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Length-weight Relationship and Condition Factor of *Auchenoglanis biscutatus* in Kiri Reservoir, Adamawa State, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author HSK wrote the first draft of the manuscript, performed the statistical analysis and managed the analyses of the study. Author AJ managed the literature searches, designed the study and wrote the protocol. Both authors read and approved the final manuscript.

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ABSTRACT

Length-weight relationship and condition factor of *Auchenoglanis biscutatus* obtained from Kiri Reservoir Adamawa State, Nigeria from July to December 2014 were studied. The objective of this study was to determine the state of physiological wellbeing of the fish in the reservoir. A total of 60 *Auchenoglanis biscutatus* were collected from fishermen catch and transported to the laboratory for analysis. Identification of fish was done using the Babatunde and Raji method. Length-Weight relationship and condition factor were calculated using the Froeze method. The results of the length - weight analyses showed that the entire fish exhibited a negative allometric growth pattern with regression exponent b values less than 3. The analyses showed that the condition factor of *Auchenoglanis biscutatus* were greater than 1 and implied that they were in good physiological condition.

Keywords: Growth in fish; fish biology; biometric relationship; ecological factors; biological factors.

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1. INTRODUCTION

Fish especially those of tropical and sub-tropical water systems are known to experience growth fluctuations due to many factors such as environmental changes, food composition, competition within the food chain, and changes in the physical and chemical properties of the aquatic medium [1,2]. Growth in fish is in length as well as in bulk [3]. Bake and Sadiku [4] described growth as the change in absolute weight (energy content) or length of fish over time, while Adedeji and Araoye [1] summarized growth as a function of fish size. The study of growth patterns in fish has been based principally on length – weight relationships [5]. The length-weight relationship is widely used in fisheries biology for several purposes such as estimating the mean weight of fish based on the known length [6,7]. Akintola et al. [8] posited that the length-weight relationship of aquatic organisms is an important predictor in fisheries biology [8].

The condition factor (K) is widely used in fisheries and fish biology studies. This factor is calculated from the relationship between the weight of a fish and its length, to describe the "condition" of that individual fish [9]. Different values in K of a fish indicate the state of sexual maturity, the degree of food source availability, age and sex of some species [10]. The condition factor which show the degree of well- being of the fish in their habitat is expressed by 'coefficient of condition' also known as length – weight factor. This factor is a measure of various ecological and biological factors such as degree of fitness, gonad development and the suitability of the environment concerning the feeding condition [11]. When the condition factor value is higher it means that the fish has attained a better condition. The condition factor of fish can be affected by a number of factors such as stress, sex, season, availability of feeds, and other water quality parameters [12]. The study is aimed at determining the state of physiological wellbeing of *Auchenoglanis biscutatus* in the reservoir.

2. MATERIALS AND METHODS

2.1 Study Area

Kiri Village is located in Shelleng Local Government Area of Adamawa State. Kiri village lies on Latitude 9°40'47" north, Longitude 12°0'51" east on the southern part of Adamawa State. The reservoir was a result of a dam that was constructed on river Gongola [13].

2.2 Sample Collection

Samples were collected from July to December, 2014. A total of 60 *Auchenoglanis biscutatus* was collected from fishermen catch and transported to the laboratory for analysis.

2.3 Sample Identification

The taxonomical key of fish by Babatunde and Raji [14] was used to identify the species.

2.4 Sampling Procedure

The length weight relationship and condition factor of the fish was carried out using the Froeze (2006) method [9].

3. RESULTS

3.1 Length - weight Determination

The results of the measurements of the total length (TL), standard length (SL) and body weight (BWT) of the fish examined are presented in Table 1. *Auchenoglanis biscutatus* had values with TL range of 27.0 – 38.0 cm, SL range of 15.0 – 19.0 cm and a BWT range of 320.0 – 536.0 g.

The result of the length-weight analysis showed that the entire fish exhibited negative allometric growth pattern with regression exponent b values less than 3.

Fig. 1-6 shows the log length- log weight relationship of *A. biscutatus* collected from fish landed in Kiri reservoir.

Table 1. Total length, standard length and body weight range distribution for *Auchenoglanis biscutatus* collected from Fish Landed in Kiri Reservoir Jul-Dec. 2014

Parameter	Range	Mean
Total length (cm)	27.0-38.0	32.3
Standard length (cm)	15.0-19.0	17.0
Body weight (g)	320.0-536.0	428.0

3.2 Determination of the Condition Factor (K)

The average values of the condition factor of the fish (Table 2) were 1.3, 1.2, 1.3, 1.4, 1.3, and 1.5 for *Auchenoglanis biscutatus* for July, August, September, October, November and December respectively. The mean K value for *Auchenoglanis biscutatus* was 1.3.

4. DISCUSSION

In this study, all the fish investigated exhibited a negative allometric growth pattern with regression analyses exponent *b* values less than 3. According to Adeyemi et al. [5] negative allometric growth pattern in fish implied that the weight increases at a lower rate than the cube of the body length. The LWR is indicative of spatial and temporal variations related to water temperature, food availability, and reproductive activity [15]. LWR parameters *a* and *b* are affected by several factors, including sex, gonad maturity, health status, season habitat, nutrition, environmental conditions such as temperature and salinity, stomach fullness, general fish condition, differences in the length range of fish specimens and collection gear [9].

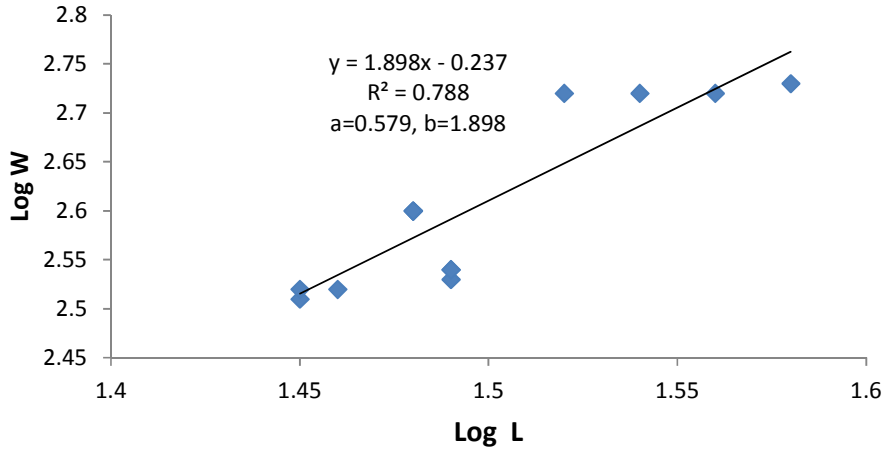

Fig. 1. Log-Length and Log-Weight relationship of *A. biscutatus*, for July

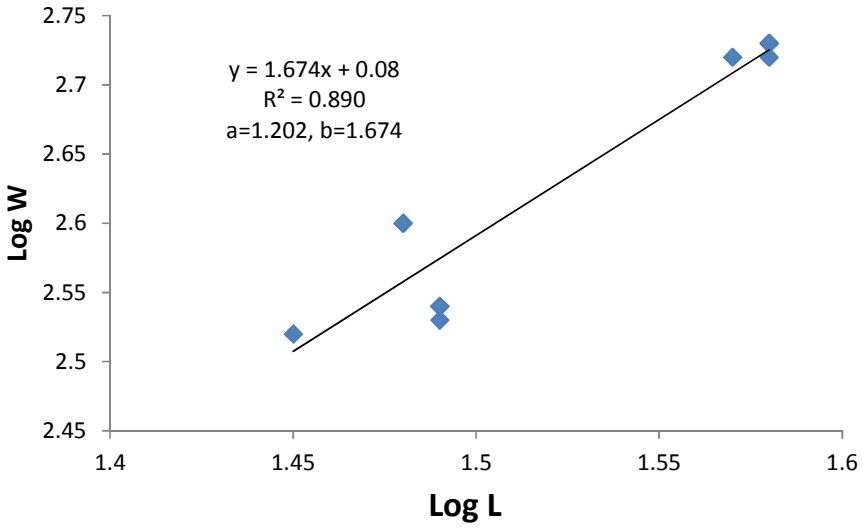

Fig. 2. Log-Length and Log-Weight relationship of *A. biscutatus*, for August

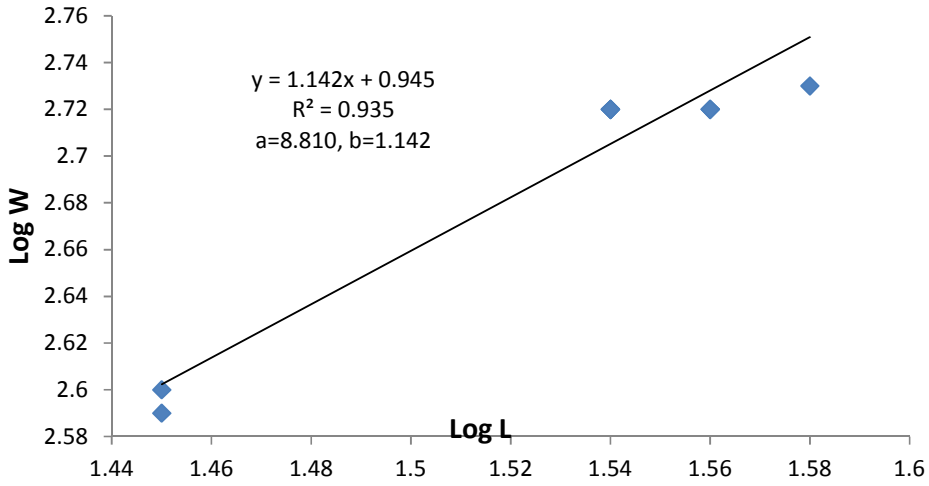

Fig. 3. Log-Length and Log-Weight relationship of *A. biscutatus*, for September

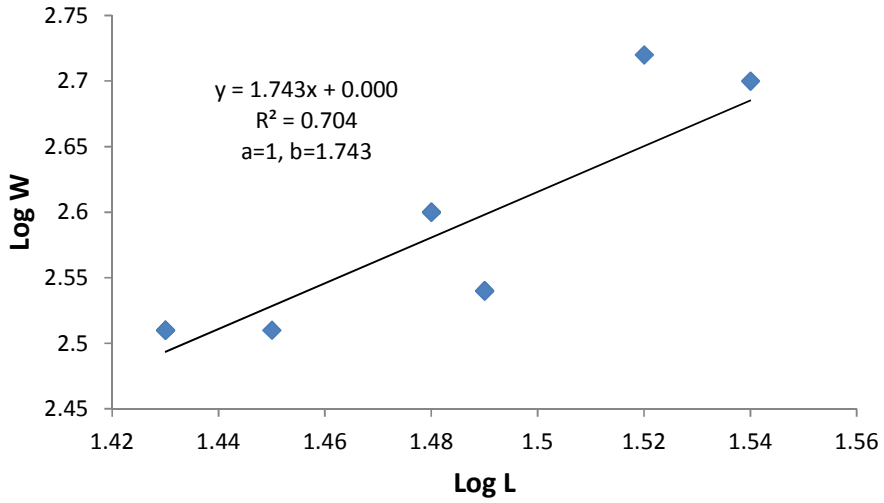

Fig. 4. Log-Length and Log-Weight relationshipship of *A. biscutatus*, for October

King reported a similar negative allometric growth pattern in many fishes in the Nigerian freshwater bodies [3]. Negative allometric growth has also been reported for *Schilbe mystus* from Dadinkowa, reservoir Gombe, Nigeria, [16], *Heterobranchus longifilis* from Idodo River, Nigeria, [10], *Mormyrus rume* from River Osse, South Western Nigeria, [17].

The values of the condition factor of the fish showed 1.3 for *Auchenoglanis biscutatus* which is greater than 1 and implies that they are in a good physiological state of well-being in the reservoir. Population dynamics studies have shown that high condition factor values indicate favorable environmental conditions such as habitat and prey availability and that low values

Table 2. Showing condition factor of *Auchenoglanis biscutatus* collected from Fish Landed in Kiri Reservoir Jul-Dec. 2014

x	July	August	September	October	November	December
	1.3	1.2	1.3	1.4	1.3	1.5
K			1.3			

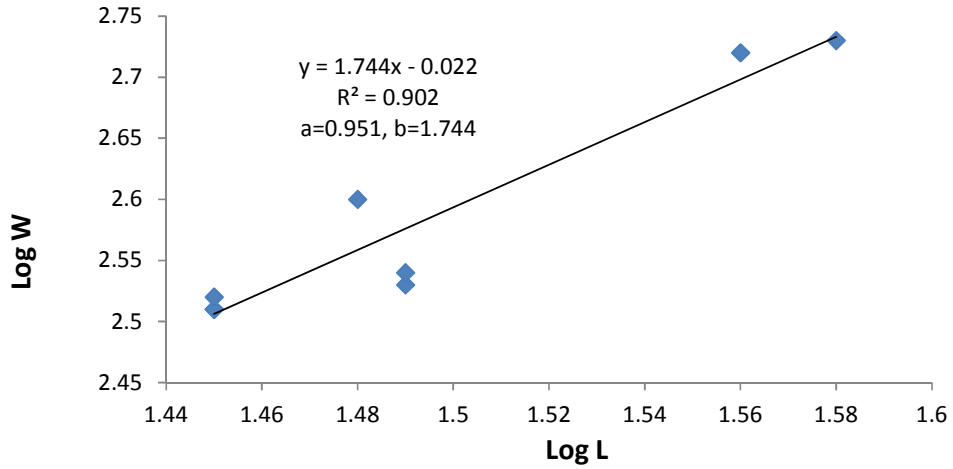

Fig. 5. Log-Length and Log-Weight relationship of *A. biscutatus*, for November

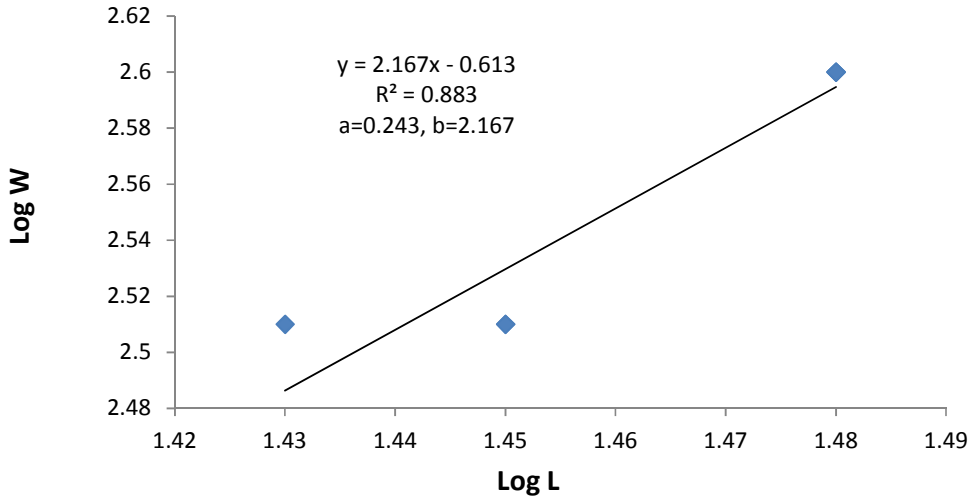

Fig. 6. Log-Length and Log-Weight relationship of *A. biscutatus*, for December

indicate less than favorable environmental conditions [18]. Hassan et al. (2018) reported K-values of 0.8 for *Schilbe mystus* in Dadin Kowa reservoir Gombe, Nigeria [16]. Ikomi and Jessa [17] reported K-values of between 2.9 and 4.8 for *Tilapia mariae* in Ethiope River, Niger-Delta – Nigeria [19]. Also, Fagade [18] had previously reported a range of between 2.9 and 4.8 for *Chromidotiliapia guentheri* from a small lake in Ibadan, Nigeria [20].

5. CONCLUSION

In conclusion, the results provide basic information on the Length weight relationship and condition factor of *Auchenoglanis biscutatus* in Kiri reservoir. *Auchenoglanis biscutatus* from Kiri Reservoir exhibited a negative allometric growth pattern. The condition factor showed that *Auchenoglanis biscutatus* was in a good physiological state of well-being in the Reservoir.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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