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First record of *Corythucha gossypii* (Hemiptera: Heteroptera: Tingidae) from Vanuatu (southwest Pacific)

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Abstract. *Corythucha gossypii* (Fabricius, 1794) (Hemiptera: Heteroptera: Tingidae) is recorded for the first time from Vanuatu (Tanna island and Mystery Island). A large number of individuals (adults as well as larvae) were observed feeding on *Ricinus communis* L., which is an introduced plant species. The presence of both adult sexes and larvae of *C. gossypii* represents evidence of an estabilished viable population of this new alien species on Tanna island and Mystery Island. It suggests the possibility of its presence also on other islands of the Vanuatu archipelago.

Key words: Hemiptera, Heteroptera, Tingidae, faunistics, Vanuatu, Oceania, alien species.

Introduction

The bean or cotton lace bug *Corythucha gossypii* (Fabricius, 1794) (Hemiptera: Heteroptera: Tingidae) is a significant pest of beans, cotton and further cultivated plants (Neal & Schaefer 2000; Miller & Nagamine 2005). It is native species for the southern continental United States, Mexico, Central America, Caribbean islands and northern South America (Drake & Ruhoff 1965; Henry & Froeschner 1988). In 2005, the species was reported from Hawaii from collections since 2001 (Miller & Nagamine 2005), most probably due to an introduction with cultivated crops and ornamental plants. In 2019, *C. gossypii* was examined on a pod of *Moringa oleifera* Lam. imported from Fiji to Japan during the inspections at Narita International Airport (Noto 2022). Fiji is also one of Vanuatu's largest importers (including agricultural products) (UNCTAD 2019). In this paper, we provide the first record of *C. gossypii* from Vanuatu, which represents an interesting case of an introduction of a small true bug for a long distance in the Pacific Ocean. The species may have been originated more probably from Fiji than from Hawaii or its native areas due to the important role of Fiji in the Vanuatu trade imports and its closer geographical position.

Material and methods

Photographs of individuals (Figs 1–7) were taken using an Olympus TG-6 camera in the camera's "microscope mode". The distribution map (Fig. 8) was created using SimpleMappr (Shorthouse 2010) and subsequently adapted in Adobe Photoshop CC 20.0.5. Maps showing details of the species distribution in Tanna island (Fig. 9) and Mystery Island (Fig. 10) were generated in Google Earth 7.1.8.3036 and edited in Adobe Photoshop CC 20.0.5.

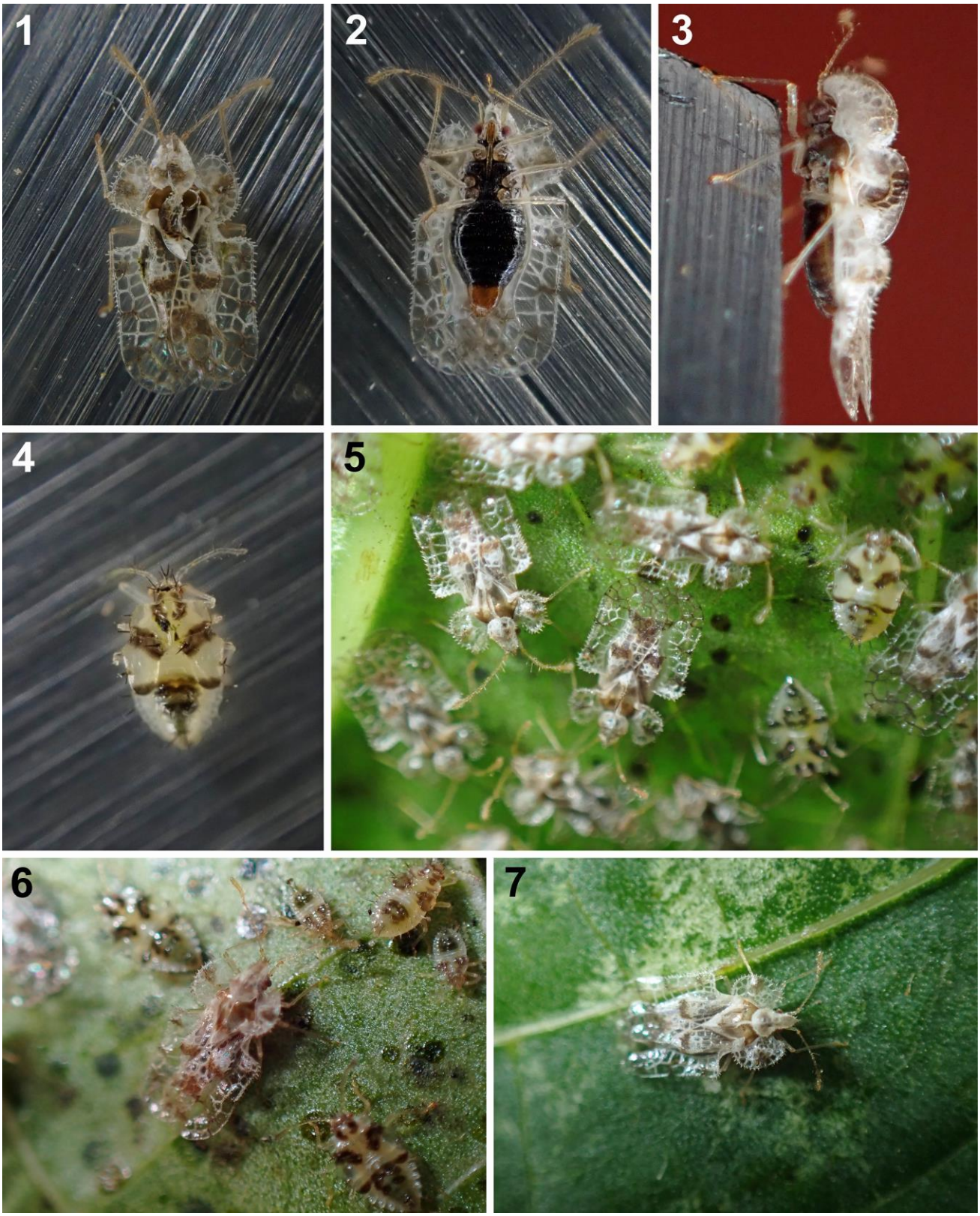
Results

***Corythucha gossypii* (Fabricius, 1794)** (Figs 1–7)

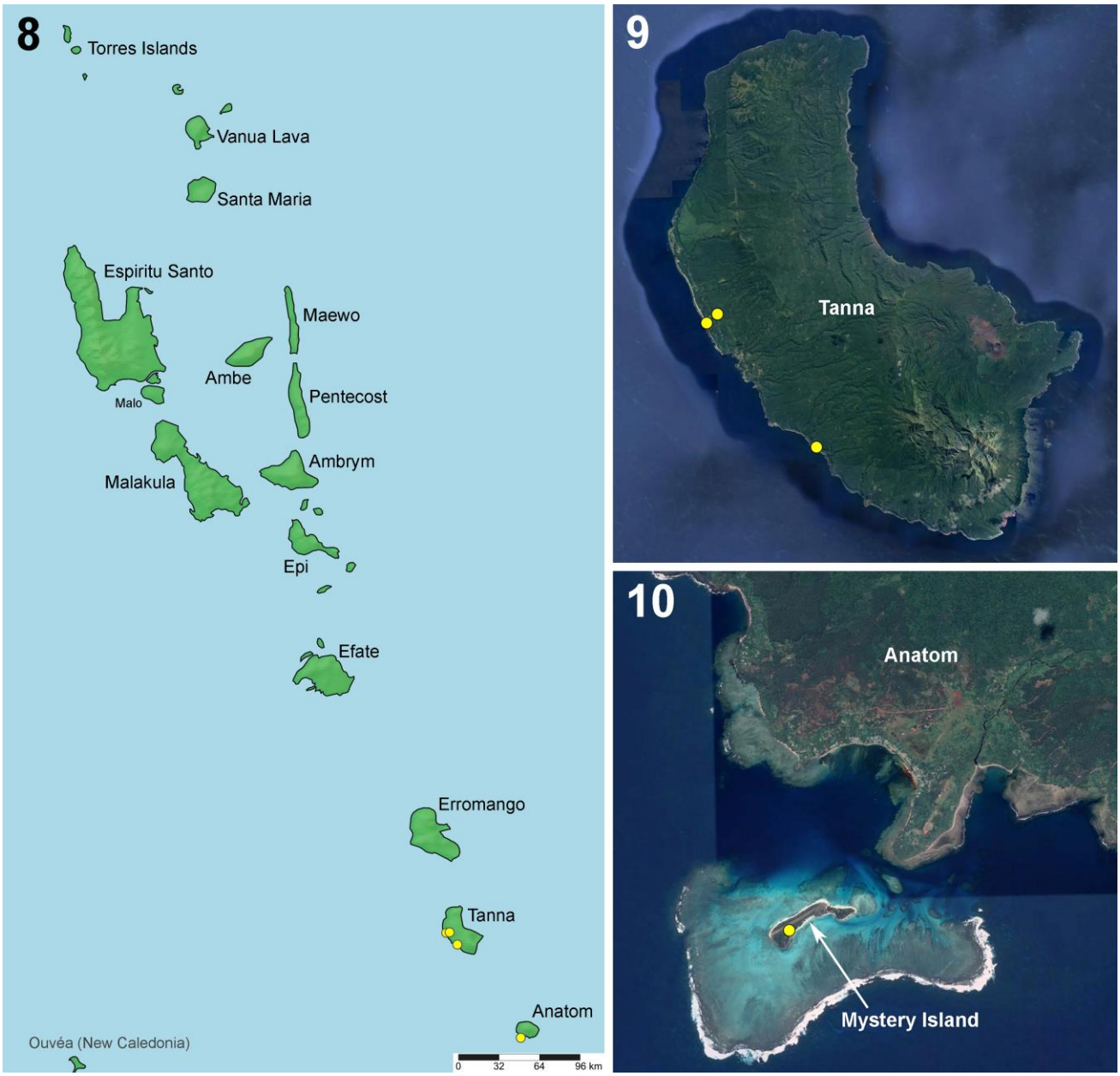
Material examined. VANUATU: Tafea Province: Tanna island: Lowanatom area, Lowkas (19°30′30.76″S 169°14′40.67″E), feeding on castor bean, *Ricinus communis* (Euphorbiaceae), 30.IX.2022, 4 ♂♂ 6 ♀♀, and tens of further adults and larvae observed, D. M. Ramík lgt. et coll., observ. et photo, V. Hemala det. [Fig. 6]; Lowanatom area, Lowkas (19°30′30.76″S 169°14′40.67″E), feeding on castor bean, *R. communis*, 3.X.2022, tens of adults and larvae observed, D. M. Ramík observ. et photo, V. Hemala det. [Fig. 5]; Lowanatom area, Lowkas (19°30′30.76″S 169°14′40.67″E), feeding on castor bean, *R. communis*, 3.XI.2022, 1 ♂ 1 ♀ 1 larva, D. M. Ramík lgt., V. Hemala det. [Figs 1–4]; Lowanatom village, near the Latun nakamal (traditional meeting place) (19°30′10.12″S 169°15′8.83″E), on *R. communis*, 5.X.2022, 2 ♂♂ 2 ♀♀, D. M. Ramík lgt. et coll., observ. et photo, V. Hemala det.; Kwataparen area, ca. 300 m SE from the Kwataparen Junior Secondary School (19°35′32.36″S 169°19′11.38″E), on *R. communis*, 28.X.2022, 1 ♂ 3 ♀♀, D. M. Ramík lgt. et coll., observ. et det. **Mystery Island (offshore Anatom island):** near the airfield (20°15′0.63″S 169°46′11.61″E), 10.XII.2022, several adults on *R. communis*, D. M. Ramík observ., photo et det., V. Hemala revid. [Fig. 7].

Identification. Only eleven species of the family Tingidae are known from the Vanuatu archipelago (Gross 1975; Guilbert 1999) and five of them are endemic of the country. Guilbert (1999) provided a comprehensive key for the identification of all of these eleven species. *Corythucha gossypii* can be distinguished from all of these species by several characters such as: hood

extended over head; apex of hood laterally compressed; sharp spines on lateral margins of paranota and on the basal part of costal margins of hemelytra; paranota basally undulating; costal margins of hemelytra usually parallel or rarely slightly concave; sharply reflexed costal area at its base; and the basal fold at calli present and non-areolate (Blatchley 1926; Slater & Baranowski 1978; Mead 1989). Useful keys for the identification of species of the genus *Corythucha* were provided by Gibson (1918) (for all the species), Blatchley (1926) (for North American species), Slater & Baranowski (1978) (for the United States and Canada) and Mead (1989) (for Florida).



Figs 1-7. *Corythucha gossypii* (Fabricius, 1794), specimens collected and observed in Vanuatu: 1–3 – habitus of adult: 1 – dorsal view; 2 – ventral view; 3 – lateral view; 4 – habitus of larva; 5–6 – living specimens from Lowanatom area on the leaf of *Ricinus communis*; 7 – detail of a living specimen from Mystery Island on the leaf of *R. communis*. (Photo: D. M. Ramík).



Figs 8-10. Distribution of *Corythucha gossypii* (Fabricius, 1794) (yellow circles) in Vanuatu archipelago: 8 – distribution of the species in the whole archipelago; 9 – detail of the species distribution in Tanna island; 10 – detail of the species distribution in Mystery Island near Anatom island (sources of maps: 8: created using SimpleMappr online tool; 9–10: Google Earth).

Biology. Although we have recorded the species only on the introduced *Ricinus communis*, the possibility of feeding on further cultivated, ornamental or introduced plant species in Vanuatu can not be excluded. Nearly 30 plant species were confirmed as host plants of *C. gossypii* (Gibson 1918; Miller & Nagamine 2005; Nava et al. 2021; Noto 2022), including families Annonaceae, Euphorbiaceae, Fabaceae, Malvaceae, Moraceae, Moringaceae, Rutaceae, Sapindaceae, Solanaceae and Thymelaeaceae. Most of the host plants of *C. gossypii* in Hawaii in 2001–2003 represented introduced plant species (even 17 from 22 species; see Miller & Nagamine 2005). Therefore the presence of *C. gossypii* on further introduced/non-native plant species is very probable also in Vanuatu. Oliveira et al. (2019) studied the biology of *C. gossypii* reared in laboratory conditions on *Ricinus communis* and they found that the development time from egg to adult is temperature dependent – the average development time was longest at 20 °C (44.5 days) and shortest at 28 °C (16.87 days). However, the average temperature in Anatom island varies between ca. 22–26 °C annualy and between ca. 18–22 °C during the September–December period (when the specimens of *C. gossypii* were observed) (see Kaniaha & Malsale 2011), it is possible to assume that the average development time of *C. gossypii* in Anatom island and in ca. 62 km distanced Tanna island is relatively longer.

Discussion

The presence of dozens of adults (Figs 1–3) and larvae (Fig. 4) at several sites in Lowanatom area during their active feeding (Figs 5–6) on *Ricinus communis* (together with the observation of species also in Kwataparen area)

represents the evidence of a viable population of *C. gossypii* in Tanna island in Vanuatu. The observation of the species in Mystery Island (Figs 7, 10) indicates the possibility of an inter-island expansion of *C. gossypii* within the Vanuatu archipelago. Our records also represent evidence of a far expansion of *C. gossypii* through a long distance within the Pacific Ocean. The nearest known Pacific records of the species are from ca. 1,200 km distant Fiji islands (see Noto 2022) and ca. 5,800 km distant Hawaiian islands (see Miller & Nagamine 2005). Although, it is not possible to prove the exact origin of the introduction of *C. gossypii* to Vanuatu, it is possible to say that its introduction have been originated more probably from Fiji than from Hawaii or its native areas. Fiji is one of the largest importers (including agricultural products) to Vanuatu (after Australia, New Zealand and China) (see UNCTAD 2019) and *C. gossypii* was also intercepted in plants (*Moringa oleifera*) imported from Fiji to Japan in 2019 during airport inspections (see Noto 2022). Therefore, the presence of viable species populations in the Fiji islands is very probable but needs confirmation. Our findings of *C. gossypii* in Vanuatu represent the second known record of the species from Oceania (with the first known confirmed evidence of a viable population) and the third known case of its introduction into the extensive Pacific region.

All our specimens of *C. gossypii* in Vanuatu were recorded or observed feeding or sitting only on one plant species – *Ricinus communis*. This introduced plant is prevalent in Tanna island and other islands of the Vanuatu archipelago. Its oldest known herbarium item from Vanuatu was collected in 1971 (MALFFB 2021), but *R. communis* has been present in Vanuatu at least since the 19th century. *R. communis* is not even an object of trade in Oceania. Therefore, *C. gossypii* was probably introduced to Vanuatu with some another plant species than with *R. communis*. The species found only the better conditions for its development on *R. communis* due to the wide spread of this plant in Vanuatu.

Another very similar case of an introduction of a Heteropteran species throughout the Pacific Ocean is represented by another tingid, the lantana lace bug *Teleonemia scrupulosa* Stål, 1873, native in the southern United States, Caribbean region, Central and South America (review of its detailed native distribution is available in Drake & Frick 1939). *T. scrupulosa* was first introduced into Hawaii in 1902 (Swezey 1923), and later it was recorded in Java, Fiji, Australia, New Caledonia and Vanuatu, but also in other parts of the world (see Drake & Ruhoff 1965; Henry & Froeschner 1988; Winston et al. 2014; Day & Bule 2016).

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