Food Habit and Growth Pattern of *Oreochromis niloticus* in Wase Dam, Nigeria

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Abstract: Food habit and growth pattern of one hundred and thirty seven (137) samples of *Oreochromis niloticus* in Wase Dam, Kano State was investigated. One hundred and thirty seven samples, which comprised of 81 males and 56 females were used for the study. Males' (4.50cm-19.50cm) with mean 12.52, females (5.00cm-20.50cm SL) of mean 13.17 and combined sexes (4.50cm-20.50 SL) of mean 12.78 did not show any significantly difference ($p<0.05$) although males were bigger than females. Stomach contents analysis using frequency of occurrence and numerical methods showed that the fish fed mainly on plankton (algae) followed by insect part, detritus then fish fry and lowest unidentified materials. The diversity of food items found in the stomach categorizes the fish as an omnivore with tendency of being a planktivore. The length-weight relationship (b-value) obtained for the male, female and combined sexes suggested negative allometric growth.
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1. Introduction

There are numerous inland water bodies in Nigeria that range from small, medium to large sizes with abundant fish species of commercial importance. Fish is a valuable and accessible source of protein in addition to income generation hence, the need to properly manage this valuable resource. Gupta and Gupta (2006) reported that the flesh of fish contains relatively large amount of vitamins, particularly A and D.

Food composition gives information on the diets, life span, stock composition and fish production, amongst others for better management while growth pattern expresses relationship between length and weight of fish. These are quite essential because of the role played in the understanding of the biology of fish population in any water body. Oronsaye and Nakpodia (2005) reported that food habit is a subject of continuous research because it constituted the basis for successful fisheries management programme on fish capture and culture. Abdel-Aziz and Gharib (2007 reported that studies on natural feeding of fish could provide useful information on the trophic relationships in the aquatic environment. Length-weight relationship is widely used to study natural populations of fish, therefore provide methods for management. One of the key factors to successful culture and manage fish is to understand some biological fundamentals, which include food habits and growth pattern.

The family Cichlidae is a valuable group of fish that has drawn so much attention recently in terms of culture in tropical and sub-tropical countries, though it has been cultured intensively for more than four decade now. Arawomo and Fawole (2006) reported that Cichlids as among the commercially exploited fishes for human consumption especially in African Lakes. However, many wild members of the population especially in Africa are under threats as a result of both natural and man-made activities.

Oreochromis niloticus, commonly known as Nile Tilapia is among the culturable fish species found in Nigeria and other parts of Africa. It is commonly found in most water bodies in Nigeria and widely distributed (Araoye, 2008). According to Yem (personal communication) it grows to reasonable size, where up to 3.5kg was observed in Kainji Lake. The species has the ability to tolerate a wide range of environmental conditions, successful reproductive strategies, fast growth and the ability to feed at different trophic levels (Gretchen *et al*., 2012). *O. niloticus* has been recommended by FAO as a fish for culture because of its importance in aquaculture and its capability in contributing to the increased production of animal protein in the world.

This study provides information on the food habits and growth pattern of this valuable fish species in the dam for better management and utilization.

2. Materials and Methods

Wase Dam is about 30km north-east of Kano city. The dam originated from Jakara River which got its name from one of the early historic settlement near Kano city. The dam was completed in 1976 and as a perennial water body. It has a catchment area of

559km^2; maximum height and width of 14.33m and 75.28m; surface area of 1,659ha.

Fresh samples of *Oreochromis niloticus* were collected at random from fishermen catches that used gill nets in the dam. Different sizes were collected and transported to the laboratory using ice-chest box for analysis. Samples were indentified to the lowest taxonomic level with the aid of manuals according to Paugy *et al*. (2003) and Froese and Paugy (2013).

Standard and total lengths and weights of each sample were measured using measuring board and assorted weigh balance depending on the size of the fish. Length and weights were measured in centimeters and grams respectively.

Stomach contents were emptied into petri-dish and 10% saline was added to disperse the food items. The contents of each stomach examined were identified using manuals by Mellanby (1979), Jeje and Fernando (1986), counted and recorded. Each proportion of items identified were calculated as percentages using frequency of occurrence (Bowen, 1983) and numerical methods (Crisp *et al*., 1978).

Length-weight relationship (LWR) was determined using the formula according to Pauly (1984);

$$W = aL^b$$

The values of length were plotted against weight values to obtain a, b and r values.

Where:

W = body weight of fish (g)

L = Length of fish (cm)

a and b = values estimated by regression.

Descriptive statistic was used to calculate means, standard deviation, minimum and maximum values of data collected. Data were also subjected to analysis of variance (ANOVA) to test for any significant difference at 5% confidence level.

Results and Discussion

One hundred and thirty seven (137) samples of *Oreochromis niloticus* comprised of 81 males and 56 females were used for the study. Males' standard length ranged between 4.50cm- 19.50cm ($\bar{X}$ =12.52), females between 5.00cm-20.50cm ($\bar{X}$ =13.17) and combined sexes 4.50cm-20.50 ($\bar{X}$ =12.78) (Table 1). Although this did not differ significantly ($p<0.05$), males were bigger than female. This contradicts the finding of Gomez-Marque *et al*. (2008) that reported 8.90cm-14.80cm SL and 9.0cm-16.50cm SL of males and females respectively but similar to that of Mortuza and Al-Misnel (2013) that reported 7.60cm-27.30cm SL, 6.90cm-26.10cm SL and 7.60cm-27.30cm SL of male, female and combined sexes respectively. The weights of males, females and combined sexes for this study ranged between 20.00-145.00g, 20.00-160.00g and 20.00-160.00g respectively, which also did not differ significantly ($p<0.05$). Obasohan *et al*. (2012) reported weights range of 61.90-112.70g while Mortuza and Al-Misnel (2013) reported weights of 14.80-430g, 13.10-402g and 13.10-430g for males, females and combined sex respectively. These observations could be due to sizes caught, habitat difference and period of study amongst other factors.

Composition of items ingested by *Oreochromis niloticus* in the dam includes fish fry, insect parts, phytoplankton (algae), detritus and unidentified items (Table 2). The major food items were phytoplankton (algae) followed by insect parts then detritus while the lowest was unidentified materials. Oso *et al*. (2006) reported algae (green, filamentous and colonial) especially *Closterium* sp. and macrophytes as major items consumed by the species. Other items include detritus, sand grain and insect parts. Omondi *et al*. (2013) did report algae as the predominant item consumed by *O. niloticus* of all sizes. Other items included detritus, zooplankton. The disparity in some of the items could be due to the difference in aquatic environment, abundance and availability of food items and sizes of fish. Similarly, Adeyemi *et al*. (2009) reported *O. niloticus* to have fed on plant parts as the dominant food item, followed by algae and detritus. Other items included unidentified particles, sand grain, crustacean and insect part. The combination of both plant and animal materials in the diet of *O. niloticus* make the species to be an omnivore. Akinwumi (2003), Oso *et al*. (2006) and Adeyemi *et al*. (2009) reported the species as an omnivore, which is similar to the findings of this study. The fish in Wase Dam could also be known as a planktivore because of the relatively high percentage of phytoplankton found in the stomachs examined. *O. niloticus* is capable of using a wide range of food resources including algae, detritus, higher plant material, chironomids, zooplankton and fish as reported by Njiru *et al*. (2004) and Shalloof and Khalifa (2009).

Length-weight relationship values of males, females and combined sexes were 1.51, 1.50 and 1.52 respectively (Figures 1, 2 and 3). In an ideal situation, b = 3, but the values of this study were less than 3, which show that the fish exhibit negative allometric growth pattern; the length and weight are not growing proportionately. Mortuza and Al-Misnel (2013) reported b-values for male, female and combined sexes of *O. niloticus* as 3.16, 2.98 and 3.08, which showed positive allometric growth. Gupta and Gupta (2006) reported b-value to have fluctuated between 2 and 4, which are higher than this study. This could be due to difference and/or condition of the environment, fishing pressure, food availability and spawning period to mention but a few. Studies have shown that the length of fish maintain a steady relationship with the weight. As b-value increases the size of fish also

increases because fish grows in all proportionately and direction. Coefficient of regression (r) for the sexes exhibited positive correlation between the lengths and weights, which shows close relationship between these parameters though the fish grow slimmer.

Conclusion and Recommendation

Oreochromis niloticus fed on items that ranged from plant to animal materials. Plankton forms an important item of the diet of the fish in the dam. The ability of the fish to feed at different trophic level makes the fish live successful in the dam. Negative allomerism showed non-proportionate growth of length and weight. To meet with the nutritional requirements of the fish, plant and animal components should be used in feed formulation. Physico-chemical parameters analyses in order to know pollution status of the dam need to be assessed. There should also be a workable management plans for the water body to protect the fisheries.

Table 1. Body measurement of *Oreochromis niloticus* in Wase Dam, Kano State

Sex	Male	Female	Combined sexes
No	81	56	137
Standard Length (cm) Mean ± SD	4.50-19.50 12.52±2.93	5.00-20.50 13.17±2.73	4.50-20.50 12.78±2.86
Total Length (cm) Mean ± SD	6.00-22.00 14.93±3.28	6.00-24.00 15.81±3.12	6.00-24.00 15.29±3.23
Weight (g) Mean ± SD	20.00-145.00 73.22±27.49	20.00-160.00 82.98±31.20	20.00-160.00 77.14±29.31

SD: Standard Deviation

Table 2. Food composition (%) of *Oreochromis niloticus* in Wase Dame, Kano State

Food Item	Frequency of occurrence (%)	Numerical method (%)
Fish fry	9.81	11.00
Insect parts	27.34	17.65
Phytoplankton (Algae) Detritus	44.69 12.00	47.45 15.64
Unidentified materials	6.16	8.26

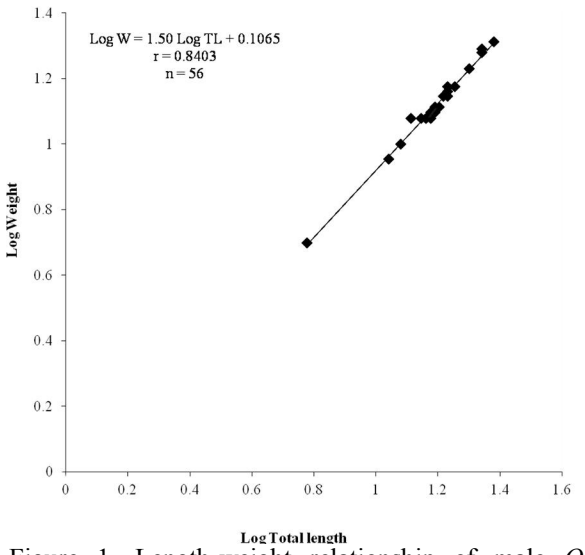

Figure 1. Length-weight relationship of male *O. niloticus* in Wase Dam

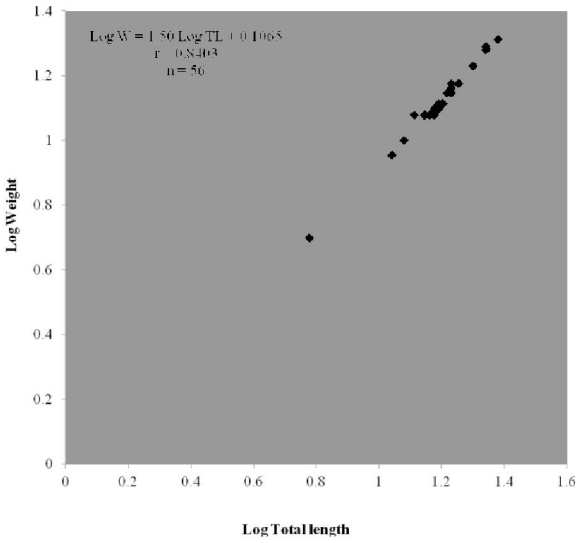

Figure 2. Length-weight relationship of female *O. niloticus* in Wase Dam

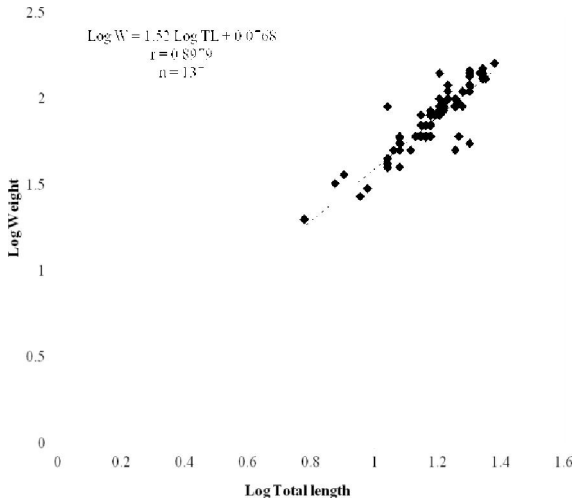

Figure 3. Length-weight relationship of combined sexes of O. niloticus in Wasw Dam

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