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Planktonic Assemblage and Diversity in Dadin Kowa Dam Gombe State Nigeria

Ja'afaru Ali
Senior Lecturer, Department of Zoology,
Modibbo Adama University of Technology, Yola Adamawa State, Nigeria
Abubakar U. M.
Assistant Lecturer, Department of Biological Sciences, Gombe State University, Gombe, Nigeria

Abstract:
Eight months Planktonic sampling of Dadin Kowa Dam Gombe State were carried out between July, 2011 and February, 2012. A total of twenty three (23) species of phytoplankton were identified under the major classes of chlorophyceae, cyanophyceae, baccilariophyceae and desmidiaceae. Chlorophyceae and cyanophyceae recorded the highest in term of species number representation. Out of the fourteen (14) zooplankton species identified, class protozoa recorded the highest in term of number of species; the other classes are rotifers, copepod and cladocerans. The Dam is said to be eutrophic as a result of the diversity of the planktons identified.

Keywords: *Planktons, assemblage, indicator and productivity*

1. Introduction

The productivity of any aquatic water body depends on the amount of plankton present in the said water body (Vasanthkumar, 2011). Planktons are all organisms (plants and animals) which live in water that have limited power of locomotion, largely move by means of flagella or various mechanisms altering their distribution by changes in buoyancy and are more or less passively drifted by waves and water current (Vasanthkumar, 2011). It is disclosed that plankton distribution depends on the carrying capacity of the environment and on the nutrient concentration in both intracellular and extra cellular. Ezra and Nwanko (2001) in Vasanthkumar (2011) observed that changes in the plankton population in Gubi reservoir were influenced by physico-chemical parameters. Physicochemical parameters also affect plankton distribution, sequential occurrence and species diversity. Plankton distribution and abundance are also affected by season (Ezra and Nwanko, 2001) as cited in **(**Vasanthkumar, 2011). Productivity studies are concern with evaluation of the capacity of an ecosystem to build up, at the expense of external energy (radiant and chemical) primary organic compounds of high chemical potential for transformation and flow to higher energy levels (Abubakar, *et. al*, 2006).

The productivity of a water body is concerned with evaluation of the capacity of an aquatic ecosystem to build up, at the expense of external energy, primary organic compounds of high chemical potential for transformation and flow to higher energy levels (Abubakar 2006). Fish yields are strongly correlated with primary production (Melack, 1976; Oglesby, 1977). A correlation between phytoplankton and productivity in ponds and lakes can be described and used to estimate fish yield by several workers, (Good year *et al*; 1972; Oladipo and Williams 2003). This study is aimed at determining the Planktonic assemblage as indicator of productivity in Dadin Kowa Dam.

2. Materials and Methods

2.1. Study Area

Dadin Kowa Dam is located 5km North of Dadin Kowa village (about 37km from Gombe town, along Gombe-Biu road) in Yamaltu Deba local Government Area of Gombe State. The area lies within longitude 11^{o} 30' E and 11^{o} 32' E, and Latitude 10^{o} 17' and 10^{o} 18' N of the equator (UBRDA, 1980). The Dam is part of River Gongola; its drainage basin is situated in North-Eastern Nigeria, with water capacity of 800million cubes and surface area of 300kilometers square.

2.2. Sampling Protocol

Four sampling stations were chosen within the study area. Station A is located at the upstream, where the major activities are fish landings, and drinking of water by animals. Station B is also at the upstream; it is open water where fishing is the only major activity taking place. Station C is at the downstream close to the portable water treatment plant, by which their effluent is draining back to the Dam. Station D is located downstream; the major activities are irrigation and washing of clothes.

Plankton sampling was done as described by (APHA, 1980). Water for plankton sampling was collected using plankton net, with a collecting bottle of 250ml capacity at the base. The net was immersed to a depth of 1.5 to 2cm and towed through a certain distance (4meters). The content of the bottles was poured in to sampling bottles and preserved using 4% formalin for laboratory analysis. In the laboratory, planktons

were identified and counted using microscope. Planktonic species identification was done as described by Finlay, *et al* (1998), Patrick and Reimer (1966, 1975) and Prescott (1961).

3. Results

Results of phytoplankton species identified in Dadin-Kowa dam are presented in Table 1. A total of 23 species of phytoplankton species were identified, with chlorophyceae (green algae) and cyanophyceae (blue green algae) having the highest number (8) each, followed by bacillariophyceae (diatom) with five (5) species and Desmidiaceae (desmids) having two (2) species respectively.

Major Classes	**Chlorophyceae**	**Cyanophyceae**	**Bacillariophyceae**	**Desmidiacee**
Phytoplankton Species	Spirogyra spp.	Anabeana spp.	Fragilaria spp.	Tubellaria spp.
	Characium spp.	Cladophora spp.	Melosira spp.	Closterium spp.
	Ulothrix spp.	Oscillatoria spp.	Cyclotella spp.	
	Scenedesmus spp.	Microcytis spp.	Navicular spp.	
	Ankistrodesmus spp.	Seperulina spp.	Diatoma spp.	
	Antinastrum spp.	Aphanocapsa spp.		
	Coelastrum spp.	Nostoc spp.		
	Volvox spp.	Aphanizomena spp.		

Table 1: Phytoplankton species identified in Dadin kowa Dam

Table 2 shows the relative abundance of various phytoplankton species identified. The table reveals that Spirogyra species, Cyclotella species and Ulothrix species had 12.7%, 10.9% and 7.2% of the total phytoplankton identified respectively. Melosira species, Microcytis species and Aphanizomenon species had 5.5%, 5.1% and 4.9% respectively. Anabeana species, Cladophora species and Aphanocapsa species had 4.7% each. Diatoma species, Separulina and Oscillatoria species had 4.3%, 4.1% and 3.9% respectively. The remaining phytoplankton species ranged between 2.0% and 3.5% of the total phytoplankton species identified throughout the study period. Table 2 also reveals that, phytoplankton species showed their high relative abundance in the month of February and a least relative abundance in the month of October.

Phytoplankton species	**Months**									
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	TOTAL	%
Antinastrum spp.	-	3	1	2	-	4	-	-	10	2.0
Ankistrodesmus spp.	3	5	2	1	2	-	2	1	16	3.3
Aphanocapsa spp.	5	3	2	4	6	-	2	1	23	4.7
Spirogyra spp.	3	6	5	2	10	9	13	14	62	12.7
Fragilaria spp.	-	-	-	2	1	3	-	-	6	1.3
Characium spp.	4	2	3	-	-	6	-	2	17	3.5
Scenedesmus spp.	2	3	-	-	2	1	3	-	11	2.3
Melosira spp.	4	6	2	3	1	5	4	2	27	5.5
Ulothrix spp.	6	7	3	4	9	2	3	1	35	7.2
Volvox spp.	-	-	-	-	2	3	2	1	8	1.6
Aphanizomenon spp.	3	4	6	2	1	2	3	3	24	4.9
Cyclotella spp.	2	4	9	6	8	4	8	12	53	10.9
Anabeana spp.	2	3	6	4	2	3	2	1	23	4.7
Navicular spp.	-	2	1	-	4	2	1	2	12	2.6
Cladophora spp.	3	4	2	2	-	3	4	5	23	4.7
Tubellaria spp.	-	-	2	3	1	4	2	1	13	2.7
Coelastrum spp.	2	2	1	3	-	-	2	4	14	2.7
Oscillatoria spp.	2	4	3	-	1	3	2	4	19	3.9
Diatoma spp.	3	4	6	2	1	-	3	2	21	4.3
Closterium spp.	4	2	-	3	2	1	2	3	17	3.5
Nostoc spp.	2	1	-	-	2	2	2	-	9	1.8
Microcytis spp.	3	2	4	-	1	6	4	5	25	5.1
Separulina spp.	-	1	4	2	-	3	6	4	20	4.1
TOTAL	53	66	62	45	56	66	66	68	488	100%

Table 2: Relative abundance of phytoplankton species identified in Dadin Kowa Dam

Results of zooplanktons identified in Dadin Kowa Dam are presented in Table 3. A total of 14 species of zooplanktons were identified with protozoa having the highest number of seven (7) species, followed by rotifers with three (3) species, Copepods and Cladocerans had two (2) species each.

Major Classes	Protozoa	Rotifers	Copepoda	Cladocerans
Zooplankton Species	Euglena spp.	Keratella spp.	Limnoclanus spp.	Dapnia spp.
	Chlamydomonas spp.	Asplachna spp.	Copepod spp.	Bosmina spp.
	Vorticella spp.	Rotaria spp.		
	Phacus spp.			
	Vanella spp.			
	Bioccoeca spp.			
	Paramecium sp.			

Table 3: Zooplankton species identified in Dadin Kowa Dam

Table 4 shows the relative abundance of various zooplankton species with Clamydomonas species and Euglena species recording the highest with 9.9% each. Keratella species and Copepod species had 8.5% and 8.1% of the total zooplankton species identified respectively. Rotaria species, Limnoclanus species and Asplanchna species recorded 7.5% each, while Daphnia species, Bosmina species and vanilla species had 7.1% each. Vorticella species and Biocoeca species had 5.7% each, while Phacus species and Cypria species had 4.2% each. The zooplanktons of the Dam recorded their high relative abundance in the month of February and a least relative abundance in the month of November (Table 4).

Zooplankton species				Months						
	JUL	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**TOTAL**	**%**
Vorticella spp.	2	1	3	-	-	3	1	2	12	5.7
Daphnia spp.	3	-	1	2	3	-	2	4	15	7.1
Bosmina spp.	4	3	1	2	-	-	2	3	15	7.1
Copepod spp.	3	3	2	1	-	1	4	3	17	8.1
Keratella spp.	4	3	1	2	3	-	2	3	18	8.5
Rotaria spp.	-	-	2	1	3	2	7	1	16	7.5
Limnoclanus spp.	-	-	1	3	2	-	-	10	16	7.5
Phacus spp.	2	3	-	-	1	-	2	3	9	4.2
Asplanchna spp.	3	2	4	-	-	2	3	2	16	7.5
Chlamydomonas spp.	3	5	2		3	12	3	2	21	9.9
Euglena spp.	2	6	4	2	-	3	3	1	21	9.9
Cypria spp.	-	-	2	3	-	-	2	2	9	4.2
Biocoeca spp.	3	-	2	1	-	3	2	1	12	5.7
Vanella spp.	3	2	2	1	3	4	-	-	15	7.1
TOTAL	**32**	**28**	**27**	**21**	**15**	**20**	**33**	**35**	**212**	**100%**

Table 4: Relative abundance of zooplanktons species identified in Dadin Kowa Dam

4. Discussion

The study reveals that the Dam is rich in phytoplankton flora. The observation shows slight seasonal variations of phytoplankton which is a known trend in tropical West Africa (Egborge 1974, John 1986, Erondu and Chindah 1991, and Kadiri 1993c). Dynamic of phytoplankton could result from a combination of alteration in the nutrient level as well as change in the predator or grazer populations (Rynolds and Descy, 1996).

Phytoplankton dominance followed the order chlorophyceae and cyanophyceae, followed by bacillariophyceae then desmidiaceae. The dominance of chlorophyceae is typical to most African waters (kadir, 1992a). This result agrees with the findings of Abubakar (2006) in Lake Geriyo, Awanda (1987) in river Kaduna. Wade (1985) observed that chlorophyceae was the dominant phytoplankton. This result however contrast that of Kolo (1996) where the order was bacillariophyceae > cyanophyceae > desmidiaceae.

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 is attributed to the diluting effect of flood as well as unfavorable photosynthetic conditions such as high turbidity and low light intensity prevailing during the rainy season. Kiss and Genkal (1993) observed a seasonal change in phytoplankton composition in river Danube, Hungary Gao & Song (2005) corroborates that phosphorous is the controlling factor in phytoplankton growth in the Changjiang Estuary, China. ACTFR (2002) states that artificial source of nutrient in a water body include fertilizers, detergent, waste water, industrial effluent and animal excreta amongst others.

Four taxa of zooplanktons were identified with slight increase in abundance between dry to rainy season. Decrease in zooplankton abundance in the rainy season might be attributed to slight decline in abundance of phytoplankton, because phytoplankton serves as nutrient to zooplanktons. Zooplankton dominance followed the order; protozoa > rotifers > copepod and cladocerans. This also agrees with Abubakar (2006) who reported the same trend in Lake Geriyo. There was higher relative abundance of phytoplankton than the zooplankton species throughout the period of study. This might be attributed to the fact that, phytoplankton are the foundation of the food web, in providing a nutritional base for zooplankton and subsequently to other invertebrates (Emmanuel and Onyema, 2007).

Emmanuel and Onyema (2007) reported a total of 18 phytoplankton species in tropical creek in south western Nigeria. Tackx *et al*, (2004) investigated that calanoid, copepods; cyclopoid dominated the shelde estuary (Belgium).

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