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Major Pestiferus Snails and Slugs of Paschim Medinipur: an Account on Diagnosis, Damage and Control

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ABSTRACT

Land snails and slugs form an important component in the forest ecosystem. In terms of number of species composition, the phylum Mollusca, to which land snails and slugs belong, is the largest phylum after Arthropoda. Mollusca serves unique ecosystem services including recycling of nutrients and they also serves as a prey for small mammals, birds, snakes and other reptiles or even carnivorous molluscs. However, land snails have the largest number of species extinctions, compared to any other taxa. Till date 1,129 species of land snails are recorded from IndianTerritory. Present study is a regular survey work performed during January, 2019 to December, 2019 on pestiferous, terrestrial mollusc of Paschim Medinipur district. Result depicts that two land snails namely *Achatina fulica* and *Macrochlamys indica* and one slug,*Laevicaulis alte* are major pest on crops, orchards and nurseries of flower and ornamental plant of Paschim Medinipur district. Beside record, their nature of damage and adopted control measures are being reported here.

INTRODUCTION

Molluscs are the second largest group of animals in the world and mostly distributed in the tropical region. Molluscs exploit all most all habitat of the world except icecaps as because they are poikilothermic animal. They are commercially viable, nutritionally enriched and ecologically sound group of valuable organism, play important role in ecosystem service. Land snails and slugs include several distinct terrestrial gastropods and belong to the second largest phylum after arthropods in terms of number of species composition with more than one lakh named species (Lydeard et al. 2004). Terrestrial gastropods constitute about six per cent of the total species on Earth (Clark & May 2002). A large part of molluscan fauna in many tropicalregionsoftheworldisstillpoorly explored.They are an important component of the forest ecosystem by recycling nutrients (Graveland et al. 1994; Dunk et al. 2004) and are prey for a number of small mammals, birds, reptiles, amphibians and other invertebrates, including carnivorous mollusc (Deepak et al. 2010). Terrestrial mollusc population is largely depends upon the soil calcium content, moisture

contain and P^H of the soil. In calcium poor habitats land snails can form an important source of calcium for other animals. Terrestrial molluscs also serve as an indicator of ecological conditions, and are very sensitive to climatic change (Shimek 1930; Simone 1999; Èejka & Hamerlík 2009). Thus, they are useful for reconstructing past environments (Bar-Yosef Mayer 2002; Gümü° 2009).

Literature survey shows that a few workers like, Blanford (1863; 1870 and 1880) gave contribution to Indian Malacology by giving description of new genera and species of terrestrial mollusc from various parts of India. Preston (1915) gave description of freshwater gastropods, Annandale (1919) and Annandale and Prashad (1919) gave description of some freshwater molluscs from Bombay Presidency in Records of Indian Museum, Hora (1925) gave information of molluscs from Western Ghats, in Bombay Natural History Society. Tonapi and Mulherkar (1963) and Tonapi (1971) gave contribution to studies on freshwater molluscs of Poona district of Maharashtra in Bombay Natural History Society. Subba Rao andMitra (1979), Subba Rao (1989) and Surya Rao et al. (2002) gave description of freshwater snails from Poona district of Maharashtra and other part of India in Zoological Survey of India, Kolkata. Indian Malacology was pioneered by William Henry Benson (1803-1870), who contributed significantly to our knowledge on Indian land snails in the mid-19th century (Naggs, 1997). From India 1488 species of snails and slugs belonging to 26 families and 140 genera have been recorded (Ramakrishna and Mitra, 2002 and Madhyastha, et al., 2004). The molluscan fauna of West Bengal has not been studied thoroughly and the available information on the terrestrial molluscs is scattered. Molluscs being epidemic remain undiscovered or under described, partly because of insufficient exploration and partly because of their often minute size (Madhyastha, et al., 2004). Land snail research, in India has truly been at snail's pace (Aravind, et al., 2005; 2008; 2010 and Aravind and Naggs, 2012). More recent studies in India, have mainly concentrated on inventorying regional snail faunas (like state or protected areas), checklist of district fauna (Chanda, 2017) and less on species description, ecology and conservation. Little information is available on species limits, distribution ranges and patterns of diversity. Recent analysis of Indian land and freshwater molluscan literature has confirmed that there are hardly some studies found on the ecology and conservation of Indian land snails compared to the wide range of historical literature available on taxonomy (Aravind, et al., 2010). In the period of intensive study, there was a drastic decline in studies on Indian land snails. There are no studies on the population status (except, Rout, 1986), phylogeny and taxonomic revision of different families or genera of Indian land snails (Sen, et al., 2012). Present report of pestiferous snail and slugs of Paschim Medinipur is certainly being the addition of regional knowledge of macro-faunal diversity of the area under study.

MATERIALS AND METHODS

Specimens were collected from selected three Blocks Garbeta-1, forest best ecosystem; Midnapur sadar, municipal ecosystem and Debra, agriculture based ecosystem are tabulated with latitude and longitude in table-1.

Table-1. Study Sites in Paschim Medinipur District

Sl. No.	Name	Longitude & Latitude
1	Garbeta-1	22̊ 51′36″N&87̊ 21′36″E
2	Midnapur Sadar	22̊ 25′53.6″N&87̊ 19′5.48″E
3	Debra	22̊ 22′8.6″N&87̊ 33′15.9″E

Specimens were collected by hand picking in the early morning and preserved in 70% alcohol in the department of Zoology, Raja N. L. Khan Women's College (Autonomous), Midnapur, Paschim Medinipur, West Bengal. Identification of species is done following existing literature (Towie, A. 1989; Aravind, et al., 2005; 2008; 2010 and Aravind and Naggs, 2012).

RESULT AND DISCUSSION

During the present study author identified three major and common molluscan pests in the study area. Two snail species namely *Achatina fulica* (Ferussac, 1821) and *Macrochlamys indica* Benson, 1832 and one slug, *Laevicaulis alte* (Ferussac, 1822) are the major molluscan pest in the study area. Their systematic position, diagnosis, damage and control measure are given bellow.

Achatina fulica (Ferussac, 1821)

Achatina fulica is a giant land snail, native to East Africa, fast growing, polyphagous plant pest. It has been introduced from its native place to many part of the world as a commercial food source for human consumption, pisciculture and fodder for livestock management.

Systematic Position

Phylum: Mollusca

Class: Gastropoda

Superfamily: Achatinoidea

Family: Achatinidae

Genus: Achatina

Species: *A. Fulica* (Ferussac, 1821)

Diagnosis

Achatina fulica has a narrow, conical shell, which is twice as long as it is wide and contains 7 to 9 whorls when fully grown (Fig. 1). The shell is generally reddish-brown in colour with weak yellowish vertical markings but colouration varies with environmental conditions and diet. A light coffee colour is common. Adults of the species may exceed

20cm in shell length but generally average about 5 to 10cm. The average weight of the snail is approximately 32 grams.

Fig. 1: A. Fulica from RNLKW College garden, Midnapur.

Damage

Achatina fulica is one of the most destructive pests affecting subtropical and tropical areas, causing large damages to farms, commercial plantations and domestic gardens. It can also be found on trees, decaying material in decomposition and next to garbage deposits. Furthermore, *A. fulica* could be an intermediate host of *Angiostrongylus costaricencis*, the etiological agent of abdominal angiostrongylosis and its dispersion could imply a possible risk of transmission of this disease (Mead, 1995). The Giant African Snail (*Achatina fulica*Bowdich, 1822) promotes substantial ecological and economic impacts in areas where it has been introduced (Raut and Barker, 2002). This herbivorous mollusc isdestroying significant amount of vegetable loss in field of Garbeta-I and Midnapur Sadar blocks of Paschim Medinipur District. It mainly feed on the foliages of divers cultivable vegetables of the study area.

***Macrochlamys indica* Benson, 1832**

The first complete description of this species was given by Godwin- Austen and the name *M. indica* is accepted (Blandford and Godwin-Austen, 1908). *Macrochlamys indica* is considered to represent a potentially serious threat as a pest, an invasive species which could negatively affect agriculture, natural ecosystems, human health or commerce.

Systematic Position

Macrochlamys indica

Phylum: Mollusca

Class: Gastropoda

Superfamily: Helicarionoidea

Family: Ariophantidae

Genus: Macrochalmys

Species: *M. Indica* Benson, 1832

A

B

Fig. 2: *Macrochlamys indica*; A, from Garbeta-I and B, from Midnapur town.

Diagnosis

The shell is perforate, depressed, smooth, polished throughout, translucent, pale brownish tawny, not distinctly striated, but with microscopic longitudinal impressed lines, slightly flexuous and not close together (Fig. 2). The spire is low, conoid. The structure is slightly impressed. The shell has 5.5 whorls that are slightly convex above. The last whorl is not descending. The last whorl is rounded at the periphery and moderately convex beneath. The aperture is slightly oblique and broadly lunette. The peristome is thin in one plane, with columellar margin is curved, oblique, and never quite vertical, carried forward and briefly reflected above. The width of the shell is 16-18.5 mm. The height of the shell is 8.5 mm.

Damage

Machrochlamys indica (Benson, 1832) is considered to represent a potentially serious threat as a pest, which could negatively affect agriculture, natural ecosystems, human health or commerce. It is polyphagous in nature and feed on several vegetables in home garden and nurseries. It eats whole leaf and stem of tender shoots and make hole on mature leaf of vegetables (fig. 2). Macrochlamysindica is common in wild areas where they thrive well on the leaves and flowers of the wild plants also. During the present study this species has been recorded from Garbeta-I and Midnapur Sadar Blocks.

***Laevicaulis alte* (Ferussac, 1822)**

Laevicaulis alte is considered a serious agricultural pest in India where it is invasive. It was first described by Férussac (1821) as *Vaginulus alte* from Central Africa. Smiroth (1914) changed it to *Laevicaulis alte*. Common name of the species is tropical leatherback slug or black slug in India.

Systematic Position

Phylum: Mollusca

Class: Gastropoda

Superfamily: Veronicelloidea

Family: Veronicellidae

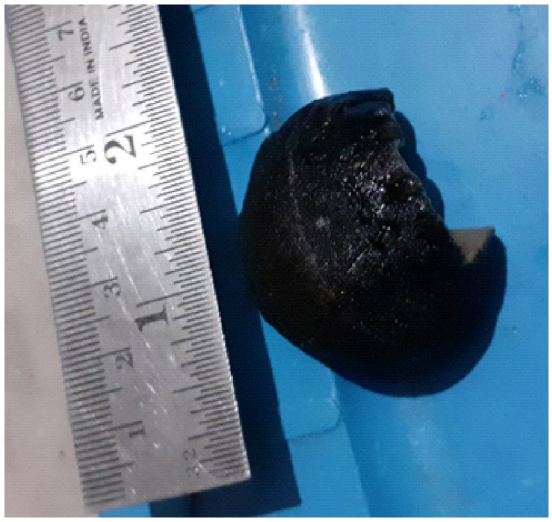
Genus: Laevicaulis

Species: *L. alte* (Ferussac, 1822)

Diagnosis

Laevicaulis alte is a round, dark-coloured slug with no shell, 7 or 8 cm long (Fig.3), when fully stretched. Its skin is slightly tuberculated. The central keel is beige in brownish colour. This

slug has a unique, very narrow foot; juvenile specimens have a foot 1 mm wide and adult specimens have a foot that is only 4 or 5 mm wide. The tentacles are small, 2 or 3 mm long, and they are only rarely extended beyond the edge of the mantle.



A

B

Fig. 3: *L. alte* ; A, Dorsal and B, ventral view, collected from Debra

Damage

Most slugs **feed at night,** and the **slime trails**, if present, can alert you to the level of activity. Damage is usually most severe during warm humid periods. Slugs can use their rasping tongues to make holes in leaves, stems, buds, flowers, roots, corns, bulbs and tubers of many plants. There are many control options available for slugs and snail but despite this they remain a persistent pest. Slugs can make a meal of a wide range of vegetables and ornamental plants, especially seedlings and other soft growth. Hosts, delphiniums, dahlias, sweet peas and tulips are regularly attacked by slugs in the study area. In the vegetable garden peas, beans, lettuce and potato tubers are often damaged. It is a most serious pest in the luminous soil of the Kansaboty River bank of Debra Block of Paschim Medinipur District.

General control measures of snails and slugs in the study area

Farmers of the study area follows mainly two type of control measures namely physical and chemical measures and their preference is to the second one.

Physical control

Hand collection with subsequent squashing of the slugs and snails is the oldest mechanical methods (Mahrous et al., 2002). Farmers of the study site simply collect and chopped the animal to reduce its population. Hand-picking during night, when the slugs and snails have left their hiding places was found effective (Hamir, 2010). Some of the farmers use sodium chloride (common salt), an effective dehydrating agent

as barrier on snail infested area. Practice of collection of the snails daily andkilling them in strong solution of common salt or in boiling water is a common practice to destroy the molluscan pest population. Some farmers also use cattle salt, caustic soda and dry quick lime as protective barriers against snail and slug infestation.

Chemical control

Majority of the farmers of the study area uses metaldehyde, methiocarb (Mesurol), common salt or combinations of these chemicals as effective molluscicides. Metaldehyde stimulate the mucous gland which cause excessive sliming and leading to death due to dehydration (Henderson, 1970; Henderson and Triebskorn, 2002; Abd El-Wakeil, 2005). Methiocarb was found more poisonous than metaldehyde against slugs (Getzin and Cole, 1964; Abd El-Wakeil, 2005). Some of farmers also use urea as toxic manure for snail and slug control of the study site.

CONCLUSION

Consequently, molluscs represent some of the most thoroughly studied pest species, with a substantive body of literature relating to population and behavioural ecology and control. Yet molluscs are also among the most intractable of pests (Barker and Watts, 2002). The pest gastropods not only directly damage the agricultural crops in the field but also lower the quality by soiling with slime and faeces. The snail affected portions of agricultural product are contaminated by rotting agents such as bacteria and fungi, which lead to further damage of fruits and vegetables in storage.Such commercially important snail and slugs are gradually increasing and infesting newer fields in the study area need effective control measure for safe guarding the crops and vegetables. Slugs grow registrant to molluscicides very rapidly and difficult to control as reported by local people. To conclude, it can be said that land mollusc density and richness were associated with abiotic factors such as rainfall and humidity as well as characteristic of soil leaf litter distribution on ground and biotic factors such as vegetation cover and various anthropogenic pressure such as land use, cattle grazing etc. So from control point of view proper management of vegetation and land use pattern should be considered to maintain a steady state of the population. Therefore, further research is needed to develop effective control measure for terrestrial molluscan pests in the area under study.

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