



Short Communication

Length-Weight Relationship of Freshwater Mussel *Lamellidens marginalis* (Lamarck, 1819) from the River Burhi Gandak, North Bihar, India

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ABSTRACT

The length-weight relationship of freshwater pearl mussel, *Lamellidens marginalis* (Lamarck, 1819) were collected and analyzed during the sampling months July 2020 to June 2021 from the River Burhi Gandak. The collected mussel specimens (n = 995) were found to be in the 30 to 80 mm shell length, and 3.1 to 36.7 g shell weight. The results length-weight relationship $W = 0.495L^{2.504}$ and the calculated R^2 value was 0.731. The growth pattern of freshwater mussel was found to be (b = 2.504) negatively allometric. The findings of the present study will provide a baseline data for the effective and efficient management of the freshwater mussel resources along the River Burhi Gandak, North Bihar, India.

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Authors' Contribution

SC sample collection, species identification and preparing the first version of manuscript. HSM critical reviewing of the research work and reviewing drafts of the manuscript for final approval. SC data analysis and curation. OS, RPD, S literature collection.

Key words

Growth pattern, Negative allometry, *Lamellidens marginalis*, River Burhi Gandak, Bihar

The bivalves are the key component biota, contributing significantly to the food chain and play a crucial role in maintaining the health of the ecosystem (Diouf *et al.*, 2017). In India, freshwater resources were distributed in various forms such as rivers, reservoirs, dams, lakes, and ponds and considered frequent places to find this mussel for collection (Natarajan and Susithira, 2016). Several species of bivalves have the unique capacity to generate pearls with a high market value, in addition to providing food for people, and their colorful, beautiful shells were of immeasurable value to people (Dey *et al.*, 2016; Ghiselin, 2009). It has been shown that the production of bivalves influences the aquatic ecology by enhancing the region with phytoplankton, zooplankton and macro invertebrates, which increases the aquatic population and enhances fish productivity (Oliver *et al.*, 2008).

The freshwater mussel belonging to the family Unionidae have gained importance among environmentalists recently. The freshwater mussels were considered as the one among the other commercially important species of bivalves in the freshwater ecosystems and distributed widely in India, Myanmar, Bangladesh and Nepal (Madhyastha *et al.*, 2010). The freshwater mussels were consumed by indigenous tribes and aids in traditional fishing in India (Natarajan and Susithira, 2016). This species were vital from an environmental and socioeconomic aspect internationally and play a significant role in aquatic habitat (Ramesha and Sophia, 2015).

Although having the potential and nutrition, the species are threatened by a various factor, which include fishing, overharvesting, environmental degradation, turning water bodies into farmland, water pollution, and a lack of knowledge on the ecological aspects of this species in an ecosystem (Mondol *et al.*, 2016; Nahar *et al.*, 2019). Being resource in the Indian subcontinent due to its ability to produce pearls as nutrition for humans and other animals and cosmeceutical, medicinal, and ornament purposes (Pradhan *et al.*, 2020).

Length-weight relationship (LWR) is the most important components used in assessment and management in fisheries (Park and Oh, 2002). Allometry and condition

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index data for freshwater mussels from the Indian region are lacking (Ramesha and Sophia, 2015). The current investigation was carried out to provide more about the allometry and growth pattern of *L. marginalis*, inhabiting the River Burhi Gandak at North Bihar, India. In this perspective of the present study was made as an effort to determine the length-weight relationship of *L. marginalis* in order to manage the healthy stocks of mussel species along the River (Pradhan *et al.*, 2020).

Materials and methods

The freshwater mussel collected on the monthly basis from from July 2020 to June 2021. The River Burhi Gandak origin in the West Champaran district from the spring of the Someshwar hills. The total catchment area of 12,500 sq km, with 10,150 sq km in Bihar and the rest in Nepal. At an elevation of 300 meters, in north latitude 27°29" and east longitude 84°8" and finally meet into the River Ganga at Khagaria district of Bihar. Sites were selected based on their physical environment similarities and accessibility. The sampling sites were Motihari (Site-1: Latitude 26°56'06"N, Longitude 85°05'13"E), Muzaffarpur (Site-2: Latitude 25°61'14"N, Longitude 85°63'70"E), and Khagaria district (Site-3: Latitude 25°50'08"N, Longitude 86°48'12"E), respectively.

The freshwater mussel, were collected by hand picking and bamboo made traps (Ghana) net. Vernier calipers were used to measure the shell precisely to 0.05 millimeters. The total weight of each mussel was measured (Ramesha and Sophia, 2015). The length-weight relationship was estimated using following formula $W=aL^b$ proposed by Le Cren (1951). This equation can be written as follows after logarithmic transformation of length-weight data:

$$\log W = \log a + b \log L$$

where W is the weight of mussel in grams, L is its total length of mussels in mm, a is the regression curves intercept (a body form-related coefficient), and b is the regression coefficient (exponent indicating isometric growth; Froese, 2006). The coefficient of determination was used to determine the degree of association between the variables (R^2) to compare the b value to the isometric value of $b = 3$ (negative allometry $b < 3$ or positive allometry $b > 3$).

Results

The findings of the LWR estimation of the freshwater mussel under study are shown in Table I, which also includes the sample size, shell length, shell weight, 95 % confidence limits for this species. The present study b value was estimated to be 2.504 and coefficient of determination (R^2) value estimated as 0.731.

Discussion

The present study sets a new record for wild specimens of this species, with the total shell length and shell weight estimated for *L. marginalis* being 80 mm total length and 36.7 g body weight. The previous highest total length and weight value of recorded were 73 mm total length and 36.4 g weight (Suryawanshi and Kulkarni, 2014). Despite the fact that our work provides both a new TL_{max} and TW_{max} for *Lamellidens marginalis*. The length-weight relationships had coefficient of determination (R^2) of 0.731, which indicated that they were significant and showed superior predictive value and less data variability. For the length-weight relationship of *L. marginalis*, the predicted growth coefficients value (b) was 2.504. According to Suryawanshi and Kulkarni (2014), the length-weight relationship for *L. marginalis* had b value of 2.608, in Nanded region, Maharashtra which appeared to be a higher lower than the current estimates of 2.504. When the length-weight relationship, the regression coefficient value (b) equals 3, the species often grows isometrically. Differences in the species relative growth value (b) reported from several locations shows regional variations in the species' length-weight relationships (Kumar *et al.*, 2012). A better comprehension of freshwater mussel cultivation and management may result from the study, which might further support in conserving and management the valuable stock of pearl mussels.

Conclusion

The findings of this study would be a baseline data for strengthening the Freshwater mussel resources thereby development and implementation of regulations by fishery managers.

Table I. Length-weight relationship of freshwater mussel *Lamellidens marginalis*.

Species	Sample size (N)	TL range (mm)		TW range (g)		Regression parameters				GCS (Global conservation status)
		Min.	Max.	Min.	Max.	a	95% CL a	b	95% CL b	IUCN/CITES
<i>Lamellidens marginalis</i>	995	30	80	3.1	36.7	0.505	0.405-0.604	2.504	2.195-2.813	LC

N, sample size; TL, total length; TW, total weight; a, intercept; b, slope; CL, confidence limits; R^2 , coefficient of determination; LC, least concern.

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IRB approval

Approval have given for the article by the Advisory Committee Members of RPCAU- College of Fisheries, Dholi-843121, Bihar, India.

Ethical statement

Not applicable as no live specimens were used in the present study.

Statement of conflict of interest

The authors have declared no conflict of interest.

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