A Preliminary Survey on Species Diversity of Microsnails in Luang Suwan Vajokkasikij Centennial Garden, Kasetsart University.

ABSTRACT

This paper reports the result of the preliminary survey on species diversity of microsnails in Luang Suwan Vajokkasikij Centennial Garden, Kasetsart University, Bang khen campus, Bangkok. Specimens were collected with randomly survey both on the shrub of trees and upper ground around the garden in day time. Four species of microsnails were found, namely Gastrocopta sp., Pupisoma cf. orcula, Lamellaxis gracilis and Liardetia cf. diliolum. Most of them may be introduced species which were introduced by many reasons; such as sneak on plants or combine with planting soil from plants trading; furthermore, dispersed by wind excepted in L. gracilis which previously reported as introduced species.

Keywords: microsnails, Gastrocopta, Pupisoma, Lamellaxis, Liardetia
INTRODUCTION

The mollusks are peculiar and fascinating animals, and in number of species rank second only to the arthropods. The great majority of mollusk are snails which their shell sizes ranging from less than millimeter to over 20 centimeters. So far the non-marine mollusks of Thailand have attracted the attention of comparatively few specialists. The previous species list of these groups were reported by Panha (1996), Hemmen and Hemmen (2001) and Panha and Burch (2005). Most of the microsnails in the publications were collected from limestone area (Panha and Burch, 2005; Dumrongrojwatana and Panha, 2005; Dumrongrojwatana and Panha, 2006). In this paper, we reported some of microsnails which collected form non-limestone area, especially in Bangkok which has no limestone.

MATERIALS AND METHODS

Field collection

Snails were collected from Luang Suwan Vajokkasikij Centennial Garden, Kasetsart University, Bang khen, Bangkok. This garden consists of 2 acres area (5 Rais in Thai), mixed with botanical garden and Public Park, more than 75 species of plants in this garden. Several habitats such as litters, rotten wood, tree's branch, etc. were observed and recorded. Both living snails and shells in each habitat were counted and collected some of them for laboratory studies.

Figure 1. Map of Luang Suwan Vajokkasikij Centennial Garden, Kasetsart University, Bang Khen, Bangkok (star)
Taxonomic study

Snails were identified by using taxonomic criteria of Vermeulen & Whitten (1998) and Panha & Burch (2006).

Shell and radula morphological study

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

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

RESULTS AND DISCUSSION

Survey of snails

In this study, Snails were found only in two patches of tree, *Grapthophyllun pictum* and *Ficus* sp. The distance of two patches about 200 meters. At *Grapthophyllun pictum* patch, 4 species were collected, two species, *Gastrocopta* sp. and *Lamellaxis gracilis*, found on ground and other two species, *Pupisoma cf. orcula*, and *Liardetia cf. dodiolum*, hang on tree. At *Ficus* sp. patch was only found one species, *Pupisoma cf. orcula*, that was collected from branches of the tree. Habitat of snails shown in Table 1.

**Table 1.** Habitat of microsnails which collected from Luang Suwan Vajokkasikij Centennial Garden, Kasetsart University.

<table>
<thead>
<tr>
<th>Taxa</th>
<th><em>Ficus</em> sp. Patch</th>
<th><em>Grapthophyllum pictum</em> Patch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Under Ground</td>
<td>Ground</td>
</tr>
<tr>
<td><em>Gastrocopta</em> sp.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Lamellaxis gracilis</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Pupisoma cf. orcula</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Liardetia cf. doliolum</em></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Remark: = not found, / = found

From table 1. microsnails which collected from, Luang Suwan Vajokkasikij Centennial Garden, Kasetsart University, Bang khen Campus, were clearly distinguished on their habitats, ground and tree. For ground snails group, two species, *Gastrocopta* sp. and *Lamellaxis gracilis*, were examined. Habitat of both species was unique, *Gastrocopta* sp. usually found in high humidity of bark or rotten wood on ground while *Lamellaxis gracilis* also found underground or sometime
climbing on ground surface. According to tree group, two species, *Pupisoma cf. orcula* and *Liardetia cf. doliolum*, were examined. Habitat of these species were similar. According to the other microsnail species, most of their habitats were limestone area, hang on the wall or live in cave, using calcium carbonate as main resource for the growth of their shells (Panha and Burch, 2005; Dumrongrojwattana and Panha, 2005; Dumrongrojwattana and Panha, 2006). This is the first record of microsnails in man–made habitats, indicated that some microsnails can survive in city environment.

**TAXONOMIC DESCRIPTION**

Subclass *Pulmonata*

Order *Stylommatophora*

Family *Vertiginidae*

**Genus** *Gastrocopta* Wollaston, 1878

*Gastrocopta* sp.

![Gastrocopta sp. A, front view B, radula](image)

Figure 2. *Gastrocopta* sp. A, front view  B, radula

(C : central tooth, L : lateral teeth and M : marginal teeth)

**Description** : Shell very small, thin, somewhat translucent, pale brown, surface shiny. Whorls moderately convex. Radial sculpture : growth lines or weak and fine radial ribs. Aperture with 5 teeth, 1 parietal tooth, 2 palatal teeth, 1 basal tooth, and 1 columella tooth. The parietal tooth partly or entirely fused. Shell 1.90 - 2.8 mm in height, 1.08 - 1.30 in width, with 4 ½ - 5 whorls. The radula teeth
has formula of 7 :4 : 1 : 4 : 7, central tooth about half width of 1st lateral tooth, central tooth tricuspid while lateral teeth fundamentally bicuspid and marginal teeth develop numerous interstitial cusplets.

**Habitat:** Under fallen leaves or in wood of rotten branches of *Graptophyllum pictum* on ground.

**Remark:** This snail also found in several localities in Chonburi Province in several habitat not only lime stone but also litters.

**Genus** Pupisoma Stolichka, 1873

*Pupisoma* cf. *orcula*

**Description:** Shell minute, thin, translucent, pale brown. Surface with a silky luster. Top whors pitted. Other whors with a radial sculpture of densely placed, though often at somewhat irregular intervals, riblets of about equal high. Spiral sculpture: fine, densely placed ridglets. Umbilicus closed or open but very tight, partly covered by the reflected peristome. Shell 1.20-1.87 mm in height, 1.30-1.50 mm in width, with 2 ½ - 4 ½ whors. The radula teeth has formula of 9 :5 : 1 : 5 : 9, fundamentally tricuspid and develop numerous interstitial cusplets.

![Figure 3](image_url)

**Figure 3.** *Pupisoma* cf. *orcula*. A, front view; B. Apical view; C. Umbilical view; D, radula (C: central tooth, L : lateral teeth and M : marginal teeth)

**Habitat:** hang on branches or under leaves surface of *Ficus* sp. and *Graptophyllum pictum*
Remark : Snail in this genus were reported only two species, *Pupisoma orcella* and *Pupisoma* sp. (Panha and Burch, 2005) and species which we found differ from previously reported. This is the third species of this genus that was reported in Thailand.

Figure 4. *Lamellaxis gracilis*. A, front view; B, right lateral view; C, left lateral view; D, radula (C: central tooth, L: lateral teeth and M: marginal teeth)

**Family** Subulinidae

**Genus** *Lamellaxis* Strebel & Pfeffer, 1882

*Lamellaxis gracilis* (Hutton, 1834)

**Synonym** : *Bulimus gracilis* Hutton, 1834

*Opeas gracile* (Hutton, 1834)

**Description** : Shell small, thin, translucent to opaque, yellowish or white. Surface slightly shiny. Spiral sculpture absent. Periostracum thin, pale yellowish green. Shell 5.0-11.64 mm in height, 2.80-3.31 mm in width with up to 6 1/2 whorls. The radula teeth has formula of 13 : 8 : 1 : 8 : 13, central tooth about one quarter width of width of 1st lateral fundamentally tricuspid in central and lateral teeth while marginal teeth have only two large cusps.

**Habitat** : ground surface or underground in dry area

**Remark** : This species is native to tropical America (Dundee, 1970; Neck, 1975), but has been introduced hidden on ornamental and agricultural plants to tropical habitats throughout the world, including European green houses (Deisler and Abbott, 1984). However, the name of this species equally confused about two genera *Lamellaxis* and *Opeas* and the distinctions between these two
genera are based on anatomy (Pilsbry, 1946), so, anatomical study will future done for final justify of examined snails.

![Image of snails]

**Figure 5.** _Liardetia cf. diliolum_. A, front view; B, apical view; C, umbilical view.

Family **Euconidae**

Genus *Liardetia* Gude, 1913

*Liardetia cf. diliolum*

**Description**: Shell very small, thin, more or less opaque, brown. Surface shiny. Top smooth, protochonch with a predominant radial sculpture, spiral striation starting on the telechone. Radial sculpture: above the periphery predominant, coarse, rather densely placed riblets following the growth lines, below the periphery riblets fading towards the umbilicus, or with fine growth lines only. Spiral sculpture: above the periphery absent or very inconspicuous grooves present in small patches, below the periphery sometime absent, usually numerous, densely placed, very fine spiral grooves. Shell 1.02-2.02 mm in height, 1.54-2.69 in width, with 4.0-5½ whorls. Radula was fail in exacting process.

**Habitat**: hang on branches or under leaves surface

**Remark**: There was no reported on this genus in Thailand before (Panha and Burch, 2006). This is the first reported but unfortunately, we only collected 1 living shell and 3 shells of this species and fail in radula exacted process. Anyway, more observation in radula, anatomy, etc., will future investigated.

**How they come?**

We have two hypothesis about these snails. First, they may introduced from somewhere into Thailand by the trading of flowering trees and/or decorative plants. Another suggestion they may dispersed by wind from one place to another place as found as in _Truncatellina rothi_ (Kirchner et al., 1997). In this study, we observed the effect of wind on dispersion of microsnails, especially the tree group. Our preliminary study about wind effect on two species, _Gastrocopta_ sp. and _Pupisoma_ cf. _orcula_, which applied from Kirchner et al. (1997), the results shown in Table 2. and Table 3.
Table 2. Terminal fall velocity for Gastrocopta sp. of approximately live weight (data from 10 shells)

<table>
<thead>
<tr>
<th>Weight (µg)</th>
<th>Fall velocity (m s⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>370</td>
<td>3.49</td>
</tr>
<tr>
<td>630</td>
<td>4.23</td>
</tr>
<tr>
<td>740</td>
<td>4.14</td>
</tr>
<tr>
<td>900</td>
<td>4.96</td>
</tr>
<tr>
<td>990</td>
<td>5.66</td>
</tr>
</tbody>
</table>

Table 3. Terminal fall velocity for Pupisoma cf. orculam of approximately live weight (data from 5 shells)

<table>
<thead>
<tr>
<th>Weight (µg)</th>
<th>Fall velocity (m s⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>3.06</td>
</tr>
<tr>
<td>430</td>
<td>3.00</td>
</tr>
<tr>
<td>450</td>
<td>3.13</td>
</tr>
</tbody>
</table>

Kirchner et al. (1997) reported that the maximum flight distance for one specimen of Truncatellina rothi in a storm of a wind velocity of 100 km h⁻¹ when starting at an altitude of 100 m above sea level, is calculated to be approximately 3,300 m. If wind velocity is reduced to 50 km h⁻¹, the distance is halved. Setting the snails to start at an altitude of 200 m enables them to reach a distance of 6,600 m in 100 km h⁻¹ wind. From this, we applied to our study of two snails species, using data from Thai Meteorological Department which reported wind velocity in central part of Thailand ranging from 15 to 30 km h⁻¹. So, we setting wind velocity at 30 km h⁻¹ and altitude 70 m above sea level, is calculated to be approximately 700 m. If wind reduced to 15 km h⁻¹ the distance is halved. From the result, it's possible that wind can blow snails from Ficus patch to Graptoiphyllum patch because the distances between two patches was 200 meters. However more data should be observed for the final conclusion.

CONCLUSION

Four species of microsnails, Gastrocopta sp., Pupisoma cf. orcula, Lamellaxis gracils and Liardetia cf. diliolum were collected from Luang Suwan Vajokkasikij Centennial Garden, Kasetsart University, Bang Khen Campus, Bangkok. Taxonomic status of them need more data, reproductive anatomy, chromosome number, karyotype etc., to justify their taxonomic status. All of them may be introduced species which introduced by many reasons such as trading of lowering trees and/or decorative plants, dispersed by wind. More observation data will observed for the answer “how they come".
ACKNOWLEDGEMENTS

We would like to thank Mr. Rungwit Chaijirawong, Ms. Khanita Nuamsee, Ms. Koraon Wongkanhaeng for drawing and anonymous reviewers for their comments on the manuscript. We also thank Mr. Wanphruek Thiamdaet and Ms. Darika Manathamkamon who help us on collecting snails specimens.

REFERENCES


Thai Meteorological Department. 7-day Forecast. Cited :http://www.tmd.go.th/7-day_forecast.php.