

Biodiversity Record: The semi-slug, *Cambodiparmarion doroshenkoi*, in Singapore

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Subjects: Semi-slug, *Cambodiparmarion doroshenkoi* (Mollusca: Gastropoda: Ariophantidae).

Subjects identified by: Tan Siong Kiat, Chan Sow-Yan and Lau Wing Lup.

Location, date and time: Singapore Island, Pasir Ris Park; Sungei Api Api; 19 June 2021; around 1220 hours.

Habitat: Among decaying leaf litter above the high tide line, in the shade of mangrove vegetation (Fig. 1) at the bank of a creek surrounded by a housing estate. In cloudy weather.

Observer: Lau Wing Lup.

Observation: At least two live examples were found in close proximity to each other within damp and deep leaf litter (Fig. 2). The shell on one of the semi-slugs was partially exposed (Fig. 3), while that of the other was completely covered by flesh (Fig. 4). The larger individual was about 3 cm when stretched out. When disturbed, this semi-slug does not exhibit wriggling behaviour, nor exude slime.



Fig. 1. Habitat of *Cambodiparmarion doroshenkoi* at Pasir Ris. (Photograph by: Lau Wing Lup).



Fig. 2. Two *Cambodiparmarion doroshenkoi* grazing on a dead leaf. (Photograph by: Lau Wing Lup).



Fig. 3. Dorsal view of a semi-slug with its shell (indicated by arrow) partially exposed. Note thin gold line on the tail. (Photograph by: Lau Wing Lup).



Fig. 4. Dorsal view of semi-slug with its shell fully concealed by its mantle. Note the tiny green eggs (circled red). (Photograph by: Lau Wing Lup).

Remarks: The semi-slugs from the forest of the Singapore Botanic Gardens and urban garden of Chestnut Avenue (Tan et al., 2017, as *Microparmarion* sp.), as well as the individuals featured here, match the description and illustration of *Cambodiparmarion doroshenkoi* in Kuznetsov & Kuzminykh (1999) and Sutcharit et al. (2020). Semi-slugs of the monotypic genus *Cambodiparmarion* are distinguished from those of the genus *Microparmarion* by their large, long stalk spermatheca and long flagellum that consists of two portions (Kuznetsov & Kuzminykh, 1999). *Cambodiparmarion doroshenkoi* were found on tree trunks and leaves in limestone areas in Cambodia (Sutcharit et al., 2020). In Singapore, it is presumed to have been accidentally introduced, possibly with imported ornamental plants.

The flesh of *Cambodiparmarion doroshenkoi* is distinctly granular in texture due to the numerous nodules on the dorsal part of the body, but not on the head. A thin gold stripe is present along the keel on the semi-slug's tail (Figs. 3, 4).

The shell of *Cambodiparmarion doroshenkoi*, too small for the animal to withdraw into, is an oval, yellowish-white, semi-transparent, rather flat plate of about two whorls, with a considerably larger second whorl, and with its edge lined with an orange-brown proteinaceous substance (Fig. 5). A particularly large specimen in this observation has an aberrant shell with a width of about 9 mm. It is thicker and less transparent, with pronounced rib-like growth lines, brownish axial bands and whitish mottling. A white and irregularly shaped non-glossy scar formation and striped pattern are present on its early whorls. The shell's inner lip is covered with numerous blister pearl-like calcified material (Fig. 6).



Fig. 5. Dorsal (left) and apertural (right) views of a normal *Cambodiparmarion doroshenkoi* shell (width about 6 mm). Note orange lining on the shell's suture. (Photographs by: Lau Wing Lup).



Fig. 6. Dorso-lateral (left) and apertural (right) views of an aberrant shell (width about 9 mm). Note rib-like growth lines, brownish axial bands, whitish mottling and striped pattern on its early whorls, and a cluster of small pearl-like calcified material on the shell's inner lip. (Photographs by: Lau Wing Lup).

Pearl formation in molluscs is mainly caused by foreign particles like sand grains or parasites that induce the mantle to react in self-defence. The pearl-like growths observed here on a shell of *Cambodiparmarion doroshenkoi* resemble the blister pearl formation in *Eucobresia glacialis*, reported by Margry (2016), in terms of its growth site and irregular shape. *Cambodiparmarion doroshenkoi* is not known to produce calcified pearl-like growth on its shell, and the present observation may be the first to be documented. However, natural pearls typically have consistent concentric layering, and a high-resolution X-ray computed microtomography is necessary to confirm that the pearl-like growths observed here on the shell of the *Cambodiparmarion doroshenkoi* are, indeed, naturally formed blister pearls (see e.g., Zwaan et al., 2014).

A pair of minute, light greenish, jelly-like eggs attached to a dead leaf beside a semi-slug (Fig. 4) was observed, but cannot be ascertained to be eggs of *Cambodiparmarion doroshenkoi* as their eggs have not been illustrated nor described.

Literature cited:

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