

Research Article – Zoology

## Ecology and population studies of land slug, *Laevicaulis alte* in shahada region

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### Abstract

The land slug, *Laevicaulis alte* is very commonly found in and around shahada tehsils. These are hermaphrodite and reproduce by cross fertilization. The annual reproductive cycle passes through three phases. The pre-reproductive phase is the preparatory phase in which accumulation of various nutritive molecules occurs. The preparatory phase occurs before onset of monsoon. The monsoon is the breeding phase in which availability of water and moisture in the environment influences the breeding activities. They lay about 22-26 eggs in a chain of mucus like jelly found in humus or under any substratum and decaying leaves in and around moist area. Slugs in Dongargaon (Site-A) and Manarad (Site-B) habitat were observed in Shahada city area. The population correlation studies between alkaline nature (pH) of soil and number of slugs in Site-A is  $r^2=0.13$  and in Site-B is  $r^2= 0.61$ . The rainfall in the season is the prime factor that might causes fluctuations in the breeding activities. The population and breeding behaviour of *Laevicaulis alte* is studied in shahada area. In present work the correlation of ecological changes and breeding cycle of a land slug *Laevicaulis alte* is studied during June 2015 to March 2016.

*Key words:* Land slug, *Laevicaulis alte*, breeding, ecology, population.

### Introduction

Mollusca is the second largest phylum after Arthropoda. Molluscs found in about all types of habitat and are most successful group of animals in terms of ecology and adaptations. Mostly in recent studies there has been an increasing interest in exploring systemic, population and ecology of mollusks because many species of molluscs are being used by various countries as food, medicine, ornament, etc. Varieties of gastropods serve as intermediate hosts of some trematode parasites which causes number of diseases to man and domestic animals. Several investigations were undertaken on varieties of animals of freshwater system. The Indian gastropods have been studied

by a number of workers. Hora (1925 and 1926) studied on the hill stream molluscan fauna of Pune, Maharashtra. Tonapi (1971) published an account of land and freshwater molluscs from Pune. Kulkarni (1973) studied on terrestrial and freshwater molluscs of mrathwada region. An extensive investigation exclusively on gastropods has been made by Raut (1981); Raut and Ghose (1984); Subba Rao and Ghose (2001). The gastropods of Indian regions are studied by many workers. Burch and Pearse (2003), Magare (2006) studied on land molluscs of North Maharashtra region of India. The present work is an attempt to report the occurrence of land slug, abundance and richness of a slug *Laevicaulis alte*, in and around shahada region.

Many slugs act as pests as they cause damage to crop plants, garden plants and forestry. Generally, slugs prefer moist, shady and decaying zone of land. Slugs predominantly prefers cold places of environment (Moens and den bruel, 1960,

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Godan 1983). Slugs are smooth, moist and slimy which are more active in monsoon. Slugs, *Laevicaulis alte* feeds on plants, tubers, humus, decaying matters, including some commercial crops. *Laevicaulis alte* slug releases much mucus as on offence in disturbed state. Many slugs in India and Europe lay eggs in late monsoon and in winter. (Getz, 1959, Kulkarni, 1973). The biological rhythms of course are dependent on the varied photoperiods play a key role in metabolism and in seasonal cycles. (Newell, 1966, Morton, 1979; Magare and Kulkarni, 1993 and Panigrahi, 2000). *Laevicaulis alte* feeds on varieties of fruits and vegetables in fields and gardens like, tomato, brinjal, cucumber, potato, cabbage, carrot, etc. and some germinating seeds in forest. (Raut and Panigrahi, 1988; Magare, 2015).

In present work an attempt was made to study the population, breeding behaviour and seasonal activity pattern in a slug, *Laevicasulis alte*, correlation of ecological changes and breeding cycle of a land slug *Laevicaulis alte* is studied during June, 2015 to March, 2016 in Shahada area from Dongargaon (Site-A) and Manarad (Site-B).

### Materials and Methods

**Study area:** Shahada is one of the big city area in Nandurbar district in India. The population, breeding behaviour, seasonal activity pattern in a slug, *Laevicasulis alte*, correlation of ecological changes and breeding cycle of a land slug *Laevicaulis alte* is studied during June, 2015 to May, 2016 in shahada area from Dongargaon (Site-A) and Manarad (Site-B) parts. Both sites have good habitat for feeding and breeding and breeding of slugs with vegetation. Observations and data collection were made in field area during June, 2015 to March, 2016.

**Sample Collection and Observation:** The slugs, *Laevicaulis alte* were collected by hand picking using gloves to prevent infection from slugs. Sample collection was made in field area from two sites i.e. Dongargaon (Site-A) and Manarad (Site-B) parts. The catch from each sampling stations was recorded from 3×3 sq. meter quadrant. The average of three quadrants was taken as a unit of study. After counting the numbers of the creeping slugs, the data of soil pH and numbers of eggs laid is noted. The identification of slug was carried out as per the records of samples

previously identified by Zoological Survey of India, Kolkata. Simultaneously the average sized maximum samples observed in length width range were recorded. Observations on number of egg laid were made in every month (Fig. 2).

### Results and Discussion

**Taxonomy:** Land slug *Laevicaulis alte* is a gastropod mollusk belongs to family veronicellidae of the order systellomorpha. The species found randomly scattered in Dongargaon (Site-A) and Manarad (Site-B) part of shahada abundantly. *Laevicaulis alte* is an endemic to India and found widely distributed throughout India (Fig. 1).

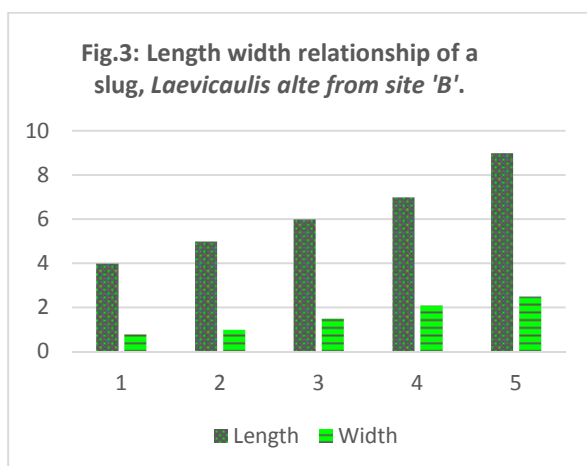
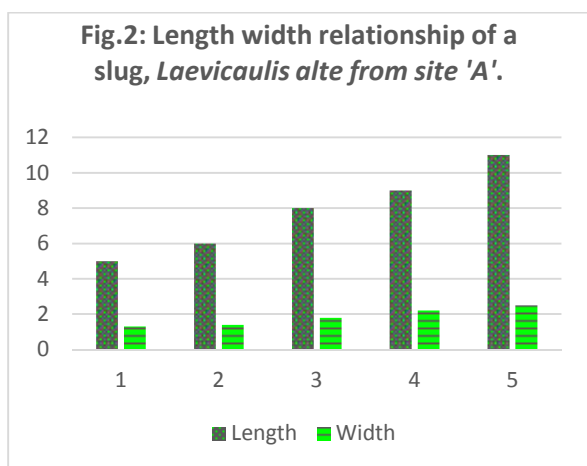


**Fig.1: Land slug, *Laevicaulis alte*.**

**Soil Parameters:** To know the ecology of slug, *Laevicaulis alte* the soil parameters from the study site was made. Mostly the slugs prefer low temperature ranges between 22-26°C. and alkaline soil rich in organic carbon. The PH of soil ranges between 6.8 to 7.8 sites of collection in Shahada area. The slugs are abundant in moist and humus rich soil.

**pH and numbers relationship:** The pH of soil ranges between 6.8 to 7.7 in Dongargaon site and 7.3 to 7.7 in Manarad sites of collection in Shahada area. The slugs were collected from Site-A area ranges in length between 5.0 to 11.0 cm., width between 0.8 cm to 2.5 cm and population recorded is 8-18 per quadrant whereas those from Site-B area are ranges between 04 to 09 cm. and width 1.3 to 2.5 cm. are 12-30 per quadrant were recorded (Figs. 2 and 3). The significant differences between the pH of soil and standard length sizes of the slugs might be due to feeding competition, available food quality, more enemies and changed

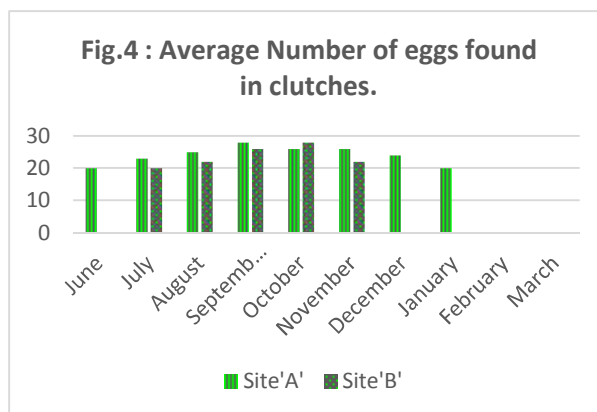
climate in their habitat. The population correlation of the slugs with pH from Site-A is  $r^2=0.13$  and in Site-B is 0.61



**Egg laying:** The slugs *Laevicaulis alte* are nocturnal. During day time they hide inside stones, wood or decaying leaves and come out their dwellings an hour after the sun set and remains active up to early morning. They prefer late monsoon and early winter for breeding and egg laying. Slugs lays about 22-28 eggs in the form of a beaded string in a mucous jelly. The number of adult slugs, *Laevicaulis alte* in a set of samples showing growth and development of body and reproductive organs as per the arbitrary criteria and development of reproductive organs.

Slugs were observed from natural grassland and vegetation ground from both sites and data is collected. The numbers of egg clutches found in different habitats of site-A and Site-B are recorded (Fig. 4). The reproductive behaviour of slugs

shows secretion of dart with swellings of erected penial apparatus in body. The excited partners are approaches towards one another and communicate the confirmation by tentacles. Secondly they release excess mucus and moving both mating partners one behind another in a small circle on a ground. Finally, male matured releases sperms in the vagina of female matured slug. Copulation lasts for about 40-50 minutes.



Rainfall is more apparent among all environmental factors which cause meaningful changes in reproductive activities of slugs. The mating process among terrestrial slugs was observed in a slug, *Arion empiricorum* (Kunkel, 1900), and *Limax* and other limacids (Gerhardt, 1934). In *Laevicaulis alte* usually courtship occurs when close circular movement of the mating partners on ground and then winds both partners close together for copulation. The present results partly correlated with the finding of Kunkel, (1900) on *Limax* slug.

Seasonal changes in temperature and pH influences reproduction in a slug, *Laevicaulis alte*. They also prefer alkaline soil and show more population density whereas in area where humidity is not in favourable range the density of slugs is less. They prefer moist and cold environment which is in favourable range during monsoon, so rainfall is the key factor regulating maximum activity of a slug, *Laevicaulis alte*. Present findings correlate with the work of Panigrahi (2000).

*Laevicaulis alte* prefers 17-20° C. (Moens and Van elen Bruel, 1960) Whereas slugs *Limax flavus* prefers, 21-27° C. range of temperature. The slugs cannot tolerate continuous high temperature and they undergo deep in soil or inside stone, wood or any

suitable substratum. The activity of many slugs shows rhythm city which is endogenous (Lewis, 1969). Slugs *Laevicaulis alte* are very active at night and in shady and cloudy climate. The results correlate with the findings of white (1959). The activity rhythms of *Laevicaulis alte* are more in evening and night. The rhythmic activities of slugs are also controlled by humidity and rainfall.

### Conclusion

Population of Land Slugs, *Laevicaulis alte* was made from eastern and western area of shahada. The land slug, *Laevicaulis alte* is very commonly found in and around shahada tehsils. These are hermaphrodite and reproduce by cross fertilization. The annual reproductive cycle passes through three phases- preparatory, breeding and spent. They lay about 22-28 eggs in a chain of mucus like jelly. Slugs in Manarad (Site-A) and Dongargaon (Site-B) habitat were observed in Shahada city area. Studies between alkaline nature of soil and number of slugs in Site-A is  $r^2=0.78$  and in Site-B is 0.62. The rainfall in the season is the prime factor that might causes fluctuations in the breeding activities. The population and breeding behaviour of *Laevicaulis alte* is studied in shahada area. In present work the correlation of ecological changes and breeding cycle of a land slug *Laevicaulis alte* is studied during June, 2015 to March 2016. The statistical correlation observed between pH of soil and number of samples in Site-A is  $r^2=0.13$  and in Site-B is 0.61

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