

LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF *CLARIAS GARIEPINUS* (BURCHELL, 1822) IN JIBIA LOCAL GOVERNMENT AREA, KATSINA STATE, NIGERIA.

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ABSTRACT

Study of Length-weight relationship is a vital fishery management instrument in assessing the average weight at a given length group and in evaluating the relative welfare and wellbeing of a fish populace. Study on length-weight relationship and condition factor of *Clarias gariepinus* from Ajiwa reservoir was conducted from March, 2021 to August, 2021 to determine the growth or development pattern of the species in Ajiwa reservoir. About 100 fish samples were collected from three sites for the periods of three 6 months. The fish samples were made up of 55 males and 45 females Length and weight of sampled fish were measured with standards methods. The length-weight regression analysis indicated that the fish species exhibited negative allometric growth pattern with regression exponent b values of 2.86, 2.91 and 2.88 for males, females and combined sexes respectively and the correlation coefficient (r) values were 0.96 (males), 0.96 (females), and 0.95 (combined sexes), these shown strong positive relations concerning the fish weight and length. The average condition factor K for males, females and combined sexes documented is greater than 1 which is a pointer that the specie is in good condition in the reservoir. The current study shown that *C. gariepinus* in Jibia reservoir in Katsina State, Nigeria showed negative allometric growth pattern with a strong positive correlation between the total length and weight of the species. Also, the condition factors of entire sampled fish species were within the appropriate recommended range for gravid tropical freshwater fish species.

Key words: African catfish, Condition factor, Jibia and Length-weight relationship

INTRODUCTION

Fishes and fish products are consumed for their high biological values in terms of high protein retaining in the body, small level of cholesterol and presence of indispensable amino acids. Fish is similarly a vital source of revenue for fishermen and fish farmers and its farming is a source of occupation in developing nations (Felix *et al.*, 2018).

The *Clarias gariepinus* (Burchell, 1822) has been found to be a very important freshwater fish and aquaculture productions in Nigeria due to its several beneficial features such as its ability to stand a fluctuating range of environmental circumstances, fast growing rate, high fecundity rate, ease of non-natural breeding and it commands worthy price (Sadauki *et al.*, 2022a). Stock assessment is a fundamental and vital instrument required for producing ideas needed in developing approaches for efficient and appropriate management, improvement and enhancement of the fish species in any water body (Gusau *et al.*, 2020). Typically, fish experience frequency growth variations as a result of some effects such as changes in nourishment composition, ecological factors, rate of reproducing among others. Length-weight relationships can be used to evaluate the influence of these factors (Suleiman, 2017). Length-weight relationships can be used to predict weight from length measurements (Muhammad *et al.*, 2020). Length-weight relationship is an important biological factor in fisheries science as it assists in easy assessment of stock difference and overall well-being of fishes (Muhammad *et al.*, 2020). Certainly, length and weight measurements can give data on the stock composition, lifespan, death, growth and production (Konan *et al.*, 2017). For production models, this key is used to forecast the biomass of the stock using fish lengths (Konan *et al.*, 2017). The relationship of length-weight guesses state factor of the fish species and fish biomass through the length frequency (Fishbase, 2013). Condition factor (K) is an assessment of overall welfare of fish and is based on the hypothesis or assumption that heavier fish are in good condition than the lighter ones (Ogamba *et al.*, 2014). The condition factor of one or greater than one indicates the better state of fish however value less than one show bad state of fish (Abobi, 2015). Condition factor can be influenced by time of year, sex, type of nourishment, organism consumed by fish, oldness of fish, amount of fat reserved, and ecological conditions (Mon *et al.*, 2020). Thus, current research was aimed at bringing the gap and therefore information on wellbeing and relatively fatness of individuals sampled. The

results of this study will add to data on the length-weight relationship and condition factors from the collected samples of *C. gariepinus* from the selected environments.

MATERIALS AND METHODS

Study Area

The reservoir is within Jibia Local Government Area of Katsina State, in northern Nigeria. Jibia is located between latitude 13° 05' N and 7° 13' E and longitude 13° 09' N and 7° 23' E. It has an estimated total human population of 169,748 persons and total land mass of about 1,037 km². The reservoir situated on the coordinates 13° 04' 18"N and 07° 15' 06"E, has a height of 23.5 m, a length of 3,660 m and a total capacity of 142 million m³. The main purpose of the reservoir is for irrigation, other purposes comprises supply of clean water, home uses and fishing activities (Sadauki *et al.*, 2022b).

Samples Collection

Samples of African catfish, *Clarias gariepinus*, were collected monthly from each landing site for period of (6) months. Five (5) samples were collected from each location with the assistance of local fishermen who used their drag nets and traps for fish capture. The fish samples were made up of 55 males and 45 females. Length and weight of sampled fish were measured with standards methods. The fish samples were transported alive to the Biology laboratory, Federal University Dutsin-Ma, Katsina State, in a plastic container filled with water for identification. Fish samples were identified using the description of Dan-kishiya *et al.*, (2018). Morphometric measurements such as body weight, total length and standard length were taken following the method of Nababa *et al.*, (2020) for morphometric identification of *Clarias gariepinus*.

Determination of Length-Weight Measurement

The length – weight relationship of *Clarias gariepinus* was calculated using the formula described by Le-Cren (1951);

$W = aL^b$ Where, W = Weight of fish (g), L = Length of fish (cm) a = constant b = growth exponent.

The values of constants a and b was estimated after logarithmic transformation of $W = aL^b$ using least square linear regression to give; $\log W = \log a + b \log L$.

Determination of Condition Factor

The condition factor (K) was determined for each sampled fish using the conventional formula as described by Froese (2006) as follows;

$$\text{Condition Factor (K)} = \frac{W \times 100}{L^3},$$

Where K = Condition factor, W = Weight in grams and L = Standard Length in cm

RESULTS

Table 1 showed results of b values, k values and r values of males, female and combined sexes respectively. The growth exponents (b) were determined as 2.86, 2.91, and 2.88 for male, female and combined sexes respectively. The growth exponent (b) values obtained from the present study were less than 3 which was an indication of negative allometric growth pattern. The ' r ' values greater than 0.90 for all the catfish species gotten from Jibia reservoir shown in Table 1. There was strong correlation between the fish's length and weight Table 1. , the K value obtained was 1.02 male 1.04 female, 1.03 combined sexes shown in Table 1. The length-weight relationship for males, females and combined was graphically represented by the following figures 1, 2 and 3 respectively.

Table 1: **Weight relationships and condition factor of *Clarias gariepinus* in Jibia reservoir, Jibia local government, Katsina State**

Sex	Mean condition factor (K)	$W = aL^b$	N	a	b	r
Male	1.02	$-1.82L^{2.86}$	45	-1.82	2.86	0.96
Female	1.04	$-1.85L^{2.91}$	55	-1.85	2.91	0.96
Combined	1.03	$-1.86L^{2.88}$	100	-1.86	2.88	0.95

N = number of samples, a = intercept/regression constant, b = the slope/regression coefficient, r = the correlation co-efficient, K = condition factor

DISCUSSION

The results of length-weight relationship of catfish species *Clarias gariepinus* obtained from Jibia Reservoir revealed allometric pattern of growth. The b values for *Clarias gariepinus* obtained from Jibia reservoir were less than 3.0 indicating negative allometric growth; this implied that the weight of fish increases at a lesser rate than the cube of the body length. Fishes can reach one or the other isometric growth, negative allometric growth or positive allometric growth. Isometric growth is connected with no change of body shape as an organism grows ($b = 3$). Negative allometric growth indicates the fish becomes slender as it increases in weight ($b < 3$) while positive allometric growth indicates the fish develops relatively stouter or deeper-bodied as it increases in length ($b > 3$) (Suleiman et al., 2017).

The mean K -values obtained in this study were greater than 1 which indicate that the fish species' wellbeing in the Reservoir was satisfactory. The condition factors (K) of the species in the current study was related to what was gotten in other tropical water bodies. In Nigeria, a range of 0.49 - 1.48 was documented by Gusau *et al.* (2021); Nababa, (2020); Nwadiaro and Okorie (1985) in Goronyo dam in Sokoto, Kwaru Lake in Dutsin-Ma and Oguta Lake in Imo respectively. Also Kumolu-Johnson and Ndimele (2011) obtained a K -value of between 0.91 and 8.46 from Ologe Lagoon in Lagos.

CONCLUSION AND RECOMMENDATIONS

The current study revealed that *C. gariepinus* in Jibia reservoir in Katsina State, Nigeria showed negative allometric growth pattern with a strong positive correlation between the total length and weight of the species. It can currently be decided that the species are in better physiological state of well-being with greater than 1 condition factor.

More studies to cover the phases of water quality, nourishment richness and stock assessment is suggested to be carried out in Jibia reservoir so as to make available extra significant scientific evidence.

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