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Morphometric studies of the tropical leatherleaf slug *Laevicaulis alte* from prachi belt of Odisha

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Abstract

The present study emphasizes the morphometric studies on a tropical leatherleaf slug *Laevicaulis alte* (Class: Gastropoda, Order: Systelommatophora, Family: Veronicellidae) recovered from Prachi belt of Odisha at Adaspur, Cuttack. The specimens (N=18) were collected from the college garden and traditional morphometric analysis was conducted in the laboratory. A significant positive correlation was obtained between the biological parameters like length-live weight (0.943), length-circumference (0.898), circumference-live weight (0.823). Considering these three sets of morphometric variables in the species i.e; live weight and length, length-circumference, live weight-circumference fitted regression equations were also developed like ($Y = 0.998x - 2.307$, $R^2 = 0.888$), ($Y = 0.607x + 0.017$, $R^2 = 0.806$), ($Y = 0.536x + 1.671$, $R^2 = 0.678$) respectively.

Keywords: *Laevicaulis alte*, Garden Pest, Morphometry, Odisha

1. Introduction

The tropical leatherleaf slug or leatherback slug *Laevicaulis alte* is African in origin^[1] but has been introduced to southern Asia, Australia and many Pacific Islands^[2]. *L. alte* (Ferussac) is a serious agrihorticultural slug pest in India and neighbouring countries^[3-9] which is also considered as invasive^[10]. Host plants include lettuce, spinach and coriander^[7] as well as tobacco^[11]. *L. alte* has also been recorded as a pest of flower beds in India and has been found feeding on a number of ornamental plants including balsam, portulaca, marigold, verbena, dahlia, cosmos, narcissus and lily^[12]. As a serious garden pest it can seriously damage seedlings and young plants of bean, cabbage, gourd, lettuce and marigold^[13]. Another report states that this species has been found to damage oil palm seedlings^[14]. In the present paper we present some preliminary results of morphometry of pestiferous slug *L. alte* recovered for the first time from the Prachi river bed in the State of Odisha.

L. alte is commonly referred as the "tropical leatherleaf or lined leatherback slug". The mantle is leathery and its surface has a slightly granulated appearance. Shell is absent. Mantle is covering the entire dorsum and overlapping the head. The keel is tan colored. A pair of eye-bearing tentacles protrudes anteriorly from underneath the mantle when the animal is active. The tentacles are 2-3 mm long and rarely extend beyond the tip of the mantle^[15]. The mantle is dark brown to blackish, with a pale line running more or less the entire length of the dorsum. An inferior pair of tentacles present on the head is bilobed and inconspicuous. The ventral side is broad, with a broad hyponotum on either side of a narrow foot. The foot is transversely grooved and is separated from the rest of the body by a groove. The foot is 4-5 mm wide in adults and 1 mm wide in juveniles. The foot is pale cream coloured and the mucus produced is sticky, milky white when the slug is irritated, but otherwise is colourless^[16]. The length of the species can be extended up to 12 cm^[10]. The respiratory orifice and anus are ventral, at the posterior side of the body^[17].

The species has several adaptations like leathery dorsal surface and narrow foot to reduce evaporation for living in dry conditions. A good summer rainfall and increased relative humidity provide a favorable environment for growth and abundance of the species^[17]. Individuals of the species are protandric hermaphrodite i.e.; they change sex from male to female during their lifetime. After mating eggs are deposited in a depression in the soil. Eggs attach to each other with the help of interconnecting thread forming a string that shapes into a ball-like mass. To maintain high humidity levels *L. alte* deposits the special fecal pellets on the top of the eggs that contain high concentrations of soil. This slug hatches from eggs and can reportedly grow from 0.5 cm to 4 cm in length in 7 months. Eggs are oval and translucent,

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measuring 6 to 8 mm in length^[10]. Hatching occurs around 1-3 weeks with new born slugs measuring around 7-8 mm in length. The young one reached maturity in five months^[2]. In India, *L. alte* breeds during monsoon season, while South African populations breed in the warm, rainy summer months^[10]. *L. alte* has shown two distinct feeding peaks, both in the early and late hours of the night^[2] and are known to be nocturnal herbivores^[16]. Detailed anatomical investigations have also been made by different scientists^[18, 19].

2. Materials and Methods

2.1. Study area

The samples (N=18) were collected from the Garden of Udayanath Autonomous College of Science & Technology, Adaspur located on the Prachi river bed of Cuttack District of Odisha. The field work was conducted in the study site during daytime starting from the month of June/July with the onset of south-west monsoon because the rain stimulates the summer aestivating slugs to emerge in large numbers. The animal was cultured in the laboratory during the period of study up to the month of October, 2014 to observe the morphology as well as the reproductive behavior of the species.

2.2. Morphometric measurements

The specimens were hand collected wearing gloves and kept in polythene covers provisioned with holes for aeration. The specimens were now safely transported to be cultured in the well maintained terrarium in the laboratory of the Department of Zoology for the purpose of morphometric analysis. Morphological parameters like total body length in stretched condition and circumference at the widest region of the body were measured using thread and centimeter scale and live weight (g) was recorded using electronic digital balance.

2.3. Statistical analysis

Statistical analysis (Standard deviation, Correlation, Regression) of the above said morphometric parameters were performed using SPSS software 19.0 version. Regression analyses for the three morphometric variables i.e., live weight; circumference and length were conducted and graphs plotted with fitted regression equations for the total number of samples^[20, 21].

3. Results and Discussion

The morphological features of *L. alte* were keenly studied and photographed in the laboratory of the department (Figs.1-3). Such morphometric observations of *L. alte* were analyzed and reported from Odisha in the present paper for the first time.



Fig 1: Dorsal View

Fig 2: Ventral View

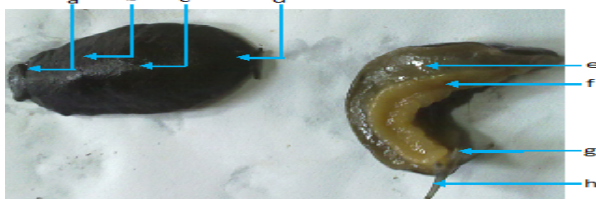


Fig 3: Morphological features of Garden Slug (a=Tail region; b=Mantle; c= Keel; d= Head region; e= Hyponotum; f= Foot; g= Inferior tentacle; h= Tentacle)

The values of descriptive statistics of morphometric parameters are reported in Table-1 given below.

Table 1: Descriptive Statistics of the sample (N=18)

Morphometric Parameter	Minimum	Maximum	Mean	±SD
Length (cm)	4.4	6.5	5.71	±0.66
Circumference (cm)	2.8	4.00	3.48	±0.45
Live Weight (g)	2.55	4.00	3.38	±0.69

A significant (at 1 % level) positive correlation was obtained between the parameters length-live weight (0.943**), length-circumference (0.898**), live weight-Circumference (0.823**). Fitted regression equation was obtained for the species considering three sets of morphometric variables i.e., length and circumference, live weight and circumference, length and live weight, (Y= 0.607x + 0.017, R² = 0.806) (Fig.4), (Y= 0.536x + 1.671, R² = 0.678) (Fig.5) and (Y= 0.998x - 2.307, R² = 0.888) (Fig.6) respectively.

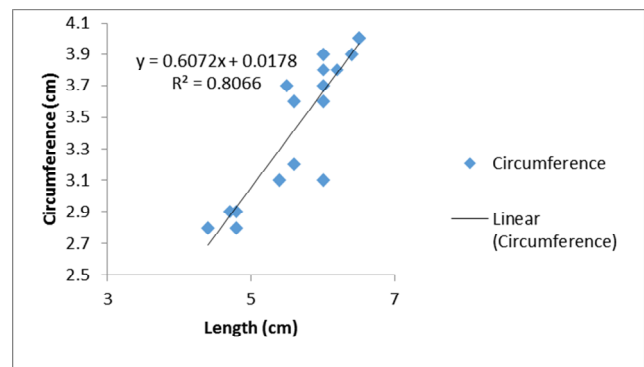


Fig 4: Regression analysis plots for (Length-Circumference)

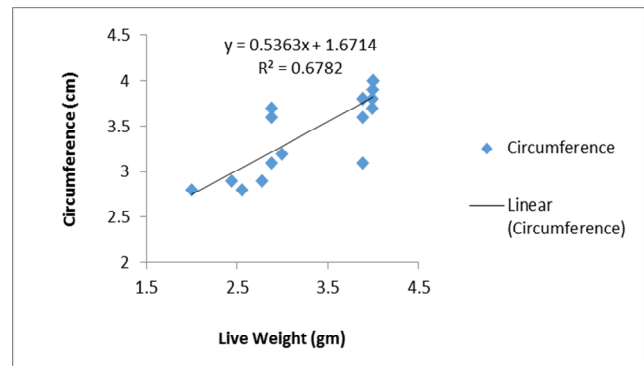


Fig 5: Regression analysis plots for (Live weight-Circumference)

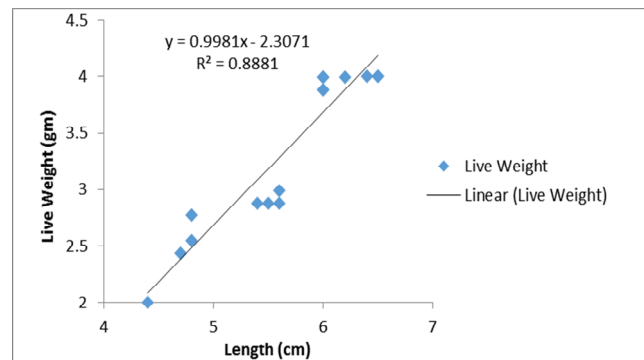


Fig 6: Regression analysis plots for (Length-Live weight)

Similar studies were also undertaken for the same species from Bangalore region [20]. Studies on the morphometry of another terrestrial slug *Mariella dussumieri* Gray (Stylommatophora: Ariophantidae) from Bangalore region was also conducted reporting similar results [21]. In both the observations a significant positive co-relation has been recorded between the three parameters as it is obtained in the present investigation. The present observations are preliminary and first of its kind from Odisha that intends to contribute for the understanding of eco-biology of pestiferous slug *Laevicaulis alte* considering the spread of such invasive species and emergence of molluscs as pests in agri-horticultural ecosystems of coastal belt of Odisha. As focus on their management is now becoming highly necessary, information on their biology which is scarce in India must be thoroughly analyzed. Hence, the data generated in the present analysis would contribute in this regard. Further studies encompassing field and laboratory observations on the eco-biology of the species need to be undertaken from different localities of Odisha.

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