

## A Study of Length-Weight, Relationship and Condition Factor of *Bagrus Bayad* in Kiri Reservoir Shelleng Local Government Area Adamawa State, Nigeria

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### ABSTRACT

The Bagrid fishes are commonly known as naked catfishes, they are commercially important species found in Nigeria fresh waters especially in Rivers and Lakes such as Niger, Kaduna, Benue, Lake Chad, and other inland waters. The study is aimed at investigating the length- weight, relationship and condition factor of *Bagrus bayad*. A total of 282 individuals of *B. bayad* were randomly sampled for a period of 6 months. *B. bayad* sample collected were dissected. All the data collected were subjected to one-way analysis of variance (ANOVA). Descriptive statistic, regression analysis, graph (bar chart) mean and standard deviation were used in calculating the data for analysis. Result from the data analysis showed the slope (b) value for male = 1.996 which is less than 3.0, hence the male fish shows a negative allometric growth pattern. While that of the female showed that the b value was 3.2971 which is positive allometric growth pattern and the combined sexes analysis shows that  $b = 2.330$ , which indicated a negative allometric growth pattern. The condition factors showed that the Male has  $K = 2.893$ , Female has  $K = 3.122$  and the Combined Sexes Condition factor is  $K = 3.002$ . *B. bayad* exhibited both negative and positive 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.

**Keywords:** *Bagrus bayad*, Condition Factor, Allometric, Kiri Reservoir, Shelleng

### Introduction

The Bagrid fishes are commonly known as naked catfishes. The family Bagridae is represented by thirty (30) genera and two hundred and ten (210) species (Zhang *et al.*, 2006). This family is of considerable commercial importance. It is wide spread in African Rivers and lakes (Froese and Pauly, 2009), spread in both shallow and deep water (Witte *et al.*, 1995). They are commercially

important species found in Nigeria fresh waters especially in Rivers and Lakes such as Niger, Kaduna, Benue, Lake Chad, and other inland waters. *Bagrus bayad*, also called *bayad* with local (Hausa) name Shambani (Holden and Reed, 1972). 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

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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. Length–weight relationship parameters (a, b) are important in stock assessment studies (Moutopoulos and Stergiou, 2002); Length-weight gives information on the condition and the growth pattern of fish (Olurin and Adenigbe, 2006), Length-weight relationship is of great importance in fishery assessment (Haimovici and Valesco, 2000). Condition factor gives a picture of the general wellbeing of fish (Abubakar, 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). Length-weight data of population serves as basic parameters for any monitoring study of fishes, since it provides important information concerning the structure and function of populations. Therefore, this study present information on the length-weight, relationship and condition factor of this valuable fish species which will aid its management in Kiri Reservoir, Shelleng local Government Area.

### Materials and Methods

A total of 282 individuals of *Bagrus bayad* were randomly sampled monthly for 6 months in the morning between 8:00am to 10:00am, and in the evening between 3:00pm and 5:30pm. In the present study, 47 males and female *Bagrus bayad* samples were collected from the reservoir each month. The sample specimen was preserved with ice block in a cooler and conveyed to laboratory where length-weight measurement and analysis for condition factor, were done. The duration for the study was 6 months from November 2016 to April, 2017. The fish used for the study were obtained from fishermen operating along kiri reservoir. The total and standard lengths were

measured with meter rule on measuring board according to (Alam *et al.*, 2014). The sex of each fish sample was determined by visual observation of genitals. Weights were determined using a top loading meter balance model PM 2000 which measured to the nearest milligram (mg) The length–weight relationship was determined using the conventional formula described by Froese (2006)

$$W = aL^b$$

The equation and the data were transformed to logarithm before the determinations were done. The equation was therefore transformed into

$$\text{Log } W = \log a + b \log L$$

Where:

W = Weight of fish in grams

L = Standard length of fish in cm

a = a constant

b = an exponent

The condition factor “K” was determined for individual fish using conventional formula described by Wang *et al.* (2012). The ratio of length to the weight of the fish was determined by the formula:

$$K = \frac{W \times 100}{L^3}$$

Where

K = condition factor

W = weight in grams

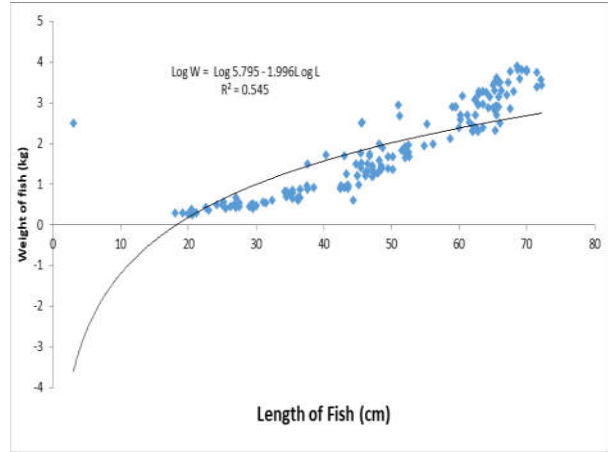
L = standard length in centimeters



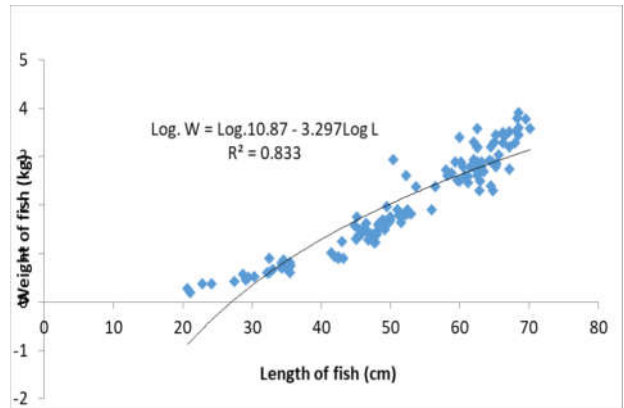
**Figure 1:** *Bagrus bayad*  
Source: (field study 2022)

**Result**

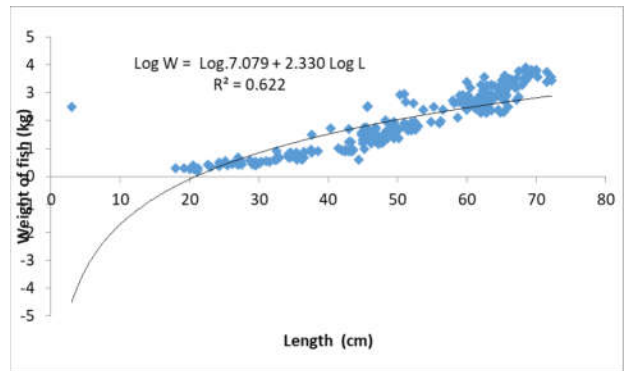
The result as presented in Figure 1 and Table 1 showed the b value = 1.996 which is less than 3.0, hence the male fish shows a negative allometric growth. A correlation value  $r^2=0.545$ , N=162;  $p<0.05$  is significant. The result in Figure 2 and Table1 showed that the b value is 3.2971, which is a positive allometric growth in the Female fish of *B. bayad*. With very high and significant r value,  $r^2 = 0.833$ , N=120;  $p<0.05$ . The combined sexes analysis shows that  $b=2.330$  which indicated a negative allometric growth and the  $r^2=0.622$ , N=282;  $p<0.05$  is a significant correlation (Figure 3 and Table 1). The condition factors as presented on Table 2 showed that Male has  $K=2.893$ , Female with  $K=3.122$  and the Combined Sexes Condition factor,  $K= 3.002$ . The Condition factors of Female *B. bayad* recorded in this study is higher than those for the Male. The Monthly variations of the Mean Condition factor are presented on Figure 4.



**Figure 1:** Length-Weight Relationship of Male *Bagrus bayad* from Kiri Reservoir



**Figure 2:** Length-Weight Relationship of Female *Bagrus bayad* from Kiri Reservoir



**Figure 3:** Length-Weight Relationship of Combined Sexes of *Bagrus bayad* from Kiri Reservoir

**Table 1:** Length-Weight relationship, Growth Pattern and Mean Condition factor *Bagrus bayad* from Kiri Reservoir

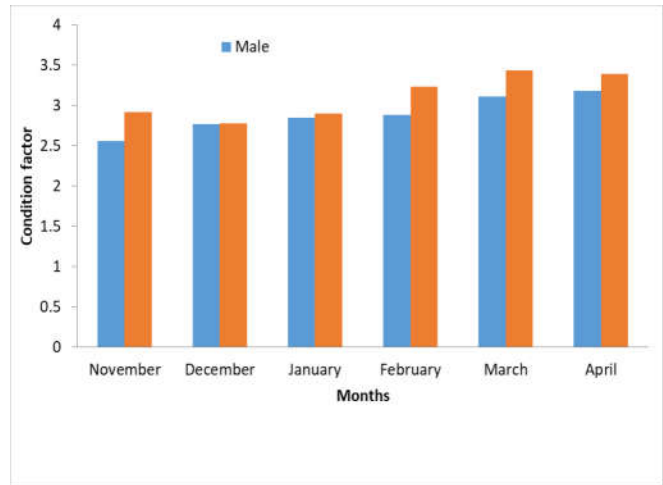
Sex	L-W relationship equation	Growth pattern (b-value)	r <sup>2</sup>	Mean K value
Male	LogW=Log5.795-1.996 LogL	1.996 (Negative Allometric)	0.545	2.893
Female	LogW=Log10.87- 3.297 Log L	3.297 (Positive Allometric)	0.822	3.112
Combined	LogW=Log7.079+ 2.330 LogL	2.330 (Negative Allometric)	0.622	3.002

4883

**Discussion**

The length-weight relationship of any fish is basically known as the measure of its growth pattern, which serve as an important component of its biological production (Fafioye and Oluajo 2005). The length weight relationship of fish is crucial in fisheries biology and their stock assessment because they help in estimating the fish’s average weight of a given length category by estimating a mathematical relation between the two (Beyer, 1998).

The size ranges recorded in this study for *Bagrus bayad* indicated a phenomenon whereby the females were larger than the males in kiri reservoir. This disagrees with Lewis (1974) and Tsadu *et al.* (2014) who reported that males of *B. bayad* recorded higher mean standard length and body weight than the females, a similar pattern of growth has been earlier reported by Offem *et al.* (2008) who recorded mean b values of 3.206, and 2.040 for male and female respectively in Cross River, which depicted negative and positive allometric growths. The present study recorded both positive and negative allometric growth patterns, this is however different from the reports of Nwabueze and Garba (2015) that reported positive allometric growth for *B. bayad* from River Niger at Asaba and River Adofi at



**Figure 4:** Monthly variation in the Condition factor of Male and Female *Bagrus bayad* from Kiri Reservoir

Ossissa in Southern Nigeria with b values of 12.864 and 14.637, respectively. Ogbe and Fagade (2002) also found positive allometric growth for *B. bayad* from lower River Benue. Similar results were also reported for *B. bayad* (b = 3.1) and *B. docmac* (b = 3.05) from Muess Channel, Sharkia Province, Egypt (El-Drawany and Elnagar, 2015). Ikongbeh *et al.* (2012) who reported allometric growth pattern in a study of length-weight relationship of *B. docmac*. Ogbe *et al.* (2006) reported positive allometric growth pattern for *Bagrus bayad* from Lower Benue River, similar observations were made by Zira *et al.* (2015) who reported that the values obtained for the length-weight relationship showed that both sexes of *B. bayad* exhibited allometric growth pattern.

In contrast to this study, El- Badawy, (1991) found negative allometric growth for *Bagrus bayad* (b = 2.8802) and *Bagrus docmac* (b = 2.7858). Musa *et al.* (2016) reported negative allometric growth for *Bagrus bayad* (b = 2.364 male; 2.714 female). Dan-kishiya *et al.* (2018) reported that *B. bayad* exhibited negative allometric growth pattern in the Zobe Reservoir since the b value analyzed is less than 3. 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). Also, other researchers such as; Okpasuo *et al.*, 2016; Abdullahi *et al.*, 2014, reported negative growth pattern of *B. bayad* in their studies. While, Ogbe and Ataguba, (2008) also reported an isometric growth pattern for *Malapterurus electricus* from Lower Benue River which contradicts the result of this study. The differences in the reported *b* values and the values from this study could be due to factors such as food availability in the water bodies, prevailing weather conditions and difference in latitude.

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 used 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 (Froese, 2006).

It was observed in the present study that mean condition factor for *B. bayad* were of values above 1.0 which indicated that fish species are doing well in the reservoir. The condition factor of the fish species in this study is favorably comparable with condition factors of different tropical fish species investigated and reported by (Saliu, 2001 and Lizama *et al.*, 2002). The condition factors (K) of the species in the present study indicated that the fish species were in good physiological condition in the Reservoir, and this was in agreement with Lawal *et al.* (2010). 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 (Ibrahim *et al.*, 2012; Nwabueze and Garba, 2015).

### Conclusion

The result of the present study had shown that *B. bayad* from Kiri Reservoir in Shelleng Local Government Area of Adamawa State, Nigeria exhibited both negative and positive 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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