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THE INFLUENCE OF PHYSICO-CHEMICAL PARAMETERS ON THE ZOOPLANKTON DISTRIBUTION OF KUSSALLA RESERVOIR, KANO STATE

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ABSTRACT
Zooplankton studies of Kusalla Reservoir in Karaye Local Government Area of Kano State were carried out over a period of twelve months from June, 2006 to May, 2007. Alongside the physico-chemical parameters of the reservoir was also determined in relation to the distribution of the zooplankton. Physico-chemical parameters showed that temperature, water depth, transparency, pH, and conductivity range between 22-28 ^{O}C, 50 – 70 cm, 25 cm- 78 cm, 6.2- 7.4, 25- 60 μ ohm/seconds respectively, so also hardness, dissolved oxygen, biochemical oxygen demand, nitrate- nitrogen, and phosphate-phosphorus ranges between 3.3-9.9 mg/l, 7.3-8.4mg/l, 2.6-4.4mg/l respectively. Different species of zooplanktons belonging to four (4) major classes; Cladocera (37.95 %), Copepods (26.6%) Rotifera (19.75%) and Protozoa (15.7%) were also recovered. The composition abundance and distribution of zooplankton varied with the variation in the Physico-chemical parameters of the reservoir.
Keywords; zooplankton, physico-chemical, Kusalla dam .

INTRODUCTION

Kano state has the largest concentration of man-made lakes in Nigeria with about 26 reservoirs across main seasonal rivers. This was sequel to the drought of the early 1970s and 1980s. Among the major reservoirs in the state are Tiga dam, Challawa Goje dam, Thomas, Watari dam, and Kussalla dam (Mbagwu, 1994). Kussalla dam is one of the reservoirs in Kano state that serve as a source of water supply to the surrounding communities. It is also use for irrigation, year round grazing and for fisheries production and tourist attraction. This resulted to gradual silting up, nutrient build up and aquatic zooplankton invasion. In addition to that, the water demand is on the increase so also the rate of abstraction of water for both rain fed and evaporation (Balarabe 1989).

Distribution of zooplankton is influenced by abiotic and biotic factors interaction although most species exist under wider range of environmental condition; certain species are limited by temperature, dissolved oxygen, salinity and other physical chemical characteristics (Jeje and Fernando, 1982).

Zooplanktons are primary consumers feeding mainly on phytoplankton and regarded as secondary producers in the trophic structure of an aquatic ecosystem. The purpose of this investigation was to determine the concentration of zooplankton in association with physico-chemical parameters of Kussalla reservoir. This will provide information on the productivity of the reservoir, so that the communities can explore resources, it is therefore, necessary to study the distribution of zooplankton as well as composition in this reservoir.

MATERIALS AND METHODS

STUDY AREA

Kussalla reservoir is located in Sudan savannah zone of Nigeria on latitude 10^{0}02N-11^{O} 00'N and longitude 11^{0}42' E-12^{0}42'E; and also Altitude of 11^{o}54E-15^{o}64'E with two distinct seasons (wet and dry). The rainy season period last from May to October and dry season last from November to April. Kusalla reservoir is approximately 90km south west of Kano city and about 2km from Karaye town, 1km off Karaye-Gwarzo road of Kano state (Figure 1.0).

Sampling

Samples were collected for a period of twelve month. Water samples were collected from six sampling stations between the hours of 8:00 am to 1:00 pm as described by Burn and David, (1999). In this method, water was sampled at surface level by dipping 1 litre plastic sampling bottle and slides over the most upper surface of water with their mouth against passage of the water into the bottle. Water samples were then transported to the laboratory for the analysis of physico-chemical parameters. The zooplanktons were collected using a silk plankton net of 20 cm diameter and 70 meshes/ cm attached with a 50ml capacity bottle at base. At each station collection was done by sinking the net and towed through a distance of 1 meter. The sample was then poured into plastic bottle of 70ml capacity and preserved in 4% formalin. Counting was done using drop method and then mounted on a microscope for identification.

Identification was carried out using various keys described by Jeje and Fernando (1986).

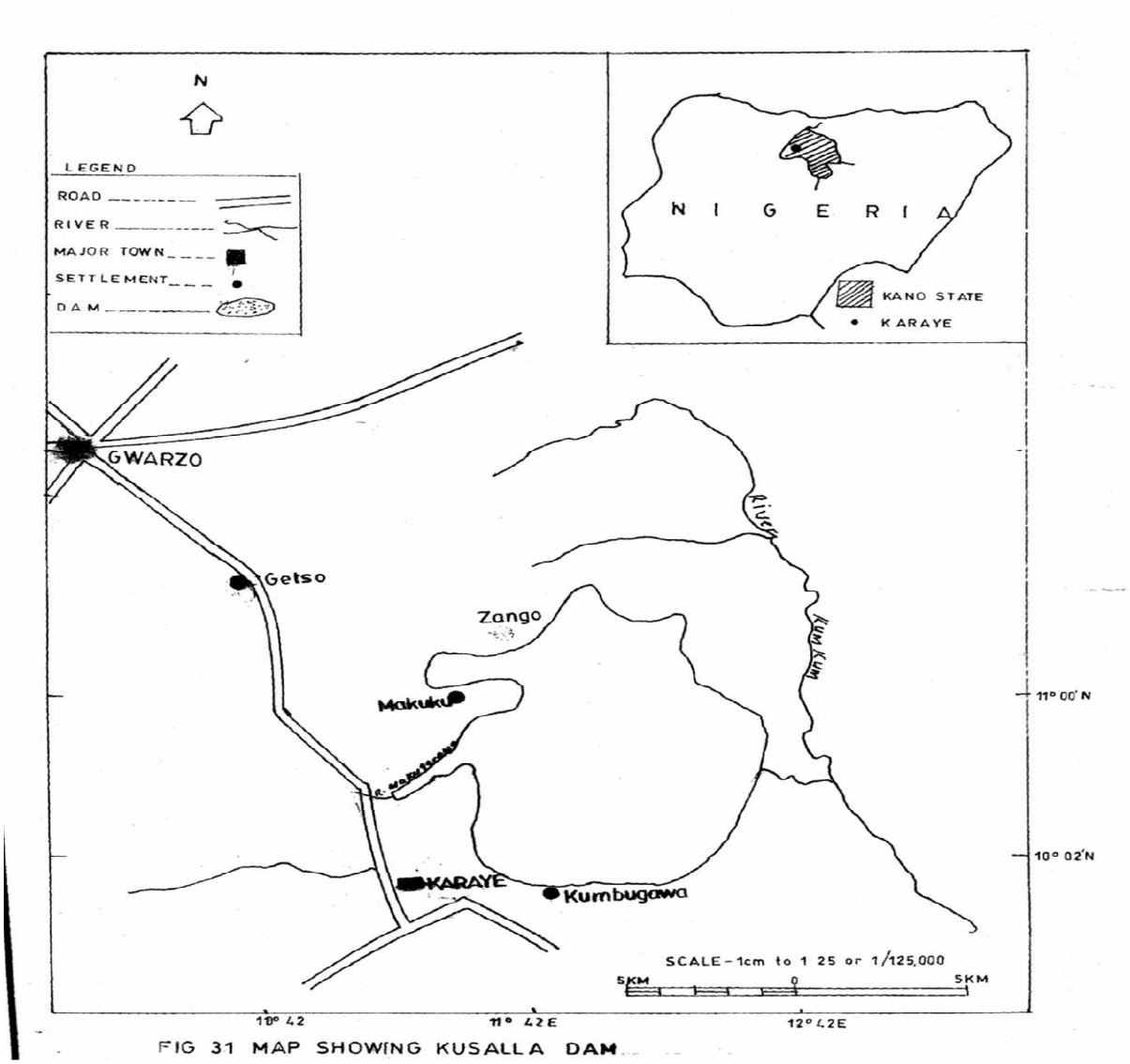

FIG 31 MAP SHOWING KUSALLA DAM

Physico-chemical parameters determined were temperature, transparency, depth, pH, hardness, conductivity, BOD, dissolved Oxygen, nitrate-nitrogen, phosphate-phosphorus were analysed by the methods of Lind (1979) and APHA (1998). The zooplankton counting and identification to the lowest taxa was carried out using various keys described by Jeje and Fernando (1982).

Data Analysis

Data collected were subjected to analysis of variance (ANOVA) and Peason correlation coefficient to ascertain variation between zooplankton and physico-chemical parameters in the two seasons, relationship between Shannon-Weiner and equitability indices were used to measure the species diversity between seasons.

RESULTS

The results obtained for the physico-chemical parameters indicate that temperature, water depth, pH, transparency, conductivity showed significant difference ($p \leq 0.05$). On the same hand, total hardness, dissolved oxygen, biochemical oxygen demand, nitrate-nitrogen, phosphate-phosphorous where highly significant between the seasons ($p \leq 0.05$).Twenty species of zooplankton were recorded during the study period as on Table 1: *Cladocera* dominated the zooplankton population of a total count (3475), with a total of 8 different species *Daphinia, Simocephalus Ceriodaphnia, Bosmia, Diaphnosoma, Macrothrix Polyphemus, and Eurycercus* species respectively. This is followed by *Copepod constituting* 26.6% of zooplankton total count and a different species of *Diaptomus, Cyclops, Nauphli, Eubranchipus* species.

Rotifera make up 19.8% of zooplankton total count and constitute the *Kellicottia, Keratella, Branchionus, Chromogaster and Rotaria* species respectively. Lastly the class Protozoa with 15.7% of total zooplankton number of individual with *Euglena, Paramecium and Chlamydomonas* species respectively.

From the analysis of variance Table 4. It was found that protozoans, cladocera, copepoda, and Rotifera showed highly significant difference between stations ($p \leq 0.05$) and there was no significant difference between the months.

Table 1.0 Zooplankton count of Kussala Dam

Class	Specie	Total count/ml
Protozoa	*Euglena spp.*	290
	Paramecium spp.	192
	Sub-total	482
Copepoda	*Diatomas spp.*	491
	Cyclops spp .	182
	Nauphilii spp.	159
	Eubranchiphus spp .	171
	Sub-total	1003
Rotifera	*Kelliocotia spp.*	322
	Keratella spp.	134
	Branchionus spp.	112
	Chromogaster spp	78
	Rotaria spp.	97
	Sub-total	743
Cladocera	*Dapnia spp.*	503
	Simocephalus spp.	152
	Ceriodaphnia spp.	111
	Bosmina spp.	93
	Diaphaesoma spp.	141
	Macrothrix spp.	93
	Polyphemus spp.	80
	Eurycercus spp.	74
	Sub-total	1247
	Total	3475

Table 2: ANOVA table for physico-chemical of Kusalla Reservoir Parameters.

Sources of variation	DF	Temperature	pH	Transparency	Depth	Turbidity
Station	5	3.79Ns	0.01NS	68.0NS	175199.0**	42.0NS
Season	1	165.01	0.86*	4669.0*	202672.0*	12246.0*
Station by season	5	0.57**	0.02NS	30.9NS	4373.0NS	49.0NS
Residual	60	76.50NS	0.08	150.6	19660.0	1313.0
Total	71	245.88				

* Significant, ** Highly significant, NS NonSignificant

Table 3: ANOVA table for physico-chemical of Kusalla Reservoir Parameters.

Sources of variation	DF	Conductivity	Hardness	Nitrate-nitrite	Phosphate-phosphorous	Dissolved Oxygen	BOD
Station	5	23.39NS	94.2NS	0.01NS	2.06NS	0.17*	1.47**
Season	1	460.06*	570.2NS	0.87**	1.10NS	7.70**	2.11**
Station by season	5	10.12NS	107.5NS	0.02NS	1.04NS	0.07NS	0.21**
Residual	60	86.13	170.2	0.09	2.73	0.06	0.04
Total	71						

* Significant, ** Highly significant, NS Non Significant

Table 4: ANOVA table for zooplankton of Kusalla Reservoir

Sources of variation	DF	PROTOZOA	CLADOCERA	COPEPODA	ROTIFERA
Station	5	55.64**	180.98**	245.99**	80.84**
Month	11	8.32**	23.12**	19.41NS	6.57*
Station by Month	55	3.02NS	7.69NS	6.058NS	3.21NS
Total	71				

* Significant, ** Highly significant, NS- Non significant

DISCUSSION

Zooplankton occurrence, distribution and diversity is characterised by physical and chemical condition of an aquatic ecosystem. Temperature showed significant difference between the seasons and this determine the distribution of zooplankton. There was high temperature during this period.

This correspond with the findings of Abdullahi and Indabawa (2005) in their study of the ecology of fresh water phytoplankton of River Hadejia, jagawa state.Water depth showed significant difference within the season and month, this also affect the distribution of zooplankton concentrations. Depth also correlate with Secchi transparency, dissolved oxygen and temperature at stations Kolo and Oladimeji (2004) in their study of shiroro lake. The pH of Kusalla reservoir ranged between 6.4-7.4, it was found to have increase with the onset of the rainy season and slightly decrease in dry season. Low pH indicates low acidity possibly due to presence of carbon dioxide, nitrates-nitrogen, and phosphates ions in this water bodies. This level of pH support many aquatic invertebrates and fishes in aquatic ecosystem similar observation was made by Edema, *et. al.,* (2002).Nitrate-nitrogen showed higher value during rainy season this could be due to run-off from farmland into the reservoir, and also fertilizer application by farmers from the catchment area, as observed by Kemdirim (2000) and Anyam (1980). Phosphate-phosphorus values was high during rainy season and dry season this could be due to pollution and farming activities from the surrounding communities. A similar finding was reported by Balarabe (2001) in his study of some ponds in Zaria, Kaduna state. Twenty different species of zooplankton with four. Major species were found namely copepod, protozoa, Cladocera, and Rotifera each with 8, 3, 4, and 5 species respectively (The density of each genera also varied with seasons. Cladocera were represented by eight (8) different species that is *daphnia sp, simocephalus spp, ceriodaphnia spp, macrothrix spp, Bosminia spp, Diaphaesoma spp, polyphemum spp, and Eurecercus spp respectively. Bosmina, and Daphnia spp* showed higher number of occurrence. Protozoan constitute the *Euglena spp, Paramecium sp, and chlamydomonas spp,* copepod also comprises of the *cyclopes spp, Nauphilii spp, diatoms sp, Eubranchipus spp.* The Rotiferans were the *Kellicottia spp, Keratella spp, Chromogaster spp, Branchionus and Rotaria spp,* respectively. The result showed high significant difference at stations and months ($p \leq 0.01$) level of probability.

Zooplankton number rose with the early rainy season and gradually decline as rainy season progresses similar report was observed by Aguigwo (1997). The dominant occurrence follow the order cladocera, copepod, Rotifera and protozoa respectively. This could be due to nature and location of the reservoir.

Conclusion

The physico-chemical parameters such as water temperature, water depth, pH, transparency, conductivity, hardness, dissolved oxygen, Biological oxygen demand, nitrate-nitrogen, phosphate-phosphorus were identified. The compositions of zooplankton of this reservoir were affected by seasonal variation through fluctuation in environmental variables such as changes in temperature, water depth, transparency, pH, hardness.

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