

## Snail: From Present Perspective to the History of Assam

Rudra N Borkakati<sup>1</sup>, Robin Gogoi<sup>2</sup>, and Birinchi K Borah<sup>3</sup>

1. Division of Entomology, Indian Agricultural Research Institute (IARI), New Delhi 110012, India
2. Division of Plant Pathology, IARI, New Delhi 110012, India  
(email: r.gogoi@rediffmail.com)
3. Regional Agricultural Research Station, Assam Agricultural University (AAU), Shillongoni, Nagaon 782002, Assam, India

Snails belong to the Phylum Mollusca and Class Gastropoda. They have a conspicuous spiral shell, made up of calcium carbonate. Normally snails hide under damp and dense vegetation during daytime and only after dusk they emerge in search of food. The pest snails have spread in recent times by travel and trade to many countries and continents, even over oceans, so that many species are now widely distributed and no longer limited to their region of origin. Thus the field slugs *Deroceras reticulatum* and *D. agreste* as well as *Arion circumscriptus* and *Lehmanna marginata* have spread from Europe to Australia and then Asia while the Mediterranean species *Cochlicella ventricosa* and *C. acute* have spread northwards (Godan, 1983). The classical example is that of the giant African snail *Achatina fulica* (Fig. 1), which was introduced into the Indian subcontinent with water hyacinth, an aquatic weed (Borkakati and Gogoi, 2008). Representatives of the Limacidae and Milacidae are found in Europe, Asia, Africa, and America. *Deroceras reticulatum* has spread to South America and *D. caruanae* to California and

South Africa and later to India. Amongst the Stylommatophoran snails, the Mediterranean *Heleix aspersa* has spread worldwide, and is today a pest throughout Europe including England and Sweden and even in Asia. *Theba pisana* from Mediterranean region has become a pest of Western Europe, South Africa, Saudi Arabia, and America. Apart from human activity, the spread of molluscs can result from winds (hurricanes) and birds (Newell, 1966).

### Snails as carriers of diseases in humans, animals, and plants

Snails may directly transmit disease, or they may serve as intermediate hosts for parasites of humans and animals. Since *Deroceras* spp. and *Arion* spp. feed readily on human and animal feces, they ingest worm eggs and disperse them with their own excreta. Alternatively, these sources of infection may adhere to the slime present on the body of the snail and as they crawl around, the worm egg may be deposited

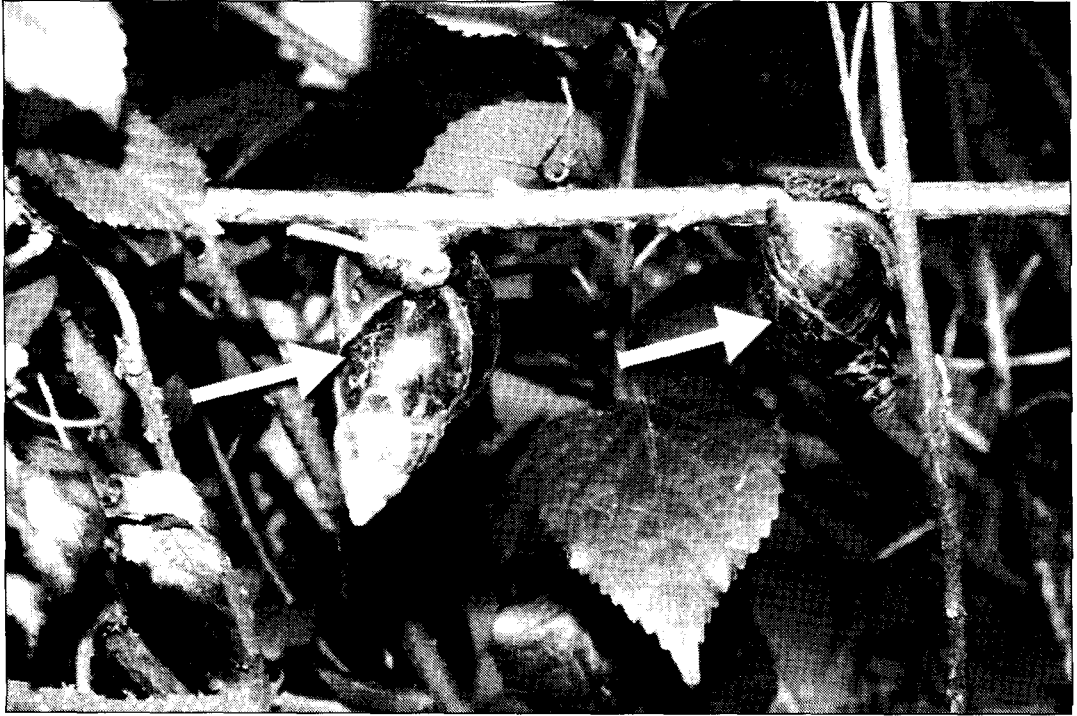


Figure 1. Giant African snail (*Achatina fulica*) on *Hibiscus* sp.

on vegetables and fruits (Dainton, 1954). The pest gastropods not only directly damage the agricultural crops in the field but also lower the quality by soiling with slime and feces (Table 1). The snail affected portions of agricultural produce are contaminated by rotting agents such as bacteria and fungi, which lead to further damage of fruits and vegetables in storage. Thus human health counters risk when

these eatables are consumed fresh or cooked without washing thoroughly.

Snails are carriers of plant pathogens and thus spread diseases of cultivated plants. Experiments on *D. reticulatum*, *L. marginata*, *Discus rotundatus*, and *Oxychilus draparnaudi* have shown that tobacco mosaic virus (TMV), introduced into the mouth, was detected in the digestive tract after 2 days and thus it could be transferable to plants. Fungal spores of *Alternaria* sp., *Fusarium* sp., and *Phytophthora* sp. have been found in the feces and slime of the bodies of *Arion* spp., *Limax* spp., *Cepaea nemoralis*, *Helicigona arbustorum*, and *Helicella obcoia* (Hassan and Vago, 1966). When slugs were fed on leaves infected with false

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**Table 1. Gastropod pests of some crops in Asia.<sup>1</sup>**

| Crop attacked                       | Country                | Snail                                            |
|-------------------------------------|------------------------|--------------------------------------------------|
| Apple tree                          | India (Northwest)      | <i>Pila globosa</i>                              |
| Cotton                              | Mauritius              | <i>Achatina fulica</i>                           |
| Rice                                | India, Myanmar (Burma) | <i>Pila globosa</i> , <i>Pilspolita geshayes</i> |
| Arrowroot                           | Philippines            | <i>Achatina fulica</i>                           |
| <i>Crotalaria juncea</i>            | Indonesia              | <i>Achatina fulica</i>                           |
| Coffee                              | Ceylon                 | <i>Achatina fulica</i>                           |
|                                     | India                  | <i>Strophocheilus oblongus</i>                   |
| Rubber (young plants)               | Malaysia, Sri Lanka    | <i>Achatina fulica</i>                           |
| Rattle box ( <i>Crotalaria</i> sp.) | Indonesia              | <i>Achatina fulica</i>                           |
| Orchid ( <i>Phalaenopsis</i> sp.)   | Philippines, Java      | <i>Achatina fulica</i>                           |
| Lettuce                             | India                  | <i>Trichia hispida</i>                           |
| Maize (leaves, young plants)        | India                  | <i>Helicella</i> spp.                            |
| Beet (young plants, tuber)          | India                  | <i>Cepaea nemoralis</i>                          |
| Tobacco (young plants)              | India                  | <i>Helix pomatia</i>                             |

1. Source: Godan (1983).

mildew (*Phytophthora phaseoli*), and thereafter were offered healthy lima bean sprouts, the latter were infected by the fungus after 5 days (Wester *et al.*, 1964). *Deroceras reticulatum* spread black root rot on cabbage and other crucifers in Brazil. Spores of *Phytophthora palmivora*, the causal organism of black pod disease in cocoa plants were dispersed by the giant African snail *A. fulica* through its feces. *Achatina fulica* and other snails are also

responsible for the spread of foot rot in black pepper (*Piper nigrum*) (Turner, 1967). *Achatina* sp. can spread the fungi *Phytophthora parasitica* and *P. colocasiae*. Spores of rust were also traced in the feces of *H. arbustorum*, *Bradybaena fruticum*, *Helicella obvia*, *Succinea putris*, and *Arion rufus*. *Zonitoides arboreus* has been identified as the disseminator of the fungal spores causing root rot in sugarcane.

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## **Molluscs as indicators of environmental pollution**

Terrestrial, freshwater, and marine molluscs are particularly sensitive to contamination

with chemical substances. They store these impurities in their bodies and can indicate the degree of pollution of land and water.

## Molluscan diversity and edible species of Northeast India

The freshwater molluscs constitute an important fraction of the ecosystem. Molluscs are found on land, in freshwater, and in the salt water of sea. Freshwater molluscs are common in rivers, ponds, lakes, quiet water pools, flowing water lake, irrigation canals, etc. Gastropods are generally found attached to submerged vegetation, rocks, sticks, etc. The majority of the snail family belong to Viviparidae, Pilidae, Lymnaeidae, and Planorbidae and live in stagnant water. Among the edible species, *Pila globosa* is the most common snail that has been consumed mainly as food by the plain tribes of Northeast India (Table 2).

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## Utility of snail during ancient Assam

The mighty river Brahmaputra and its tributaries are filled with rain water during monsoon season, which often creates moderate to severe flood situation in Assam in Northeast India. Naturally, this is also the peak season of multiplication of a particular half-moon shaped snail species, locally known as *Junai samuk*. During the era of Ahoms, who migrated from Thailand and ruled Assam for more than 600 years, from 1200 AD to 1826 AD, people used to collect *Junai samuk* (Bora, 2004b) and a long-tailed conical shaped snail (Rabha, 2004) from river banks, ponds, and *beels* (water remaining in depressions). The collected

**Table 2. Freshwater snails of Northeast India.<sup>1</sup>**

| Species of Gastropoda            | Abundancy <sup>2</sup> | Remarks    |
|----------------------------------|------------------------|------------|
| <b>1. Order Basomatophora</b>    |                        |            |
| <b>Family Lymnaeidae</b>         |                        |            |
| <i>Lymnea luteola fimpura</i>    | +++                    | Non-edible |
| <i>L. acuminata f. refuscens</i> | ++                     | Non-edible |
| <i>L. acuminata f. gacilior</i>  | ++                     | Non-edible |
| <i>L. luteola f. ovalis</i>      | ++                     | Non-edible |
| <i>L. luteola f. typica</i>      | +++                    | Non-edible |
| <b>Family Planorbidae</b>        |                        |            |
| <i>Indoplanorbis exustus</i>     | +++                    | Non-edible |

*continued*

Table 2. *continued*

| Species of Gastropoda             | Abundancy <sup>2</sup> | Remarks    |
|-----------------------------------|------------------------|------------|
| <b>2. Order Mesogastropoda</b>    |                        |            |
| <b>Family Bithyniidae</b>         |                        |            |
| <i>Dignostoma cerameopema</i>     | +                      | Non-edible |
| <b>Family Viviparidae</b>         |                        |            |
| <i>Angulyagra oxytropis</i>       | ++                     | Non-edible |
| <i>Bellamyia bengalensis</i>      | +++                    | Edible     |
| <i>B. bengalensis f. typica</i>   | +++                    | Edible     |
| <i>B. bengalensis f. balteata</i> | +++                    | Edible     |
| <i>B. dissimilis</i>              | +++                    | Edible     |
| <i>Cipangopaludina lecythis</i>   | +                      | Non-edible |
| <b>Family Piliidae</b>            |                        |            |
| <i>Pila globosa</i>               | +++                    | Edible     |
| <i>P. scutata</i>                 | ++                     | Edible     |
| <i>P. theobaldi</i>               | ++                     | Edible     |
| <i>P. virens</i>                  | ++                     | Edible     |
| <b>Family Thiariidae</b>          |                        |            |
| <i>Brotia costula</i>             | +++                    | Edible     |
| <i>Paludomus conica</i>           | ++                     | Non-edible |
| <i>Thiara lineata</i>             | ++                     | Non-edible |
| <i>T. tuberculata</i>             | ++                     | Non-edible |
| <i>T. scabra</i>                  | ++                     | Non-edible |
| <i>Sulcospira hugeli</i>          | ++                     | Non-edible |
| <i>Paludomus pustulosa</i>        | ++                     | Non-edible |
| <i>P. reticulata</i>              | ++                     | Non-edible |
| <i>T. granifera</i>               | +                      | Non-edible |
| <b>Family Cyclophoridae</b>       |                        |            |
| <i>Cyclophorus bensoni</i>        | +                      | Non-edible |
| <b>3. Order Stylomataphora</b>    |                        |            |
| <b>Family Achatinidae</b>         |                        |            |
| <i>Achatina fulica</i>            | +++                    | Non-edible |
| <b>Family Ariophantidae</b>       |                        |            |
| <i>Macrochlamys indica</i>        | +                      | Non-edible |

1. Source: State Biodiversity Strategy and Action Plan, Assam, 2002.

2. +++ = High; ++ = Medium; + = Poor.

snails were sun-dried for several days, and shells were separated from the dried body and stored. During winter months, when people used fire to get relief from severe cold, they burned those shells by placing between the layers of dry cake of cow dung along with some fire wood. The shells that turned white were ground and this powder formed calcium carbonate or lime. This lime was mainly used for two purposes: (1) in house construction; (2) as edible lime. Since the lime had cementing property, it was blended with other ingredients and applied in construction of houses particularly the big monuments (Fig. 2), e.g., Rang Ghar, Tolatal Ghar, Kareng Ghar, *dol* (temples) and many other structures found in Sivsagar district of Assam (see box below). It is interesting that besides snail lime, stone lime, *hanh koni* (eggs of duck/swan), *mati mah* (black gram;

*Vigna mungo*), *borali* fish (freshwater shark; *Wallago attu*), *Bora chawal* (sticky glutinous rice), oil, *gur* (jaggery), resin, *son* (sunhemp; *Crotalaria juncea*), gum of bael (*Aegle marmelos*), and milk were also important ingredients for preparing cements (Bora, 2004a) and making bricks which were not weaker than marble (Deka, 1980). Mostly Moghul architects were specially hired from western India by the Ahom Swargadeo (King) for their artistic expertise and skillness in building such monuments. Although these monuments are gradually affected by natural calamities, they are still bearing the living history of the prosperous Ahom kingdom of ancient Assam.

Snail lime was used as edible lime while chewing betel-nut (*Areca catechu*) along with betel leaf (*Piper betle*; *pan*) and tobacco.

### Monuments constructed with snail lime in Assam

#### Rang Ghar

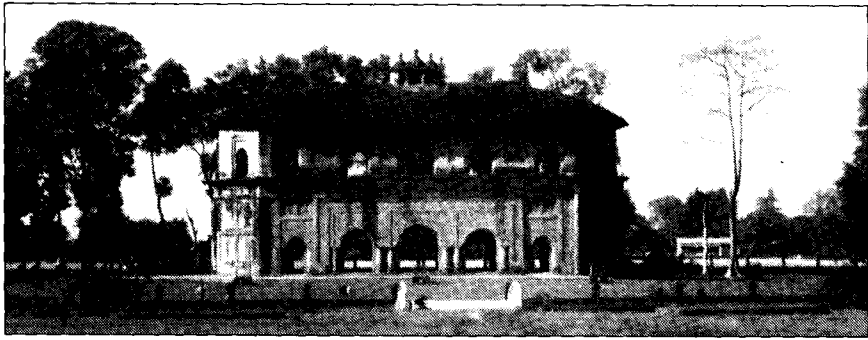
“*Rang ghar*” means “house of entertainment”. This beautiful structure was built by Swargadeo Pramatta Singha (1744–1751 AD) at Joysagar, a neighboring place of Sivsagar. It was used as a sports pavilion of outdoor stadium and known as one of the oldest amphitheatres in Asia.

#### Tolatal Ghar

“*Tolatal ghar*” means “multistoried house”. This monument was built by Swargadeo Rudra Singha (1696–1714 AD) at Joysagar. Originally there were seven stories in the main structure. Three floors were underground and called Tolatal Ghar and the rest aboveground floors were called Kareng Ghar. There were two secret tunnels in the Tolatal Ghar; one was about 20 km long connected with Kareng Ghar of Gargaon. This served as the military station of the Ahom Kings.

#### Kareng Ghar

“*Kareng ghar*” means “royal house” or “*Rajmahal*”. This palace of Tai-Ahom kings, located at Gargaon, was a seven-storied structure built by Swargadeo Rajeswar Singha around 1762 AD.



**Figure 2.** Monuments constructed with snail lime during Ahom dynasty in Assam: (top) Rang Ghar, (middle) Tolatal Ghar, and (bottom) Kareng Ghar (Photo credit: Kharkhuwa; [www.google.com](http://www.google.com)).

## Conclusion

Today, there is no use of snails except some edible species consumed by the people of a few countries like China. The lime present in the shell of snail is no longer considered enough for commercial use. Snails are now primarily focused as pests of agricultural crops. A systematic eco-friendly management strategy is needed to overcome the problem of snails, since we do not have any right to make this unique creature extinct by massive killing and disturb the balance of biodiversity of the wonderful earth.

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