# LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF BAGRUS BAYAD IN ZOBE RESERVOIR, DUTSIN-MA, KATSINA STATE, NIGERIA

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***ABSTRACT***

*The length-weight relationship is an essential management tool that estimates mean weight at a specific length in a given set of fish stock to assess the comparative well-being of a fish stock. This study evaluated the relationship and Fulton's condition of Bagrus bayad in the Zobe reservoir. 60 fish obtained from the Zobe reservoir were sampled monthly for three (3) months. The length and weight of sampled fish were measured using a standard procedure. The result showed that the fish population comprised 16 males and 44 females. Length-weight regression analysis indicated that the species displayed negative allometric growth, where the b-values of 2.62, 2.76, and 2.72 suggest that the weight of the species increases at a slower rate than its length as observed in the males, females, and combined sex respectively in the sampled fish population. The sampled fish population's linear relationships "r" revealed 0.76, 0.88, and 0.86 in males, females, and combined sexes. The condition factor (K) for male, female, and combined sexes were 0.57, 0.65, and 0.63, respectively, revealing the moderate health condition of the fish in the reservoir, since the individual and the combined condition factor "K" values recorded were less than 1. The condition factors of the sampled fish species were not within the recommended range for gravid tropical freshwater fish species. Fishermen used the Malian traps and drag nets to capture the fish. In addition, consideration should be given to the type of gear, mesh sizes used, and fish life stages in the water bodies to avoid indiscriminate fishing in the reservoirs.*

***KEY WORDS***

*Allometric growth, condition factors, Bagrus bayad, Zobe Reservoir*.

## 1. INTRODUCTION

*Bagrus bayad*, commonly known as the naked catfish, is a genus of large catfish species endemic to freshwater habitats in Africa (Yongo *et al.,* 2018). Bagrid catfishes are vital to aquatic ecosystems, playing a crucial role in shaping their dynamics and structure. There is a notable lack of detailed research on the reproductive biology, diet, and growth patterns of *Bagrus bayad* in the study area. Understanding the length-weight relationship parameters (a, b) is essential for stock assessment studies (Moutopoulos and Stergiou, 2002), as they inform fish biomass status (Froese, 1998). Despite the importance of *Bagrus bayad*, research on its morphological parameters in Zobe Reservoir is scarce. Most studies have focused on feeding behavior and fish

diets (Greenwood, 1956; Verbeke, 1959). However, there is a significant knowledge gap regarding the biological parameters of this species in Zobe reservoir. The only available data on morphometric variation among *B. docmac* populations is from the Ugandan side of Lake Albert (Mwanja *et al.,* 2014). This study aims to address this knowledge gap by investigating the morphometric characteristics, specifically the length-weight relationship and condition factor, of *B. bayad* populations in Zobe Reservoir. Understanding these parameters is crucial for informed management and conservation of *B. bayad* in Zobe Reservoir. This research provides essential scientific information for the sustainable utilization and management of the species, ultimately contributing to the conservation of *B. bayad* in Zobe Reservoir. The ecological and economic importance of *Bagrus bayad* in Zobe Dam necessitates urgent research attention. As a native African freshwater fish, *B. bayad* faces significant threats, including declining populations due to Nile perch introduction, resulting in restricted habitats and altered distribution patterns. Despite its ecological significance, comprehensive studies on *B. bayad's* reproductive biology, dietary habits, and growth patterns, particularly in Zobe Dam, are scarce. Investigating morphological parameters, such as length-weight relationships and condition factors, is essential for informed management and conservation strategies. Existing research in the area has primarily concentrated on feeding behavior, socioeconomic implications, and the value chain of Bagrus species, highlighting the need for more in-depth investigations.

## 2. MATERIALS AND METHODS

### 2.1. Study Area

Zobe Reservoir 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 Reservoir, 2010) and lies between latitude 12°23'17.9"N to 7°28'28.9"N and longitude 7°27'57.12"E to 7°34'47.68"E. Construction of the Reservoir began in 1972 and was commissioned in July 1983. The main purpose is to supply 65,000 cubic meters of potable water to the Katsina metropolis daily and an irrigation potential of 8,000 hectares to support farming in the Dutsinma Area. However, despite the main purpose, there are a lot of fishing activities in the Reservoir.

### 2.2. Sampling Method

60 specimens of *B. bayad* were obtained weekly from Zobe Reservoir for 3 months (1$^{st}$ April 2024 to 30$^{th}$ June 2024). Samples were usually collected in the mornings between 9.00 am and 11.00 am. The total length and standard length were measured according to Olatunde (1977) by placing the sample on a measuring board graduated at 1cm intervals. The sex and maturity of each fish specimen were determined by visual examination of the urogenital opening (Holden and Raitt, 1974).

### 2.3. Method of Data Collection

Specimens were obtained from fishermen operating at Zobe Reservoir. Fishermen used various fishing gear, including hand nets, cast nets, and gill nets of various mesh sizes. The total weight (TW) and gutted weight (GW) were measured to the nearest 0.01 g using a sensitive Mettler electronic scale. For each fish specimen, the total length (TL) and standard length (SL) were measured at the landing site to the nearest 1 mm using a ruler.

### 2.4. Method of Data Analysis

Data were analyzed using Statistical software for data science: SPSS Software (Version 25). This software helped to establish morphometric relationships of the regression equations for the *B. Bayad* species. The Length – Weight relationship and condition factors were analyzed using
Log W = log a + b log L. Where W = weight of fish in grams. L = Total length of fish in centimeters. a = constant. b = an exponent.

K= 100W/L3. Where K = the condition factor. W = weight of fish in grams. L = Total length of fish in cm.

Le-Cren (1951) noted that the condition is related to both sex sizes. Therefore, the calculation for the condition factor was done separately for males, females, and combined sexes.

## 3. RESULTS AND DISCUSSION

**Table 1** shows the relationship between length and weight and the condition factor of *B. bayad*. The relationships between length and weight using the linear regression analysis, and it also shows the coefficient of determination $r^2$ according to sex and combined sexes. The correlation is positive, $r^2$ varying from 0.76 (Males) to 0.88 (Females) and 0.86 for the combined sexes.

Table 1: Length-Weight Relationship and Condition Factors

| SEX | N | MEAN CONDITION K | A | B | $R^2$ |
|---|---|---|---|---|---|
| Males | 16 | 0.57 | -1.68 | 2.62 | 0.76 |
| Females | 44 | 0.69 | -1.86 | 2.76 | 0.88 |
| Both sexes | 60 | 0.63 | -1.82 | 2.72 | 0.86 |

N= Number of samples, a = Intercept/regression constant, b = Gradient/regression coefficient, r = Correlation co-efficient, K = Condition factor.

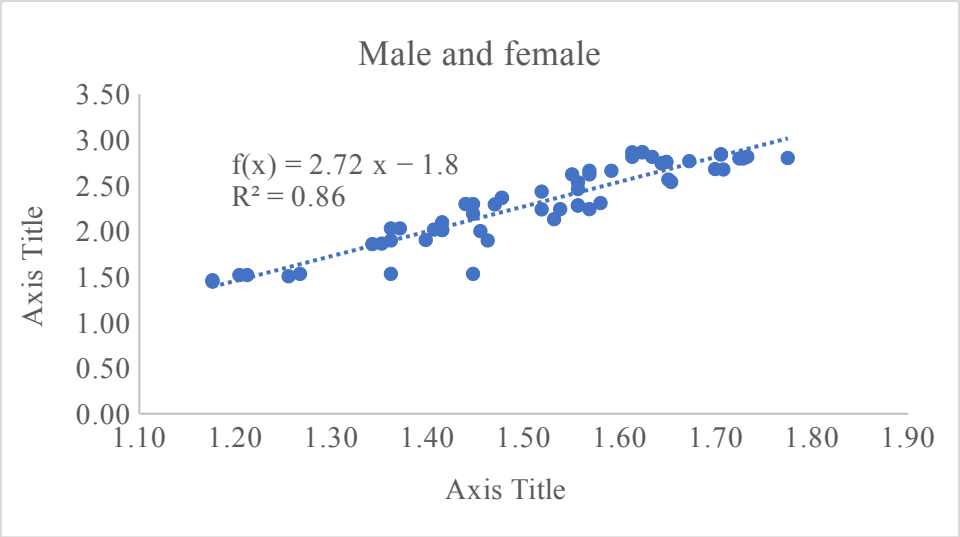


Figure 1: Length-Weight relationship of male and female

## 4. Length-Weight Relationship of Male and Female B. Bayad

The results of this study showed that the average total lengths and total body weight values of the two sexes separately and the combined sexes were in line with some previous investigations in the same water body. This study's length-weight regression coefficients of the males, females, and combined sexes are 2.62, 2.76, and 2.72, respectively. The findings of this study showed that *B. bayad* exhibited a negative allometric growth pattern since the **b** value is less than three (3), and it is interpreted that the *B. bayad* is becoming slimmer with an increase in length. This study is in line with the work of (Ali *et al.,* 2022) who also established a negative allometric growth pattern in *B. bayad* in Challawa Gorge Reservoir, Kano State, Nigeria with a **b** value of 2.30 and it also agreed with the work of Dan-kishiya (*et al.,* 2018) who found negative allometric growth pattern in zobe reservoir of *B. bayad* with a b value of 2.90.

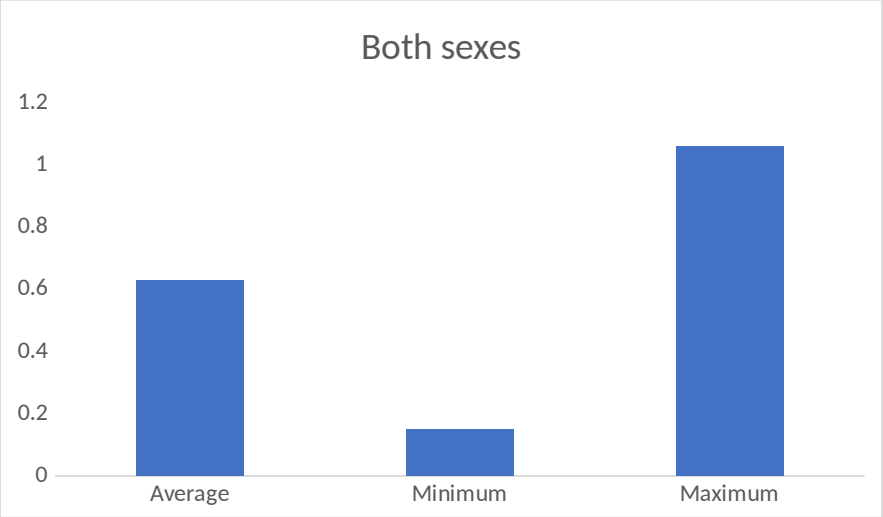


Figure 2: Condition Factor of male and female

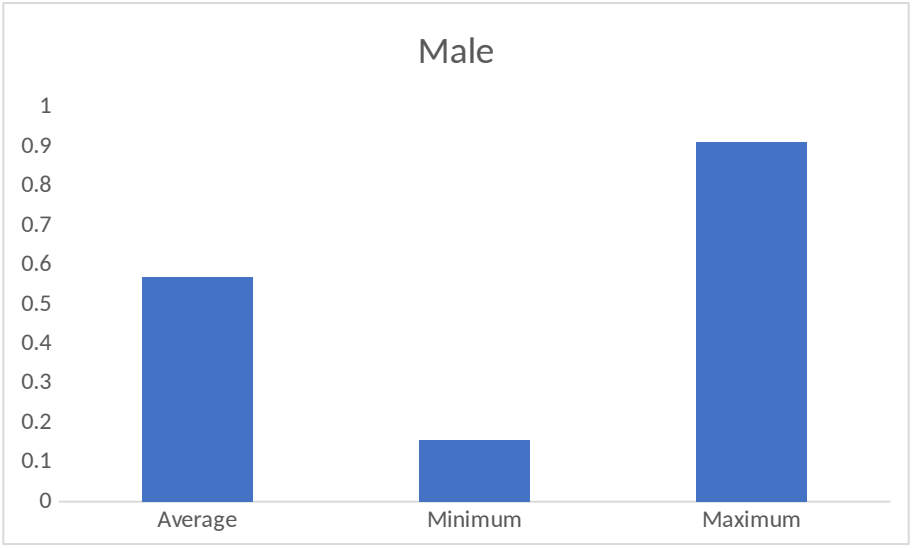


Figure 3: Condition Factor of male

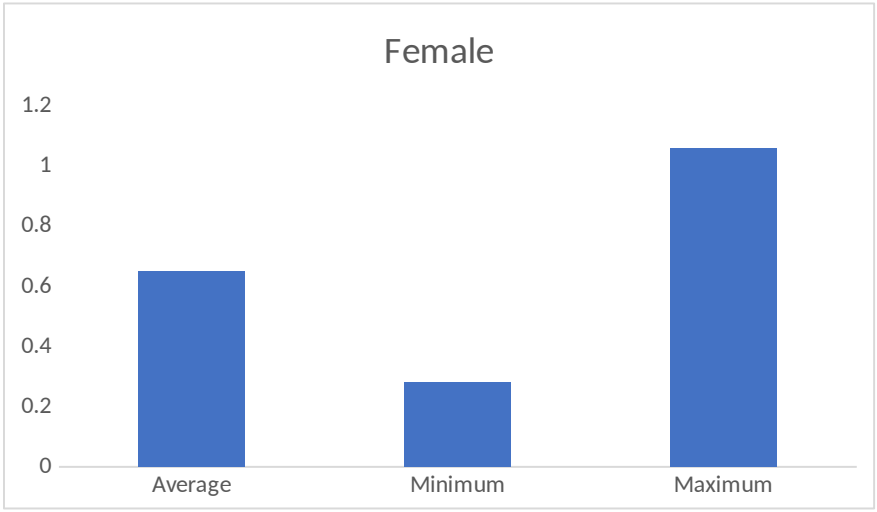


Figure 4: Condition Factor of female

## 5. Condition Factor of Male and Female Bagrus Bayad

The condition factor (K) reveals the fish's relative health status. Average K values were 0.57 for males, 0.65 for females, and 0.63 for the combined group. Since these values fall below 1, it suggests the fish may not be thriving optimally. However, peak K values reached 1.06 for females and the combined group, indicating some individuals are healthy, likely due to favorable environmental conditions or adequate resource availability. The K value in this study is similar to the findings of Dan-kishiya (*et al.,* 2018) who found a K value greater than 1, from the Zobe reservoir of *Bagrus bayad,* and similar findings have been reported by Ibrahim *et al.* (2012, and Malami and Magawata (2010

## 6. Conclusion

This study provides insights into the length-weight relationship, growth pattern, and condition factor of *Bagrus bayad.* The results confirm a negative allometric growth pattern, where individuals become relatively slender as they grow. While some individuals exhibit optimal health, the overall condition factor suggests that the population may face challenges in thriving. These findings align with previous research on *B. bayad*, highlighting the importance of continued monitoring and sustainable management practices to ensure the long-term health of this species.

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