Abbreviated datasheet

Semperula spp.*

*In April 2013, the family Veronicellidae, a target on the 2013 and 2014 AHP Prioritized Pest Lists, was broken down into six genera of concern, including *Semperula* spp. Information in the datasheet may be at the family, genus, or species level. Information for specific species within the genus is included when known and relevant; other species may occur in the genus and are still reportable at the genus level.

*Information for specific species within the genus is included when known and relevant. Other species may occur in the genus and are still reportable at the genus level.

Scientific Name

Semperula birmanica (Theobald, 1864)
Semperula carusi (Simroth, 1893)
Semperula insularis Thomé, 1983
Semperula maculata (Templeton, 1858)
Semperula parva (Heynemann, 1885)
Semperula tailandensis Thomé et al, 1994
Semperula wallacei (Issel, 1874)

Synonyms:

Semperula birmanica
Vaginulus birmanicus Thobald, 1864
Vaginula birmanica Tapperoni-Canefri

Semperula carusi
Vaginula carus Simroth, 1893

Semperula maculata
Vaginula borneensis Simroth, 1897
Vaginula creophila Simroth, 1918
Vaginula hennigi Simroth, 1889
Vaginula maculata Templeton, 1858
Vaginula newtoni Simroth, 1893
Vaginula rufiglandula Simroth, 1918
Vaginula signata Simroth, 1918
Vaginula svelana Simroth, 1918
Vaginula variegatula Simroth, 1918

Semperula wallacei
Vaginula wallacei Issel, 1874
Vaginula idae Semper, 1885
Vaginulus reinhardti Semper, 1885
Vaginula parva Heynemann, 1885

Vaginula chavesi Simroth, 1893
Vaginula djiloloensis Simroth, 1897
Semperula celebensis Forcart, 1973
Semperula reinhardti Thomé, 1988b
Semperula christmasis Thomé, 1983
Semperula soleni Forcart, 1969

Common Name
No common name, leatherleaf slugs

Type of Pest
Mollusk

Taxonomic Position
Class: Gastropoda, **Order:** Systellommatophora, **Family:** Veronicellidae

Reason for Inclusion in Manual
CAPS Target: AHP Prioritized Pest List – 2011 through 2015*

*Originally listed under the family Veronicellidae.

Pest Description
Veronicellidae are anatomically distinct from many other terrestrial slugs in that they have a posterior anus, eyes on contractile tentacles, and no pulmonate lung. The sensory tentacles are bilobed. This family also lacks a mantel cavity (Runham and Hunter, 1970).

Although this family is fairly easy to tell apart from others, species within this family can be difficult to distinguish due to similar morphology between species and multiple color variations within a single species. Taxonomy is based on the morphology of the hermaphroditic reproductive system.

Semperula maculata
"Body ovate-oblong, depressed, rounded behind; the dorsum dark or brownish-grey, densely studded with minute papillae; speckled with black, angular or irregular maculae; a yellow mesial line down the back; margins edged with a yellowish or pale band; superior pair of horns hyaline, the buccal pair yellowish-grey. The body never makes any approach to linear even when most extended; it is always rather broad, and fully rounded posteriorly, less so at the anterior extremity. There is no defined margin separating the central part from the edges; the latter are merely a little flatter…it occupies in breadth about one-fifth or rather more of the under surface, and is separated by a deep groove from the mantle, so that it appears as if winged…The under surface of the body of the animal on each side of the foot is covered with minute papillae or tubercles, about 180 in an inch" (Templeton, 1858).

Semperula wallacei
"Yellow-brown notum with gray spots; hyponota and sole yellow-brown, sometimes with tiny black spots on hyponota; finely papillate notum; female opening a transverse slit, usually with dark surrounding pigmentation; sole half or less width of a hyponotum (Forcart 1969)". This species can reach 44 mm (about 1 $^{3}/_{4}$ in) in length and 19 mm (about $^{3}/_{4}$ in) in width (Paustian, n.d.).

Damage
Due to their apparent lack of host specificity, few reports as to specific damage caused by Veronicellidae species to agriculture have been published in the malacological or agricultural literature.

Visual signs of *Veronicellidae* can include chewing or rasping damage to plants, presence of eggs, juveniles and adults, mucus and slime trails, and/or ribbon like feces.

Pest Importance
Veronicellidae can be pests in tropical regions of America, Africa, and Asia where distribution is limited (Runham and Hunter, 1970). This family can also transmit pathogens to humans indirectly when they consume vegetables and fruits that have been contaminated with mucus and feces. The slugs can also transmit pathogens to plants and livestock. Displacement of native mollusk species may also occur (USDA-APHIS, 2010a).

Semperula maculata
Semperula maculata is a pest of rubber trees in India, Malaysia, and Sri Lanka. This species can seriously slow the growth of young rubber plants and feed on latex from tapped mature trees (Jayarathnam, 1992). They can sometimes become trapped in the collecting bowl, thus contaminating the product. In Indonesia, this species is also damaging to crops such as tobacco, leafy vegetables, and ornamental plants like orchids (Whitten et al., 1996).

Semperula wallacei
Semperula wallacei (=*Vaginula idae*) is considered a pest of *Nicotiana tabacum* (tobacco) in the Pacific Islands (Godan, 1983).

Known Food Sources*
Nicotiana tabacum (tobacco) (Godan, 1983).

*Terrestrial mollusks do not show host specificity and can feed on multiple crops as well as other materials, like decaying organic matter.

Pathogen or Associated Organisms Vectored
Human and Animal Pathogens
Species of this family have been found to carry several nematode parasites, including *Angiostrongylus cantonensis* (rat lungworm), *A. costaricensis*, and *A. malaysiensis*. *A.*

cantonensis can cause symptoms similar to meningitis in humans including headache, stiff neck, tingling or painful feelings in the skin, lowgrade fever, nausea, and vomiting (USDA-APHIS, 2010a).

Note: While most cases of human infections result from consumption of raw or partially cooked snail meat, government inspectors, officers and field surveyors are at-risk due to the handling of live snail, samples, and potential exposure to mucus secretions. ***Wear gloves when handling mollusks and wash hands thoroughly after any mollusk survey or inspection activities.***

Plant Pathogens
Unknown.

Known Distribution

This species is restricted to the Oriental and part of the Australian biogeographical regions (Gomes and Thomé, 2004). Distribution lists may not be all inclusive.

Semperula birmanica
Asia: China (including Hong Kong and Macau), India, Indonesia (including Bali, Java, Lombok, and Sumatra), Malaysia, Myanmar, Philippines, and Vietnam (reviewed in Gomes and Thomé, 2004).

Semperula carusi
Asia: Singapore (reviewed in Gomes and Thomé, 2004).

Semperula insularis
Oceania: Christmas Island (Australia) (reviewed in Gomes and Thomé, 2004).

Semperula maculata
Asia: Brunei (as Borneo), Cambodia?, China, India, Indonesia, Malaysia, Philippines, Singapore, Sri Lanka, and Thailand (reviewed in Gomes and Thomé, 2004).

Semperula tailandensis
Asia: Thailand (reviewed in Gomes and Thomé, 2004).

Semperula wallacei
Asia: China (including Hong Kong and Macao), Indonesia, and Vietnam; **Oceania:** Christmas Island (Australia), Fiji, Samoa, and Vanuatu; **Caribbean:** St. Croix (USVI), Guadeloupe, Martinique, Grenada, and Barbados (reviewed in Gomes and Thomé, 2004; David Robinson, 2014, personal communication).

Potential Distribution within the United States

No risk documents exist for any of the tropical terrestrial mollusks that give potential distribution in the United States. Host material is unlikely to limit their distribution since they are all polyphagous, but these species are limited by climate. If introduced, the tropical terrestrial mollusks would most likely be limited to the southern part of the

United States and possibly the West Coast where the climate is similar to native ranges. This is supported by detections of these species which have all been in either the southern United States or West Coast (USDA-APHIS, 2010a).

Survey

CAPS-Approved Method*:

Visual. See the Introduction to the mollusk manual for specific information on visual surveys.

Survey Site Selection

New introductions of terrestrial mollusks will likely be related to commerce and human-assisted movement. The habitat and land-use type of each survey site may be variable, ranging from agricultural land, to residential or industrial features. When planning the survey route for a particular site, examine the following microhabitats:

- Near heavily vegetated areas, especially gardens and fields where plants have been damaged by feeding;
- Under rocks, asphalt or cement pieces that are in loose contact with the ground surface;
- Discarded wooden boards and planks, fallen trees, logs, and branches;
- Damp leaf litter (not wet or soggy), compost piles, and rubbish heaps; and
- Under flower pots, planters, rubber mats, tires and other items in contact with the soil.

Trap Placement

Trapping ***cannot*** be used alone, but can be used to supplement visual surveying. Trapping for terrestrial mollusks is not species specific and will attract non-target species, including non-mollusks. Platform or baiting traps can be used to supplement visual inspection. Trap placement can occur in the same areas that visual surveys occur.

Time of year to survey

Most species of terrestrial mollusks are active during nocturnal hours, when environmental conditions are cool and wet. Some species may also be active during daylight, especially during overcast and rainy days in the spring and fall. If possible, plan surveys during spring and fall, and during early morning and overcast days. Many slugs and snails have diurnal patterns of activity, so early morning and evening hours may be the best time to carry out a survey (Pearce and Örstan, 2006).

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at http://caps.ceris.purdue.edu/.

Key Diagnostics/Identification

CAPS-Approved Method*:

Morphological and Molecular: Differentiation from the native species is only by dissection and only if the specimen is mature enough. All veronicellid samples should be sent to Dr. Robinson for morphological identification. All specimens will then be confirmed through molecular diagnostics performed at the CPHST Mission lab.

A key to terrestrial mollusks (including Veronicellidae) is found here: http://idtools.org/id/mollusc/index.php.

In April 2013, the family Veronicellidae, a target on the 2013 and 2014 AHP Prioritized Pest Lists, was broken down into six genera of concern. When conducting a general mollusk survey, if samples are negative for Veronicellidae, then negative data may be reported for each of these six genera: *Belocaulus, Colosius, Laevicaulis, Sarasinula, Semperula,* and *Veronicella*. All positives must be reported at the species level.

Refer to "Appendix N - Data Entry Guide for Selected Taxonomic Groups" of the most recent year's CAPS Guidelines for additional information on data entry for mollusks. https://caps.ceris.purdue.edu/caps_agreement_guidelines.

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at http://caps.ceris.purdue.edu/.

Easily Confused Species

Semperula wallacei can be confused with *Sarasinula plebeia* (Brodie and Barker, 2012).

References

Brodie, G. and G. M. Barker. 2012. *Sarasinula plebeia* (Fischer, 1868). Family Veronicellidae. 'USP Introduced Land Snails of the Fiji Islands Fact Sheet Series', No. 4.

Godan, D. 1983. Pest Slugs and Snails: Biology and Control. Springer-Verlag, Berlin. 445 pp.

Gomes, S. R. and J. W. Thomé. 2004. Diversity and distribution of the Veronicellidae (Gastropoda: Soleolifera) in the Oriental and Australian biogeographical regions. Memoirs of the Queensland Museum 49(2).

Jayarathnam, K. 1992. Chapter 16. Pests. In: M. R. Sethuraj and N. T. Mathew (eds) Natural Rubber: Biology, Cultivation and Techology. pp. 360-369.

Paustian, M. No date. *Semperula wallacei* (Issel, 1874). Terrestrial Slugs Web. Accessed May 23, 2014 from: http://terrslugs.lifedesks.org/pages/31996.

Pearce, T. A. and A. Örstan, 2006. Chapter 22. Terrestrial Gastropoda. In Sturm, C. F., T. A. Pierce, and A. Valdés (eds.). The Mollusks: A Guide to Their Study, Collection, and Preservation. American Malacological Society.

Runham, N. W. and P. J. Hunter. 1970. Terrestrial slugs. Hutchinson and Company LTD, London, England.

Templeton, R. 1858. On a new species of Vaginula from Ceylon. The annals and magazine of natural history, including zoology, botany and geology 3(1): 49-50.

USDA-APHIS. 2010a. New Pest Response Guidelines. Tropical Terrestrial Gastropods. USDAAPHIS-PPQ-Emergency and Domestic Programs-Emergency Planning, Riverdale, Maryland. http://www.aphis.usda.gov/import_export/plants/manuals/.

USDA-APHIS. 2010b. New Pest Response Guidelines. Temperate Terrestrial Gastropods. USDA-APHIS-PPQ-Emergency and Domestic Programs-Emergency Planning, Riverdale, Maryland. http://www.aphis.usda.gov/import_export/plants/manuals/.

Whitten, T., R. E. Soeriaatmadja, and S. Afiff. 1996. The Ecology of Java and Bali. Tuttle Publishing.

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Reviewed by: David Robinson, USDA-APHIS National Malacologist.