



<https://doi.org/10.53032/tvcr/2025.v7n3.43>

A Morphometric Study of Cultured Fresh Water Pearl Mussel *Lamellidens marginalis*

Vijiyata Singh Rathour

Department of Zoology,
Sharda Devi Degree College, Jhansi, U.P., India
Vijiyatarathour20@gmail.com

Vijay Kumar Yadav

Department of Zoology,
Bipin Bihari College, Jhansi, U.P., India

Abstract

Environmental parameters, such as water temperature, have been shown to be major factors influencing pearl mussel shell growth and biomineralization process. A pearl has structural and chemical properties similar to the pearl nacre of the shell interior. Its shape is determined by the irritant foreign body and its quality by the secretion nature of pearl sac thus the outer epithelium of the mantle tissue is the keynote in the “orchestra” of bio-mineralization of pearl (Simkiss and Wada 1980). The freshwater pearl mussel, *Lamellidens marginalis* commonly found at Betwa river was cultured in the culture pond at Bipin Bihari Degree College, Jhansi in nets bags with bamboo/wire frames for 10 months. Measurements were taken of the length, height and total body weight for morph metric study in different seasons. The present study investigates the length and height in each period of culture showed good growth in the summer season and less in the winter season. It was found that the effect of water temperature, in culture pond impact on pearl quality a linear relationship and the shell length increased, as the temperature increases along with the same linear relationship.

Keywords: Temperature, Biomineralization, *Lamellidens marginalis*, Nacre

Introduction

Morphometry is described as the study of relationship between increases of one body parameter to the other. It is known that animals change their shapes and sizes, their body proportions may also change. The most popular wealth of mussels in India is *Lamellidens marginalis*, *L. corrianus*, and *Parreysia corrugata* (Janki Ram et al. 1992). There have been several morphometric studies done for bivalves. Specifically, these works were conducted to differentiate species, determine shell dimension-volume relationships. A general assessment of the freshwater pearl mussel often includes shell size (length, height and width) and mussel weight wet and dry. This metric has been used, for example, in analyses of the morphological development of the shell (Anderson and Gutreuter 1983; Gosling 2003). In this region no attempt has been made to culture these animals for the production of pearl, present work was undertaken to produce pearl from *L. marginalis* and also to find effect of temperature on mortality, growth, and secretion of nacre in these mussels.

Material and Method

Lamellidens marginalis collected from freshwater bodies around Bundelkhand region and subjected to pre-operative conditioning for two days. By keeping in surgical trays to ensures proper relaxation of adductor muscles in preparation for surgery. The average length, weight and height were calculated with the help of normal scale, vernier caliper and weight with the help of digital weighing machine. The shell of mussels was of tagged numbers on the basis of insertion date. 10 mussels were measured with normal scale and verniar caliper and number was tagged on their shell. Individual mussels were taken up for a particular mantle cavity insertion method as this is the appropriate and simple technique for the designer pearl production. The handmade designer nuclei made by shell powder were used for the insertion process. Postoperative care is an important step in freshwater pearl culture operation that is required for the implanted mussels to recover. The implanted mussels are placed at the rate of three mussels per bag in a ventral side up position for a period of 10 days. Sufficient care is taken to allow free opening and closing of the shell valves for respiration. The units are daily examined; dead mussels and those that reject the nucleus are removed. The implanted mussels are placed in nylon bags (1.0 cm mesh, 12 x 14 cm) at three mussels per bag and cultured. The Physico-chemical parameters and water level of the ponds are monitored throughout the culture period. At the end of the culture period (10 months), harvesting was done. The mussels were sacrificed for collection of pearls. 22 specimens of *Lamellidens marginalis* were selected for the morphological study of mussels. Length and height were measured with scale and weight with a weighing machine. Monthly changes in length, weight and height recorded. The average length, weight and height were calculated on the basis of tag numbers on the shell of mussels. Mussels were observed at regular intervals to measure the increment of length in mussels.

Result and Discussion

Growth study

Per month the mussels were measured. It was observed that the mussel showed increment in size and weight. Maximum length 2.727%, Height 3.846%, Weight 1.949% increment gain was observed during the Nov- Aug (10 Months) study period (Table 1).

Mussels gain good growth in the summer season and less in the winter season. In summer the plankton production was good due to high temperature that is the important reason for good growth rate. (Table1). Similar observations are also made by earlier researchers for example (Gimin, *et al.*, 2004, Jagadis and Rajagopal 2007, Jayalakshmy *et al.*, 2013, Suryawanshi and Kulkarni 2014, Natarajan and Susithira 2016, Sereflisan *et al.*, 2016) studied the growth of freshwater mussels, *Lamellidens marginalis*. The shell length, height, width, weight, tissue weight and total weight of mussels during the study period were studied.

Table 1

Descriptive statistics parameters of the cultured freshwater pearl mussel *Lamellidens marginalis* during Pond culture

	Initial length (cm)	Final length (cm)	Initial height (cm)	Final height (cm)	Initial weight (cm)	Final weight (cm)
Mean	9.27454	9.85474	2.19090	2.33636	73.01455	76.46182
SD	0.88149	1.17934	0.23531	0.21007	17.7180	18.2742

Length increment

The present investigation reveals that the temperature was positively co relate to the Length. As the temperature increases the length of mussel also shows increment (Table 2).

10 mussels were measured with the help of normal scale and vernier caliper and number was properly tagged and hanged in the culture pond for 10 months (Nov-Aug). growth of mussels were observed at regular intervals and recorded the increment in length of mussels in cm. It is evident from the data presented in table no 13 graph 3 that temperature has a positive correlation with the increase in length of mussels. This relation was also analyzed statistically using regression co efficient. For this analysis of regression co-efficient, mean and standard deviation were also calculated and the findings were also calculated and the findings were presented in graph 3 which show that length and temperature have a linier relationship (A.V. Suryavanshi 2019,2015 and Debora et al. 2009)

Table 2
Month wise variations between Temperature and Length from Nov-Aug

Month	Nov	Dec	Jan	Feb	Mar	Apr	Ma y	Jun e	July	Au g	Mean (Σx)	SD (σ)
Tem p (°C)	24	23	24	25	26	26	27	28	27	26	25.6	2.24
L (Cm)	10. 5	10. 5	10. 52	10. 55	10. 59	10. 65	10. 73	10. 82	10. 87	10. 9	10.66 3	0.148 32

Co-relation Co-efficient between Temperature and Length increment= 0.54238

$$r = \frac{\sum(x - \bar{x})(y - \bar{y})}{n\sigma_x\sigma_y}$$

Length and Temperature are positively co- related.

Regression co-efficient

$$b_{LT} = r \frac{\sigma_L}{\sigma_T} = 0.03591$$

Regression Line of length on Temperature

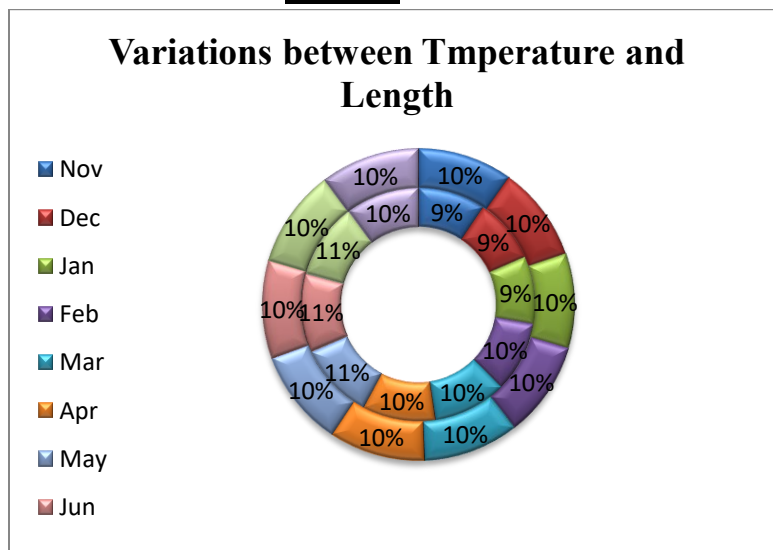
$$L - \bar{L} = b_{LT} (T - \bar{T})$$

$$L - 10.663 = 0.03591 (T - 25.6)$$

$$\boxed{L = 0.03591 T + 9.743704}$$

The equation shows the relation between Length and Temperature.

The equation shows the relation between Length and Temperature. The temperature was positively co-related to the Length. As the temperature increases the length of mussel also shows increment. In this equation by putting the value of temperature of water body the value of length of mussel was easily determine. The relationship between temperature and the length of mussels can also be derived by using the above formula $\{L = 0.03591 T + 9.743704\}$.

Graph 1

The graph explains the positive relationship between temperature and length of mussels. During the summer season when temperature rises, the length of shell increases.

Conclusion

Growth study showed good gain in mussel's length, height and weight in under observed conditions. We found that increasing temperature leads to the good growth of mussels and good growth of mussels shows good nacre secretion signs. Mortality rate depends upon the temperature, increasing temperature leads to heavy mortality. Nacre secretion depends upon the availability of food, temperature and physicochemical parameters of water.

Acknowledgement

The author is also thankful to Bipin Bihari Degree College, Jhansi for providing the facilities to carry out this work.

References

1. Anderson RO, Gutreuter SJ (1983). Length, weight, and associated structural indices. In: Nielsen LA, Johnson DL (eds) Fisheries techniques. American Fisheries Society, USA, p 300.
2. Gosling E(2003). Bivalve molluscs: biology, ecology and culture. Fishing News Books, Oxford.
3. Janki Ram, K. and Tripathi, S.D(1992). A manual on fresh water pearl culture. Manual series 1: 44 p. Central institute of fresh water aquaculture, Bhubaneshwar , India.
4. Suryawanshi A. V. and A. N. Kulkarni (2015). Nacre Secretion with Respect to Temperature in Fresh Water Bivalvel *Parreysia corrugata* from Nanded Region, Maharashtra. *International journal of pure and applied biosciences*. 3 (4): 33-36p.

5. Suryawanshi A. V. and A. N. Kulkarni (2019). Comparative study of length-weight relationship of *parreysia corrugata* (muller), and *lamellidens marginalis* (lamark), from Nanded region, Maharashtra (India). *Indian J.L.Sci.* 3 (2): 77-80p.
6. Gimin R., R. Mohan, L.V. Thinh and A.D. Griffiths (2004). The relationship of shell dimensions and shell volume to live weight and soft tissue weight in the mangrove clam, *Polymesoda erosa* (Solander, 1786) from northern Australia. *NAGA, 32 WorldFish Center Quarterly* V.27 3-4p.
7. Debora P.; Antonio O.; Walter A. P. B.; Marcio R. P (2009). The effect of temperature and body size on filtration rates of *Limnoperna fortunei* (Bivalvia, Mytilidae) under laboratory conditions. *Braz. arch. biol. technol.* vol.52(1).
8. Jayalakshmy KV, Maheswari Nair, Dileep kumar R and Vijayan M(2013). Biometric and morphometric studies of *perna viridis* and *perna indica* along the southwest coast of India: a statistical approach. *Journal of Experimental Biology and Agricultural Sciences*, Volume – 1(4).
9. Şereflişan Hülya and Mahmut A. Gokçe(2016). Growth Performance of the Freshwater Mussel, *Unio terminalis delicates* (Lea, 1863) (Mollusca: Bivalvia: Unionidae) in the Golbasi Lake, Turkey. *Pakistan journal Zool.*, vol. 48(4): 1109- 1115p.
10. Suryawanshi A. V. and A. N. Kulkarni (2014). Length-weight, length-height, and height-weight relationship of *Parresia corrugata* from Nanded region. *Indian journal of Applied and pure biology*, 29 (1): 133-137p.
11. Natarajan Nirmala and R. Susithira(2016). Studies on Growth and Survival Rate of Pearl Freshwater Mussel *Lamellidens Marginalis* during the Culture in a Pond. *IOSR Journal of Pharmacy and Biological Sciences*, Volume 11, Issue 1 Ver. II, 36- 42p.
12. Jagadis I. and Rajagopal S(2007). Age and growth of the venus clam *Gafrarium tumidum* (Roding) from south-east coast of India. *Indian Journal Fish*, 54(4): 351- 356p.