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LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF SILVER CATFISH (*BAGRUS BAYAD* FORSKAL, 1775) IN ZOBE RESERVOIR, DUTSINMA LOCAL GOVERNMENT AREA, KATSINA STATE, NIGERIA.

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ABSTRACT
Study on length-weight relationship and condition factor of *Bagrus bayad* from Zobe reservoir was conducted from April to July, 2017 to ascertain the growth pattern and the state of well-being of the species in the Reservoir. Specimens were obtained on weekly basis from the artisanal fishermen catches at their landing site in the Reservoir, for the period of the study. A total of 296 fish sample comprising of 145 males and 151 females were analysed. The result showed that the species exhibited negative allometric growth pattern with regression exponent b values of less than 3, while the correlation coefficient (r) values of 0.94 (males), 0.95 (each for females and combined sexes) revealed a strong positive correlation. The condition factor recorded is more than 1 which is an indication that the species is in good physiological state of well-being in the Reservoir

Key words: *length-weight*, *Bagrus bayad*, Growth, Condition factor, Reservoir

INTRODUCTION

Growth is an irreversible increase in dry mass of living material and a fundamental characteristic of all living organisms. Growth can be measured at various levels of biological organization (Growth of Population, cell or organism). At the level of the organism there are a variety of parameters which may be measured (length, area, volume and mass). In fisheries science, the usual starting point is determination of growth quality and the basis of which is the weight-length relationship of the target species (Demirel and Dalkara, 2012). According to Omoniyi *et al*, (2010), growth in fish can be evaluated from morphometric parameters relative to total length and length-weight relationship is used in morphometric inter-specific and intra-specific population comparisons to assess index of well-being of the fish populace. Also, Obasohan *et al*, (2012) reported that morphometric characters can be used to assess the influence of environmental factors of fish populations. While the condition factor in fish serves as an indicator of physiological state of the fish in relation to its welfare (Le Cren, 1951). Hence, condition, fatness, or well-being in fishes can be evaluated using condition factors (Tesch, 1968) based on the simple hypothesis that heavier fish of a given length are in better condition (Froes, 2006). 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 (Imam *et al*., 2010). The length-weight relationship and condition factor of fresh water fishes has been widely documented (Mzungu *et al*., 2017; Dan-kishiya , 2013; Demirel and Dakara, 2012; Obasohan *et al.,* 2012; Alhassan and Ansu-darko 2011; Imam *et al*., 2010). Also, the length- weight relationship of fishes from Zobe Reservoir has been documented (Mzungu *et al*., 2017). However there is no documented work on this commercially important species in the Reservoir which form the bases for this work so as to provide preliminary data for further researches.

MATERIALS AND METHODS

Study Area

Zobe Dam Reservoir is an earth-filled structure with a height of 19 m and a total crest length of 2,750 m located in Dutsinma Local Government Area of Katsina State ("Zobe Dam," 2010) and lies between latitude 12° 23' 17.9" to 7° 28' 28.9N and longitude 7 ° 27 ' 57.12 to 7 ° 34 ' 47.68 E (Plate 1). Construction of the Dam began in 1972 and was commissioned in July, 1983. The main purpose is to supply 65,000 cubic meters of portable water to Katsina metropolis daily and irrigation potential of 8,000 hectares to support farming in the Dutsinma Area. However, despite the main purpose, there is a lot of fishing activities in the Reservoir.

Plate1. Map of the study area (ng.geoview.info>zobe_reservoir)

Fish Sampling

Fish were samples weekly from artisanal fishermen catches which employ the use of different fishing gears ranging from traps, long line, and nets of different mesh sizes at the fish landing sites from April to July, 2017. Fish samples were transported to the laboratory in an ice cube box for further analysis. In the laboratory fishes were identified using identification guide by Holden and Reed, (1972) and Olaosebikan and Raji (2004).

Morphometric Measurements

The Weight of each individual fish was measured using a weighing balance (Model: ADAM. CQT 2000), while the length was measured with a measuring board.

Length – weight relationship

The analysis of length-weight data is aimed at describing mathematically the relationship between length and weight to enable conversion of one to another. It also measures the variation from the expected weight for length of individual fish. Calculations for males and females fish species was done separately and also combined using the conventional formula described by Le-Cren (1951) as in Dan-kishiya (2013) as follows:

$$W = alb \quad \text{---------- (1)}$$

The above equation (1) and data were transformed in to logarithms before the calculations were made. Therefore equation (1) becomes:

$$\log W = \log a + b \log L \quad \text{---------- (2)}$$

Where W = weight of fish in grams

L = Total length of fish in centimeter

a = constant

b = an exponent.

Condition factor (K)

The condition factors (K) were also calculated for individual fish species for each month using the conventional formulae described by Worthington and Richardo (1930) as:

$K= 100W/L^3$ ---------- (4)

Where K = the condition factor

W = weight of fish in grams

L = Total length of fish in cm.

Le -Cren (1951) noted that condition is related to both sex sizes. Therefore, calculation was made for males and females separately and their statistical differences were obtained.

RESULT

The values of the regression coefficients 'a' and 'b' and the condition factor of *B. Bayad* from Zobe Reservoir are presented in Table 1 and figures 1-3. The intercept (a) values were -2.08 for the males, -2.13 for the females and the sexes combined had -2.12 as the intercept. While, the corresponding exponent 'b' values were 2.88, 2.92 and 2.90 for the males, females and combined sexes respectively. The exponent (b) values recorded in the present study are less than 3 which is an indication of negative allometric growth pattern. However, there was strong correlation between the length and weight of *B. bayad* throughout the study period as shown in the values of correlation coefficient which ranged from 0.94 to 0.95.

Table 1: Length-weight relationship Parameters and condition factor of *Bagrus bayad* from Zobe Reservoir, Dutsinma Local Government Area, Katsina State

Sex	N	Regression Coefficient		Correlation Coefficient r	Condition factor (K)	Growth Pattern
		a	b			
Male	145	-2.08	2.88	0.94	1.01	A-
Female	151	-2.13	2.92	0.94	1.04	A-
Combined	296	-2.12	2.90	0.95	1.03	A-

N= number of samples, A- = negative allometry

The values of the condition factor recorded in the present study were 1.01 (Males), 1.04 (Females) and for the combined sexes was 1.03 as also shown in Table 1. All the values of the condition factor recorded were greater than 1 and implied that the species is in good physiological state of well-being in the Reservoir.

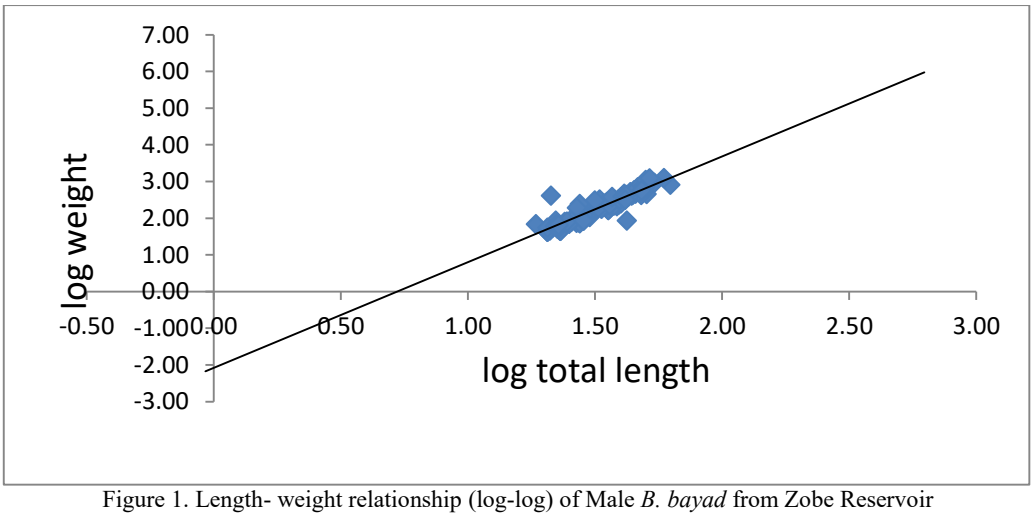

Figure 1. Length- weight relationship (log-log) of Male *B. bayad* from Zobe Reservoir

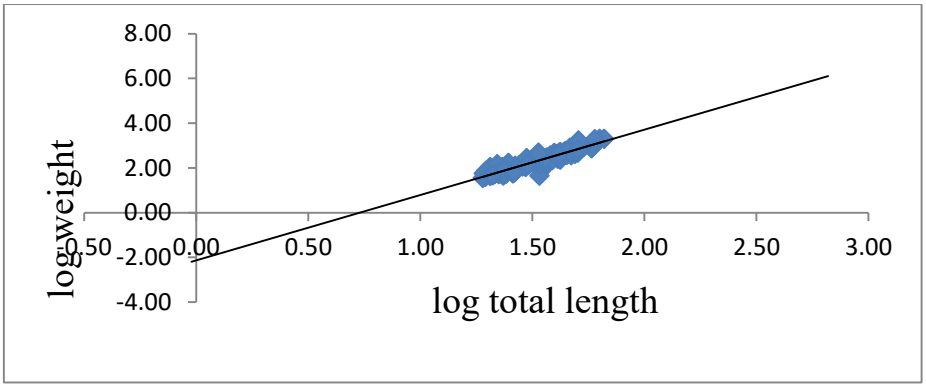

Figure 2. Length- weight relationship (log-log) of Female *B. bayad* from Zobe Reservoir

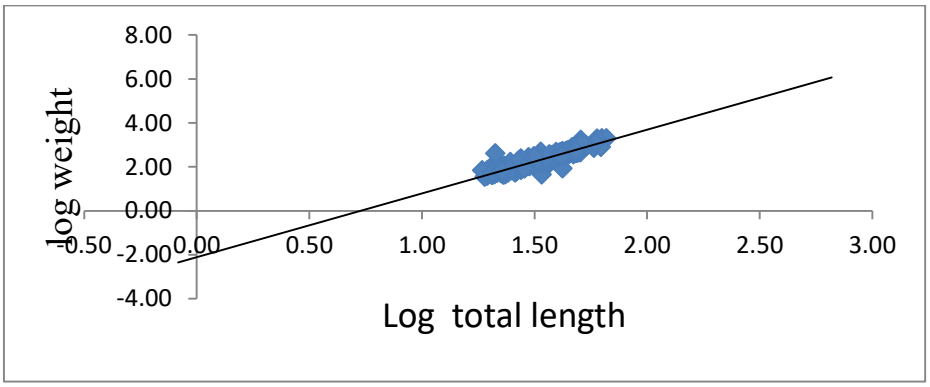

Figure 3. Length- weight relationship (log-log) of combine sexes of *B. bayad* from Zobe Reservoir

DISCUSSION

The knowledge of length-weight relationship is important in fisheries management since it can be use as a comparative tool in growth studies (Moutopoulos and Stergiou, 2002) and also in modeling aquatic ecosystems (Kulbicki *et al*., 2005). The result of the present study showed that *B. bayad* exhibited negative allometric growth pattern in the Reservoir since the b value analyzed is less than 3. This means that the fish becomes thinner with increase in length. According to Adeyemi *et al*, (2009) negative allometric growth pattern in fish implied that the weight increases at a lesser rate than the cube of the body length. Negative allometric growth pattern in freshwater fishes has been reported (Mzungu *et al*., 2017; Getso *et al*., 2017; Dan-kishiya , 2013; Ikongbeh *et al*., 2013; Ibrahim *et al*., 2012; Imam *et al*., 2010). Also, the negative growth pattern of *B. bayad* in the present study is similar to what was reported by other researchers (Okpasuo *et al*., 2016; Abdullahi *et al*., 2014). But, in disagreement with the findings of Nwabueze and Garba (2015) who reported positive allometric growth of *B. bayad* from River Adofi in Southern Nigeria. However the b-value recorded is within the documented values of 2.5 to 3.5 for tropical fish species (Gayannilo and Pauly, 1997) suggesting that the result of the present study is valid.

Condition factor is a useful index for monitoring of feeding intensity, age and growth rates in fish (Ndimele *et al*., 2010). The relationship of length-weight can be use in the estimation of condition factor (K) of fish species based on the hypothesis that heavier fish of a particular length are in a better physiological condition (Bagenal and Tesch, 1978). The condition factors (K) of the species in the present study indicated that the fish species were in good physiological condition in the Reservoir. This was attributed generally to the carnivorous and sometimes omnivorous feeding habits of the species. A similar finding has been reported by other researchers from different water bodies ((Nwabueze and Garba, 2015; Ibrahim *et al.,* 2012; Alhassan and Anso-darko, 2011; Malami and Magawata, 2010; Neimat, 2003).

CONCLUSION

The result of the present study had shown that *B. bayad* from Zobe Reservoir in Dutsinma Local Government Area of Katsina State, Nigeria exhibited negative allometric growth pattern with a strong positive correlation between the total length and weight of the species and also the species are in good physiological condition in the Reservoir.

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