

Length-Weight Relationship and Condition Factor of Six Small Fish Species of the Floodplain Wetlands of Assam

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Received: 5th May, 2026

Revised: 15th May, 2026

Accepted: 23rd May, 2026

Published: 27th May, 2026

ABSTRACT

LWR (Length Weight Relationship) parameters are very important to determine different aspects, like fish growth and condition. The parameters in the LWR study reflect the current status of a fish species in a particular geographical area. The study tried to explore the LWRs of six (06) floodplain wetland species of Assam, i.e., *Chanda nama*, *Lepidocephalus guntea*, *Mystus vittatus*, *Puntius ticto*, *Parambassis lala*, and *Rasbora daniconius*. The floodplain wetlands, which harbor a large number of indigenous small fish populations, are facing anthropogenic stress in recent times. The length range of the species studied was between 2.0 and 9.4 cm, and the weight ranged between 0.14 – 9.58 g. The regression coefficient was found to be higher in species like *C. nama* (0.96), *R. daniconius* (0.93), while it was found to be lower in other species, with the least value in *M. vittatus* (0.69). The condition factor (K) in all the studied species was found close to 1, with the least value in *P. ticto* (0.90 ± 0.21) and the highest in *L. guntea* (1.07 ± 0.12). Length-weight exercise after a regular interval is very necessary to understand the health of the fish species in these water bodies.

Keywords: LWRs, floodplain, wetland, condition factor

Introduction

Studies on allometric relationships, like length-weight relationships, can elicit significant insight into the environment and pattern of growth in fishes (Froese, 2006). Moreover, such studies are also essential for proper management and conservation of the fish resources (Osha & Usman, 2019). Condition factor is also an important parameter in understanding the life cycle and proper management of species (Imam et al., 2010). Wetland resources are the center of social, cultural, and recreational activities, and a major proportion of people globally are dependent directly or indirectly on these water bodies (Chong, 2005). The wetlands of Assam are known to harbor more than 100 species of indigenous fish population with high nutritional and ecological importance (Dey, 1981; Baruah, 2000). However, due to increasing anthropogenic stress, habitat destruction, and loss of hydrological connectivity, the wetland fish species are facing a serious threat in recent times (Nayak and Biswas, 2020). In the present study, a length-weight study of six species, i.e., *Puntius ticto*, *Chanda nama*, *Rasbora daniconius*, *Mystus vittatus*, *Lepidocephalus guntea*, and *Parambassis lala*. Although these

Result

A total of 192 specimens from 6 different species, i.e., *Puntius ticto*, *Chanda nama*, *Rasbora daniconius*, *Mystus vittatus*, *Lepidocephalus guntea*, and *Parambassis lala* were considered for study. In all the species studied, the maximum length didn't exceed 10 cm, and the highest length and weight were

fish species are also reported to be found in rivers and streams, the collection is done from the floodplain wetlands of Assam. The study aims to determine the allometric parameters of the species and understand the general well-being of these six small species.

Methods and Methodology

Small fishes in the study are described as species whose maximum length does not exceed 10 cm. Both live and dead species were collected from different wetlands of Dibrugarh and Tinsukia of Assam. The length-weight measurements were taken in the laboratory of the Department of Zoology, Tinsukia College. The maximum and minimum values of all the species were recorded. The species were measured to the nearest length of 0.01 cm and weight of 0.01 g. The length-weight relationship of the fish was calculated using the regression equation: $\log W = \log a + b \log L$ with 95% confidence limits of the two constants 'a' and 'b'. To remove outliers log-log plot of length-weight was done (Froese, 2006). Condition factor measures the general well-being of the fish, which was calculated using the formula $K = 100W/L^3$ (Tesch, 1978), where K = condition factor; W = weight (g); L = length (cm).

recorded in *M. vittatus* (9.54 cm and 9.58 g). The length range of the species studied was between 2.0 and 9.4 cm, and the weight ranged between 0.14 - 9.58 g. The regression coefficient was found to be higher in species like *C. nama* (0.96), *R. daniconius* (0.93), while it is found to be lower in other species. The condition factor

(K) in all the studied species was found close to 1, with the least value in *P. ticto* (0.90 ± 0.21) and the highest in *L. guntea* (1.07 ± 0.21).

Species	N	TL (cm)		BW (gm)		Regression Parameters		95% CL of a	95% CL of b	r ²	K
		Min.	Max.	Min.	Max.	a	b				
<i>P. ticto</i>	33	4.0	5.1	0.77	2.41	0.0057	3.14	0.0015-0.0091	2.79-3.24	0.82	0.90±0.21
<i>C. nama</i>	32	3.5	6.9	0.75	5.91	0.0195	2.89	0.0131-0.0290	2.64 - 3.14	0.96	1.01±0.11
<i>R. daniconius</i>	40	5.2	7.1	1.17	4.12	0.0029	3.33	0.0017-0.0050	3.18 – 3.45	0.93	1.00±0.16
<i>M. vittatus</i>	30	6.4	9.4	3.36	9.58	0.0591	2.40	0.0190-0.0983	2.21-2.75	0.69	0.99±0.13
<i>L. guntea</i>	31	6.7	9.2	1.8	4.75	0.0080	2.94	0.0021-0.0150	2.29-3.19	0.74	1.07±0.12
<i>P.lala</i>	32	2.0	4.5	0.14	2.59	0.0281	2.98	0.0171-0.0368	2.70-3.01	0.78	1.04±0.29

Table 1: Length-weight Co-relation of the species under study

Discussion

The parameter 'a' represents the intercept of the regression line over log-transformed weight-at-length data (Carlander, 1977) and reflects the body shape of the species, where $a = 0.001$ represents elongated fish, $a = 0.01$ represents fusiform fish, and $a = 0.1$ represents spherical fish (Froese, 2014). As per the present investigation, the shape of *P. ticto*, *R. daniconius*, and *L. guntea* is elongated, while *C. nama* and *P. lala* are fusiform in shape. The shape of *M. vittatus* is from fusiform to a nearly spherical shape. The 'b' parameter represents the

slope of the regression line over log-transformed weight-at-length data, and values between 2.5 to 3.5 represent a normal distribution (Carlander, 1969). However, there is a slight deviation in the 'b' value from normal in *M. vittatus* and *L. guntea*, with a lower value of less than 2.5. Le Cren (1951) suggested that the ideal fish maintains an isometric growth pattern ($b = 3$), but can deviate from the normal value and show an allometric pattern which may be negative ($b < 3$) or positive ($b > 3$). *R. daniconius* (3.18 – 3.45) and *M. vittatus* (2.21-2.75) showed largely

positive and negative allometry, while other species showed all forms of growth pattern, i.e., isometric, positive, and negative allometry. The deviation in the 'b' values is attributed to differences in the length ranges, sex, fullness of stomach, environment, etc. (Li et al., 2014; Moutopoulos & Stergiou, 2002). Moreover, the coefficient of correlation (r^2) value was lowest in *M. vittatus* (0.69), followed by *L. guntea* (0.74) and *P. lala* (0.78). The highest value was found in *C. nama* (0.96), followed by *R. daniconius* (0.93) and *P. ticto* (0.82). The deviation in value may be attributed to different stages of growth or other reasons (Ali et al., 2013). The findings of the 'b' and ' r^2 ' values showed a more or less synergistic relationship and suggest that there are certain factors that influence the deviations from normal. The condition factor (K) determines the general wellness of a species and records the highest value in *L. guntea* (1.07 ± 0.12). However, the values didn't differ much from 1 in all the studied species.

Conclusion

LWRs are very important to understand many aspects of fish growth, which include the growth pattern, shape, and wellness of any species. The floodplain wetlands are rapidly diminishing due

to anthropogenic activities that result in the destruction of the habitat and breeding ground of many indigenous fish species. This study envisages the understanding of such six species from the floodplain wetlands of Assam.

References:

- 1 Ali A., Dahanukar N., Raghavan R. (2013). Length-weight and length-length relationship of three species of snakehead fish, *Channa diplogramma*, *C. marulius*, and *C. striata* from the riverine reaches of Lake Vembanad, Kerala, India. *Journal of Threatened Taxa*, 5(13): 4769-4773.
- 2 Baruah U.K., Bhagowati A.K., Talukdar R.K. and Saharia P.K. (2000). Beel Fisheries of Assam: Community-based Co-management Imperative. *Socscience*, 23: 36-40.
- 3 Carlander K.D. (1969). *Handbook of freshwater fishery biology*. The Iowa State University Press, Ames, 1: 752-753.
- 4 Chong, J. (2005). *Protective Values of Mangroves and Coral Ecosystem: A Review of Methods and Evidence*; IUCN: Gland, Switzerland, 36-38.
- 5 Dey S.C. (1981). *Studies on the hydrobiological condition of some beels of Kamrup district of Assam and their bearing on fish production*. Final technical report, North Council, Shillong, 177-178.

- 6 Froese R., (2006). Cube law, condition factor, and weight-length relationships: history, meta-analysis, and recommendations. *Journal of Applied Ichthyology*, 22: 241–253.
- 7 Froese R., Thorson J.T., & Reyes Jr. R.B. (2014). A Bayesian approach for estimating length-weight relationships in fishes. *Journal of Applied Ichthyology*, 30(1): 78-85.
- 8 Imam T. S., Bala U., Balarabe M. L., & Oyeyi T.I. (2010). Length-weight relationship and condition factor of four fish species from Wasai Reservoir in Kano, Nigeria. *African Journal of General Agriculture*, 6 (3): 101-136.
- 9 Le Cren ED. (1951). The length–weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*). *J. Anim. Ecol*, 20: 201-219.
- 10 Li Q., X X. L., & Huang J. R. (2014). Length–weight relationships of 16 fish species from the Liuxihe national aquatic germplasm resources conservation area, Guangdong, China. *Journal of Applied Ichthyology*, 30: 434–435.
- 11 Moutopoulos D. K., & Stergiou K. I. (2002). Length–weight and length-length relationships of fish species from the Aegean (Greece). *Journal of Applied Ichthyology*, 18: 200–203.
- 12 Nayak N., & Biswas S.P. (2020). Wetland shrinkage: A threat to the indigenous fish population of Assam. *NeBIO*, 11(1): 7-8.
- 13 Osho E.F., & Usman A.R. (2019). Length-weight relationship, condition factor, and fecundity of African Snakehead *Parachanna obscura* from the Anambra River, South-East Nigeria. *Croatian Journal of Fisheries*, 77(2): 99-105.