



## A review of burrower bugs (Hemiptera: Heteroptera: Cydnidae *sensu lato*) of Guam

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### Abstract

Five species representing the family Cydnidae *sensu lato* are recorded from Guam; three of them are reported for the first time from the island: *Byrsinus varians* (Fabricius, 1803), *Fromundus biimpressus* (Horváth, 1919), and *Rhytidoporus indentatus* Uhler, 1877. The widespread species, *Fromundus pygmaeus* (Dallas), was recorded by Ruckes (1963) and verified by us. The occurrence of a fifth species, previously listed from the island by Ruckes (1963) and Lis (1996), namely *Adrisa flavomarginata* (Vollenhoven, 1868), is regarded as doubtful. Of four currently known burrower bug species occurring on Guam, three are Oriental and one is American in origin. A key to all burrower bug species known from the island is provided. Additionally, *Microporus shiromai* Froeschner, 1976 from Hawaii is regarded as a junior synonym of *Byrsinus varians* (Fabricius, 1803).

**Key words:** Hemiptera, Heteroptera, Cydnidae, *Microporus shiromai*, Guam, review, faunistics, taxonomy, new records, new synonym, key to species

### Introduction

Although the burrower bug fauna of the Oriental and Australian Regions is relatively well known (see, e.g., Lis 1994, 1996, 1997, 1999a,b,c,d, 2000a,b, 2001; Lis and Heyna 2001), some of the Pacific islands are still unsatisfactorily explored. Literature data (Ruckes 1963, Lis 1996) record two species of this family from Guam: *Fromundus pygmaeus* (Dallas, 1851) and *Adrisa flavomarginata* (Vollenhoven, 1868). However, an accurate identification of the latter species was regarded by Ruckes (1963) as almost impossible and very questionable because all three of the specimens available to him were very badly damaged. Therefore, only a single burrower bug species (i.e., *F. pygmaeus*) can be regarded as positively recorded from the island. As a result of our studies, we record three species new to the island and document the occurrence of *F. pygmaeus*. We did not discover specimens of *A. flavomarginata*.

Additionally, *Microporus shiromai* Froeschner from Hawaii is regarded as a junior synonym of *Byrsinus varians* (Fabricius).

Beginning in 2004, RSZ began to work with personnel at the University of Guam to better understand the insect fauna of Guam and the Northern Mariana Islands. The primary purpose of these studies is to verify existing records and to document more recent introductions to Guam. Guam is a primary area of military, business, and tourist movement, and introductions are common and sometimes devastating to the native fauna and flora as well as to the economy. It is important that we have an understanding of those species being introduced to the island so that when necessary, best management practices can be implemented.

## Material and methods

The majority of the material for this study was gathered by the second author (RSZ) during ongoing insect diversity studies on Guam. In this paper, we also include some specimens collected on Guam that are housed in the B.P. Bishop Museum, Honolulu, Hawaii. All specimens collected for this study were taken at lights. Those specimens collected by RSZ were taken at a series of fluorescent lights that lined the outside of a three-story laboratory and office building (Marine Biology Laboratory) near the University of Guam campus. The area surrounding the building consisted of general vegetation and grasses on a sandy soil. Specimens were also collected at the Fadian Point aquaculture lab at a 150-watt mercury vapor lamp (BioQuip Products), which was situated in a grassy area surrounded by shrubby vegetation and trees.

The external morphology concept follows Froeschner (1960) and Lis (1994). A general distribution of the species follows Froeschner (1960) and Lis (1999c, 2006). Specimens are deposited in the collection of the first author (JAL), the James Entomological Collection at Washington State University, and the Wilford Leon Guerrero Insect Museum at the University of Guam. Material borrowed from the Bishop Museum is housed in that collection.

## Key to the burrower bug species recorded from Guam

1. Antennae 4-segmented, 2nd segment very long; body length exceeding 9 mm.....*Adrisa flavomarginata*
- Antennae 5-segmented, 2nd segment of different length; body length not exceeding 7 mm..... 2.
2. Submargins of head with both types of setae, i.e., hairlike setae and peglike setae (Figs. 1–2, 7–8) ..... 3.
- Submargins of head with hairlike setae only (Figs. 3–6), peglike setae never present ..... 5.
3. Costal margin with numerous (about 10–24) hairlike setae; evaporative areas on meso- and metapleuron very narrow, just outlining peritreme and almost indistinct (Fig. 9)..... *Byrsinus varians*
- Costal margin with a few (1–3) hairlike setae; evaporative areas on meso- and metapleuron large and easily visible (Figs. 10–12)..... 4.
4. Submargins of head with several setigerous punctures (4–12) (Figs. 5–6); evaporative areas on meso- and metapleuron entirely dull (Fig. 11)..... *Fromundus pygmaeus*
- Submargins of head with more than a dozen setigerous punctures (about 20) (Figs. 7–8); areas on meso- and metapleuron with a transverse polished band almost reaching the apex of peritreme (Fig. 12) ..... *Rhytidoporus indentatus*
5. Smaller species, body length not exceeding 5 mm (3.0–4.5 mm); body weakly or moderately punctured..... *Fromundus pygmaeus*
- Larger species, body length exceeding 5 mm (5.3–6.9 mm); body densely punctured ..... *Fromundus biimpressus*

## Review of species

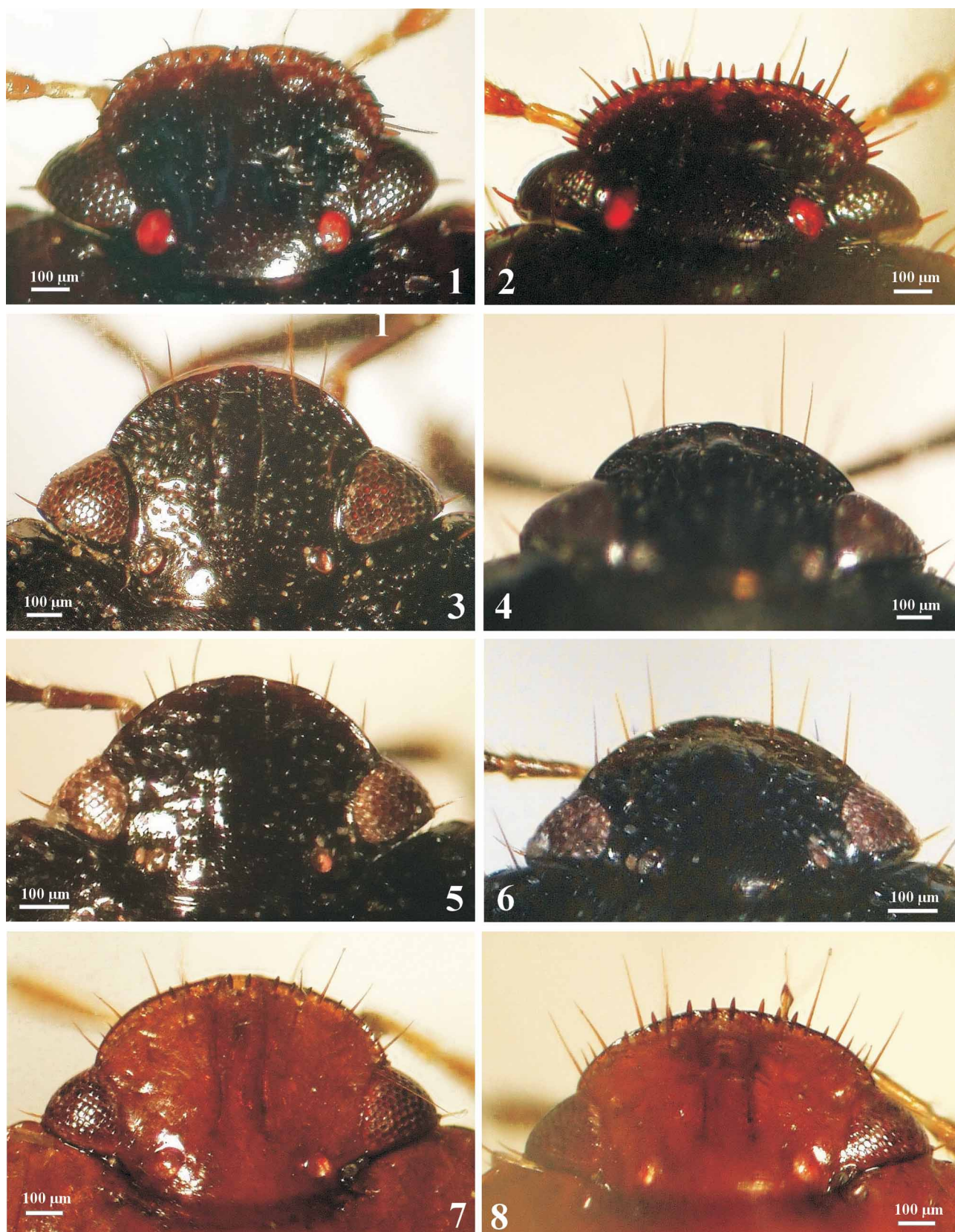
### *Byrsinus varians* (Fabricius, 1803), first territory record

(Figs. 1–2, 9)

*Microporus shiromai* Froeschner, 1976: 232, new synonym.

**Diagnostic characters:** Body from pale brown to blackish brown, 3.4–4.5 mm in length. Head sparsely punctured; clypeus subapically with two peglike setae (Figs. 1–2); each paraclypeus with a submarginal row of 10–12 setigerous punctures (7–8 peglike setae, and 3–5 hairlike setae); 2<sup>nd</sup> antennal segment shorter than 3<sup>rd</sup> segment. Pronotum moderately punctured, each lateral margin with numerous (19–40) submarginal setigerous punctures. Each costal margin with 11–24 setigerous punctures. Evaporative areas on meso- and metapleuron small, almost indistinct (Fig. 9). Paramere described in Lis (1994).

**Material examined:** Guam: Mangilao Village, University of Guam campus, Marine Biol. Lab. Area, at lights, N13°25.714' E144°47.913', 1 female 17 May 2004, 1 female 18 May 2004, 2 females 19 May 2004, R.S. Zack collr.; Guam: Mangilao Village, Fadian Point, University of Guam aquaculture center, N13°26.586' E144°49.176', 5 males 11 females 8 Aug 2005, R.S. Zack, MV light.



**FIGURES 1–8.** Head in two dorsal views. 1, 3, 5, 7—showing head shape and puncturation, 2, 4, 6, 8—showing head vestiture.



**Distribution:** Bangladesh, Brunei, Burma, Chagos Archipelago, Cambodia, China (Hainan, Tianjin, Neimenggu, Ningxia), India, Indonesia, Japan, Korea, Laos, Malaysia, Maldive Islands, Philippines, Sri Lanka, Thailand, Vietnam.

**Remarks:** When describing *Microporus shiromai* as a new species from Hawaii, Froeschner (1976) was aware that this species was introduced into Hawaii from elsewhere; however, he decided to describe it as a new because, as he wrote, “this recently collected species needs a name, under which accumulating data can be stored.” Moreover, he stated that “its occurrence on the island represents a recent introduction,” and all the morphological characters “suggest an Old World origin of the species, but give no clue to a particular part thereof.” At present, it is clear that *M. shiromai* has all of the characters of the Oriental *B. varians*, and should be regarded as its junior synonym. Unfortunately, the type specimens were not found in Froeschner’s collection (personal information from Dr. A. Wolski), and therefore the present synonymization is based only upon the original species description.

***Fromundus biimpressus* (Horváth, 1919), first territory record**  
(Figs. 3–4, 10)

**Diagnostic characters:** Body from dark brown to black, 5.2–6.5 mm in length. Head laterally clearly punctured, clypeus and vertex impunctate or with single punctures only; clypeus subapically without setigerous punctures (Figs. 3–4); each paraclypeus with 2–3 submarginal setigerous punctures bearing hairlike setae; 2<sup>nd</sup> antennal segment as long as or only a little shorter than the 3<sup>rd</sup> segment. Pronotum weakly punctured, each lateral margins with 4 submarginal setigerous punctures. Each costal margin with a single setigerous puncture. Evaporative areas on meso- and metapleuron large, entirely dull (Fig. 10). Paramere described in Lis (1994).

**Material examined:** Guam: Mangilao Village, University of Guam campus, Marine Biol. Lab. Area, at lights, N13°25.714’ E144°47.913’, 3 males 7 females 18 May 2004, 1 male 1 female 19 May 2004, R.S. Zack collr.

**Distribution:** China (Fujian, Guangdong, Yunnan), Indonesia (Sumatra), Laos, Malaysia (Malaya), Thailand, Vietnam.

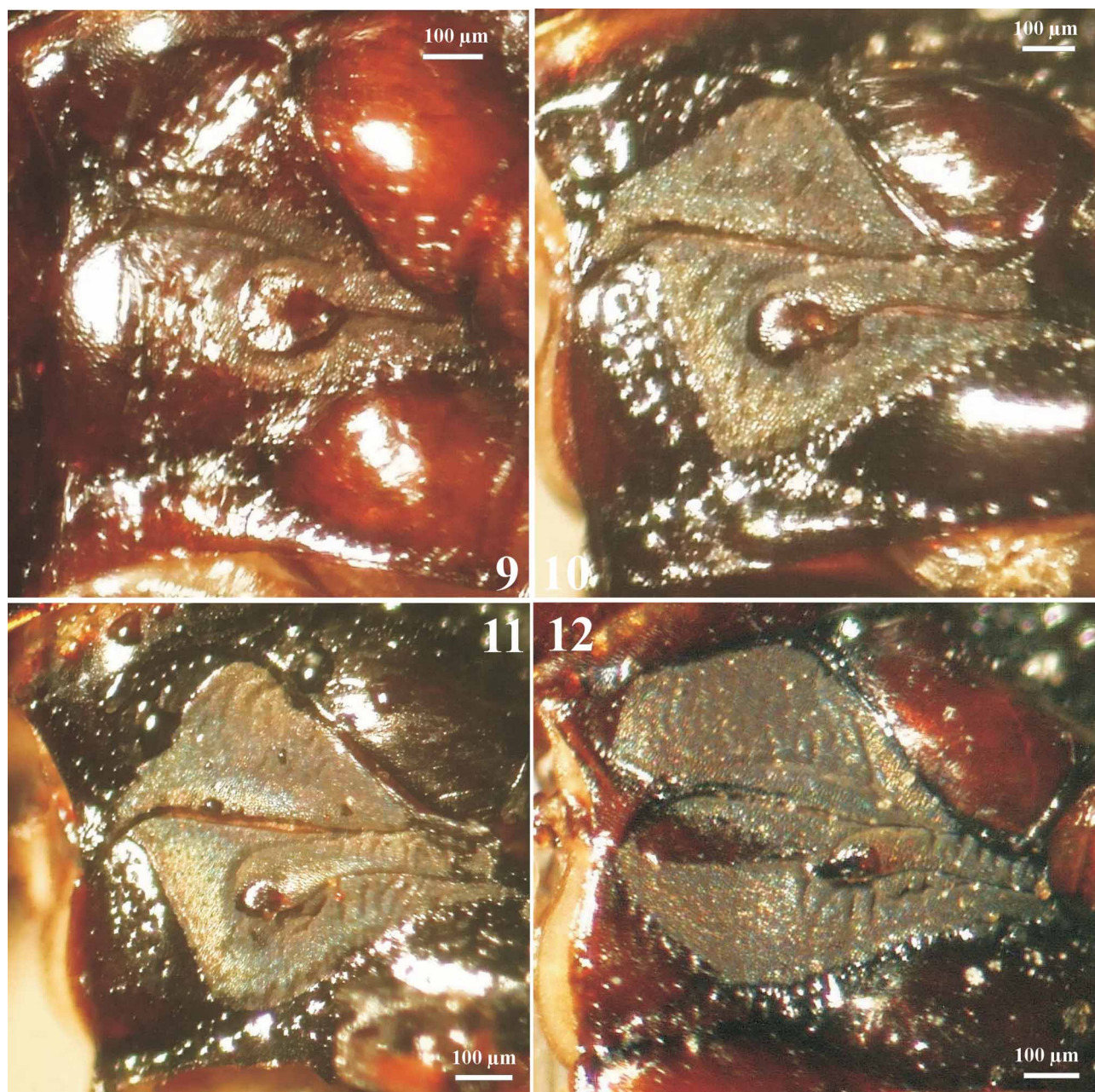
***Fromundus pygmaeus* (Dallas, 1851)**  
(Figs. 5–6, 11)

**Diagnostic characters:** Body from ochraceous to black, shiny, moderately punctured, 3.2–4.5 mm in length. Submargins of head with hairlike setae (2–5 on either paraclypeus), pegs and peglike setae on paraclypei almost always absent, only sporadically one or two may be present; clypeus without a subapical pair of hairlike setae, only sporadically with a pair of short slender pegs. 2<sup>nd</sup> antennal segment a little shorter than 3<sup>rd</sup> segment. Pronotal submargins with hairlike setae (a row of 4–6 setae on either side). Costa with a single setigerous puncture bearing a hairlike seta. Evaporative areas on meso- and metapleuron large, entirely dull (Fig. 11). Paramere described in Lis (1994).

**Material examined:** Guam: Mangilao Village, University of Guam campus, Marine Biol. Lab. Area, at lights, N13°25.714’ E144°47.913’, 1 male 1 female 17 May 2004, 1 male 2 females 18 May 2004, 1 male 2 females 19 May 2004, R.S. Zack collr.; Guam, Mangilao, 15-x-71, La Plante, Lot at light, 2 females, A.A. La Plante Collection, Bishop Museum, Acc. #1977.84 (Bishop Museum, Honolulu); Guam, Tamuning, 31-x-71, La Plante, Lot at light, 1 male, A.A. La Plante Collection, Bishop Museum, Acc. #1977.84 (Bishop Museum, Honolulu).

**Distribution:** Australia, Bismarck Archipelago (Manus, Mussau, New Ireland, New Britain), Burma, Brunei, Cambodia, Chagos Archipelago, China (Sichuan, Guangdong, Hainan, Guangxi, Yunnan, Jiangxi, Hubei, Taiwan), Christmas Islands, Cocos-Keeling Islands, Cyprus, Fiji, Hawaii, Hong Kong, India (incl.

Andamans and Nicobars), Indonesia, Iran, Iraq, Israel, Japan, Jordan, Korea, Laos, Malaysia, Maldives Islands, Marquesas, Micronesia, Nepal, New Caledonia, New Hebrides, Pakistan, Papua New Guinea, Philippines, Réunion (Bourbon Island), Samoa, Saudi Arabia, Singapore, Sri Lanka, Solomon Islands, Society Islands, Thailand, Vietnam, Yemen.



**FIGURES 9–12.** Evaporative areas on meso- and metapleuron. 9—*Byrsinus varians*, 10—*Fromundus biimpressus*, 11—*F. pygmaeus*, 12—*Rhytidoporus indentatus*.

***Rhytidoporus indentatus* Uhler, 1877, first territory record**

(Figs. 7–8, 12)

**Diagnostic characters:** Body from brown to almost black, 3.80–5.80 mm in length. Head impunctate or almost impunctate; clypeus subapically with a pair of setigerous punctures bearing peglike setae (Figs. 7–8); each paraclypeus with a row of about 10 submarginal setigerous punctures bearing hairlike and peglike setae (Figs. 7–8); 2<sup>nd</sup> antennal segment as long as or shorter than 3<sup>rd</sup> segment. Pronotum weakly punctured, very



often almost impunctate, each lateral margin with 5–6 submarginal setigerous punctures. Each costal margin with 1–3 setigerous punctures. Evaporative areas on meso- and metapleuron large, bearing a transverse polished band toward apex of peritreme (Fig. 12). Paramere described in Froeschner (1960).

**Material examined:** Guam: Mangilao Village, University of Guam campus, Marine Biol. Lab. Area, at lights, N13°25.714' E144°47.913', 16 males 22 females 17 May 2004, 16 males 13 females 18 May 2004, 18 males 12 females 19 May 2004, R.S. Zack collr.

**Distribution:** USA (including Hawaii), Haiti, Cuba, Dominican Republic, Puerto Rico, St Croix Island.



FIGURE 13. *Adrisa flavomarginata*—dorsal habitus.

*Adrisa flavomarginata* (Vollenhoven, 1868)

**Remarks:** Three badly damaged specimens, tentatively identified as *A. flavomarginata*, were recorded from Guam by Ruckes (1963); nevertheless, he was aware that identification of those specimens was doubtful. At present, it is impossible to determine the correct generic and species placement of that record. Because the presence of *A. flavomarginata* in Guam can not be completely excluded, the species is placed in the key to the Cydnidae of the island, and its dorsal body habitus is presented on the photograph (Fig. 13).

**Distribution:** Australia, Guam?, New Caledonia.

## Discussion

Of the four burrower bug species currently known from Guam, three are of Oriental and a single one is of American origin.

*F. pygmaeus* is one of the commonest and widespread burrower bug species known from the Old World tropics and subtropics, and therefore its presence on Guam, as recorded by Ruckes (1963) and verified through this study, is not a surprise. The status of the two other Oriental species, *F. biimpressus* and *B. varians*, recorded for the first time from the island, probably represent somewhat recent introductions. As neither species was recorded from the island by Ruckes (1963), we can probably regard them as being introduced to the island during the last 50 years. But, it is possible that these species might simply have been overlooked by Ruckes.

The biology of most tropical burrower bugs is relatively unknown and we can add little to this knowledge based on our efforts in Guam. All specimens used in this study were taken at light traps in fairly nondescript habitats. In Hawaii, and in the Orient as well, *B. varians* (= *Microporus shiromai*) has been somewhat studied (Froeschner 1967; Lis 1994; Lis et al. 2000) and is regarded as a serious pest of pearl millet, *Pennisetum typhoides* (Burm.) (Ghauri 1975; Lis 1994; Lis et al. 2000). Although this species of millet is absent from Guam, three relatives occur there (Meyer 2000), namely *P. setaceum* (Forssk.) Chiov., *P. purpureum* Schumach., and *P. polystachyon* (L.) Schult. It is possible that at least one of them has become an alternative host for *B. varians*, which could make it a pest on Guam.

Most surprising on Guam is the presence of the American species, *R. indentatus*; our most commonly collected species. This species has been recorded from Hawaii (Froeschner 1967) and it may be a recent introduction to Guam via that route. However, we cannot be certain of this.

Other species of burrower bugs may occur on Guam. Our collecting was limited to a small area near the University of Guam in Mangilao Village, which is located on the eastern shore of the island. Surveys need to be conducted throughout the island in differing types of habitat to gain a more thorough understanding of the burrower bug fauna.

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We wish to thank Ms K. Kami (Bishop Museum, Honolulu, Hawaii) for the loan of the specimens used in our study, and to Dr. A. Wolski (Plant Protection Institute, Sosnicowice Branch, Poland) for his help in tracing the Froeschner types during his visit to the Smithsonian Institution in 2008. Drs. Aubrey Moore and Ross Miller of the University of Guam have been especially generous in supporting this and other studies on the island.

## References

- Froeschner, R.C. (1960) Cydnidae of the Western Hemisphere. *Proceedings of the United States National Museum*, 111, 337–680.  
Froeschner, R.C. (1976) The burrowing bugs of Hawaii, with description of a new species (Hemiptera: Cydnidae).

*Proceedings of the Hawaiian Entomological Society*, 22, 229–236.

- Ghauri, M.S.K. (1975) On a new subspecies of *Aethus laticollis* Wagner (Hemiptera: Heteroptera: Cydnidae) as a serious pest of *Pennisetum typhoides* (Burm.) in India. *Journal of the Bombay Natural History Society*, 72(1), 226–227.
- Lis, J.A. (1994) A revision of Oriental burrower bugs (Heteroptera: Cydnidae). Upper Silesian Museum, Bytom, 349pp.
- Lis, J.A. (1996) A review of burrower bugs of the Australian Region, with a discussion on the distribution of the genera (Hemiptera: Heteroptera: Cydnidae). *International Journal of Invertebrate Taxonomy – Genus (Wrocław)*, 7(2), 177–238.
- Lis, J.A. (1997) Three new Australian genera of burrower bugs with four new species (Heteroptera: Cydnidae). *Polish Journal of Entomology*, 66, 189–201.
- Lis, J.A. (1999a) A revision of Australian species of the genus *Macroscytus* Fieber (Hemiptera: Heteroptera: Cydnidae). *Entomologica Scandinavica*, 29(4) [1998], 459–479.
- Lis, J.A. (1999b) A revision of the Australian genus *Eulonips* Lis, with descriptions of three new species (Heteroptera: Cydnidae). *Polish Journal of Entomology*, 68(1), 29–39.
- Lis, J.A. (1999c) Burrower bugs of the Old World – a catalogue (Hemiptera: Heteroptera: Cydnidae). *International Journal of Invertebrate Taxonomy – Genus (Wrocław)*, 10(2), 165–249.
- Lis, J.A. (1999d) The genus *Chilocoris* (Heteroptera: Cydnidae) in Australia. *Acta Societatis Zoologicae Bohemicae*, 63, 139–155.
- Lis, J.A. (2000a) *Cydnotomus* - a new Australian burrower bug genus, with two new species (Heteroptera, Cydnidae). *Deutsche Entomologische Zeitschrift*, 47, 137–141.
- Lis, J.A. (2000b) A review of the Australian species of *Geotomus* Mulsant et Rey, 1866, with descriptions of three new species (Hemiptera: Heteroptera: Cydnidae). *Polish Journal of Entomology*, 69(4), 411–428.
- Lis, J.A. (2001) *Prolactistes australis* gen. et sp. nov. from Australia, with remarks on its systematic position within the family (Hemiptera: Heteroptera: Cydnidae). *Annales Zoologici (Warszawa)*, 51(1), 103–107.
- Lis, J.A. (2006) Cydnidae Billberg, 1820 – burrowing bugs (burrower bugs). In: Aukema B. & Rieger H. (eds.) *Catalogue of the Heteroptera of the Palaearctic Region. Volume 5. Pentatomomorpha II*. The Netherlands Entomological Society, Wageningen, pp. 119–147.
- Lis, J.A. & Heyna, J. (2001) Revision of the Australian genus *Blaena* (Heteroptera: Cydnidae). *European Journal of Entomology*, 98(3), 321–350.
- Lis, J.A., Becker, M. & Schaefer, C.W. (2000) Burrower bugs (Cydnidae). In: Schaefer, C. W. & Panizzi, A. P. (eds) *Heteroptera of economic importance*. CRC Press, Boca Raton, pp. 405–419.
- Meyer, J.-Y. (2000) Preliminary review of the invasive plants in the Pacific islands (SPREP Member Countries). In: Sherley, G. (ed.). *Invasive species in the Pacific: A technical review and draft regional strategy*. South Pacific Regional Environment Programme, Samoa, 190 pp.
- Ruckes, H. (1963) Heteroptera: Pentatomoidea. *Insects of Micronesia*, 7(7), 307–356.