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Morphometric analyses reveal synonymy of two monotypic genera, *Huangiella* and *Tumoris* (Acari, Eriophyoidea, Eriophyidae)

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Abstract

Morphological variation of *Huangiella lanyuensis* (Huang, 2001) and *Tumoris sanasaii* Huang, 2001 from Taiwan was analyzed using multivariate statistical methods. We show that these species are the same and propose to use the name *Tumoris sanasaii*. No significant differences between populations from Lanyu and Green Island (type localities for *H. lanyuensis* and *T. sanasaii*, respectively) were found; however, mites from Yangmingshan (northern Taiwan) differed substantially from these two groups. Synonymy resulted from our study is as follows: *Huangiella* Kammerer, 2006 is a junior synonym of *Tumoris* Huang, 2001; *Absentia lanyuensis* Huang, 2001 is a junior synonym of *Tumoris sanasaii* Huang, 2001. We also study the sexual variation of populations from Green Island. The result showed the females significantly larger than the males at 17 variables.

Keywords

Multivariate analysis, Eriophyid mites, Lanyu, Green Island, valid name, *Tumoris sanasaii*

Introduction

Eriophyid mites, also known as gall, blister, erineum, bud and rust mites, have more than 200 genera and about 3700 described species worldwide (De Lillo and Amrine 2003). They differ from the other mites by having only two pairs of legs and by their entirely herbivorous habits. The body is minute in size (80–250 μm) with most of the body structures reduced. These characteristics make them a difficult taxon to study and the actual diversity may be several folds higher than currently known (Amirne 1996).

Huang (2001a, b) established two monotypic eriophyid genera *Absentia* and *Tumoris* based on *A. lanyuensis* Huang and *T. sanasaii* Huang, respectively. The former species was reported from *Symplocos cochinchinensis philippinensis* (originally misidentified as *S. c. cochinchinensis*) in Lanyu (Orchid Island) (Huang 2001a), whereas the latter was collected from Green Island (Ludao) from the same plant subspecies (Huang 2001b). No subsequent species has been added to these two genera since then. The name *Absentia* was later found preoccupied and a replacement name, *Huangiella*, was proposed by Kammerer (2006).

Here we add another mite population from *S. c. cochinchinensis* in northern Taiwan and made several morphometric analyses to determine if these groups are distinct. Sexual variation in the Green Island population was also analyed by multivariate analysis to reveal the morphological difference between sexes.

Materials and methods

Acquisition of specimens and preparation of slide specimens

Specimens used in the present study were collected from Lanyu (22°2'45"E, 121°31'50"N) in 31-Aug.-1994, 18-Aug.-1998 and 28-May-2008, from Green Island (22°39'52"E, 121°29'17"N) in 5-Jun.-2000 (collected from different trees), and from Yangmingshan (25°10'15"E, 121°34'26"N) in 18-Aug.-1999 and 24-Aug.-1999 (prepared and measured by CFW and KWH). Specimen mounting was followed by Huang (2008). Every specimen was mounted dorso-ventrally on a single slide.

Through microscopic examination, 136 out of the 246 slides prepared from the mite samples collected from *S. c. philippinensis* on Lanyu and Green Island were found to be the species in question. Eighty-five individuals allowing measurements of all morphometric variables, including 32 females from Lanyu (LF), 22 males and 31 females from Green Island (GM and GF, respectively), were chosen for morphometric measurement and analysis. We also prepared mite specimens collected from *Symplocos c. cochinchinensis* in Yangmingshan (north Taiwan). Out of 24 individuals, 16 females (YF) were chosen for measurements.

Variable Selection and Measurement

Thirty-three variables for morphometric analyses were selected and measured (Table 1). The variables includes ones based on the the homologous landmarks or length of setae commonly used in taxonomic descriptions. The distance between setal tubercles was measured by truss method (Strauss and Bookstein 1982; Huang et al. 1996) (Fig. 1), and was doubly measured in opposite orientations then averaged. All morphometric data in this study were shown in micrometers (μm).

Table 1. 33 morphometric characters and their abbreviation used in this study.

Variables		Abbreviation
1	body length	BL
2	shield length	SL
3	shield width	SW
4	distance between the dorsal tubercles	Dt-Dt
5	dorsal setae length	Ds.l
6	distance between the 1st coxal tubercles	Ct1-Ct1
7	1st coxal setae length	Ct1.l
8	distance between the 2nd coxal tubercles	Ct2-Ct2
9	the 2nd coxal setae length	Ct2.l
10	distance between the 3rd coxal tubercles	Ct3-Ct3
11	the 3rd coxal setae length	Ct3.l
12	cross distance from the 1st to the 2nd coxal tubercles	Ct1\Ct2
13	distance from the 1st to the 2nd coxal tubercles	Ct1-Ct2
14	cross distance from the 2nd to the 3rd coxal tubercles	Ct2\Ct3
15	distance from the 2nd to the 3rd coxal tubercles	Ct2-Ct3
16	genital width	Gs.W
17	genital length	Gs.L
18	distance between the genital tubercles	Gt-Gt
19	genital setae length	Gs.l
20	distance between the lateral tubercles	Lt-Lt
21	lateral setae length	Lt.l
22	cross distance from the lateral tubercles to the 1st ventral tubercles	Lt\Vt1
23	distance from the lateral tubercles to the 1st ventral tubercles	Lt-Vt1
24	distance between the 1st ventral tubercles	Vt1-Vt1
25	the 1st ventral setae length	Vt1.l
26	distance between the 3rd ventral tubercles	Vt3-Vt3
27	the 3rd ventral setae length	Vt3.l
28	cross distance from the 3rd coxal tubercles to the genital tubercles	Ct3\Gt
29	distance from the 3rd coxal tubercles to the genital tubercles	Ct3-Gt
30	cross distance from the genital tubercles to the lateral tubercles	Gt\Lt
31	distance from the genital tubercles to the lateral tubercles	Gt-Lt
32	cross distance from the genital tubercles to the 1st ventral tubercles	Gt\Vt1
33	distance from the genital tubercles to the 1st ventral tubercles	Gt-Vt1

Analysis

We evaluated geographic and sexual variations in morphology with multivariate analysis of variance (MANOVA). Morphometric data obtained from 101 mites from three localities was analyzed. Females of Yangmingshan, females of Lanyu, and females of Green Island (YF+LF+GF) were used to test if they are the same species, whereas the individuals from Green Island (GM and GF) were used to detect the sexual variation. Morphometric measurements (including distance between setal bases and the lengths of setae) were standardized by subtracted the mean. Principal components analysis

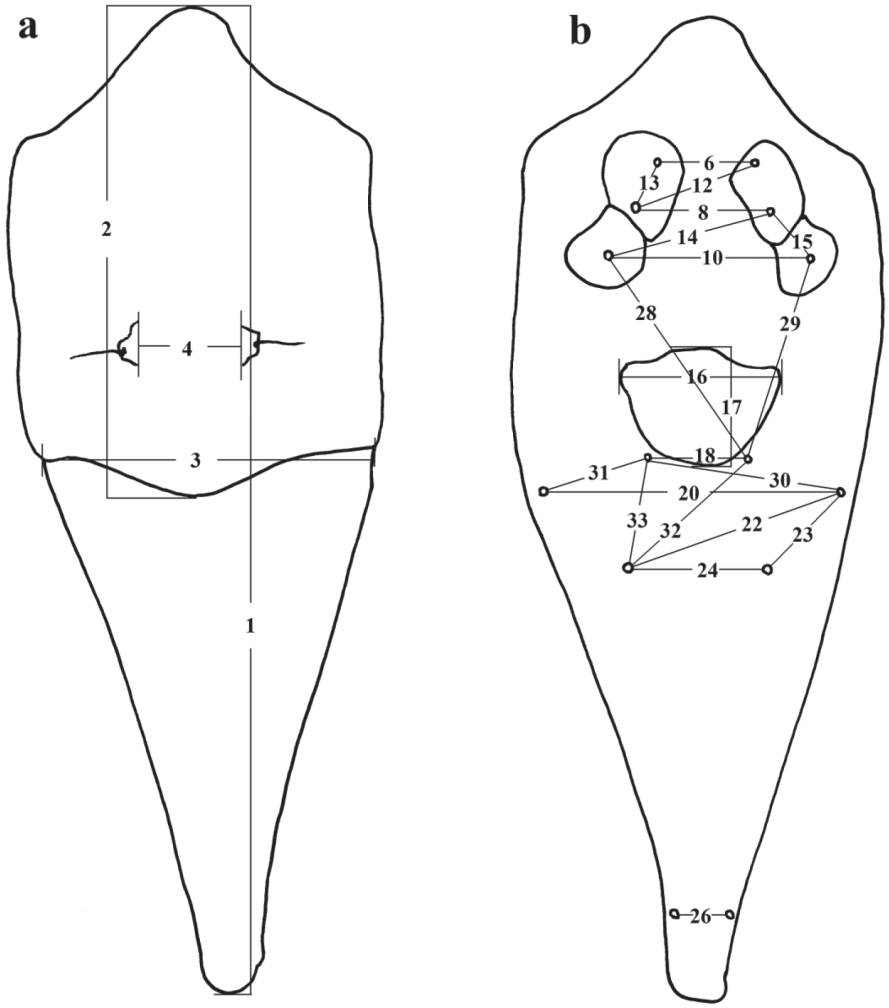

Figure 1. Contour drawing of *Tumoris sanasaii* Huang, 2001 and the measurement of the 33 variables used in this study. The number corresponds to the number of the variable listed in Table 1. **a** dorsal view **b** ventral view.

(PCA) was then applied to reduce multicollinearity. Variation among populations in derived orthogonal principal components was firstly identified with MANOVA. Once a significant result was detected, pair-wise MANOVA tests after Bonferroni adjustment (α-level: 0.05 divided by n comparisons) were followed to identify the pair(s) leading to the difference. We also created a canonical centroid plot, which provides a convenient way for simultaneously inspect differences among populations (the canonical centroid plot depicted the 95% confidence interval for centroid of each population and an overlap of boundary represents no difference in response variables).

We then applied analysis of variance (ANOVA) to determine which response variable (i.e. PC1, PC2, etc.) accounted for the variation. Lastly, differences in those morphometric measurements with high absolute loadings in selected principal components (those that significantly differed among populations) were tested with ANOVA or *t*-test. For the MANOVA test, normality of response variables (PC values for morphometric measurements) was confirmed with Shapiro–Wilk test, and multivariate outliers were identified with jackknifed Mahalanobis distance. All the procedures were implemented in JMP 8.0 (SAS Institute Inc., Cary, N.C.).

Results and discussion

Geographical variation

We applied PCA to reduce the dimensionality in 33 standardize morphometric variables. The three principal axes (PC1–3) were normally distributed within the three locations (Shapiro–Wilk test, W ranged from 0.92 to 0.97, all $P > 0.05$), and there were no outliers in PC values. PC1, PC2, and PC3 varied significantly among the three locations (MANOVA Wilks' λ test: $F_{6,60} = 6.04$, $P < 0.0001$). Canonical centroid plot revealed that morphological characteristics in Yangmingshan (YF) statistically differed from those in Lanyu (LF) and Green Island (GF) (pair-wise MANOVA: $F_{3,11} = 13.54$ and $F_{3,20} = 14.56$, respectively; both $P < 0.001$), whereas the latter two cannot be distinguished from each other ($F_{3,27} = 2.59$, $P > 0.05$) (Fig. 2). Further ANOVA showed that these variations were due to the differences in PC1 ($F_{2,32} = 8.83$, $P < 0.001$) and PC3 ($F_{2,32} = 8.13$, $P < 0.005$), but cannot be explained by PC2 ($F_{2,32} = 0.43$, $P = 0.65$). Absolute values of loadings were higher in Bl, Lt-Lt, Lt\Vt1, Vt1-Vt1, Gt\Lt, and Gt-Lt for PC1, and higher in Sw and Ct1-Ct2 for PC3 (Table 2). Among these variables (using original measurements), Bl (YF: 151.7±3.1 (mean±1SD), 147.9–155.2 (range); LF+GF: 135.3±13.2, 114.3–178.1; *t*-test, $t = 2.44$, $P < 0.05$) and Sw (YF: 61.5±2.0, 58.7–63.3; LF+GF: 51.7±5.6, 39.5–66.8; $t = 3.45$, $P < 0.005$) in YF were significantly different (all were larger) from those in LF and GF (combined due to similarity in morphology).

Sexual variation

The three principal axes derived from 33 standardized morphometric variables were normally distributed (W ranged from 0.93 to 0.98, all $P > 0.05$), and varied significantly between the males (GM) and the females (GF) in Green Island (MANOVA $F_{3,34} = 46.51$, $P < 0.0001$) (Fig. 3). Sexual differences were observed in PC1 (*t*-test, $t = 11.87$, $P < 0.001$), but not in PC2 ($t = -0.51$, $P = 0.62$) and PC3 ($t = 0.14$, $P = 0.89$). Absolute loadings were higher in Bl, Sl, Ds.l, Ct3-Ct3, Ct1\Ct2, Gs.w, Gs.l, Gt-Gt, Lt-Lt, Lt\Vt1, Lt-Vt1, Vt1-Vt1, Ct3\Gt, Ct3-Gt, Gt\Lt, Gt-Lt, and Gt\Vt1 for PC1 (Table 2).

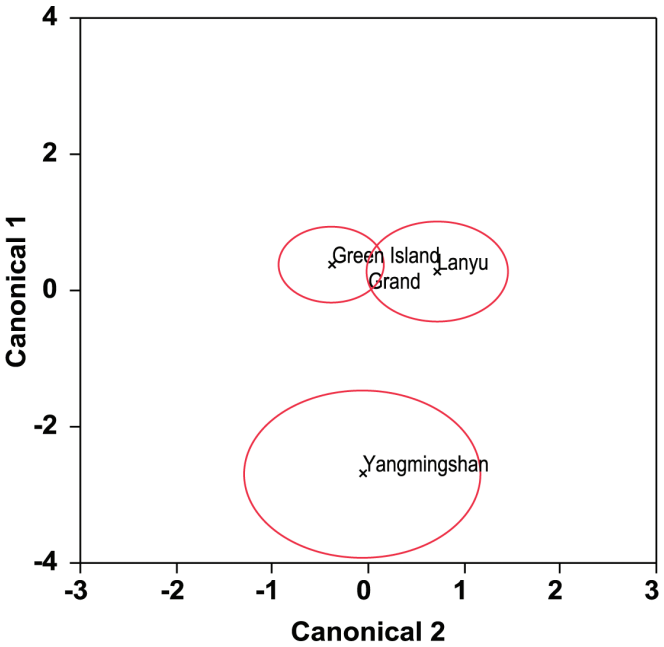

Figure 2. Canonical centroid plot for geographical variation in morphometric characteristics for Yangmingshan (YF), Lanyu (LF) and Green Island (GF).

Sexual variation was observed in all these 17 variables (*t*-test), with the females significantly larger than the males (Table 3).

Identity of the geographical groups

The analyses on geographical groups revealed no significant differences between the Lanyu and Green Island populations, indicating that *H. lanyuensis* and *T. sanasaii* are actually the same. On the other hand, the group from Yangmingshan, previously identified by KWH as *Tumoris sanasaii*, is distinct. Though sharing similar diagnostic characters with *T. sanasaii*, the Yangmingshan group differs significantly from the true *T. sanasaii* by morphometry. The former group feeds on a different subspecies of host plant in the temperate northern Taiwan, in contrast to true *T. sanasaii* living on subtropical or tropical Green Island and Lanyu. At present it is difficult to determine whether it is intra- or inter-specific difference. We would suggest their differentiation being above subspecies level because eriophyid mites have more rapid evolution rate than their host plants. A further study using multidisciplinary approaches would be required to solve the problem.

Owing to the reduced morphological structures and minute size of eriophyids, descriptive diagnosis is usually unsatisfactory in differentiating closely related species.

Table 2. Loadings in principal components of geographical and sexual variations in morphometric variables of Eriophyoid mites in Taiwan (only PCs that significantly differ among populations were shown).

Morphometric variables	Geographical variation		Sexual variation
	PC1	PC3	PC1
Bl	-0.85	0.27	0.60
Sl	0.30	0.51	0.80
Sw	-0.02	-0.64	0.59
Dt-Dt	-0.33	0.47	0.23
Ds.l	-0.26	0.55	0.61
Ct1-Ct1	0.35	0.18	0.49
Ct1.l	-0.01	0.19	0.27
Ct2-Ct2	0.37	-0.12	0.55
Ct2.l	0.49	-0.21	0.41
Ct3-Ct3	0.23	-0.19	0.66
Ct3.l	0.32	-0.35	0.20
Ct1\Ct2	0.54	0.27	0.60
Ct1-Ct2	-0.15	0.61	0.41
Ct2\Ct3	0.40	-0.12	0.58
Ct2-Ct3	-0.07	-0.05	0.40
Gs.w	0.57	0.03	0.90
Gs.l	0.36	0.02	0.90
Gt-Gt	-0.05	-0.10	0.74
Gs.l 2	-0.47	-0.21	0.36
Lt-Lt	0.66	0.48	0.83
Lt.l	0.02	-0.49	0.20
Lt\Vt1	0.71	0.18	0.85
Lt-Vt1	0.33	-0.19	0.65
Vt1-Vt1	0.60	0.27	0.67
Vt1.l	-0.53	-0.11	0.26
Vt3-Vt3	0.04	0.15	0.14
Vt3.l	0.37	-0.31	-0.05
Ct3\Gt	0.51	-0.49	0.88
Ct3-Gt	0.39	-0.40	0.72
Gt\Lt	0.69	0.34	0.89
Gt-Lt	0.70	0.50	0.69
Gt\Vt1	0.60	-0.17	0.85
Gt-Vt1	0.40	-0.24	0.37

Molecular identification is also difficult owing to the hardness to isolate a single individual of an identified species from a mite community without making a slide. Morphometric analyses thus provide a reasonable option with balance in effectiveness and efficiency. The present and many previous studies have proved morphometrics a useful tool in eriophyoid classification (Huang et al. 1996; Magud et al. 2007; Skoracka et al. 2002; Navia et al. 2006, 2009; Skoracka 2009a, b).

Table 3. The 17 characters with significant difference between male and female of *Tumoris sanasaii* in Green Island.

Morphometric variables	Male		Female		t-value
	mean±1SD	range	mean±1SD	range	
Bl	126.6±6.2	114–137	132.7±9.4	114–159	2.32*
Sl	50.0±2.7	45–54	54.7±3.1	50–60	5.05***
Ds.l	6.6±1.1	4.9–8.7	8.2±1.8	4.9–12	3.36**
Ct3-Ct3	16.8±0.8	14–18	18.5±1.2	16–20	4.96***
Ct1\Ct2	9.4±0.6	8.3–11	10.2±1.0	8.7–13	2.82*
Gs.w	14.0±1.6	11–18	19.0±1.3	16–21	10.78***
Gs.l	4.7±1.5	2.6–7.9	12.3±1.0	8.9–16	13.36***
Gt-Gt	11.1±1.4	9–15	14.0±1.1	12–16	6.95***
Lt-Lt	34.0±1.4	31–37	37.8±2.2	33–41	6.39***
Lt\Vt1	29.4±1.1	26–31	33.7±2.3	27–38	7.26***
Lt-Vt1	18.6±1.5	16–21	20.8±2.2	14–23	3.48**
Vt1-Vt1	15.4±1.2	12–17	18.7±2.1	16–24	5.92***
Ct3\Gt	21.0±1.0	19–23	24.8±1.2	23–28	10.91***
Ct3-Gt	15.8±1.3	13–18	18.7±1.8	17–25	5.68***
Gt\Lt	22.3±1.1	19–24	25.9±1.2	24–29	9.31***
Gt-Lt	10.7±1.0	9–12	12.3±1.2	10–14	4.49***
Gt\Vt1	19.5±1.1	18–21	22.1±1.3	20–25	6.80***

*$P<0.05$; **$P<0.005$; ***$P<0.001$

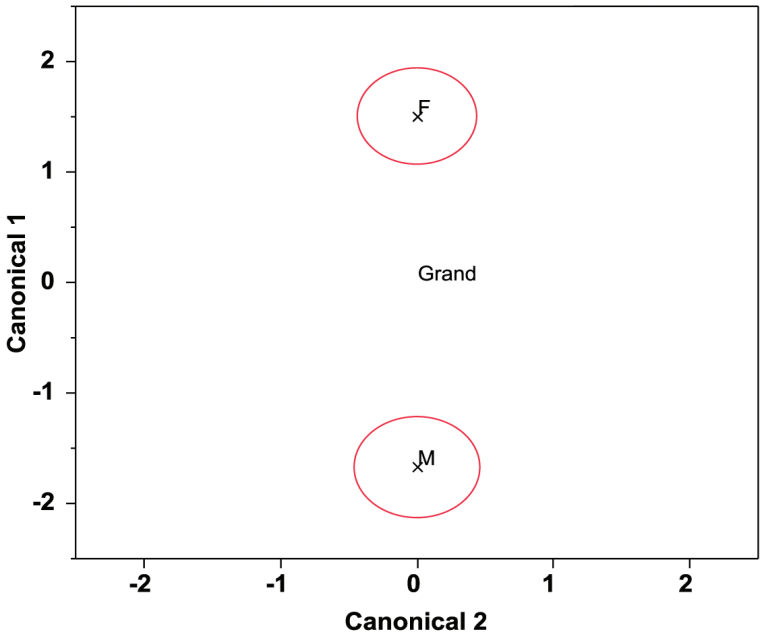

Figure 3. Canonical centroid plot for sexual variation in morphometric characteristics for male (M) and female (F) of Green Island.

Taxonomy

***Tumoris* Huang, 2001: 98**
http://species-id.net/wiki/Tumoris
Plate 1a, b, c, d

Absentia Huang, 2001: 58 (preoc., *Absentia* Togashi, 1990)
Absentia lanyuensis Huang - type species (= *Tumoris sanasaii* Huang, syn. n.)
Huangiella Kammerer, 2006: 269 (nom. nov. pro *Absentia* Huang)(= *Tumoris*, syn. n.)

Type species: *Tumoris sanasaii* Huang, by original designation.

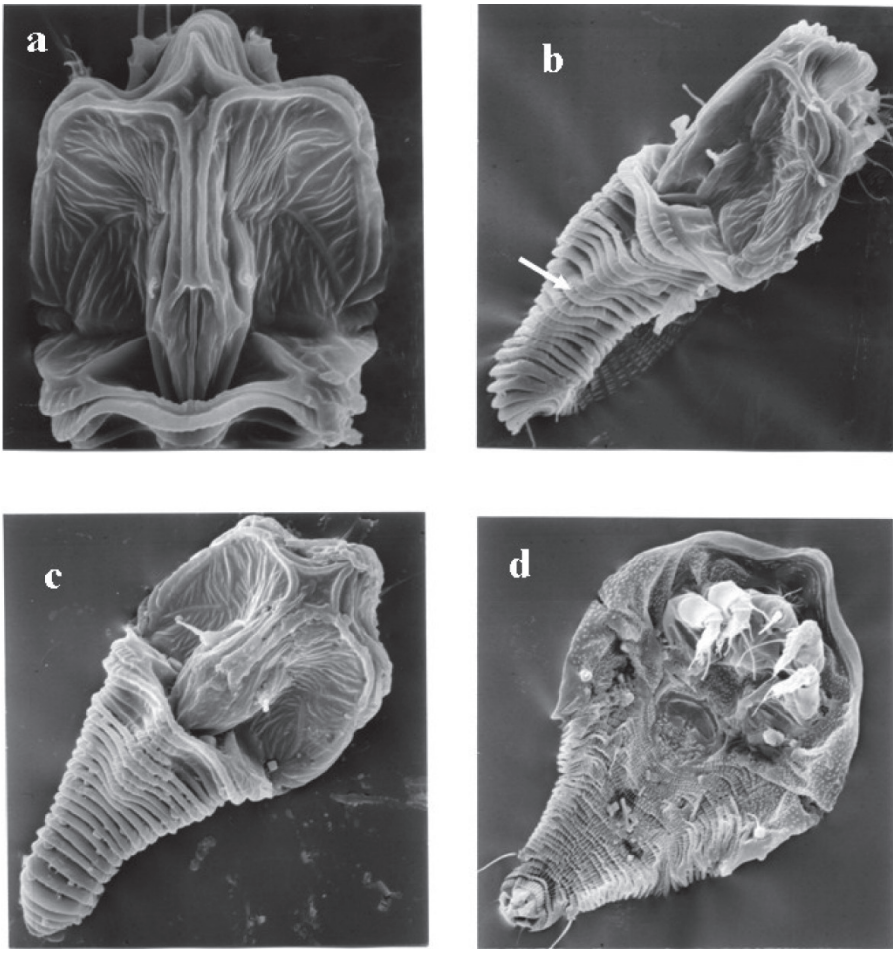

Plate 1. SEM micrographs of *Tumoris sanasaii* Huang, 2001. **a** prodorsal shield **b** lateral view, white arrow means submedian ridge **c** dorsal view **d** ventral view.

Redefinition of the genus. Body spindle-shape, narrowing abruptly posteriorly; shield pentagonal, lobe present, with bulge between scapular tubercles, scapular tubercles set ahead of rear shield margin, seta directed upward; leg segments normal, coxae with 3 pairs of tubercles and seta, hind genual seta absent; empodium simple; opisthosoma differentiated into broader dorsal annuli and narrower ventral annuli, first dorsal annulus broad, fused forming a broad plate joined to prodorsal shield, dorsum with 3 ridges, median ridge ending before submedian ridges, the second ventral tubercle and setae (*e*) absent; coverflap with short ridges at base.

Differential diagnosis. This genus is close to *Proneotegonotus* Mohanasundaram 1983, but differs from the latter by the absence of the second ventral tubercle and setae (*e*), presence of the first ventral tubercles and setae (*d*), and a bulge between the dorsal tubercles in prodorsal shield.

Classification. In Huang (2001b) *Tumoris* was assigned to Tegonotini by the presence of lateral lobes in opisthosoma. After examining more specimens from several localities, we found the lateral lobes previously recognized were actually the submedian ridges on the dorsal opisthosoma (Pl. 1, b). According to the scapular tubercles located ahead of the rear shield, we re-assign this genus to Phyllocoptini.

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Review of the genus *Hartemita* Cameron, 1910 (Hymenoptera, Braconidae, Cardiochilinae), with the description of six new species from Vietnam

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Abstract

The Oriental and East Palaearctic genus *Hartemita* Cameron, 1910 (Braconidae: Cardiochilinae) is recorded for the first time from Vietnam. Sixteen species of the genus *Hartemita* are currently recognized from Oriental and East Palaearctic regions. One species is newly recorded for Vietnam, *Hartemita singaporensis* (Mao, 1945) and six new species from Vietnam are described and illustrated: *Hartemita coffeana* **sp. n.**, *H. daklaka* **sp. n.**, *H. khuatbaolinhae* **sp. n.**, *H. similis* **sp. n.**, *H. maculata* **sp. n.** and *H. vietnamica* **sp. n.** A key to species of the genus *Hartemita* Cameron is included.

Keywords

Braconidae, Cardiochilinae, *Hartemita*, new species, key, Oriental, East Palaearctic, Vietnam

Introduction

The small genus *Hartemita* Cameron, 1910 (Braconidae: Cardiochilinae) is comparatively rare in collections and easily recognizable by its enlarged hind basitarsus (Figs 5,

22, 55, 83, 100). In this respect they resemble stingless bees (Meliponini) which occur over most of its range and as suggested by one of the referees this may be not coincidence. It has an Oriental and East Palaearctic distribution, but was unknown from Vietnam (Long and Belokobylskij 2003). It comprised 16 species; of these, three are from southern and eastern Palaearctic regions, three are from an intermediate area (Nepal) and the other ten occur in the Oriental region (Dangerfield and Austin 1990, Chou 1995, Chen, He and Ma 1998 and 2004; Belokobylskij and Ku 2001; Ahmad and Shujauddin 2004; Belokobylskij 2005; Yu, van Achterberg and Horstmann 2005). As far as known all species of Cardiochilinae are koinobiont endoparasitoids of lepidopterous larvae. Extensive Malaise trapping in Vietnam resulted in the collecting of one described species of the genus *Hartemita*. Six additional species are new to science and are described in this paper. A comprehensive key to species of the genus *Hartemita* is provided.

Material and methods

Two recent and larger collections of Cardiochilinae from Vietnam are used for this revision: the Braconidae collection in the Institute of Ecology & Biological Resources (IEBR) at Hanoi (assembled by the first author) and the Netherlands Centre for Biodiversity Naturalis collection (RMNH) at Leiden (assembled during five RMNH-IEBR expeditions in Vietnam).

For recognition of the subfamily Cardiochilinae, see van Achterberg (1993), for a key to the genera of Cardiochilinae, see Dangerfield et al. (1999) and for a diagnosis of the genus *Hartemita*, see Dangerfield and Austin (1990). For the terminology used in this paper, see Dangerfield and Austin (1990) and van Achterberg (1993). The scale bars in the plates indicate 1.0 mm.

Systematics

Genus *Hartemita* Cameron, 1910

http://species-id.net/wiki/Hartemita
Figs 1–86

Hartemita Cameron, 1910: 99. Type-species: *Hartemita latipes* Cameron, 1910, by monotypy [examined].
Laminitarsus Fullaway, 1919: 57. Type-species: *Laminitarsus muirii* Fullaway, 1919, by monotypy [examined].

Biology. Largely unknown; only one species (*H. buteae*) has been reared from an unidentified Noctuid larva.

Checklist and distribution

Hartemita basilaris Dangerfield & Austin, 1990, from Indonesia
Hartemita bruneiensis Dangerfield & Austin, 1990, from Brunei and East Malaysia
Hartemita buteae Ahmad & Shujauddin, 2004, from India
Hartemita chapini (Mao, 1945), from Philippines and Malaysia
Hartemita chinensis Chen, He & Ma, 1998, from China
Hartemita coffeana sp. n., from Vietnam
Hartemita daklaka sp. n., from Vietnam
Hartemita excavata Chen, He & Ma, 1998, from China and Vietnam
Hartemita flava Chen, He & Ma, 1998, from China
Hartemita khuatbaolinhae sp. n., from Vietnam
Hartemita latipes Cameron, 1910, from Indonesia, East and West Malaysia
Hartemita maculata sp. n., from Vietnam, China and Nepal
Hartemita muirii (Fullaway, 1919), from Philippines and Japan
Hartemita nigrotestacea Belokobylskij & Ku, 2000, from Japan and South Korea
Hartemita punctata Chen, He & Ma, 1998, from China
Hartemita rhadinotarsa Dangerfield & Austin, 1990, from India, Indonesia and Nepal
Hartemita rudis (Mao, 1945), from Philippines
Hartemita similis sp. n., from Vietnam
Hartemita singaporensis (Mao, 1945), from Singapore, Laos, West and East Malaysia and Vietnam
Hartemita spasskensis Belokobylskij, 2005, from Far East Russia
Hartemita townesi Dangerfield & Austin, 1990, from China (Taiwan)
Hartemita vietnamica sp. n., from Vietnam

Key to species of the genus *Hartemita* Cameron

1 Maximum width of hind basitarsus 1.2–1.6 times apical width of hind tibia and dorsally convex (Figs 5, 28, 46, 64, 67, 71, 86); but sometimes weakly so (Figs 80, 83); if 1.2 times then hind basitarsus 3.8–6.0 times as wide as second hind tarsal segment (Figs 64, 67, 80, 83) **2**

– Maximum width of hind basitarsus 0.8–1.1 times apical width of hind tibia and dorsally nearly straight (Figs 22, 52, 55, 58, 61, 77, 89, 92), but rarely slightly convex (Fig. 16); if 1.1 times then hind basitarsus 2.8–3.5 times as wide as second hind tarsal segment (Figs 40, 49, 74) **11**

2 Dorso-apically hind basitarsus strongly protruding, beyond apex of second tarsal segment (Fig. 71); scutellum distinctly convex; maxillary palp 0.7–0.8 times as long as height of head; [head weakly excavate medio-posteriorly in dorsal view; hind tibial spurs yellowish-brown]; Singapore, East and West Malaysia, Laos, *Vietnam ..... ***H. singaporensis* (Mao, 1945)**

– Dorso-apically hind basitarsus weakly or not protruding, not surpassing middle of second tarsal segment (Figs 5, 28, 46, 64, 67, 86); scutellum slightly convex or flat; maxillary palp 1.0–1.5 times as long as height of head **3**

3 Ventral margin of clypeus curved medially (Figs 4, 23, 81, 84); hind basitarsus comparatively wide apically (Figs 5, 28, 83), but in *H. chinensis* less so (Fig. 86) **4**

– Ventral margin of clypeus more or less concave or straight medially (Figs 41, 62, 78); hind basitarsus comparatively wide apically (Figs 46, 64, 67, 80) ... **8**

4 Maxillary palp about 1.3 times as long as height of head; hind basitarsus 2.3–2.5 times as long as wide, 4.4–5.0 times as wide as second tarsal segment and 1.4–1.5 times as long as width of apex of hind tibia (Figs 5, 28, 83); propleuron entirely yellow; hind coxa with one black spot **5**

– Maxillary palp about as long as height of head; hind basitarsus 2.8–3.0 times as long as wide, 3.6 times as wide as second tarsal segment and about 1.2 times as long as width of apex of hind tibia (Fig. 86); propleuron with a blackish spot posteriorly; hind coxa with two black spots; [mesosternum black; third hind tarsal segment of female 1.2–1.3 times longer than wide]; Oriental China ..... ***H. chinensis* Chen, He & Ma, 1998**

5 Hind basitarsus about 2.3 times as long as remaining tarsal segments and 1.2 times as wide as apex of hind tibia (Fig. 83); third hind tarsal segment of female slightly longer than wide; mesosternum yellow; scutellar sulcus with 3 carinae; hind tarsal claws with 3–4 teeth; Oriental China ..... ***H. flava* Chen, He & Ma, 1998**

– Hind basitarsus about 1.8 times as long as remaining tarsal segments and 1.3–1.4 times as wide as apex of hind tibia (Figs 5, 28); third hind tarsal segment of female about twice as long as wide; mesosternum black; scutellar sulcus with 5–6 carinae; hind tarsal claws with 5–8 teeth **6**

7 Hind tarsal claws with 8 large teeth (Fig. 8); face finely punctate; hind basitarsus largely blackish (Fig. 5); temples parallel-sided (Fig. 7) and slightly punctate; Philippines, Japan ..... ***H. muirii* (Fullaway, 1919)**

– Hind tarsal claws with 5 large teeth (Fig. 27); face rugose-punctate; hind basitarsus only apically blackish (Fig. 28); temples rather bulging (Fig. 23), roughly punctate dorsally and rugose-punctate ventrally; Vietnam..... ***H. khuatbaolinhae* sp. n.**

8 Second-fourth hind tarsal segments slender, distinctly longer than wide (Fig. 64); dorsal side of hind basitarsus distinctly more curved than nearly straight ventral side and with a rather distinct apical prominence (Fig. 64); hind femur yellow; [posterior half of notauli widely crenulate; frons entirely smooth]; Oriental China, Nepal ... ***H. townesi* Dangerfield & Austin, 1990**

– Second-fourth hind tarsal segments robust, slightly longer than wide (Figs 46, 67, 80); dorsal side of hind basitarsus similar to ventral side and truncate apically, without apical prominence (Figs 46, 67, 80); hind femur largely dark brown or black dorsally **9**

9 Hind basitarsus elliptical (Fig. 67); face distinctly punctate; mesopleuron below precoxal sulcus coarsely punctate; basal and apical quarter of hind tibia and largely spurs dark brown (Fig. 67); Brunei, *East Malaysia ..... ***H. bruneiensis* Dangerfield & Austin, 1990**

– Hind basitarsus nearly parallel-sided (Figs 46, 80); face punctulate or sparsely punctate; mesopleuron below precoxal sulcus rugulose-punctulate or smooth; hind tibia mainly and spurs yellowish-brown (Figs 46, 80) **10**

10 Head in dorsal view comparatively short and occiput weakly concave (Fig. 79); pronotum coarsely rugose-striate; POL 1.2–1.3 times diameter of posterior ocellus; dark part of hind basitarsus close to base of basitarsus (Fig. 80); mesopleuron below precoxal sulcus densely rugulose-punctulate; Japan, South Korea ..... ***H. nigrotestacea* Belokobylskij & Ku, 2001**

– Head in dorsal view comparatively long and occiput distinctly concave (Fig. 42); pronotum largely smooth except for median groove; POL 1.6 times diameter of posterior ocellus; dark part of hind basitarsus distinctly removed from base of basitarsus (Fig. 46); mesopleuron below precoxal sulcus smooth; Vietnam..... ***H. vietnamica* sp. n.**

11 Ventral margin of clypeus more or less curved medio-ventrally (Figs 75, 90) and hind basitarsus 0.8 times wider than apex of hind tibia (Figs 77, 92) and 2.2–2.3 times wider than second hind tarsal segment **12**

– Hind basitarsus 0.9–1.1 times wider than apex of hind tibia (Figs 16, 22, 40, 49, 52, 55, 58, 61, 74, 89) and 2.5–4.0 times wider than second hind tarsal segment, if rarely 0.8 times wider than apex of hind tibia then usually ventral margin of clypeus straight medio-ventrally or nearly so (Fig. 50) **13**

12 Hind basitarsus about 1.2 times as long as remaining tarsal segments (Fig. 92); hind basitarsus of male about 5 times as long as wide; face distinctly punctate; fourth hind tarsal segment of male distinctly longer than wide (Fig. 92; female unknown); [maxillary palp about as long as height of head]; Oriental China ..... ***H. punctata* Chen, He & Ma, 1998**

– Hind basitarsus about 1.5 times as long as remaining tarsal segments (Fig. 77); hind basitarsus of male about 4 times as long as wide; face faint transverse rugae; fourth hind tarsal segment of male slightly wider than long (Fig. 77; female unknown); India..... ***H. buteae* Ahmad & Shujauddin, 2004**

13 Hind basitarsus comparatively wide and its apical half largely yellowish (Fig. 16); hind basitarsus 4.0 times as wide as second hind tarsal segment (Fig. 16); occiput deeply concave (Fig. 13); [scutellar sulcus with 5–6 carinae; hind tarsal claws with 5–6 teeth]; Vietnam ..... ***H. coffeana* sp. n.**

– Hind basitarsus comparatively narrow elliptical and its apical half more or less blackish or dark brown (Figs 22, 40, 49, 52, 58, 61, 74), but yellowish-brown in *H. basilaris* (Fig. 55); hind basitarsus 2.8–3.3 times as wide as second hind tarsal segment (Figs 22, 40, 49, 52, 58, 61, 74, 89); occiput slightly to moderately concave (Figs 18, 36, 48, 51, 57, 60, 73), but deeply so in *H. excavata* (Fig. 88)..... **14**

14 Ventral margin of clypeus weakly but evenly curved medially (Figs 53, 56, 59); temple largely smooth, but coarsely punctate in *H. basilaris*; hind basitarsus distinctly narrowed apically (Figs 55, 58), but slightly so in *H. chapini* (Fig. 61); length of body 6–9 mm, but in *H. chapini* up to 5 mm.....**15**

– Ventral margin of clypeus nearly straight to slightly concave medially (Figs 17, 35, 47, 50; 72, 87); temple more or less punctate; hind basitarsus slightly narrowed apically (Figs 22, 40, 49, 52, 74, 89); length of body 4.0–6.3 mm.....**18**

15 Head coarsely punctate (Fig. 53); hind basitarsus largely yellowish-brown; dorsal margin of clypeus evenly curved (Fig. 53); second-fifth hind tarsal segments less slender (Fig. 55); vein SR1 of fore wing almost vertical basally; [hind coxa with two black spots dorsally]; Indonesia, *East Malaysia .... ***H. basilaris* Dangerfield & Austin, 1990**

– Head smooth or mainly finely punctate (Figs 56, 59); hind basitarsus largely dark brown or blackish; dorsal margin of clypeus straight or slightly sinuate (Figs 56, 59); second-fifth hind tarsal segments slender (Figs 58, 61); vein SR1 of fore wing distinctly oblique basally.....**16**

16 Outer side of hind tibia partly dark brown apically (Fig. 61); second submarginal cell of fore wing 3.3–4.0 times as long as wide near level of vein r; second-fifth hind tarsal segment less robust (Fig. 61); anterior transverse carina of propodeum absent; length of body 5.0–6.1 mm]; Philippines .... ***H. chapini* (Mao, 1945)**

– Outer side of hind tibia (except for dark brown basal ring) yellowish apically (Figs 96, 100); second submarginal cell of fore wing 3.6–4.6 times as long as wide near level of vein r; anterior transverse carina of propodeum more or less developed; length of body 6–9 mm.....**17**

17 Mesoscutum completely black near notauli (Fig. 95); OOL black (Fig. 93); ovipositor sheath dark brown; anterior transverse carina of propodeum moderately to weakly developed Indonesia, East and West Malaysia .... ***H. latipes* Cameron, 1910**

– Mesoscutum brownish-yellow near notauli (Fig. 99); OOL yellow (Fig. 97); ovipositor sheath yellowish-brown; anterior transverse carina of propodeum coarsely developed; [apical rim of clypeus in Chinese specimens brownish-yellow]; Oriental China, Vietnam, Nepal.....***H. maculata* sp. n.**

18 Hind basitarsus 2.0–2.3 times as long as remainder of tarsus (Figs 49, 74); inner hind spur 0.5–0.6 times as long as hind basitarsus; maxillary palp about 1.3 times as long as height of head.....**19**

– Hind basitarsus 1.4–1.8 times as long as remainder of tarsus (Figs 22, 40, 52, 89); inner hind spur 0.7 times as long as hind basitarsus; maxillary palp about as long as height of head or slightly shorter, but 1.3–1.4 times as long in *H. rhadinotarsa* and *H. similis*.....**20**

19 Clypeus concave medio-ventrally (Fig. 47); second submarginal cell of fore wing about 4 times as long as wide; medio-posteriorly mesoscutum with a wide depressed area; Philippines.....***H. rudis* (Mao, 1945)**

– Clypeus truncate and protruding medio-ventrally (Fig. 72); second submarginal cell of fore wing 3.3–3.4 times as long as wide; mesoscutum medio-posteriorly without a wide depressed area; Far East Russia ..... ***H. spasskensis* Belokobylskij, 2005**

20 Tarsal claws with 5–6 teeth; hind tibia yellow apically; [second and third metasomal tergites with black spots laterally; second submarginal cell of fore wing 3.0–3.3 times as long as wide]; Oriental China ..... ***H. excavata* Chen, He & Ma, 1998**

– Tarsal claws with 2–4 teeth (Figs 21, 39); hind tibia dark brown apically (Figs 22, 40, 52) 21

21 Second and third metasomal tergites black laterally; vein 3-SR of fore wing 2.3–2.4 times as long as vein 2-SR and 0.7 times as long as vein SR1 (Fig. 37); Vietnam..... ***H. similis* sp. n.**

– Second and third tergites brownish-yellow laterally; vein 3-SR of fore wing 1.5–1.7 times as long as vein 2-SR and 0.5–0.6 times as long as vein SR1 (Fig. 19)..... **22**

22 Apical 0.3–0.4 of hind tibia dark brown or blackish (Fig. 52); vein 1-SR of fore wing gradually merging into vein 1-M; mesoscutum with 3 blackish patches; India, Nepal, Indonesia ..... ***H. rhadinotarsa* Dangerfield & Austin, 1990**

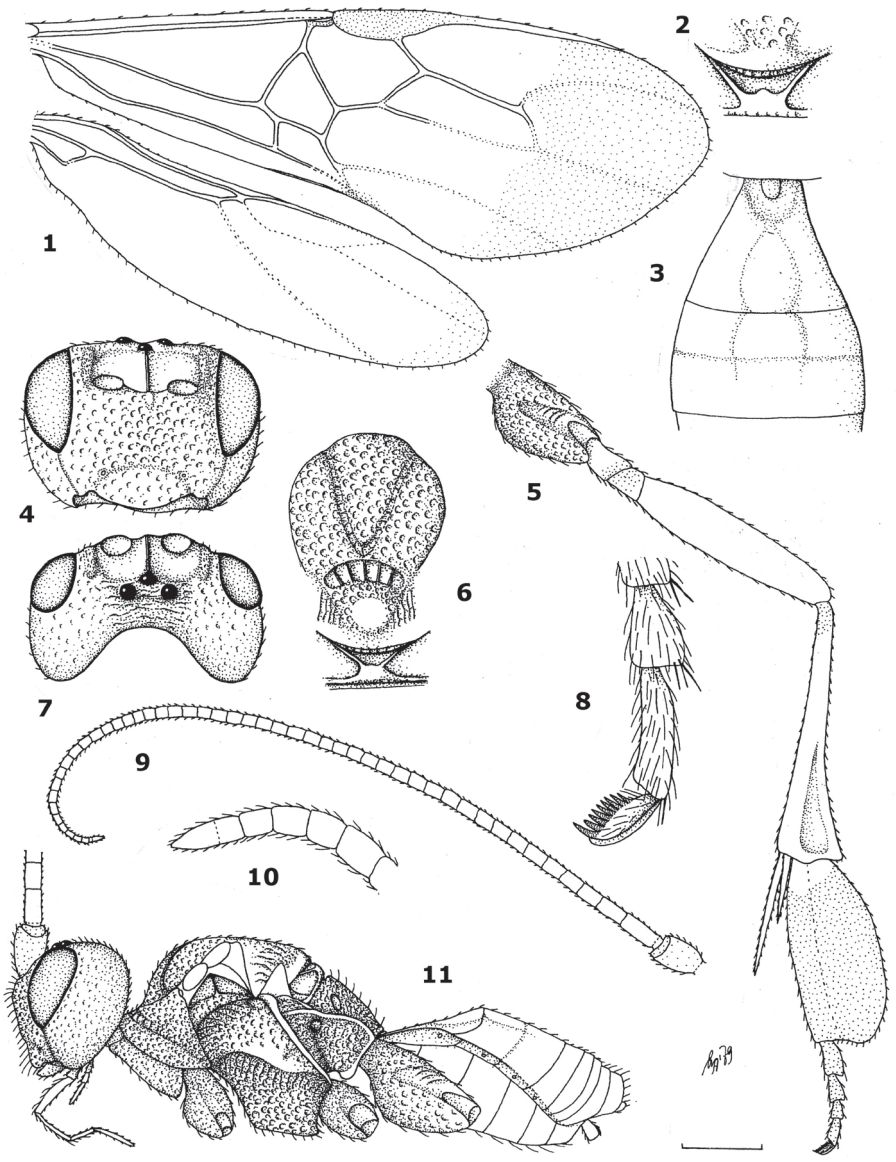
– Apical 0.2 of hind tibia dark brown or blackish (Fig. 22); vein 1-SR of fore wing angled with vein 1-M (Fig. 19); mesoscutum brownish-yellow, without blackish patches; Vietnam..... ***H. daklaka* sp. n.**

Descriptions

***Hartemita coffeana* sp. n.**
urn:lsid:zoobank.org:act:84E385BC-439E-4A08-A798-61E3B7C464E7
http://species-id.net/wiki/Hartemita_coffeana
Figs 12–16

Type material. Holotype, female (IEBR), "Card.059", "[S Vietnam:] Dak Lak, Easo, coffee farm, MT, 108°37'E, 02.vii.2008, Ngo Hien".

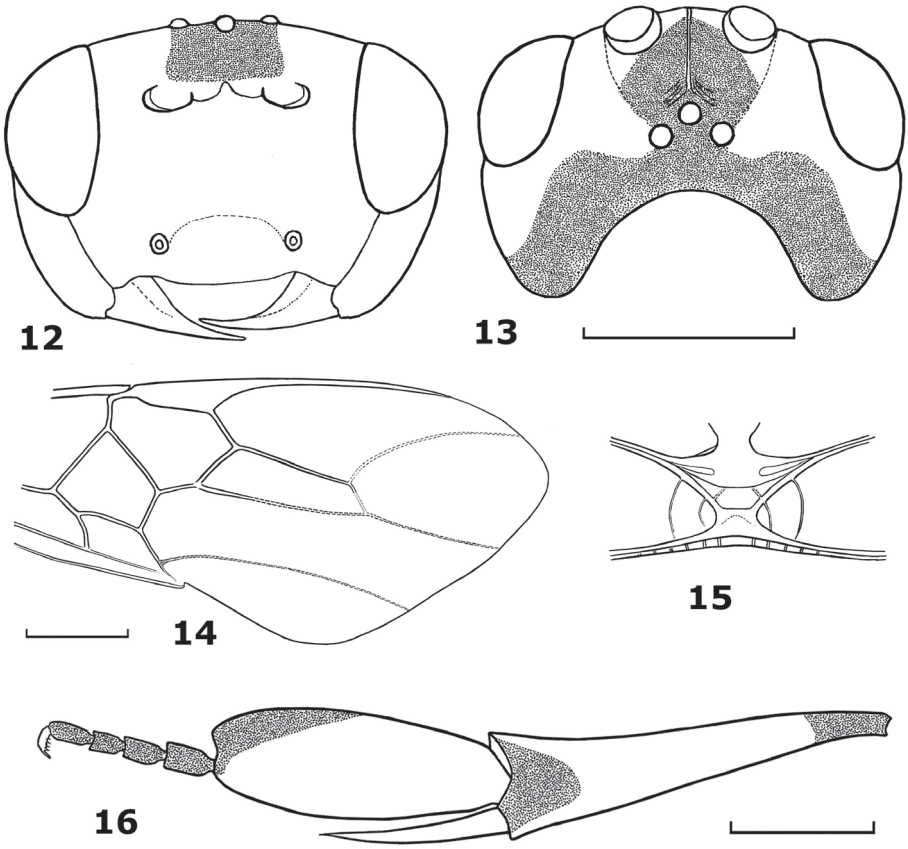
Diagnosis. The new species is close to *H. rhadinotarsa* Dangerfield & Austin, but differs by having epistomal suture indistinctly developed, with the rugosities of the face and the punctures of the clypeus distinct (suture distinct and face and clypeus finely punctate in *H. rhadinotarsa*); the occiput deeply concave (moderately concave in *H. rhadinotarsa*); the hind tarsal segments (excerpt basitarsus) 0.6 times as long as hind basitarsus (0.8 times in *H. rhadinotarsa*) and the hind tarsal claws with 5 teeth (2–4 teeth in *H. rhadinotarsa*). Differs from *H. excavata* Chen, He & Ma by having the transverse diameter of the eye in dorsal view 1.3 times as long as the temple (0.9 times in *H. excavata*), POL 1.5 times OD (1.3 times in *H. excavata*) and the scutellar sulcus with 5 cross-carinae (3 cross-carinae in *H. excavata*).



Figures 1–11. *Hartemita muirii* (Fullaway), female, holotype. **1** wings **2** metanotum dorsal **3** first-third metasomal tergites dorsal **4** head frontal **5** hind leg **6** mesosoma dorsal **7** head dorsal **8** outer hind claw **9** antenna **10** apex of antenna **11** habitus lateral. 1, 5, 9, 11: 1.0 × scale bar 2: 2.6 × 3, 4, 6, 7: 1.3 × 8, 10: 5.0 ×.

Description. Holotype, female, body length 6.2 mm, fore wing length 7.3 mm, antenna 7.8 mm.

Head. Antennal segments 52; third segment 1.2 times as long as fourth segment; length of third, fourth and penultimate segments 2.3, 1.9 and 2.0 times their width,



Figures 12–16. *Hartemita coffeana* sp. n., female, holotype. **12** head frontal **13** head dorsal **14** fore wing **15** metanotum dorsal **16** hind tibia and tarsus.

respectively; head width 2.2 times its median length; occiput deeply excavate (Fig. 13); temple behind eyes convex anteriorly, gradually narrowed posteriorly (Fig. 13); length of temple 0.9 times transverse diameter of eye; OOL:POL:OD = 19:9:6; frons wide and with a median carina (Fig. 13); eye glabrous, width of face 1.5 times height of eye; clypeal margin nearly straight medially, epistomal suture indistinct; malar space 1.4 times width of mandible; face largely rugose; clypeus shiny and punctate; temple very shiny and with sparse but large and discrete punctures, distance between punctures twice diameter of puncture; frons smooth laterally, striate medially and transversely rugose posteriorly.

Mesosoma. Length of mesosoma 1.1 times its height; pronotal trough sparsely crenulate medially, remainder of pronotal side sparsely punctate; propleuron sparsely punctate; notauli flattened posteriorly, narrowed anteriorly and crenulate; scutellar sulcus with 5 cross-carinae; scutellum convex, punctate; median arch of metanotum with lateral cross-carinae (Fig. 15); mesopleuron shiny, medially with sparse punctures and

rugose-punctate anteriorly; precoxal sulcus crenulate anteriorly and rugose posteriorly; mesosternum areolate-punctate; metapleuron and propodeum rugose.

Wings. Length of fore wing 2.9 times its maximum width; length of pterostigma 4.0 times its median width; r:2-SR:3-SR = 18:20:40; second submarginal cell of fore wing 3.4 times longer than its maximum width (Fig. 14); vein 1-CU1 0.4 times as long as vein 2-CU1; vein 3-SR joining SR1 at 100°. Length of hind wing 4.3 times its width; vein M+CU 0.4 times as long as vein 1-M.

Legs. Length of hind femur 4.2 times its width; length of hind tibia 4.4 times its apical width; hind basitarsus slightly produced apically (Fig. 16), flattened, not broadly laminate, 2.8 times longer than wide and as wide as apical width of hind tibia (Fig. 16); second-fifth hind tarsal segments 0.6 times as long as hind basitarsus; inner hind tibial spur 0.6 times as long as hind basitarsus; hind tarsal claw with 5 teeth; hind coxa and outer side of hind femur rugose-punctate; upper side of hind tibia with some spines.

Metasoma. Second metasomal tergite 0.8 times as long as third tergite; ovipositor sheath short; ovipositor curved.

Colour. Body yellow; scapus yellow, black apically and laterally; frons black medially, yellow laterally; stemmaticum and vertex black; temple black along occiput margin; hind femur yellow with black band on upper side; hind tibia yellow, black basally and apically; hind basitarsus yellow, black apically; hind spurs and tarsus (except basitarsus) dark brown.

Male. Unknown.

Distribution. S Vietnam: Dak Lak.

Etymology. After the genus *Coffea* Linnaeus, because the new species was collected at a coffee farm.

Hartemita daklaka sp. n.

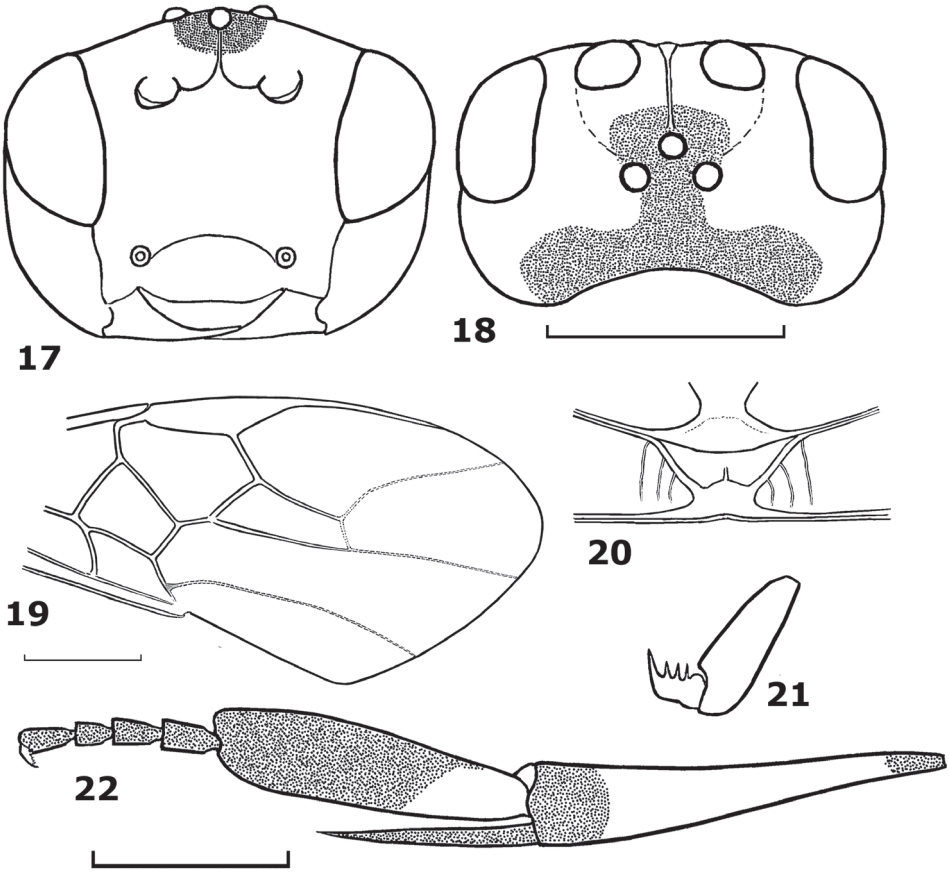
urn:lsid:zoobank.org:act:EA72044F-96F5-4DEA-994F-BB73E93D9CB8
http://species-id.net/wiki/Hartemita_daklaka
Figs 17–22

Type material. Holotype, male (IEBR), "Card.058", "[S Vietnam:] Dak Lak, Easo, coffee farm, MT, 108°37'E, 02.vii.2008, Ngo Hien".

Diagnosis. Occiput moderately concave; medio-ventral margin of clypeus slightly concave; mesopleuron entirely smooth; precoxal sulcus crenulate anteriorly and smooth posteriorly; hind tarsal claw with 3–4 teeth; hind basitarsus as wide as apical part of hind tibia, parallel-sided, flattened and not broadly laminate or produced apically.

Description. Holotype, male, body length 4.9 mm, fore wing length 5.1 mm, antenna 6.5 mm.

Head. Antennal segments 43; third segment 1.2 times as long as fourth segment; length of third, fourth and penultimate segments 2.2, 1.8 and 1.0 times their width, respectively; epistomal suture distinct and evenly curved (Fig. 17); clypeal margin slightly concave medially (Fig. 17); in dorsal view head width 1.8 times its median length; occiput moderately concave (Fig. 18); temple behind eyes convex anteriorly,



Figures 17–22. *Hartemita daklaka* sp. n., male, holotype. **17** head frontal **18** head dorsal **19** fore wing **20** metanotum dorsal **21** hind tarsal claw **22** hind tibia and tarsus.

roundly narrowed posteriorly (Fig. 18); length of temple 0.65 times transverse diameter of eye; OOL:POL:OD= 13:7:5; frons deep; eye glabrous, transverse diameter of eye 1.8 times its width dorsally; width of face 1.4 times height of eye; malar space 1.9 basal width of mandible (Fig. 17); face shiny and largely punctate laterally, face medially and clypeus sparsely finely punctate; area around facial node rugose.

Mesosoma. Length of mesosoma 1.1 times its height; pronotal trough crenulate medially, remainder of pronotal side finely punctate; notauli shallow and rugose posteriorly; scutellar sulcus with 5 cross-carinae (in paratype 3); scutellum convex and largely punctate; propleuron shiny and with sparse fine punctures; mesopleuron shiny and largely smooth medially; precoxal sulcus and mesosternum areolate-punctate; median arch of metanotum without lateral cross-carinae (Fig. 20); metapleuron and propodeum dull and rugose.

Wings. Length of fore wing 2.6 times its maximum width; pterostigma medium-sized; length of pterostigma 3.8 its median width; r:2-SR:3-SR = 9:16:21; length of

second submarginal cell of fore wing 3.3 times its maximum width; vein 1-CU1 0.14 times vein 2-CU1; vein 3-SR joining SR1 at 100° (Fig. 19). Length of hind wing 4.0 times its width; vein M+CU 0.4 times as long as vein 1-M.

Legs. Length of hind femur 4.6 times its width; length of hind tibia 5.3 times its apical width; hind basitarsus flattened, not broadly laminate and not produced apically (Fig. 22), 4.0 times as long as wide; hind basitarsus as wide as apical width of hind tibia; second-fifth hind tarsal segments comparatively long (Fig. 22), 0.6 times as long as hind basitarsus; inner hind tibial spur 0.7 times as long as hind basitarsus; hind tarsal claw with 3 teeth (Fig. 21).

Metasoma. Metasoma 0.9 times as long as mesosoma; second metasomal tergite as long as third tergite or slightly longer; ovipositor sheath very short; ovipositor curved.

Colour. Body yellow; antenna dark brown; scapus black, but yellow ventrally; palpi brown, except first yellow segment; frons black posteriorly and yellow anteriorly (Fig. 18); vertex black; middle trochantellus, basal ring of middle tibia, middle spurs and tarsus (except yellow base of basitarsus) dark brown; hind femur yellow, but dark brown dorsally; hind tibia yellow, black basally and apically; hind basitarsus black, but yellow basally; hind trochanter and trochantellus, spurs and tarsus dark brown; wings brown, smoky apically.

Female. Unknown.

Distribution. S Vietnam: Dak Lak.

Etymology. Named after the province of its type locality: Dak Lak.

***Hartemita khuatbaolinhae* sp. n.**

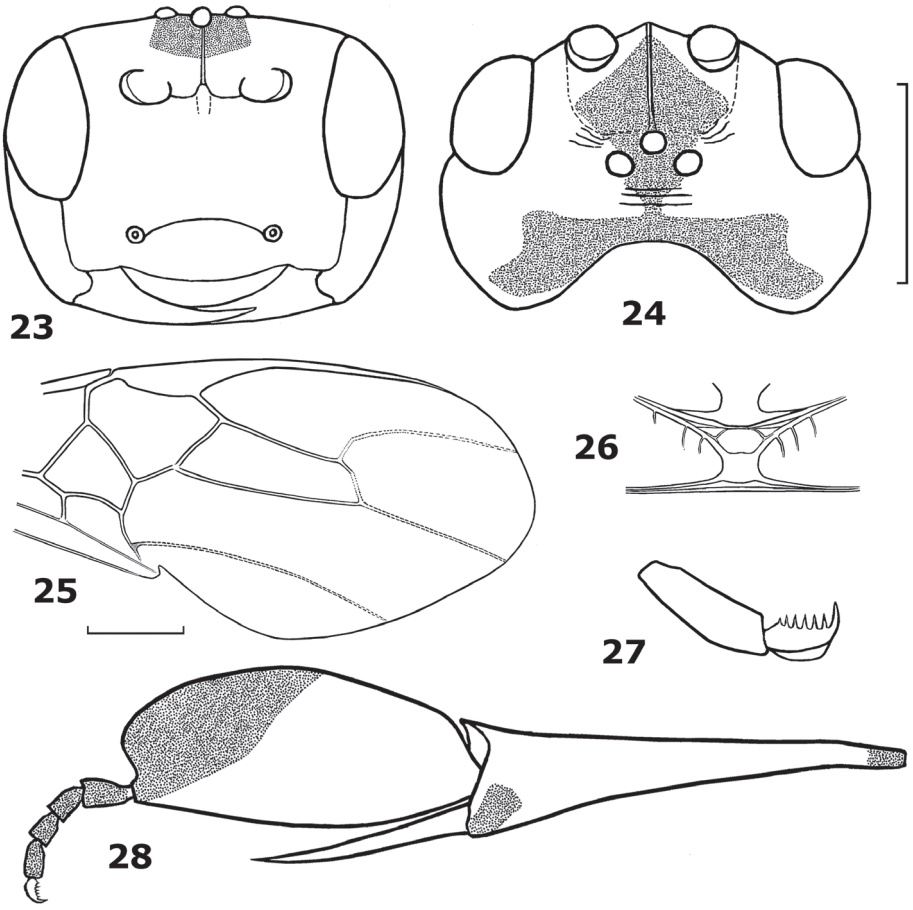
urn:lsid:zoobank.org:act:C26438F4-7228-40B7-BD5C-09B1C1653211
http://species-id.net/wiki/Hartemita_khuatbaolinhae
Figs 23–28

Type material. Holotype, female (IEBR), "Card.001", "[NE Vietnam:] Phu Tho, Xuan Son NP, forest, 10.v.2005, P. Th. Nhi." Paratypes: 1 female (RMNH), "Card.002", data as holotype; 1 female (IEBR), "Card.010", "[CN Vietnam:] Ha Tinh, Huong Son, Son Hong, 23.iv.2004, Tr. X. Lam".

Diagnosis. The new species is similar to *H. muirii* (Fullaway), but differs by having the face rugose-punctate (punctate in *H. muirii*; Fig. 4), temples bulging (subparallel-sided in *H. muirii*; Fig. 7), hind basitarsus largely yellow (largely blackish in *H. muirii*; Fig. 5) and the hind claw with 5 teeth (8 teeth in *H. muirii*; Fig. 8).

Description. Holotype, female, body length 7.7 mm, fore wing length 8.2 mm, antenna 9.5 mm.

Head. Antennal segments 52 (paratype: 51); third antennal segment 1.3 times fourth segment; length of third, fourth and penultimate segments 2.1, 1.6 and 1.6 times their width, respectively; eye glabrous, twice as long as its lateral width; width of face 1.5 times as long as height of eye; clypeal margin convex medio-ventrally (Fig. 23); epistomal suture distinct and evenly curved; malar space 1.2 times basal width of mandible (Fig. 23);



Figures 23–28. *Hartemita khuatbaolinhae* sp. n., female, holotype. **23** head frontal **24** head dorsal **25** fore wing **26** metanotum dorsal **27** hind tarsal claw **28** hind tibia and tarsus.

in dorsal view head transverse, its width nearly twice as long as its median length; occiput deeply excavate (Fig. 24); temple behind eyes convex anteriorly and roundly narrowed posteriorly; length of temple 1.2 times transverse diameter of eye (Fig. 24); width of eye 0.55 times temple laterally; OOL:POL:OD= 15:9:6; face rugose-punctate; clypeus largely punctate; frons smooth and with a median carina; area around ocelli with transverse and dense rugae; temple largely rugose ventrally and with large punctures dorsally.

Mesosoma. Length of mesosoma 1.3 times its height; pronotal trough rugose dorsally, remainder of pronotal side smooth; notauli deep and areolate posteriorly; scutellar sulcus with 6 cross-carinae (paratype with 5); scutellum convex and punctate; mesoscutum rugose-punctate; median arch of metanotum with short lateral cross-carinae (Fig. 26); mesopleuron smooth medially and rugose-punctate anteriorly; precoxal sulcus shallow; mesosternum rugose-punctate; metapleuron and propodeum rugose.

Wings. Length of fore wing 2.3 times its maximum width; length of pterostigma 4.3 times its median width; r:2-SR:3-SR = 16:26:53; length of second submarginal cell of fore wing 3.2 times its maximum width; vein 1-SR+M slightly sinuate (Fig. 25); vein 1-CU1 0.5 times vein 2-CU1 (10:22); vein 3-SR joining SR1 at 90°. Length of hind wing 4.6 times its width; vein M+CU 0.3 times as long as vein 1-M.

Legs. Length of hind femur 4.25 times its median width; hind basitarsus broadly laminate, slightly produced apically and 2.1 times as long as wide (Fig. 28); width of hind basitarsus 1.4 times apical width of hind tibia; second-fifth hind tarsal segments 0.6 times as long as hind basitarsus (Fig. 28); inner hind tibial spur 0.6 times as long as hind basitarsus; hind claw with 5 teeth (Fig. 27).

Metasoma. Metasoma as long as mesosoma; second metasomal tergite 0.85 times as long as third tergite; ovipositor sheath very short, round apically; ovipositor almost straight.

Colour. Body yellow; antenna dark brown; scapus yellow, but apex and outer side dark brown; frons and stemmaticum black; vertex yellow anteriorly and black posteriorly; temple partly black dorsally; median and lateral lobes of mesoscutum and mesosternum black; middle trochantellus, apical upper and lower sides of hind coxa, hind trochanter apically, hind trochantellus, apical third of basitarsus and hind tarsus (except basitarsus) black; fore wing brown, but smoky apically.

Male. Unknown.

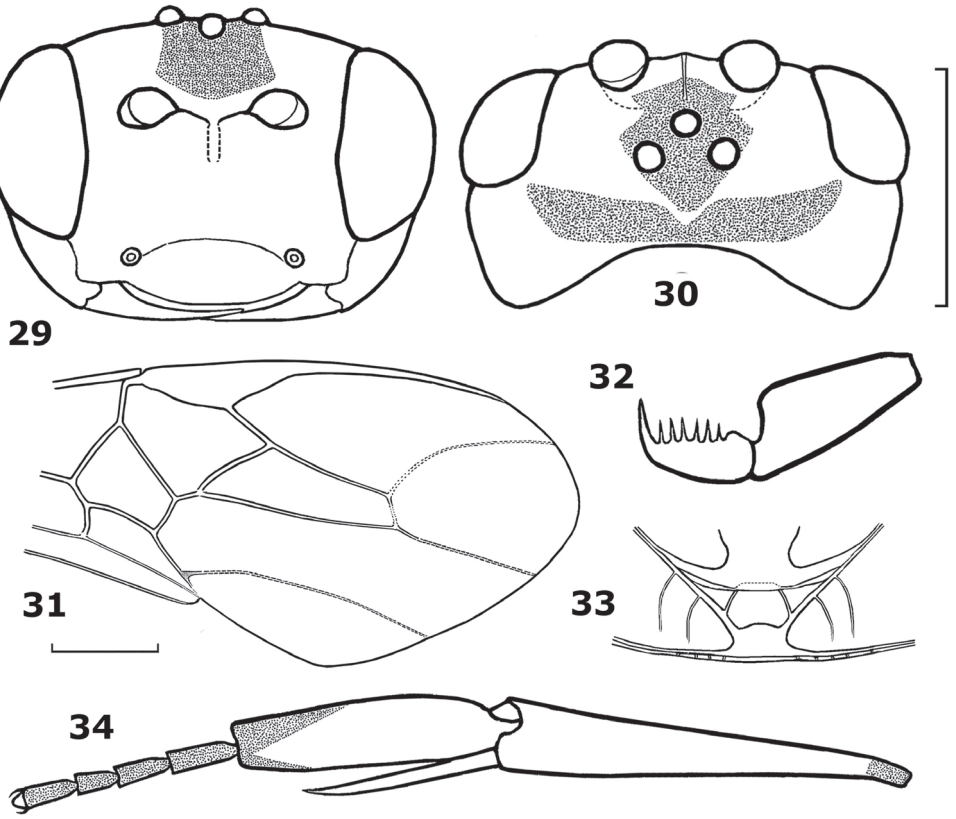
Distribution. N Vietnam: Phu Tho and C Vietnam: Ha Tinh.

Etymology. The species named after the granddaughter of the first author, Khuat Bao Linh.

***Hartemita maculata* sp. n.**

urn:lsid:zoobank.org:act:46FBE7D8-FA4A-45CC-8EF7-3D619335097
http://species-id.net/wiki/Hartemita_maculata
Figs 29–34, 91–94

Type material. Holotype, female (IEBR), "Card.026", "[C.N.Vietnam:] Nghe An, Con Cuong, Pu Mat NP, 250 m, 12.ix.2005, P. Th. Nhi". Paratypes: 2 males (IEBR, RMNH), "Card.052", "Card.053", "[N.E. Vietnam:] Thai Nguyen, Dai Tu, Minh Tien, MT, 21°43'N 105°34'E, 350 m, 10–15.ix.2007, K. D. Long"; 1 female (IEBR), "Card.054", id., but tea farm, 31.v.2008, K. D. Long; 1 female (RMNH), "Card.066", "[N.E. Vietnam:] Vinh Phuc, Tam Dao NP, 100 m, MT, 30.iv.2008, P. H. Thai"; 1 male (IEBR), "Card.032", "[C. Vietnam:] Thua Thien-Hue, Nam Dong, MT, 2–6.v.2005, N. Q. Truong"; 2 females (IEBR, RMNH), "Card.067", "Card.068", 6 males (IEBR, RMNH), "Card.069", "Card.070", "[N.E. Vietnam:] Phu Tho (Xuan Son NP), garden, MT, 20–25.v.2010, K.D. Long, N. H. Thao"; "Card.071", "Card.072", id., but 19–21.vi.2009; "Card.073", id., but 29.vi-05.vii.2009; "Card.074", id. but 25–30. vii.2009; 1 female (RMNH) "N. Vietnam: Ninh Binh, Cuc Phuong N.P., nr entrance, [Mal. trap], c 225 m, 14.iv.-1.v.2000, Mai Phu Quy, RMNH'00"; 1 female



Figures 29–34. *Hartemita maculata* sp. n., female, holotype. **29** head frontal **30** head dorsal **31** fore wing **32** hind tarsal claw **33** metanotum dorsal **34** hind tibia and tarsus.

(RMNH) "[China:], Hunan, Lianyun Mt., cotton-shelter, 2.vii.2007, 28°30.203'N 113°48.619'E, altitude 590 m, Li Ze-jan"; 1 male (RMNH), [China:] Hunan, Mufu Mt., Yanziping, altitude 1330 m, 29.vi. 2007, 28°58.524'N 113°49.638'E, Li Ze-jan"; 1 female (RMNH), "China: Fujian, Nanjin, 30.v.1991, no. 96 9320, Liu Changmin, RMNH'99".

Diagnosis. The new species is similar to *H. latipes* Cameron, but differs by having the mesoscutum brownish-yellow near the notauli (Fig. 93) (completely black near the notauli in *H. latipes*; Fig. 89); OOL yellow (Fig. 91) (black in *H. latipes*; Fig. 87); the ovipositor sheath yellowish-brown (dark brown in *H. latipes*); the anterior transverse carina of the propodeum coarsely developed (moderately to weakly developed in *H. latipes*); the mesosternum and the mesopleuron of female yellowish-brown (largely black in *H. latipes*) and the tarsal claws with 4–5 large teeth (Fig. 32) and 0–2 small teeth (2–3 (rarely 4) large teeth and 3–4 small teeth in *H. latipes*).

Description. Holotype, female, body length 8.0 mm, fore wing length 7.6 mm, antenna 7.8 mm.

Head. Antennal segments: 43 (paratypes: 41, 42 (2) or 43); third antennal segment 1.4 times as long as fourth; length of third, fourth and penultimate segments 1.9, 1.6, 2.0 times their width respectively; clypeal margin convex medio-ventrally (Fig. 29); epistomial suture distinct, curved; width of face 1.3 times height of eye; malar space equal to basal width of mandible; in dorsal view head width 2.3 times its median length; occiput weakly concave (fig. 30); temple behind eyes almost perpendicular posteriorly (Figs 30, 97); length of temple 0.9 times as long as transverse diameter of eye; OOL:POL:OD = 16:8:6; frons concave; eye glabrous; laterally length of eye twice its width and 0.75 times temple.

Mesosoma. Length of mesosoma 1.3 times its height; pronotal trough shiny and smooth as surroundings; notauli shallow and smooth; scutellar sulcus with 3 cross-carinae; scutellum, mesopleuron and mesosternum shiny and smooth; precoxal sulcus crenulate anteriorly and smooth posteriorly; metapleuron smooth anteriorly and rugose posteriorly; median arch of metanotum with lateral cross-carinae (Fig. 33); propodeum largely rugose.

Wings. Length of fore wing 2.7 times its maximum width; pterostigma length 3.2 times its median width; vein r arising near middle of pterostigma; r:2-SR:3-SR = 13:20:35; length of second submarginal cell of fore wing 3.5 times its width; vein 1-CU1 0.4 times vein 2-CU1; vein 3-SR joining vein SR1 at 100° (Fig. 31). Length of hind wing 4.3 times its width; vein M+CU 0.3 times vein 1-M.

Legs. Length of hind femur 4.2 times its width; hind basitarsus flattened, not broadly laminate and not produced apically, its width 0.9 times distal width of hind tibia; length of hind basitarsus 3.75 times as long as its width (Figs 34, 100); hind tarsal segments 2–5 not shortened, 0.8 times as long as hind basitarsus (Fig. 100); inner hind tibial spur 0.7 times as long as hind basitarsus; outer side of hind tibia with long sparse spines; hind claw with 5 large teeth and 1 small tooth (Fig. 32).

Metasoma. Metasoma 1.2 times length of mesosoma dorsally; second tergite 0.8 times as long as third segment; ovipositor sheath very short, round apically; ovipositor curved.

Colour. Body yellow; antenna brown; scapus dark brown laterally; frons, stemmaticum black; vertex black posteriorly; lateral and middle lobes of mesoscutum, mesosternum black; wings brown, but parastigma yellow; apex of fore wing (behind vein r-m) darker; near apex of hind coxa with a large black spot; trochantellus, basal ring of hind tibia, apex of hind basitarsus and remainder of hind tarsus dark brown; basal corner of second metasomal tergite and fourth and fifth tergites black apically.

Male. Body length 7.0–7.8 mm, fore wing length 6.8–8.3 mm, antenna 7.8–8.4 mm; antennal segments 40–44.

Distribution. N Vietnam: Ninh Binh, Vinh Phuc, Thai Nguyen and Phu Tho and C Vietnam: Nghe An and Thua Thien-Hue; Oriental China and Nepal.

Etymology. The species is named **"***maculata***",** because of the distinctly maculate mesoscutum.

Notes. Specimens from Vietnam have the hind claws with 5–6 teeth and the propodeum rugose with a faint transverse carina anteriorly. Most common species in North and Central Vietnam. Runs in the key by Dangerfield & Austin (1990) to *H. latipes* Cameron, but this species has a Sundaland distribution and differs as indicated

above. The only specimen reported as *H. chapini* (Mao) from Malaysia has been examined and belongs to *H. latipes*. As a result, *H. chapini* is a species only known from the Philippines.

***Hartemita similis* sp. n.**
urn:lsid:zoobank.org:act:1B96DB85-C911-40BE-ACF2-A9A7E3BD0296
http://species-id.net/wiki/Hartemita_similis
Figs 35–40

Type material. Holotype, male (IEBR), "Card.057", "[S Vietnam:] Dak Lak, Easo, coffee farm, MT, [ca 12°45'N] 108°37'E, 02.vii.2008, Ngo Hien". Paratype: 1 male (RMNH), "S. Vietnam: Dong Nai, Cat Tien N.P., Bird trail, Mal. trap 9–12, c 100 m, 1–9.x.2005, C. v. Achterberg & R. de Vries, RMNH'05".

Diagnosis. The new species is similar to *H. punctata* Chen, He & Ma, but differs by having the ventral clypeal margin moderately concave medially (nearly straight in *H. punctata*; Fig. 90), the malar space 1.2 times as long as the basal width of the mandible (equal in *H. punctata*), hind tibia dark brown apically (yellow in *H. punctata*; Fig. 92) and the basitarsus 3.7 times its median width (5.0 times in *H. punctata*; Fig. 92).

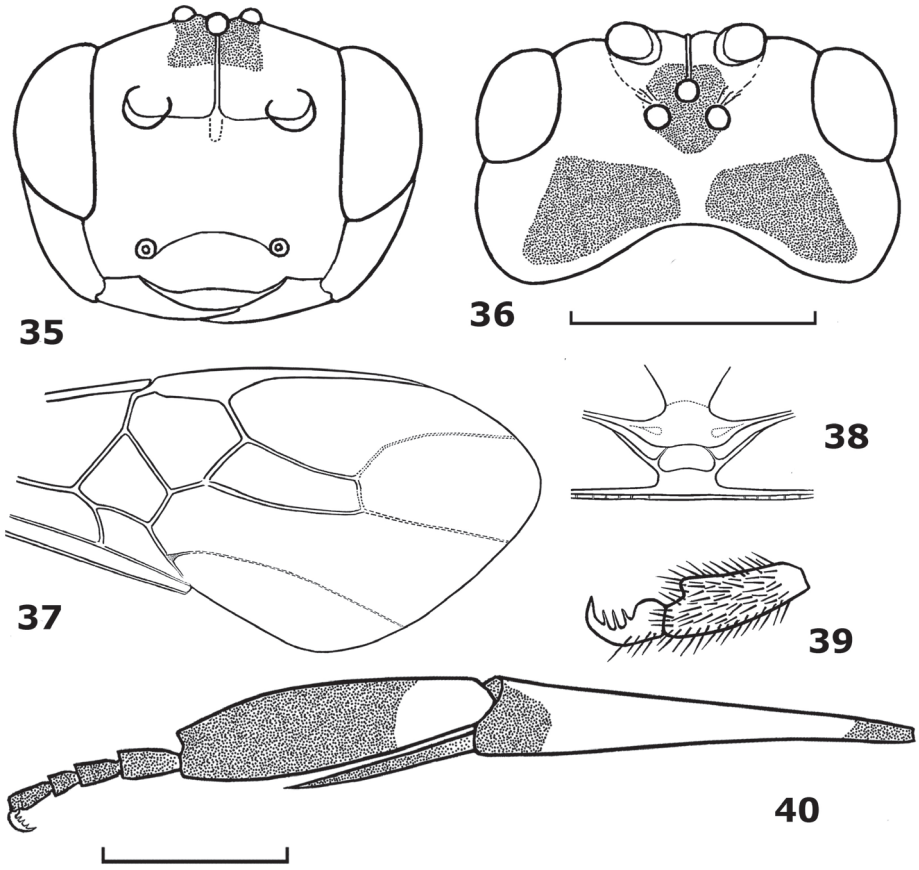
Description. Holotype, male, body length 5.9 mm, fore wing length 5.6 mm, antenna 6.5 mm.

Head. Antennal segments 43; third segment 1.2 times as long as fourth segment; length of third, fourth and penultimate segments 2.0, 1.7 and 1.3 times their width, respectively; eye glabrous, width of face 1.4 times height of eye; clypeal margin moderately concave medially (Fig. 35); epistomal suture distinct and curved; malar space 1.2 times width of mandible (Fig. 35); in dorsal view head width twice its median length; frons narrow; occiput moderately concave (Fig. 36); temple behind eyes convex anteriorly and roundly narrowed posteriorly (Fig. 36); length of temple as long as transverse diameter; OOL:POL:OD = 15:6:5; frons with a median carina (Fig. 35). Face and clypeus shiny and sparsely punctate; vertex and temple shiny and sparsely punctate.

Mesosoma. Length of mesosoma 1.2 times its height; pronotal trough crenulate medially, remainder of pronotal side rugose dorsally and smooth ventrally; notauli narrow and more or less flat; scutellar sulcus with 3 cross-carinae; median arch of metanotum with a pair of lateral cross-carinae (Fig. 38); middle and lateral lobes of mesoscutum rugose-punctate; scutellum punctate; mesopleuron smooth medially, rugose dorsally; precoxal sulcus wide; mesosternum areolate-punctate; propodeum rugose.

Wings. Length of fore wing 2.5 times its maximum width; length of pterostigma 3.5 times its median width; r:2-SR:3-SR= 8:11:27; length of second submarginal cell 3.7 times its maximum width; vein 1-CU1 0.3 times vein 2-CU1; vein 3-SR joining vein SR1 at 100° (Fig. 37). Length of hind wing 4.7 times its width; vein M+CU 0.5 times as long as vein 1-M.

Legs. Length of hind femur 4.3 times its middle width; length of hind tibia 5.1 times its apical width; hind basitarsus flattened, not broadly laminate and not pro-



Figures 35–40. *Hartemita similis* sp. n., male, holotype. **35** head frontal **36** head dorsal **37** fore wing **38** metanotum dorsal **39** hind tarsal claw **40** hind tibia and tarsus.

duced apically (Fig. 40); hind basitarsus as wide as apical width of hind tibia and 3.7 times as long as wide; inner hind tibial spur 0.6 times as long as hind basitarsus; second-fifth hind tarsal segments 0.54 times as long as hind basitarsus (Fig. 40); hind tarsal claw with 3 teeth (Fig. 39).

Metasoma. Metasoma 1.2 times longer than mesosoma; second metasomal tergite longer than third tergite.

Colour. Body yellow; palpi brown; antenna brown, scapus yellow, but outer side dark brown; stemmaticum and vertex black, but separated by yellow area; middle and lateral lobes of mesoscutum and mesosternum black; middle leg yellow, but trochanter apically, trochantellus, tibia basally, spurs and tarsus dark brown (but basitarsus yellow basally); upper apex of hind coxa, trochanter and trochantellus, upper side of hind femur, tibia basally and apically, spurs and hind tarsus dark brown; wing brown and smoky apically; second-third metasomal tergites laterally (but less developed on third tergite) and fourth-seventh tergites medially black.

Female. Unknown.

Distribution. S Vietnam: Dak Lak, Dong Nai.

Etymology. Named "*similis*" (Latin for "like", "resembling"), because it is similar to *H. punctata*.

***Hartemita vietnamica* sp. n.**
urn:lsid:zoobank.org:act:03B9AA0E-9D47-4649-9447-A651436CD0A7
http://species-id.net/wiki/Hartemita_vietnamica
Figs 41–46

Type material. Holotype, female (IEBR), "Card.065", "[NE Vietnam:] Vinh Phuc, Tam Dao NP, 100 m, MT, 30.v.2008, P. H. Thai". Paratype: 1 male (RMNH), "Card.039", "[CN Vietnam:] Nghe An, Con Cuong, Pu Mat NP, 22.iv.2006, P. Th. Nhi".

Diagnosis. The new species is similar to *H. bruneiensis* Dangerfield & Austin, but differs by having the occiput deeply excavate (weakly excavate in *H. bruneiensis*; Fig. 66); vein 3-SR joining vein SR1 at 100° (90° in *H. bruneiensis*); hind tibia yellow ventrally (dark brown ventrally; Fig. 67); hind claw with 3 teeth (4–7 teeth in *H. bruneiensis*) and scutellum rugose-punctate (punctate in *H. bruneiensis*).

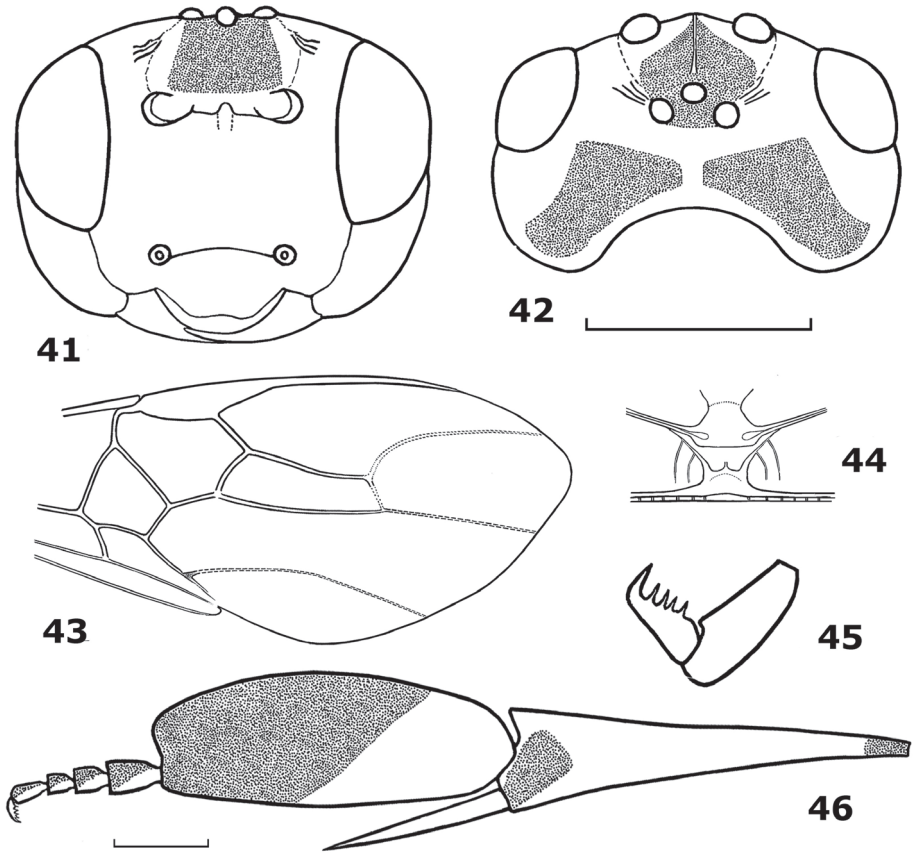
Description. Holotype, male, body length 6.0 mm, fore wing length 6.8 mm, antenna 7.1 mm.

Head. Antennal segments 46 (paratype 44); third segment 1.25 times as long as fourth segment; length of third, fourth and penultimate segments 2.0, 1.6 and 1.0 times their width, respectively; eye glabrous, width of face 1.5 times height of eye; clypeal margin slightly concave medially (Fig. 41); epistomal suture distinct and curved; malar space 1.4 times width of mandible; in dorsal view head twice wider than its median length; occiput deeply concave (Fig. 42); temple behind eyes convex anteriorly and roundly narrowed posteriorly; length of temple nearly as long as transverse diameter of eye; OOL:POL:OD = 15:8:5; frons with a median carina (Fig. 42); face and clypeus sparsely punctate.

Mesosoma. Length of mesosoma 1.2 times its height; pronotal trough rugose dorsally, remainder of pronotal side smooth; notauli deep and crenulate anteriorly, nearly separated posteriorly by a carina; scutellar sulcus with 3 cross-carinae; mesoscutum punctate; scutellum rugose-punctate; median arch of metanotum with lateral cross-carinae (Fig. 44); mesopleuron smooth medially; precoxal sulcus shallow; mesosternum areolate-punctate; metapleuron and propodeum rugose.

Wings. Length of fore wing 2.7 times its maximum width; pterostigma length 4.0 times its median width; r:2-SR:3-SR = 10:15:35; second submarginal cell of fore wing length 3.4 times its maximum width; vein 1-CU1 0.4 times as long as vein 2-CU1; vein 3-SR joining vein SR1 at 100° (Fig. 43). Length of hind wing 3.9 times its maximum width; vein M+CU 0.4 times as long as vein 1-M.

Legs. Length of hind femur 5.2 times its width; hind basitarsus broadly laminate, slightly produced apically; length of hind tibia 3.5 times its apical width; hind basi-



Figures 41–46. *Hartemita vietnamica* sp. n., male, holotype. **41** head frontal **42** head dorsal **43** fore wing **44** metanotum dorsal **45** hind tarsal claw **46** hind tibia and tarsus.

tarsus 2.7 times as long as wide (Fig. 46); hind basitarsus 1.3 times wider than apical width of hind tibia; inner hind tibial spur 0.5 times as long as hind basitarsus; second-fifth hind tarsal segments 0.4 times as long as hind basitarsus (Fig. 46); hind tarsal claw with 4 teeth (Fig. 45).

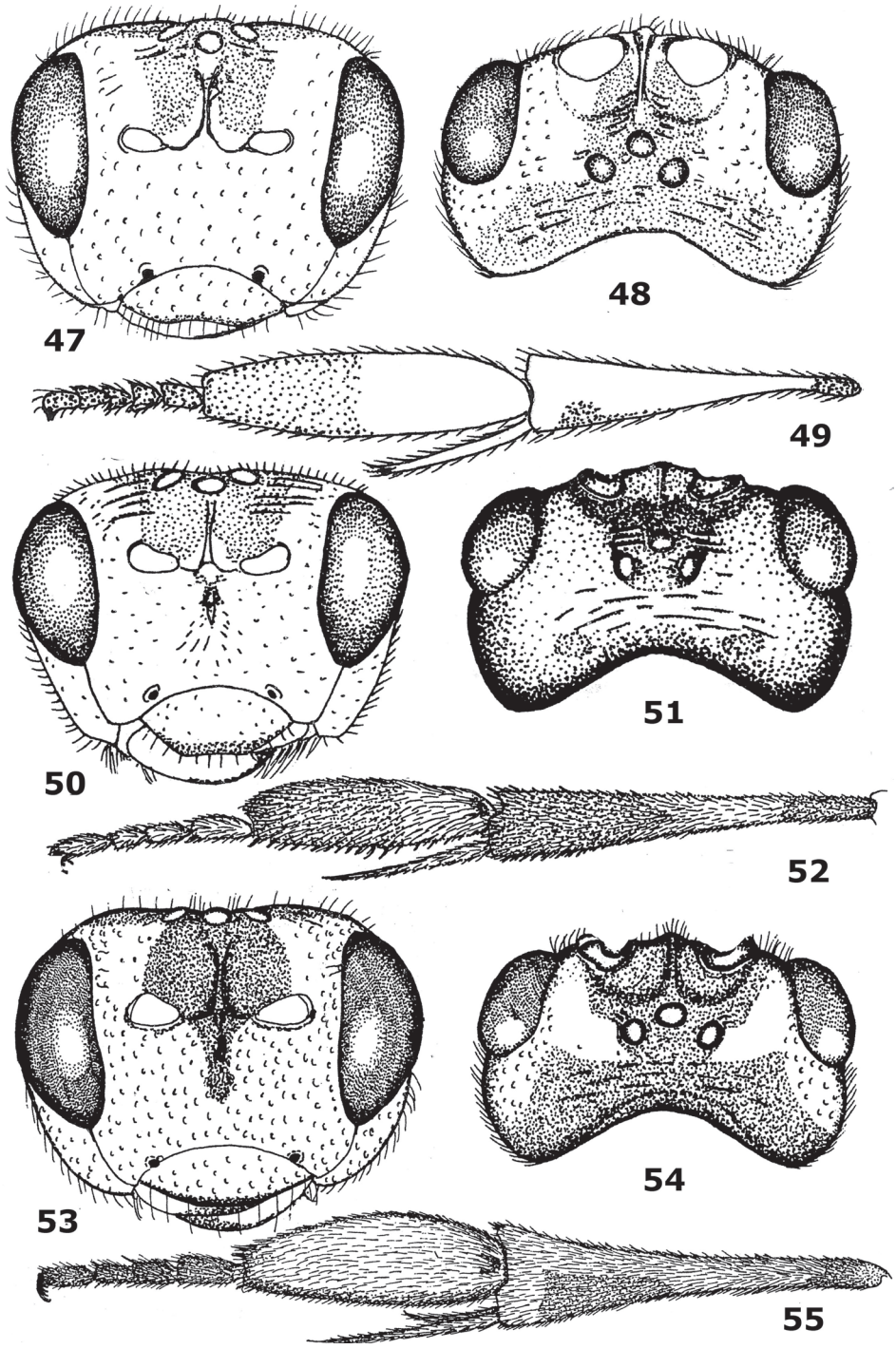
Metasoma. Second tergite shorter than third tergite.

Colour. Body and palpi yellow; antenna brown, but scapus yellow with dark brown spot apically and on outer side; frons black; vertex yellow anteriorly and black posteriorly (Fig. 42); middle and lateral lobes of mesoscutum black; mesosternum black dorsally and yellow ventrally; middle leg yellow, but outer side of trochantellus black; hind coxa dorso-apically, trochanter and trochantellus, basal ring of hind tibia, apical half of hind basitarsus dark brown or black; second-fifth hind tarsal segments dirty brown.

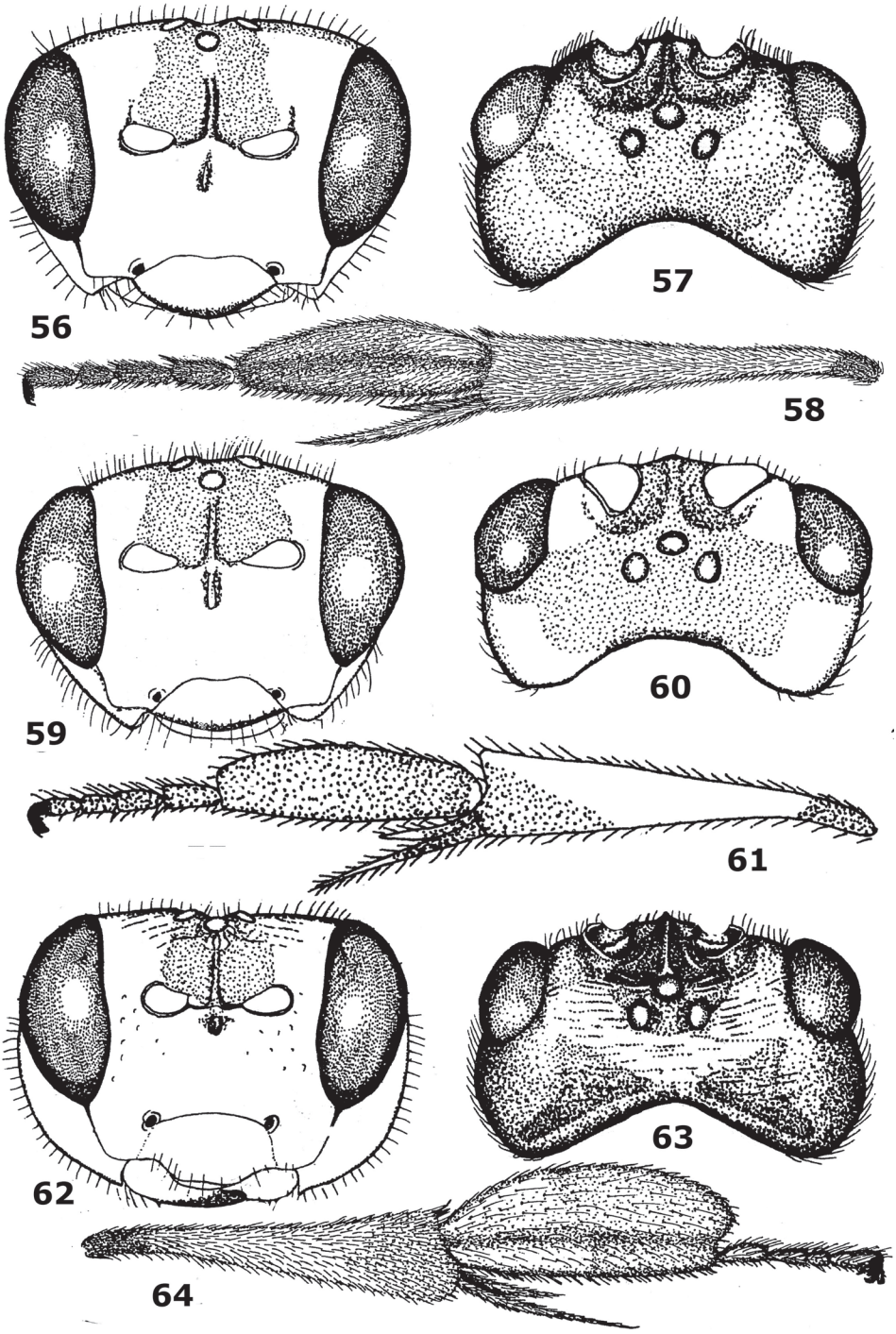
Female. Unknown.

Distribution. N Vietnam: Vinh Phuc and C Vietnam: Nghe An.

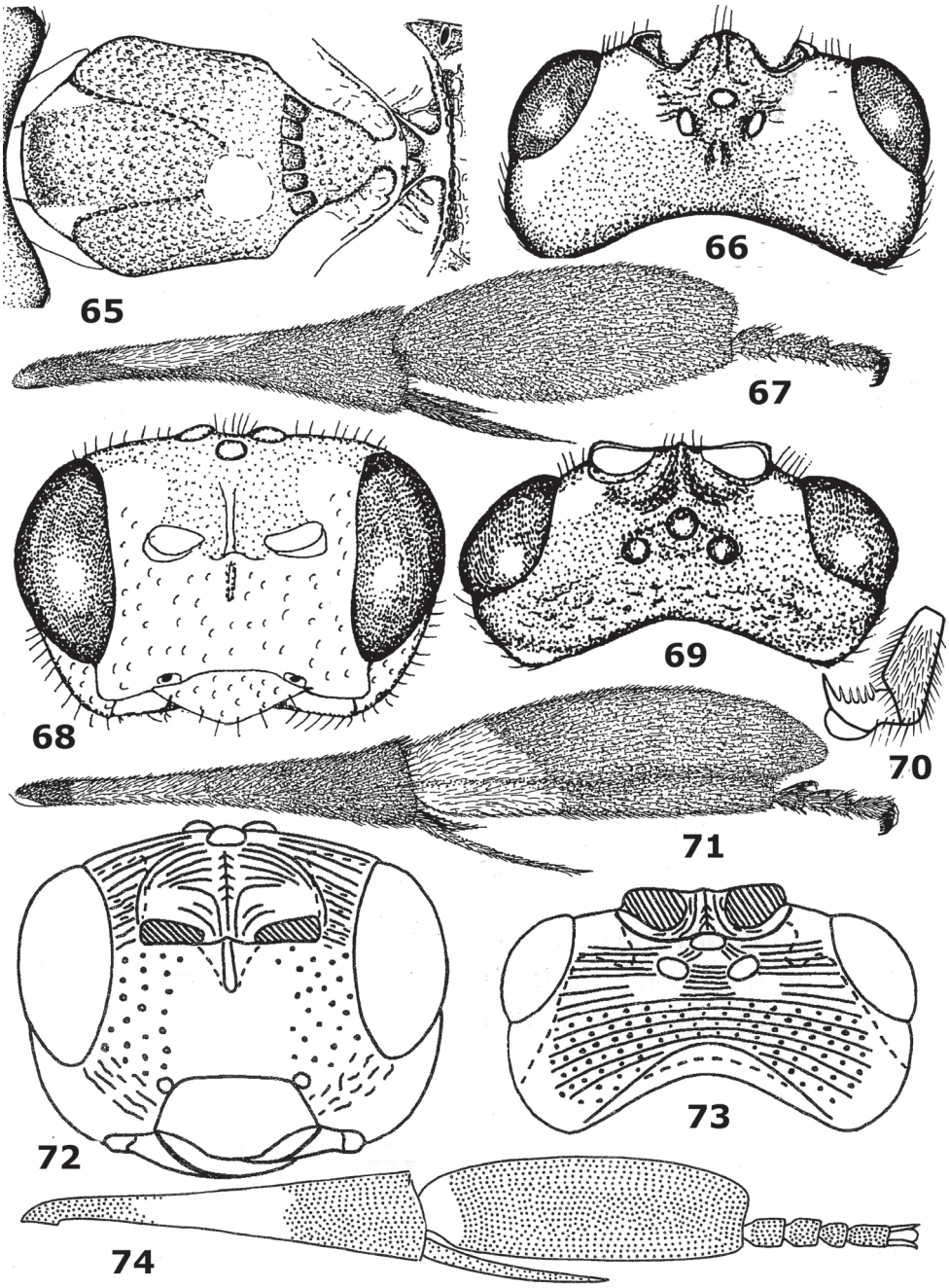
Etymology. The species is named after the country of origin: Vietnam.



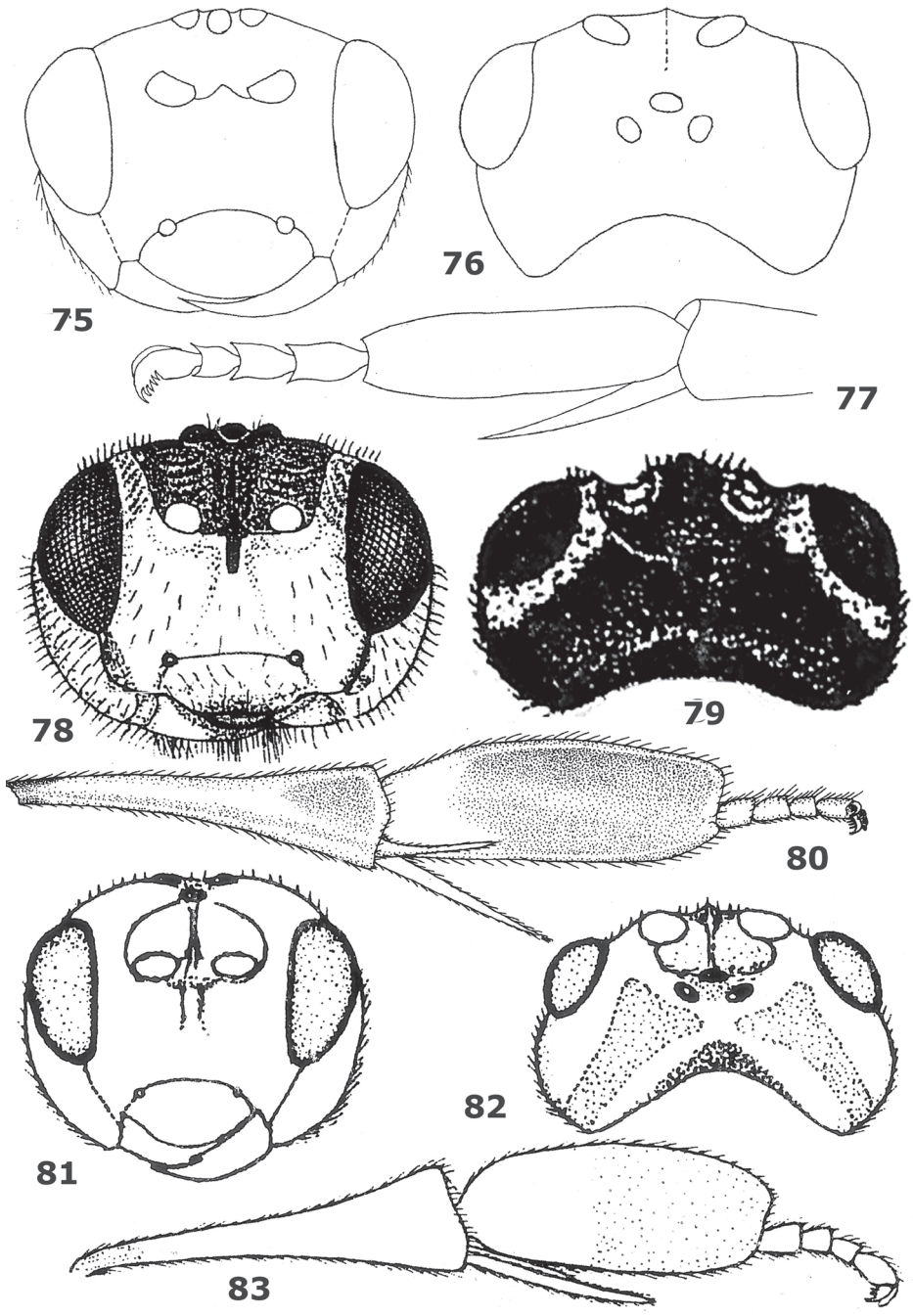
Figures 47–55. 47–49 *Hartemita rudis* (Mao), female, holotype. **50–52.** *H. rhadinotarsa* Dangerfield & Austin, female, paratype. **53–55.** *H. basilaris* Dangerfield & Austin, female, holotype. **47, 50, 53** head frontal **48, 51, 54** head dorsal **49, 52, 55** hind tibia and tarsus lateral. After Dangerfield and Austin (1990).



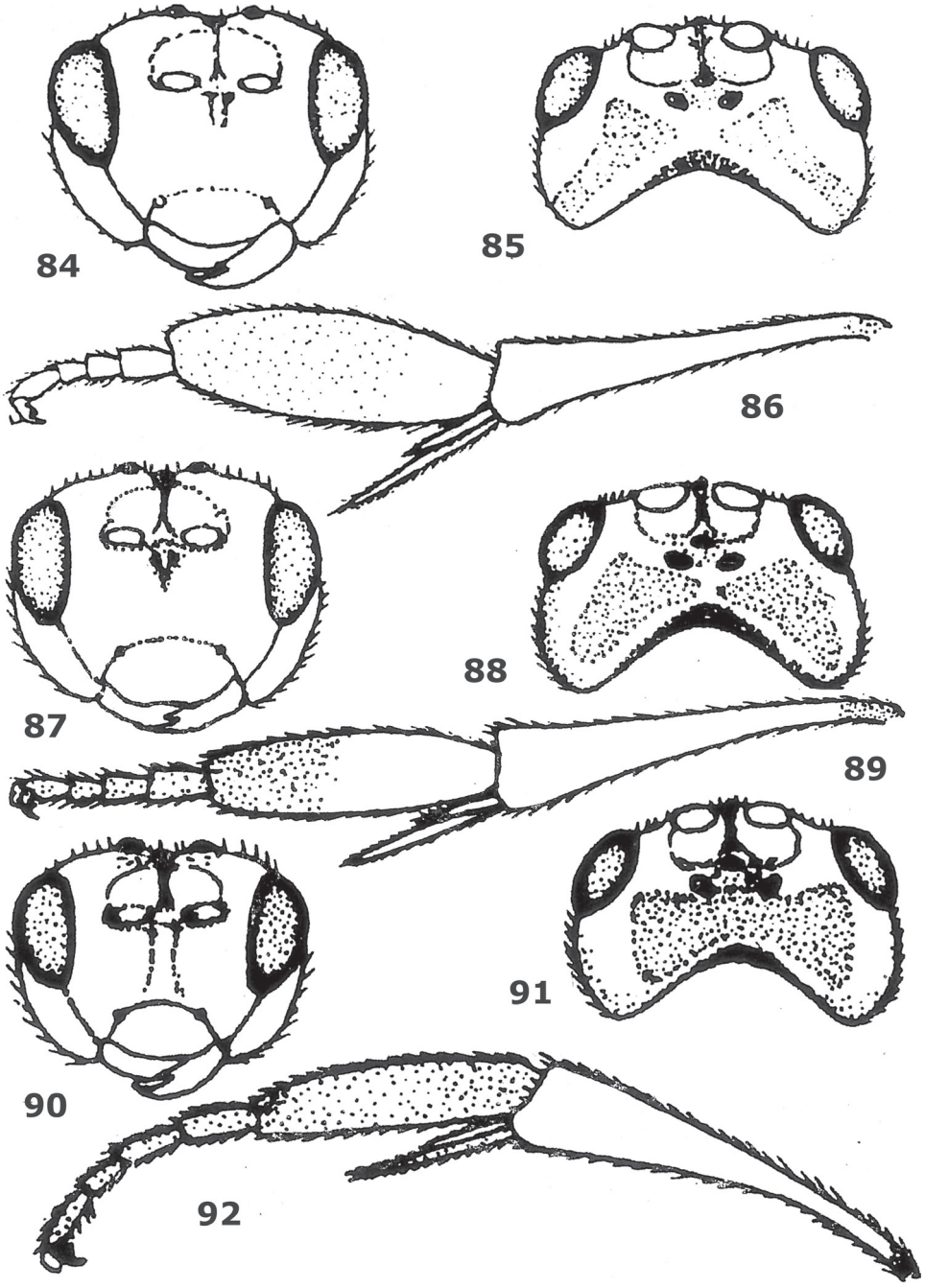
Figures 56–64. 56–58. *Hartemita maculata* sp. n., female. **59–61.** *H. chapini* Dangerfield & Austin, female. **62–64**. *H. basilaris* Dangerfield & Austin, female, holotype. **56, 59, 62** head frontal **57, 60, 63** head dorsal **58, 61, 64** hind tibia and tarsus lateral. After Dangerfield and Austin (1990).



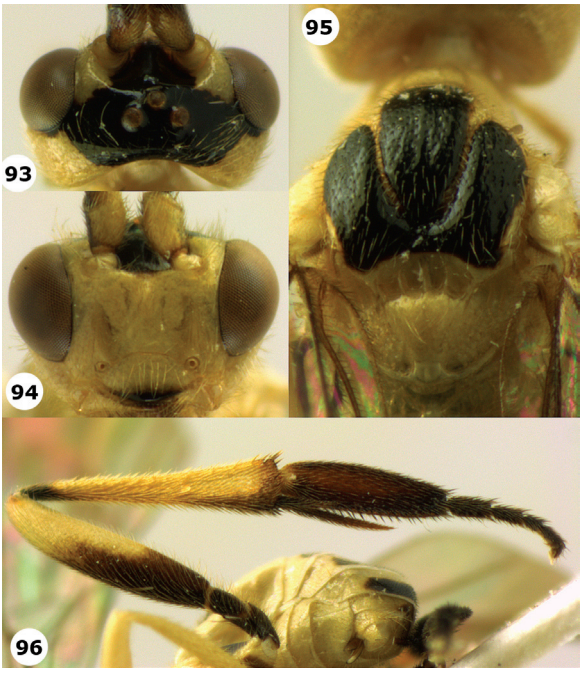
Figures 65–74. 65–67. *Hartemita bruneiensis* Dangerfield & Austin, male, holotype. **68–71.** *H. singaporensis* (Mao), female. **72–74.** *H. spasskensis* Belokobylskij, female, holotype. **65** mesonotum and metanotum dorsal **68, 72** head frontal **66, 69, 73** head dorsal **67, 71, 74** hind tibia and tarsus lateral **70** hind tarsal claw. Figures **65–69, 71** after Dangerfield and Austin (1990) and **72–74** after Belokobylskij (2005)



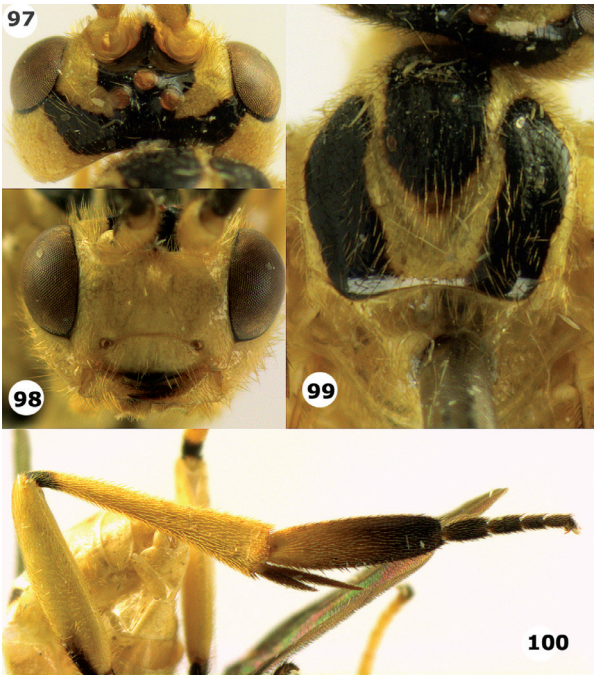
Figures 75–83. 75–77. *Hartemita buteae* Ahmad & Shujauddin, male, holotype. **78–80**. *H. nigrotestacea* Belokobylskij & Ku, female. **81–83**. *H. flava* Chen, He & Ma. **75, 78, 83** head frontal **76, 79, 82** head dorsal **77, 80, 83** hind tibia and tarsus lateral. Figures **75–77** after Ahmad and Shujauddin (2004), **78–80** after Belokobylskij & Ku (2001) and 81–83 after Chen, He and Ma (1998)



Figures 84–92. 84–86. *Hartemita chinensis* Chen, He & Ma, female. **87–89**. *H. excavata* Chen, He & Ma, male, holotype. **90–92**. *H. punctata* Chen, He & Ma, male, holotype. **84, 87, 90** head frontal **85, 88, 91** head dorsal **86, 89, 92** hind tibia and tarsus lateral. After Chen, He and Ma (1998).



Figures 93–96. *Hartemita latipes* Cameron, male, East Malaysia (Sabah). **93** head dorsal **94** head dorsal **95** mesoscutum and scutellum dorsal **96** hind leg.



Figures 97–100. *Hartemita maculata* sp. n., male, paratype, Vietnam. **97** head dorsal **98** head dorsal **99** mesoscutum and scutellum dorsal **100** hind leg.

Additional Vietnamese species

***Hartemita singaporensis* (Mao, 1945)**
http://species-id.net/wiki/Hartemita_singaporensis
Figs 68–71

Material. 2 females (IEBR, RMNH), "Card.055", "Card.056", "[S Vietnam:] Dak Lak, Easo, coffee farm, MT, ? 108°37'E, Ngo Hien"; 2 males (IEBR), "Card.033", "Card.034", "[C Vietnam:] Thua Thien-Hue, Nam Dong, MT, 02–06.v.2005, N. Q. Truong".

Notes. All specimens from Vietnam have the ocelli small, OOL 3 times diameter of posterior ocellus (about 2.5 times in Malaysian specimens); temple narrow, transverse diameter of eye 1.1 times width of temple in lateral view; notauli narrow, smooth; scutellar sulcus with 3 cross carinae (3–5 cross carinae in Malaysian specimens); mesopleuron mainly smooth medially with sparse fine punctures; precoxal sulcus crenulate anteriorly and smooth posteriorly. New record for Vietnam.

Acknowledgements

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RESEARCH ARTICLE

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Heteroxiphia Saini & Singh (Hymenoptera, Xiphydriidae), a genus new to China with descriptions of two new species

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Abstract

Heteroxiphia Saini & Singh, 1987 is redescribed and *Heteroxiphia sinica* **sp. n.** and *H. tenuipalpa* **sp. n.** from China are described. A key to three species is provided and a key for separation of *Heteroxiphia, Trixiphidia* Wei, 1999 and *Yangixiphia* Wei, 2002 is also provided.

Keywords

Hymenoptera, Xiphydriidae, *Heteroxiphia*, new species, China, India

Introduction

Specimens of Xiphydriidae are rarely collected in the field and many species are represented in collections by only one or a few specimens. Maa (1949) revised the Asiatic taxa of the family but *Heteroxiphia* and its type species, *Heteroxiphia maai* Saini & Singh, 1987 were subsequently described by Saini and Singh (1987) from northwestern India based on a single female. In 2000 and 2007, two specimens of Xiphydriidae

were collected separately from Henan and Gansu Provinces, China. They represent two undescribed species of *Heteroxiphia*. The genus is redescribed based on new material and two new species are described below.

Material and methods

Terminology of sawfly genitalia follows Ross (1945). Wing venation follows Niu and Wei (2010, Plate 1).

The images were obtained using a Nikon D2x digital camera and Motic BA400 microscope and further processed with Helicon Focus 5.1(©HeliconSoft) and Adobe Photoshop CS2 software.

Abbreviations used are: OOL = distance between the eye and outer edge of lateral ocellus; POL = distance between the mesal edges of the lateral ocelli; OCL = distance between a lateral ocellus and the occipital carina or hind margin of the head; and CD = the ratio of the distance between the cenchri and the breadth of a cenchrus.

Type specimens of the new species are deposited in the Insect Collection of Central South University of Forestry and Technology, Changsha, P. R. China.

Taxonomy

Heteroxiphia Saini & Singh, 1987

http://species-id.net/wiki/Heteroxiphia

Heteroxiphia Saini & Singh, 1987: 356. Type species: *Heteroxiphia maai* Saini & Singh, 1987, by original designation.

Description. Small, body length 11–13 mm. Clypeus with an acute middle tooth; head almost as broad as thorax, not strongly extended behind eyes, lateral sides roundly narrowed in dorsal view; breadth of upper part of hind orbit distinctly longer than eye breadth but not much longer than long axis of eye; genal carina developed, extending to upper part of hind orbit; occipital carina almost complete, very narrowly separated at posterior margin of postocellar area; temple and postocellar area polished, very sparsely punctured; lower half of hind orbit with longitudinal carinae; distance between antennal sockets 2 times breadth of inner orbit and 2 times distance between antennal socket and anterior margin of clypeus; eyes short elliptical, inner margins indistinctly divergent downward in front view, distance between eyes at level of antennal sockets about 1.4–1.5 times height of eye; malar space (the entire distance from the eye to the lower edge of the antennal groove) distinctly longer than pedicel, about 1.5–2 times diameter of middle ocellus, with a large fovea; frons with curved and irregular carinae and punctures, supraclypeal area with regular longitudinal carinae;

mandibles each with four teeth; maxillary palp with 3 palpomeres, first palpomere shortest, second palpomere slender and longest; labial palp with 3 palpomeres, first palpomere slender and longest, third palpomere more or less enlarged with an elliptical disc (sensory pit). Antenna shorter than head and thorax together, weakly compressed, strongly tapering toward apex, with 15–19 antennomeres, third antennomere shorter than 4th and 5th antennomeres together, each antennomere not broader than long. Anterior margin of pronotum deeply and broadly emarginated, middle part of pronotum very narrow; length of propleura in ventral view about 1.5 times as long as broad; mesoscutellum without tubercle, CD= 3.2–3.5; inner tibial spur of front leg bifurcate at apex, outer tibial spur minute; hind femur about 3.5–4 times longer than broad; apical tarsomeres not strongly enlarged; tarsal claws small, inner tooth of fore and middle claws slightly shorter than half length of outer tooth, hind claw with a very small inner tooth. Wings hyaline, forewing with vein 2r present, cell R1 broadly open at apex, anal cell with a cross vein at about apical 1/4; cells R1, Rs, M and A in hind wing closed. Body black with some white maculae.

Distribution. China (Henan, Gansu); India (Himachal Pradesh).

Remarks. Saini and Singh (1987, fig. 3) stated and figured that members of *Heteroxiphia* have four labial palpomeres. Observation of the labium of the two Chinese species shows that the basal short ring in Fig. 3 of Saini and Singh (1987) is an elevated platform of the labium, thus the labial palp has only three palpomeres.

Heteroxiphia is recognized by a combination of the following characters: maxillary palp with 3 palpomeres, the second palpomere much longer than the first and third palpomeres; labial palp also with 3 palpomeres; hind claw with a minute inner tooth; cell R1 in forewing broadly open, cell R1 in hind wing closed; face and lower half of hind orbit with regular longitudinal carinae; malar space about 1.5 times diameter of middle ocellus and with a large fovea; body black with some white maculae.

Heteroxiphia is closely allied to *Trixiphidia* Wei, 1999 (Wei and Xiao 1999). These are the only two genera of Xiphydriidae with three maxillary and labial palpomeres. *Yangixiphia* Wei, 2002 has also three maxillary palpomeres. The following key distinguishes the three genera.

1 Cell R1 in forewing closed; labial palp with four palpomeres, the second palpomere longer than the third. China (Guizhou) ..... ***Yangixiphia* Wei, 2002**

– Cell R1 in forewing open; labial palp with three palpomeres, the third palpomere longer than the second **2**

2 Cell R1 in hind wing open; each claw with a long inner tooth close to and hardly shorter than outer tooth; face and hind orbits coarsely punctate, without regular carinae; maxillary palp with second palpomere about as long as third palpomere; labial palp with second palpomere more than 3 times as long as broad, third palpomere slender, hardly enlarged (Figs 1–2 in Wei and Xiao, 1999). China (Henan) ..... ***Trixiphidia* Wei, 1999**

– Cell R1 in hind wing closed; fore and middle claws each with a small inner tooth remote from and about 1/2–1/3 length of outer tooth, hind claw with

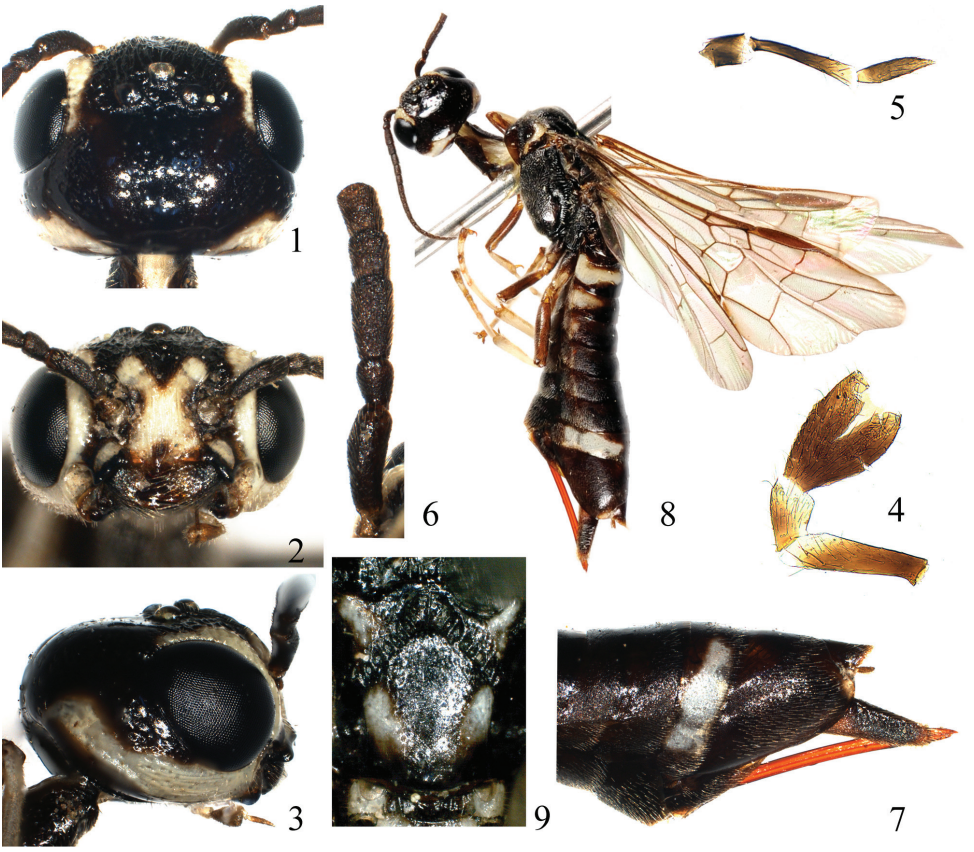
a minute inner tooth; face and hind orbits with regular carinae, not punctate; maxillary palp (Figs 5, 13) with second palpomere much longer than third palpomere; labial palp (Figs 4, 12) with second palpomere about 1.5–2 times as long as broad, third palpomere short and distinctly enlarged. China (Henan, Gansu); India (Himachal Pradesh) .....***Heteroxiphia*** **Saini & Singh, 1987**

Heteroxiphia sinica **Wei & Niu, sp. n.**
urn:lsid:zoobank.org:act:15136759-A469-4BEB-8632-2CE1B705E3BB
http://species-id.net/wiki/Heteroxiphia_sinica
Figs 1–9

Description. Female (holotype, Fig. 8). Body length 11mm. Black, a long and broad stripe on inner orbit, a short stripe on lateral corner of clypeus, a large X-shaped mark on face and anterior margin of frons, malar space (Fig. 2), a broad and long stripe on hind orbit (Fig. 3), outer margin and posterior corner of pronotum, tegula, an elliptical spot on posterior part of lateral lobe of mesoscutum, a round mark on lateral side of mesoscutellum, cenchrus, lateral mark on metascutellum, a strongly curved and narrow middle stripe on first abdominal tergite, a broad transverse band on second abdominal tergite, a short band on third abdominal tergite, a minute lateral dot on 4th abdominal tergite and a long band on 8th abdominal tergite (Figs 7, 8), white; legs black, each tibia and tarsus white, 4th tarsomeres and apical half of each terminal tarsomere dark brown. Body hairs silver. Wings hyaline, stigma and veins dark brown.

Clypeus, face and frons with distinct longitudinal carinae and microsculpture, lateral part of frons densely punctured; vertex and upper part of hind orbit sparsely punctured; head behind eyes strongly shiny (Fig. 1); dorsal side of pronotum densely punctured, lateral lobe largely polished, shiny, bottom of furrows with a row of short carinae; dorsal side of propleuron shiny with some large punctures, ventral side of propleuron densely punctured and microsculptured; mesonotum minutely and densely punctured, lateral sides and posterior half of mesoscutellum sparsely punctured, shiny; bottom of furrows on mesonotum with a row of short carinae; metascutellum densely punctured; mesopleuron and metapleuron coarsely and densely punctured, mat, lower posterior corner glossy, impunctate; first abdominal tergite sparsely punctured, shiny; second abdominal tergite glossy, lateral side with some punctures, basal 2/3–4/5 of other tergites densely microsculptured, weakly shiny; abdominal sternites microsculptured with obscure punctures, feebly shiny; basal sheath polished, apical sheath microsculptured.

Distance between eyes at clypeus level about 1.4 times eye height; malar space 1.3 times length of pedicel (Fig. 2); middle fovea furrow like, broad, lateral fovea punctiform; face and front distinctly above top of eyes (Figs 2, 3); interocellar furrow obscure, postocellar furrow fine, curved; POL: OOL: OCL = 5: 8: 18; vertex roundly convex (Figs 1, 3); lateral side of temple shorter than eye in dorsal view (Fig. 1); occipital ca-



Figures 1–9 *H. sinica* sp. n., holotype **1** Head, dorsal view **2** Head, front view **3** Head, lateral view **4** Labial palp **5** Maxillary palp **6** 1st–5th antennomeres **7** Apex of abdomen, lateral view **8** Adult female, lateral view **9** Mesoscutellum

rina and genal carina developed, close to each other near lateral corner of postocellar area; length ratio of maxillary palpomeres about 3: 7: 5, first palpomere short, slightly longer than broad, second palpomere 6 times longer than broad, distinctly broadened toward apex, third palpomere 4.3 times longer than broad, apical part strongly tapering (Fig. 5); labial palp with 3 palpomere, first palpomere slightly (1.05×) longer than third palpomere, third palpomere strongly enlarged, 2 times as long as second palpomere (Fig. 4). Antenna with 19 antennomeres, slightly shorter than 2 times head breadth, basal part of flagellum weakly compressed, strongly tapering toward apex (Fig. 8), length ratio of basal 5 antennomeres: 18: 7: 13: 7: 7; hairs on antennomeres quite procumbent (Fig. 6). Mesoscutellum 1.25 times as long as broad, distinctly narrowed backward and strongly protruding forward (Fig. 9); cenchrus small, CD=3.5; central part of metascutellum concave. Inner tibial spur of fore leg bifurcate at apex; metabasitarsus slightly shorter than following 4 tarsomeres together; fore and middle claw with inner tooth slightly shorter than half length of outer tooth, inner tooth of hind claw slightly shorter than 1/3 length of outer tooth. Vein Sc in forewing distinctly basal to

Rs, 2r curved and interstitial to 1r-m, cell 2Rs slightly shorter than 1Rs, cell 1M about 1.8 times longer than broad, first abscissa of Rs slightly longer than first abscissa of vein 1M, cu-a 1.5 times length of and interstitial to first abscissa of vein 1M; cell R1 in hind wing with a short apical stump, cell M as long as Rs, apex of anal cell acute, upper part of cu-a distinctly oblique inwards. Ovipositor sheath (distance between base of basal sheath and apex of apical sheath) about as long as hind tibia and metabasitarsus together, strongly bent ventrally (Fig. 7), apical sheath about 4 times longer than broad in dorsal view.

Male. Unknown.

Distribution. China (Henan Province).

Etymology. This is the first Chinese species of the genus and so it is named as *sinica*.

Holotype ♀, China: Jiyuan, Huanglianshu, 1700 m, 2000.VI.7, Wei Meicai leg.

Remarks. See the key to species for differences between *H. sinica* and other two species of the genus.

***Heteroxiphia tenuipalpa* Wei & Niu, sp. n.**

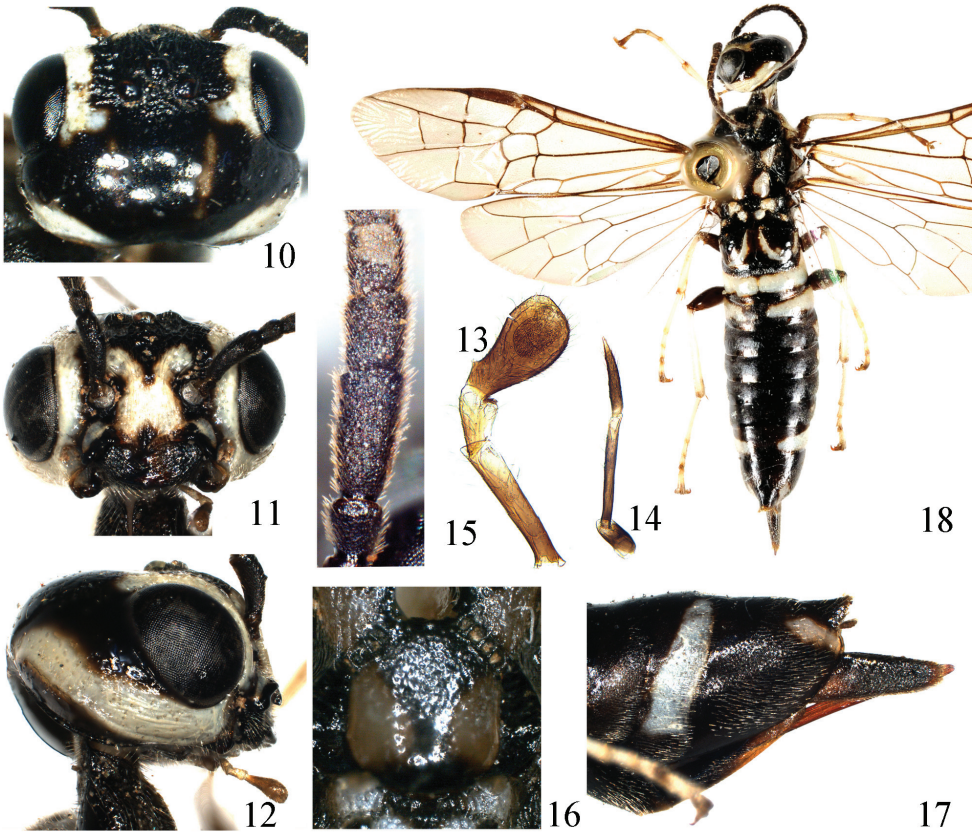
urn:lsid:zoobank.org:act:A50ADBE5-4F03-45B6-9D31-1AC2A2D94227

http://species-id.net/wiki/Heteroxiphia_tenuipalpa

Figs 10–18

Description. Female (holotype, Fig. 18). Body length 13 mm. Black, a long and broad stripe on inner orbit, a short stripe on lateral corner of clypeus, a large X-shaped mark on face and anterior margin of frons, malar space (Fig. 11), a broad and long stripe on hind orbit (Fig. 12), narrow anterior margin, broad lateral and posterior margins of pronotum, tegula, lateral stripe on prescutum, an elliptical spot on posterior part of lateral lobe of mesoscutum, a round mark on lateral side of mesoscutellum, cenchrus, lateral mark on metascutellum, a strongly curved middle stripe on first abdominal tergite, a broad transverse band on second abdominal tergite, a medially separated band on third abdominal tergite (Fig. 18), a small lateral spot on 4th and 5th abdominal tergites, a long band on 8th abdominal tergite and a short stripe on posterior corner of 9th tergite (Fig. 17), white; lateral side of postocellar area with obscure brown stripe (Fig. 10); legs black, apex of hind coxa and hind trochanter brown, each tibia and tarsus white, extreme apex of hind tibia, tibial spurs, 4th tarsomere and apical half of each terminal tarsomere black brown. Body hairs silver. Wings hyaline, apical part slightly infuscate, stigma and veins dark brown.

Clypeus, face and frons with distinct longitudinal carinae and microsculpture, lateral part of frons densely punctured; vertex and upper part of hind orbit sparsely punctured, head behind eyes strongly shiny (Fig. 10); dorsal side of pronotum densely punctured, lateral lobe largely polished, shiny, bottom of middle and lateral furrows with short carinae; dorsal side of propleuron shiny with some large punctures, ventral side of propleuron densely punctured and microsculptured; mesonotum minutely and densely punctured, lateral sides and posterior 2/3 of mesoscutellum sparsely punc-



Figures 10–18 *H. tenuipalpa* sp. n., holotype **10** Head, dorsal view **11** Head, front view **12** Head, lateral view **13** Labial palp **14** Maxillary palp **15** 1st–4th antennomeres **16** Mesoscutellum **17** Apex of abdomen, lateral view **18** Adult female, dorsal view

tured, shiny; bottom of furrows on mesonotum with many short carinae; metascutellum coarsely punctured; mesopleuron and metapleuron coarsely and densely punctured, mat, lower posterior corner glossy, impunctate; first abdominal tergite sparsely punctured, shiny; second abdominal tergite glossy, lateral side with some punctures, basal 4/5 of other tergites densely microsculptured, weakly shiny; abdominal sternites microsculptured with obscure punctures, feebly shiny; basal sheath polished, apical sheath microsculptured.

Distance between eyes at clypeus level about 1.5 times eye height; malar space 1.3 times length of pedicel (Fig. 11); middle fovea round, lateral fovea punctiform; face and front distinctly above top of eyes (Figs 11, 12); interocellar furrow obscure, postocellar furrow fine, curved; POL: OOL: OCL = 5: 9: 20; vertex roundly convex (Figs 10, 12); lateral side of temple slightly longer than eye in dorsal view; occipital carina and genal carina developed, close to each other near lateral corner of postocellar area; maxillary palp slender, length ratio of palpomeres about 3: 7: 5, first palpomere

short, 2 times longer than broad, second palpomere 10 times longer than broad, not broadened toward apex, third palpomere 7 times longer than broad, gradually tapering toward apex (Fig. 14); labial palp with 3 palpomeres, first palpomere 1.25 times length of third palpomere, third palpomere strongly enlarged, 2 times as long as second palpomere (Fig. 13). Antenna with 19 antennomeres, slightly shorter than 2 times head breadth, basal part of flagellum weakly compressed, strongly tapering toward apex (Fig. 18), length ratio of basal 5 antennomeres: 18: 7: 15: 9: 8; hairs on antennomeres oblique, not procumbent (Fig. 15). Mesoscutellum about as long as broad, not narrowed posteriorly and roundly protruding anteriorly (Fig. 16); cenchrus small, CD=3.2; central part of metascutellum concave. Inner tibial spur of fore leg bifurcate at apex; hind basitarsus slightly shorter than following 4 tarsomeres together (10: 11); fore and middle claws with inner tooth slightly shorter than half length of outer tooth, inner tooth of hind claw about 1/3 length of outer tooth. Vein Sc in forewing interstitial with base of vein Rs, 2r curved and interstitial with 1r-m, cell 2Rs slightly shorter than 1Rs, cell 1M about 1.8 times longer than broad, first abscissa of Rs as long as first abscissa of vein 1M, cu-a 1.5 times length of and interstitial to first abscissa of vein 1M; cell R1 in hind wing with a short apical stump, cell M as long as Rs, apex of anal cell acute, upper part of cu-a distinctly oblique inwards. Ovipositor sheath 1.2 times as long as hind tibia and metabasitarsus together, distinctly bent ventrally (Fig. 17), apical sheath slightly more than 4 times longer than broad in dorsal view.

Male. Unknown.

Distribution. China (Gansu Province).

Etymology. This species is named after its slender maxillary palp.

Holotype ♀, China: Gansu, Maiji, Dongcha Forest Plant, 2007.VI.13, Wu Xingyu leg.

Remarks. See the following key to species for differences between *H. sinica* and other two species of the genus.

Key to species of *Heteroxiphia*

1 Mandible and mesopleuron with distinct white maculae; upper half of inner orbit black, without white stripe; frons coarsely punctured without regular carinae; inner tooth of hind claw minute, shorter than 1/4 length of outer tooth; vein cu-a in forewing distinctly apical to base of vein 1M; mesoscutellum densely punctured; third maxillary palpomere narrower than second palpomere; antenna with 15 antennomeres. India: Himachal Pradesh.....***H. maai***

– Mandible and mesopleuron black, without distinct white maculae; entire inner orbit with broad white stripe; frons with regular carinae; inner tooth of hind claw distinct, about 1/3 length of outer tooth; vein cu-a in forewing interstitial with base of vein 1M; mesoscutellum sparsely punctured in posterior half; third maxillary palpomere stouter than second palpomere; antenna with 19 antennomeres. China.....**2**

2 Prescutum entirely black; mesoscutellum longer than broad, narrowed posteriorly (Fig. 9); maxillary palp shorter and stouter, second palpomere 6 times longer than broad, distinctly broadened toward apex, third palpomere 4.3 times longer than broad (Fig. 5); temple shorter than eye in dorsal view (Fig. 1); hairs on antennomeres procumbent (Fig. 6); first palpomere of labial palp 1.05 times longer than third palpomere; vein Sc in forewing distinctly basal to base of vein Rs; ovipositor sheath as long as hind tibia and hind basitarsus together. China: Henan ..... ***H. sinica***

– Lateral side of prescutum white; mesoscutellum as long as broad, not narrowed posteriorly (Fig. 16); maxillary palp very slender, second palpomere 10 times longer than broad, not broadened toward apex, third palpomere 7 times longer than broad (Fig. 14); temple longer than eye in dorsal view; hairs on antennomeres oblique, not procumbent (Fig. 15); first palpomere of labial palp 1.25 times longer than third palpomere; vein Sc in forewing interstitial with base of vein Rs; ovipositor sheath 1.2 times as long as hind tibia and hind basitarsus together. China: Gansu..... ***H. tenuipalpa***

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RESEARCH ARTICLE

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Obrieniolus, a new monotypic genus of Naupactini (Coleoptera, Curculionidae, Entiminae) from the Peruvian Andes and its phylogenetic placement

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Abstract

A new monotypic genus of Naupactini (Coleoptera: Curculionidae), *Obrieniolus* del Río is described based on the new species *Obrieniolus robustus* del Río, endemic to Peru. This genus is easily recognized by the black, denuded and shiny integument, with imbricate microsculpture and the rounded body, with short, cordiform and moderately convex elytra. According to a cladistic analysis based on 69 continuous and discrete morphological characters, the new genus is the sister taxon of a group formed by *Amitrus* Schoenherr, *Trichocyphus* Heller, *Amphideritus* Schoenherr, *Asymmathetes* Wibmer & O'Brien and *Galapaganus* Lanteri. The paper includes habitus photographs, line drawings of genitalia, mouthparts, and other external features of taxonomic value, and a dichotomous key to the genera of Naupactini distributed in the South American Transition Zone.

Keywords

Obrieniolus robustus, new taxa, phylogeny, Paramo-Puna subregion, South American Transition Zone

Introduction

The tribe Naupactini (Curculionidae: Entiminae) consists of approximately 65 genera (Alonso-Zarazaga and Lyal 1999) with over 500 species mainly distributed in Central

and South America (Wibmer and O´Brien 1986). Six genera and 28 species of this tribe have been reported for the Paramo-Puna subregion of the Andean region (Cabrera and Willink 1973; Morrone 2001) or Central-Northern area of the South American Transition Zone *sensu* Morrone (2006). These genera are *Amitrus* Schoenherr, 1840 (8 spp.), *Amphideritus* Schoenherr, 1840 (8 spp.), *Asymmathetes* Wibmer & O'Brien, 1986 (7 spp.), *Galapaganus* Lanteri, 1992 (15 spp., only two in this region), *Melanocyphus* Jekel, 1875 (2 spp.), and *Trichocyphus* Heller, 1921 (1 sp.). Some of them have been revised (Lanteri 1989, 1992; del Río and Lanteri 2007) and the remaining are currently under revision (del Río 2010). Their species diversity is poorly known, the phylogenetic relationships among them have never been assessed, and there is scarce information on host plants and biological aspects, even though some species are possible potato pests (Munro 1968; Peña 2001).

In the present contribution we describe a new Andean genus and species which cannot be accommodated within any of the existing weevil genera. This new monotypic taxon is endemic to Peru and ranges throughout the Puna province, mainly characterized by a shrublike steppe, with bushes 40 to 150 cm high. A cladistic analysis was performed to analyze the relationship of the new genus with other Naupactini from the Andes and the Pacific coastal deserts, a monophyletic clade within this tribe (del Río and Lanteri unpublished).

Materials and methods

The material studied comes only from the Charles W. O´Brien personal collection (CWOB). The holotype and three paratypes have been returned to CWOB collection, and one paratype has been deposited in the Museo de La Plata collection (MLP).

Dissections of female and male genitalia were done according to standard entomological techniques. Measurements were taken with an ocular micrometer. Abbreviations used in the description are as follows: LB: length of body, measured from apex of rostrum to apex of elytra; WRa: width of rostrum across apex; WRb: width of rostrum at base; LR: length of rostrum from anterior margin of eye to apex; LA: maximum length of antenna; A1: length of funicular article 1; A2: length of funicular article 2; WC: maximum width of club; LC: maximum length of club; WP: maximum width of pronotum; LP: maximum length of pronotum; WE: maximum width of elytra; LE: maximum length of elytra. For line drawings we used a camera lucida adapted to a stereoscopic microscope Nikon MZ1000.

Phylogenetic analysis. The data matrix (see Appendix 1) includes 13 terminal species of Naupactini, belonging to eight genera: *Amitrus* (*A. alutaceus* and *A. mundus*); *Amphideritus* (*A. vilis* and *A. puberulus*); *Asymmathetes* (*A. pascoei* and *A. nigrans*); *Galapaganus* (*G. femoratus* and *G. galapagoensis*); *Melanocyphus* (*M. bispinus* and *M. lugubris*); *Trichocyphus* (*T. formosus*); *Mendozella* (*M. curvispinis*); and the new genus *Obrieniolus* (*O. robustus*). Each genus is represented by two species (one of them the type species), except for those that are monotypic.

The 69 characters selected (table 1) correspond to the external morphology (54) and to the genitalia (10 of females and five of males). Sixteen continuous characters correspond to ranges of ratios between measurements and were treated as such, avoiding the use of *ad hoc* methods to establish ranges (Goloboff et al. 2008). Multistate characters with intraspecific variation were treated as polymorphic, as indicated in TNT (e.g. [0 1]). All discrete characters were treated as unordered.

Parsimony analysis was performed with the software "Tree Analysis using New Technologies" (TNT) (Goloboff et al. 2003) using the 'traditional' search approach based on 100 replicates using TBR branch swapping, and hold 10. Discrete characters were mapped on the most parsymonious cladogram through Winclada version 1.00.08 (Nixon 2002). Homoplasy was estimated using consistency and retention indices (Kluge and Farris 1969; Farris 1989). Branch support was evaluated by bootstrap (Felsenstein 1985) with 100 replicates, and values over 50% were indicated below each branch (Fig. 14).

The most parsimonious tree was rooted with *Mendozella curvispinis*, which is the only terminal taxon distributed in the Monte province, belonging to the South American Transition Zone but not to the Paramo-Puna subregion (Lanteri 1989; Lanteri and Morrone 1991).

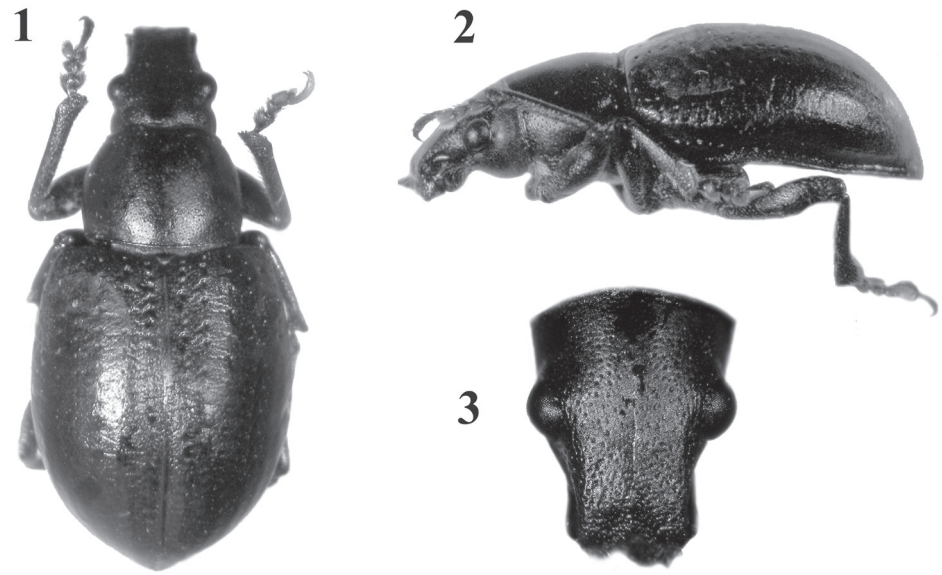
Taxonomy

***Obrieniolus* del Río, gen. n.**
urn:lsid:zoobank.org:act:DF6EDE47-07C1-4E1B-A2CE-6D01D6970930
http://species-id.net/wiki/Obrieniolus

Type species. New species *Obrieniolus robustus* del Río.

Diagnostic description. Body rounded and medium-sized; integument black, denuded and shiny, with imbricate microsculpture and reddish-brown tarsi (Figs 1–2); rostrum very short with narrow epistome (Fig. 3); maxillae with suboval mala, not excavate, almost parallel to longitudinal axis of palpus (Fig. 7); prementum subcordate without setae (Figs 4–6); posterior margin of pronotum constricted and slightly posteriorly "V" shaped; elytra cordiform, moderately convex, with slightly posteriorly curved base and slightly prominent and subquadrate humeri (Fig. 1); punctures of striae strongly separated from each other; scutellum tiny, denuded; front coxae slightly separated from each other, 3× closer to anterior than to posterior margin of prosternum; row of denticles only present in front tibiae; outer bevels of hind tibiae broad and oblique. Ovipositor thin and curved in lateral view, longer than abdomen (Fig. 11); sternite VIII with subrhomboidal elongate plate and apodeme *ca.* 2× longer than plate (Fig. 10); spermathecal duct very long, membranous and sinuous (Fig. 13).

Etymology. The genus is named after the outstanding weevil specialist Charles W. O´Brien, who loaned us the material for this study.

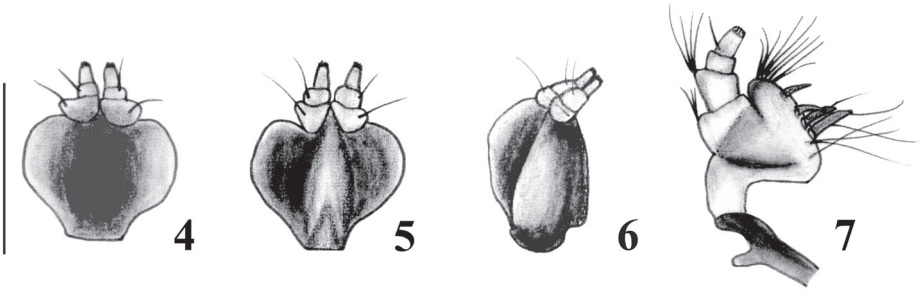


Figures 1–3. *Obrieniolus robustus* **sp. n.**, holotype **1** habitus, dorsal **2** habitus, lateral **3** head and rostrum, dorsal.

Remarks. *Obrieniolus* is distinguished by the particular shape of the body (cordiform, extremely rounded and short), completely covered with imbricate microsculpture, the strongly separated punctures of the elytral striae, and the bursa copulatrix studded with dense and minute spines directed backwards, near the vagina. Other generic characters are common in most Naupactini inhabiting mountain environments, **e.g.** the black, denuded and strongly sclerotized integument, the absence of metathoracic wings and the reduced shoulders.

Natural history. *Obrieniolus* seems to be endemic to northeastern Peru, Department of La Libertad, at about 2800 m of elevation. Its distribution corresponds to the Puna biogeographic province, that also extends in eastern Bolivia, northern Argentina and Chile (Morrone 2006), which is a steppe shrublike formation with bushes 40 to 150 cm high. The area where *Obrieniolus* occur is close to the Coastal Peruvian Desert province, a narrow strip along the Pacific coast from northern Peru to northern Chile (Morrone 2006), characterized by the extremely dry climate.

Obrieniolus robustus was found under rocks, in dry hills with grasses and sparse small shrubs. No specific host plant associations are known. The possibility of parthenogenesis is inferred based on the absence of males. This kind of reproduction seems to be frequent in the Andean species of Naupactini (Lanteri and Normark 1995; del Río 2010).



Figures 4–7. Mouthparts of *Obrieniolus robustus* **sp. n.**. **4** prementum, external view **5** prementum, internal view **6** prementum, lateral view **7** left maxilla.

***Obrieniolus robustus* del Río, sp. n.**
urn:lsid:zoobank.org:act:3DDE1999-9F5C-4698-B296-9B06BE9A6604
http://species-id.net/wiki/Obrieniolus_robustus

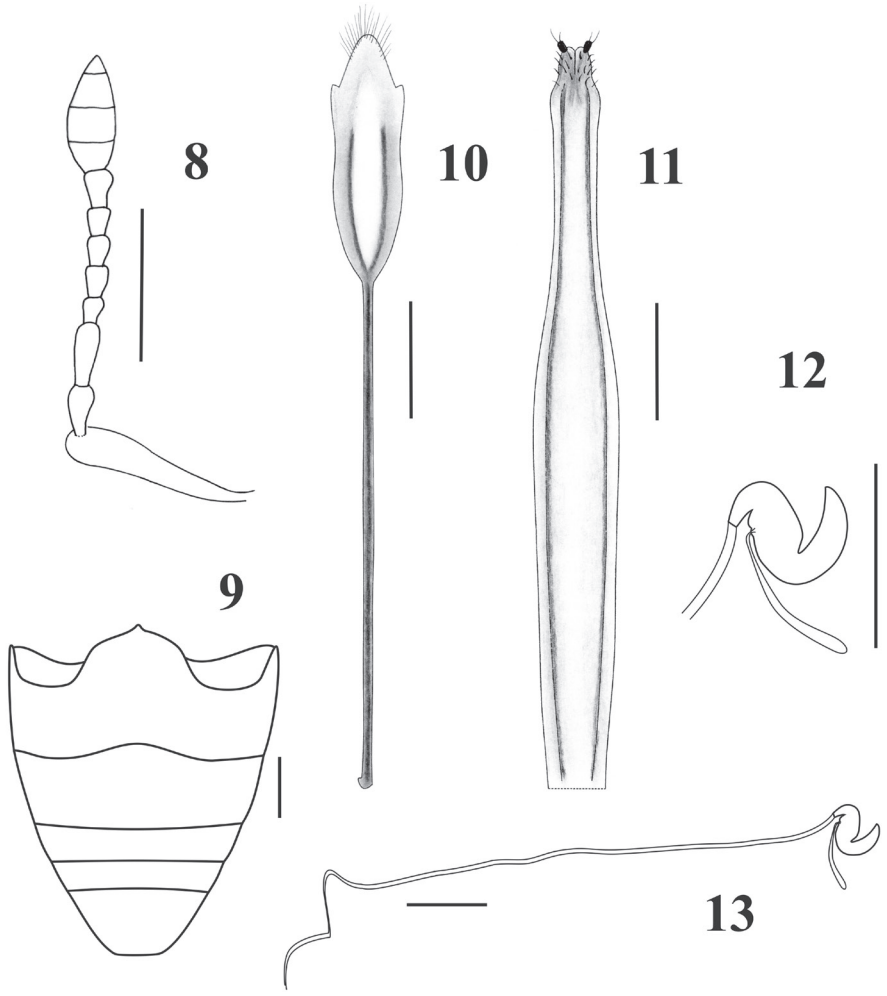
Etymology. The species epithet is an adjective alluding to one of the distinctive characters of the new species, which is its robust body shape.

Material examined. Holotype. Female, 10.8 mm long, with labels as follows "Perú, La Libertad Dept., Otuzco P., 1.2 mi NW Agallpampa, on rd. to Trujillo, 2840m, under rocks on dry hillside with sparse brown grass, sparse small brown plants, XI-27-1977, G. Noonan & M. Moffett". Pinned with genitalia dissected and placed in a microvial with glycerin. Deposited at CWOB.

Type locality. Perú: Department of La Libertad, Otuzco, Agallpampa.

Paratypes. 4 ♀♀ same data as holotype (3 CWOB; 1 MLP).

Description. *Female.* Species medium sized (LB: 8.5–10.8 mm), body broadly rounded (Figs 1–2). *Integument* visible, dark, with imbricate microsculpture, tarsi reddish brown. *Vestiture*. Dorsum naked of scales; pleura (mesepimeron and metaepisternum) covered with whitish setiform scales; legs and venter with disperse short yellowish decumbent setae, longer and more abundant in inner face of femur and tibia. *Rostrum* (Fig. 3) slightly shorter than wide (LR/WRa: 0.87–0.94), sides moderately convergent toward apex (WRb/WRa: 1.39–1.40), dorsum flat, punctate-foveolate (with disperse broad punctures and small punctuation between them); dorso-lateral carinae absent; median groove narrow, extended up to posterior margin of eyes or slightly exceeding them. Epistome slightly depressed, narrow, subtriangular, denudate and with strigose sculpture. Scrobes curved, deep, ending below eyes. *Mouthparts.* Mandibles naked of scales; outer face foveolate, with coarse setae. Maxillae (Fig. 7) with suboval mala, not excavate, almost parallel to longitudinal axis of palpus; basal area with thin long setae (~5), lacinial teeth short, curved and wide (1+3); distal area with wide long setae (~13); palpifer and articles 1–2 of palpi transverse, and article 3 subcylindrical. Prementum (Figs 4–6) subcordate; external surface alveolate, moderately concave and naked of setae; inner surface without setae, with prominent median keel. Palpi smooth, (setae



Figures 8–13. Antennae, ventrites and female genitalia of *Obrieniolus robustus* **8** left antenna **9** ventrites **10** sternite VIII **11** ovipositor, ventral view **12** spermatheca **13** spermatheca with spermathecal duct. Scale line: 1 mm.

4-1-0), forming a very open angle with prementum axis. Gular angle near 90° in lateral view. Eyes medium- sized and moderately convex. Preocular depression absent. Frons wide (*ca.* 3x diameter of eye), slightly convex, punctate-foveolate. Vertex slightly convex. Postocular constriction distinct. *Antennae* (Fig. 8) short and robust (LB/LA: 2.80–2.93), covered with wide decumbent setae. Scape slender, reaching middle of eye. Funicular article 2 about 1.2× as long as article 1; funicular articles 3–7 slightly longer than wide (1.5×). Club oval (LC/WC: 2-42-2.47), acuminate.

Pronotum (Figs 1–2) subcylindrical, moderately transverse (WR/LR: 1.27–1.32); flanks moderately curved; disc slightly convex, punctate-foveolate, with imbricate microsculpture; median groove absent; anterior margin slightly emarginated, strongly thickened; base posteriorly "V" shaped. S*cutellum* subtriangular, minute, convex, denuded.

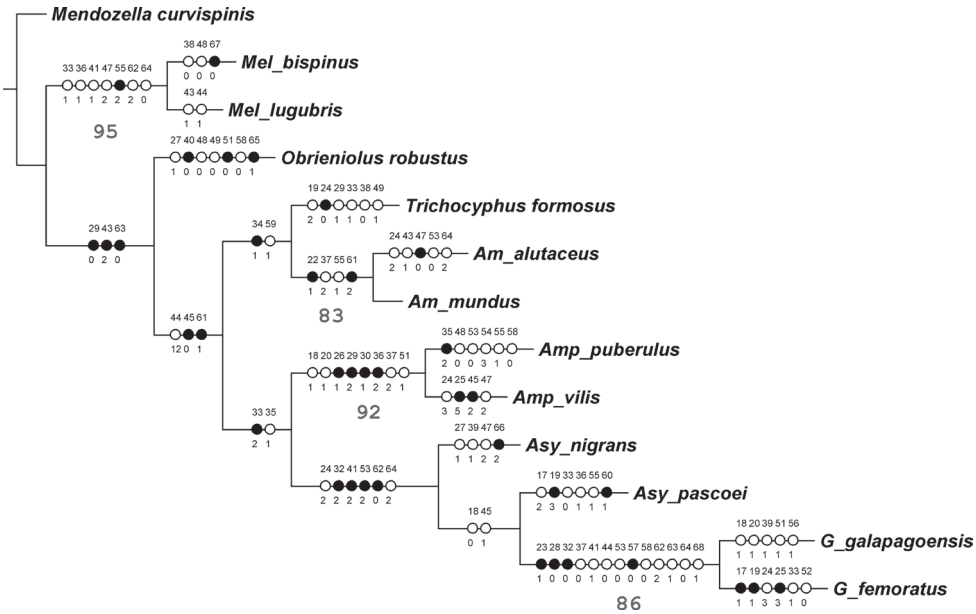


Figure 14. Most parsimonious tree, based on morphological characters, analyzed under equal weights (L 195.20, CI 0.58, RI 0.53). Bootstrap values over 50% below the corresponding branches. Discrete characters (17 to 68) mapped on the branches: open circles=homoplasies, black circles=synapomorphies. Numbers of characters and character states as in table 1.

Elytra (Figs 1–2) subcordate, short (LE/WE: 1.19–1.27), moderately convex, with imbricate microsculpture and finely transversally rugose in the posterior half; base slightly posteriorly curved; humeri subquadrate, slightly prominent; striae well defined, punctures very distant from each other, deep, medium sized in anterior third, smaller in median third and inconspicuous in posterior third; striae 9–10 closer on posterior two-thirds; intervals flat, 3–4× as wide as striae; apical declivity moderately abrupt; apex subacute. Metathoracic wings absent.

Legs. Black, naked of scales, with imbricate microsculpture. Front coxae slightly separate, 3x closer to anterior margin than to posterior margin of prosternum (almost reaching anterior margin); protibiae with row of 7–11 acute medium sized denticles and strongly acute mucro; meso and metatibiae without denticles and mucro; metatibial apex with broad outer bevel (placed in whole tibial apex), oblique regarding tibial axis, with small whitish iridescent scales; dorsal comb slightly shorter than apical comb or subequal.

Abdomen (Fig. 9) Intercoxal portion of ventrite 1 broader than cavities of hind coxae (1.6–1.7×); ventrite 2 longer than ventrites 3+4 (1.4×); apex of ventrite 5 blunt, slightly emarginated.

Female genitalia. Sternite VIII (Fig. 10) with plate subrhomboidal, elongate, having apical tuft of long setae and a pair of lateral sclerotized stripes reaching 2/3 of plate; apodeme 1.8–2× longer than plate. Ovipositor (Fig. 11) slender, very long, curved in

lateral view, 1.3–1.35× longer than ventrites 1–5; ventral baculi slender, subparallel; coxites slightly sclerotized; styli well developed, thin, directed backwards. Bursa copulatrix studded with dense and minute spines directed backwards, near the vagina. Spermathecal body (Fig. 12) subcylindrical, strongly sclerotized; nodulus truncate-conical, short; ramus indistinct; cornu of medium length. Spermathecal duct (Fig. 13) very long (~8mm, longer than abdomen) membranous and sinuous.

Morphometrics. Holotype, female: rostrum LR/WRa: 0.94, WRb/WRa: 1.4; antenna LB/LA: 2.93, A2/A1:1.17, club LC/WC: 2.42; pronotum WP/LP: 1.27; elytra LE/WE: 1.22; LE/LP: 2.55.

Male. Unknown.

Cladistic analysis: results and discussion

The parsimony analysis resulted in a single most parsimonious cladogram 195.20 steps long, with CI = 0.58 and RI = 0.53 (Fig. 14). *Melanocyphus* is the sister taxon of the remaining genera, that form a clade justified by eight synapomorphies, such as the narrow epistome (char. 29.0) and the elytral base straight to slightly curved backwards (char. 43.2). Within this clade, *Obrieniolus* is the sister taxon to the remaining Naupactini from the Andes and the Pacific coastal deserts of South America. The new genus is characterized by several apomorphies. Some of them are continuous characters related to the shape of elytra (char. 9), length of ventrite 2 regarding 3+4 (char. 11) and length of ovipositor (char. 13). Other apomorphies are the rostral sulcus exceeding posterior margin of eyes (char. 27.1), the scutellum indistinct (char. 40.0), the apical declivity of elytra moderately abrupt (char. 48.0), the elytral intervals markedly wider than striae (char. 49.0), the punctures of striae strongly separated from each other (char. 51.0), the plate of sternite VIII of female subrhomboidal, elongate (char. 58.0), and the presence of spines in the bursa copulatrix (char. 65.1).

The sister clade of *Obrieniolus* is divided into two groups, one including *Trichocyphus* and *Amitrus*, and the other, with *Amphideritus*, *Asymmathetes* and *Galapaganus*. The first group is characterized by the wide intercoxal area of ventrite 1 (char. 10), the very stout antennae (char. 34.1) and the row of setae along the ovipositor, on the external side of baculi (char. 59.1). The second group is mainly supported by the gular angle strongly obtuse (char. 33.2) and the antennal scape reaching to slightly exceeding hind margin of eyes (char. 35.1).

Each genus included in the tree was recovered as monophyletic with high nodal support (BP over 80%), except *Asymmathetes*, which is not monophyletic. On the contrary, the relationships among the Andean genera are weakly supported.

The new genus *Obrieniolus* is superficially similar to *Amitrus*, because both have a strongly sclerotized black integument, devoid of scales and are almost lacking setae, and have a distinct sculpture. However, the current cladistic analysis shows that the new genus is not closely related to *Amitrus* or to any other genus, justifying its treatment as a separate generic taxon. Characters such as the strongly sclerotized integu-

ment, dull coloured, sculpturate, and usually devoid of scales, as well as the reduction of elytral humeri and metathoracic wings, are common in several groups inhabiting the high Andes, under similar extreme environments.

The Andean Naupactini are distributed in different biogeographic provinces of the Paramo-Puna subregion: *Melanocyphus* inhabit the Colombian Paramos; *Obrieniolus* occur in the Northern Puna, in the boundaries of the Peruvian Coastal Desert; *Trichocyphus* and *Amitrus* also inhabit in the Puna, but they reach a southern and broader distribution range; *Amphideritus* have representatives in the Paramos of Venezuela and Colombia, and along the Pacific coastal deserts of Peru and Chile; *Asymmathetes* inhabit the Paramos of Ecuador; and the species of *Galapaganus* inhabit in the Peruvian Coastal Desert, the Galapagos islands and continental Ecuador.

Key to genera of Naupactini from South American Transition Zone

1 Antennae squamose ..... ***Mendozella***
– Antennae setose **2**
2 Cavities of front coxae separated ..... ***Asymmathetes***
– Cavities of front coxae confluent **3**
3 Elytral intervals strongly convex; base of pronotum bisinuate ... ***Melanocyphus***
– Elytral intervals moderately convex to flat; base of pronotum not bisinuate ... **4**
4 Mandibular cusp prominent; antennae long, with funicular articles 3–7 markedly longer than wide; front femora much wider than posterior femora; spermathecal body subglobose ..... ***Galapaganus***
– Mandibular cusp slightly prominent or reduced; antennae medium length to short, with funicular articles 3–7 slightly longer than wide to moniliform; front femora slightly wider than posterior femora to subequal; spermathecal body subcylindrical **5**
5 Antennae stout (maximum width of funicular articles about 1\3 high of eye); intercoxal area of ventrite 1 more than 2 times width of cavity of hind coxae ... **6**
– Antennae moderately stout to slender (maximum width of funicular articles less than ¼ high of eye); intercoxal area of ventrite 1 less than 2 times width of cavity of hind coxae **7**
6 Elytral setae long and erect on entire elytral surface; all pairs of tibiae with row of denticles on inner margin ..... ***Trichocyphus***
– Elytral setae present only on elytral apex; pro and mesotibia with row of denticles on inner margin, metatibia always lacking denticles ..... ***Amitrus***
7 Elytral setae dense; sides of rostrum strongly curved; epistome elevated and with a transversal callosity separating it from rostrum; pre-epistome reduced to absent; antennal scape curved; elytra suboval ..... ***Amphideritus***
– Elytral setae absent; sides of rostrum slightly curved; epistome depressed, without transversal callosity; pre-epistome well developed; antennal scape straight to slightly curved; elytra subcordate ..... ***Obrieniolus***

Table 1. List of characters, character states and codes

Continuous characters	
0.	Body length in mm, taken from apex of rostrum to apex of elytra (LB).
1.	Ratio between length of rostrum and width of rostrum at apex (LR/WRa).
2.	Ratio between width of rostrum at base and width at apex (WRb/WRa).
3.	Ratio between width of frons and high of eye (WF/He).
4.	Ratio between body length and length of antenna (LB/LA).
5.	Ratio between length of funicular article 2 and 1 (A2/A1).
6.	Ratio between length and width of antennal club (LC/WC).
7.	Ratio between maximum width and length of pronotum (WP/LP).
8.	Ratio between maximum length of elytra and maximum length of pronotum (LE/LP).
9.	Ratio between maximum length and width of elytra (LE/WE).
10.	Ratio between width of intercoxal area of ventrite 1 and width of cavity of hind coxa (Wzi/Wcm).
11.	Ratio between length of ventrite 2 and ventrites 3+4 (L2/L3+4).
12.	Ratio between length of apodeme and plate of sternite VIII (LAE/LPE).
13.	Ratio between length of ovipositor and length of ventrites 1-5 (LOv/Lv).
14.	Ratio between length of aedeagus and length of ventrites 1-5 (LAe/Lv).
15.	Ratio between length of aedeagal apodemes and length of median lobe (LAp/Lml).
Discrete characters	
External morphology	
16.	Scaly vestiture of antennae: present (0); absent (1).
17.	Scaly vestiture of pronotum: absent (0); scarce (1); abundant (2).
18.	Elytral vestiture: squamose (0); setose (1); scarce or absent (2).
19.	Scaly vestiture of elytra: absent (0); mostly absent, restricted to some areas (1); present in all surface, but not entirely covering the integument (2); present in all surface, completely covering the integument (3).
20.	Elytral vestiture of decumbent setae: absent (0); present, dense (1).
21.	Elytral setae: absent (0); short, suberect (1); long, erect (2).
22.	Setae of the elytral apex: absent (0); present, usually forming a tuft (1).
23.	Scutellum: squamose (0); setose (1); denuded (2).
24.	Rostrum and frons: smooth (0); punctuate or foveolate (1); foveolate-strigose (2); coarsely strigose (3); lacunose (4).
25.	Pronotum: smooth (0); punctuate or foveolate (1); strigose (2); tuberculate (3); coarsely lacunose (4); foveolate-granulose (5).
26.	Sides of rostrum: straight to slightly curved (0); strongly curved (1).
27.	Rostral sulcus: reaching frons (0); exceeding posterior margin of eyes (1).
28.	Rostral carinae: present, strong (0); present, slight (1); absent (2).
29.	Size of epistome: narrow (0); moderately wide (1); very wide (2).
30.	Epistome: depressed (0); elevated, with a posterior transversal callosity (1).
31.	Pre-epistome: absent or reduced (0); well developed (1).
32.	Support of mandibular cusp: prominent (0); slightly projected (1); reduced (2).
33.	Gular angle: about 90° (0); moderately obtuse (1); strongly obtuse (2).
34.	Antennae: slender to moderately stout (0); very stout (1).
35.	Length of antennal scape: short, not reaching hind margin of eyes (0); medium sized, reaching to slightly exceeding hind margin of eyes (1); long, largely exceeding hind margin of eyes (2).

36.	Antennal scape: straight (0); slightly curved (1); moderately curved (2).
37.	Funicular articles 3-7: distinctly longer than wide (0); slightly longer than wide (1); moniliform (2).
38.	Sides of pronotum: almost straight (0); slightly to moderately curved (1); strongly curved (2).
39.	Pronotal base: straight (0); "V" shaped (1); bisinuate (2).
40.	Scutellum: indistinct (0); small to medium sized (1).
41.	Maximum width of elytra: about middle (0); on posterior third (1); on anterior third (2).
42.	Elytral disc: strongly to moderately convex (0); slightly convex to flat (1).
43.	Elytral base: strongly to moderately bisinuate (0); slightly bisinuate (1); straight to slightly curved backwards (2) strongly curved backwards (3).
44.	Elytral humeri: strongly prominent (0); moderately prominent (1); slightly prominent (2).
45.	Humeri: rounded (0); subquadrate (1); oblique (2).
46.	Humeral teeth: absent (0); present, prominent (1).
47.	Elytral apex: rounded (0); subacute (1); acute (2).
48.	Apical declivity of elytra: strongly to moderately abrupt (0); slightly abrupt (1); soft (2).
49.	Elytral intervals: markedly wider than striae (more than 3x) (0); slightly wider than striae (1,5-2x) (1); about same width of striae or slightly slender (2).
50.	Elytral intervals: flat to slightly convex (0); moderately convex (1); strongly convex (2).
51.	Punctures of elytra: strongly separated from each other (0); close to each other (1); very close to each other (2).
52.	Metathoracic wings: present, well developed (0); absent (1).
53.	Front coxae: contiguous (0); slightly separate (1); distinctly separate from each other (2).
54.	Row of denticles on inner margin of tibiae: present on three pairs of tibiae (0); present on front and middle tibiae (1); present only on front tibiae (2); absent on three pairs of tibiae (3).
55.	Outer bevel of metatibial apex: broad, squamose (0); moderately broad, squamose (1); absent (2).
56.	Apical comb of hind tibiae longer than dorsal comb (0); about as long as dorsal comb (1); shorter than dorsal comb (2).
57.	Front femora: more robust than middle and posterior femora (0); subequal (1).
Female genitalia	
58.	Plate of sternite VIII of female: subrhomboidal, elongate (basal half longer than apical half) (0); subrhomboidal, not elongate (basal and apical half subequal) (1).
59.	Rows of setae along sides of baculi (ovipositor): absent (0); present (1).
60.	Coxites: slightly sclerotized (0); moderately to strongly sclerotized, not projecting (1); strongly sclerotized, tapering into a nail-like process and covering styli (2).
61.	Length of spermathecal duct: longer than ovipositor (=long) (0); as long as ½ ovipositor (=medium-sized) (1); shorter than 1/2 ovipositor (=short) (2).
62.	Spermathecal body: subcylindrical, long (0); subcylindrical, short (1); globose (2)
63.	Ramus of spermatheca: indistinct to slightly developed (0); well-developed (1).
64.	Cornu of spermatheca: short (0); medium length to long (1); very long (2).
65.	Spines on bursa copulatrix: absent (0); present (1).
Male genitalia	
66.	Angle between median lobe and its apodemes: almost flat (0); obtuse (1); about 90° (2).
67.	Apex of median lobe: acute (0); subacute (1); rounded, with a pointed projection at apex (2).
68.	Setae on apex of median lobe: absent (0); present (1).

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Appendix I

A data matrix including 13 terminal species of eight genera of Naupactini from the South American Transition Zone.

Note: The data matrix with the 13 species of Naupactini can be found on the ZooKeys website as a Microsoft Excel file (.xls), doi: 10.3897/zookeys.102.1240.app).

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Review of the subgenus *Polyphylla* (*Granida*) from continental Asia (Coleoptera, Scarabaeidae, Melolonthinae)

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Abstract

A review of *Polyphylla* Harris, 1841, species belonging to the subgenus *Granida* Motschulsky, 1861, from continental Asia is presented. One new species is described from Thailand: *Polyphylla* (*Granida*) *simoni* **sp. n.** *Polyphylla* (*G.*) *nikodymi* de Wailly, 1993, is recorded from Thailand for the first time. *Polyphylla* (*G.*) *minor* Nomura, 1977, is recorded from Yunnan (China) for the first time. The previously unknown female of *P.* (*G.*) *phongsali* Zídek, 2006, is described.

Keywords

new species, new locality records, Scarabaeidae, Melolonthinae, Melolonthini, *Polyphylla*, *Granida*, mainland Asia

Introduction

The subgenera *Granida* Motschulsky, 1861, and *Grananoxia* Brenske, 1890, of the genus *Polyphylla* Harris, 1841, form a pair of subgenera distinguished from other Eurasian subgenera by unequal tarsal claws in males. The basal tooth of the inner claw on

the protarsus is distinctly longer than that of the outer claw, whereas the meso- and metatarsal claws bear more robust basal teeth on the outer claws. As far as it is known, tarsal claws in females are equal. Members of the subgenus *Grananoxia* differ from *Granida* species by their nearly unicolor pale brown body and entire surface of vertex and pronotum covered with pale, long erect setae (Li and Yang 1997). Species of the subgenus *Granida* are characterized by the surface of vertex and pronotum having a rather complex scaly pattern (e.g., Zídek 2006).

In the literature, the pattern of elytral sculpture (four scaly longitudinal stripes on each elytron) has also been used as a suitable delimiting character of the subgenus *Granida* (e.g., de Wailly 1993). However, this character was rejected by Zídek (2006) and recently also by Kobayashi and Chou (2008) and Keith (2010). Zídek (2006) described *P.* (*G.*) *phongsali*, currently the only known *Polyphylla* (*Granida*) species with maculate elytral pattern, while the elytra of *P.* (*G.*) *parva* Kobayashi & Chou, 2008, bear scaly stripes being strongly reduced, with only sutural and lateral stripes visible. It should be noted, that some other characters generally used for the delimitation of Eurasian subgenera of the genus *Polyphylla* (e.g., number of teeth on the outer margin of protibia), were found to be extremely variable in Nearctic members of *Polyphylla*, even within particular species (Young 1988).

Eight species of the subgenus *Granida* are currently recognized. De Wailly (1993) and Bezděk (2006) listed six species, and two additional were described by Zídek (2006) and by Kobayashi and Chou (2008). Five of them are rather well known species distributed in Japan: *P.* (*G.*) *albolineata* (Motschulsky, 1861) and *P.* (*G.*) *schoenfeldti* Brenske, 1890, and Taiwan: *P.* (*G.*) *taiwana* (Sawada, 1950), *P.* (*G.*) *minor* Nomura, 1977, and *P.* (*G.*) *parva* Kobayashi & Chou, 2008. The remaining three continental Asian species are rare and known from a very limited number of specimens. The *P.* (*G.*) *jessopi* de Wailly, 1993, and *P.* (*G.*) *phongsali* Zídek, 2006, were described from single male specimens from China and Laos, respectively. *Polyphylla* (*G.*) *nikodymi* de Wailly, 1993, was known only from five type male specimens from Myanmar.

Recently, the authors had the opportunity to study several specimens of the subgenus *Granida* collected by Czech entomologists in China, Laos and Thailand. Examination of this material allowed us to describe one new species, to describe previously unknown female of *P.* (*G.*) *phongsali*, and to define the geographic distribution of *P.* (*G.*) *nikodymi* and *P.* (*G.*) *minor*.

Since the previously known continental Asian *Polyphylla* (*Granida*) species were described recently and their descriptions are rather detailed, the authors have decided to mention only the important diagnostic characters of these species.

Material and methods

The following abbreviations (after Arnett et al. 1993) identify the collections housing the material examined (curators names are in parentheses):

ABCC Czech Republic, České Budějovice, Aleš Bezděk collection;

BMNH United Kingdom, London, Natural History Museum (Malcolm Kerley, Maxwell Barclay);
DKCC France, Chartres, Denis Keith collection;
JZCP Czech Republic, Praha, Jiří Zídek collection;
MNCP Czech Republic, Praha, Milan Nikodým collection;
NMPC Czech Republic, Praha, National Museum (Natural History) (Jiří Hájek);
PFHC Czech Republic, Hradec Králové, Pavel Filip collection;
PPCB Czech Republic, Brno, Petr Pacholátko collection;
RSCV Czech Republic, Velenice, Richard Sehnal collection;

Specimens of the newly described species are provided with one red printed label: "*Polyphylla simoni*, HOLOTYPUS [PARATYPUS], [type specimen number], ♂, R. Sehnal & A. Bezděk det. 2009".

Exact label data are cited for type specimens. Authors' remarks are in brackets: [p] – printed; [h] – handwritten. Labels are separated by double slash "//".

Taxonomy

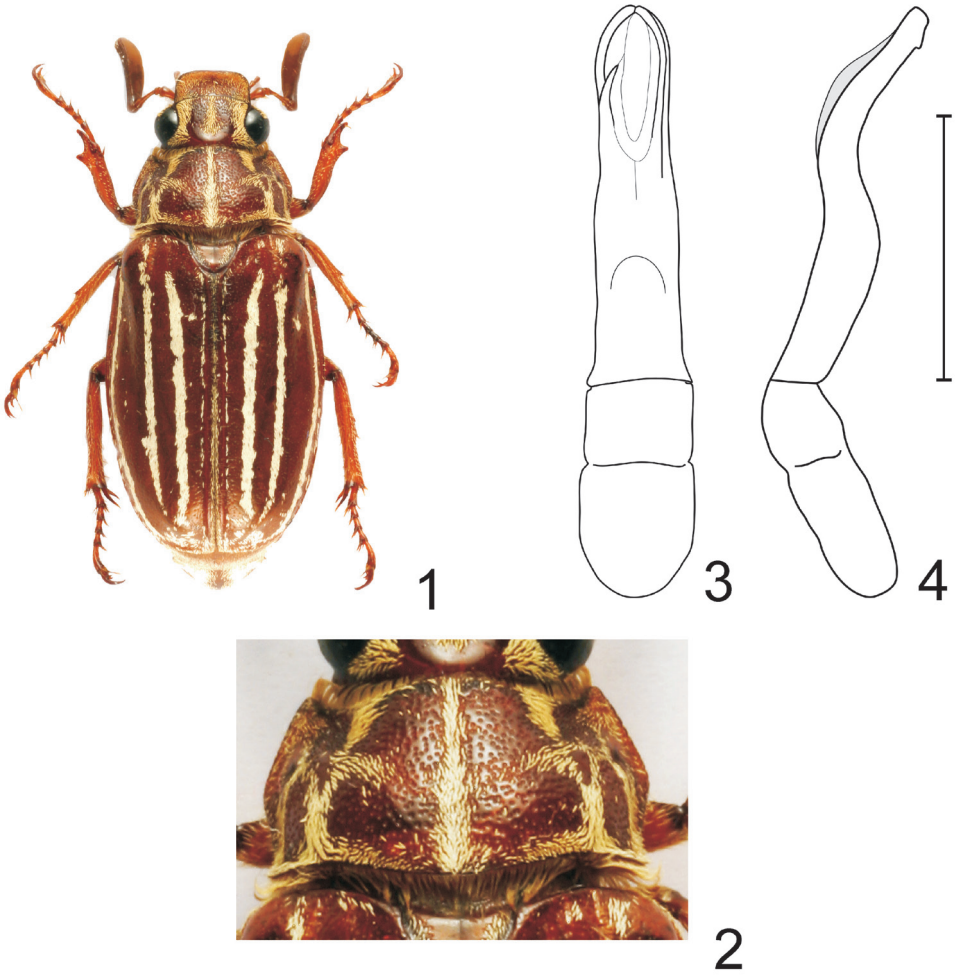
***Polyphylla (Granida) simoni* Sehnal & Bezděk, sp. n.**
urn:lsid:zoobank.org:act:5BB817CC-4399-4DED-BDE3-CFAF2DE8B6BC
http://species-id.net/wiki/Polyphylla_(Granida)_simoni
Figs 1–4

Type locality. "N Thailand, 100 km NE of Nan, Doi Phu Kha N.P.".

Type material examined. Holotype (male), labeled: "N Thailand, 100 km NE of Nan, Doi Phu Kha N.P., 20.-25.IV.2004, Filip Pavel lgt. [p]", in BMNH; paratypes Nos. 1–5 (all males), same data, PT Nos. 1–3 in RSCV, PT No. 4 in NMPC, PT No. 5 in PFHC.

Description of holotype. Male, body length 22.0 mm excluding pygidium. Body elongate, moderately convex. Surface color chestnut brown, pronotum very slightly darker (Fig. 1). Dorsal surface of head, pronotum and scutellum covered with whitish to pale ochrous scales, elytra with whitish scales. Head appendages, legs (except of femora) and ventral surface of abdomen covered with short, whitish to pale ochrous setae. Pro-, meso- and metasternum as well as femora with long pale ochrous hair-like setae.

Labrum deeply bilobed with several erect setae laterally. Clypeus transverse with anterior margin considerably upturned, anterior angles broadly rounded, sides very slightly convergent posteriad; surface with coarsely, dense, laterally somewhat confluent punctures; scales denser and erect along anterior and lateral margins, posteriorly less dense and recumbent. Frontoclypeal suture present, forming an uninterrupted narrow ridge. Frons coarsely, irregularly punctured. Pale ochrous scales on frons form three stripes, medial longitudinal stripe separated from lateral stripes by coarsely



Figures 1–4. *Polyphylla* (*G.*) *simoni* sp. n. **1** Habitus of holotype male (length 22.0 mm), dorsal view **2** Detail of pronotum, dorsal view **3** Male genitalia, dorsal view **4** The same, right lateral view, shaded area indicates overlapping part of left paramere. Scale bar: 5 mm for Figs 3–4.

punctured areas. Vertex impunctate and shiny. Canthus narrow, reaches to about half of eye width, with pale ochrous erect setae. Angle between lateral side of clypeus and canthus obtuse (in view from above). Antenna with ten antennomeres, club heptamerous, gently curved outwards, two times longer than shaft. Scapus dilated apically and covered with narrow brush of moderately long erect setae, pedicellus short and stout, about as long as wide, antennomere 3 slender, with three erect setae, as long as basal antennomeres combined. Terminal maxillary palpomere sparsely covered with short erect setae.

Pronotum transverse, convex, widest approximately at middle. Lateral margins bisinuate, anterior angles prominent with rounded apex, posterior angles obtusely an-

gulate with somewhat upturned apex. Anterior margin thinly bordered. Basal border interrupted medially. Surface of pronotum rugged, with complex scaly pattern (Fig. 2).

Scutellum parabolic, with disc slightly impressed and impunctate, lateral sides covered with scales, apex broadly rounded.

Elytra nearly parallel-sided in basal half, rounded apically, moderately convex. Surface coarsely irregularly punctuate, covered with whitish scales forming four longitudinal stripes on each elytron plus one short longitudinal row of few isolated patches arising on humeral umbone. Longitudinal stripes with poorly defined edges. Beetle macropterous, capable of flying.

Ventral surface of thorax densely covered with long, erect setae. Abdominal sternites with dense, short, recumbent setae, anterior margin impunctate. Pygidium triangulate, broadly rounded apically, densely covered with recumbent scales, nearly impunctate and with only few isolated setae along midline.

Pro- and mesofemora densely, irregularly punctuate, with long erect setae. Setae of metafemora somewhat sparser and shorter. Protibia bidentate, covered with sparse, short, setae, terminal spur inserted against basal tooth. Meso- and metatibia very slightly expanded apically, with transversal carina medially armed with 3–4 short thick bristles. Surface of meso- and metatibia covered with sparse, short, recumbent setae, mixed with long and erect setae on inner sides. Tarsal claws with distinct basal tooth ventrally, unequal in all legs. Protarsus with distinctly longer basal tooth of inner claw, whereas meso- and metatarsi with more robust basal teeth on outer claws.

Male genitalia. Parameres fused basally for more than half of length, nearly two times longer than phallobase (Fig. 3, arcuate in lateral view, with a small ventral tooth apically (Fig. 4).

Female unknown.

Variability. The paratypes slightly vary in body length (20.0–23.0 mm, excluding pygidium), otherwise they are very similar to the holotype.

Etymology. The species is named in honor of Šimon, son of the first author.

Collecting method. All specimens were collected at light.

Distribution. NE Thailand (Fig. 20).

Diagnosis. This species belongs to a group of *Granida* species with well-defined scaly stripes on the elytra. *Polyphylla* (*G.*) *albolineata*, *P.* (*G.*) *schoenfeldti* and *P.* (*G.*) *taiwana* are rather large (27–32 mm) and with unidentate protibia in males. *Polyphylla* (*G.*) *simoni* sp. n. is thus similar mainly to *P.* (*G.*) *nikodymi* from mainland Asia and *P.* (*G.*) *minor* from Taiwan and China. These species are easily separated by the shape of the male genitalia. Parameres bear a small tooth subapically in *P.* (*G.*) *simoni* sp. n. (see in the lateral view), while this small tooth is located much more basally in *P.* (*G.*) *nikodymi* and *P.* (*G.*) *minor* (compare Fig. 4 and Fig. 7). Moreover, the antennomere 3 is long and slender and more than three times longer than antennomere 2 in *P.* (*G.*) *simoni*, while it is rather stout and twice as long as antennomere 2 in *P.* (*G.*) *nikodymi* and *P.* (*G.*) *minor*.

***Polyphylla (Granida) minor* Nomura, 1977**
http://species-id.net/wiki/Polyphylla_(Granida)_minor
Figs 5–7

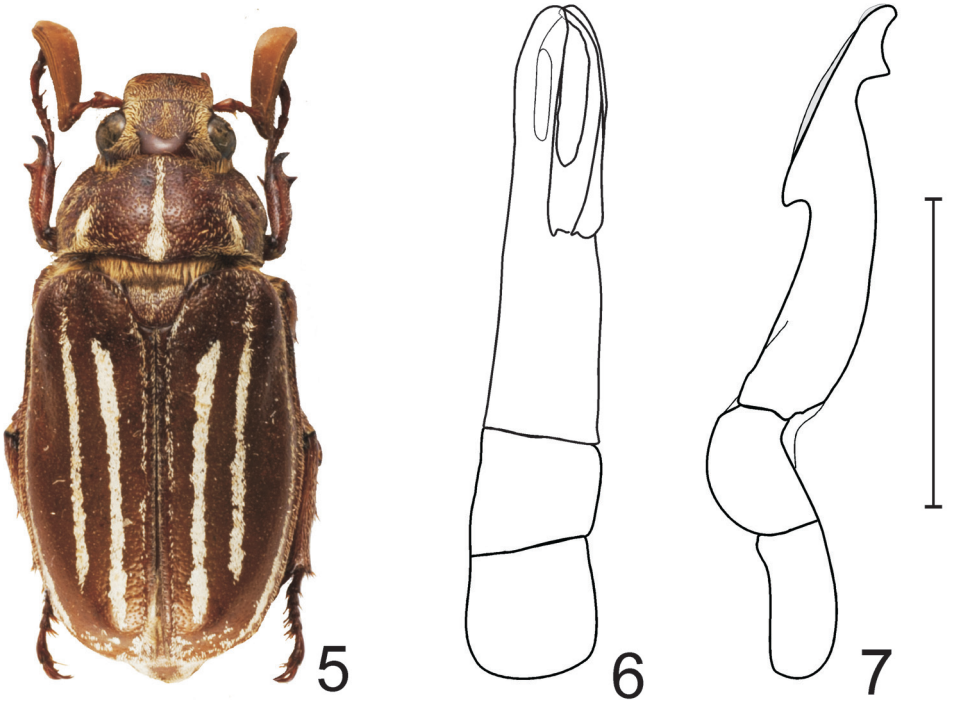
Polyphylla (*Granida*) *minor* Nomura, 1977: 104.

Type locality. "Wushe, Hotso, Taiwan".

Type material not examined.

Additional material examined. Formosa (Tchaj-wan), Nantou, Wushe, 1.6.-6.6.2002, Jar. Dalihod leg., 1 male in RSCV; Formosa (Tchaj-wan), Nantou, Wushe, 4.6.-6.6.2004, Jar. Dalihod leg., Jana Dalihodová Baštová leg., 2 males in RSCV; China, Yunnan prov., Kunming – Xishan, 19. 5. 1993, L. Bocák lgt., 1 male in PPCB.

Diagnosis. *Polyphylla* (*G.*) *minor* and *P.* (*G.*) *nikodymi* share similar shape of antennomere 3 (rather short, only twice as long as antennomere 2 and with distinct anterodistal tooth). These species are easily separated by the shape of the male genitalia Figs 6–7 and Figs 9–10) and by the scaly pattern on pygidium (the pygidium is impunctate and bare along midline in *P.* (*G.*) *minor*, while it is entirely covered with recumbent scales in *P.* (*G.*) *nikodymi*).



Figures 5–7. *Polyphylla* (*G.*) *minor* **5** Habitus of male (Yunnan, China, length 19.5 mm), dorsal view **6** Male genitalia, dorsal view **7** The same, right lateral view, shaded area indicates overlapping part of left paramere. Scale bar: 5 mm for Figs 6–7.

Distribution. Taiwan. Recorded from Yunnan province of China for the first time.

Remarks. The specimen from Yunnan slightly differs from those from Taiwan by the shape of whitish scales on pronotum and elytra that are slightly broader. No relevant differences were found in the shape of male genitalia. If these morphologic characters were constant in other specimens coming from the same area, it would be reasonable to assume a subspecific status of the population from Yunnan. However, the material available is insufficient to decide whether such differences fall within the intersubspecific variability.

Although we were not able to study type material of *P.* (*G.*) *minor*, all three males from Taiwan examined by us were collected from the type locality of this species.

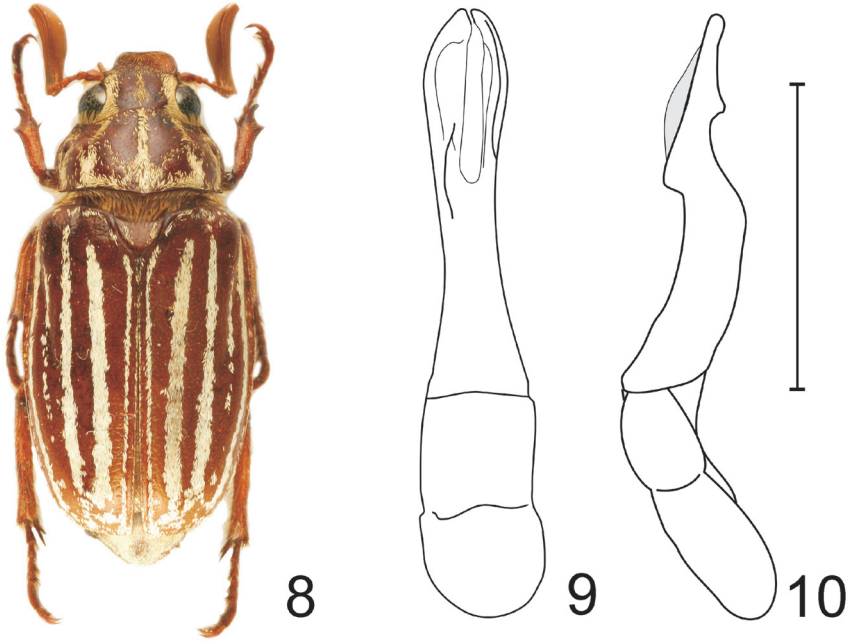
Polyphylla (Granida) nikodymi de Wailly, 1993

http://species-id.net/wiki/Polyphylla_(Granida)_nikodymi
Figs 8–10

Polyphylla (*Granida*) *nikodymi* de Wailly, 1993: 13.

Type locality. "Birmanie, Süd-Ost".

Type material examined. Paratype (male), labeled: "Birmanie, Süd-Ost, 10.V.1990 [h] // PARATYPUS [p, red label] // Polyphylla (Granida) nikodymi De Wailly 1994



Figures 8–10. *Polyphylla* (*G.*) *nikodymi* **8** Habitus of paratype male (length 22.5 mm), dorsal view **9** Male genitalia, dorsal view **10** The same, right lateral view, shaded area indicates overlapping part of left paramere. Scale bar: 5 mm for Figs 9–10.

[h, red label]", in NMPC; paratype (male), labeled: "Birmanie, Süd-Ost, 10.V.1990 [h] // PARATYPUS [p, red label]", in PPCB.

Additional material examined. THAILAND NE, Loei prov., Phu Rua N.P. 1100m, 17˚30'N, 101˚21'E, 6.-9.iv.1999, D. Hauck leg., 1 male in PPCB.

Diagnosis. For separation from related species, see diagnosis of *P.* (*G.*) *minor*. Male genitalia as in Figs 9–10.

Distribution. Southeast Myanmar, first record for Thailand.

Remarks. De Wailly (1993) wrote that antennomere 3 is long and slender. However, judging from the material available to us, the antennomere 3 is relatively short and rather stout (in comparison to other *Granida* members) with an anterodistal tooth, and only twice as long as antennomere 2.

Each specimen from the type series bears only a vague handwritten locality label "Birmanie, Süd-Ost". Thus, the specimen from NE Thailand is the first specimen with exact locality data and it is the first record of this species for Thailand.

Paratypes of *P.* (*G.*) *nikodymi* are deposited in PPCB and NMPC (see also Bezděk and Hájek 2010); none of them is housed in the collection of David Král (Prague, Czech Republic) as was erroneously stated by de Wailly (1993).

Polyphylla (Granida) jessopi de Wailly, 1993

http://species-id.net/wiki/Polyphylla_(Granida)_jessopi
Figs 11–15

Polyphylla (*Granida*) *jessopi* de Wailly, 1993: 12.

Type locality. "China, Foochow".

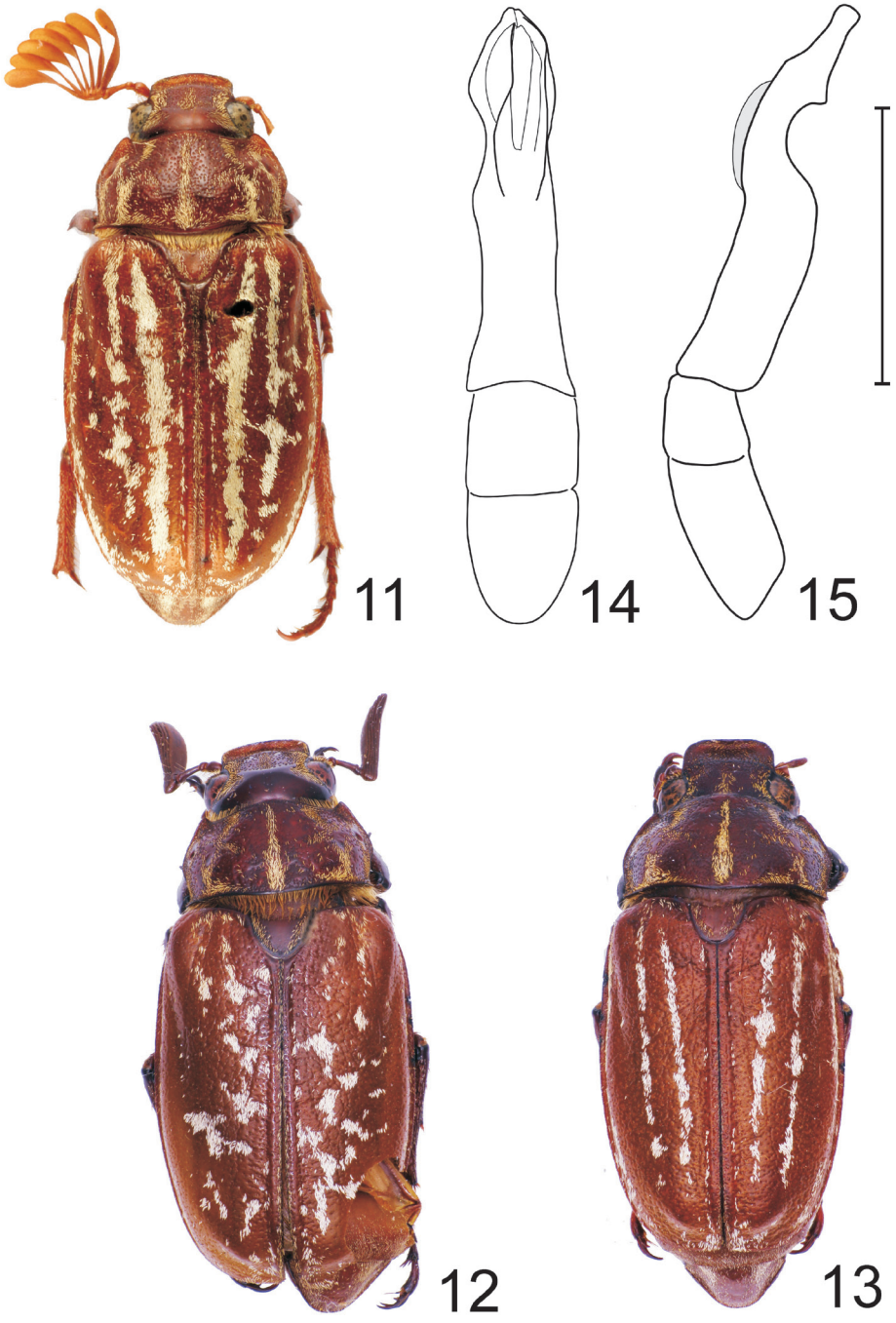
Type material examined. Holotype (male), labeled: "CHINA, Foochow [p], vi. 1936 [h], M. S. Yang [p, white label] // next to Polyphylla nov. sp. [h] Ph. de Wailly det [p] // Pres. by Com. Ins. Ent. B. M. 1948–152 [p] // TYPE [h, red label]", aedeagus is glued on label separately pinned: "CHINA, Foochow, KIENG, vi. 1936, M. S. Yang [h] // Brit. Mus. 1948–152 [h] // next to Polyphylla nov. sp. [h] Ph. de Wailly det [p]", in BMNH.

Additional material examined. CHINE Guangxi / Da Yao Shan / V. VI. 2008 / SINIAEV leg., 2 males and 1 female in DKCP.

Diagnosis. Scaly stripes on the elytra are partially fragmented (Figs 11, 13), rarely the elytra are completely maculate (Fig. 12). Antennomere 3 long and slender, three times longer than antennomere 2. Basal margin of pronotum convex medially. Male genitalia as in Figs 14–15.

Distribution. Fukien and Guangxi provinces of China.

Remarks. For a long time, *P.* (*G.*) *jessopi* was known from single male only. Recently, Keith (2010) reported three additional specimens collected in Guangxi (China) with variable elytral pattern. Except of two specimens with the same pattern as the holotype, one male has maculate elytra. Such distinct variability in elytral pattern is very unusual in Palaearctic members of the genus *Polyphylla*.



Figures 11–15. *Polyphylla* (*G.*) *jessopi* **11** Habitus of holotype male (length 19.0 mm), dorsal view **12** Habitus of male (Guangxi, China, length 20.0 mm), dorsal view **13** Habitus of female (Guangxi, China, length 18.0 mm), dorsal view **14** Male genitalia, dorsal view **15** The same, right lateral view, shaded area indicates overlapping part of left paramere. Scale bar: 5 mm for Figs 14–15.

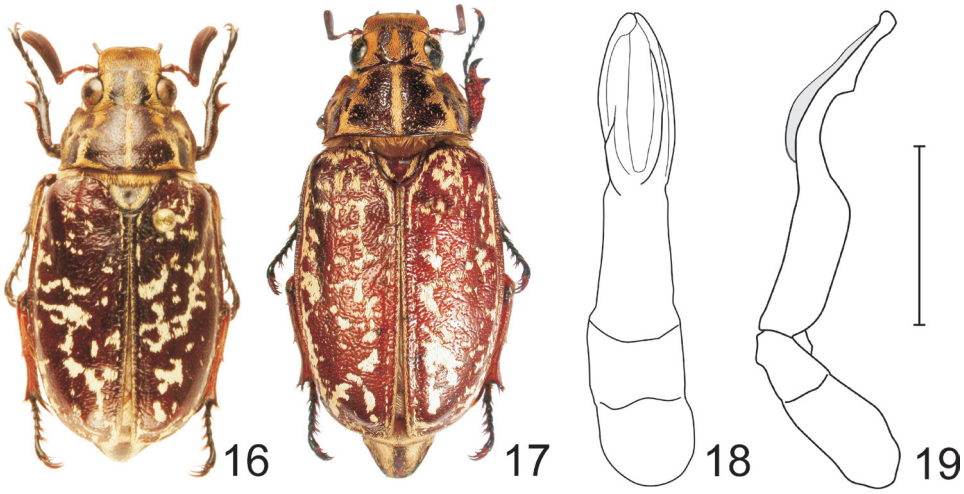
***Polyphylla (Granida) phongsali* Zídek, 2006**
http://species-id.net/wiki/Polyphylla_(Granida)_phongsali
Figs 16–19

Polyphylla phongsali Zídek, 2006: 10, pl. 3.

Type locality. "N. Laos, Phongsali, Gnoi-ou".

Type material examined. Holotype (male), labeled: "N. Laos, Phongsali, Gnoi--ou, Li Jingke VI-2003 [h] // BMNH (E) 2006–162 [h] // J. ZIDEK det. 2006 [p] Polyphylla phongsali Zídek [h] HOLOTYPE [p, red label]", in BMNH.

Additional material examined. LAO-NE, Hua Phan prov., ~20˚12'N, 104˚01'E, PHU PHAN Mt. 1500–1900m, 17.v.-31.vi. 2007, M. Brancucci leg., 1 male in ABCC; LAOS-NE, Houa Phan prov., 20˚13'09-19"N, 103˚59'54"-104˚00'03"E, 1480–1510m, PHOU PHANE Mt., 22.iv.-14.v.2008, Vít Kubáň leg., 1 male and 1 female in NMPC; LAOS-NE, Houa Phan prov., 20˚13'N 103˚59'E, Ban SALUEI village, 16.vi.2009, 1350 m, at light, Vít. Kubáň leg., 1 male in NMPC; LAOS-NE, Houa Phan prov., 20˚12-13.5'N 103˚59.5'-104˚01'E, Ban Saluei → Phou Pane Mt., 1340–1870 m, 1.v.-16.vi. 2009, Lao collectors leg., 1 male in NMPC; Laos, Houaphan prov., 38 km S of Sam Neua, Saluei 9.-22.5.2009, Martinů lgt. 1350–1900 m, 1 male in JZCP and 1 male in RSCV; Laos, Houaphan prov., 38 km S of Sam Neua, Saluei 9.-22.5.2009, Bednařík lgt. 1350–1900 m, 1 male in RSCV.



Figures 16–19. *Polyphylla* (*G.*) *phongsali* **16** Habitus of male (Hua Phan, Laos, length 22.5 mm), dorsal view **17** Habitus of female (Hua Phan, Laos, length 28.0 mm), dorsal view **18** Male genitalia, dorsal view **19** The same, right lateral view, shaded area indicates overlapping part of left paramere. Scale bar: 5 mm for Figs 18–19.

Diagnosis of female (Fig. 17). Similar to male (Fig. 16), with the following exceptions. The length of the only known female specimen is 28.0 mm (except of pygidium), while the length of males varies between 21.5–24.5 mm. Anterior margin of clypeus only very feebly upturned, nearly flat. Antennal club pentamerous. Outer margin of anterior tibia distinctly tridentate. Upper apical spur of metatibia broad, flattened, blunt apically. Tarsal claws of all pairs of legs equal in length.

Collecting methods. The female specimen was collected at light.

Diagnosis. An easily recognizable *P.* (*Granida*) species because of its maculate elytra. Antennomere 3 long and slender, more than three times longer than antennomere 2. Basal margin of pronotum is almost straight against the scutellum, while convex in other *Granida* species. It is most likely to be confused only with some *P.* (G.) *jessopi* specimens bearing the same maculate elytral pattern. *P.* (*G.*) *phongsali* in average larger than *P.* (*G.*) *jessopi* (the length of males varies between 21.5–24.5 mm versus 18.5–20.0 mm in *P.* (*G.*) *jessopi*). Male genitalia as in Figs 18–19.

Distribution. Northern Laos.

Remarks. The species was originally described from a single male. Here we recorded eight additional specimens from northern Laos (Fig. 20). The specimens with altitude data were collected between 1350–1900 m a.s.l.

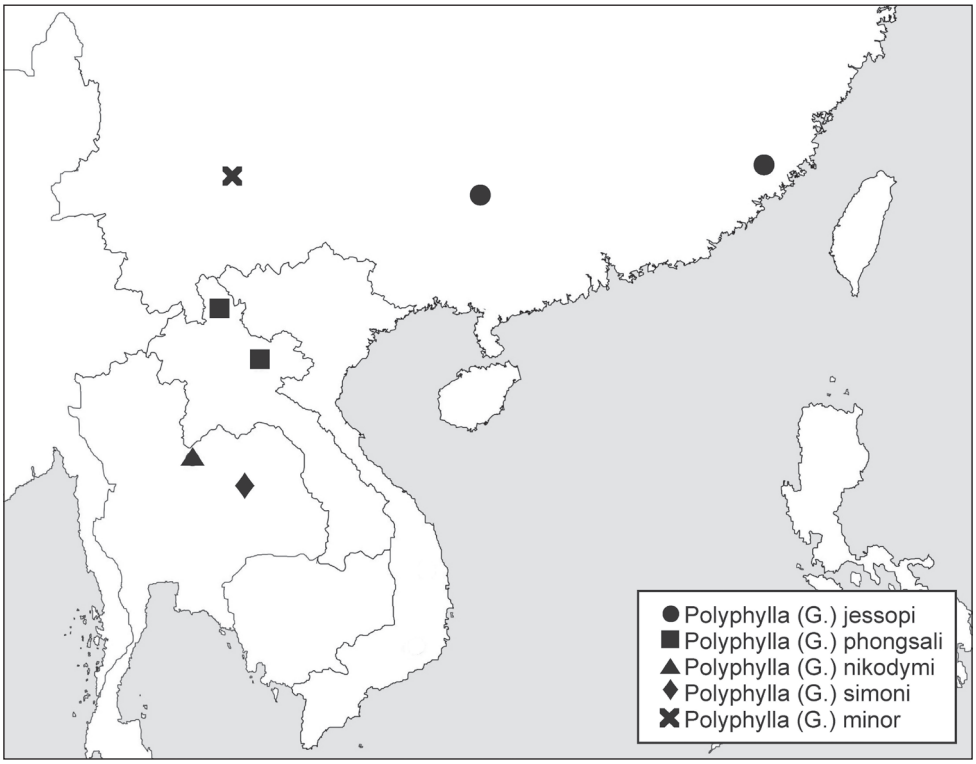


Figure 20. Distribution of *Polyphylla* (*Granida*) species in continental Asia. Because of imprecise locality data, distributional mark of *P.* (*G.*) *nikodymi* in Myanmar is omitted.

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Paracrias pluteus (Hymenoptera, Eulophidae) in Brazil: new distribution and host records, and with a new host group for *Paracrias*

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Abstract

Bruchines damage agricultural crops and trees, reducing the quantity and quality of the seeds. The aim of this study is to record, for the first time, *Paracrias pluteus* as a parasitoid on the immature stages of *Sennius spodiogaster* and *S. cupreatus* on seeds of *Melanoxylon brauna* in Teixeiras, Minas Gerais State, Brazil. *Paracrias pluteus* is a parasitoid without previous host records and known only from Costa Rica. Specimens obtained in this study add to knowledge of the biology of *Paracrias* species with a new host group (Chrysomelidae: Bruchinae), and the first host record and a new distribution for *P. pluteus*.

Keywords

Bruchinae, seeds, parasitoid, Hymenoptera, Eulophidae, *Paracrias pluteus*, new distribution, Brazil

Introduction

Bruchines (Coleoptera: Chrysomelidae: Bruchinae) are considered pests of seeds of native and cultivated legumes in Latin America, causing damage to several economically important agricultural species (Rojas-Rousse et al. 2007) such as *Glycine max* (Costa et

al. 2007), *Phaseolus coccineus*, *P. vulgaris*, *P. lunatus* (Hansson et al. 2004, Bonet 2008), *Vigna radiata* (Somta et al. 2008), *V. unguiculata* (Aebi et al. 2008), and tree species such as *Enterolobium contortisiliquum* (Morandini and De Viana 2009), *Melanoxylon brauna* (Santos et al. 1991), *Mimosa bimucronata* (Silva et al. 2007), *Sclerolobium* sp. (Santos et al. 1997) and *Senna multijuga* (Sari and Ribeiro-Costa 2005).

Infestations of bruchines result in a large reduction of the quantity and quality of seeds, making them unsuitable for human consumption and for agricultural use (Somta et al. 2008). Currently the most efficient method to control these infestations on a large scale is to fumigate the seeds with chemicals (Sing et al. 2008), but this method has economic, social and environmental implications (Somta et al. 2008). Therefore, control measures including plant resistance (Ignacimuthu et al. 2000, Schmale et al. 2003, Appleby et al. 2004), plant extracts with biocide activity (Raja et al. 2004, Koona et al. 2005), and natural enemies (Sanon et al. 1998, Gauthier et al. 1999, Schmale et al. 2006) such as parasitoids of the families Braconidae, Eulophidae, Pteromalidae (Schmale et al. 2001, 2002, Rojas-Rousse et al. 2007) and Trichogrammatidae (Pintureau et al. 1999) constitute more sustainable alternatives.

The aim of this study is to record, for the first time, the occurrence of *Paracrias pluteus* Hansson, 2002 (Hymenoptera: Eulophidae) as a parasitoid on immature stages of *Sennius* spp. (Coleoptera: Chrysomelidae: Bruchinae) on *Melanoxylon brauna* Schott in Teixeiras, Minas Gerais State, Brazil.

Materials and methods

Seeds of *Melanoxylon brauna* infested by bruchines were studied in the Laboratório de Sementes Florestais (LASF), Universidade Federal de Viçosa (UFV) in Viçosa (20°46'11"S, 42°52'31"W), Minas Gerais State, Brazil. Seeds were collected in Teixeiras, Minas Gerais State, in September 2009 and sent to LASF where they were stored in plastic bags in a room of the laboratory without temperature, humidity or photoperiod control. Insects that emerged from the seeds were collected and stored in 70% alcohol for subsequent identification. Two bruchine species were and identified as *Sennius spodiogaster* Kingsolver, 1987 and *S. cupreatus* Kingsolver, 1987 (Coleoptera: Chrysomelidae: Bruchinae). Apart from the bruchines, three females and nine males of a parasitoid species emerged. This parasitoid was subsequently identified as *Paracrias pluteus*.

Results and discussion

Paracrias pluteus is a parasitoid without previous host records and known only from Costa Rica (Hansson 2002). The knowledge of the biology of *Paracrias* is poor, the only known hosts are Curculionidae beetles that attack seeds (Schauff 1985) or buds (Woolley and Schauff 1987). The specimens obtained in this study add to this knowl-

edge with a new host group (Chrysomelidae: Bruchinae) for the genus, and the first host record for *P. pluteus*.

Paracrias species occur exclusively in the New World with the greatest diversity in the tropics (Hansson 2002). In 2001 eight species were known, but Gumovsky (2001) and Hansson (2002) increased this number to 65. Hansson (2009) released an interactive identification key for *Paracrias* species online (http://www.neotropicaleulophidae.com/Index.html), but species described by Gumovsky were not included because their descriptions did not include most of the characters used in the key.

Even though the number of described species of *Paracrias* is relatively high, *P. pluteus* is only the fifth species of the genus known to occur in Brazil. *Paracrias* was described by Ashmead (1904) from specimens collected in Brazil, with the singular included species *Paracrias laticeps* Ashmead. The other species that occur in Brazil are *P. panamensis* Gumovsky (Gumovsky 2001), *P. beus* Schauff (De Santis and Fidalgo 1994) and *P. petilicornis* Hansson (Hansson 2002).

Paracrias pluteus belongs to the *ordinatus* species-group, which is characterized by the forewing which has a narrow membrane along the fore margin of marginal vein, post-marginal vein absent, a very large speculum, and wing membrane distal to speculum sparsely setose (Hansson 2002). Within this group, *P. pluteus* is distinguished mainly by having a strong, transverse and flat carina on procoxae and with prepectus fully reticulated (Figs 1 and 2). Males are distinguished from females by having all flagellomeres distinctly separated, a longer petiole and by being more colorful (Figs 1 and 2).

Figure 1. Lateral view of *Paracrias pluteus* adult female. Lateral view of *Paracrias pluteus* Hansson, 2002 (Hymenoptera: Eulophidae) adult female with detail to prepectus entirely reticulated and its less bright body color. Teixeiras, Minas Gerais State, Brazil.

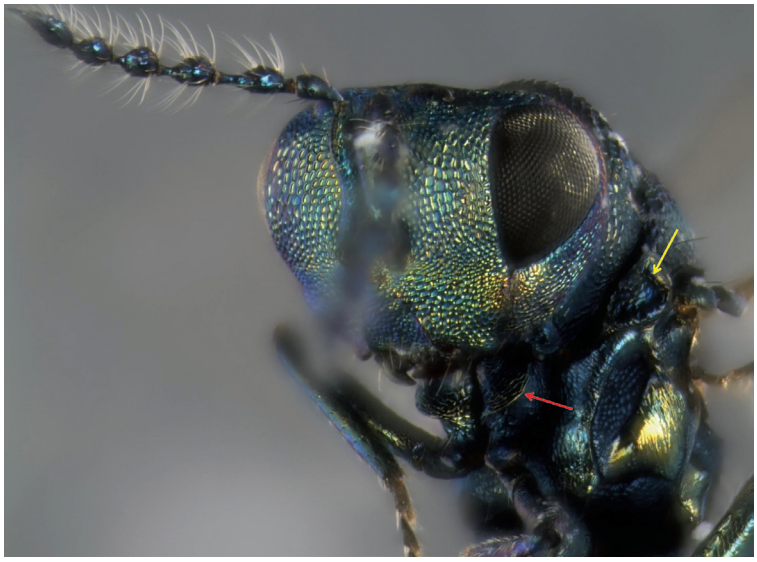

Figure 2. Frontal view of *Paracrias pluteus* adult male head. Frontal view of *Paracrias pluteus* Hansson, 2002 (Hymenoptera: Eulophidae) adult male head with detail to prepectus entirely reticulated (yellow arrow), procoxae carina (red arrow), its antennae and its bright body color. Teixeiras, Minas Gerais State, Brazil.

Melanoxylon brauna is a plant of high economic value, and *S. spodiogaster* and *S. cupreatus* may destroy as much as 50% of its seeds (Santos et al. 1991). Studies on the biology of *P. pluteus* may provide important information for its use in programs of biological control of these bruchines.

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