

Studies on length-weight relationship and relative condition factor of *Garra langlungensis* (Ezung, Shangningam and Pankaj, 2021) from Langlung River, Nagaland, India

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ABSTRACT

The present study documents the relationship between the total length (TL) and weight (W) of an ornamental fish, *Garra langlungensis* from Nagaland, India. The b value for males, females and pooled population showed negative allometric growth. No previous record on the length-weight relationship (LWR) is available for this species.

Key words: Allometric growth, Length-weight relationship, *Garra langlungensis*, Condition factor

Introduction

Knowledge of the length-weight relationship is very important in fishery biology and stock assessment of fishery resources, and condition factor for comparing the condition, fatness, or well-being (Tesch, 1968; Beyer, 1987; King, 2007; Bobori *et al.*, 2010). The length-weight relationship also allows life history and morphological comparison between different fish species or fish populations from different habitats or regions (Goncovalles *et al.*, 1997; Santos *et al.*, 2002). Length-weight relationships can predict weight from length measurements made in the yield assessment (Pauly, 1993). The mathematical relationship between the two variables, length and weight, is a suitable index for understanding the survival growth, maturity, reproduction and general well being of the fishes (Le Cren, 1951).

Fish can attain either isometric growth, negative allometric growth or positive allometric growth. Iso-

metric growth is associated with no change of body shape as an organism grows. Negative allometric growth implies the fish becomes more slender as it increases in weight. In contrast, positive allometric growth implies the fish becomes relatively stouter or deeper-bodied as it increases in length (Riedel *et al.*, 2007). Condition factor can also indicate the suitability of a specific water body for the growth of fish and environmental differences in ecological conditions such as seasonal changes, nutritional quality and type of aquatic system e.g. rivers or lakes (Yilmaz *et al.*, 2012; Alam *et al.*, 2014; Mouludi-Saleh and Eagderi, 2019).

Garra langlungensis is a member of the labeonine genus *Garra* Hamilton, 1822 and is currently located only from Langlung River, Nagaland (Ezung *et al.* 2021). There is no previous information on the length-weight relationship and condition factor of this species. Hence, an effort has been made in the present study to determine the length-weight rela-

tionship and relative condition factor of indigenous ornamental fish *Garra langlungensis* from Langlung River, Nagaland.

Materials and Methods

Samplings were collected from Langlung River (25°42'57.4 N'' 93°39'50.8 E), near Zutovi village, Dimapur, Nagaland using cast net of different mesh sizes and scoop net during march 2017- February 2018. All measurements and weights were taken using a vernier caliper to the nearest mm and an electrical weighing machine up to 0.1g. Length-weight calculations were made following Le Cren, 1951 $W = aL^b$. The logarithmic transformation of which gives the linear equation: $\text{Log } w = a + b \log l$. The confidence limit at 95% was determined for both a and b parameters. The relative condition factor was estimated using Le Cren's equation $Kn = W / aL^b$. Where W = weight in gram, L = length in mm, a = a constant being the initial growth index and b = growth coefficient. Constant 'a' represents the point at which the regression line intercepts the y-axis and 'b' the slope of the regression line.

Results

Length-weight relationship

A total of 213 specimens were collected to analyse the length-weight relationship of *Garra langlungensis*. Length-weight equations were estimated for male, female and pooled populations separately. The scatter diagram plotted for length against their respective weight obtained a smooth curve (Fig. 1-3). The statistical analysis of length-weight parameters for

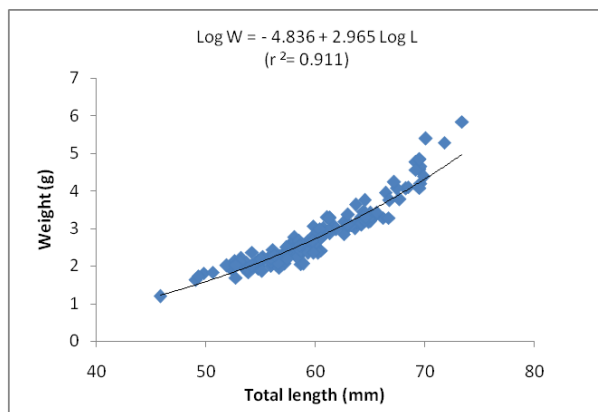


Fig. 1. Length-weight relationship in males of *Garra langlungensis*

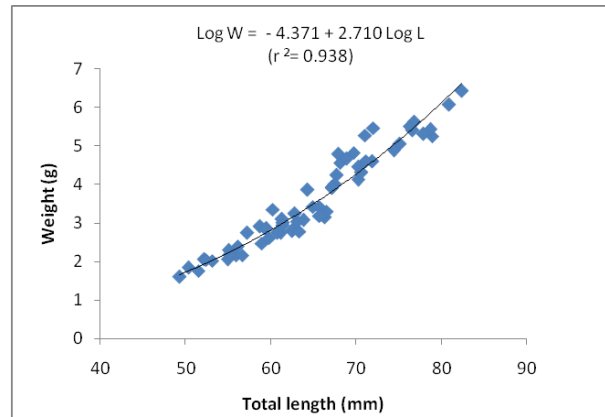


Fig. 2. Length-weight relationship in females of *Garra langlungensis*

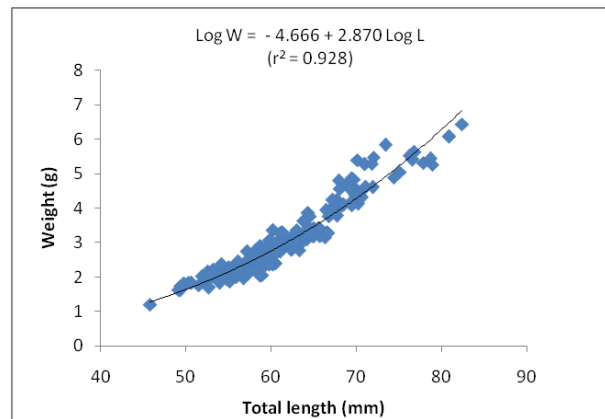


Fig. 3. Length-weight relationship in the pooled population of *Garra langlungensis*

males, females and the pooled population is shown in Table 1. The coefficient of correlation, 'r²' between total length and body weight for males, females and pooled population were estimated as 0.91, 0.94 and 0.93 which is significant at 1% level.

Relative condition factor

The relative condition factor of *Garra langlungensis* was estimated for males, females and pooled population separately. The Kn value was found to be highest in males, followed by females and the pooled population. The estimated value with average, standard error and range are shown below (Table 2).

Discussion

Length-weight relationship

The exponent value b is an important parameter of

Table 1. Descriptive statistics and length and weight parameters of *Garra langlungensis*

	No. of fishes	Range Length (cm)	Range Weight (g)	Mean Length (cm)	Mean Weight (g)	a	b	95% confidence limit of a	95% confidence limit of b	r ²
Males	149	73.4-45.8	5.8-1.2	59.9	2.8	0.0079	2.965	0.0061-0.0104	2.810-3.110	0.91
Females	64	82.4-49.3	6.4-1.6	64.8	3.6	0.0126	2.710	0.0095-0.0179	2.515-2.862	0.94
pooled	213	82.4-45.8	6.4-1.2	61.4	3	0.0094	2.870	0.0079-0.0116	2.751-2.967	0.93

Table 2. Relative condition factor values of *Garra langlungensis*

Sex	n	Average	S.E	Max	Min
Males	149	1.824	0.012	2.267	1.445
Females	64	1.737	0.019	2.116	1.484
Pooled	213	1.720	0.010	2.267	1.445

the length-weight relationship in determining the growth pattern of the fish species (Froese, 2006). The calculated 'b' values in males, females and pooled population in the present study were 2.965, 2.710 and 2.870 and fell under the normal distribution frequency of exponent b between 2.5 to 3.5 (Froese, 2006). The males were found to have the highest 'b' indicating that males are in better condition and gain in weight faster in relation to length than the females and pooled population. Differences in 'b' values could be due to some general conditions of the fish such as sex, age, feeding and reproductive activities and certain environmental factor, as suggested by (Le Cren, 1951; Yildirim *et al.*, 1998). The growth pattern in *Garra langlungensis* showed negative allometric growth ($b < 3$).

Relative condition factor

Condition factor is a useful index for monitoring and evaluating feeding intensity, growth rates, and fish population (Oni *et al.*, 1983; Brian *et al.*, 2000). It can also be used as an index to assess the condition of the aquatic ecosystem of the fish habitat as it is strongly influenced by both biotic and abiotic environmental conditions (Barnham, 1998). According to Le Cren (1951) and Jisr *et al.* (2018), an overall fitness for fish species is assumed when Kn values are equal or close to 1. The Kn value of males (1.824) was higher than females (1.737) and pooled population (1.720) in the present study showing that males are in better condition than females and pooled population. The relative condition factor was found to be more than 1 in all three populations determining that the fishes are living in good condition.

Conclusion

The study provides the first reference for the length-weight relationship and relative condition factor of an ornamental fish *Garra langlungensis* population from the Langlung River of Nagaland. The present research on *Garra langlungensis* concludes that the length-weight relationship deviated from the cube law and indicated negative allometric growth. The mean relative condition factor (Kn) for males, females and the pooled population was more than 1, showing the good condition and satisfactory growth of the species in this river.

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