Dry Season Phytoplankton Composition Of Ibiekuma Dam, Ekpoma, Edo State

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Abstract

In this study, the phytoplankton composition of Ibiekuma dam, Ekpoma was investigated between January and February, 2010. A total of 20 phytoplankton taxa belonging to three divisions; Bacillariophyta, Chlorophyta and Euglenophyta were observed. All the species of Bacillariophyta observed were pennate forms. Only Surirella elegans was observed in the three areas studied in the dam while Synedra acus,was observed in SW2 (inside dam) and Pinnularia viridis in SW3(downstream of dam). The taxa was dominated qualitatively by green algae(desmids).SW2 accounted for most of the desmids encountered. Generally the division Chlorophyta had the highest percentage composition (55%), followed by Bacillariophyta (40%) and Euglenophyta (5%). In the physico-chemical parameters studied, temperature fluctuated between a mean of 27.25°C (SW3) to 28.75°C (SW1 and SW2). pH values of the three areas studied had a mean range of 6.41 to 7.01 and there was slight variation in mean conductivity values (SW1, 31.53µScm^{-1}; SW2, 30.58µScm^{-1}; SW3, 30.15µScm^{-1}). Total dissolved solids ranged from 14.9mgl^{-1} (SW3) to 15.28mgl^{-1} (SW1).

Key words: Phytoplankton, Ibiekuma, dam, taxa, desmids

Introduction

This study was carried out to contribute to the knowledge of freshwater algae of Edo State. To benefit from the algae of lakes, ponds, dam reservoirs and rivers, it is necessary to study the taxonomy of freshwater systems (Atici, 2002). Algae (phytoplankton) are the source of oxygen in aquatic systems and are the main autochthonous primary producers. They also serve as indicators of pollution in any water body as primary producers and as such could be used in determining water pollution level.

A dam is a barrier that blocks the flow of water and produces a reservoir. Natural dams can include beaver dams, lava flows or landslides. Artificial dams are built for water storage or flood control or to generate electricity (Jackson, 2009). Reservoirs created by dams are major sources of agricultural irrigation water, and irrigation water contains significant amount of silicon, calcium, sulphur, potassium and magnesium, which are taken up by rice plant (Husnain and Tsugiyuki, 2009).

The Nigeria climate is tropical, characterized by high temperatures and humidity as well as marked wet and dry seasons (Adesalu, 2010). Previous studies on limnological investigations of some Nigerian reservoirs, lakes, springs and streams have also been reported (Kadiri and Opute, 1989; Olele and Ekelemu, 2008; Mustapha, 2008; Indabawa, 2009; Mustapha, 2006; Kadiri, 2000b; Kadiri, 2001; Edokpayi and Osimen, 2001 and Tiseer et al., 2008).

This study is important because it will help to narrow the dearth of phycological information on the Ibiekuma dam as well as provide opportunity for monitoring changes in its physico-chemical content and algae composition.

Study Area

The Ibiekuma stream is a perennial First Order rainforest stream in Ekpoma, southern Nigeria (Figure 1). The stream takes its source within the Ambrose Alli University permanent site and joins other rivers one of which empties into the Atlantic Ocean. The study area is characterized by flat land surface, easily worked sandy loam soils. Geologically, the area is composed of the basement complex of the Precambrian era. The University impounded the stream in 1993, with assistance from the EEC primarily to supply water to the University community and its environs (Edokpayi and Osimen, 2001and 2002).

Materials and Methods

Water samples for the study were collected for four weeks on weekly basis from the Ibiekuma dam, during the dry season between January and February, 2010. Samples were taken from upstream of the dam, midstream and downstream. Measurements of parameters studied (temperature, pH, conductivity and total dissolved solids) were taken *in situ*, using a mercury in bulb glass thermometer, portable pH meter (Model Jenway, 2010), conductivity and TDS meter. Phytoplankton samples were collected from the sampling sites by means of a 55µm mesh net. Water samples were collected with a 10 litre bucket and filtered through a 55µm mesh plankton net 10 times. The samples collected were poured into 1 litre plastic containers and preserved with 4% formaldehyde. Observation and identification of phytoplankton was carried out in the phycology laboratory of Ambrose Alli University, Ekpoma with the aid of a compound microscope and classification was with the aid of publications of Kadiri (1987), Opute (2000) and other relevant publications and monographs.

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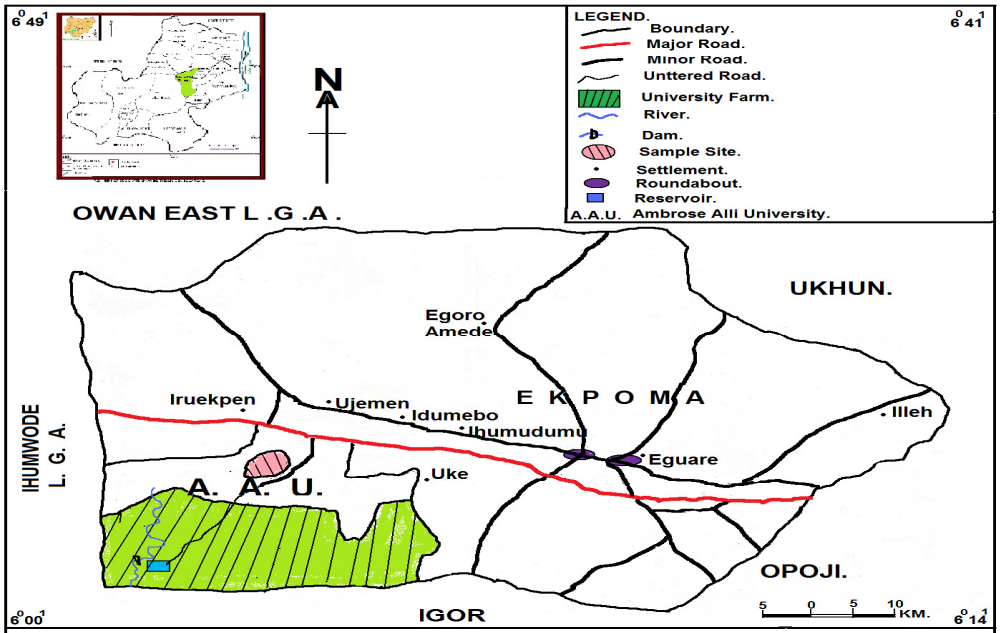

Fig. 1 LOCATION OF THE SAMPLE SITE IN A. A. U. EKPOMA.

Results

Table 1 shows result of some physico-chemical characteristics of Ibiekuma dam and upstream and downstream areas recorded during dry season. The mean temperature of 28.75°C was recorded for up stream (SW1) and midstream (SW2) and 27.25°C. was recorded at downstream ((SW3). pH value of SW2 was highest with 7.01 while SW3 recorded the lowest pH value. Conductivity values in the three different areas studied fluctuated around the same mean (SW1, 31.53µScm^{-1}; SW2, 30.58µScm^{-1}; SW3, 30.15µScm^{-1}). TDS was highest in SW1 with a value of 15.28mgl^{-1}(See Table 1). Table 2 revealed the phytoplankton species identified in the three sections of the stream. A total of 20 phytoplankton taxa comprising of Bacillariophyta, Chlorophyta and Euglenophyta divisions were recorded. Species encountered were more in SW2 (midstream) than SW1(upstream) and SW3(downstream) were identified (see also Table 3 and Figure 2).

Discussion

Temperature values fluctuated between 21°C to 31°C during dry season investigation. This observation is supported by the findings of Indabawa (2009) and Mustapha (2008). Variations in water temperature in the dry season can be attributed to intensified heat radiation and effect of harmattan respectively (Olele and Ekelemu, 2008). The mean pH values recorded for Ibiekuma dam was slightly acidic (6.41 to 7.01). This may be due to the high carbon dioxide concentration occurring from organic decomposition (Mustapha, 2008). This report is however at variance with the finding of Tiseer et al., (2005) for Samaru stream, Zaria.

The relativity high values (28.2 µScm^{-1} to 33.2µScm^{-1}) of electrical conductivity observed in this study is due to the evaporation of water, leaving a higher concentration of salt within a smaller volume of water (Imoobe and Oboh, 2003) and (Olele and Ekelemu, 2008). TDS followed the same pattern with conductivity.

The observation of more Chlorophyta than Bacillariophyta (diatoms) in this study conformed to the typical trend in tropical water bodies (Kadiri, 1999 and Kadiri and Omozusi,

2002). With the exception of *Ulothrix tennuisima*,all other species observed under Chlorophyta are desmids. High diversity of desmids is an indication that the water body is largely unpolluted. The desmids recorded could be a pointer that the dam is poor in its ionic composition (Kadiri, 2002).This is supported by the observation of just one species of *Euglena acus* (Euglenophyta), which is characteristic of eutrophic or nutrient rich water bodies (Adesalu, 2010).

The number of phytoplankton species observed in this study for each division encountered can be compared with the findings of Tiseer et al., (2008), who also recorded similar results on their phytoplankton study on Samaru stream during the dry season (10 species of Bacillariophyta, 11 species of Chlorophyta and 1 species of Euglenophyta).

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Table 1: Physico-chemical characteristics of the Ibiekuma dam and its immediate upstream and downstream areas during the dry season

SWI

parameters	WK1	WK2	WK3	WK4	Mean
TempoC	25	30	31	29	28.75
pH	6.00	6.40	6.78	6.45	6.41
E.cond.µs/cm	31.5	30.2	33.2	31.2	31.53
TDS(mg/l)	15.2	14.2	16.6	15.1	15.28

SW2

parameters	WK1	WK2	WK3	WK4	Mean
TempoC	27	29	31	28	28.75
pH	8.86	6.46	6.35	6.56	7.01
E.cond.µs/cm	31.8	31.0	31.0	28.5	30.58
TDS(mg/l)	15.4	14.8	14.9	14.4	14.88

SW3

parameters	WK1	WK2	WK3	WK4	Mean
TempoC	21	30	29	29	27.25
pH	6.51	6.58	6.55	6.45	6.52
E.cond.µs/cm	28.2	31.3	30.9	30.2	30.15
TDS(mg/l)	14.4	15.1	14.7	15.4	14.9

SW=Sampled water
SW1=Upstream
SW2=inside stream
SW3=Downstream

Table 2: Distribution and composition of phytoplankton in Ibiekuma dam and its upstream and downstream areas.

Phytoplankton Taxa	SW_1	SW_2	SW_3
Bacillariophyta			
Suirella engleri Muller f. *genuine*. recta	-	+	+
Surirella elegans Ehr.	+	+	+
Frustulia rhomboides (Ehr.) DeToni	-	+	+
Fragillaria sp.	+	+	
Pinnulaira rivularia Hustedt	+	-	+
Pinnularia viridis (Nitzsch) Ehr.			+
Eunotia flexuosa Breb and Kutz.	+	+	-
Synedra acus Kutz.	-	+	
Chlorophyta			
Closterium ralfsii Breb. var. hybridum Raben	+	+	+
Closterium acerosum (Schr.) Ehr.	-	+	
Closterium dianae Ehr. var. *arcuatum* (Breb) Raben	-	+	+
Closterium lineatum Ehr.	-	+	-
Cosmarium sp.	-	+	-
Cosmarium quadrum Lund	+	+	-
Cosmarium depressum (Nag.) Lund	+	+	-
Ulothrix tenuissima Kutz.	-	+	+
Micrasterias jenneri Ralfs var. *simplex* West	-	+	-
Staurastrum setigertum Cleve	+	+	-
Cosmarium stapperssii Evens	+		+
Euglenophyta			
Euglena acus Ehrenberg	+	+	-
Total No. of Phytoplankton	10	17	9

Key: + = Presence SW_1 = Upstream SW_3 = Downstream
- = Absence SW_2 = Inside dam

Table 3: Summary of phytoplankton composition of Ibiekuma dam and its upstream and downstream (January and February 2010).

Division	Order	Families	General	Total Taxa	% composition
Bacillariophyta	1	5	6	8	40
Chlorophyta	1	2	5	11	55
Euglenophyta	1	1	1	1	5
	3	8	12	20	100

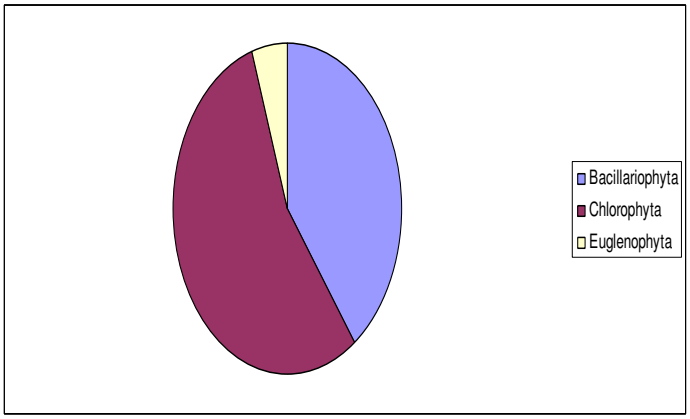

Figure 2 Phytoplankton composition of Ibiekuma dam.