

Effects of Some Physicochemical Parameters on *Oreochromis Niloticus* in Dadin Kowa Reservoir Gombe State Nigeria

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Abstract—The physicochemical study of Dadin Kowa reservoir Gombe State Nigeria has been carried out fortnightly over a period of six months (May to October, 2014). Water samples were collected using 250ml sampling bottles and brought to the laboratory for analysis. Only temperature and transparency were determined insitu. There were no significant difference ($P>0.05$) in all the parameters within various months and all the parameters were almost within the tolerable limit for supporting aquatic life. *Oreochromis niloticus* were sampled by the local fishermen at the landing sites using various mesh sizes of gillnet (2.0, 2.5, 3.0cm). Laboratory measurements were conducted to determine the length and weight of the fish and this information were used to determine the condition factor of the fish. All fish were in good condition as they have condition factor values up to 1 and above. Regulation of the smaller mesh sizes and number of fishermen fishing at a time is recommended as the physicochemical parameters were within the tolerable limits.

Keywords— Physicochemical, parameters, *Oreochromis niloticus*, Dadin kowa, Dam.

I. INTRODUCTION

WATER is a universal and the most vital solvent essential to the existence of all living organisms particularly man (Adeneyi, 2004). Water as an important natural resource influences human settlement patterns, agricultural activities and siting of industries (Nwaugo, *et al.*, 2006). Incidentally in wealth-generating processes, water is a victim of dumping of wastes which degrade the water for other uses (Trouba, 2002). Increase in industries, especially small and medium scale, has its own share of waste generation and disposal problem (Ajiwe *et al.*, 2000). The interactions of both physical and chemical properties of water play a significant role in the composition, distribution and abundance of aquatic organisms. Apart from these, it gives an insight in to the relationships between organisms and their environment and can be used to determine water quality, and productivity of the water body (United Nation Environment Programme, 2006).

Water abstraction for domestic use, agriculture production, industrial production, power generation, and forestry practices can lead to deterioration in water quality that impact not only aquatic organisms, but also the availability of safe water for human consumption (UNEP, 2006). Chronic exposure of aquatic organisms to environmental pollutants

with possible effects on growth and reproduction are important considerations of fish farmers (Lamai, *et al.*, 1999).

The physico-chemical study of water could also help in understanding of the structure and function of a particular water body in relation to its inhabitant. The chemical elements found in water have an effect on biological processes which lead to interconversion of energy, production of organic materials and ultimately to production of aquatic resources such as fisheries and other biological components found in water ecosystem (Mustapha, 2003). The proper balance of physical, chemical and biological properties of water in lakes, ponds, reservoirs, and rivers is an essential ingredient for successful production of fish and other aquatic resources. The presence or absence of a particular chemical element in a water body might be a limiting factor in the productivity of such water body (Mustapha and Omotosho, 2005).

Water pollution occur when a body of water is adversely affected due to addition of large amount of materials to the water, when it is unfit for its intended use, its considered polluted (Poppe and Hurt, 1997).

The aim of this study is to assess some of the physicochemical parameters and relate it to general well being of *Oreochromis niloticus* in Dadin Kowa Dam.

II. MATERIALS AND METHOD

A. 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 11o 30' E and 11o 32' E, and Latitude 10 o 17' and 10o 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 300kilometer square.

B. Physicochemical Sampling

Water samples were collected from the three stations forthrightly over a period of six months (May-October, 2014). Sampling bottles of 250ml capacity were used; the bottles were rinsed before being filled with water for physicochemical analysis in the laboratory. Only temperature and transparency were determined in situ.

Temperature readings (water and air) were measured using mercury in-glass thermometer. Transparency was

measured as described by Sterling (1985) using secchi disc depth. The pH of the water was determined using electronic digital temperature pH meter (model 3150 Jenway). Electric conductivity was determined as described by (Golterman, *et al.*, 1978); using portable HANA electronic conductivity meter (model: EC 215). Dissolved Oxygen and Alkalinity were determined using Jenway AquaGem water analyzer (model: 4510). Each parameter measured has its module and tablet that were used for sample preparation before taking the sample concentrations.

C. Fish Sampling

Oreochromis niloticus was sampled using gillnets of different mesh sizes (2.0, 2.5 and 3.0cm) and transported to the laboratory for measurement. Standard length and weight of the fish were measured as described by Olatunde, (1983). Condition factor (K) was determined using conventional formula described by Le Cren (1951).

$$K = \frac{W * 100}{L^3}$$

Where:

K = Condition factor

W = Weight in grams

L = Standard length in cm

III. RESULTS

The lowest mean water temperature value of 26⁰c was recorded in the month of August, while the highest temperature value of 29⁰c was recorded in the months of June and July (Table 1). Highest transparency value of 11.4cm was recorded in the month of June, where the lowest value of 8cm was recorded in the month of August (Table 1). Highest pH value of 8.0 was recorded in the month of May and its lowest value of 6.38 in the month of October (Table 1). Conductivity recorded its lowest value of 21 μ s/cm in the month of May and the highest value of 62 μ s/cm was recorded in the month of June (Table 1). The lowest dissolved oxygen value of 4.9mg/l was recorded in the month of May and the highest value of 7.3mg/l was recorded in the months of July and October. Alkalinity recorded its lowest value of 79mg/l in the month of August and the highest value of 81mg/l in the month of July (Table 1).

The lowest condition factor value of 1.02 was recorded in the month of September, while the highest condition factor value of 2.00 was recorded in the month of July (Table 2).

Temperature correlated positively with pH and negatively correlated with dissolved oxygen and alkalinity. Transparency correlated positively with pH, dissolved oxygen and alkalinity. pH positively correlated with alkalinity. Conductivity negatively correlated with alkalinity (Table 3)

Discussion

Water temperature fluctuated between 26⁰c to 29⁰c throughout the period of the study which fall within the normal range of 8-30⁰c that fish adopt in the tropics (Alabaster and Lioyd, 1980). Transparency ranges from 8.0 to 11.4cm, the highest value of 11.4 in the month of June might be attributed to the onset of the rainy season which is related to increase in

debris load by water run-off. Its agrees with Abubakar *et al.*, (2006) who reported that reduced activity and lack of rains accounted for higher transparency. Abubakar (2006) also reported that suspended materials can clog fish gills, reducing resistance to diseases and growth rate. The monthly mean variation of the pH values ranged from 6.38 to 8.0. The recorded values fall within the recommended values of 6-9 in most tropical natural water (ACTFR, 2002). Boyd and Lichkoppler, (1979) also reported pH values of 6-9 as ideal for supporting aquatic life including fish. Mean conductivity values ranged from 21 - 62 μ s/cm which fall within the recommended values of 10 - 1000 μ s/cm by (ACTFR, 2000). Sterling (1985) reported that acidic (pH<4.5) or alkaline (pH >8) waters have appreciable higher conductivity values. Dissolved oxygen values ranged from 4.9 - 7.34mg/l Its falls within the recommended values of Kolo and Tukura (2007) who reported that many species of fish can survive in dissolved oxygen concentrations well below 6mg/l. The alkalinity of ranged between 79 - 81mg/l during the period of the study. Kolo and Yisa (2000) reported alkalinity values of 84 - 128mg/l. Sterling (1985) recommended alkalinity values of 50 - 300mg/l for freshwater fish culture.

The condition factor in this study ranges from 1.02 - 2.00 which agrees with Lagler (1952) who reported that the condition factor values are not constant for individual species or populations, but is subject to wide variations. The condition factor should be equal to 1.0, while <1 or >1 indicate below and average conditions respectively. Wade (1992) stated that condition factor greater or equal to 1.0 is good.

TABLE I
MEAN MONTHLY VARIATION OF PHYSICO-CHEMICAL PARAMETERS OF
DADIN KOWA DAM

Parameters	Months						
	May	June	July	August	September	October	Mean
Temp (°C)	28.0	29.0	29.0	26.0	27.0	28.0	27.83
Transparency (cm)	10.0	11.4	9.4	8.0	9.2	10.0	9.66
pH	8.0	7.4	6.7	7.0	6.74	6.38	7.04
Conductivity (μ s/cm)	21.0	62.0	39.0	42.0	32.0	30.2	37.7
DO (mg/L)	4.9	5.2	7.3	6.0	6.5	7.3	6.2
Alkalinity (mg/l)	80.06	80.19	81.00	79.00	80.16	80.02	80.13

TABLE II
MEAN CONDITION FACTOR OF OREOCHROMIS NILOTICUS IN DADIN KOWA
DAM

	Months						
	May	June	July	Aug	Sept	Oct	Mean
No. of fish	20	20	20	20	20	20	20
Weight (g)	45.0	48.0	46.0	40.0	42.0	48.0	44.83
Length (cm)	16	14	13.2	15.0	16.0	15.4	14.93
Condition factor (K)	1.09	1.75	2.00	1.20	1.02	1.30	1.39

TABLE III
CORRELATION MATRIX OF THE PHYSICO-CHEMICAL PARAMETERS OF
DADIN KOWA DAM

	Temperature	Transparency	pH	Conductivity	DO ₂	Alkalinity
Temperature	1					
Transparency	.03	1				
pH	.57*	.71*	1			
Conductivity	.28	.37	-.43	1		
Dissolved O ₂	-.83*	.73*	-.03	.274	1	
Alkalinity	-.81*	.88*	.74*	.79*	.17	1

*Correlation is significant at 0.05 level (2tailed).

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