LENGTH-WEIGHT RELATIONSHIP OF FRESH WATER PULMONATE SNAIL *INDOPLANORBIS EXUSTUS*

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Abstract

The present work carried out on the length-weight relationship of freshwater pulmonate snail *Indoplanorbis exustus*. The snail population ranged between 3-17 mm shell lengths were collected from local pond near Aurangabad, Maharashtra, India and maintained in large plastic jar troughs with continuous water refreshment and aeration. Length of snail was calculated with the help of vernier caliper. The total live weight, dry tissue weight, wet tissue weight and shell weight were measured with nearest 0.01mg on one pan electronic balance. Parameters of the length (L) and weight (W) relationship were estimated by using the formula $W = aL^n$. The relationship between shell length and different parameters was also compared and discussed. It has been found that the rate of increase of length in relation to width is proportional at every stage of its growth, but when it attained the maturity stage, the growth of snail increased very slowly.

Key words: Length – weight relationship, vernier caliper, *Indoplanorbis exustus.*

Introduction

The study of length – weight relationship in animals is a basic biostatistical approach in biology and is usually applied in molluscs and fisheries research also. The allomatric relationship provides important information about comparative growth of various body parameters. In molluscs, the growth rates of various parts of the body are not uniform as the relative proportions of the body change with increase in size. Length-weight and Allometric relationship in pulmonate snail *Cassidula nucleus* Martyn was well studied by Shanmugam (1997). Environmental influences on shell allometry have been suggested by Vermeif (1980). The shell allometry and soft tissue weight relationship for mussels, clams, bivalves and gastropods was done by Okumus and Stirling (1995), Appleyard and Dealreris (2001), Orban *et al.*, (2002).

Length – weight relationship of intertidal molluscs from Mumbai, India was studied by Jaiswar and Kulkarni (2002). The relationship of shell dimensions and shell volume of *Polymesoda erosa* was described by Gimin, *et al.*, (2004). Though the numbers of reports were available on the length – weight relationship and allometric relationship of molluscs, the available information on gastropod particularly on pulmonate snails was limited. Ramasamy *et al.*, (2013) described length-weight and allometry relationship of a cuttlefish *Sepia pharaonis.* Variation in the Allometric relationship may occur between reproductive activity and age. The allometric relationship provides important information about comparative growth of various body parameters. A proper understanding of allometry in various body parts is essential to define the growth of a species. The morphometric characters and their allometric relationship are to a large extent is influenced by age, local environmental condition and pollution density of the species (Schaefer *et al.,* 1985).

An attempt had been made in the present probe on freshwater pulmonate snail *Indoplanorbis exustus*, to correlate the length-weight relationships between various morphological characters. The freshwater snail *Indoplanorbis exustus* is widely distributed in various parts of the India, and commonly available in the area where study was undertaken in Aurangabad, Maharashtra.

Materials and Method

The snails *Indoplanorbis exustus* ranged between 3-17 mm shell lengths were collected from local pond near Aurangabad, Maharashtra, India. The snails were maintained in tap water in laboratory for acclimatization. The sorting was done to make groups of snail population ranged between 3- 17 mm, with 2 mm class intervals. Total eight groups of snails were cultured. Animal length, animal width, aperture length, aperture width were measured for each group of snails. Length of snail was calculated with the help of vernier caliper, with an accuracy of 0.1mm. The total live weight, dry tissue weight, wet tissue weight and shell weight were measured with nearest 0.01mg on one pan electronic balance. The soft body was dried in a hot air over at a constant temperature of 60^{O}C for 24 Hours to obtain dry tissue, later it was weighed with accuracy.

The parabolic equation $W = aL^n$ was used to study. It can be expressed in Logarithmic form as: - Log W = log a + n Log L i.e. Y = a + bX; Where, a = log a, b = n, Y = Log W & X = Log L

Which is linear relationship between X and Y.

To find out the difference, if any between length and weight, the data were subjected to ANOVA. The relationship between two characters can be expressed by the general equation. Y = a + bX

Where, Y = Some measures of a part.

X = Measures of the whole body.

b = Slope of curve.

The relationship between shell length and different parameters was examined using linear regression. The parabolic equation $W = aL^{n}$ was used in logarithmic forms as

log W = Log a + n log L I.e. Y = a + bX

The correlation coefficient values for different parameters are calculated. Different parameters like length of shell (AL), Length of aperture (APL), width of snail (AW) width of aperture (APW), Total weight (TW), dry tissue weight (DW), Wet tissue (WW), and shell weight (SW), were measured and S.D values of these parameters are calculated.

Result and Discussion

The Relationship of snail shell length, width, aperture width, total weight, tissue weight, dry tissue weight has been depicted in graphs I and II. Each parameter shows strong correlation with other parameters. In fig. I, it has been noted that length and width growth was directly proportional; till the snail reached 13mm length, later the width growth was slowed down. Similarly in fig. II, dry tissue weight increased along with length but later on it did not showed linear growth. From the snail 13 mm the dry tissue weight and width of snail increased parallel. Again the different parameters of weight increased rapidly up to 13 mm length.

The rate of increase of length in relation to width is proportional at every stage of its growth. From figure, it has been clear that the rate of growth in the first few months was faster, but when it attained the maturity stage, the growth of snail increased very slowly. After maturation the energy was utilized for the other activities reproduction and their fight against adverse climatic conditions, up to some extent; growth of snail decreased. When animal weight was taken as basic index, it was found that small sized snails grow rapidly (From 34.4mg – 590mg) but the snails of weight 590mg above, increased slowly as compare to young (immature) snails.

The difference may be due to decrease in the growth rate in mature snails. Since most of the energy was utilized for the other physiological activities, particularly for reproduction rather than growth. *I.* e*xustus* show egg-laying activity at the size of about 7 – 9 mm shell length. But in libratory condition they show activity of egg-laying from 9 mm shell length. When we compare total length of shell with weight of the species, like in other animals, in these molluscs too, the rate of growth by weight is faster than their length (Cren, 1951). The linear regression and correlation coefficient (r) for the various parameters for snail were shown in Table-I, showed high degree of interdependence in the length- weight relationship.

In *I. exustus*, each parameter showed strong correlation with other parameter. The rate of increase of length in relation to width is proportional at every stage of its growth. Similarly the shell length to shell width relationship of *C. radiate* was also linear (Ismail *et al.,* 1999). It has been observed that the rate of growth in first few months was faster, but it attained the maturity stage, the growth of snail increased very slowly. From the statistical results, it had been observed that the decrease in growth rate in mature snails, because most of the energy is utilized for the other physiological activities, particularly for reproduction rather than growth. Changes in the habitual allometry of length- weight relationships are associated with the increase in size and sexual maturity as observed in other molluscan species (Shanmugam, 1994, 1997).

Conclusion

The present study revealed that the length- weight relationship of *I. exustus* showed an allometric growth. It provides base line information on length- weight relationship of *I. exustus*, which is very much constructive for the study of biology and distribution along the Indian waters. Length- weight relationship between all parameters can be used for scrutinize the growth of this species in the natural stipulation.

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Table- I

Character	AL	AW	APL	APW	TW	SW	WW	DW
AL	-	0.992	0.979	0.916	0.962	0.959	0.930	0.961
AW	0.992	-	0.967	0.884	0.940	0.945	0.909	0.957
APL	0.979	0.967	-	0.933	0.969	0.961	0.948	0.950
APW	0.916	0.884	0.933	-	0.957	0.920	0.932	0.868
TW	0.962	0.940	0.969	0.957	-	0.985	0.983	0.955
SW	0.959	0.945	0.961	0.920	0.985	-	0.981	0.976
WW	0.930	0.909	0.948	0.932	0.983	0.981	-	0.943
DW	0.961	0.957	0.950	0.868	0.955	0.976	0.943	-

Correlation coefficient (r) values for the snail *Indoplanorbis exustus* significant at 0.01 levels.

AL- Animal Length; AW- Animal Weight; APL- Aperture Length; APW- Aperture Width; TW- Total Weight; SW- Shell Weight; WW- Wet Weight; DW- Dry Weight.

Fig. I Allometric relation of length with different parameters of snail *I. exustus,* AL-animal length, AW-animal width, APL-aperture length, APW-aperture width

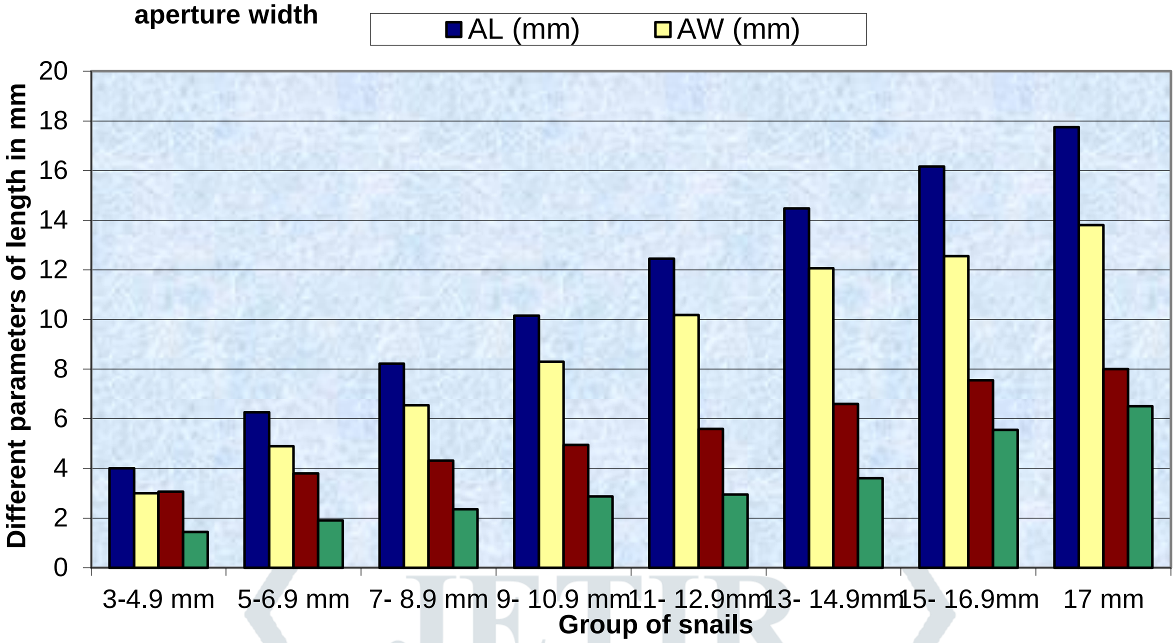

Fig. II Allometric relation of shell length with different parameters of weight in snail *I. exustus* TW-total weight, WW-wet weight, DW-dry weight