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Reproductive Biology of Barb Species (*Puntius spp*) in FUTA Wetlands and Ala River

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Abstract

This study is conducted to determine the Length-Weight relationship, Fecundity of barbs species collected from Federal University of Technology Akure (FUTA) wetlands and Ala river. Three species of barb fish (*Puntius javanicus, Puntius Chola, Puntius sophore*) were found within the study locations. The growth pattern of the sample fish was discovered to be negative isometric that is the b values of each specie were less than 3. The values of b reported in this study also implied that *P. javanicus, P. sophore* and *P. chola* did not follow cube law (b=3) strictly. The condition factor of the studied fish was in a good condition with the highest and lowest average value of 1.68±0.51 (*P. javanicus*) and 4.07±0.60 (*P. sophore*) for FUTA river. The fecundity of *P. javanicus* and *P. sophore* at FUTA river ranged between 36eggs to 81eggs and 31 to 104 eggs respectively while at Ala river, the fecundity of *P. javanicus* and *P. chola* ranged between 22eggs to 57eggs and 22 to 77eggs respectively. The relationship of fecundity with length and weight has been calculated and summarized.

Keywords: Barb fish, Ala River, FUTA wetlands, Length-Weight Relationship (LWR), Fecundity.

Introduction

Barbs, also called barbel, (genus Barbus), any of numerous freshwater fishes belonging to a genus in the carp family, Cyprinidae. Barbs are native to Europe, Africa, and Asia. Generally, Aquarium fish are broadly grouped into two categories on the basis of

breeding behaviour viz., egg layer (oviparous) and live bearers (ovo-viviparous).
Reproduction is one of the important physiological systems that are crucial in the lifecycle of living organisms including fish. The main objective of the reproduction is to maintain the existence of the species and therefore fish have strategies and tactics to achieve this objective (Zainal, 2014).
The relationship between Length and Weight is one of the most widely used methods in fisheries research and its importance has been well documented (Pauly, 1993; Petrakis & Stergiou, 1995; Moutopoulos & Stergiou, 2002; Froese, 2006). Both length and weight are important tools in fish fecundity and gonald maturation.
In this study, we present the L-W relationship and fecundity for 3 different Species of barbs caught in FUTA wetland and Ala River.

Materials and Method

The university (FUTA) occupies an area of about 5 km^2, lies between Latitudes 7° 17′ 0′’ N -7° 19′ 0′’ N and Longitudes 5° 7′ 0′’ E -5° 9′ 0′’ E. Ala river is one of the major tributaries of River Ogbese in the Southeastern Akure, Nigeria. The river has a total length of about 58km out of which about 14.8km is within Akure Township (Ayeni *et al,* 2011). It took its source from the Northwestern part of Akure and flow towards the Southeastern part of the town. It has a Latitude of 7.262064 and a Longitude of 5.201870.
All fish LWRs presented here are collected data of field studies conducted during the space of six months. Fish samples were collected seasonally from Novenber 2021-April 2022 in freshwaters environment of Ala river and FUTA wetlands. The LWR stated in this study is presented as; W = aLb. The parameters a (intercept) and b (slope) were estimated by linear regression based on logarithms: Log (W) = Log (a) + b Log (L).

Results

Length-Weight Relationship and Condition Factor of Barb Species at FUTA and Ala River

The result of regression coefficient, condition factor and growth pattern of *P. sophore*, *P. javanicus* and *P. chola* (collected from both FUTA and Ala river) were presented in Table 1. In Ala river, the observed growth curve of *P. javanicus*; y = 0.8242x + 0.4457 with R^2 = 0.9553 and for *P. chola*; y = 0.5845x + 0.4947 with R^2 = 0.9755 (Figures 1 and 2) while, the observed growth curve for *P. sophore* is y = 0.8895x + 0.4276 with R^2 = 0.6975 and *P. javanicus*; y= 0.4754x +0.5601 with R^2 = 0.8878 at FUTA river (Figures 3 and 4). The determination coefficient (R^2) for Ala river and FUTA river ranged from 0.9553 to 0.9755 and from 0.6975 to 0.8878, respectively. It means that 69% to 97% of variant can be explained by the model. The correlation

coefficients (r) were higher than 84% in all the species across studied locations and this informed the positive and strong relationship between weight and length. The average b value indicates that *P. sophore*, *P. javanicus* and *P. chola* had allometric negative growth pattern. The average condition factor for *P. sophore* and *P. javanicus* at FUTA river was 4.07±0.60 and 1.68±0.51 respectively while at ALA river, the condition factor for *P. javanicus* and *P. chola* was 2.31±0.24 and 2.85±0.87 respectively. The values of the condition factor recorded in this study were greater than 1 and this indicated that the fish were in a good condition.

Table 1: Sex ratio, Length - Weight relationship, Condition factor and Growth pattern of *Barb species* collected from FUTA and ALA River.

Parameters	**FUTA River**		**ALA River**	
	P. sophore	*P. javanicus*	*P. chola*	*P. javanicus*
Length (cm)	4.25±1.63[a]	4.95±1.13[a]	4.12±0.29[b]	3.76±0.52[b]
Weight (g)	1.70±1.08[ab]	2.03±1.11[b]	1.61±0.19[a]	1.44±0.24[a]
Sex ratio	1:3.1	1:4	2.3:3	1:3.2
A	0.43	0.56	0.49	0.45
B	0.89	0.48	0.58	0.82
R	0.84	0.94	0.99	0.98
R^2	0.70	0.89	0.98	0.95
Growth pattern	NA	NA	NA	NA
Condition Factor	4.07±0.60[b]	1.68±0.51[a]	2.31±0.24[a]	2.85±0.87[ab]

***Mean with same superscript along the rows are not significantly different at p>0.05**

NA = Negative Allometry.

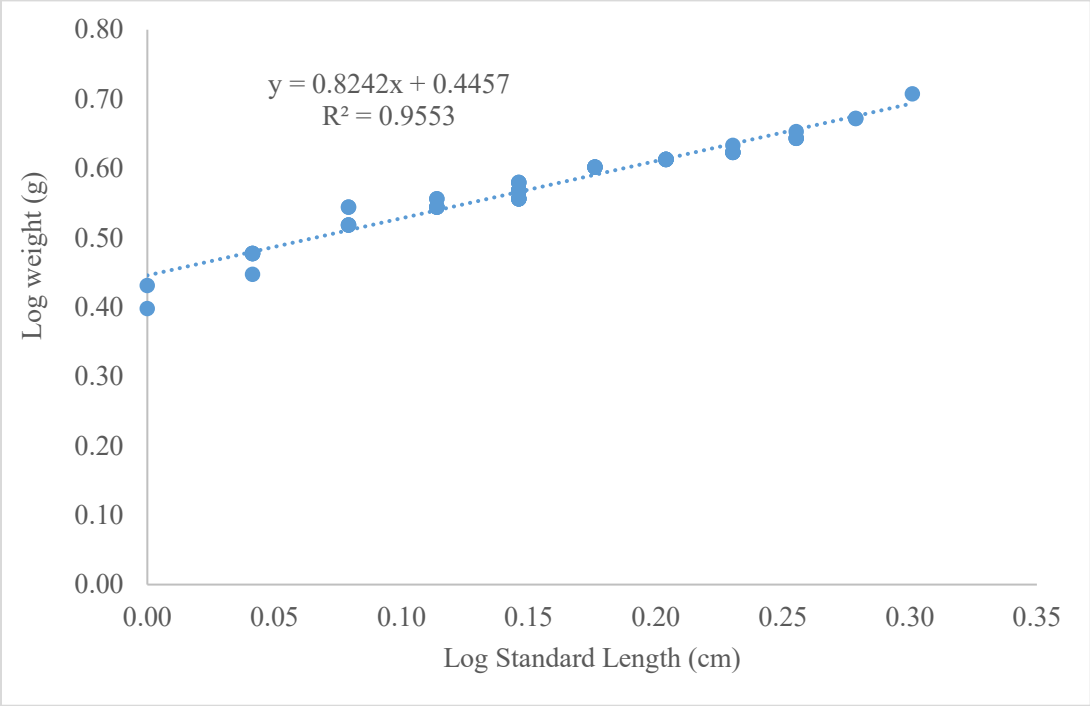


Figure 1: Length - Weight relationship of *P. javanicus* in Ala River

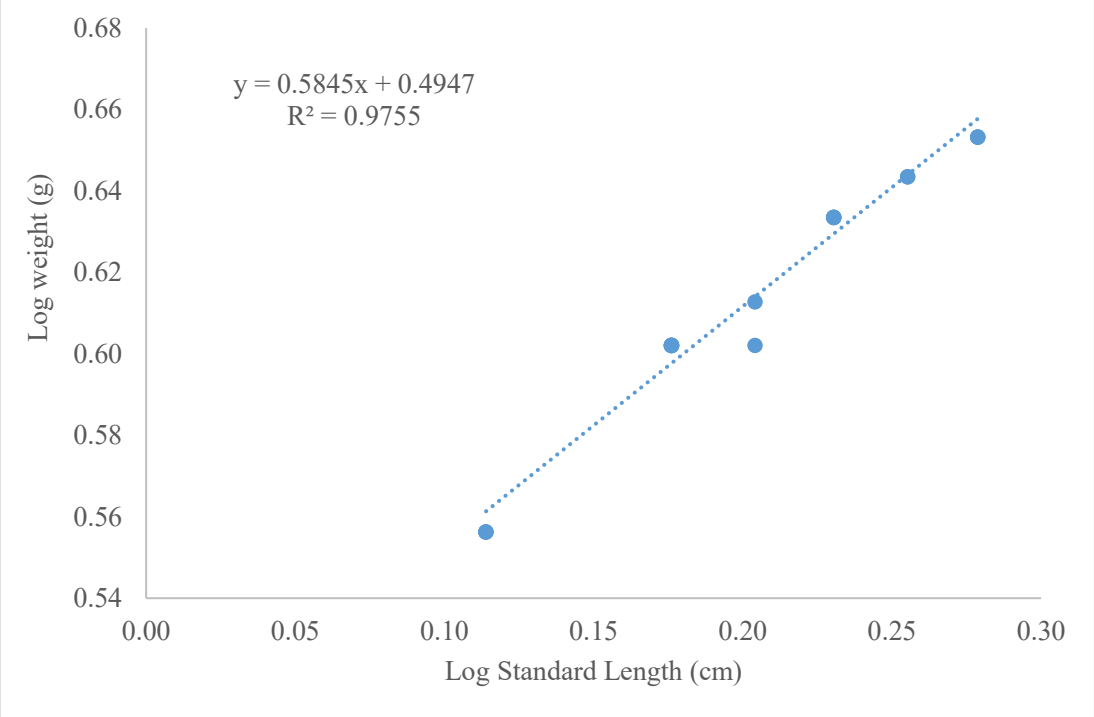


Figure 2: Length - Weight relationship of *P. chola* in ALA River

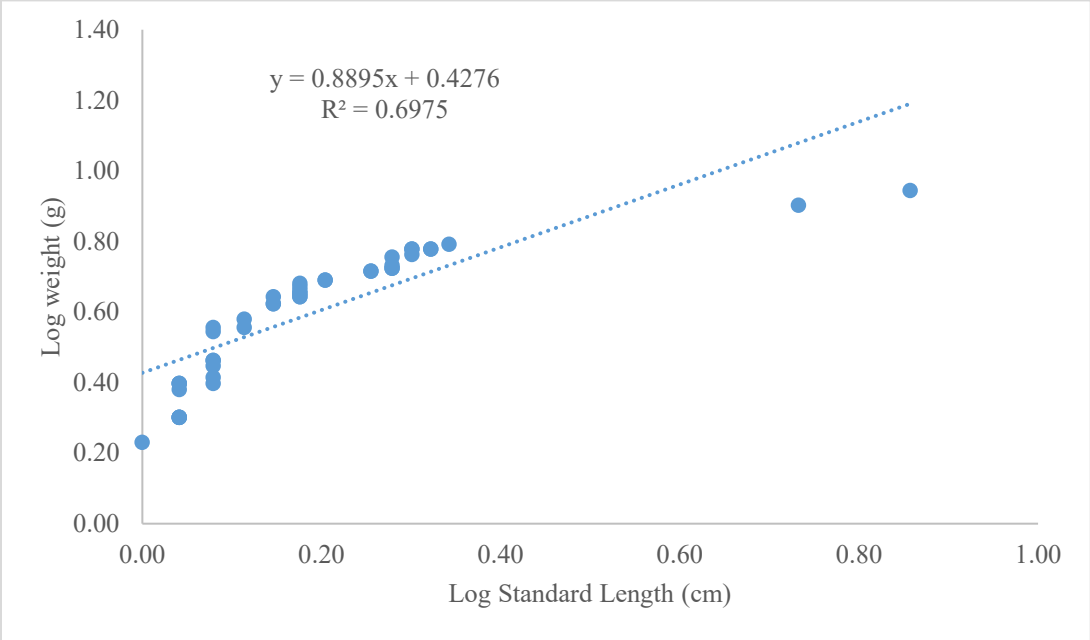


Figure 3: Length - Weight relationship of *P. sophore* in FUTA River

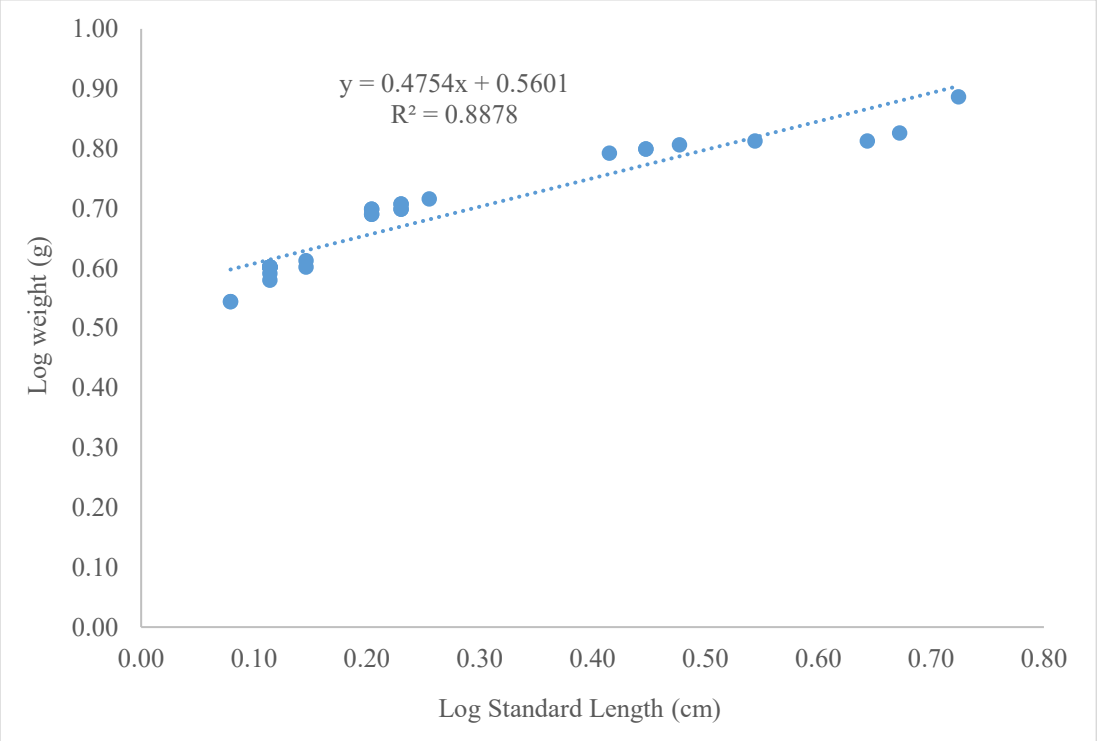


Figure 4: Length - Weight relationship of *P. javanicus* in FUTA River

Fecundity

The fecundity of *P. javanicus* and *P. sophore* at FUTA river ranged between 36eggs to 81eggs and 31 to 104 eggs respectively while at Ala river, the fecundity of *P. javanicus* and *P. chola* ranged between 22eggs to 57eggs and 22 to 77eggs respectively. The relationship of fecundity with length and weight has been calculated and summarized.

Fecundity-length and weight of *P. chola* at Ala River

The logarithmic relationship between fecundity and length has been shown in figure 5 the equation derived is: (Log F= 2.61x0.008 (r=0.84)). The correlation coefficient 'r' was found to be (0.84) which indicates a positive correlation between these two parameters. The logarithmic relationship between fecundity and weight has been shown in Figure 6. The equation derived is as follows: (Log F= 4.86x+0.35 (r=0.94)). The value of correlation coefficient (r) was found to be 0.94and was found to be significant at 5% significant level. This indicates that weight is more closely related to fecundity than length.

Fecundity-length and weight of *P. javanicus* at Ala River

The logarithmic relationship between fecundity and length has been shown in Figure 7 the equation derived is: (Log F= 9.38x – 4.40 (r=0.81)). The correlation coefficient 'r' was found to be (0.81) which indicates a positive correlation between these two parameters. The logarithmic relationship between fecundity and weight has been shown in Figure 8. The equation derived is as follows: (Log F= 1.218x + 1.34 (r=0.83)). The value of correlation coefficient (r) was found to be 0.94 and was found to be significant at 5% significant level. This indicates that weight is more closely related to fecundity than length.

Fecundity-length and weight of *P. javanicus* at FUTA River

The logarithmic relationship between fecundity and length has been shown in Figure 9 the equation derived is: (Log F= 1.28x + 0.696 (r=0.74)). The correlation coefficient 'r' was found to be (0.74) which indicates a positive correlation between these two parameters. The logarithmic relationship between fecundity and weight has been shown in Figure 10. The equation derived is as follows: (Log F= 0.448x + 1.50 (r=0.82)). The value of correlation coefficient (r) was found to be 0.82 and was found to be significant at 5% significant level. This indicates that weight is more closely related to fecundity than length.

Fecundity-length and weight of *P. sophore* at FUTA River

The logarithmic relationship between fecundity and length has been shown in Figure 11 the equation derived is: (Log F= 4.83x – 1.80 (r=0.90)). The correlation coefficient 'r' was found to be (0.90) which indicates a positive correlation between these two parameters. The logarithmic relationship between fecundity and weight has been shown in Figure 12. The equation derived is as follows: (Log F= 0.56x + 1.461 (r=0.94)). The value of correlation coefficient (r) was found to be 0.94 and was found to be significant at 5% significant level. This indicates that weight is more closely related to fecundity than length.

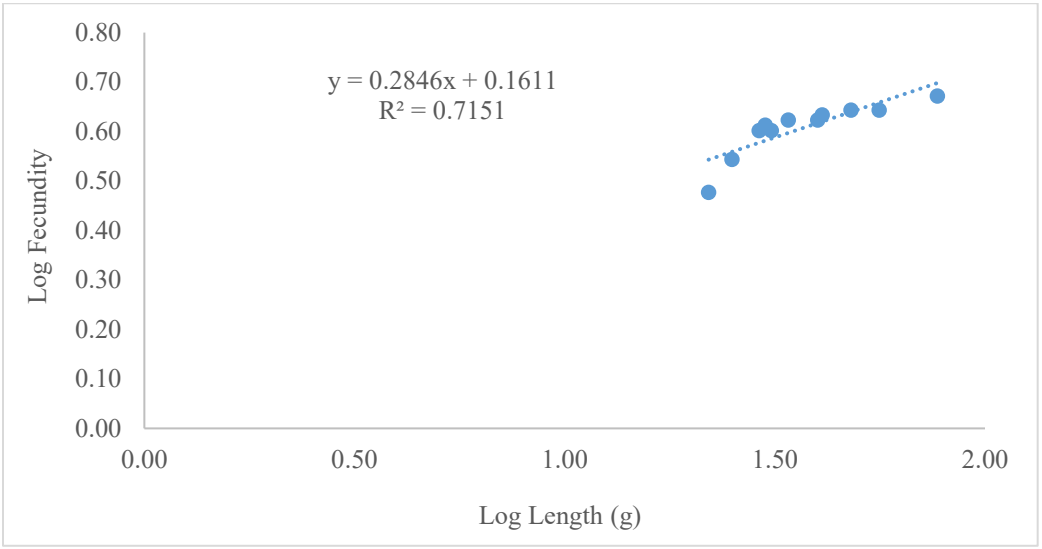


Figure 5: Fecundity - Length relationship of *P. chola* in Ala River

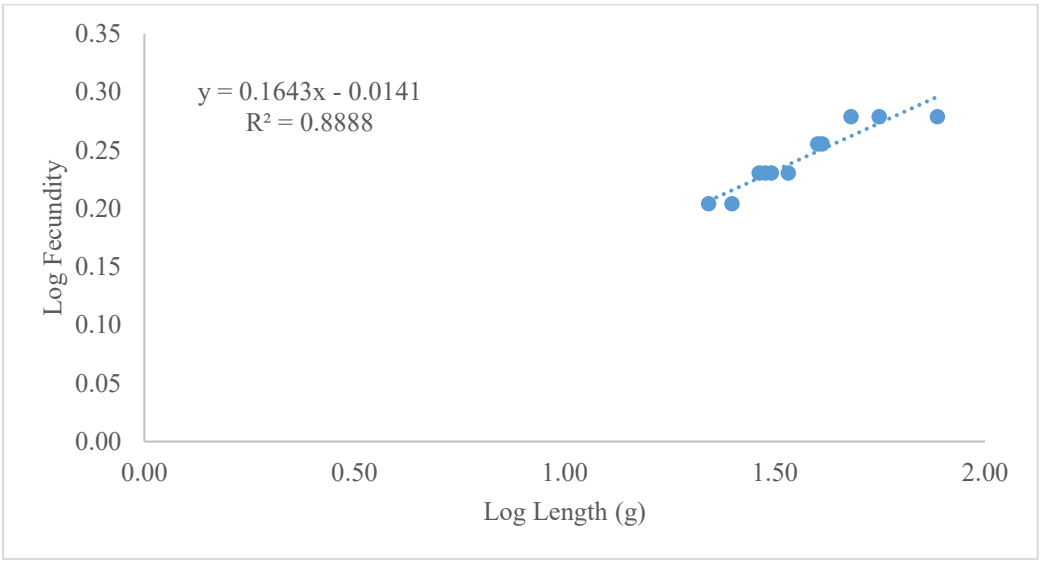


Figure 6: Fecundity - Weight relationship of *P. chola* in Ala River

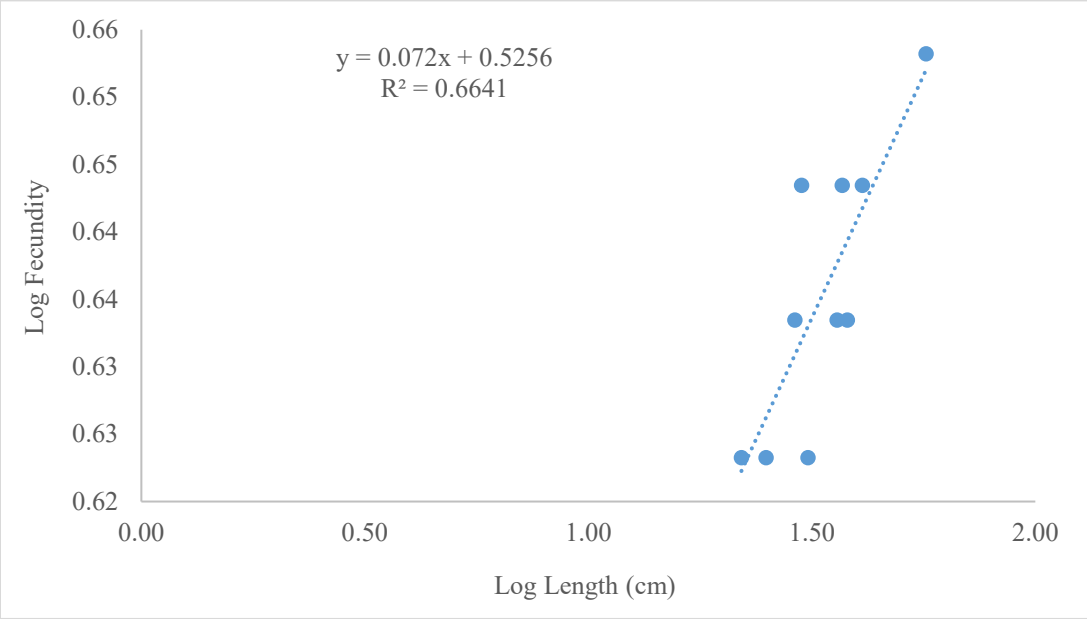


Figure 7: Fecundity - Length relationship of *P. javanicus* at Ala River

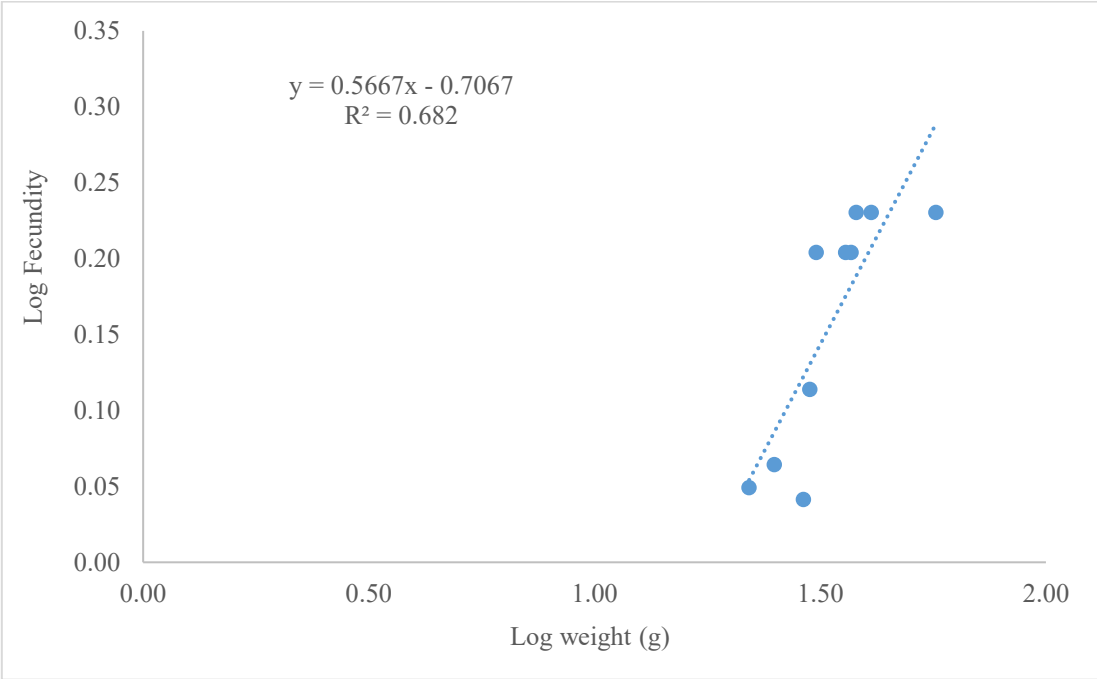


Figure 8: Fecundity - Weight relationship of *P. javanicus* at Ala River

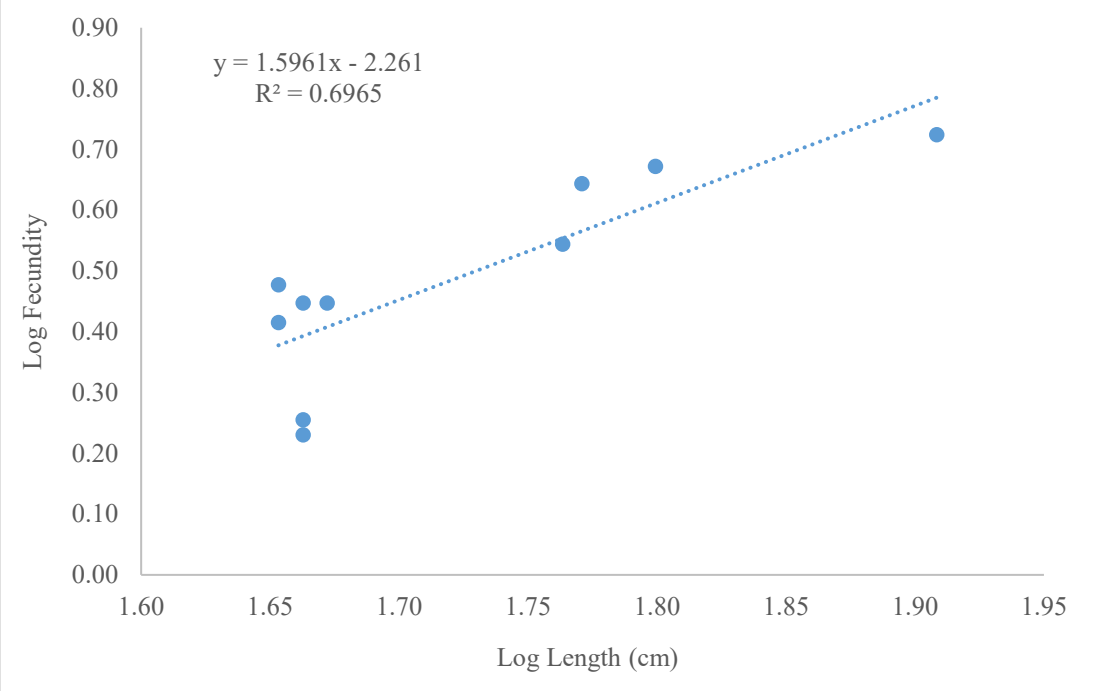


Figure 9: Fecundity - Length relationship of *P. javanicus* at FUTA River

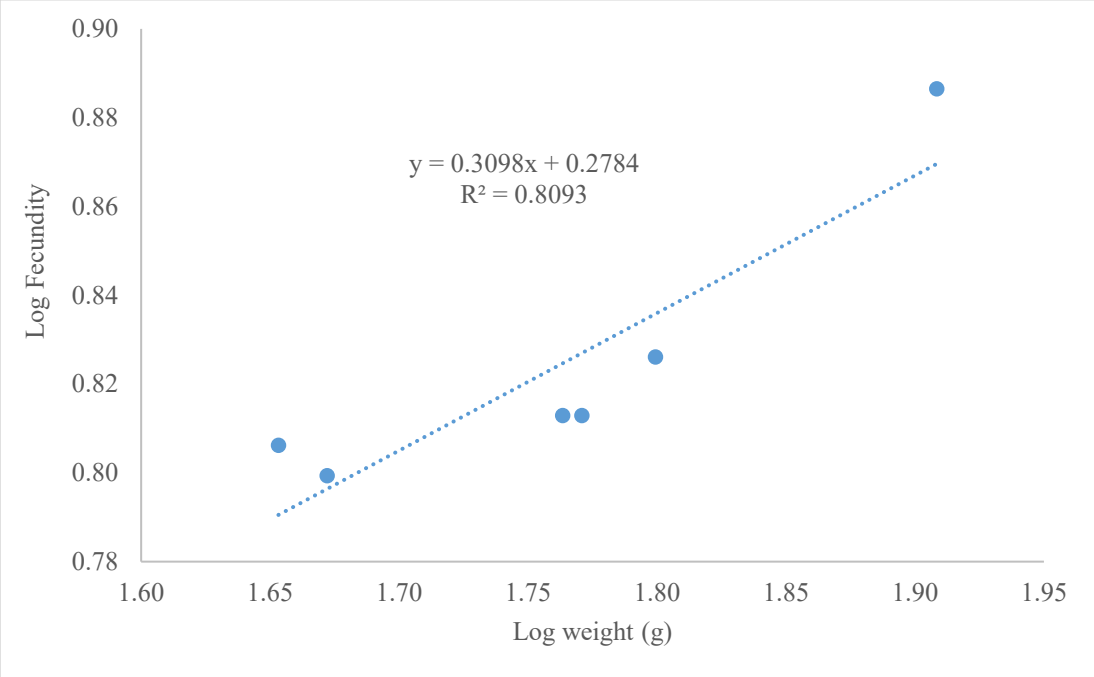


Figure 10: Fecundity - Weight relationship of *P. javanicus* at FUTA River

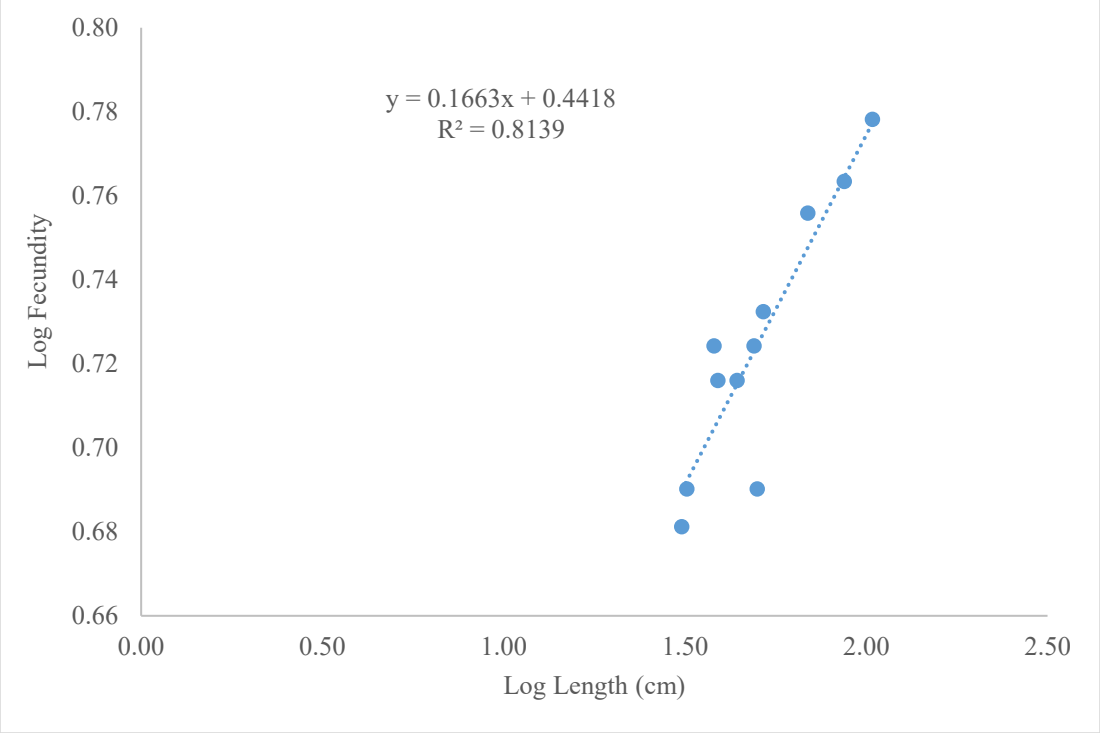


Figure 11: Fecundity - Length relationship of *P. sophore* at FUTA River

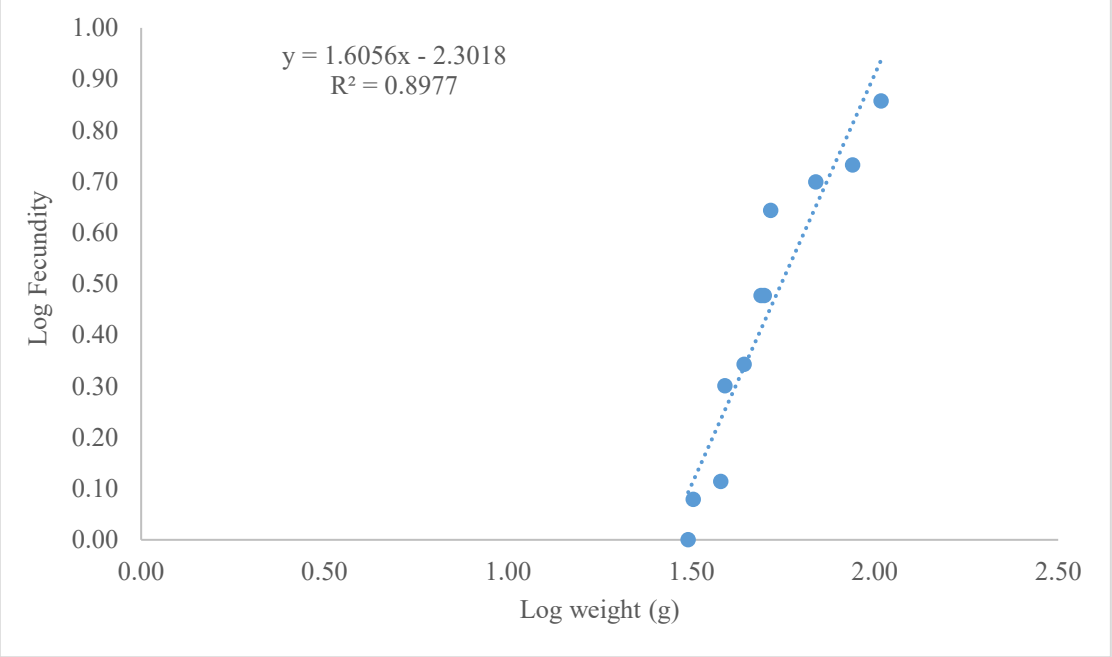


Figure 12: Fecundity - Weight relationship of *P. sophore* at FUTA River

Discussion

The Linear Allometric Model analysis showed that there was a variation in b values. The values were less than 3 and this indicates a negative allometric growth pattern. Mahapatra *et al.* (2014) reported a negative allometric growth pattern in indigenous *Pseudambassis ranga*. The difference in b values could be due to changes in food availability and gonad maturation

There was a linear, positive and significant relationship between fecundity, length and weight. This observation was similar to the linear and positive relationship in *Puntius chola* fecundity, length and weight as reported by Bimal and Aparna (2012) in Kangsa river, Bangladesh. In the present study, correlation coefficient 'r' value obtained between fecundity and weight was found to be highest in weight of *P. chola* and *P. sophore* (r=0.94) and lowest in weight of *P. javanicus* obtained from FUTA river (0.82). The 'r' value for the relationship between fecundity and weight was higher than the 'r' value for the relationship between fecundity and length. Bhattacharya and Banik (2015) reported similar finding when studying fecundity of *Ompok pabo* in Tripua, India.

Conclusion

In conclusion, the results from this study has clearly shown that that the growth form is negative allometry. The condition factor of the studied fish was in a good condition with the highest and lowest average value of 1.68±0.51 (*P. javanicus*) and 4.07±0.60 (*P. sophore*) for FUTA river. Fecundity is directly proportional to body weight (Simpson, 1951) and Begenal (1967) pointed out that fecundity is more closely connected with the weight of the fish than its length. The number of eggs being a number of units of weight will show an exponential relationship with the entire organism. This has been found to be true in the present study.

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