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## Length-weight relationship of *Lepidocephalichthys guntea* (Hamilton, 1822) from Haora River, Tripura, India

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**Abstract**

Length-weight relationship of *Lepidocephalichthys guntea* was studied separately for male, female, unknown and combined (male, female and unknown) on a monthly basis between January 2017 to December 2017 from Haora River, Tripura, India. In the study, a positive allometric growth ( $b > 3$ ) was observed among female, unknown and combined population, whereas the male population showed negative allometric growth (2.91). The correlation coefficient value was estimated at 0.929, 0.937, 0.904 and 0.941 for male, female, unknown and combined, respectively. The total length (TL)-Weight (W) relationships were found to be  $W=0.0090TL^{2.91}$ ,  $W=0.0056TL^{3.19}$ ,  $W=0.0048TL^{3.24}$  and  $W=0.0051L^{3.22}$  for male, female, unknown and combined *L. guntea*, respectively.

**Keywords:** Total length-Weight relationship, *Lepidocephalus guntea*, Haora, Tripura

**1. Introduction**

Fisheries science and management uses the length-weight relationship of individuals in a fish population as a vital tool for assessing population characteristics [17, 4]. It helps in establishing the mathematical relationship between two variables, as a means of inter-conversion of these variables and for understanding their survival, growth, maturity, reproduction, and general well-being [12]. It also describes the type of somatic growth whether isometric or allometric [17]. The Guntea loach, *Lepidocephalichthys guntea* [6] is an indigenous cobitids (Cypriniformes) native to southern and south-East Asian countries [8], which has recognized for its excellent taste and fleshy food fish among the common people. The species is characterized by their with elongate and laterally compressed dark yellowish body, dorsal and ventral profile almost parallel, caudal fin rounded with no lateral line, a series of dark blotches along mid lateral and a black colored spot on the upper half of caudal fin base [14, 19]. It thrives well in flowing and clear standing water bodies. This fish is found in the aquarium trade due to its ornamental value and is also documented under Least Concern category as per IUCN Red List of threatened species [9]. Till date, no information is available on the length-weight relationship for this species from Tripura, India. Thus, the present study was aimed to estimate the length-weight relationships of *L. guntea* obtained from Haora River, Tripura, India.

**2. Materials and Methods**

Haora is one of the major river systems in the state of Tripura, India. The river has its origin from the eastern side of the Baramura hills. Then it flows westerly through the alluvial plains and passes by important towns like Champaknagar, Jirania, Khumulwng, Khayerpur and the capital city Agartala before finally flowing down into Bangladesh. The flow length of the river is 53 kms in Indian territory and basin area is 570 sq. kms. A total number of 157 specimens of various ages were collected using cast net (mesh size of 15–20 mm) from the Haora river at Agartala (23°82'N, 91°27'E; 23°82'N, 91°26'E) in West Tripura district of Tripura, India on a monthly basis between January 2017 to December 2017. Freshly caught fish specimens were preserved in ice and shifted to the laboratory. Fish specimens were identified to species level using standard manuals [19, 10]. The total length (TL) was recorded to the nearest 0.01 cm using vernier caliper and body weight (W) was taken to an accuracy of 0.1 g using an electronic weighing machine. After weighing, the samples were washed with clean water and preserved in 10% formaldehyde for further study. Sexes were distinguished following [20, 16]. In mature males, the pectoral fins are enlarged with fused, thickened innermost (7th and 8th) rays

forming a structure known as the lamina circularis. Besides, fishes were dissected to confirm the sex based on gonadal structures, whereas those were not distinguished during the period of investigation; kept under 'unknown' group.

Length-weight relationship of this species was calculated using the cube law <sup>[12]</sup>,  $W = aL^b$  and logarithmically transferred into linear relationship *i.e.*  $\ln W = \ln a + b \ln L$ , Where,  $W$  = Weight (g) of the fish specimens,  $L$  = total length (cm),  $a$  = intercept and  $b$  = slope of the regression line. The 95% confidence limits of parameters ( $a$  and  $b$ ) and the coefficient of determination ( $R^2$ ) were determined.

All statistical analyses were performed, using MS Excel 2007. Extreme outliers were removed from the analyses <sup>[4]</sup>.

### 3. Results

A total of 157 samples (Male= 36, Female= 35 and Unknown= 86) were used to estimate the length-weight relationships. All the descriptive statistics and estimated parameters for length-weight relationships including sample size ( $n$ ), total body length (TL) and body weight ( $W$ ), maximum and maximum range of weight (g) and length (cm), regression parameters  $a$  and  $b$  and their 95% confidence limits as well as the coefficients of determination ( $R^2$ ) are given in Table 1. The 'b' value in TL-W relationship for *L. guntea* was found to be 2.91, 3.19, 3.24 and 3.22 for male, female, unknown and combined, respectively. The correlation coefficient ( $R^2$ ) was observed to be 0.929, 0.937, 0.904 and 0.941 for male, female, unknown and combined species, respectively. The regression graph of length-weight relationships were shown in the Fig. 3. A linear relationship between the length and weight was established. The regression equation represented as follows:  
Male:  $\log W = -4.707048163 + 2.91 \ln TL$   
Female:  $\ln W = -5.184733909 + 3.19 \ln TL$   
Unknown:  $\ln W = -5.326168571 + 3.24 \ln TL$   
Combined:  $\ln W = -5.287187371 + 3.22 \ln L$

### 4. Discussion

Length-weight relationship of fishes are used by the fishery scientists to access the possible differences between or among separate stocks of the same species <sup>[11]</sup> and also to calculate the mean weight of fish based on known length <sup>[1]</sup>. The present study reveals that the 'b' values for *L. guntea* among different sexes were found within the expected range of 2.5 to 3.5 <sup>[4]</sup> which indicates that their present growth status is quite well. The positive allometric growth was reported in female (3.19), unknown (3.24) and combined (3.22) population. However, negative allometric growth was observed in male population (2.91), which was an indication of loss of energy during breeding and courtship activities <sup>[2]</sup>. Several investigators also reported the 'b' values for *L. guntea*, which was found within the range of 2.68-3.48 from Morang District, Nepal <sup>[3]</sup>; 2.66-3.76 from Ghati Beel of Assam, India <sup>[5]</sup> and 3.23-3.32 in Bangladesh <sup>[15]</sup>. The variations in the 'b' value among are contributed by both the intrinsic factors such as gonadal development, age, sex, genetic makeup, etc. and

extrinsic factors such as food availability, season, habitat characteristics <sup>[18, 13]</sup>. Moreover, the specimens were collected during the pre-monsoon and monsoon season (March–September, 2017) for the study, which indicates the increase in weight (g) than length (cm) in female, resulting in higher 'b' value compared with male population. This fact might be due to gonadal development in female *Guntea*, which was also reported by other researchers <sup>[7, 5]</sup>. The correlation coefficient ( $R^2$ ) was calculated from the data and found to be 0.929, 0.937, 0.904 and 0.941 for male, female, unknown and combined population, respectively. This indicates that the variables (total length and weight) are highly correlated. <sup>[5]</sup> reported a strong linear relationship (*i.e.*  $R^2 < 0.91$ ) between total length and weight of *L. guntea* from Ghati Beel of Dhemaji district of Assam, which was found in accordance to the present finding. Similarly, <sup>[3]</sup> also reported a good correlation coefficient of *L. guntea* varying from 0.915, 0.859 and 0.829 for female, male and juvenile, respectively.

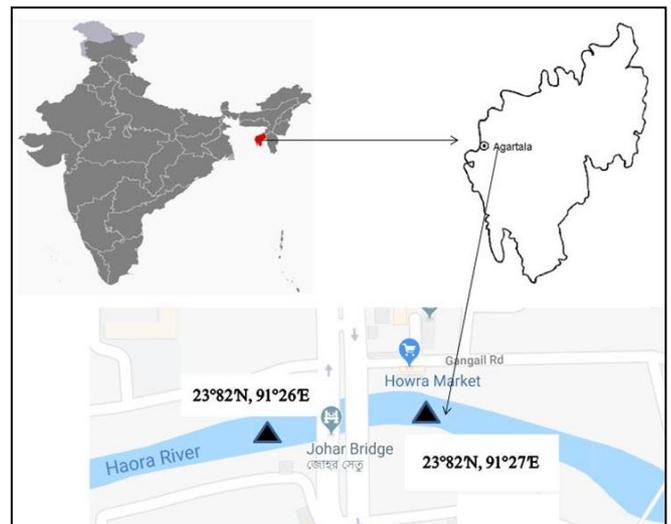
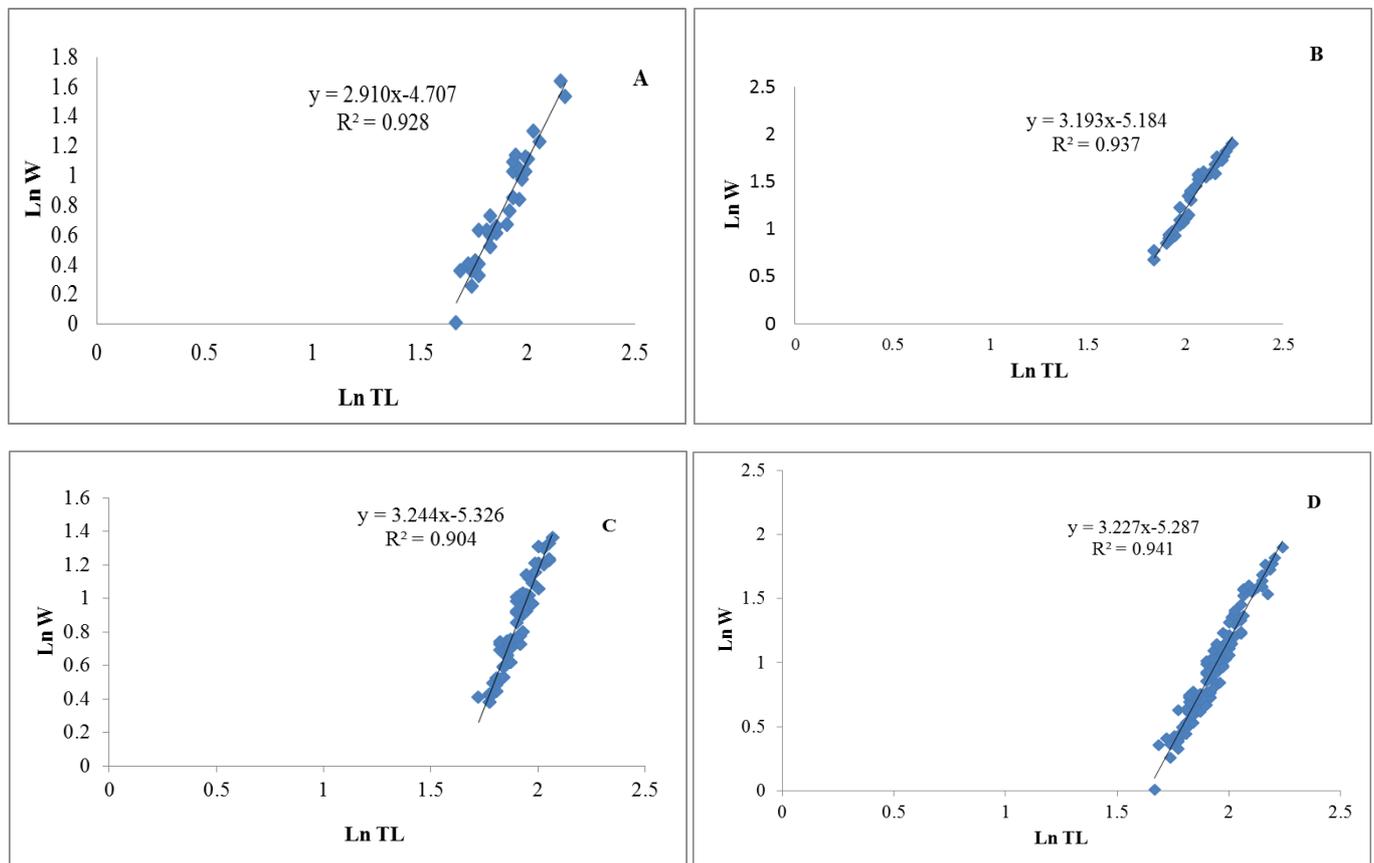


Fig 1: Map of study area



Fig 2: *Lepidocephalichthys guntea*



**Fig 3:** Relationship between Ln TL (cm) and Ln W (g) of *Lepidocephalichthys guntea* (A-Male, B-Female, C-Unknown and D- Combined).

**Table 1:** All the regression parameters and 'b' values according to Ln TL and Ln W relationship of *Lepidocephalichthys guntea*

	Sample size (n)	Total Length range (cm)		Total Weight range (g)		Regression parameters				R <sup>2</sup>
		Minimum	Maximum	Minimum	Maximum	a	95% CL of a	b	95% CL of b	
Male	36	5.3	8.8	1.01	5.13	0.0090	0.0053- 0.0153	2.91	2.6300- 3.1911	0.929
Female	35	6.3	9.4	1.95	6.69	0.0056	0.0030- 0.0101	3.19	2.9012 - 3.4862	0.937
Unknown	86	5.6	7.9	1.46	3.91	0.0048	0.0031- 0.0075	3.24	3.0161- 3.4729	0.904
Combined	157	5.3	9.4	1.01	6.69	0.0051	0.0040- 0.0065	3.22	3.1000- 3.3553	0.941

\*a: Intercept, b: Regression coefficient, CL: Confidence limit, R<sup>2</sup>: coefficient of determination

## 5. Conclusion

From the study, it concluded that the length-weight relationships of *L. guntea* could be highly correlated to each other. The 'b' value for female, unknown and combined, *L. guntea* population was found to be greater than three ( $b > 3$ ) which indicates positive allometric growth. The 'b' value for male, *L. guntea* was observed to be less than three ( $b < 3$ ) indicating a negative allometric growth. It is also concluded that the aquatic habitat of *L. guntea* is quite favourable for growth and survival. The information on *L. Guntea*, could be supportive for the fishery biologists of the region to study their population dynamics and prepare suitable management way for sustainable management, conservation and judicious use of such resources.

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