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Observations on the Morphological Parameters of the Freshwater Snails Bellamya Dissimilis and Lymnaea Acuminata

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ABSTRACT

The study was conducted on the morphological aspects such as shell shape and shell dimensions of freshwater snails *Bellamya dissimilis* and *Lymnaea acuminata*. The shell of *B. dissimilis* is globular in shape with broad ovate mouth and 4-5 whirls that are dextrally rotated. Shell length and shell width ranges from 2.3-3.9cm and 3.2-5.9cm respectively. Snail *B. dissimilis* gives birth to a large number (120-130) of fully developed young ones measures up to 0.2-0.5cm in length. The shell of *L. acuminata* is tapering conical with 3-5 whorls that end in dextral opening of shell. Shell length and shell width ranges from 1.2-2.7cm and 1.9-3.5cm respectively. The snail is hermaphrodite and breeds almost throughout the year, this snail contains the egg clutches and each egg clutch contains 170-180 eggs.

Introduction

Molluscs are a part of the invertebrate macro fauna of freshwater habitats throughout the world. A study of freshwater snails is of great value to malacologists because of their role as intermediate hosts of the larvae of a variety of trematode parasites (Yamaguti, 1975; Brown, 1978, Afshan *et al*, 2013). Mollusca provide unique ecosystem services including recycling of nutrients and they provide a prey base for small mammals, birds, snakes and other reptiles (Reddy *et al*, 2013).Freshwater snails belonging to the genus *Bellamya* and *Lymnaea* are common species of the family Viviparidae and Lymnaeidae respectively. In malacology, shell morphology has been useful in describing, identifying, characterizing (Wullschleger *et al*, 2002) and study on morphology (i.e. size and shape) has been an important aspect in any biological fields, such as anatomy, ecology, systematic and phylogeny (Madan *et al*, 2015). The Pulmonate basommatophoran includes several families of freshwater snails, among which is the family Lymnaeidae.

The difference between the shape, size, and whirls of shells can be seen by observing variety of viviparous species (Smith, 2000), and it have traditionally been used as an informative source of systematic characters (Chiu *et al*, 2002). Some snails have their coils opening to the right of their shells (dextral coiling), whereas the coils of other snails open to the left (sinisterly coiling).In present study both the species of *Lymnaea* and *Bellamya* shells are dextrally coiled. Except Neotropical region, the genus *Bellamya* is distributed throughout the world (Preston, 1915).The snails belong to family Lymnaeidae and Viviparidae are generally hermaphrodites where both sperm and eggs are produced either simultaneously or sequentially in the same individual. Usually but not always, simultaneous hermaphrodites are not self-fertile. Although they are hermaphroditic, they generally copulate for exchange of sperms.

Freshwater snails are diverse and occupy various aquatic environments including man-made ponds and ditches throughout the globe (Watson *et al*, 2004 and Strong *et al*, 2008). Total numbers of species inhabiting the freshwater ecosystem are few as compared to marine ecosystem and our knowledge of this group is rather limited (Subha Rao, 1989). Among Indian Planorbid Molluscan population of Pulmonate Gastropoda, very little is known regarding their importance as a food source and as vector (Das *et al*, 2015). In the present paper the attempt has been made to collect base data to know the morphological characters of freshwater snails *Bellamya* and *Lymnaea* species commonly available.

Materials and Methods

The freshwater snails *Bellamya dissimilis* and *Lymnaea acuminata* were collected from different location sites in the city and nearby Aurangabad in summer season (Feb-May 2016). *Lymnaea acuminata* were collected from the artificial pond located in botanical garden of Dr. Babasaheb Ambedkar Marathwada University campus, Aurangabad. The geospatial location of collections spots is at Latitude: 19º54'9.58" N and Longitude: 75º18'42.29" E for *Lymnaea* and for *Bellamya dissimilis* it was at Latitude: 19˚37'57.44" N and Longitude 75˚14'30.41"E, the Godavari river near Kaygaon Toka, Pravara Sangam, Aurangabad.

Fig 1.Satellite view showing the location of Godavari river site, Kaygaon Toka.

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Fig 2. Artificial Pond in Botanical Garden. University, Campus. Aurangabad.

Time of sampling was between 9:00 AM to 12:00 PM by hand picking using hand gloves and snails were carried in the laboratory in plastic bottles. The snails were washed with tap water and were maintained in large plastic trough with continuous water refreshment and aeration. A total of 200 snails of each species were collected and their morphometric details were recorded with the help of Vernier Caliper and total body weight was measured by using electronic weigh balance.

The snail species were got identified by Zoological Survey of India (ZSI) Pune. For the morphometric study measurements of shells were taken.

Results

The morphometric study of the snails was performed based on five parameters: Animal Shell Length (ASL), Animal Shell Width (ASW), Aperture Length (APL), Aperture Width (APW) and Total Body Weight (TBW). The mean shell length and shell width of *B.dissimilis* was 3.141±0.281cm and 4.503±0.428cm respectively. The mean aperture length and aperture width was 1.199±0.118cm and 0.948±0.085cm respectively, and the mean total body weight was 2.042±0.495gm.

The animal shell length of snail *B.dissimilis* ranges between 2.3-3.9cm, animal shell width ranges between 3.2-5.9cm, aperture length ranges from 0.9-1.9cm, aperture width ranges from 0.7-1.1cm and total body weight ranges from 0.68-3.55gm.

The mean shell length and shell width of *L.acuminata* was 1.980±0.295cm and 2.702±0.333cm respectively (Table 1). The mean aperture length and aperture width was 1.231±0.155cm and 0.660±0.090cm respectively, and the mean total body weight was 0.454±0.094gm.The animal shell length of snail *L.acuminata* ranges between 1.2-2.7cm, animal shell width ranges between 1.9-3.5cm, aperture length ranges from 0.3-1.8cm aperture width ranges from 0.4-1.0cm and total body weight ranges from 0.24-0.82gm(Table 1).

Table 1. Morphometric measurements (ranges, Mean±SD) of freshwater snail B. dissimilis and L. acuminata.

Parameters Measurements(cm)	Animal Shell Length (ASL)	Animal Shell Width (ASW)	Aperture Length (APL)	Aperture Width (APW)	Total Body Weight (TBW gm)
Bellamya dissimilis	2.3-3.9	3.2-5.9	0.9-1.9	0.7-1.1	0.68-3.55
	3.141±0.281	4.503±0.428	1.199±0.118	0.948±0.085	2.042±0.495
Lymnaea acuminata	1.2-2.7	1.9-3.5	0.3-1.8	0.4-1.0	0.24-0.82
	1.980±0.295	2.702±0.333	1.231±0.155	0.660±0.090	0.454±0.094

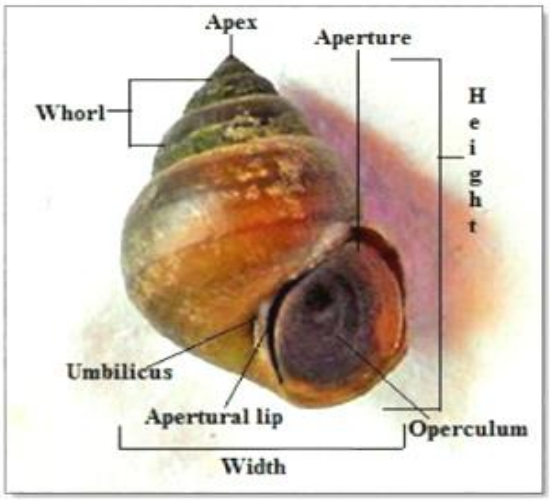

Fig 3. Bellamya dissimilis (Mueller, 1774).

Systematic Position
Phylum: Mollusca
Class: Gastropoda
Sub-class: Prosobranchia
Order: Archietaenioglossa
Family: Viviparidae
Sub-family: Bellamyinae
Genus: *Bellamya*
Species: *dissimilis*

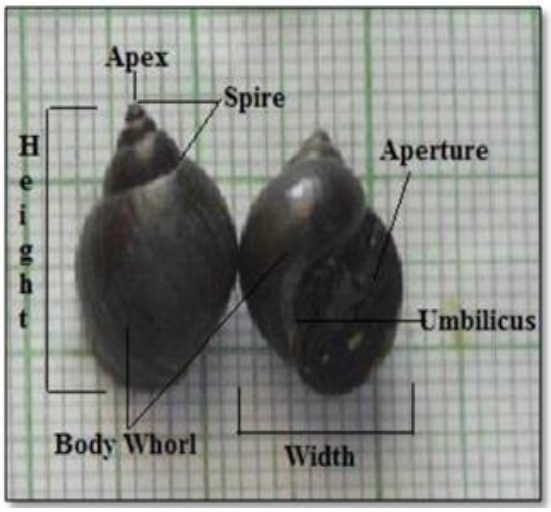

Fig 4. Lymnaea acuminata (Lamarck, 1822).

Systematic Position
Phylum: Mollusca
Class: Gastropoda
Sub-class: Pulmonate
Order: Hygrophila
Family: Lymnaeidae
Sub-family: Lymnaeinae
Genus: *Lymnaea*
Species: *acuminata*

Bellamya dissimilis

(Mueller, 1774): The shell is conical and globular in shape, high and narrow, broadly ovate, Shell is greenish and brownish in colour. 4-5 body whorls indistinctly angulated; spire swollen and suture deeply impressed, without dark spiral bands, Shell of *Bellamya dissimilis* is dextrally coiled with a large aperture and bluntly pointed spire, rim of the aperture often black, the umbilicus is small and partly covered by the parietal lip of the aperture.Shell length and shell width ranges from 2.3-3.9cm and 3.2-5.9cm respectively.

This species shells are usually covered with the moss like alga. Prosobranch gastropods possess a shell lid it is called an operculum which shows the lines of growth, grown to the foot end, so it closes the shell aperture, the snail withdrawn into the shell. Besides closing their shell with it, operculum is used for locomotion. The operculum is deep brownish in colour. *Bellamya* species belongs to Viviparidae family which gives directly birth to the young ones. Instead of laying egg masses, the snails brood their young ones. This snail gives birth to a large number (120-130) of fully developed young ones measures up to 0.2-0.5cm in length.

Lymnaea acuminata

(Lamarck, 1822): The shell is conical in shape; there are usually 3-5 whorls that show increasing in size. Shell of *Lymnaea* is blackish in colour. Shell length and shell width ranges from 1.2-2.7cm and 1.9-3.5cm respectively. As compared to the snail *B.dissimilis L.acuminata* does not have the shell lid i.e. operculum and umbilicus is very small as compared to *B.dissimilis.* Aperture is oval and large and collumella twisted. *Lymnaea acuminata* is a species of freshwater snail in the family Lymnaeidae. The snail is hermaphrodite and breeds almost throughout the year, snail when produce egg clutch found that in one egg clutch there are 170-180 eggs are present. The juveniles measures about 0.2 cm in length (from apex of shell to margin of aperture) and adult snails about 3.5 cm. they are herbivorous feeding upon aquatic vegetation. This snail lives in stagnant water such as ponds, lakes etc. It easily survives in polluted waters.

Discussion

Gastropods are unsegmented, unsymmetrical mollusks provided with univalve, spirally coiled shells. In gastropods, the body whorl or last whorl is the most recently formed and largest whorl of a shell terminating in the aperture. It is called body whorl because most of the body of the soft parts of the animal fits into this whorl. In both the species the height of the spire and the body whorl shows variation. Among the freshwater pulmonates, the snails belonging to family Lymnaeidae are most widely used in various types of research works. The snails of the Genus *Lymnaea* are important members of freshwater ecosystems. (Omole A.J *et al*, 2005) reported that snails shell increases as the body size increases and tha the shell makes up 30-40 % of the whole body by weight. In snail *Lymnaea* both dextral and sinisterly forms are found in nature, with sinisterly individuals representing up to 2% of the population (Wandelt J *et al*, 2004). The snail *L.acuminata* serves as intermediate host of some trematodes and other helminthes parasites which cause severe disease to domestic animals. They are serious agricultural and horticultural pests and also form an important link in aquatic food chains (Pande, 2008). In our previously published data (Jadhav *et al*, 2016), the morphometric measurements of period of June-Sept 2016 showed slight variation as compared to the present work. In monsoon season snail *Bellamya dissimilis* shell measurements were : average shell length 2.65±0.42cm, shell width 4.45±0.56cm, aperture length was 1.05±0.11cm, aperture width 0.79±0.12cm and total body weight 1.60±0.16g . There was an increase in values of all parameters as compared to monsoon season data of snail *Lymnaea acuminata* (Shejwal *et al* 2016) too. The monsoon data were: average shell length 1.696±0.282cm, shell width 2.466±0.353cm, aperture length 0.903±0.144cm, aperture width 0.499±0.080cm and total live weight 0.286±0.124g. The variation found may be due to change in the atmosphere, the water temperature recorded in monsoon season was 26.75±2.36 and during summer season was 30.75±1.70.

The results obtained by Afshan *et al*, 2013 showed the range of shell length (1.2-1.8cm) and shell width (0.57-0.96cm) of *L. acuminata* with the mean 1.52±0.03cm and 0.76±0.018cm of shell length and shell width respectively, number of whorls 4 having the shell brown in colour and are dextrally rotated. The aperture length and aperture width showed somewhat similar results obtained in the present study (Table 1), aperture length ranges from 0.3-0.8cm and aperture width ranges 0.4-0.8cm and the mean aperture length and aperture width was 1.10±0.02cm and 0.62±0.02cm respectively. They showed results of *Bellamya bengalensis* from pothwar region, Pakistan mean shell length and shell width was 2.65±0.06cm and 1.72±0.03cm respectively with 5 whorls, shell greenish or brownish in colour, and dextrally coiled. In studies of Pande, 2008 he observed during oviposition the gelatinous egg masses; each contains 50-100 eggs or even more, and is deposited on the substrate.

The adult Viviparidae (mystery-snail) females bear live young ones inside its specialized marsupium mantle cavity indicating the recruitment patterns in natural habitat (Afshan, *et al*, 2013). Adult shells of *Bellamya chinensis* are uniform in colour without banding and vary between light to dark olive-green and brownish as similar characters shown in *Bellamya dissimilis*, there are up to seven whorls that are convex and have a clear suture (Menno Soes D, *et al*, 2011).The morphometric measurement of shell of various gastropod snails is very interesting job in malacology. Hence, shell morphometrics is used as primary guideline for species identification in the "general handbooks" and the taxonomic literature of mollusks (Chiu, *et al*, 2002). And even after death the shells are suitable for us so as to record the information about snail's life histories and environmental habitats (Astor, 2014). To this end we are currently characterizing these snails, which will further help in delineating these species and further work needs to continue to look upon the seasonal morphometric variation and physico-chemical analysis.

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