzed using Microsoft excel (version, 15th) for descriptive statistics (Frequencies and percentages).

RESULTS AND DISCUSSION
Results of composition and relative abundance of plankton across the Nafada corridor of river Gongola, are presented (Tables 1 and 2). Phytoplankton composition and diversity, a total of one hundred and forty - two mulative abundance of individual species and a total number of seventeen (17) species which comprises of four (4) taxon namely; Chloropyceace, Cyanophyceae, Baccilariophyceae and Desmidaceae were observed. In terms of abundance, the taxon; Chlorophyceae had the highest value (74) representing 52.11%, while the least value (3) representing 2.11% was recorded in Desmidacea. Analysis on individual species indicated that *Spirogyra spp* of the family Chlorophyceae had the highest value (28) representing 19.72%, while least value (3) representing 2.11% was recorded from both *Pediastrum spp* of the family Chlorophyceae and *Closterum spp* of the family Desmidiacea (Table 1).In the zooplankton composition and diversity, a total of forty eight (48) cumulative abundance of individual species and a total number of eight species which comprises of three taxon namely; Protozoa, Rotifers and Copepoda were found. In terms of abundance the taxon; Protozoa had the highest value (25) representing 52.08%, while the least value (9) representing 18.76% was observed in Copepoda. Individual species Analysis shows that *Rotaria spp* of the family Rotifers had the highest value (9) representing 18.76%, while least value (4) representing 8.33% was recorded from both *Phacus spp* of the family Protozoa and *Daphnia spp* of the family Copepoda (Table 2).

Table 1: Relative Abundance of Phytoplankton in Nafada Corridor of River Gongola

Family	Plankton species	Abundance	Percentage
Chlorophycea	*Spirogyra spp*	50	13.77
	Characium spp	21	5.79
	Scendesmus spp	11	3.03
	Pediastrum spp	18	4.96
	Volvox spp	52	14.33
Cyanophycea	*Anabena spp*	31	8.54
	Cladophora spp	21	5.79
	Oscillatoria spp	19	5.23
	Nostoc spp	10	2.76
	Alpharizomena spp	14	3.86
Bacillarophycea	*Fitagaria spp*	15	4.13
	Cyclotella spp	18	4.96
	Navicular spp	22	6.06
	Diatoma spp	45	12.40
Desmidiacea	*Tubellaria spp*	9	2.48
	Closterum spp	7	1.93
Total		**363**	**100**

Table 2: Relative Abundance of Zooplankton in Nafada Corridor of River Gongola

Family	Plankton species	Abundance	Percentage
Protozoa	*Euglena spp*	15	15.62
	Chlamydomonas spp	12	12.49
	Phacus spp	9	9.40
	Paramicium	10	10.41
Rotifers	*Karatella spp*	11	11.45
	Rotaria spp	4	4.16
	Brachinus spp	8	8.33
Copepoda	*Limnoclanus spp*	9	9.40
	Copepod spp	10	10.41
Cladoceran	*Daphnia spp*	8	8.33
Total		**96**	**100**

The highest value from the taxon; Chlorophyceae in terms of abundance of phytoplankton recorded from this study was in agreement with the findings of Olele *et al.* (2019) who reported similar result for phytoplankton sampled in river Ethiope, Delta State, Nigeria. *Spirogyra spp.* of the family Chlorophyceae had the highest value in terms of the number of phytoplankton species sampled which was in consistent with the findings of Iloba and Ikomi (2018) from Umuaja watershed of river Ethiope, Delta State. The high presence of *Spirogyra spp* an algae bloom forming species observed during the study might be as a result of bloom episodes due to the rapid accumulation of the *Spirogyra spp*. Phytoplankton is the primary biological components which collects and transfers energy to higher organisms through the food chain (Saifullah *et al.,* 2014; Nababa *et al*., 2019). The highest value of *Spirogyra spp* in the study area could be attributed to allochonous flow of nutrients. In the zooplankton in terms of abundance the taxon; Protozoa had the highest value, while in terms of individual species Rotaria *spp* of the family Rotifers had the highest value. Olele *et al.* (2019) reported that zooplankton species are common in most inland water bodies of Nigeria. The low value of zooplankton compared to phytoplankton observed in this study might be as a result of the inability of the water body to retain high number of species due to rapid flow of the Almakashi corridor, involving wide range of other environmental factors which corroborated the reports of Kadhim (2014).

CONCLUSION

Findings from this study shows that phytoplankton family and species were more divers in terms of abundance and distribution within the Nafada corridor of river Gongola than zooplankton. Several species within four families of phytoplankton and three families of zooplankton were observed. The high presence of *Spirogyra spp.* an algae bloom forming species observed during the study might be as a result of bloom episodes.

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