Length - Weight Relationship and Condition Factor of (*Oreochromis Niloticus)* in Wudil River Kano State, Nigeria

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Abstract— The aim of this study was to determine the length-weight relationship and condition factor of *orechromis niloticus* in at wudil river Kano state, Nigeria. The Length-weight relationship and condition factor of *Oreochromis niloticus* in Wudil River was investigated using thirty (30) specimens of *oreochromis niloticus*. Samples were obtained monthly from – September 2016 to January 2017. Fish sample were obtained from the catch of fishermen at landing sites. The fishers used a wide range of fishing gear such as hook and line, long line, cast nets, gill nets and traps. Fish specimen randomly were easily identified by the dark bands or stripes found on their tail. Samples were chilled in iced blocks at the point of collection before being transported in a plastic jerry can to the laboratory for further analysis. Total length and weight were measured using standard methods. The result of length-weight regression analysis of *Oreochromis niloticus* is shown in table 1. The value for males (22.87, females 20.15 and combined 21.48, all shows allometric growth. The length- weight relationship of male figure 3, female figure 2, and combine figure 1 showed linear relationship with the significance coefficient of 0.6473, and 0.0887 in male and combined respectively as p> 0.05 between length and weight. The monthly means condition factor value of male, female and combine of *Oreochromis niloticus* is showing in table 2. The condition factor computed for male *Oreochromis niloticus* was 2.049 while for the female is 2.373 and for combined was 2.216. There was no significance difference (p>0.05 invariability within the month.

Keywords— Length, weight, condition factor, Wudil River.

I. Introduction

Fishes are highly important in the development of Nigeria both economically and health wise as source of protein with low cholesterol level in the diets of many populace as well as an intermediate host to some parasites. Knowledge of some quantitative aspects such as length weight and condition factor (K) or ponderal index of fishes is an important tool for the study of fishing biology. The condition factor in fish serves as an indicator of physiological state of the fish in relation to its welfare (Le Cren, 1951). K also provides information when comparing two populations living in certain feeding density, climate and other conditions (Weatherly and Gills 1987).Thus, condition factor is important in understanding the life cycle of fish species and it contributes to adequate management of these species, hence, maintaining the equilibrium in the ecosystem. In sub-Saharan Africa, fish accounts for 10% of the animal protein consumed, and 98% of this is finfish (Delgado and McKenna, 1997). The average per capita consumption of fish in Africa in 1992 was about 8Kg having increased from an average of 7Kg per annum from 1969-1974(Ahmed, 1997). Almost 40% of fish consumed in Africa, south of the Sahara is freshwater fish as compared to the global average of 25%. In West Africa finfish is largely consumed, while per capita consumption has not grown over the last 20 years (Bonga, 1999). When fishes are kept in lentic water, their feeding capacity tends to be negatively affected, more especially polluted water. Dams and/or reservoirs have downstream effects on riverine environments and subsequently block nutrient flow along the strata of the ecosystem, thus, telling on fisheries production in downstream reservoirs and river channels. Such patterns reflected dams acting as nutrient traps. Haruna (2003) reported that some aquatic plants that are hazardous to navigation and fishing show explosive population growth in new impoundments e.g. Phragmites, Typha, and Cyperus spp in lake Jakara. Growth of fish is subject to natural environmental changes particularly climate. However, some problems are caused by human activities including fishing where more fish are taken than are replaced by birth and subsequent new fish recruitment and growth. In Nigeria over 80% of reservoirs or dams that are in existence in the country are located in the northern region which produced up to 410, 000 metric tons of fish annually. Like any other morphometric characters, the LWR can be used as character for the differentiation of taxonomic units and the relationship changes with the various development events in life such as metamorphosis, growth and onset of maturity (Thomas *et al*..,2003).

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II. Study area

The specimens were randomly sampled at landing site from fishermen at Wudil River, Kano state. Kano State is a state located in North-Western Nigeria, Created on May 27, 1967 from part of the Northern Region, Kano state borders Katsina State to the north-west, Jigawa State to the north-east, Bauchi State to the south-east and Kaduna State to the south-west. The

https://doi.org/10.17758/EAP.C0917047

capital of Kano State is Kano. Subsistence and commercial agriculture is mostly practiced in the outlying districts of the state. Some of the food crops cultivated are millet, cowpeas, sorghum, maize and rice for local consumption while groundnuts and cotton are produced for export and industrial purposes.

Wudil local government area in Kano state is 44km away from Kano city, along Maiduguri road, also the channel that links Kano to Gombe, yola, jigawa, and bauchi states. Most of the people in wudil are fishers and sand packers, due to the presence of Wudil River, its head quarters are in the town of wudil on the A237 highway. It has an area of 362 km2 and a population of 185,189 at the 2006 census. Its coordinates lies between 11º 49'N 8º 51'ECoordinates: 11º 49'N 8º 51'. The postal code of the area is 713. River kogin wudil is a stream and is located in jigawa state, Nigeria. The estimate terrain elevation above sea level is 394 meters. Its latitude lies between 12º 3'55.15" while longitude 8º 59' 41. 42'.

III. Method Of Data Collection

Thirty (30) *Oreochromis niloticus* were sample randomly at Wudil River, Kano state from the catch of fishermen at landing sites. They were easily identified by the dark bands or stripes found on their tail. Identification of fish species was also done using field guide by Olaosebikan and Raji (1998) and FAO (1992) samples were chilled in iced blocks at the point of collection before being transported in a plastic jerry can to the laboratory of fisheries department, Kano University of science and technology wudil.

IV. Laboratory Analysis

The samples were mopped on filter paper to removed excess water from their body surface. The total length (TL) and standard (SL) was measured in centimeter. The total length was measured as the distances from the tip of the snout to the tip of the caudal fin, while the standard length was measured the distance from the tip of the snout to the caudal peduncle, the body weight of each specimen was taken using a top loading mettle balance (model LP502.A) to the nearest 0.01g after drying excess water with filter paper.

V. Length-Weight Relation

The length-weight relationship was determined using conventional formula described by lecren (1951) and used by kefas and Abubakar (2010).

$$w = {}_{a}L^{b}$$

The equation and the data were transformed to logarithm before determination was made. The equation was therefore be transformed into.

LogW = Loga + bLogL

Where, W = weight of fish in grams

L = standard length of fish in cm.

a = constant.

b = an exponent.

VI. Condition Factor

The condition (k) was determined for individual fish using the conventional formula describe by Worthington and Richard (1931) as adopted by ja'afaru and tashara (2009). The ratio of the length to the weight of the fish was determined as.

$$K = \frac{W \times 100}{L3}$$

Where, k = condition factor.

W = weight in grams.

L = standard length in cm.

VII. Sex Determination

Each specimen was dissected ventrally with the aid of a small scissors inserted through the vent. Also a semicircular cut was made laterally on the side of specimen for better observation. The gonads which are two parallel tubules located on the dorsal wall of the abdominal cavity were then examined with the naked eye in the case of sexually mature forms and dissecting microscope was employed for examination of the sexually maturing forms. Males have gonads with smooth exterior, while the females have gonads with a rough exterior (Olurin and aderibigbe.., 2006).

VIII. Result

The result of length-weight regression analysis of *Oreochromis niloticus* is showing in table 1. The value for males (22.87, females 20.15 and combined 21.48, all indicated allometric growth. The length- weight relationship of male figure 3, female figure 2, and combine figure 1 showed linear relationship with the significance coefficient of 0.6473, and 0.0887 in male and combined respectively as p> 0.05 between length and weight. The monthly means condition factor value of male, female and combine of *Oreochromis niloticus* is showing in table 2. The condition factor computed for male *Oreochromis niloticus* was 2.049 while for the female is 2.373 and for combined was 2.216. There was no significance difference (p>0.05 invariability within the month.

IX. Condition Factor

In fish, the factor of condition (K) reflects, through its variations, information on the physiological state of the fish in relation to its welfare. From a nutritional point of view, there is the accumulation of fat and gonadal development (Le Cren, 1951). From a reproductive point of view, the highest K values are reached in some species (Angelescu et al., 1958). K also gives information when comparing two populations living in certain feeding, density, climate and other conditions; when determining the period of gonadal maturation and when following up the degree of feeding activity of a species to verify whether it is making good use of its feeding source (Bagenal and Tesch, 1978). From the above assertions we could conclude that the five species in this work reproduce between M ay to October since they recorded the lowest K at about this period.

TABLE I:
CONDITION FACTOR ANALYSIS OF *OREOCHROMIS NILOTICUS*

Sex	**Average length**	**Average weight**	**Condition factor (k)**
Male	23.5	249.58g	1.923
Male	22.3	228.38g	2.095
Male	20.5	190.09g	2.206
Female	20.6	190.93g	2.184
Male	22.5	234.72g	2.061
Male	23.5	278.56g	2.146
Male	23.3	265.55g	2.099
Female	21.2	192.90g	2.025
Female	20.5	192.67g	2.236
Female	19.08	170.80g	2.459
Female	19.9	194.80g	2.472
Male	23.6	242.76g	1.847
Male	21.8	222.62g	2.149
Female	20.1	199.83g	2.461
Female	19.2	186.72g	2.638
Male	22.5	236.81g	2.079
Female	20.2	196.93g	2.389
Male	23.4	257.59g	2.010
Male	19.8	224.77g	2.896
Female	20.3	206.70g	2.471
Female	20.2	198.69g	2.411
Female	19.3	183.70g	2.555
Male	23.6	281.63g	2.143
Female	21.7	196.81g	1.926
Female	20.1	194.72g	2.398
Male	25.2	272.66g	1.704
Male	23.2	239.55g	1.918
Female	19.3	212.70g	2.959
Female	20.5	192.74g	2.237
Male	23.4	250.61g	1.956

TABLE II. COMPARISON OF CONDITION FACTORS OF COMBINED, MALE AND FEMALE ORECHROMIS NILOTICUS FROM WUDIL RIVER

Sex	Mean weight (g)	Mean Standard Length (cm)	Condition factors
Male	245.06	22.87	2.049
Female	194.11	20.15	2.373
Combined	219.58	21.48	2.216

TABLE III.
LENGTH-WEIGHT RELATIONSHIP OF OREOCHROMIS NILOTICUS IN WUDIL RIVER

Sex	**Prediction Exponential equation**	**Transformed Log.**	**Coefficient (R2)**
Male	59.671e0.0617x	Log W=Log 59.671+0.0617Log L	0.6473
Female	128.5e0.0206x	Log W = Log 128.5 + 0.0206Log L	0.0887
Combined	45.05e0.0733x	Log W = Log45.05 + 0.0733 Log L	0.7968

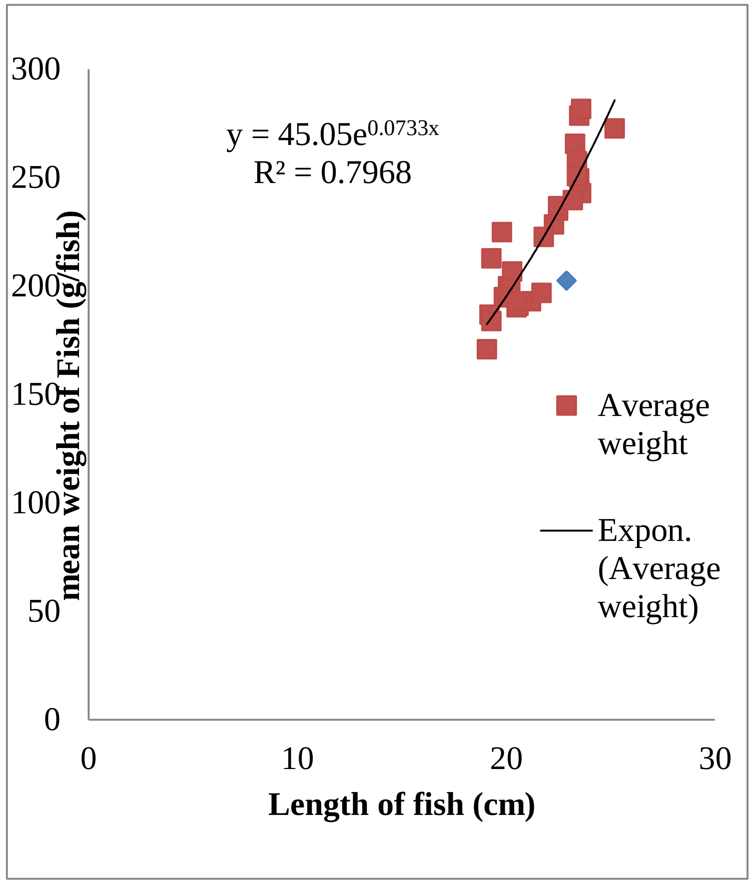

Fig. 1: Length-weight Relationship of *Oreochromis niloticus* in Wudil River

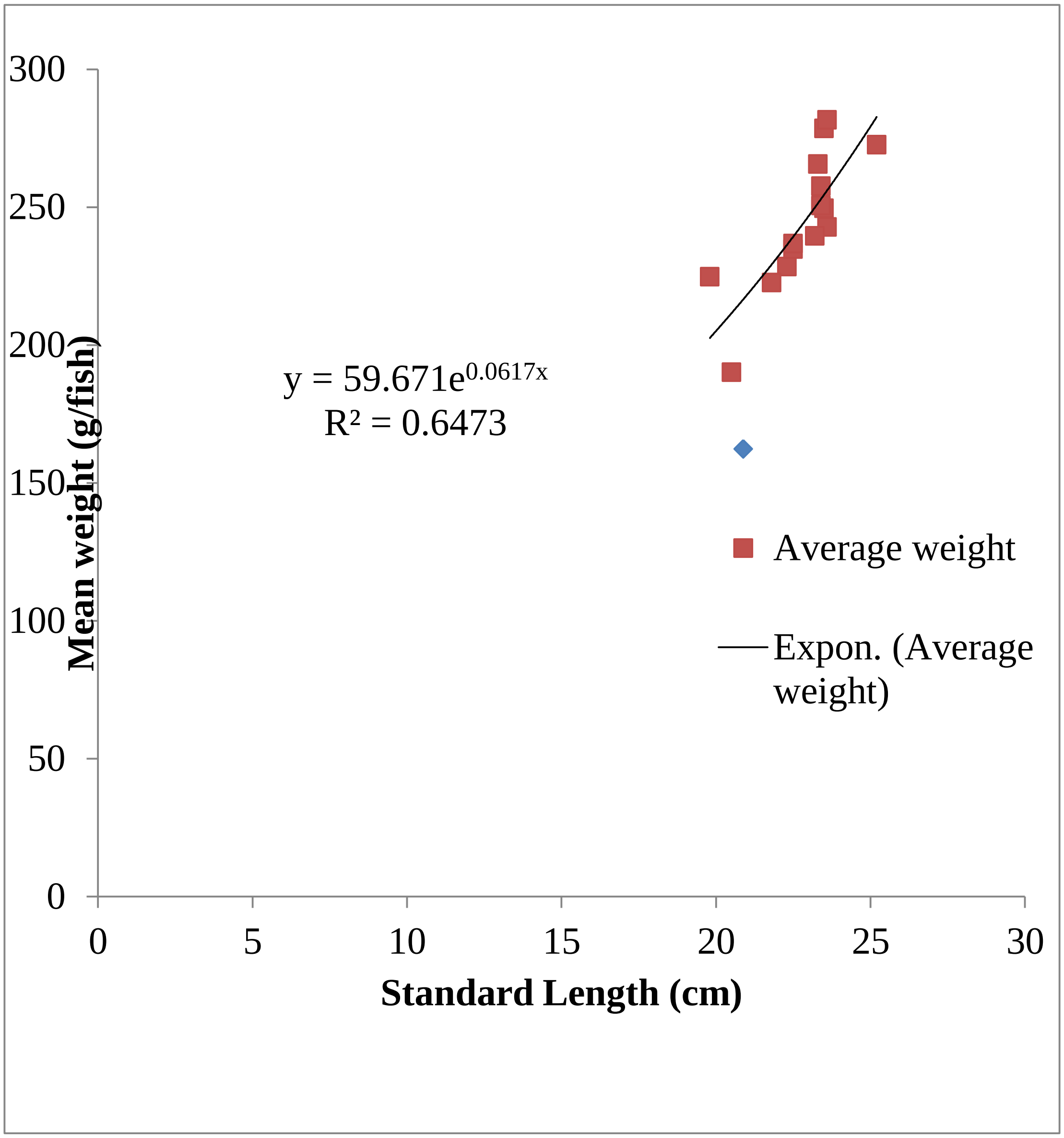

Fig. 2. Length-weight relationship of the male *Oreochromis niloticus* from Wudil River

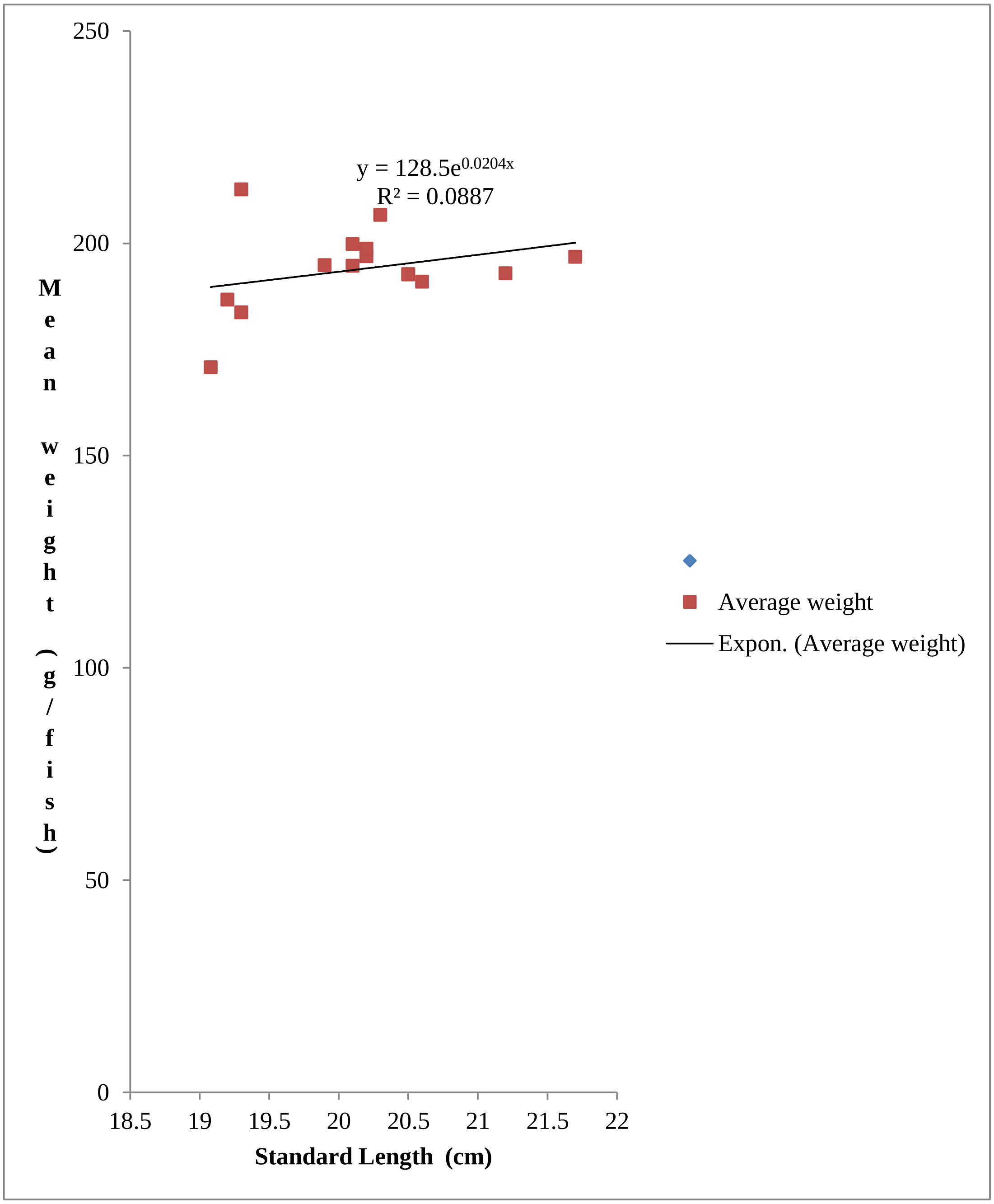

Fig. 3. Length-Weight Relationship of Female *Oreochromis niloticus* in Wudil River

CONCLUSION

The length –weight relationship equations were determined each of the sexes and combined using exponential equation (Figure I, II and III. The expression can be transformed logarithmically as suggested by LeCren (1951) log a + b log L. The data of length-weight of *Oreochromis niloticus* is presented in (Table 2). As observed from the above equations values for all specimens were practically identical and did not followed the cube law (b= 0.0617, 0.0206 and 0.0733). The agreement between the empirical weight and computed weight from regression can be termed as ideal growth for negative allometric since all the b values were lower than 3. Length-weight regression analyses showing that the values of male, female and both sex (Combined) exhibited allometric growth. There was significance correlation ($p>0.05$) between the length and weight of both sex. The monthly mean condition factor indicate that the fish where stable conditions throughout the period of research.

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