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Assessment Of Zooplankton Abundance And Water Quality Of Kitoro Reservoir, New Bussa, Niger State, Nigeria

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Abstract: Surface water reservoirs are considered as one of the planet's most important freshwater resources and provide a lot of benefits. Reservoirs are stagnant surface water bodies, receive and stores rain fall water through flooding. The aim of this research was to assess the water quality and zooplankton abundance of kisra reservoir in both wet and dry season. The water samples were collected once in a month at three (3) different locations using the water sampling bottle for water quality analysis and the zooplankton samples were collected using the zooplankton net with mesh size of 50µm. The samples were analyzed using standard analytical techniques as recommended by APHA for water quality parameters and was subjected to statistical analysis using independent T-Test. The zooplankton was analyzed using zooplankton Microscope. The result showed a significant difference ($P < 0.05$) in pH, water temperature, dissolve oxygen (D.O), turbidity, alkalinity and depth while there was no significant difference ($P > 0.05$) in biological oxygen demand (B.O.D) and water conductivity. The rain water in wet season, high temperature in dry season, settling effect of the suspended particles could all be factors responsible for that significant difference. Copepoda (56%) dominant the group in wet season, cladocera (29%) was next and lastly rotifera (15%) while in dry season, rotifera (64%) dominanted the group, then cladocera (23%) and copepoda (13%) was the least at the time of the study. Although in terms of species diversity, rotifer has more species than any other group in both wet and dry season and there were more zooplankton in wet season than in dry season. The study shows that, seasons affect both the water quality parameters and zooplankton composition in the reservoir.
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1. Introduction

Water quality characteristics play a very crucial role in the determination of the suitability of aquatic environment for the growth and development of the biota (King and Jonathan, 2003). Water quality is influenced by a number of factors, of which anthropogenic pollution arising from watershed activities is the most significant (Petlušová *et al*., 2019). The quality of the aquatic ecosystem and the ecological effects of pollution can be predicted by assessing zooplankton communities (Dorak, 2013; Rasheed *et al*., 2017; Santos and Ferreira, 2020). Zooplanktons are microscopic organisms that are essential components of aquatic food webs as primary consumers and they respond quickly to environmental change (Sharma and Sharma, 2020). The variation of zooplankton assemblages in freshwater ecosystems is influenced by space and time (Kar *et al*., 2018). Most of the species are cosmopolitan in distribution. The distribution of zooplankton communities depends on many factors, some of which are change of climatic conditions, physico-chemical parameters and vegetation cover. Zooplankton species have high sensibility to environmental changes and impacts, leading to shifts in composition and diversity of the communities associated to increase of biodiversity, with a high potential to endemism (Caroni and Irvine, 2010; Davidson *et al*, 2011; Xiong *et al*., 2016; Leibowitz, 2003). The objective of this study was to carry out water quality and zooplankton assessment of Kitoro reservoir in NIFFR, New Bussa Niger State in relation to seasonal variation.

2. Material and Methods

The study area was kitoro reservoir located at Niffr estate, New Bussa, Niger State. The reservoir was constructed in 2008. It is located at latitude of N9^{0}52'44'' and a longitude of E4^{0}32'20'. It has a distinct rainy season from April\May to October and a dry season from November to March.

The sampling was carried out once in a month (from May 2020 to February 2021) using250ml glass sampling bottles between 09:30am to 10:30am and they were all analyzed within 24hrs after collection. The experiment was carried out at limnology laboratory in National Institute for freshwater fisheries research (NIFFR), New Bussa, Niger State. Analysis for the physicochemical parameters of the water samples were carried out following the standard methods for the examination of water and waste water (APHA, 2005). Water temperature was taken *in-situ* using mercury-in-glass thermometer.
Data collected from the study were statistically analyzed using independent T-test. Zooplankton samples were collected using silk bolting zooplankton net with mesh size of 50µm and mouth diameter of 12cm. Samples were preserved in 10% formalin and were allowed to stand undisturbed for over 24 hours on a flat surface to allow organisms settle. Thereafter, the sample volume was reduced to about 10ml by siphoning with a pipette fitted with a flexible rubber tubing of 5mm diameter. The tip of the pipette was also fitted with a 50µm mesh size zooplankton net to prevent accidental loss of organisms during siphoning. This was done once in a month across both the wet and dry season at three (3) different stations.

3. Results

Table 1. Mean value of parameters of Kitoro Reservoir. There was no significant difference ($P > 0.05$) in Biological Oxygen Demand (B.O.D), turbidity and water conductivity while there was significant difference ($P < 0.05$) in pH, water temperature, Dissolved Oxygen (D.O), alkalinity and depth.

Table 1. Mean value of parameters of Kitoro Reservoir.

PHYSICOCHEMICAL PARAMETERS	WET SEASON MEAN±S.D	DRY SEASON MEAN±S.D
pH	7.03±0.05*	7.13±0.05**
B.O.D (mg/l)	4.12±0.49*	3.77±2.43*
Water Temperature (^{0}C)	27.25±1.89*	29.37±0.58**
D.O (mg/l)	12.33±2.66*	5.67±1.37**
Turbidity (m)	0.25±0.07*	0.14±0.08**
Alkalinity (mg/l)	10.00±0.00*	19.67±8.98**
Water Conductivity (µs/cm)	65.67±5.54*	71.08±29.61*
Depth (m)	0.79±0.20*	0.32±0.14**

Table 2. Zooplankton Composition of Kitoro Reservoir in Wet Reservoir

Species Composition	Station 1	Station 3	Station 3
ROTIFERA (14%)			
Pythgra	+	-	+
Brachionus fulcatus	+	+	-
Polyarthra sp	+	+	-
Brachionus calyciflorus	+	+	+
Lecane sp	+	-	+
MEAN 19			
CLADOCERA (29.01%)			
Diaphanosoma exisum	+ +	+	
Moina sp	+ +	+	
Nauplii	+ +	+	
Bosmina sp	+ -	+	
MEAN 38			
COPEPODA (56.49%)			
Cyclopoid sp	+	+	+
Copepodites	+	+	+

MEAN	74

+ Present - Absent

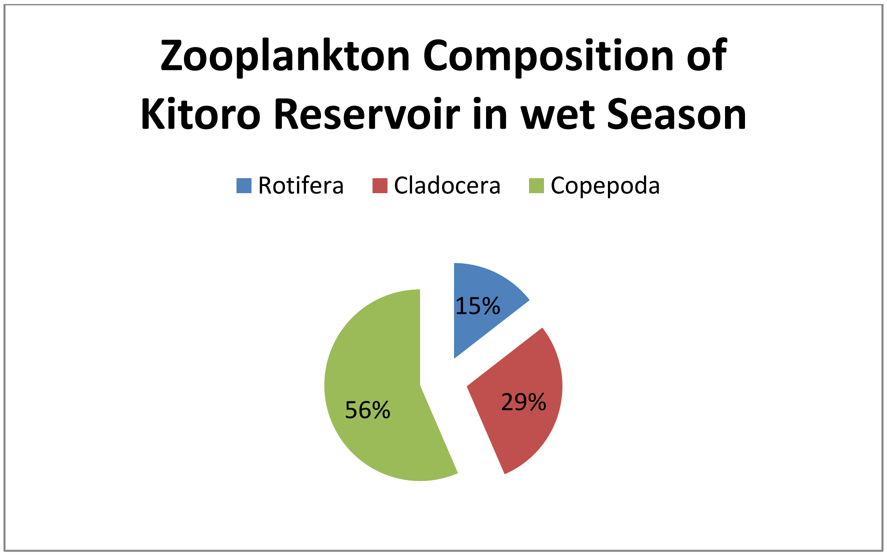

Figure 1: Showing the Distribution of Zooplankton in Kitoro Reservoir in Wet Season

Table 3: Zooplankton Composition of Kitoro Reservoir in Dry Season

Composition Species	Station 1	Station 2	Station 3
ROTIFERA (63.33%)			
Pythgra	+	+	+
Brachionus fulcatus	+	+	+
Brachionus calyciflorus	+	+	-
Trichocerca cylindrical	+	-	+
Filinia opoliensis	+	-	+
Keratella tropica	+	-	+
Brachionus angularis	+	+	+
Lecane sp.	+	+	+
MEAN **57**			
CLADOCERA (23.33%)			
Diaphanosoma exisum	+	+	+
Moina sp	+	-	+
Nauplii	+	-	+
MEAN **21**			
COPEPODA (13.33%)			
Cyclopoid sp	+	+	+
Copepodites	+	+	+
MEAN **12**			

+ Present - Absent

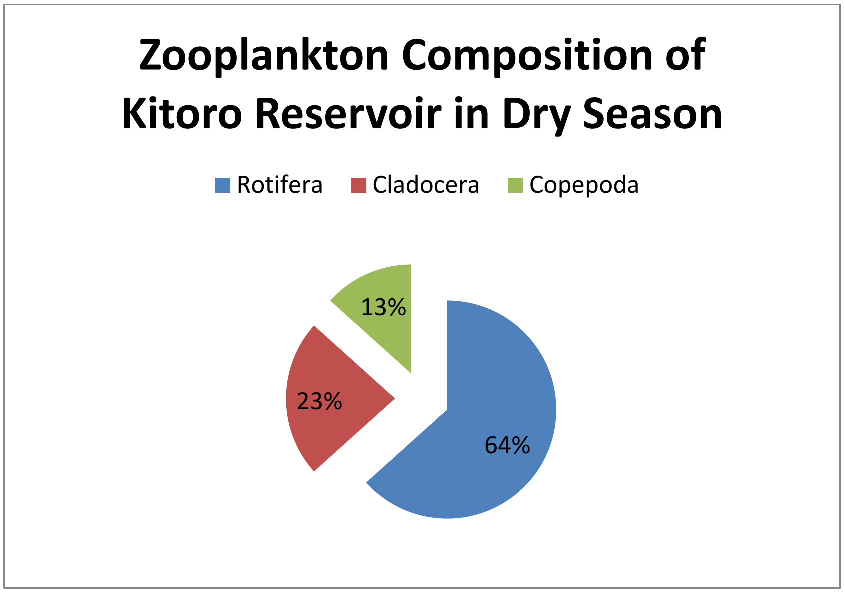

Figure 2: Showing the Distribution of Zooplankton in Kitoro Reservoir in Dry Season

4. Discussions

The result for physicochemical parameter was shown in table 1, the result showed that, pH, Water temperature and Alkalinity was significantly higher in dry season than in wet season i.e there was significant different ($P < 0.05$). The intensity of the sunlight in the dry season could push the water temperature to be higher in dry season, rainfall, which has little salt content could be a reason for low Alkalinity in wet season and cloud cover, could all be a contributing factor for this significant different. The high temperature value during the dry season indicates the high rate of metabolic processes or activities in the water body.

D.O, Depth and Turbidity was significantly higher in wet season than in dry season ($P < 0.05$). The reason why turbidity was significantly higher in wet season may be attributed to run-offs that carried dissolved fertilizer, pesticides, herbicides and other particles from cultivated fields into the reservoir, during rainy season silt, clay and other suspended particles contribute to the turbidity values, while during dry season settlement of silt and clay results to low turbidity values. Dissolve Oxygen was significantly higher in wet season could be attributed to seasonal fluctuation to the effect of temperature on the solubility of oxygen in water. At high temperatures, the solubility of oxygen decreases while at lower temperatures, it increases, also dry season decrease in dissolved oxygen concentration could be due to increased input of organic load into the water (mainly as leaf litter) through erosion, whose decomposition increases oxygen depletion and stream stagnation (Izonfuo and Bariweni, 2001). The depth was significantly higher in wet season due to flood coming from rainfall, it settles in and drastically increase the depth and volume of water in the reservoir. There was no significant difference ($P > 0.05$) in B.O.D and water conductivity.

Zooplankton composition of Kitoro reservoir in wet season shows that Copepoda has the highest composition with 56% of the total species present in the time of this study, Cladocera was the next populated with 29% while Rotifera has the least populated group with 14% of the total group.

In the dry season, Rotifera was the most dominant group with 63% of the Zooplankton present in the reservoir, Cladocera was the next dominant with 23% and Copepoda with 13% of the total group in the period of the study.

The increased number of zooplanktons during the rainy season which could be linked to the influx of nutrient (Phytoplankton) while the decrease of Zooplankton in the dry season could be due to high temperature. Copepoda are also better equipped to maintain their positions in flowing water (wet season) when compared with rotifera and cladocera. As a result, copepoda and rotifera vary in their tolerance to flow, which is capable of changing the zooplankton community structure and its composition.

When the population of copepoda decreases, the population of other groups (rotifera and cladocera) will increase as copepoda are fast and they shoot, this make other group of zooplankton to hide and avoid them thereby decreasing their population. In a situation where copepoda population decreases, other groups will have the freedom to multiply and grow thereby increases their population, this could be the reason for dominant of rotifera in the dry season.

CONCLUSION

Finally, it was discovered that, season variation affect both the water quality parameters and zooplankton composition in the reservoir as there was significant difference in all the water quality parameters except B.O.D and water conductivity where there was no significant difference. The dominant of zooplankton group also differs in both wet and dry season.

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References

[1]. American Public Health Association – APHA. Standard methods for the examination of water and wastewater. Washington, DC: 2005; APHA.

[2]. Caroni R, Irvine K. The potential of zooplankton communities for ecological assessment of lakes: redudant concept or political oversight? Biology and Environment Proceedings of the Royal Irish Academy 2010; 110(1): 35-53.13.

[3]. Davidson T, Bennion AH, Jeppesen E, Clarke GH, Sayer C. The role of cladocerans in tracking long-term change in shallow lake trophic status. Hydrobiologia 2011; 676: 299-315.14.

[4]. Dorak Z. Zooplankton abundance in the lower Sakarya River Basin (Turkey): Impact of environmental variables. J. Black Sea Mediterr. Environ. 2013; 19, 1–22.

[5]. Izonfuo WA, Bariweni AP. The Effect of Urban Runoff Water and Human Activities on some physico-chemical parameters of the Epie Creek in the Niger Delta. Journal of Appied Sciences and Environmental Management 2001; 5(1) 47-55.

[6]. Kar S, Das P, Das U, Bimola M, Kar D, Aditya G. Correspondence of zooplankton assemblage and water quality in wetlands of Cachar, Assam, India: Implications for environmental management. Limnol. Rev. 2018; 18, 9–19. DOI: 10.2478/limre-2018-0002.

[7]. King RP, Jonathan GE. Aquatic environmental perturbation and monitoring Texas: African Experience. 2003.

[8]. Leibowitz SG. (2003): Isolated wetlands and their functions: An ecological Perspective, Wetlands 23(3):517-531.

[9]. Petlušová V, Petluš P, Zemko M, Rybansky,Ľ. Effect of landscape use on water quality of the Žitava river. Ekológia (Bratislava) 2019; 38(1), 11– 24. DOI: 10.2478/eko-2019-0002.

[10]. Rasheed KA, Flayyh HA, Dawood AT. The biological indicators studies of zooplankton in the Tigris River at the city of Baghdad. Int. J. Environ. Agri. Biotech. 2017; 2(1), 138–148. DOI: 10.22161/ijeab/2.1.19.

[11]. Santos JM, Ferreira MT. Use of aquatic biota to detect ecological changes in freshwater: Current status and future directions. Water, 2020; 12, 1611. DOI: 10.3390/w12061611.

[12]. Sharma BK, Sharma S. Zooplankton diversity of a subtropical reservoir of Meghalaya, northeast India with remarks on spatial and temporal variations, Opusc. Zool. (Budapest), 2020; 51(1), 67–86. DOI: 10.18348/opzool.2020.1.67.

[13]. Xiong W, Li J, Chen Y, Shan B, Wangs W. Determinants of community structure of zooplankton in heavily polluted river ecosystems. Scientific Reports 2016; 6(1): 22-43.

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