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Shell and Radula Morphology and Reproductive Anatomy of the Introduced Carnivorous Snail, *Gulella bicolor* (Pulmonata: Streptaxidae) from Chon Buri Province

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ABSTRACT

Shell and radula morphology and reproductive anatomy of an introduced carnivorous snail, *Gulella bicolor* (Hutton, 1834) collected from Chon Buri Province. This is the first record of this species in Thailand which is considerable to attach on plant or in the soil of potted plant imported from other countries.

Key words: carnivorous snail, *Gulella bicolor*, Streptaxidae, Thailand

INTRODUCTION

In July 2007, there had been accidentally found two living rosy snails which resembled *Gulella bicolor*, a world wide introduced carnivorous snail on the grounds of Burapha University, Bangsaen, Chon Buri Province. The area was near patch of bailey which had white leadtree (*Leucaena leucocephala*) as dominant species. Further observation of this patch indicated a small population of this snail along with a few species of microsnails. This paper was focused on morphology and taxonomy of shell, radula and reproductive anatomy of snail and its distribution in Chonburi Province.

MATERIALS AND METHODS

Study Sites

The snail in question was observed in several places in Chonburi Province. Study sites shown in figure 1. Habitats where the snails were found including leaf litters, decaying wood, limestone rocks, cave, and various soil types. Snails were identified by using taxonomic criteria of Annandale and Prashad (1920), Berry (1964), Naggs (1989) and Vermeulen and Whitten (1998).

Shell morphological and radula study

Shell : Shells were cleaned using a soft camel hair brush and warm water.

Radula : the baccal mass was dissected from the snail's head region, and radula was carefully removed. The tissue remaining on the radula was removed and kept in a solution of 10 % potassium hydroxide solution. The radula was placed on a glass slide, dorsal side up, flattened and mounted temporarily in 70 % ethanol. A cover slip was applied and sealed to the slide with permount. Observation on radulae were made using a compound microscope, Olympus BX 50.

Anatomy of the reproductive tract

Snails were relaxed by suffocation

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Figure 1 Study Sites, Chon Buri Province 1: Burapha University, 2: Koh Loi.

technique (Patterson, 1971). When the animals were fully extended and did not respond to prodding, they were killed and fixed in 70 % ethanol. Snail dissections were prepared by using criteria of Patterson (1971).

RESULTS

The snails was identified as rosy snail *Gulella bicolor* (Hutton, 1834), an introduce species. Other snail were found with *G. bicolor* and identified as *Lamellaxis gracilis*, *Landouria winteriana*, and *Gastrocopta* sp. In our survey, rosy snail was found only in Bangsaen and Koh Loi. In Bangsaen, four living rosy snails were found as three adults and one juvenile; and only three empty shells also recorded at Kho Loi.

Taxonomic Description
Phylum Mollusca
Class Gastropoda
Subclass Pulmonata
Family Streptaxidae
Genus *Gulella*

Gulella bicolor (Hutton,1834)
(Figure 2, A: shell, B-C: radula, and D: reproductive system)

Synonym: *Pupa bicolor* Hotton,1834, *Ennea bicolor,* Pfeiffer,1855*, Hutton bicolor,* Laidlaw, 1950

Common Name: Two-tone gulella

Habitat: Snails usually found in man-made habitats during day light hours.

Living Snail: The shell of living specimens is red-orange anteriorly, and yellow posteriorly. The anterior and posterior portions of the shell are red-orange and yellow in color, respectively, hence the common name "two-toned gulella" and the specific name "bicolor".

Shell: The shell is small, rather thin, somewhat transparent, Surface shiny. Shell 5.0-7.0 mm high, 1.4-1.6 mm wide, with up to 8 whorls, turreted to subcylindrical, hyaline, cream –colored, moderately shiny, apex obtuse, delicately striated. According to the growth lines toward the suture and over the entire surface, but first two apical whorls smooth, the last whorl slightly ascending. Peristome white thickened reflected lib. Behind

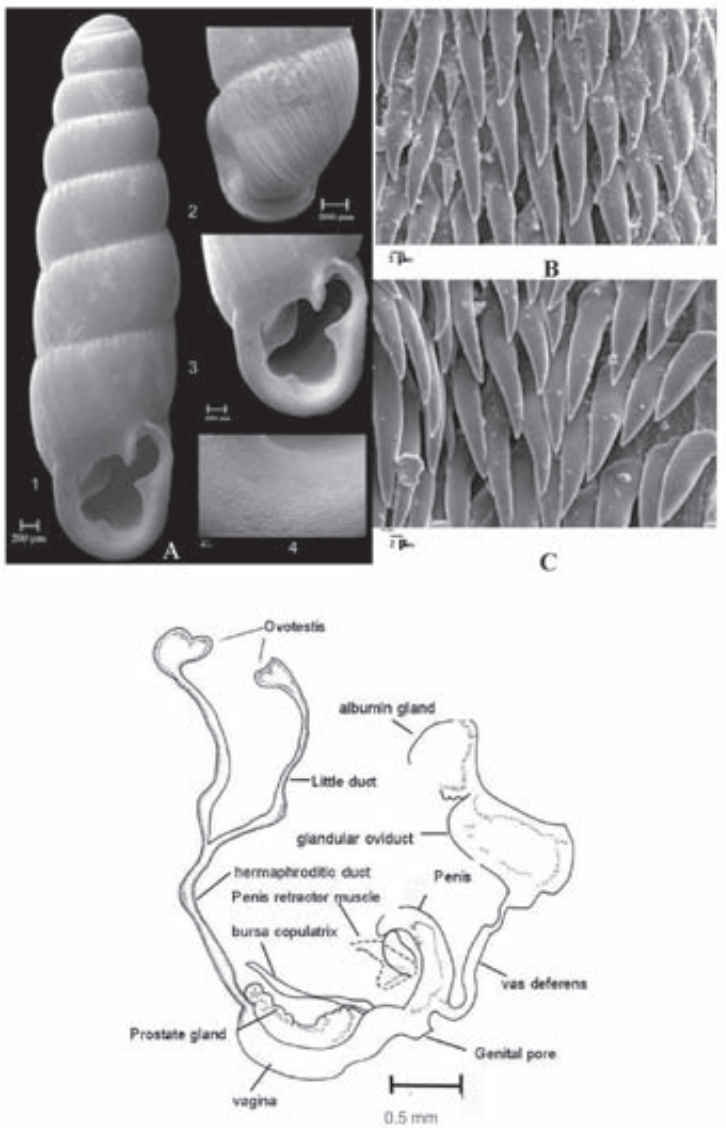

Figure 2 *Gulella bicolor* (Hutton, 1834) 1A: shell, 2A: shell texture, 3A: peristome, 4D: texture of apex, B-C: radula and D: Diagram of reproductive tract 5mm

the peristome, there are two shallow pits on the outside of the last whorl, corresponding with the internal palatal fold. Aperture almost quadrate, slight high than broad, with rounded base, aperture with four teeth: one simple lamella on parietal wall close to the peristome, a deeply situated columella in the interior of the shell, a small blunt tooth closed (Figure 2 A).

Radula: The radula is of the classical carnivorous type. Individual tooth is long, slender cutting types which have the appearance of gently curving, sharp blades (Figure 2 B and C).

Reproductive tract: The ovotestis consists of two lobes whose duct unites to form the little hermaphrodite duct. The little hermaphrodite duct is very thin, passes almost direct talon which, in

Figure 3 Living *Gulella bicolor* (Hutton, 1834)

this species is hardly more thin a kink before its opening into the glandular genital duct. The creamy white is prostate gland, irregular shape. The vagina is long and last of duct consists of flagellated bursa copulatrix and is creamy in color. The penis constricts abruptly at the posterior end and anterior has retractor muscle contract ocular nave (Figure 2 D).

DISCUSSION

The *Gulella bicolor* in this study show the characteristic of coloration in the species. This species is native to India, Southeast Asia and southern Africa (Dundee, 1970; Naggs, 1989). It has been introduced to tropical areas throughout the world including the West Indies, Cuba, South America (Dundee, 1970). In the past, generic name of this species was confused, being reported as *Indoenea*, *Huttonella*, *Ennea*. Nowadays, its generic name, *Gulella* based on the type species (Naggs, 1989). This species is not native to Thailand, but considered to attach on imported plants or in the soil potted plant into Thailand. The extent of its success is uncertain but the present study suggests some reproduction occurring as juveniles. *G. bicolor* was found in bailey which has white leader, *Leucaena leucocephala*, as the dominant species. The snails were usually found with *Lamellaxis gracilis* on which it is reported to feed (Dundee, 1970)

CONCLUSION

An non-indigenous carnivorous snail, *Gulella bicolor* was found in Burapha University, Bangsaen, Chonburi Province. This species fed on other snails but its impact on indigenous Thai snail is unknown.

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