

Full Length Research Paper

Studies in variation in length-weight relationship, condition of factor and size distribution of *Oreochromis niloticus* and *Syndontis schall* obtained in the ecology lower River Benue at Makurdi Nigeria

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The study was carried out to investigate the length, weight, condition of factor and the size distribution of two different species which were *O. niloticus* and *S. schall* from River Benue. The fish samples were obtained from Wadata fish market. The length-weight relationship was determined using Le standard method. Variation in standard length of *S. schall* range from 26.00 to 40.10cm, while standard length varied from 14.00 to 21.01cm in *O. niloticus*. Similarly, total length ranged from 28.30 to 42.90cm in *S. schall* and bodyweight varied from 248.40 to 432.20g. The total length in *O. niloticus* ranged from 16.01 to 23.01cm and the bodyweight ranged from 66.60 to 86.20g. However the weight of *S. schall* was higher than that of *O. niloticus* and perhaps this was due to the condition of factor of the two different fish species and their feeding habits.

Keywords: *Oreochromis niloticus*, *syndontis schall*, length- weight, condition of factor.

INTRODUCTION

Studies on food and feeding habits gives information on seasonal changes of fish because of the type and magnitude of food available. (Akpan and Isangedihi, 2005). Length-weight data of a population of fish is a basic parameter for any study, since it provides important information concerning the structure and function of population of fish.

Oreochromis niloticus and *Synodontis schall* are fishes of high economic value and they play an important role in the ecology and fisheries of West Africa and other inland water regions. The success of good scientific planning and management of fish species largely require that the knowledge of their biology be well understood. The genus *Synodontis* is a small to medium sized fish belonging to the family *Mockoidae* (Imam *et al.*, 2011). The genus contains only three species in Lake Nasser

(*S. schall*, *S. serratus*, *S. frontosus*). This genus consists of some members of which are commercially more important than others (Akombo *et al.*, 2014). *Synodontis membraneus* is generally preferred by fishermen and consumers because of their sizes. They command a higher market value than other species of the genus because they grow bigger in size (Akombo *et al.*, 2014). In Benin, there is however, no information of many aspects of the genus (Philippe *et al.*, 2006). Work done on distribution and abundance was restricted to very large water bodies including Lake Volta, the upper Nile, Lake Chad and Kainji Lake of Nigeria (Araoye, 1999). *S. schall* is one of the species that can be seen in the fish market throughout the year. A lot of studies have been carried out on *S. schall* in different water bodies by many authors but not much has been done on the species in River Benue at Makurdi (Akombo *et al.*, 2014). Fish found in tropical and sub-tropical water system experience frequent growth fluctuation due to the

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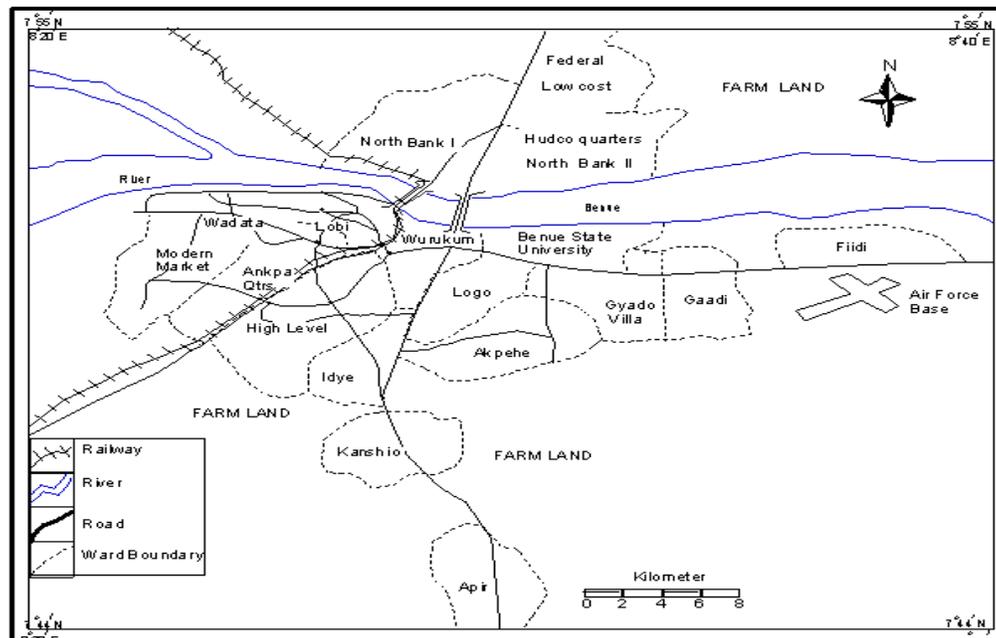


Fig 1. Map of Makurdi Showing its Wadata Fish Market on the bank of River Benue.

changes in food composition, environmental variables and spawning conditions among others (Adeyemi *et al.*, 2010). Length-weight and length-length relationship can be used to assess the influence of these factors in fish. This study therefore seek to determine the sizes distribution and the condition factor and evaluate the length-weight relationship between the two species of the fish of *O. Niloticus* and *S. Schall*.

MATERIALS AND METHODS

Study Area

The study was carried out in Makurdi, at the Wadata fishing market located directly on the bank of River Benue, the capital city of Benue State, Nigeria. Makurdi is located in central Nigeria with the second largest River, River Benue. The city is in the guinea savanna vegetative belt surrounded by the bank of the River Benue in Nigeria. Makurdi is situated at latitude $7^{\circ}15' - 7^{\circ}45'$ North and Longitude $8^{\circ}15' - 8^{\circ}40'$ East and 104 meters elevation above the sea level (Figure 1). The river divides the town into North and south Banks and the town covers an area of about 16 kilometers square. The river constitutes the main source of water supply for the inhabitants of the town and for irrigation. Makurdi is fast becoming a metropolitan center with attendant health, social, housing and associated environmental problems. The rainfall seasons at Makurdi produces a river regime of peak flows from August to early October and low flow from December to April. The rainy season which last for

seven months (April to October) has a mean annual rainfall ranging from 1200-2000mm. High temperature values averaging $28-33^{\circ}\text{C}$ are recorded in Makurdi throughout the year, particularly from March to April. Harmantans winds are accompanied with cooling effects mostly during the nights of December and January (Nyagba, 1995).

Collection of fish samples

The fish samples for this study were obtained from the fishing landing site at Wadata market in Makurdi, Benue State. The fishermen also revealed that the fish were mostly caught by the use of gill nets of various mesh sizes and cast nets as traps. The fish bought were preserved in the ice-chest cooler and taken to the laboratory for further analysis. They were preserved in the ice-chest to reduce posthumous digestion to the barest minimum.

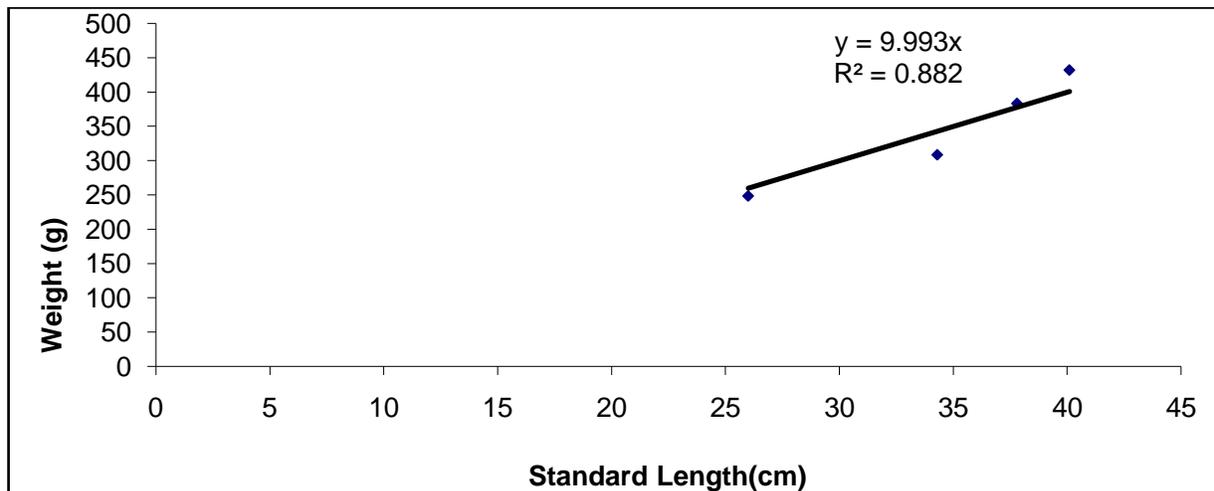
Determination of length-weight measurement

The fish samples were obtained at Wadata market fishing site. Weighing balance was used to measure the weight in grams of each of the fish and a measuring tape was used to measure the standard length and the total length of the individual fish species to the nearest centimeter. The length-weight relationship was determined using the equation below: $W = al^b$, (Le cren, 1951) Where, W = weight of fish (g), l = standard length of the fish (cm) a = constant b = an exponent. The condition factor (k) was calculated using the equation below:

Table 1. Variation of standard length, total length, and weight of *Synodontis schall*.

Morphometries	Minimum	Maximum	Mean	Std Error
STDL (cm)	26.00	40.10	34.55	3.10
TOLT (cm)	28.30	42.90	36.52	3.09
WGT (g)	248.40	432.20	343.12	40.54

Key: STDL = Standard length, TOLT = Total length, WGT = Weight Std error = Standard error.

**Fig 2.** Length-Weight Relationship of *Synodontis schall* in River Benue at Makurdi.**Table 2.** Variation of standard length, total length and weight of *Oreochromis niloticus*.

Morphometric	Minimum	maximum	Mean	Std Error
STDL (cm)	14.00	21.01	18.10	1.48
TOTL (cm)	16.01	23.01	20.03	1.50
WGT (g)	66.60	86.20	77.52	4.15

Key: STDL = Standard length, TOTL = Total length, WGT = Weight Std error = Standard error.

(K) = (100w) SI^b (Carlander, 1969) Where, K = the condition factor w = weight of the fish in grams, SI = standard length of the fish in centimeters b = regression coefficient.

RESULTS

The data presented in Table 1 is variation in length-weight relationship and condition of factor of *S. schall* obtained in river Benue during the course of the study. The standard length of the fish ranged from 26.00 to 40.10cm and the total length varied from 28.30.42.90cm with body weight that range from 248.40 to 432.20g. The fish had a R^2 value of 0.882 as shown in fig.2 and a mean weight of 343.12g. Similarly variation in length-weight relationship and condition of factor of *O. niloticus* was presented in Table 2. The standard length, total length and weight of *O. niloticus* were observed to be

different from those of *S. schall*. This is so because of the food taken by the individual fish species and their respective environmental conditions. Standard length of *O. niloticus* was observed to range from 14.00 to 21.01cm, total length of varied from 16.01 to 23.01cm and body weight range from 66.60 to 86.20g. *O. niloticus* had an R^2 value of 0.7015 (fig. 3) and a mean weight of 77.52g.

DISCUSSION

Relationship between length and weight of the two species of fish were examined. The findings of this present investigation showed a higher length-weight relationship between *S. schall* ($R^2 = 0.882$ as compared to the *O. niloticus* ($R^2 = 0.7015$). This result conforms to that of Akombo *et al.*, (2014) that reported a high positive

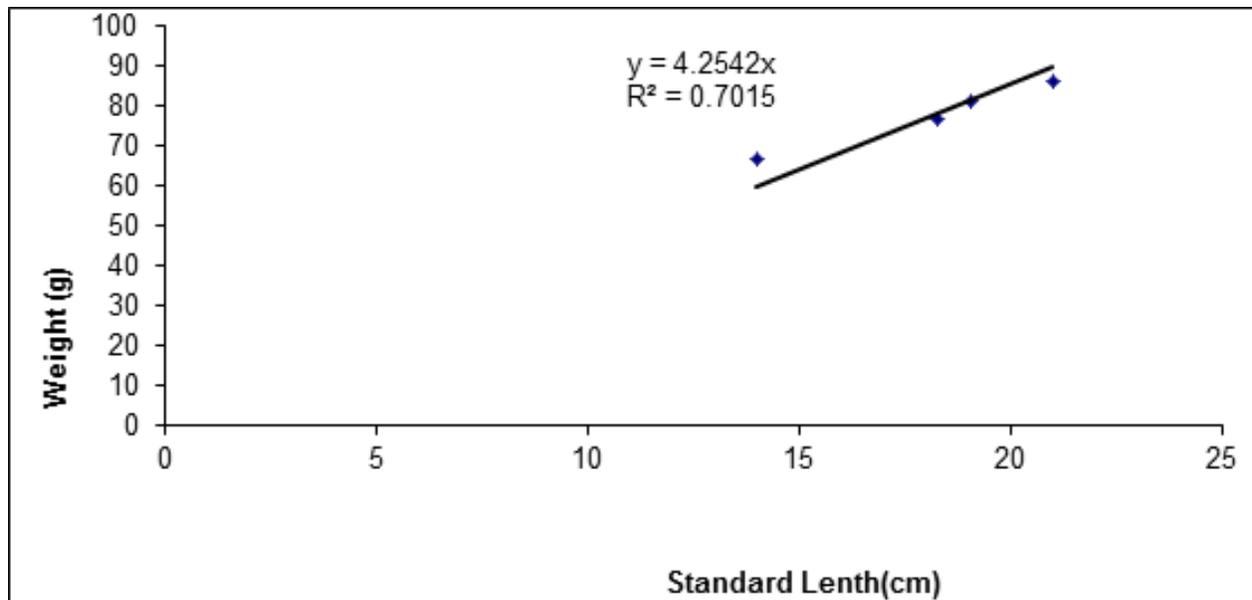


Fig 3. Length-Weight Relationship of *Oreochromis niloticus* in River Benue at Makurdi.

Length-weight relationship between *S. schall* in the same lower river Benue. This is an indication that increases in length with corresponding increase in weight of the fish (Augustine *et al.*, 2016). The mean total length of *Syndontis schall* during this study differs significantly to the findings of 12.06 ± 0.2 cm reported by an earlier study (Offem *et al.*, 2009). This may be ascribed to the different ecology of the fish in the different environments with different habitat quality. The quality and quantity of food available may also account for the differences in the fish morphology and condition factor of the fish. Similarly Akombo *et al.* (2014) reported the length of *Syndontis schall* in lower river Benue that ranged from 6.1-30.4 cm and bodyweight that varied from 5.3-864.5 which differs significantly from the result of this study. The difference may be due to the different time of sampling. During the course of this study the mean body weight, total length and standard length of *Oreochromis niloticus* differs significantly from the report of a study in a tropical reservoir in Abuja, Nigeria. (Dan-Kishaya 2013). This may be linked to the ecology of variation in the different habitats and the time of sampling the fish samples. The growth pattern in the two different species was allometric.

CONCLUSION

The present studies observed that, each of the two species of fish sold in Wadata fish market had different length and weight relationship due to factors such as difference in body size and body weight, difference in food availability and environmental conditions found in river Benue.

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