



## Pacific Pests and Pathogens - Fact Sheets

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### Yellow-shelled semi-slug (403)



Photo 1. Side view of the yellow-shelled semi-slug, *Parmarion martensi*, showing the shell partly covered by the mantle. Contrast the grey colour with Photo 2.



Photo 2. A yellow-shelled semi-slug, *Parmarion martensi*, brown, and showing the shell partly covered by the mantle, the cream ridge (keel) along the tail, and black antennae.



Photo 3. A yellow-shelled semi-slug, *Parmarion martensi*, showing little of the shell, but the cream ridge (keel) along the tail is clear.

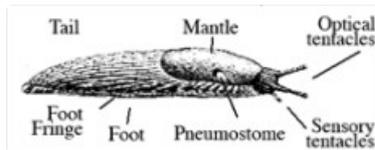


Diagram. Slug anatomy.



Photo 4. A yellow-shelled semi-slug, *Parmarion martensi*, with dark body colour, and shell well-covered by mantle (similar to Photo 5).



Photo 5. A yellow-shelled semi-slug, *Parmarion martensi*, with dark body colour, shell well-covered by mantle, and distinct cream-coloured line of the keel.

#### Common Name

Yellow-shelled semi-slug. A semi-slug does not have a shell that it can retract into.

#### Scientific Name

*Parmarion martensi*

#### Distribution

Restricted. Asia, North America (Hawaii), Oceania. Apart from Hawaii, the only other Pacific island where *Parmarion martensi* has been recorded is Fiji. Records from American Samoa and Samoa are based on a misidentification of *Parmella planata*.

## Hosts

It is reported as a pest of cabbages, legumes, papaya and young rubber trees.

## Symptoms & Life Cycle

An invasive species, with wide host range. The slug varies from pale grey to dark brown, up to 45 mm long. A plate-like shell is present (8 mm long and 5 mm wide) (Photos 1&2), but this is not always visible as it is covered partly or entirely by the mantle (see Diagram and Photos 3-5). There is a pale cream ridge (also called the keel) from the edge of the mantle extending along the tail (Photo 2,3&5). The tentacles bearing the eyes are dark-brown to black, while the lower pair is tan/cream. The slug is hermaphroditic, meaning that it can function as either a male or a female.

It is found singly or in groups on the ground, in trees and also around and on dwellings. It is mostly nocturnal. Apart from being a pest of cabbages, legumes and young rubber, it has been seen feeding on fallen fruits of avocado, guava, citrus, mango and papaya.

The slug is spread on horticultural produced, soil on shoes and machinery and, possibly, camping equipment.

## Impact

In Fiji, it was known in low and mid-altitude areas, but surveys in 2010 caused concern when the slug was found in undisturbed high altitude areas of Taveuni (>800 m). This was considered a threat to "overall ecosystem function and the conservation of endemic biodiversity"<sup>1</sup>.

Apart from it being a pest of crops, it is an efficient host of the human rat lungworm parasite (*Angiostrongylus cantonensis*). The slug acquires the lungworm by eating the faeces of rats and transmitting this disease-causing organism to humans in contaminated water or on vegetables. Infection in humans causes meningitis, leading to death or permanent brain damage.

## Detection & inspection

Look for a grey to brownish slug, up to 45 mm long, often climbing on trees and buildings. Look for the yellowish shell, partly or completely covered by the mantle, and look for the cream ridge along the tail.

There are molecular tests available.

## Management

### BIOSECURITY

USDA reports that *Parmarion martensi* has been intercepted on lettuce, fennel, sweet potato, banana, passion fruit, lemon grass and *Heliconia* sp. It is, therefore, a biosecurity risk for those countries not yet infested with the slug, and every effort should be made to prevent its further spread. It is a threat to crops, to human health, and as a potential competitor to native land slugs (and snails).

### NATURAL ENEMIES

Predatory snails, such as *Euglandina rosea* and *Gonaxis quadrilateralis*, and flatworms, e.g., *Platydemus manokwari*, have been introduced into Pacific island countries to control invasive snails (and slugs) such as the Giant African snail, but the effects have been a disaster for local slug (and snail) populations. Such introductions are to be discouraged. Environmental impact studies are essential before the introduction of these predators because of their non-specific nature.

Indian runner ducks will eat slugs (and snails); they are the only type of livestock that will do so. The fact that *Parmarion martensi* is often aerial, on buildings or within the foliage of climbing plants and trees, may limit the potential of ducks to manage this slug.

### CULTURAL CONTROL

Cultural control is important. The following should be done:

- Make a strip of bare earth about 1.5 m wide around cultivated areas. Bands of sand or broken and crushed egg shells are also effective.
- Collect the slug regularly; many factors determine the success of this method, not least the size of the area to be treated and labour availability.
- Set up 'beer traps'. Pour beer into a shallow pan. The beer attracts the slugs, and they fall in and drown.

### CHEMICAL CONTROL

The usefulness of metaldehyde (pellets containing 1.5-1.8 % active ingredient) over large areas is not encouraged, it is a chemical toxic to livestock, pets and human beings, as well as slugs (and snails). If used:

- Take care to prevent livestock, pets and children from eating the pellets.
- Poisoned snails should never be fed to pigs or other livestock.
- Put the pellets in tins or bamboos in the evening and collect them in the morning. Alternatively, scatter the baits sparsely in and around the plants to be protected so that pets and wildlife will not eat too much of the bait if found. It is best to water the site before applying the baits to stimulate slug activity and increase the chance that the baits will be eaten.
- Note, chemical control needs to be combined with cultural methods to be effective.

More recently, baits with iron-based poisons, e.g., iron phosphate and sodium ferric EDTA have been shown to be effective and safer to use. *However, use to manufacturers' instructions.*

*Note, a ban on the outdoor use of metaldehyde will be introduced in the UK from Spring 2020. It can be used in permanent greenhouses. Metaldehyde poses an unacceptable risk to birds and mammals.*

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<sup>1</sup>Information from Brodie G, Barker GM (2011) Introduced land snails in the Fiji Islands: are there risks involved? In: Veitch CR, Clout MN, Towns DR (eds.) 2011. pp32-36. Island Invasives: Eradication and Management. IUCN, (International Union for Conservation of Nature), Gland, Switzerland, and Helicarionidae. Terrestrial Mollusc Tool. USDA, UF, Lucid (<http://fdtools.org/id/mollusc/factsheet.php?name=Helicarionidae>); and Cowie RH, Hayes KA, Kim Jr, Bustamente KM, Yeung NW (2018) *Parmarion martensi* Simroth, 1893 (Gastropoda: Ariophantidae), an intermediate host of *Angiostrongylus cantonensis* (rat lungworm), on Maui. Records of the Hawaii Biological Survey for 2017. Edited Neal L. Evenhuis. Bishop Museum Occasional Papers 123: 7-10 (2018); and from Brodie G, Barker GM (2012) *Parmarion martensi* Simroth, 1893. Family Ariophantidae. USP Introduced Land Snails of the Fiji Islands Fact Sheet Series, No. 1. Photos 1&2 *Parmarion martensi* (DSC00332 & DSC07854. ([www.NatureLoveYou.sg](http://www.NatureLoveYou.sg)), Diagram Billion. Wikipedia. (<https://en.wikipedia.org/wiki/Slug>).

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