

Review of the genus *Stephanospathius* Belokobylskij, 1992 (Hymenoptera, Braconidae), with discussion of their tribal position

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Abstract

A review of the Afrotropical genus *Stephanospathius* Belokobylskij is provided. A new species *Stephanospathius benoiti* **sp. n.** from the Republic of Congo, and the male and, for the first time, the female of *S. ornatipes* (Kieffer) are described. A discussion of the status and composition of the tribe Stephaniscini is given and a new name for this tribe, Leptospathiini, **nom. n.**, is proposed. A key to the included genera and a key to species of *Stephanospathius* are provided.

Keywords

Braconidae, Stephaniscini, Leptospathiini, new species, new name, redescription, key to genera and species

Introduction

The fauna of the braconid subfamily Doryctinae of the Afrotropical region had been studied for more than two centuries, but our knowledge of this group, even at generic level, was fragmentary and incomplete until recently (Belokobylskij and Quicke

1999, Belokobylskij 2005). At present, 37 doryctine genera in ten tribes are recorded in this zoogeographic region (Shenefelt and Marsh 1976, Belokobylskij 1992, 2005, Yu et al. 2005, etc.), including 17 endemic genera (*Leptorhaconotus* Granger, 1949, *Pseudodoryctes* Szépligeti, 1915, *Schlettereriella* Szépligeti, 1904, *Stephanospathius* Belokobylskij, 1992, *Ivondrovia* Shenefelt & Marsh, 1976, *Bathycentor* Saussure, 1892, *Cryptodoryctes* Belokobylskij & Quicke, 2000, *Bulbonervus* Shenefelt, 1969, *Paradoryctes* Granger, 1949, *Doryctoproctus* Belokobylskij, 2005, *Grangerdoryctes* Belokobylskij, 2005, *Odontodoryctes* Granger, 1949, *Priosphys* Enderlein, 1920, *Terate* Nixon, 1943, *Spathioplites* Fischer, 1962, *Toka* Nixon, 1943, *Afrospathius* Belokobylskij & Quicke, 2000, and *Hemiospathius* Belokobylskij & Quicke, 2000). Only a single large revision of this group (as well as all Braconidae) has been provided for the fauna of Madagascar (Granger 1949), but numerous additional new taxa from this island await description.

The peculiar Afrotropical genus *Stephanospathius* Belokobylskij was described for the type species *Stenophasmus ornatipes* Kieffer from Cameroon (Belokobylskij 1992), and only a single male of this rare taxon was known until now. Additional morphological information about this genus was published as result of a study of internal sculpture and valvilli of ovipositor by Rahman et al. (1998). Only a single host is known for the members of this tribe, viz. *Schlettereriella gardneri* (Nixon) which was reared from *Oemida gahani* Distant (Cerambycidae) (Nixon 1954). Given the host range of related taxa, as well as the known host of *Schlettereriella*, it is possible to suggest that *Stephanospathius* species parasitize larvae of the family Cerambycidae and analogous xylophagous beetle groups inhabiting similar ecological conditions. A new Afrotropical species of *Stephanospathius*, as well as first recorded female of the type species of this genus, *S. ornatipes* (Kieffer), are described below and keys to species of *Stephanospathius* and genera of the tribe Leptospathiini nom. n. (Stephaniscini nom. nudum: Wharton and Achterberg 2000, Yu et al. 2005) are provided.

Material and methods

The terminology of morphological features, measurements and sculpturing follows Belokobylskij and Tobias (1998), the nomenclature for the wing venation follows Belokobylskij and Tobias (1998) and Belokobylskij and Maeto (2009). The following abbreviations are used: POL – postocellar line; OOL – ocular-ocellar line; Od – maximum diameter of lateral ocellus; SDEI – Senckenberg Deutsche Entomologische Institut (Müncheberg, Germany); MRAC – Musée royal de l’Afrique centrale (Tervuren, Belgium); ZISP – Zoological Institute, Russian Academy of Sciences (St. Petersburg, Russia).

Systematic part

Tribe Leptospathiini nom. n.

Stephaniscini Enderlein, 1912: 1 (type genus *Stephaniscus* Kieffer, 1904, junior homonym of *Stephaniscus* Haeckel, 1884), invalid name (Yu et al. 2005); Shenefelt and Marsh 1976: 1372, Fischer 1981a: 44, 1981b: 122, Belokobylskij 1992: 918.

Type genus. *Leptospathius* Szepligeti, 1902.

Description. Head subcubical in dorsal view, weakly transverse. Occipital carina mainly present. Malar suture absent or sometimes very shallow. Maxillary palpi very long or (in apterous form) short. Scape of antenna wide and short, without apical lobe or basal constriction. First segment of antennal flagellum usually shorter than second segment, sometimes almost equal to it, rarely longer than second one. Mesosoma elongate, sometimes weakly depressed, but strongly transformed in apterous or micropterous forms. Notauli present, usually shallow posteriorly. Prepectal carina present; postpectal carina absent. Sternaulus (precoxal suture) present or absent. Propodeum usually without delineated areas, with distinct propodeal bridge (heavy sclerites between coxal and metasomal foramens). Fore wing. Radial cell not shortened. Both radiomedial veins present. Position of recurrent vein variable. Discoidal cell anteriorly usually shortly petiolate. Parallel vein not interstitial. Brachial cell closed in distal posterior margin by brachial vein. Transverse anal veins absent. Hind wing with 4 hamuli. Medial cell large, distinctly widened towards apex. Radial cell widened apically, sometimes with transverse medial vein. Submedial cell usually short, but sometimes long. Hind wing of male without stigma-like enlargement. Sometimes wings absent or scale-shaped. Fore tarsus often long or very long. Hind coxa long, often (but not always) without basal tooth. All femora rather slender and elongate. First metasomal tergum long and narrow, much longer than its apical width, dorsope absent or very small, acrosternum distinctly or strongly elongated. Second tergum with basal subtriangular area more or less distinctly delineated by furrows, but sometimes with divergent long lateral furrows; apterous and micropterous forms without furrows. Laterotergites maximum separated in second and basal half of third tergites. In fully-winged taxa, terga behind second one entirely covered by very dense, rather short and pale setae. Ovipositor sheath long, longer than metasoma.

Distribution. Afrotropical, Oriental, Australasian and Neotropical Regions.

Contents. Tribe includes five genera: *Austrospathius* Belokobylskij, Iqbal & Austin, 2004; *Leptospathius* Szepligeti, 1902; *Oroceguera* Seltmann & Sharkey, 2007; *Schlettereriella* Szepligeti, 1904; *Stephanospathius* Belokobylskij, 1992.

Diagnosis. Leptospathiini is related to the tribe Spathiini characterised by elongate acrosternum of the first metasomal tergum. The main and unique apomorphic character of Leptospathiini is the presence of distinct and usually wide propodeal bridge (heavy sclerites between coxal and metasomal foramens); the feature is unknown in other doryctine groups (including similar subtribe Trigonophasmina of the tribe Spathiini:

Belokobylskij 1992). Additional but not comprehensive diagnostic features of this tribe separating it from the tribe Spathiini are: the second tergum often with furrows, the parallel vein of fore wing always not interstitial and arising from the posterior one-third of the distal margin of brachial cell, and the propodeum usually without delineated areas.

Key to genera of the tribe Leptospathiini

- 1 Apterous or micropterous forms. Ocelli absent. Second tergum without any furrows **2**
- Fully-winged forms. Ocelli present. Second tergum with two more or less distinct furrows..... **3**
- 2 Propodeal tubercles distinct. First flagellar segment distinctly longer than second segment. Propodeal bridge narrow. Acrosternum of first tergum long, 0.7 times as long as tergum. Vertex and frons coarsely and densely rugose-reticulate. Australasian Region
..... ***Austrospathius* Belokobylskij, Iqbal & Austin**
- Propodeal tubercles absent. First flagellar segment subequal or slightly shorter than second segment. Propodeal bridge wide. Acrosternum of first tergum short, 0.4 times as long as tergum. Vertex and frons smooth. Neotropical Region (Costa Rica)..... ***Oroceguera* Seltmann & Sharkey**
- 3 First flagellar segment of antennae almost equal to or weakly shorter than second segment. Fore femur on inner side with numerous coarse regular oblique carinae. Hind coxa of female with distinct basoventral tooth; hind coxa of male without tooth. Sternaulus absent. Acrosternum of first tergum long, about 0.8 times as long as tergum. Recurrent vein postfurcal or interstitial. Pronope and high pronotal carinae always present. Afrotropical Region.....
..... ***Stephanospathius* Belokobylskij**
- First flagellar segment of antennae distinctly shorter than second segment. Fore femur on inner side without carinae. Hind coxa of female and male without tooth. Sternaulus present. Acrosternum of first tergum short, less than 0.5 times as long as tergum. Recurrent vein antefurcal. Pronope and pronotal carinae usually absent **4**
- 4 Frons with large lateral protuberances. Base of ocellar triangle less than its lateral sides. Lateral furrows of second metasomal tergum divergent posteriorly and touched second suture. Submedial cell of hind wing small; first abscissa of mediocubital vein 0.2–0.3 times as long as second abscissa. Radial cell of hind wing without transverse vein. Afrotropical Region
..... ***Schlettereriella* Szepligeti**
- Frons without lateral protuberances. Base of ocellar triangle not less than its lateral sides. Lateral furrows of second metasomal tergum strongly convergent posteriorly and restricted basal subtriangular area, far spaced of second suture. Submedial cell of hind wing large; first abscissa of mediocubital vein subequal to second abscissa. Radial cell of hind wing with more or less distinct transverse vein. Oriental and Australasian Regions ***Leptospathius* Szepligeti**

***Stephanospathius* Belokobylskij, 1992**

<http://species-id.net/wiki/Stephanospathius>

Belokobylskij 1992: 919, Rahman et al. 1998: 334, Yu et al. 2005.

Type species. *Stenophasmus ornatipes* Kieffer, 1911.

Diagnosis. This genus resembles *Schlettereriella* Szepliget. Besides the characters, given in the key, *Stephanospathius* also differs in having the fore trochantellus dorsally with distinct transverse carina transformed to pointed flange on its inner part, the vertex and most of mesoscutum smooth, hypopygium with distinct insertion on posterior margin, and the second suture weakly curved and fine.

Description. Head usually not depressed. Antennal sockets large (Fig. 2). Frons weakly concave, without median keel or furrow, laterally along eyes with distinct subparallel carinae fused anteriorly with margin of antennal socket. Ocelli arranged in obtuse anteriorly triangle (Fig. 2). Eyes glabrous, with weak emargination opposite antennal sockets. Occipital carina not joined below with hypostomal carina at short distance but situated very far from base of mandible. Malar suture very shallow or almost indistinct. Clypeus distinctly convex, with distinct lower flange; clypeal suture complete. Hypoclypeal depression rather large and round. Postgenal bridge rather wide. Maxillary palpi 6-segmented, labial palpi rather short and 4-segmented. Third segment of labial palpi not shortened, rather long. Antenna slender, long, almost filiform. Pedicel basally with rather distinct carina on dorsal side. First flagellar segment subcylindrical, weakly curved, almost as long as second segment.

Mesosoma more or less distinctly depressed (Figs 1, 14). Promesosoma long, wide and laterally convex in basal 0.7 and narrow in apical 0.3. Pronotal carina absent laterally, dorsally in anterior 0.3 transformed in thick flange, curved up and divided medially by rather distinct excavation (Fig. 2); before this flange developed more or less wide and deep pronope. Sides of pronotum without delineated median groove. Posterior propleural lobe long and wide. Mesonotum weakly or very weakly and gently-roundly elevated above pronotum (Figs 1, 14). Median lobe of mesonotum without median furrow and anterolateral shoulders. Notauli shallow, complete, rather wide, fused in almost middle of mesoscutum (Figs 2, 15). Prescutellar depression rather long, deep or shallow, with median carina; high lateral longitudinal wing-like flanges developed on the level of depression. Scuto-scutellar suture distinct. Scutellum almost flat, with fine lateral carinae. Metanotum with short, narrow and rounded median tooth. Subalar depression shallow and wide. Mesopleural pit deep, short and narrow. Sternaulus (precoxal suture) absent (Figs 1, 14). Prepectal carina shortly following on lateral sides of mesopleuron. Metapleural flange rather long, wide basally and narrowed towards apex, rounded apically. Propodeum without (Fig. 2) or with delineated areas, in first case with complete median and two lateral carinae; lateral tubercles absent. Propodeal spiracles rather small and round. Metapleural suture distinct. Metasternum medioventrally with distinct narrow and closely situated pair of tubercles.

Wings (Figs 12, 21). Pterostigma of fore wing narrow and long. Radial vein arising distinctly before middle of pterostigma. Recurrent vein weakly postfurcal. Nervulus almost interstitial or weakly postfurcal. Discoidal cell long and shortly petiolate anteriorly. Anterior abscissa of basal vein thickened. Basal and recurrent veins subparallel. Parallel vein arising from basal 0.15–0.2 of apical side of brachial cell. First abscissa of costal vein of hind wing about 0.5 times as long as second abscissa. Radial vein arising from costal vein closely to basal vein. Radial cell without additional transverse vein. Medial cell 10.0–11.0 times longer than width, 0.55–0.6 times as long as hind wing. Nervellus present. Submedial cell small. First abscissa of mediocubital vein 0.2–0.27 times as long as second abscissa. Recurrent vein short, weakly antefurcal, weakly oblique toward base of wing.

Legs. Fore coxa distinctly enlarged. Fore femur (Figs 9, 17) clavate, dorsally with keel in subapical 0.4, along inner margin in upper half with coarse and semi-circular numerous coarse carinae. Fore trochantellus dorsally with distinct transverse carina transformed in pointed flange on its inner part. Fore tibia with numerous and rather short thick spines arranged in almost single row (Figs 9, 17). Fore tarsus very long, more than 3.0 times longer than fore tibia, about 1.5 times longer than mesosoma. Middle tibia without spines. Middle trochantellus in outer apical part with distinct pointed tooth (Figs 10, 17). Hind coxa long and narrow, with distinct baso-ventral tooth in female (Figs 11, 14, 16) and without it in male (Fig. 10). Hind femur clavate (Fig. 16). Hind tibia with at least two spines on apical outer margin near spur, with patch of dense setae on inner apical part. Hind tibial spurs rather short, slender, setose, inner spur 0.17–0.25 times as long as hind basitarsus. Basitarsus of hind tarsus dorsally weakly concave, ventrally with narrow keel, 0.8–0.85 times as long as second-fifth segments combined. Claws short, with very wide and obtuse basal lobe.

Metasoma. First tergum long or very long, more or less narrow, petiolate (Figs 4–5, 18). Acrosternum 0.75–0.8 times as long as first tergum (Figs 3, 16). Basolateral lobes of first tergum absent; spiracles situated in basal 0.4–0.45 of tergum on large spiracular tubercles. Second tergum with short basal and almost triangular area separated shallow and distinctly convergent furrows, absent or almost absent posteriorly (Figs 6, 19). Second suture straight, shallow, sometimes partly almost indistinct. Second and third (at least basally) terga with separate lateroterga (Fig. 16). Hypopygium of female rather large, pointed apically, upper subapically with pointed and rather narrow additional lobes (Fig. 20). Ovipositor with two obtuse and small dorsal nodes apically, densely serrate ventro-apically. Ovipositor sheath almost as long as body, with contrasting pale band in subapical 0.2–0.3.

Distribution. Afrotropical Region

Key to species of the genus *Stephanospathius*

- 1 Petiole narrow, its length 9.0–13.0 times maximum width, 1.1–1.25 times length of mesosoma (Figs 4, 5). Median length of second tergum 3.0–4.5 times its basal width. Mesoscutum of female medioposteriorly densely rugulose. Body length 10.6–16.2 mm. – Cameroon, Republic of Congo *Stephanospathius ornatipes* (Kieffer)

- Petiole wide, its length 4.3 times maximum width, 0.7 times length of mesosoma (Fig. 18). Median length of second tergum 1.6 times its basal width (Fig. 19). Mesoscutum of female medioposteriorly finely punctate and with distinct median carina. Body length 13.9 mm. – Republic of Congo.....
 *Stephanospathius benoiti* sp. n.

***Stephanospathius ornatipes* (Kieffer, 1911)**

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

Figs 1–12

Stenophasmus ornatipes Kieffer, 1911: 119.

Stephanospathius ornatipes: Belokobylskij 1992: 919, Yu et al. 2005.

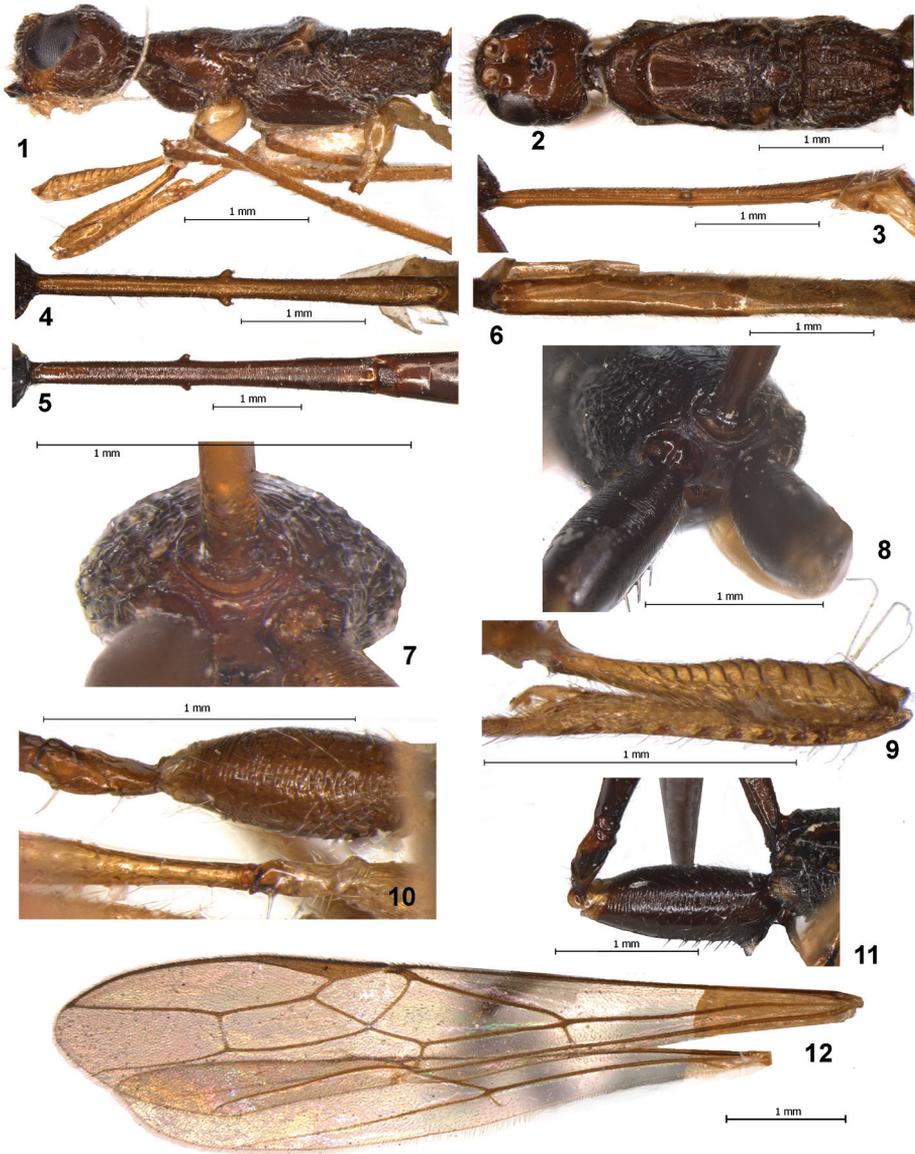
Examined material. Male (holotype), “Kamerun, Conradt”, “Syntypus” (red), “*Stenophasmus ornatipes* n. sp.” (handwriting by Kieffer), “Kieffer det.” (handwriting), “Holotypus *Stenophasmus ornatipes* Kieffer” (red), “*Stephanospathius ornatipes* (Kieffer), det. Belokobylskij, 1992” (SDEI); 1 female, Republic of Congo, “Musée du Conco, Mayumbe: Dinai, 19 – X – 1924, A. Collart” (MRAC); 1 female, Republic of Congo, “Musée du Conco, Mayumbe: Buhurumbe (?), 10 – X – 1924, A. Collart” (ZISP); 1 female (without head and most part of legs), Republic of Congo, “Musée du Conco, Eala, VII – 1936, J. Ghesquiere” (MRAC).

Description. Female. Body length 10.6–16.2 mm; fore wing length 7.4–10.8 mm.

Head width 1.1–1.2 times its median length, 1.0–1.1 times its total length, 1.15–1.2 times its maximum height, 1.2–1.3 times maximum width of mesoscutum. Head behind eyes (dorsal view) weakly convex anteriorly and distinctly roundly narrowed posteriorly or entirely roundly narrowed. Transverse diameter of eye 1.4–1.5 times longer than temple. Ocelli medium-sized, in triangle with base 1.3–1.4 times its sides, situated before middle of head. POL 1.5 times Od, 0.6–0.7 times OOL. Occiput with dense and white setae (dorsal view). Eye 1.25–1.3 times as high as broad. Malar space height 0.2–0.25 times height of eye, 0.5–0.7 times basal width of mandible. Face width 0.8–0.85 times height of eye and 1.0–1.1 times height of face and clypeus combined. Clypeus distinctly convex. Width of hypoclypeal depression 1.1–1.3 times distance from edge of depression to eye, 0.45–0.5 times width of face. Hypostomal flange very narrow.

Antennae slender, weakly setiform, more than 54-segmented (apical segments missing). Scape short and wide, apically curvedly cutting along outer side, 1.5–1.6 times longer than maximum width. First flagellar segment almost round in dissection, distinctly curved basally, 5.0–5.5 times longer than its apical width, 0.9–0.95 times as long as second segment. Most flagellar segments with fine median constriction. Sub-apical segments 3.3 times longer than their width.

Mesosoma 2.7–3.2 times longer than its height, 2.6 times longer than its maximum width. Median lobe of mesoscutum distinctly protruding forward and convex anteriorly. Mesoscutum 1.3–1.4 times longer than its maximum width. Notauli finely and



Figures 1–12. *Stephanospathius ornatipes* (Kieffer) (1–4, 6, 7, 9, 10, 12 – male; 5, 8, 11 – female) **1** head and mesosoma, lateral view **2** head and mesosoma, dorsal view **3** first tergite, lateral view **4, 5** first tergite, dorsal view **6** second-fifth tergites, dorsal view **7, 8** propodeum and propodeal bridge, posterior view **9** fore femur and tibia, inner view **10** hind coxa, trochanters and trochantellus and basal part of middle leg **11** hind coxa, trochanters and trochantellus **12** fore and hind wings.

widely striate. Prescutellar depression shallow, rather narrow medially and wider laterally, with distinct median carina, almost smooth on rest part or sometimes with short sparse rugae, medially 0.2 times as long as scutellum. Scutellum flat, 1.1 times longer

than maximum width. Subalar depression almost entirely finely rugulose-reticulate, with distinct and short striae anteriorly.

Wings. Fore wing 5.0–5.3 times longer than its maximum width. Pterostigma 6.0–7.0 times longer than wide. Metacarp 1.4–1.7 times longer than pterostigma. First and second radial abscissae forming very obtuse angle. Second radial abscissa 3.0–3.5 times longer than first abscissa, 0.55–0.6 times as long as the almost straight third abscissa, 1.3–1.5 times longer than first radiomedial vein. Second radiomedial cell long and wide, 3.2–3.6 times longer than its maximum width, 0.85–1.0 times as long as the rather wide brachial cell. First medial abscissa distinctly concavely curved. Nervulus postfurcal, distance from nervulus to basal vein about 0.4 times nervulus length. Hind wing 7.5–8.0 times longer than wide. First costal abscissa 0.45–0.5 times as long as second abscissa. Recurrent vein short, straight or weakly curved, weakly postfurcal or antefurcal, pigmented.

Legs. Hind coxa elongate-oval, with long and rather narrow basoventral tooth, 2.5 times without tooth or 2.2–2.3 times with tooth longer than wide, tooth with dense and white pubescence. Hind femur 4.8–5.1 times longer than wide, 0.55–0.6 times as long as hind tibia. Hind tarsus 1.1 times longer than hind tibia. Second segment of hind tarsus 0.5 times as long as basitarsus, 4.0 times longer than fourth segment, 2.0 times longer than fifth segment (without pretarsus).

Metasoma 1.8–2.0 times longer than head and mesosoma combined. Petiole very weakly or weakly and evenly widened towards apex. Maximum width of first tergum almost equal to its width at level of spiracular tubercles, 1.8–2.0 times its minimum width; length of petiole 7.3–8.8 times its maximum width, 0.9–1.1 times length of mesosoma, 0.7–0.85 times length of head and mesosoma combined. Median length of second tergum 2.5–3.0 times its basal width, 1.3–1.4 times length of third tergum. Length of second and third terga combined 5.0 times basal width of second tergum, 0.6–0.7 times length of petiole.

Sculpture and pubescence. Vertex, frons and temple smooth, temple below with distinct striation on narrow part; face almost entirely coarsely and densely rugose-reticulate, clypeus densely reticulate-rugose. Pronotum mostly smooth, its side below distinctly curvedly striate at narrow area. Mesoscutum smooth on median lobe, its lateral lobes finely and densely punctate, medially mesoscutum densely rugulose or rugulose-striate. Scutellum almost smooth or sparsely and finely punctate. Mesopleuron smooth in lower 0.8–0.9. Propodeum without delineated areas, with distinct and complete median and two weakly curvedly convergent posteriorly lateral longitudinal carinae, entirely coarsely and mostly transversely rugose-striate, sculpture medially sometimes distinctly fine. Metapleuron rugose-striate, but sometimes sculpture fine. Hind coxae densely transversely striate in dorsal half, finely rugulose-striate to almost smooth in ventral half. Hind femur dorsally very finely rugulose-reticulate, sometimes almost smooth, smooth on the most part. First tergum almost entirely densely transversely striate, often finely sculptured basally and almost smooth apically at short distance. Second tergum mostly smooth, rugose-striate in basal area. Remaining terga smooth. Vertex in posterior 0.2–0.3 with rather dense, long and semi-erect pale setae, remainder of vertex glabrous. Median lobe of mesoscutum sparsely and shortly setose, almost glabrous an-

teriorly; lateral lobes entirely with dense, semi-erect and mainly short pale setae, with additional sparse long setae along notauli and marginally. Metapleural lobe with short and dense pubescence. Hind tibia dorsally with numerous and dense short and sparse long semi-erect setae; length of long setae 0.5–0.9 times maximum width of hind tibia.

Colour. Head reddish brown or dark reddish brown, darkened dorsally, face sometimes mostly yellowish brown, malar space yellow or brownish yellow. Metasoma almost black. Petiole and second metasomal tergum reddish brown or dark reddish brown, often petiole black, remaining terga brownish yellow or light reddish brown, but infuscate medio-posteriorly. Palpi pale yellow. Fore and middle legs yellow or pale brownish yellow, fore tarsi infuscate, middle trochantellus and wide submedian part of femur more or less brown. Hind coxa, trochanter, trochantellus and femur dark reddish brown to almost black at least partly, tibia brownish yellow, but infuscate apically, tarsus yellowish brown; apical segments of all tarsi infuscate. Fore wing evenly and very faintly infuscate. Pterostigma entirely dark brown.

Male (holotype). Body length 11.6 mm; fore wing length 6.6 mm.

Head width 1.1 times its median length, equal to its total length, 1.15 times its maximum height, equal to maximum width of mesoscutum. Head behind eyes (dorsal view) weakly convex anteriorly and distinctly roundly narrowed posteriorly. Transverse diameter of eye 1.3 times longer than temple. Ocelli medium-sized, in triangle with base 1.3 times its sides, situated before middle of head. POL 1.4 times Od, 0.75 times OOL. Occiput with very dense and white setae (dorsal view). Eye 1.3 times as high as broad. Malar space height 0.2 times height of eye, about 0.5 times basal width of mandible. Face width 0.85 times height of eye and 1.1 times height of face and clypeus combined. Clypeus distinctly convex. Width of hypoclypeal depression equal to distance from edge of depression to eye, 0.4 times width of face. Hypostomal flange very narrow.

Antennae entirely missing.

Mesosoma 3.2 times longer than its height, about 3.0 times longer than its maximum width. Median lobe of mesoscutum distinctly protruding forward and convex anteriorly. Mesoscutum 1.4 times longer than maximum width. Notauli mostly almost smooth. Prescutellar depression shallow, rather narrow medially and wider laterally, with distinct median carina, almost entirely smooth, medially 0.2 times as long as scutellum. Scutellum flat, 1.1 times longer than maximum width. Subalar depression entirely rugose-striate.

Wings. Fore wing 4.8 times longer than its maximum width. Pterostigma 6.5 times longer than width. Metacarp 1.3 times longer than pterostigma. First and second radial abscissae forming very obtuse angle. Second radial abscissa 4.0 times longer than first abscissa, 0.6 times as long as the straight third abscissa, 1.5 times longer than first radiomedial vein. Second radiomedial cell long and wide, 3.3 times longer than its maximum width, 0.9 times as long as the wide brachial cell. First medial abscissa distinctly curved. Nervulus very weakly postfurcal. Hind wing 7.0 times longer than width. First costal abscissa 0.5 times as long as second abscissa. Recurrent vein short, straight, weakly postfurcal, pigmented.

Legs. Hind coxa without basoventral tooth, elongate-oval, 2.7 times longer than width. Hind femur 4.8 times longer than width, 0.55 times as long as hind tibia. Hind

tarsus almost as long as hind tibia. Second segment of hind tarsus 0.45 times as long as basitarsus, 3.3 times longer than fourth segment, 1.6 times longer than fifth segment (without pretarsus).

Metasoma 2.4 times longer than head and mesosoma combined. Petiole mostly almost parallel-sided, weakly and curvedly widened in apical 0.25. Maximum width of first tergum 0.85 times its width at level of spiracular tubercles, 1.6 times its minimum width; length of petiole 13.0 times its maximum width, 1.25 times length of mesosoma, 0.95 times length of head and mesosoma combined. Median length of second tergum 4.5 times its basal width, 1.4 times length of third tergum. Length of second and third terga combined almost 8.0 times basal width of second tergum, 0.65 times length of petiole

Sculpture and pubescence. Vertex, frons and temple smooth; face almost entirely coarsely and densely striate-rugose, clypeus rugose. Pronotum mostly smooth, its side below distinctly striate at narrow area. Mesoscutum mostly smooth, its lateral lobes finely punctate, finely rugulose latero-marginally. Scutellum smooth. Mesopleuron smooth in lower 0.7. Propodeum without delineated areas, with distinct median and two weakly convergent posteriorly lateral longitudinal complete carinae, entirely coarsely and mostly transversely rugose-striate. Metapleuron coarsely rugose-striate. Hind coxae entirely densely transversely and semi-circularly striate. Hind femur dorsally finely rugulose-reticulate. First tergum entirely densely transversely striate, sometimes partly rugulose-striate. Second tergum basally finely and densely striate. Remaining terga smooth. Vertex in posterior 0.3 with rather dense, long and semi-erect pale setae, remainder of vertex glabrous. Median lobe of mesoscutum sparsely and shortly setose, glabrous anteriorly; lateral lobes almost entirely with dense, semi-erect and mainly short pale setae, with additional sparse long setae along notauli and marginally. Metapleural lobe with short and dense pubescence posteriorly. Hind tibia dorsally with numerous and dense short and sparse long semi-erect setae; length of long setae 0.4–0.7 times maximum width of hind tibia.

Colour. Head and metasoma reddish brown to dark reddish brown, face laterally pale, malar space yellow. Petiole yellowish brown, remainder metasoma brownish yellow, but brown apically. Palpi pale yellow. Fore and middle legs yellow or brownish yellow. Hind coxa and trochanter reddish brown, femur brownish yellow, tibia and tarsus almost yellow; apical segments of all tarsi infusate. Fore wing hyaline. Pterostigma entirely brown.

***Stephanospathius benoiti* sp. n.**

urn:lsid:zoobank.org:act:EBC1B03B-90B0-46DF-9B23-36D6090F8782

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

Figs 13–21

Type material. Holotype: female, Republic of Congo, “Musée du Congo, Eala, VII–1936, J. Chesquiere”, “R. dét. cc. 4917” (MRAC).

Description. Female. Body length 13.9 mm; fore wing length 9.4 mm.

Head width 1.3 times its median length, 1.1 times its total length, 1.15 times its maximum height, 1.2 times maximum width of mesoscutum. Head behind eyes (dorsal view) roundly narrowed. Transverse diameter of eye 1.25 times longer than temple. Ocelli medium-sized, in triangle with base 1.3 times its sides, situated almost on middle of head. POL 1.4 times Od, 0.6 times OOL. Occiput with very dense and white setae (dorsal view). Eye 1.3 times as high as broad. Malar space height 0.2 times height of eye, 0.5 times basal width of mandible. Face width 0.85 times height of eye and 1.1 times height of face and clypeus combined. Clypeus distinctly convex. Width of hypoclypeal depression equal to distance from edge of depression to eye, 0.45 times width of face. Hypostomal flange very narrow.

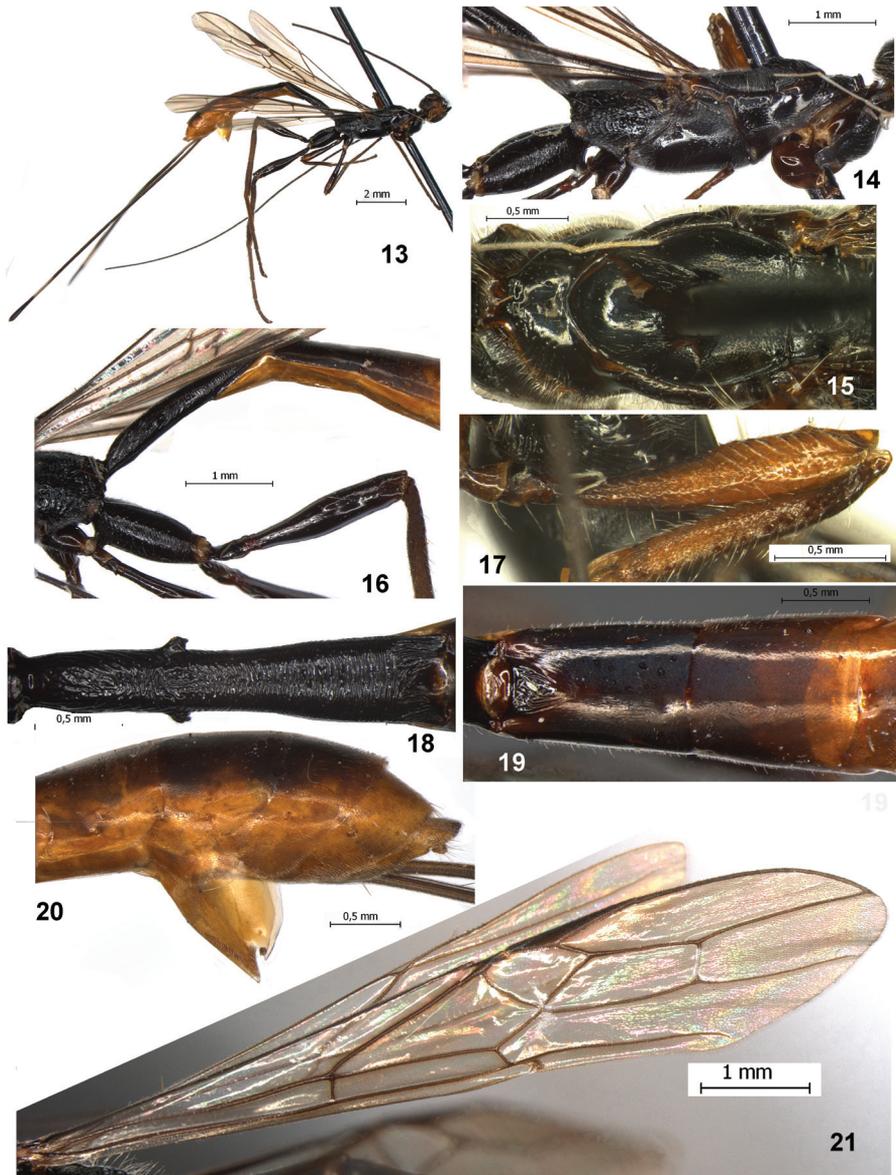
Antennae slender, weakly setiform, more than 62-segmented (apical segments missing). Scape short and wide, apically curvedly cutting along outer side, 1.5 times longer than maximum width. First flagellar segment weakly curved basally, 4.5 times longer than apical width, almost as long as second segment. Most flagellar segments with fine median constriction. Subapical segments about 3.5 times longer than their width.

Mesosoma 2.9 times longer than its height, 2.7 times longer than its maximum width. Median lobe of mesoscutum distinctly protruding forward and convex anteriorly. Mesoscutum 1.35 times longer than maximum width. Notauli finely striate anteriorly, but mostly smooth. Prescutellar depression shallow, rather narrow medially and wider laterally, medially 0.15 times as long as scutellum, with distinct median carina, smooth. Scutellum flat, 1.1 times longer than maximum width. Subalar depression widely finely and densely punctate, with sparse short striation along upper side.

Wings. Fore wing 5.1 times longer than its maximum width. Pterostigma about 5.5 times longer than wide. Metacarp 1.5 times longer than pterostigma. First and second radial abscissae forming very obtuse angle. Second radial abscissa 3.3 times longer than first abscissa, 0.6 times as long as the almost straight third abscissa, 1.6 times longer than first radiomedial vein. Second radiomedial cell long and wide, 3.1 times longer than its maximum width, 0.7 times as long as the wide brachial cell. First medial abscissa distinctly concavely curved. Nervulus weakly postfurcal, distance from nervulus to basal vein 0.1–0.2 times nervulus length. Hind wing 7.0 times longer than wide. First costal abscissa 0.5 times as long as second abscissa. Recurrent vein short, straight, weakly postfurcal, pigmented.

Legs. Hind coxa with long and rather narrow basoventral tooth, elongate-oval, 2.4 times without tooth and 2.2 times with tooth longer than wide, tooth with dense and white pubescence apically. Hind femur 4.7 times longer than wide, 0.65 times as long as hind tibia. Hind tarsus 1.1 times longer than hind tibia. Second segment of hind tarsus 0.5 times as long as basitarsus, 3.5 times longer than fourth segment, 1.8 times longer than fifth segment (without pretarsus).

Metasoma 1.6 times longer than head and mesosoma combined. Petiole weakly, but distinctly and rather evenly widened towards apex. Maximum width of first tergum 1.1 times its width at level of spiracular tubercles, 2.1 times its minimum width; length of petiole 4.3 times its maximum width, 0.7 times length of mesosoma, 0.55



Figures 13–21. *Stephanospathius benoiti* sp. n. female **13** total view **14** mesosoma and coxae, lateral view **15** pronotum and mesoscutum **16** propodeum, hind coxa and femur and basal half of metasoma, lateral view **17** fore femur and tibia, inner view **18** first tergite, dorsal view **19** second and third tergites, dorsal view **20** apical part of metasoma with hypopygium, lateral view **21** fore and hind wings.

times length of head and mesosoma combined. Median length of second tergum 1.6 times its basal width, 1.1 times length of third tergum. Length of second and third terga combined 3.3 times basal width of second tergum, 0.9 times length of petiole. Ovipositor sheath 0.9 times as long as body.

Sculpture and pubescence. Vertex, frons and most part of temple smooth, temple below and posteriorly curvedly striate; face entirely coarsely and densely rugose-reticulate with granulation. Pronotum mostly smooth, its side below distinctly and curvedly striate at narrow area. Mesoscutum smooth on median lobe, but finely punctate in posterior half and with rather distinct median carina, its lateral lobes finely and densely punctate. Scutellum very finely and densely punctate. Mesopleuron mostly smooth. Propodeum with large basolateral areas weakly delineated by carinae, medial carina 0.7 times as long as propodeum medially; propodeum almost entirely distinctly and mostly transversely rugose-striate, basolateral areas medially almost smooth on narrow area. Metapleuron rugose-striate, sparsely punctate with smooth areas in anterior 0.3. Hind coxae densely transversely striate with fine granulation in dorsal half, finely striate to almost smooth in ventral half. Hind femur dorsally very finely striate and partly with punctation. First tergum coarsely rugose-striate in basal 0.4, curvedly and transversely densely striate and partly with fine granulation in apical 0.6. Second tergum mostly very finely striate-coriaceous, coarse rugose-striate in small basal area. Remaining terga smooth. Vertex in posterior 0.2–0.3 and temple with rather dense, long and semi-erect pale setae, remainder of vertex glabrous. Median lobe of mesoscutum sparsely and shortly setose, not much dense along notauli, lateral lobes entirely with dense, semi-erect and mainly short pale setae, with a few long setae along notauli. Metapleural lobe posteriorly with short and dense pubescence. Hind tibia dorsally with numerous and dense short and sparse long semi-erect setae; length of long setae 0.4–0.8 times maximum width of hind tibia.

Colour. Head black, face light reddish brown, darkened dorsally, malar space yellowish brown. Metasoma almost black. Petiole black, second metasomal tergum dark reddish brown, remaining terga reddish brown with dark places, brownish yellow or yellow laterally and below. Palpi yellow or pale yellow. Fore leg light reddish brown, fore tibia darkened basally; middle coxa, trochanters and most part of femur dark reddish brown, apical 0.4 of femur, tibia and tarsus light reddish brown. Hind coxa, trochanters and femur black, hind tibia dark reddish brown, tarsus reddish brown. Fore wing evenly and faintly infuscate. Pterostigma entirely dark brown.

Diagnosis. This new species resembles *S. ornatipes*; the main differences between these taxa are indicated in the key.

Etymology. In honour of Dr. P.L.G. Benoit, who firstly recognised this new species.

Discussion

Subfamily Stephaniscinae was erected by Enderlein (1912) for eight doryctine genera with type genus *Stephaniscus* Kieffer. Ten mostly not closely related genera were included in the tribe Stephaniscini in Braconidae Catalogue by Shenefelt and Marsh (1976). The status and composition of this tribe was reassessed by Belokobylskij (1992) in his reclassification of subfamily Doryctinae, which suggested a new apomorphic character of Stephaniscini (the presence of propodeal bridge) and substantially reduced the

number of genera to three (*Schlettereriella* Szepligeti, *Leptospathius* Szepligeti, *Stephanospathius* Belokobylskij). Later Wharton and Achterberg (2000) and Yu et al. (2005) showed that this tribal name is “invalid because its type genus *Stephaniscus* Kieffer, 1904 is a junior homonym of *Stephaniscus* Haeckel, 1884”. As a result, in the last World Catalogue (Yu et al. 2005), the members of the tribe Stephaniscini were placed in the tribe Spathiini. However, I have retained this tribe under the substitutional name Leptospathiini nom. n. that includes five genera (*Austrospathius* Belokobylskij, Iqbal & Austin, *Leptospathius* Szepligeti, *Oroceguera* Seltmann & Sharkey, *Schlettereriella* Szepligeti and *Stephanospathius* Belokobylskij) because the diagnostic characters of this group are important and evolutionally valuable (Belokobylskij 1992).

Tribe Leptospathiini is related to some members of the tribe Spathiini (which requires reclassification: see, for example, Zaldivar-Riveron et al. 2008). Both of these tribes are characterised by the petiolate first metasomal tergum with its acrosternum distinctly or strongly elongated. However, the elongated acrosternum appears several times in different phylogenetic lines of subfamily Doryctinae (Belokobylskij 2007, Zaldivar-Riveron et al. 2007), and a recent molecular phylogenetic analysis showed that the genera of the Neotropical Spathiini genera formed a separate cluster of taxa in comparison with Old World Spathiini genera (Zaldivar-Riveron et al. 2008). The acrosternum is very long (larger than a half of tergum) in the members of the tribe Spathiini. On the other hand, the members of Leptospathiini have significant variation of the acrosternum length from weakly elongated (less than a half of tergum in *Leptospathius*, *Schlettereriella* and *Oroceguera*) to strongly elongated (more than half of tergum in *Austrospathius* and *Stephanospathius*). The main apomorphic character of Leptospathiini is the presence of a distinct and usually wide propodeal bridge (heavy sclerites between coxal and metasomal foramina). This feature is unique for Doryctinae taxa and undoubtedly evolutionally significant.

According to current information on the internal structures of doryctine ovipositors (Rahman et al. 1998), *Leptospathius* and *Schlettereriella* are closely related (and distinctly separate from *Spathius* Nees) particularly in characters such as a loss of the valvillus and the modification of the most anterior subctenidial seta into a branched “pseudovalvillus”. These characters are not recorded in *Stephanospathius* (and unknown for *Austrospathius* and *Oroceguera*) and this genus has developed valvillus and normal subctenidial seta, which were the additional reason (besides external morphology) to place this genus separately in the tribe. The structures of the venom glands and reservoir of *Leptospathius* and *Schlettereriella* are also very similar (Quicke et al. 1992), but do not have principal differences with other doryctine taxa (information about these structures in *Stephanospathius* is absent).

Similar result was obtained in Zaldivar-Riveron et al.’s (2008) molecular phylogeny of the Doryctinae genera, although *Leptospathius* was not included in the study. The position of *Stephanospathius* on the phylogenetic trees is highly variable and different in every tree, but in only a single tree does this genus have subbasal nesting with Old World *Spathius* taxa. On the other hand, *Schlettereriella* in all phylogenetic trees was a sister group to African *Pseudodoryctes* Szepligeti, *Doryctoproctus* Belokobylskij

and *Rinamba* Cameron in an as yet unresolved cluster of African-Holarctic doryctine genera. These ambivalent results undoubtedly show that only an additional wide and comprehensive morphological and molecular study of Leptospathiini and related genera can help us to understand the real status and phylogeny of this peculiar tribe.

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References

- Belokobylskij SA (1992) On the classification and phylogeny of the braconide wasps of subfamilies Doryctinae and Exothecinae (Hymenoptera, Braconidae). Part I. On the classification, 1. Entomologicheskoe obozrenie 71 (4): 900–928. [In Russian]
- Belokobylskij SA (2005) Two new taxa of subtribe Rhaconotina (Hymenoptera: Braconidae, Doryctinae, Doryctini) from Africa, with a key to subtribe genera. Annales de la Societe entomologique de France (n.s.) 40 (2): 205–210.
- Belokobylskij SA (2007) Revision of the genus *Spathiostenus* Belokobylskij 1993 (Hymenoptera, Braconidae: Doryctinae). Insects Systematics and Evolution 38(4): 433–446. doi:10.1163/187631207794760903
- Belokobylskij SA, Maeto K (2009) Doryctinae (Hymenoptera, Braconidae) of Japan. (Fauna mundi. Vol. 1). Warszawska Drukarnia Naukowa, Warszawa, 806 pp.
- Belokobylskij SA, Quicke DLJ (2000) Seven new genera of the subfamily Doryctinae (Hymenoptera: Braconidae) from Old World. Journal of Hymenoptera Research 9(1): 111–141.
- Belokobylskij SA, Tobias VI (1998) Introduction. In: Lehr PA (Ed) Keys to the Insects of the Russian Far East. Neuropteroidea, Mecoptera, Hymenoptera 4(3): 8–26. Dal'nauka, Vladivostok. [In Russian]
- Enderlein G (1912) Zur Kenntnis der Spathiinen und einiger verwandter Gruppen. Archiv fur Naturgeschichte 78(2): 1–37.
- Granger C (1949) Braconides de Madagascar. Mémoires de l'Institut Scientifique de Madagascar, Biologie Animale (A) 2: 1–428.
- Fischer M (1981a) Versuch einer systematischen Gliederung der Doryctinae, insbesondere der Doryctini, und Redescriptionen nach Material aus dem Naturwissenschaftlichen Museum in Budapest (Hymenoptera, Braconidae). Polskie Pismo Entomologiczne 51: 41–99.

- Fischer M (1981b) Untersuchungen an Stephaniscini aus dem Britischen Museum in London und dem Naturwissenschaftlichen Museum in Budapest (Hymenoptera, Braconidae, Doryctinae). Sitzungsberichten der Österreichische Akademie der Wissenschaften Mathematisch-naturwissenschaftliche Klasse, Abteilung I 190 (6-7): 121–160.
- Kieffer JJ (1911) Nouveaux Stephanides d’Afrique. Bolletino della Societe Entomologica Italiana 41: 116–121.
- Nixon GEJ (1954) Two new braconid parasites of wood-boring Coleoptera (Hymenoptera). Annales and Magazine of Natural History 12(7): 380–384.
- Quicke DLJ, Tunstead J, Falco JV, Marsh PM (1992) Venom gland and reservoir morphology in the Doryctinae and related braconid wasps (Insecta, Hymenoptera, Braconidae). Zoologica Scripta 21: 403–416. doi:10.1111/j.1463-6409.1992.tb00340.x
- Rahman MH, Fitton MG, Quicke DLJ (1998) Ovipositor internal microsculpture and other features in doryctine wasps (Insecta, Hymenoptera, Braconidae). Zoologica Scripta 27(4): 333–343. doi:10.1111/j.1463-6409.1998.tb00465.x
- Shenefelt RD, Marsh PM (1976) Hymenopterorum Catalogus. Pars 13. Braconidae 9. Doryctinae. Dr W. Junk, ‘s-Gravenhage, 1263–1424.
- Wharton RA, Achterberg C van (2000) Family group names in Braconidae (Hymenoptera: Ichneumonoidea). Journal of Hymenoptera Research 9(2): 254–270.
- Yu DS, van Achterberg C, Horstman K (2005) World Ichneumonoidea 2004. Taxonomy, biology, morphology and distribution. CD/DVD. Taxapad, Vancouver. www.taxapad.com
- Zaldivar-Riverón A, Belokobylskij SA, León-Regagnon V, Martínez JJ, Briceño R, Quicke DLJ (2007) A single origin of gall association in a group of parasitic wasps with disparate morphologies. Molecular Phylogenetics and Evolution 44: 981–992. doi:10.1016/j.ympev.2007.05.016
- Zaldivar-Riveron A, Belokobylskij SA, León-Regagnon V, Briceño R, Quicke DLJ (2008) Molecular phylogeny and historical biogeography of the cosmopolitan parasitic wasp subfamily Doryctinae (Hymenoptera: Braconidae). Invertebrate Systematics 22: 345–363. doi:10.1071/IS07028

A revision of the genus *Amamiclytus* Ohbayashi from Taiwan and the Ryukyu Islands (Coleoptera, Cerambycidae)

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Abstract

The clytine genus *Amamiclytus* Ohbayashi, 1964, from Taiwan and the Ryukyu Islands is revised. Seven species and one subspecies are recognized as follows: *A. nobuoi nobuoi* Ohbayashi, 1964, (Amami Islands); *A. nobuoi akusekianus* Niisato, 2005, (Tokara Islands); *A. subnitidus* Holzschuh, 1984, (Taiwan); *A. setiger* **sp. n.** (Taiwan), *A. nubilus* **sp. n.** (Taiwan), *A. juni* **sp. n.** (Taiwan), *A. yulongi* **sp. n.** (Taiwan) and *A. hirtipes* (Matsushita, 1940), **comb. n.** (Taiwan). All of them are described or redescribed and a key to species is presented. The generic features of *Amamiclytus*, including male and female genitalia from these taxa, are presented. The systematic position of *Amamiclytus* within the tribe Clytini is discussed.

Keywords

Amamiclytus, Clytini, revision, new species, Taiwan, Ryukyu Islands

Introduction

Clytine beetles of the genus *Amamiclytus* Ohbayashi, 1964, are easily recognized at first observation by the small, black and glossy body with the ordinary arrangement of white pubescent maculation on the elytra. The genus is distinguishable from related

genera, like *Rhaphuma* Pascoe, by rather widely separated antennal insertions, long, erect, pale hairs on the middle and hind tibiae, and also by the peculiar structure of the male endophallus. Up to the present time, a total of seven taxa, including one subspecies, have been recorded from a rather restricted area between the Ryukyu Islands of Southwest Japan and northern Indochina. They are *Amamichlytus nobuoi nobuoi* Ohbayashi, 1964, from Amami Isls., Japan, *A. nobuoi akusekianus* Niisato, 2005, from Tokara Isls., Japan, *A. hirtipes* (Matsushita, 1940), from Taiwan, *A. subnitidus* Holzschuh, 1985, from Taiwan, *A. dembickyi* Holzschuh, 1991, from North Vietnam, *A. squamifer* Holzschuh, 1991, and *A. setosulus* Holzschuh, 1991, from Northwest Thailand.

In spite of Taiwan's rich longicorn beetles fauna, only two species of this genus, *A. hirtipes* and *A. subnitidus*, were known from there. The first author preliminarily examined the Taiwanese *Amamichlytus* species more than a quarter century ago, and presented an oral report at the annual meeting of the Japanese Society of Coleopterology (Niisato 1983). According to his provisional report, a total of six species in the genus were recognized from Taiwan, of which five were unnamed species.

In this study, we basically follow the work of Niisato (1983), and carefully describe or redescribe the members of the genus from Taiwan and the Ryukyu Islands considering details of external morphology and male and female genitalia. We also discuss the systematic position of *Amamichlytus* in the tribe Clytini.

Abbreviations

Measurements of body parts. HW– width of head across eyes; PL– length of pronotum; PW– maximum width of pronotum; PA– apical width of pronotum; PB– basal width of pronotum; EL– length of elytra; EW– humeral width of elytra; M– arithmetic mean.

Maculations consisting of white pubescence. Dorsal side: Pb– basal band on pronotum, usually enlarged along entire margin; B– basal bands near elytral bases; S– sutural spot on elytra behind scutellum; La– lateral bands before middle of elytra, sometimes almost reaching or joining S; Lp– transverse bands behind middle of elytra, usually incomplete, not reaching external and sutural margins; A– apical bands of elytra. Ventral side: Msl– lateral maculation of mesosternum; Mss– maculation on mesosternal process; Mta– L-shaped band along apical margin of metathorax, extending to apical 1/2–2/3 of metepisternum; V1–V4– lateral bands along apical margins of ventrites 1–4, usually enlarged along entire apical margin in basal segments.

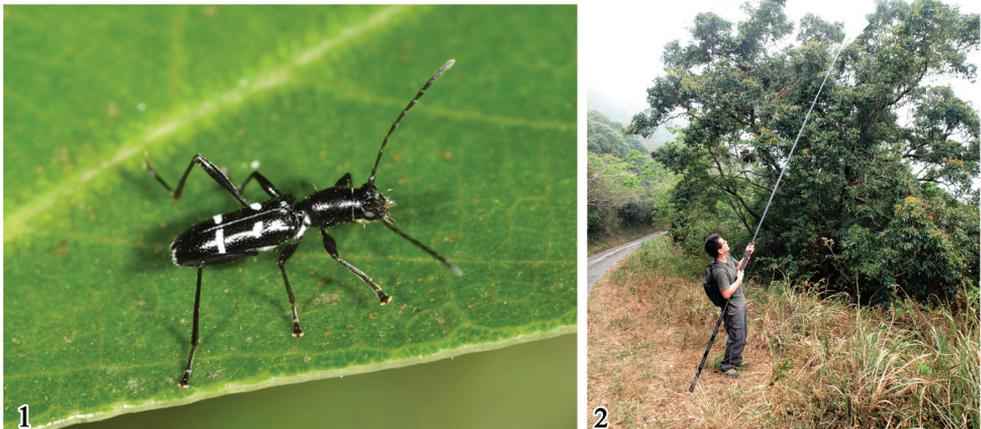
Depositories of type specimens. EUMJ– Ehime University Museum, Matsuyama, Japan; HUM– Hokkaido University Museum, Sapporo, Japan; MMNS– National Museum of Natural Science, Taichung, Taiwan; NHMO– Natural History Museum of Osaka, Japan; NMNS– National Museum of Nature and Science, Tokyo, Japan.

Historical review

The genus *Amamiclytus* Ohbayashi, 1964, was established for *A. nobuoi* Ohbayashi from Amami-Ōshima Is., Southwest Japan. Later, this type species was synonymized with the Taiwanese species, *Rhaphuma hirtipes* Matsushita, 1940, by Kojima et al. (1965). They also re-affirmed the validity of the genus *Amamiclytus* and placed it under *Amamiclytus* as *A. hirtipes* (Matsushita, 1940). According to their paper, this action was made by comparison with specimens determined as *R. hirtipes* by the late Dr. M. Hayashi from his collection. Later, Kusama and Takakuwa (1984) restored *A. nobuoi* as a valid species. However, they never examined the true *R. hirtipes*, and confused several different species in the genus with it. So at least as of that time, it was uncertain whether *R. hirtipes* should be transferred to the genus *Amamiclytus* or not.

The holotype of *Rhaphuma hirtipes* was assumed to be deposited in an institution somewhere in Berlin, or lost during the war. However, the first author discovered the holotype of *R. hirtipes* in the general collection of the Hokkaido University. By examination of this type specimen, Niisato (1983) accepted the placement in the genus *Amamiclytus*, and recognized six species in the genus, of which five needed to be described as new taxa for the Taiwanese fauna. After Niisato's presentation, *A. subnitidus* Holzschuh, 1984, was described from Kaohsiung, Taiwan. Until now, four taxa in this genus from Taiwan have remained undescribed.

Based on our recent examination of the late Dr. Masao Hayashi's collection deposited in the Natural History Museum of Osaka, we only located a single species, *A. subnitidus*, in his collection. This indicates that the previously incorrect action by Kojima et al. (1965) was due to the misidentification of *A. subnitidus* with *A. hirtipes*. Succeeding authors of the picture books of Taiwanese Cerambycidae (Yu and Nara 1988, Yu et al. 2002, Hua et al. 2009) inherited this mistake.



Figures 1–2. *Amamiclytus subnitidus* Holzschuh and its collecting site: **1** Male habitus **2** Mt. Dahan Shan, Pingdong County, S. Taiwan. Photo by Y. Ito on 4. April. 2010.

Taxonomy

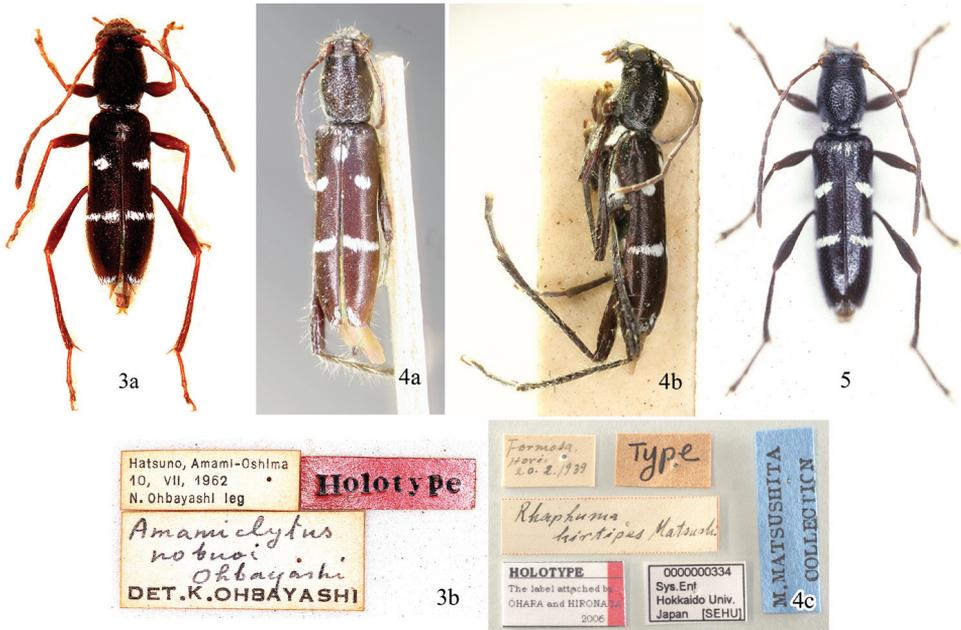
Genus *Amamiclytus* Ohbayashi, 1964

<http://species-id.net/wiki/Amamiclytus>

Amamiclytus Ohbayashi, 1964: 21, pl. 4, fig. 1; type species: *Amamiclytus nobuoi* Ohbayashi, 1964.

Description. Small to very small clytine with black, glossy body arranged with white pubescent maculations on pronotum, elytra and ventral surface, characterized by relatively well-separated eyes, and dense hair on middle and hind tibiae. Colour mostly black, glossy, sometimes more or less matted, usually with brownish antennae and legs, and sometimes also on meso- and metathoraces, and abdomen. Hairs and pubescence mostly very short though some partially dense and long; head usually sparsely clothed with pale gray pubescence on frons in both sexes, though more or less sparsely so in ♀; antennae with long, pale brown hairs along underside of 2nd to 4th or 5th segments; pronotum thinly pubescent, with white pubescent band along base (*Pb*), transverse or separated at sides, though sometimes sparse or quite absent according to species; scutellum with fine pale pubescence; elytra basically with three white maculations: 1) semicircular maculation or slightly oblique short band on basal third to fourth (*La*), 2) almost complete arcuate band on apical third to 2/5 (*Lp*), 3) narrow but usually clear band at apices (*A*), supplemented with the following maculation according to species: 4) basal narrow band (*B*), 5) sutural spot behind scutellum (*S*); prosternum with white pubescence on basal half to 2/3; metasternum with white pubescence at sides (*Mst*) and on intercoxal process (*Mss*); metathorax with L-shaped band along apical margin of metasternum, extending to apical half to 2/3 of metepisternum (*Mta*); abdomen with white pubescence at sides of ventrites 1–2, sometimes with same, though sparse maculation on ventrite 3 or ventrites 3–4 (*V1–V4*).

Head across eyes almost equal to the width of pronotum; frons almost quadrate, flattened, provided with a fine smooth median line, usually closely or coarsely punctured; clypeus flattened or slightly raised; mandible short and broad, rather strongly hooked near apex, with almost smooth inner margin, covered with numerous short hairs on surface, a few long hairs on outer margin near apex; maxilla with galea and lacinia weakly developed, terminal segment of palpus clearly flabellate, strongly dilated apicad in ♂, weakly so in ♀; terminal segment of labial palpus strongly dilated apicad in ♂, weakly so in ♀; vertex raised towards antennal cavities which are usually separated each other by half to 2/5 the width of occiput; occiput distinctly convex; genae relatively shallow, almost half to 1/3 the depth of lower eye-lobes in frontal view; eye moderately large, almost semicircular, a little narrower than frons in frontal view. Antennae thin, moderate in length or relatively long, slightly thickened apicad except for those of *A. hirtipes* which are simply slender; scape almost cylindrical, 3rd segment 1.5–2.0 times as long as 4th segment, terminal segment usually obtusely pointed.



Figures 3–5. Holotypes of *Amamiclytus* spp.: **3** *Amamiclytus nobuoi* Ohbayashi (in EUM), a, habitus in dorsal view, b, labels; **4** *Rhaphuma hirtipes* Matsushita (in HUM), a, habitus in dorsal view, ditto in lateral view, c, labels; **5** *Amamiclytus subnitidus* Holzschuh (in Holzschuh coll.).

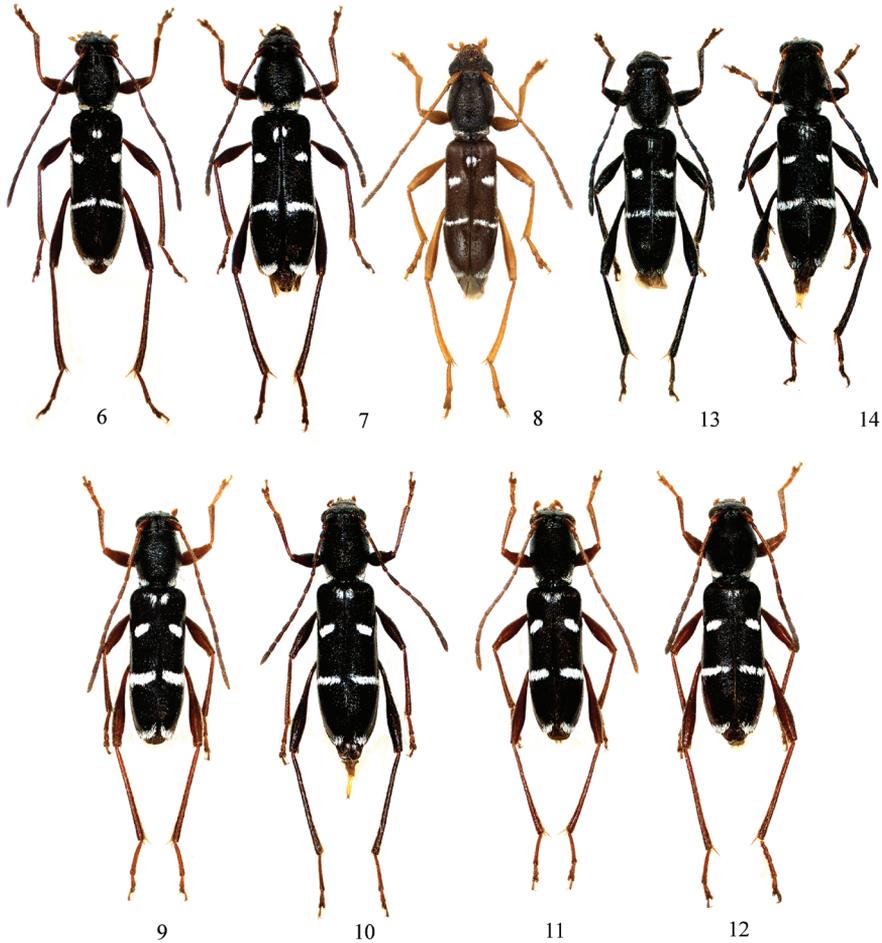
Pronotum globose or slightly elongate, slightly narrower than elytra, simply arcuate at sides; disc distinctly convex though slightly depressed above, provided with large shallow punctures. Scutellum small, regular triangular.

Elytra relatively short to relatively long; sides rounded at humeri, weakly arcuately emarginate at a level between basal fourth and apical half; apices oblique, slightly arcuate at margins, usually with weak dents at external angles; disc evenly convex with slight depression near suture just behind scutellum. Hind wing with vein Cu not attaining AA_{3+4} which is forming an ordinary H-shape.

Ventral surface smooth; prosternum moderately emarginate near apical half in profile; metasternum slightly convex; abdomen relatively slender, with male anal ventrite arcuately rounded at apical margin.

Legs long and slender; hind legs 1.5–2.0 times as long as elytra, with femur gradually swollen apicad, slightly compressed, usually exceeding elytral apex at apical fifth, almost equal to the length of hind tibia, 1st tarsal segment varied in length according to species, 1.5–2.5 times as long as the following two segments combined.

Male genitalia. Relatively large and somewhat elongate, basically related to that of several species of *Rhaphuma*. Median lobe elongate and slender, slightly reflexed in profile; dorsal plate almost equal in width to, or a little longer than ventral plate, gently narrowed to rounded apex; ventral plate gently narrowed to pointed apex; median struts slender. Endophallus about twice the length of median lobe, provided with minute or medium-sized spinous spicules behind crescent-like sclerites, densely cov-

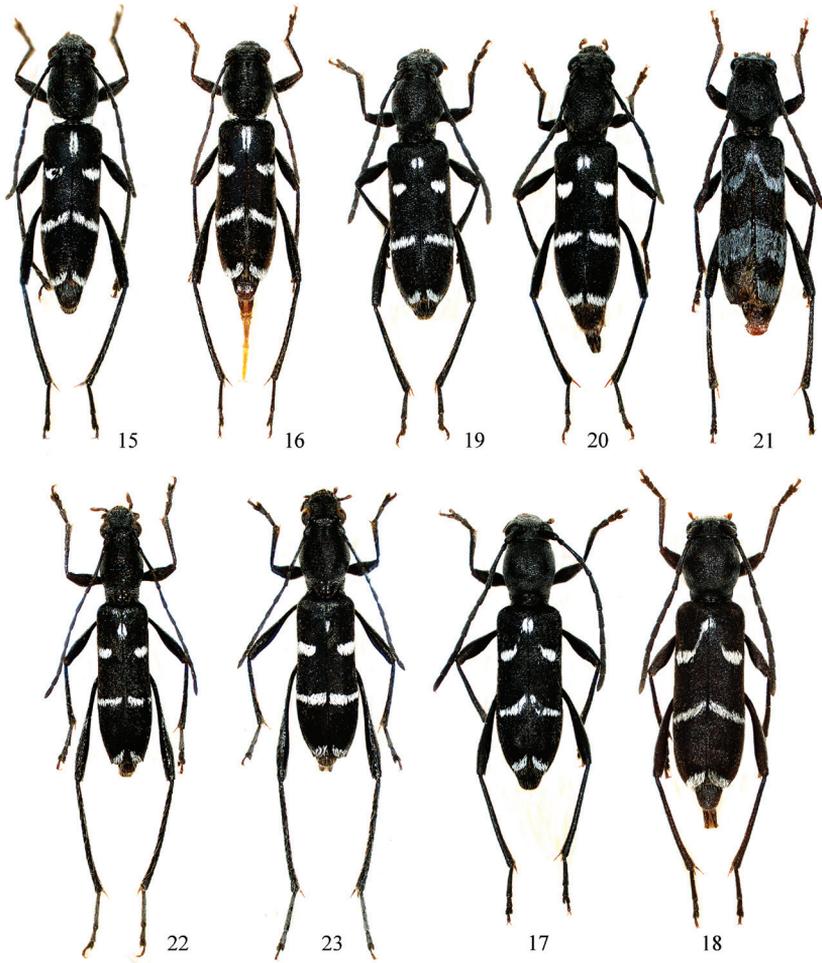


Figures 6–14. *Amamiclytus* spp. from Japan and Taiwan: **6** *A. nobuoi nobuoi* Ohbayashi, ♂ **7** ditto, ♀ **8** *A. nobuoi akusekianus* Niisato, holotype ♂ **9** *A. subnitidus* Holzschuh, ♂ **10** ditto, ♀ **11** ditto (Bilyu, Xiulin Township), ♂ **12** ditto, ♀ **13** *A. setiger* sp. n., holotype ♂ **14** ditto, allotype ♀.

ered with minute serrate or crenulate spicules on apical part. Tegmen usually elongate, shorter than median lobe; parameres nearly half to $2/5$ the length of tegmen, divided in apical fifth to third, with each lobe almost rounded at apex, which is provided with short and long setae; basal ridge raised. Eighth tergite more or less elongate, slightly longer than wide. Eighth sternite distinctly transverse, emarginate or transversely truncate at apical margin, provided with long projection at middle of basal margin.

Female genitalia. Coxite lobe ovoid, scattered with short and long setae. Stylus half to equal in length to coxite lobe, elongate, weakly dilated apicad. Spermatheca narrow, weakly broadened apicad; gland short and thin; duct relatively long and thin.

Geographical distribution. Indochina, China, Taiwan, Japan (Ryukyus), Malay Peninsula, Sumatra and Borneo.



Figures 15–23. *Amamiclytus* spp. from Taiwan: **15** *A. nubilus* sp. n., holotype ♂ **16** ditto, allotype ♀ **17** *A. juni* sp. n., holotype ♂ **18** ditto, allotype ♀ **19** *A. yulongi* sp. n., holotype ♂ **20** ditto, allotype ♀ **21** ditto, paratype ♂ **22** *A. hirtipes* (Matsushita), comb. n., ♂ **23** ditto, ♀.

Comments. The species of the genus *Amamiclytus* OHBAYASHI have so far been known from a rather restricted area between Indochina and the Ryukyu Islands of Southwest Japan. However, several undetermined species belonging to the genus have been found from Sumatra, Borneo and the Malay Peninsula. The genus contains small, glossy black species with pure white pubescent maculations on the body surface, and are slightly similar in external appearance to several members of the genus *Rhaphuma* Pascoe. They share the following features: 1) body relatively elongate, especially in elytra, meso- and metasterna, and legs; 2) antennae thin and long, with 3rd segment usually longer than scape; 3) antennal cavities approximate each other; 3) eyes large and prominent, rather distinctly approximate in front; 4) mandible almost smooth and provided with numerous short hairs along inner margin; 5) labial and

maxillary palpi show distinct sexual dimorphism in each terminal segment, strongly dilated apicad in ♂ or weakly so in ♀. However, *Amamiclytus* is very distinct in the tribe Clytini by a combination of the following characters: 1) body small and rather convex, with relatively long antennae and legs; 2) colour wholly black, usually brownish antennae and legs, strongly glossy or sometimes more or less matted; 3) white scaly pubescence form the maculations on elytra, ventral surface and sometimes on the base of pronotum, of which elytra are always provided with three arcuate or transverse bands, sometimes supplemented with vague basal band along basal margin and a longitudinal spot near suture behind scutellum; 4) mid and hind tibiae provided with long erect hairs; 5) frons relatively wide, with a fine median groove; antennae usually thickened towards apical segments, though simply slender in *A. hirtipes*, with antennal cavities widely separated at sides of frons; 6) pronotum rather convex, simply arcuate at sides; 7) male genitalia relatively large, with endophallus densely provided with minute serrate or crenulate spicules on apical part, without spinous spicules.

Adults of the genus are usually found on various types of tree blossoms as *Castanopsis*, *Quercus* and *Acer* mainly in spring and early summer season, such as February to June, except for *A. hirtipes* which appears in the autumn season. Larvae of *A. nobuoi*, bore in the dead, thin twigs of *Machilus thunbergii* and *Rhaphiolepis indica* var. *umbellata* (Niisato, 2007).

Key to species of the genus *Amamiclytus* from Taiwan and the Ryukyu Islands

- 1 Pronotum longer than wide, weakly or moderately arcuate at sides, usually provided with white basal band..... **2**
- Pronotum as long as, or slightly longer, than wide, usually strongly arcuate at sides, without white pubescence near basal margin **6**
- 2 Elytra glossy, sparsely clothed with very short pale pubescence..... **3**
- Elytra matted, densely clothed with brownish pubescence **5**
- 3 Elytra provided with white spot near suture behind scutellum; strongly glossy, sparsely clothed with pale pubescence ***A. nobuoi* Ohbayashi**
- Elytra without white spot near suture behind scutellum..... **4**
- 4 Elytra moderately glossy, without long pale hairs; frons distinctly longer than wide; erect pale hairs of hind tibia sparse and not so long ***A. subnitidus* Holzschuh**
- Elytra strongly glossy, scattered with a few erect long pale hairs; frons almost as long as wide; erect pale hairs of hind tibiae long and dense ***A. setiger* sp. n.**
- 5 Pronotum provided with distinct basal white band; elytra without white spot near suture behind scutellum ***A. nubilus* sp. n.**
- Pronotum not forming a distinct basal white band, though sparsely clothed with white pubescence near basal margin; elytra with white spot near suture behind scutellum ***A. hirtipes* (Matsushita), comb. n.**
- 6 Pronotum finely punctured; elytra with white bands before middle arcuate, usually reaching to sutural white spot, white bands behind middle arcuate; abdomen without lateral white bands on ventrites 3–4 ***A. juni* sp. n.**

- Pronotum coarsely punctured; elytra with white bands before middle semicircular, usually isolated but rarely arcuate and almost reaching to sutural white spot, lateral bands behind middle almost transverse or slightly oblique; abdomen provided with lateral white bands on ventrites 3–4 *A. yulongi* sp. n.

***Amamiclytus nobuoi nobuoi* Ohbayashi, 1964**

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

Figs 3, 6–7, 34, 41–46

Amamiclytus nobuoi Ohbayashi, 1964: 21, pl. 4, fig. 1; type locality: Hatsuno, Amami-Ōshima.

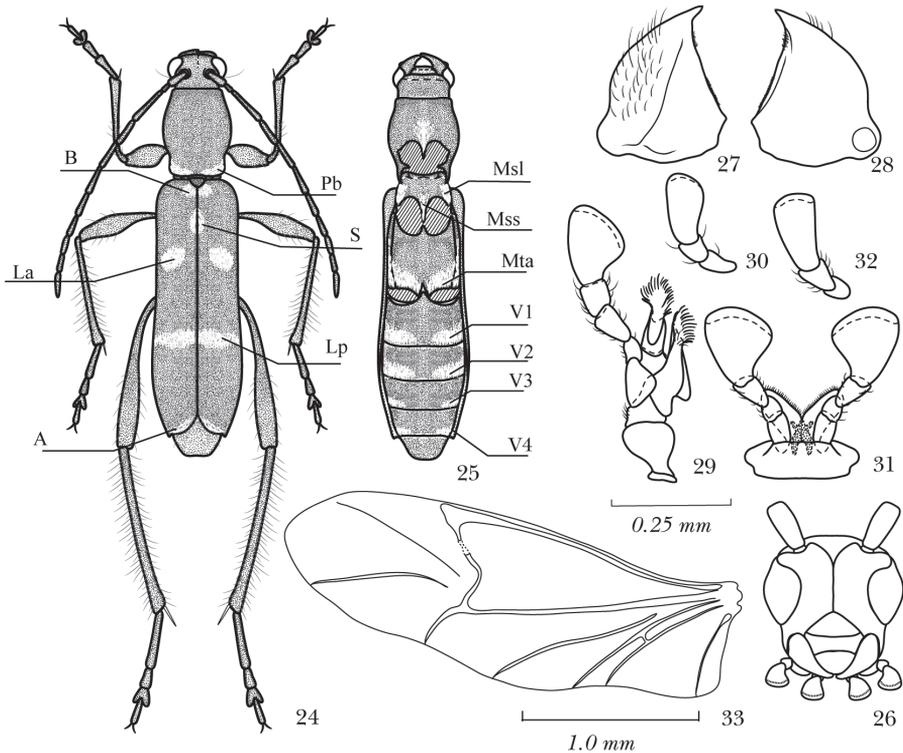
Amamiclytus hirtipes: Kojima et al. 1965: 85. (nec Matsushita, 1940)

Amamiclytus nobuoi nobuoi: Niisato 2007: 502.

Description. Male and female. Body length (from vertex to elytral apices) 4.0–5.1 mm in ♂, 4.0–4.9 mm in ♀. Colour black, glossy in general, distinctly so on elytra, dark brown in antennae, meso- and metathoraces, abdomen and legs except for pale brown tibiae and yellowish brown tarsi, mouthparts except for black mandibles yellowish brown. Body moderately clothed with fine pale pubescence, sparsely with erect long pale hairs on clypeus, genae, near pronotal base, abdominal ventrites and hind tibiae; head sparsely with pale hairs, largely exposing disc, scattered with a few erect long pale hairs, very thinly with pale gray pubescence on frons in both sexes; antennae distinctly with long pale brown hairs along undersides of segments 2–5; pronotum largely exposing disc, thinly pubescent, with a few erect long pale hairs, *Pb* at sides transverse, slightly narrowed inwards; scutellum hardly pubescent; elytra sparsely with pale pubescence, without long erect pale hairs, *B* very sparse, barely recognized, *S* on basal eighth small and longitudinally oblong, *La* on basal third semicircular, slightly oblique, *Lp* on apical third, almost complete though narrow, weakly arcuate, *A* moderately dense; prosternum moderately with white pubescence near basal 2/3, *Msl* distinct, *Mss* almost absent, *Mta* very sparse along posterior margin of metasternum, dense and entire on apical 2/5 of metepisternum; *V1* and *V2* dense, narrowed to middle.

Head across eyes almost as wide as pronotum, HW/PW 0.80–1.06 (M 0.95) in ♂, 0.89–0.95 (M 0.92) in ♀; frons as long as wide, arcuately dilated apicad, with a fine but deep smooth median line, closely roughly punctured; clypeus almost flattened; vertex raised towards antennal cavities which are separated from each other by about half the width of occiput; occiput distinctly convex, sparsely punctured. Antennae thin and long, gradually thickened apicad, attaining apical third in ♂ or 3/5 in ♀ of elytra; scape almost cylindrical, 3rd segment 1.4–1.8 times as long as 4th segment, middle segments weakly thickened at apices, terminal segment short, rounded at apex in ♂.

Pronotum slightly longer than wide, strongly arcuate at sides; PL/PW, 1.18–1.38 (M 1.27) in ♂, 1.09–1.20 (M 1.13) in ♀, PB/PA 0.92–1.00 (M 0.95) in ♂, 0.87–1.00 (M 0.92) in ♀, EL/PL 2.40–3.00 (M 2.68) in ♂, 2.67–3.11 (M 2.92) in ♀, PW/EW



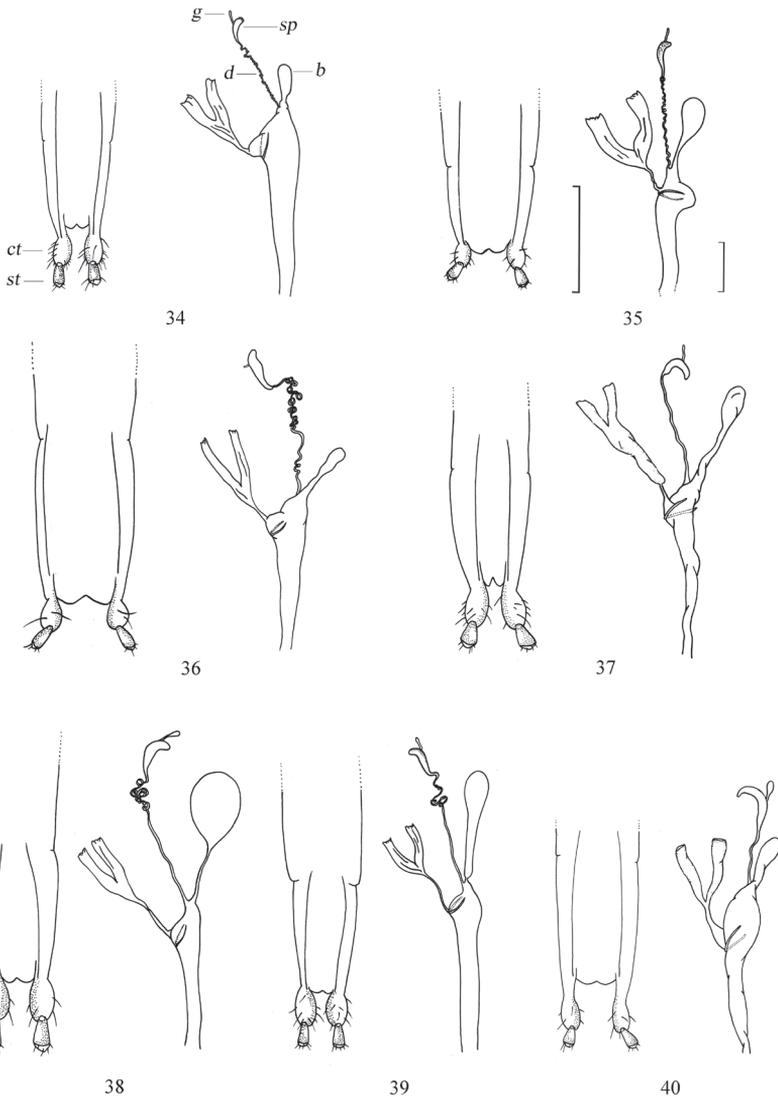
Figures 24–33. Body parts of *Amamicyltus* spp.: **24** Dorsal habitus showing white pubescent maculation (alphabetical codes see “Abbreviations”) **25** ditto, ventral view (V3 and V4 are hypothetically shown and absent in true *A. hirtipes*) **26** head, frontal view **27** left mandibles, ventral view **28** ditto, ventral view **29** left maxilla, ventral view **30** ditto, ♀ **31** labium, ventral view **32** ditto, ♀ **33** left hind wing **24–25** *A. hirtipes* (Matsushita), comb. n. **26–33** *A. subnitidus* Holzschuh.

0.76–0.91 (M 0.83) in ♂, 0.79–0.82 (M 0.80) in ♀; disc moderately convex though slightly depressed above, provided with large shallow punctures, though densely finely punctured in apical half in ♂. Scutellum regular triangular, slightly acute at apex.

Elytra relatively long and slender, EL/EW 2.73–2.86 (M 2.78) in ♂, 2.55–2.80 (M 2.64) in ♀; sides with almost rounded humeri, gently arcuate at a level between basal fourth and apical half, then gently arcuate and narrowed to oblique apices, without any dent at inner and outer angles; disc almost evenly convex, sparsely provided with fine shallow punctures.

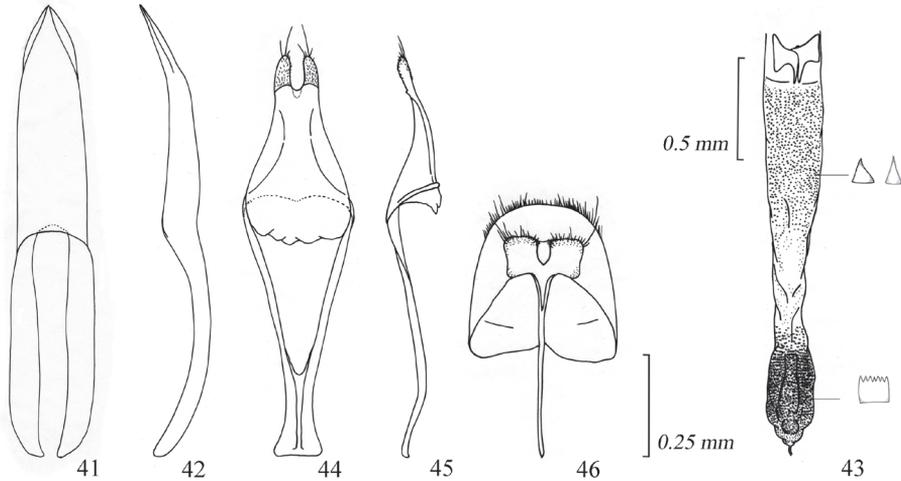
Ventral surface almost smooth, provided with a few coarse punctures on prosternum, minute ones on meso- and metathoraces and abdomen; ♂ anal ventrite 3/5 the length of basal width, weakly arcuate at apical margin.

Legs slender, rather long; hind legs 1.4–1.7 times as long as elytra, with femur strongly swollen in apical half, slightly exceeding elytral apex, 1st tarsal segment 1.6–2.0 times as long as the following two segments combined.



Figures 34–40. Female genitalia of *Amamiclytus* spp.: **34** *A. nobuoi nobuoi* Ohbayashi **35** *A. subnitidus* Holzschuh **36** *A. setiger* sp. n. **37** *A. nubilus* sp. n. **38** *A. juni* sp. n. **39** *A. yulongi* sp. n. **40** *A. hirtipes* (Matsushita). *ct* coxite lobe *st* stylus *b* bursa copulatrix *sp* spermatheca *d* spermathecal duct *g* spermathecal gland. Scale: 0.5 mm.

Male genitalia. Median lobe about 2/5 the length of elytra, slender and elongate; dorsal plate slightly wider than ventral plate in apical eighth, distinctly narrowed to apex which is rounded; ventral plate almost parallel-sided in basal half, then strongly narrowed to apex which is strongly pointed at the extremity, slightly reflex in profile; median struts slender, almost half the length of median lobe. Endophallus densely provided with minute spinous spicules behind crescent-like sclerites at a level between basal



Figures 41–46. Male genitalia of *Amamiclytus nobuoi nobuoi* Ohbayashi: **41** Median lobe, ventral view **42** ditto, lateral view **43** endophallus **44** tegmen, ventral view **45** ditto, lateral view **46** abdominal segment 8, ventral view.

2/5 and 4/5, densely covered with minute serrate spicules on apical sixth. Tegmen elongate, slightly shorter than median lobe; parameres more or less elongate, nearly 2/5 the length of tegmen, divided in apical fourth, gently arcuate in external margins, arcuately emarginate in inner margins, almost rounded at apices which are provided with numerous short and a few long setae; basal ridge slightly raised; ring part almost parallel-sided in basal third. Eighth tergite slightly elongate, semicircular, gently narrowed apicad in apical fourth, with apical margin weakly arcuate, provided with numerous short and a few long setae. Eighth sternite very small, distinctly transverse, almost 1/3 the length of median lobe, with apical margin almost transverse, deeply concave at middle.

Female genitalia. Coxite lobe ovoid, scattered with short and long setae. Stylus almost half in length to coxite lobe, elongate, weakly dilated apicad. Bursa copulatrix small, weakly constricted near base. Spermatheca narrow, gently arcuate, weakly broadened apicad; gland thin, attached near apical third; duct thin, strongly coiled throughout.

Specimens examined. 1♀ (holotype), Hatsuno, Amami-Ōshima, 10–VII–1962, N. Ohbayashi leg. (EUMJ); 2♀♀, Hatsuno, Amami-Ōshima Is., Kagoshima Pref., 28–VI–1970, K. Sakai leg.; 1♂, 1♀, same locality, 24–VI–1970, T. Kobayashi leg.; 1♂, 1♀, same locality, 19–VI–1971, H. Yokoyama leg.; 1♂, same locality and collector, 29–VI–1971; 1♀, same locality and collector, 30–VI–1971; 1♀, same locality, 6–VII–1973, M. Ito leg.; 1♂, same locality, 6–VII–1975, K. Kuzugami leg.; 1♂, Chûô-Rindô, Naze City, Kagoshima Pref., 30–VI–2001, T. Kurihara leg.; 1♀, Ôganeku, Yamato Village, Ōshima Gun, Kagoshima Pref., 30–VI–2003, T. Kurihara leg.

Geographical distribution. Amami Isls. (Amami-Ōshima Is.), Ryukyus, Japan.

Comments. The nominotypical subspecies of *A. nobuoi* Ohbayashi is endemic to the Amami-Ōshima Isls., mid-Ryukyus of Southwest Japan. The adult beetles mainly

appear in summer between mid June and early July, and are often found on tree blossoms. The larvae bore in freshly dead twigs of *Rhaphiolepis indica* var. *umbellata* and *Machilus thunbergii* (Niisato, 2007). Though not so rare until 1970's, only a few specimens of *A. nobuoi nobuoi* have been collected since the 1980's. This clytine has been recently treated as "Data Deficient", a category of endangered animals in the Japanese Red Data Book (Ministry of the Environment, Japan, 2007).

This species is somewhat similar in external morphology to *A. setiger* sp. n. from Taiwan, but can be easily distinguished from the latter by the elytra lacking erect long pale hairs and quite different structure of the male genitalia.

***Amamiclytus nobuoi akusekianus* Niisato, 2005**

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

Fig. 8

Amamiclytus nobuoi akusekianus Niisato 2005: 383, figs 1a, b, 2b, d, f; type locality: Akuseki-jima Is., Tokara Isls., N. Ryukyus, Kagoshima Pref., Japan.

Description. Differentiated from the nominotypical subspecies from Amami-Ōshima Is. by the following features: 1) antennae and legs yellowish brown, instead of chocolate brown; 2) legs shorter, with hind femora not reaching elytral apices even in ♂; 3) tergite 8 gently arcuate at apical margin instead of transversely truncate; 4) median lobe longer and more slender, with apical part narrowed in straight line to the extremity and well exposed in ventral view.

Specimens examined. 1♂ (holotype) (NMNS), 1♀ (paratype), Akuseki-jima Is., Tokara Isls., N. Ryukyus, Kagoshima Pref., Japan, host collected on 16-17-II-1986, emerged out on 5-VII-1986, K. Mori leg.; 1♂ (paratype), same data as the preceding but on 12-VI-1986; 1♂ (paratype), same locality as the holotype, emerged on 5-VI-1987.

Geographical distribution. Tokara Isls. (Akuseki-jima Is.), Ryukyus, Japan.

***Amamiclytus subnitidus* Holzschuh, 1984**

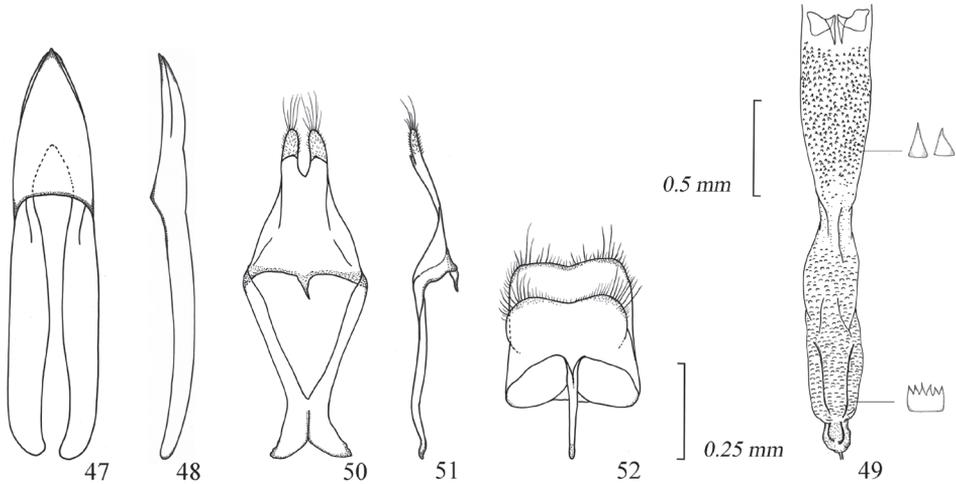
http://species-id.net/wiki/Amamiclytus_subnitidus

Figs 1, 5, 9-12, 26-33, 35, 47-52

Amamiclytus subnitidus Holzschuh, 1984: 358, fig. 6; type locality: Formosa, Takao Hsien, Laopi.

Amamiclytus hirtipes: Kojima et al. 1965: 74; Yu et al. 2001: 97, pl. 14, fig. 22; Chou 2004: 207.

Description. Male and female. Body length (from vertex to elytral apices) 3.2-5.1 mm in ♂, 3.7-5.3 mm in ♀. Colour black, more or less glossy in general, distinctly so on elytra, dark brown on antennae, meso- and metathoraces, abdomen, brown on legs



Figures 47–52. Male genitalia of *Amamiclytus subnitidus* Holzschuh: **47** Median lobe, ventral view **48** ditto, lateral view **49** endophallus **50** tegmen, ventral view **51** ditto, lateral view **52** abdominal segment 8, ventral view.

except for yellowish-brown tarsi, mouthparts, except for black mandibles, yellowish-brown. Body sparsely clothed with fine pale pubescence, with a few erect long pale hairs on genae, pronotum, pro- and mesosterna, abdominal ventrites, and along undersides of mid and hind legs except for tarsi; head sparsely clothed with pale hairs, and moderately with pale gray pubescence on frons and genae in ♂, sparsely so in ♀; antennae with long pale brown hairs along undersides of segments 2–4; pronotum thinly pubescent, sparsely with erect long pale hairs, *Pb* at sides transverse, slightly narrowed inwards; scutellum thinly with pale pubescence; elytra rather thinly with pale pubescence, without erect, long, pale hairs, *B* around scutellum rather densely pubescent, *S* absent, *La* on basal fourth semicircular, distinctly oblique, *Lp* on apical 2/5, almost complete, relatively narrow, slightly arcuate, *A* along apical margin densely pubescent; ventral surface with *Ps* dense near basal 2/3, *Msl* and *Mss* distinct, *Mta* dense along posterior margin of metasternum except near middle, distinctly dense and entire on apical 2/3 of metepisternum; *V1* and *V2* at sides dense, narrow to middle, *V3* feebly present at sides near apical margin, though sometimes disappeared.

Head across eyes almost as wide as pronotum, HW/PW 0.91–1.13 (M 0.99) in ♂, 0.83–1.00 (M 0.91) in ♀; frons distinctly wide, about 1.7 times as wide as long, arcuately dilated apicad, with a fine shallow smooth median line, closely roughly punctured; clypeus slightly convex; vertex raised towards antennal cavities which are separated each other by 2/5 the width of occiput; occiput distinctly convex, feebly sparsely punctured. Antennae thin and long, gradually thickened apicad, attaining apical fifth in ♂ or 2/5 in ♀ of elytra; 3rd segment 1.5–2.0 times as long as 4th segment, terminal segment elongate in ♂.

Pronotum rather distinctly longer than wide, completely arcuate at sides; PL/PW, 1.05–1.33 (M 1.21) in ♂, 1.00–1.33 (M 1.15) in ♀, PB/PA 0.82–1.08 (M 0.95) in

♂, 0.92–1.00 (M 0.95) in ♀, EL/PL 2.36–3.27 (M 2.80) in ♂, 2.67–3.30 (M 2.95) in ♀, PW/EW 0.76–0.95 (M 0.84) in ♂, 0.68–0.80 (M 0.74) in ♀; disc moderately convex though slightly depressed above, provided with large shallow punctures. Scutellum regularly triangular, slightly acute at apex.

Elytra moderate in length, rather slender, EL/EW 2.58–3.13 (M 2.83) in ♂, 2.27–2.70 (M 2.51) in ♀; sides rather strongly rounded at humeri, gently arcuate at a level between basal fourth and apical half, then gently arcuate and narrowed to apices which are oblique, without any dent at inner and outer angles; disc evenly convex, sparsely provided with deep, more or less coarse punctures.

Ventral surface almost smooth, provided with a few coarse punctures on prosteronum, minute ones on meso- and metathoraces and abdomen; ♂ anal ventrite 3/10 the length of basal width, truncate at apical margin.

Legs slender, relatively long; hind legs 1.5–2.0 times as long as elytra, with femur strongly swollen in apical half, and exceeding elytral apices at apical fifth, 1st tarsal segment 1.7–2.4 times as long as the following two segments combined.

Male genitalia. Median lobe about 1/3 the length of elytra moderately elongate and slender; ventral plate almost equal in width to or slightly shorter than ventral plate, gently narrowed to apex which is rounded; ventral plate almost parallel-sided near basal 2/5 then strongly narrowed to apex which is distinctly, strongly pointed at the extremity, weakly reflex in profile; median struts long and slender, almost 7/10 the length of median lobe. Endophallus densely provided with minute and medium-sized spinous spicules behind crescent-like sclerites at a level between basal 3/10 and 3/5, densely covered with minute serrate spicules on apical fourth. Tegmen slightly elongate, distinctly shorter than median lobe; parameres wide, slightly elongate, nearly half the length of tegmen, divided in apical third, gently arcuate in external margins, arcuately emarginate in inner margins, almost rounded at apices which are provided with numerous short and long setae; basal ridge moderately raised; ring part gently narrowed to apex which is widely expanded. Eighth tergite slightly elongate, almost quadrate, slightly dilated apicad in apical 2/5, apical margin weakly emarginate, provided with numerous short and a few long setae. Eighth sternite transverse, about 1/4 the length of median lobe, slightly emarginate at apical margin, strongly prominent at the middle of basal margin.

Female genitalia. Coxite lobe ovoid, scattered with four or five short setae. Stylus almost equal in length to coxite lobe, more or less elongate, gently dilated apicad. Bursa copulatrix large, distinctly constricted in basal half. Spermatheca, narrow, weakly arcuate; gland attached just behind apex; duct thin and strongly coiled throughout.

Specimens examined. 1♂ (holotype), Formosa, Takao Hsien, Laopi, 6–IV–1978, Kezuka leg. (Holzschuh coll.). [Taoyuan County, N. Taiwan] 2♂♂, 1♀, near Mt. Lala Shan, Fuxing Township, 12–V–1978, T. Shimomura leg.; 1♂, same locality, 28–VI–1979, J.-J. Luo leg.; 2♂♂, Sihleng, Fuxing Township, 26–IV–1982, N. Ohbayashi leg. [Hsinchu County, N. Taiwan] 1♂, Dalu Forest Road, Wufeng Township, alt. 1,400m, 5–IV–1994, C.-C. Chen leg.; 2♂♂, 2♀♀, same locality and collector, 24–IV–1994; 2♂♂, same locality, alt. 1,100–1,400m, 18–V–2002, Y.-L. Lin leg.; 2♀♀, same locality and collector, 7–VII–2004; 1♂, 1♀, same locality and collector, 24–V–

2009; 1♂, 1♀, same locality, East Feeder, 27–28–VI–2003, D.-I. Hwang leg.; 4♂♂, 1♀, Mt. Lidong Shan, Jianshi Township, alt. 1,400m, 22–V–2005, Y.-L. Lin leg.; 1♀, Yufong, Jianshi Township, alt. 800m, 4–IV–2009, Y.-L. Lin leg. [Taichung County, C. Taiwan] 2♂♂, Deji Reservoir, Heping Township, 30–IV–1982, N. Ohbayashi leg.; 3♂♂, 2♀♀, Mt. Anma Shan, Heping Township, 5–28–VI–2002, N. Ohbayashi leg.; 1♂, 1♀, Siangyang-Liyuan, alt. 1,793–2,250m, 8–VII–2005, S.-T. Hisamatsu leg.; 1♀, Lilengsi Forest Road, Heping Township, alt. 1,700m, 25–IV–2000, W.-I. Chou leg. [Nantou County, C. Taiwan] 1♀, Cueifong, Ren'ai Township, 5–VI–1976, T. Matsumoto leg.; 1♂, Meifong, Ren'ai Township, 7–V–1973, K. Matsuda leg.; 1♂, 1♀, same locality, 27–IV–1977, S. Saito leg.; 1♀, Songgang-Meifong, Ren'ai Township, 3–V–1977, J. Ito leg.; 1♂, Meiyuan, Ren'ai Township, 20–IV–1995, M. Hayashi leg.; 3♂♂, same locality, 28–IV–1995, M. Yagi leg.; 1♀, Nanshansi, Ren'ai Township, 17–IV–1977, W. Suzuki leg.; 1♀, same locality, 13–IV–1978, M. Ito leg.; 1♂, same locality, 24–III–1979, T. Ito leg.; 1♂, same locality and collector, 21–IV–1982; 1♀, same locality, 31–III–1980, M. Yagi leg.; 1♂, 1♀, same locality, 28–30–III–1981, H. Torigai leg.; 1♂, 1♀, Lianhuachih, Yuchi Township, 16–III–1978, J. Ito leg.; 1♀, same locality, 25–III–1980, K. Matsuda leg.; 13♂♂, 6♀♀, same as the preceding but 27–III–1980; 1♀, Sun moon Lake, Yuchi Township, 9–IV–1978, M. Ito leg.; 1♂, same locality, 13–V–1996, C.-K. Yu leg.; 1♀, same locality, alt. 800m, 3–IV–2000, Y.-L. Lin leg.; 2♂♂, 1♀, Bilyusi, Ren'ai Township, alt. 2,200m, 12–V–2002, Y.-L. Lin leg.; 1♂, same locality, 15–V–2007, C.-C. Chen leg.; 3♂♂, Mt. Guandao Shan, alt. 1,500m, Ren'ai Township, 12–V–1984, J.-J. Luo leg.; 1♀, same locality, 23–V–1985, M. Yagi leg.; 1♀, same locality and collector, 20–IV–1986; 1♀, same locality, 5–V–1985, K. Kusama leg.; 2♂♂, same locality, 12–V–2007, Y.-L. Lin leg.; 2♂♂, 1♀, Gaofeng, Ren'ai Township, 22–III–2007, native collector leg.; 2♂♂, 1♀, same locality, 5–V–2009, J.-J. Luo leg. [Hualien County, E. C. Taiwan] 1♀, Bilyu, Xiulin Township, 8–V–1977, S. Saito leg.; 1♂, 1♀, same locality, 2–VI–1978, M. Ito leg.; 2♂♂, 1♀, same locality and collector, 9–VI–1978; 3♂♂, same locality and collector, 13–VI–1978; 3♂♂, same locality and collector, 14–VI–1978; 9♂♂, 1♀, same locality and collector, 15–VI–1978; 1♂, same locality and collector, 17–V–1978. [Chiayi County, S. Taiwan] 1♀, Jhaoping, Alishan Township, 9–VI–1938, Y. Yano leg. [Kaohsiung County, S. Taiwan] 1♀, Shanping, Maolin Township, 30–III–1978, K. Matsuda leg.; 1♂, Mt. Nanfenshan, Liouguei Township, 22–IV–1985, W.-R. Chen leg.; 2♂♂, 1♀, Tengjihih, Taoyuan Township, alt. 1,400m, 28–III–2007, Y.-L. Lin leg. [Pingdong County, S. Taiwan] 1♂, Siaogwei Lake, Wutai Township, alt. 1,500m, 2–V–1998, C.-C. Chen leg.; 1♂, 1♀, Mt. Dahan Shan, Chunri Township, alt. 1,200m, 21–IV–2005, Y.-L. Lin leg.; 1♂, same locality and collector, 13–IV–2009; 1♂, 1♀, same locality and collector, 5–V–2009.; 1♀, same locality, 16–IV–2007, T. Niisato leg.; 1♂, same locality and collector, 5–V–2009; 7♂♂, 1♀, same locality and collector, 3–V–2009. 1♂, Tiantizo, 1–VIII–1976, K. Matsuda leg.

Geographical distribution. Taiwan.

Comments. *Amamiclytus subnitidus* Holzschuh is closely related in external morphology and pubescent maculation to *A. setiger* sp. n., but is clearly separable from

the latter by the sparsely pubescent pronotum, the absence of erect long pale hairs on elytra, and the transverse frons which is 1.7 times as wide as long instead of being as wide as long. These two species are also easily distinguished by the male genitalia. This species has the elongate median struts which are about 7/10 the length of the median lobe, and has a rather strongly expanded base of the ring part of the tegmen.

The population from Bilyu, Xiulin Township in east-central part of the central mountains of Taiwan, shows a slight colour variation in antennae and legs which are clearly pale brown, but other characteristics agree quite well with the populations from other localities.

This is the most common species from the genus in Taiwan, and widely recorded from various localities north to south on the island. The adult beetles appear from early spring to early summer (March to June), and visit various tree blossoms.

***Amamiclytus setiger* sp. n.**

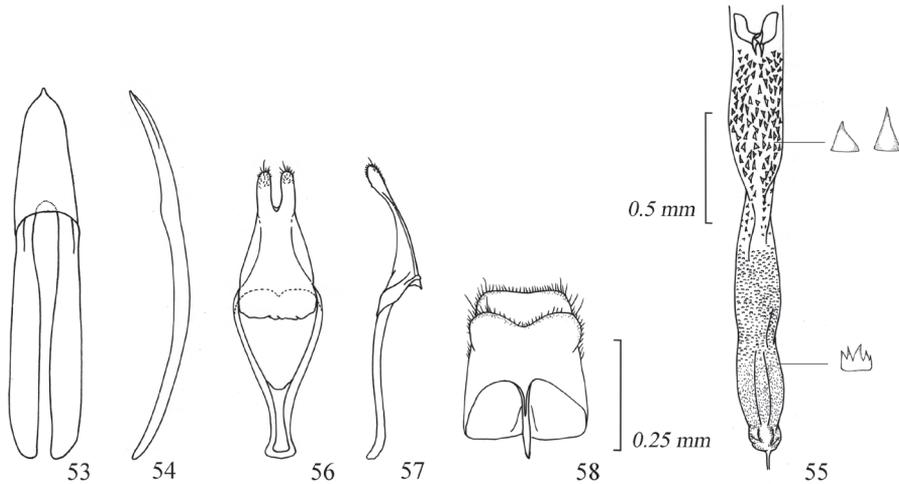
urn:lsid:zoobank.org:act:6ADAC35E-EE09-4256-8266-11B65684FB54

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

Figs 13–14, 36, 53–58

Description. Male and female. Body length (from vertex to elytral apices) 3.3–4.4 mm in ♂, 3.6–4.2 mm in ♀. Colour nearly same as *A. subnitidus*, though strongly glossy. Hairs almost as in *A. subnitidus*, though partly, sparsely provided with erect long pale hairs, especially on elytra and hind tibia; head sparsely with pale hairs, very thinly with pale gray pubescence on frons in both sexes; *Pb* as in *A. subnitidus*, though sparser; scutellum completely bare; elytra thinly with pale short pubescence, provided with a few erect very long pale hairs, with maculation almost as in *A. subnitidus*, though *B* and *Lp* more sparse; venter of thoraces basically similar to that of *A. subnitidus*, though *P*₃ more sparse near basal half, *Mta* dense and entire on apical third of metepisternum; *V1–V3* almost as in *A. subnitidus*; hind tibia densely with erect long pale hairs.

Head similar to *A. subnitidus*, though frons almost as wide as long, slightly convex, with a weaker median line, clypeus almost flattened; HW/PW 0.93–1.08 (M 0.99) in ♂, 0.80–0.94 (M 0.89) in ♀. Antennae similar to *A. subnitidus*, attaining apical 2/5 in ♂ or half in ♀ of elytra; 3rd segment 1.3–1.8 times as long as 4th segment, terminal segment more or less elongate in ♂. Pronotum almost as in *A. subnitidus*, rather strongly arcuate near middle of sides; PL/PW 1.07–1.38 (M 1.25) in ♂, 1.06–1.13 (M 1.10) in ♀, PB/PA 0.92–1.00 (M 0.99) in ♂, 0.92–0.93 (M 0.93) in ♀, EL/PL 2.36–3.29 (M 2.75) in ♂, 2.44–2.89 (M 2.71) in ♀, PW/EW 0.80–0.88 (M 0.83) in ♂, 0.71–0.95 (M 0.86) in ♀; disc distinctly convex though depressed above, provided with large shallow punctures. Scutellum as in *A. subnitidus*. Elytra almost as in *A. subnitidus*, though rather slender, scattered with a few medium-sized punctures, with apices weakly acute at external angles; EL/EW 2.60–3.06 (M 2.85) in ♂, 1.83–2.94 (M 2.59) in ♀. Ventral surface almost as in *A. subnitidus*, though sparsely punctured on abdomen; anal ventrite 2/5 the length of basal width in ♂, slightly arcuate at apical margin. Legs similar to *A.*



Figures 53–58. Male genitalia of *Amamicytus setiger* sp. n.: **53** Median lobe, ventral view **54** ditto, lateral view **55** endophallus **56** tegmen, ventral view **57** ditto, lateral view **58** abdominal segment 8, ventral view.

subnitidus, though femur more strongly swollen in apical half, with 1st tarsal segment 1.7–2.3 times as long as the following two segments combined.

Male genitalia. Basically similar to that of *A. subnitidus*, though median lobe larger and more slender, nearly $3/5$ the length of elytra. Median lobe moderately elongate; dorsal plate almost equal in width to or a little shorter than ventral plate, distinctly narrowed to apex which is bluntly prominent; ventral plate almost parallel-sided near basal sixth then gently narrowing to apex, and strongly narrowed to near apical fourth, which is very prominent at the extremity, weakly reflexed in profile; median struts long and slender, almost $3/5$ the length of median lobe. Endophallus densely provided with medium-sized spinous spicules behind crescent-like sclerites at a level between basal $3/10$ and $3/5$, densely covered with minute notched spicules on apical third. Tegmen more or less elongate, distinctly shorter than median lobe; parameres moderately wide, slightly elongate, almost half the length of tegmen, divided in apical third, gently arcuate in external margins, arcuately emarginate in inner margins, almost rounded at apices which are provided with short and a few long setae; basal ridge moderately raised; ring part almost parallel in basal $2/5$. Eighth tergite almost quadrate, gently narrowed to apex in apical $3/5$, almost transverse at apical margin, provided with numerous short setae. Eighth sternite transverse, almost $1/5$ the length of median lobe, distinctly emarginate at apical margin.

Female genitalia. Almost as in *A. subnitidus*, though bursa copulatrix weakly constricted in basal half, spermathecal duct more strongly coiled in apical half.

Type series. Holotype ♂, Dalu Forest Road, Wufeng Township, alt. 1,400m, Hsinchu County, N. Taiwan, 5–IV–1994, C.-C. Chen leg. Allotype ♀, Yufong, Jianshi Township, alt. 800m, Hsinchu County, N. Taiwan, 19–IV–2002, Y.-L. Lin leg. Para-

types (17♂♂, 8♀♀): [Taoyuan County, N. Taiwan] 1♀, Shan-Paling, Fuxing Township, 24-V-1988, native collector leg. [Hsinchu County, N. Taiwan] 1♂, same data as the allotype; 1♂, same data as the holotype; 1♂, same locality, alt. 1,100-1,400m, 27-VII-2004, Y.-L. Lin leg. [Taichung County, C. Taiwan] 1♀, "Mt. DaKeng, Beitun District", 16-V-1941, K. Seki leg. [Nantou County, C. Taiwan] 5♂♂, 3♀♀, Gaofeng, alt. 1,300m, Ren'ai Township, 8-VII-2007, N. Ohbayashi leg.; 2♂♂, Tseifong, Ren'ai Township, 1-V-1981, K. Kinugasa leg.; 1♂, Mt. Guandao Shan, Ren'ai Township, alt. 1,500m, 5-V-1985, K. Kusama leg.; 1♀, same locality, 6-VI-1995, S. Tsuyuki leg.; 1♂, 1♀, Nanshanshi, Ren'ai Township, 15-IV-1972, K. Matsuda leg. [Kaohsiung County, S. Taiwan] 1♂, Fengshan, 23-V-1977, K. Ushizima leg.; 1♂, same locality and date, W.-L. Chen leg. [Formosa] 2♂♂, 1967, no further data; 1♀, 1967, no further data; 1♂, 1969, no further data. Holotype and allotype are preserved in NMNS, and paratypes are in EUMJ, HUM, MMNS, NHMO and the private collections of the above collectors.

Geographical distribution. Taiwan.

Comments. *Amamiclytus setiger* sp. n. is a distinctive species in having a very glossy body with erect, long, pale hairs especially on the elytral surface, and easily distinguished from the other members of the Taiwanese *Amamiclytus*. Concerning the morphology of male genitalia, this new species and *A. subnitidus* Holzschuh share several structures such as the distinctly long median struts, the ratio of the length between parameres and tegmen which is nearly half in length, similar forms of abdominal segment 8, and the similar pattern of spinous spicules behind crescent-like spicules on the endophallus. In female genitalia, the two species also have similar structure as shown in the above description. Therefore, these two species seem to form a species-group among the Taiwanese members of the genus.

This new species mainly appears in the summer season since most of the type series were collected in July, except for several paratypes collected in April and May.

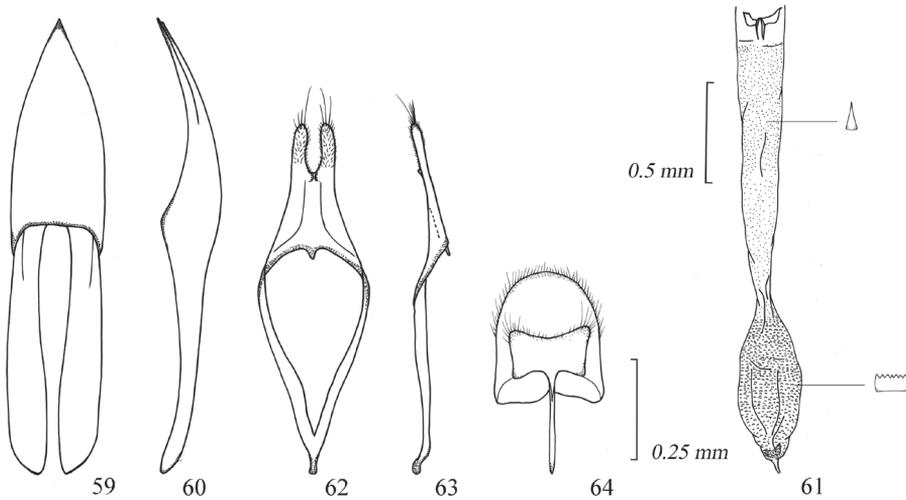
***Amamiclytus nubilus* sp. n.**

urn:lsid:zoobank.org:act:2AFA6B4C-76CA-4AA1-A054-BE3DFFB395CF

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

Figs 15–16, 37, 59–64

Description. Male and female. Body length (from vertex to elytral apices) 3.6–4.5 mm in ♂, 4.0–5.2 mm in ♀. Colour almost as in *A. subnitidus*, though distinctly mated in general. Body densely clothed with fine pale pubescence, partly with erect, long, pale hairs especially dense on mid and hind tibiae; head moderately with pale hairs, rather densely with pale gray pubescence on frons in ♂, sparsely in ♀; antennae moderately with pale pubescence, with long pale brown hairs on undersides of segments 2–5; pronotum rather densely with pale pubescence, with erect, long, pale hairs, *Pb* conspicuous; scutellum rather thinly with pale pubescence; elytra densely with light brown pubescence throughout, without erect, long, pale hairs, *B* absent, *S* on basal tenth dense and elongate, *La* on basal third strongly arcuate, slightly oblique, *Lp* on



Figures 59–64. Male genitalia of *Amamiclytus nubilus* sp. n.: **59** Median lobe, ventral view **60** ditto, lateral view **61** endophallus **62** tegmen, ventral view **63** ditto, lateral view **64** abdominal segment 8, ventral view.

apical 2/5 almost complete, narrow, distinctly oblique, *A* distinct though rather narrow; prosternum densely with white pubescence near basal 2/3, *Msl* and *Mss* distinct, *Mta* dense and enlarged on entire of metepisternum; *V1–V4* dense, narrow to middle, though *V3–V4* sometimes sparse; fore and mid legs with pale gray pubescence, especially dense on femora.

Head almost as wide as pronotum, HW/PW 0.89–1.00 (M 0.99) in ♂, 0.89–1.00 (M 0.95) in ♀; frons as long as wide, arcuately dilated apicad, with a thin weak smooth median line, finely sparsely punctured; clypeus slightly convex; vertex raised towards antennal cavities which are separated from each other by half the width of occiput; occiput distinctly convex, sparsely punctured. Antennae thin and long, gradually dilated apicad, attaining apical half in ♂ or 3/5 in ♀ of elytra; 3rd segment 1.3–2.0 times as long as 4th segment, terminal segment short, rounded at apex in ♂.

Pronotum slightly or moderately longer than wide, weakly arcuate at sides; PL/PW, 1.13–1.38 (M 1.25) in ♂, 1.10–1.29 (M 1.19) in ♀, PB/PA 1.00–1.00 (M 1.00) in ♂, 1.00–1.06 (M 1.01) in ♀, EL/PL 2.45–3.22 (M 2.80) in ♂, 2.69–3.00 (M 2.86) in ♀, PW/EW 0.75–0.90 (M 0.84) in ♂, 0.75–0.83 (M 0.79) in ♀; disc moderately convex, provided with large shallow punctures. Scutellum regular triangular, acute at apex.

Elytra relatively long and slender; EL/EW 2.70–3.18 (M 2.94) in ♂, 2.50–2.83 (M 2.68) in ♀; sides distinctly rounded at humeri, gently arcuate at a level between basal fifth and apical half, then gently arcuate and narrowed to apices which are oblique, slightly arcuate at margins, minutely acute at outer angles; disc evenly convex, densely provided with fine shallow punctures.

Ventral surface almost smooth, provided with a few coarse punctures on prosteronum, with minute punctures on meso- and metathoraces, and abdomen; anal ventrite in ♂, $3/5$ the length of basal width, moderately arcuate at apical margin.

Legs slender, relatively long; hind legs 1.5–1.8 times length of elytra, with femur weakly swollen in apical half, exceeding elytral apices at apical fifth, 1st tarsal segment 1.5–2.0 times as long as the following two segments combined.

Male genitalia. Median lobe nearly $2/5$ the length of elytra, wide, moderately elongate; ventral plate almost equal in width to, or a little shorter than ventral plate, gently narrowed to apex which is bluntly rounded; ventral plate almost parallel-sided near basal half then more or less strongly narrowed to apex which is distinctly pointed at the extremity, weakly reflexed in profile; median struts elongate, almost half the length of median lobe. Endophallus densely provided with minute spinous spicules behind crescent-like sclerites from basal $1/5$ to $3/5$, densely covered with minute serrate sclerites on apical third. Tegmen more or less elongate, distinctly shorter than median lobe; parameres elongate, slightly slender, nearly $2/5$ the length of tegmen, divided in apical third, with lobe gently arcuate in external margin, arcuately emarginate in inner margin, almost rounded at apices which are provided with numerous short and a few long setae; basal ridge moderately raised, gently convergent to apex. Eighth tergite slightly elongate, semicircular, gently convergent to apex in apical half, with apical margin weakly arcuate, provided with numerous short setae. Eighth sternite more or less small, distinctly transverse, gently emarginate at apical margin.

Female genitalia. Coxite lobe ovoid, sparsely provided with short and long setae. Stylus almost half of length of coxite lobe, elongate, gently dilated apically. Bursa copulatrix small, strongly constricted in basal $2/3$. Spermatheca slightly narrow, strongly arcuate; gland thin, attached at apical $2/5$; duct more or less thin, slightly sinuate, not coiled.

Type series. Holotype ♂, Sinsian, Wulai Township, Taipei County, alt. 300m, N. Taiwan, 4-III-2000, Y.-L. Lin leg. Allotype ♀, Lianhuachih, Yuchi Township, Nantou County, C. Taiwan, 20-III-1978, J. Ito leg. Paratypes (54♂♂, 23♀♀): [Taipei County, N. Taiwan] 1♂, Wulai, 21-II-2004, Y.-L. Lin leg.; 1♀, Sinsian, Wulai Township, alt. 300m, 11-III-2000, Y.-L. Lin leg.; 1♂, Fushan, Wulai Township, 21-III-1998, M. Sakai leg. [Taoyuan County, N. Taiwan] 3♂♂, Sule, Fuxing Township, 26-III-1979, T. Ito leg.; 1♂, same locality and collector, 28-III-1979; 6♂♂, 1♀, Sihleng, Fuxing Township, 26-IV-1982, N. Ohbayashi leg.; 1♂, same locality and collector, 28-IV-1982; 1♀, Baling, Fuxing Township, 31-III-1998, M. Sakai leg.; 1♀, Ronghua, Fuxing Township, 15-III-1998, C.-C. Chen leg.; 3♂♂, same locality, alt. 500m, 3-III-2002, Y.-L. Lin leg.; 6♂♂, Ronghua, Fuxing Township, alt. 500m, 27-III-2003, Y.-L. Lin leg.; 3♂♂, 1♀, Gaoyi, Fuxing Township, alt. 500m, 21-IV-2007, Y.-L. Lin leg. [Hsinchu County, N. Taiwan] 1♀, Dalu Forest Road, Wufeng Township, 17-IV-1994, C.-C. Chen leg.; 1♂, 1♀, same locality, alt. 1,100–1,400m, 24-III-2007, Y.-L. Lin leg.; 1♂, same locality and collector, 15-III-2009; 1♀, same locality and collector, 1-IV-2009.; 1♂, 1♀, Shihlei, Jianshi Township, 6-III-2010, Y.-L. Lin leg. [Nantou County, C. Taiwan] 10♂♂, 2♀♀, Lianhuachih, Yuchi Town-

ship, 16–III–1978, J. Ito leg.; 5♂♂, 1♀, same locality and collector, 17–III–1978; 1♂, same locality and collector, 18–III–1978; 1♀, Gaofeng, Ren'ai Township, alt. 1,300m, 5–V–2009, J.-J. Luo leg.; 1♀, Nanshansi, Ren'ai Township, 30–III–1972, K. Matsuda leg.; 1♂, same locality, 19–III–1978, J. Ito leg.; 1♂, same locality and collector, 22–III–1978; 1♀, same locality and collector, 26–III–1978; 1♂, 1♀, same locality, 11–IV–1978, M. Ito leg.; 1♂, 1♀, same locality and collector, 14–IV–1978; 1♂, same locality and collector, 29–IV–1978; 1♂, 1♀, same locality, 19–III–1978, C.-K. Yu leg.; 1♂, same locality, 17–III–1979, T. Ito leg.; 2♀♀, same locality and collector, 24–III–1979; 1♀, same locality, 28–III–1980, M. Yagi leg.; 1♀, same locality, 3–IV–1981, Y. Yamamoto leg. [Hualien County, E. C. Taiwan] 1♂, Bilyu, Xiulin Township, 2–VI–1978, M. Ito leg. [Kaohsiung County, S. Taiwan] 1♂, 8–III–1978, J. Ito leg.; 1♀, same collector, Wetuan, Liugui Township, 7–III–1978. [Pingdong County, S. Taiwan] 1♂, Mt. Dahan Shan, Chunri Township, 1–III–2007, T. Yoro leg. Holotype and allotype are preserved in NMNS, and paratypes are in EUMJ, HUM, MMNS, NHMO and the private collections of the above collectors.

Geographical distribution. Taiwan.

Comments. In having the matted body with similar pattern of white pubescent maculation on the elytra, *A. nubilus* sp. n. is somewhat similar to *A. juni* and *A. yulongi* spp. n. which will be subsequently described, but is clearly distinguished from these two congeners by the relatively elongate pronotum with white pubescent maculation along the basal margin. Considering the male genitalia, this new species has some relationship with *A. subnitidus* Holzschuh and *A. setiger* sp. n., but is clearly separable from them by markedly broadened median lobe and rather narrow ring parts of tegmen. Besides, it is very unique that this new species and *A. hirtipes* (Matsushita), comb. n. share an uncoiled duct in spermatheca of female genitalia in spite of strongly coiled ones in the other five species from Japan and Taiwan. The true affinity of *A. nubilus* is uncertain since the morphological convergence is recognized in both external and genitalic features between some sympatric species of the genus. It may be possible to consider that *A. nubilus* sp. n. has the closest relationship with *A. hirtipes* (Matsushita), comb. n. by their uncoiled duct of spermatheca.

Amamiclytus nubilus sp. n. is widespread over the entire island of Taiwan and is rather common among the Taiwanese members of the genus. Adult beetles are usually found on various kinds of tree blossoms in the spring season mainly from March to April.

***Amamiclytus juni* sp. n.**

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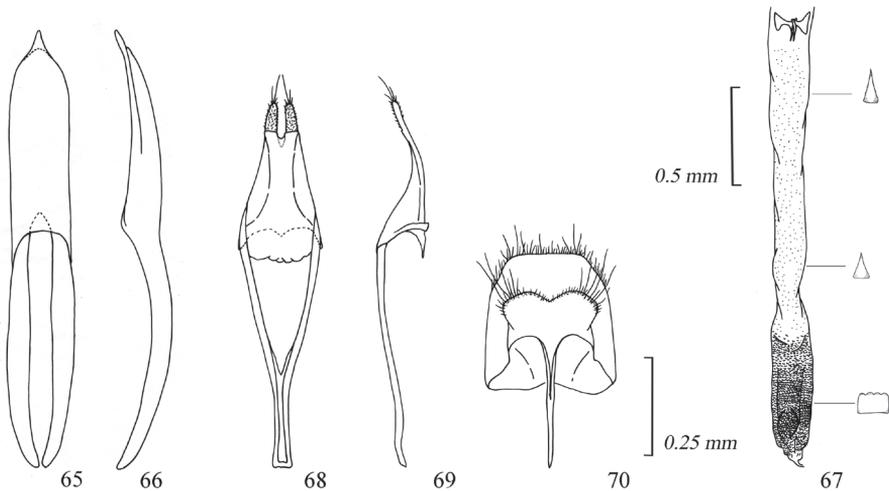
http://species-id.net/wiki/Amamiclytus_juni

Figs 17–18, 38, 65–70

Description. Male and female. Body length (from vertex to elytral apices) 3.40–4.70 mm in ♂, 3.70–5.20 mm in ♀. Colour black, more or less matted in general,

dark brown on antennae, meso- and metathoraces, abdomen and legs, yellowish brown on mouthparts except for black mandibles. Body densely clothed with fine pale pubescence especially on pronotum and ventral surface, sparsely with erect long pale hairs on clypeus, genae, pronotal base, prosternal process and abdominal ventrites, mid and hind femora; head sparsely with pale gray pubescence on frons in ♂, sparsely so on that of ♀; antennae with long pale brown hairs along undersides of segments 2–4; pronotum densely with pale gray pubescence except for middle of disc forming a vague oblong black spot, *Pb* absent; scutellum thinly with pale pubescence; elytra densely with light brown pubescence throughout, *B* absent, *S* on basal eighth longitudinally oblong, *La* on basal 2/5 obliquely arcuate, usually attaining *S*, *Lp* on apical 2/5 almost complete, narrow, slightly arcuate, *A* rather narrow; *Ps* sparse near basal 2/3, *Msl* distinct, *Mss* completely absent, *Mta* rather sparse along posterior margin of metasternum, dense and entire on apical half of metepisternum; *VI* widely separated at sides, dense though narrowed inwards, *V2* feeble and sometimes disappeared.

Head across eyes almost as wide as pronotum, HW/PW 0.81–0.94 (M 0.88) in ♂, 0.80–1.00 (M 0.89) in ♀; frons as long as wide, arcuately dilated apicad, with a thin feeble smooth median line, densely, finely punctured; clypeus slightly convex; vertex raised towards antennal cavities which are separated from each other by half the width of occiput; occiput distinctly convex, rather densely coarsely punctured. Antennae thin and relatively short, gradually thickened apicad, attaining apical 2/5 in ♂ or half in ♀ of elytra; 3rd segment 1.4–2.0 times as long as 4th segment, terminal segment rather short and rounded at apex in ♂.



Figures 65–70. Male genitalia of *Amamiclytus juni* sp. n.: **65** Median lobe, ventral view **66** ditto, lateral view **67** endophallus **68** tegmen, ventral view **69** ditto, lateral view **70** abdominal segment 8, ventral view.

Pronotum almost equal in length to the maximum width near middle, strongly arcuate at sides; PL/PW 1.00–1.20 (M 1.08) in ♂, 0.92–1.29 (M 1.05) in ♀, PB/PA 0.81–0.93 (M 0.88) in ♂, 0.81–1.18 (M 0.94) in ♀, EL/PL 2.64–3.00 (M 2.92) in ♂, 2.72–3.22 (M 2.97) in ♀, PW/EW 0.71–0.83 (M 0.78) in ♂, 0.68–0.85 (M 0.78) in ♀; disc slightly convex, almost flattened above, densely provided with fine shallow punctures. Scutellum regularly triangular, feebly acute at apex.

Elytra relatively short, EL/EW 2.25–2.75 (M 2.46) in ♂, 2.08–2.90 (M 2.40) in ♀; sides with strongly rounded humeri, gently arcuate at a level between basal and apical fourth, then arcuately narrowed to apices which are slightly arcuate, without any spine at outer or inner angle; disc almost evenly convex, though distinctly depressed near suture in basal fifth, densely provided with fine shallow punctures.

Ventral surface almost smooth, provided with a few coarse punctures on prosteronum, with densely minute punctures on meso- and metathoraces, and abdomen; anal ventrite in ♂, 2/5 the length of basal width, distinctly arcuate at apical margin.

Legs relatively short and slender; hind legs 1.4–1.6 times as long as elytra, with femur gradually swollen apicad, exceeding elytral apex at apical fifth, 1st tarsal segment 1.5–2.0 times as long as the following two segments combined.

Male genitalia. Median lobe almost 1/3 the length of elytra, slightly arcuate in profile; dorsal plate slightly wider than ventral plate in apical eighth, rounded at apex; ventral plate almost parallel-sided in basal 3/4 then strongly narrowed to apex which is sharply pointed at the extremity; median struts slender, almost half the length of median lobe. Endophallus largely sparsely provided with minute spinous spicules behind crescent-like sclerites, densely covered with minute crenulate spicules on apical fifth. Tegmen elongate, distinctly shorter than median lobe; parameres narrow, nearly 2/5 the length of tegmen, divided in apical third, with lobe moderately narrowed in weak arcuate line to apex, provided with numerous short setae and a few relatively long setae; basal ridge slightly raised; ring part almost approximate in apical 2/5. Eighth tergite elongate and quadrate, moderately narrowed from apical fourth to apex which is transversely truncate, provided with numerous short to long-sized setae. Eighth sternite distinctly narrower than 8th tergite, apical margin bi-arcuately rounded, triangularly concave near middle.

Female genitalia. Coxite lobe ovoid, provided with a few relatively long setae. Stylus elongate, almost 3/5 in length to coxite lobe, gently dilated apicad. Bursa copulatrix very large, almost circular, though strongly constricted in basal half. Spermatheca relatively narrow, moderately arcuate, bluntly pointed at apex; gland attached at apical third; duct thin, slightly sinuate in basal 2/3, coiled multiple times in apical third.

Type series. Holotype ♂, Ronghua, Fuxing Township, alt. 500m, Taoyuan County, N. Taiwan, 9–III–1997, C.-C. Chen leg. Allotype ♀, Nanshansi, Ren'ai Township, Nantou County, C. Taiwan, 21–III–1979, T. Ito leg. Paratypes (7♂♂, 22♀♀): [Taoyuan County, N. Taiwan] 1♂, 1♀, Sule, Fuxing Township, 26–III–1979, T. Ito leg. [Hsinchu County, N. Taiwan] 1♂, 3♀♀, Shihlei, Jianshi Township, 6–III–2010, Y.-L. Lin leg. [Hualien County, E. C. Taiwan] 1♀, Bilyu, Xiulin Township, 2,200m, 29–III–1981, T. Shimomura leg. [Nantou County, C. Taiwan] 1♀, same locality and

collector as the holotype, 17-III-1979; 2♂♂, 2♀♀, same locality, 19-III-1978, C.-K. Yu leg.; 1♀, same locality, 16-III-1978, J. Ito leg.; 1♀, same locality and collector, 17-III-1978; 1♂, 2♀♀, same locality and collector, 19-III-1978; 1♀, same locality and collector, 22-III-1978; 1♀, same locality and collector, 25-III-1978; 1♀, same locality and collector, 26-III-1978; 1♀, same locality, 26-III-1978, Y. Ito leg.; 1♀, same locality and collector, 31-III-1978; 1♀, same locality and collector, 28-III-1979; 1♀, same locality, 14-IV-1978, M. Ito leg.; 1♂, same locality, 21-III-1979, T. Ito leg.; 1♀, same locality, 11-IV-1985, J.-J. Luo leg.; 1♀, Tseifong, Ren'ai Township, 4-IV-1971, B.-S. Chang leg.; 1♀, Mt. Guandao Shan, Ren'ai Township, 14-IV-1973, J.-J. Luo leg. Holotype and allotype are preserved in NMNS, and paratypes are in EUMJ, HUM, MMNS, NHMO and the private collections of the above collectors.

Geographical distribution. Taiwan.

Comments. *Amamiclytus juni* sp. n. and the following new species, *A. yulongi* sp. n. are both short with rounded body with a similar pattern of white pubescence on pronotum, elytra and ventral surface. They form an isolated species group among the Taiwanese members of the genus. These two species are also similar in regards to the male genitalia, for instance, in median lobe with long and shapely pointed ventral plate which is well exposed from ventral view, short and simply pointed lobes of parameres.

Most of the type series of *A. juni* sp. n. were collected in early spring season in northern and central Taiwan nearly thirty years ago. According to our original field observations, this new species was not so rare and usually found on the blossoms of *Castanopsis* oak together with the other *Amamiclytus* species.

***Amamiclytus yulongi* sp. n.**

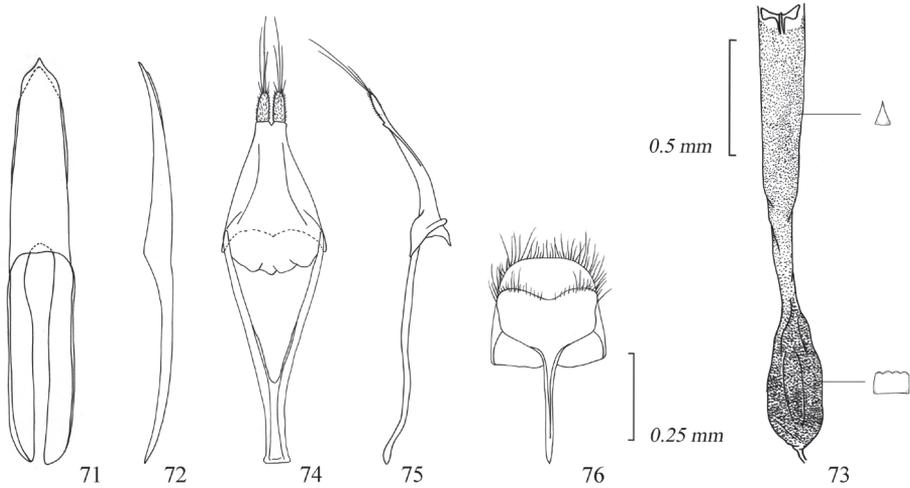
urn:lsid:zoobank.org:act:6FEFB8FD-B296-4BB1-BA4E-0DE85E94B814

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

Figs 19–21, 39, 71–76

Description. Male and Female. Body length (from vertex to apices of elytra) 4.0–4.7 mm in ♂, 4.9–5.1 mm in ♀. Colour almost as in *A. juni* sp. n., though more strongly glossy on elytra. Hairs and pubescence almost as in *A. juni* sp. n.; head more densely clothed with pale gray pubescence on frons in both sexes; antennae densely with pale pubescence on segments 4–11; pronotum thinly with pale hairs, sparsely with pale gray pubescence; elytra densely with light brown pubescence throughout, *B* very sparse, *S* on basal tenth relatively small and oblong, *La* on basal third semicircular, almost always isolated, rarely arcuate and attaining to *S*, *Lp* on apical 2/5 more or less narrow, almost transverse, *A* not so narrow; *Msl* and *Mss* distinct, *Mta* moderately pubescent, not so dense; *V1* as in *A. juni* sp. n., *V2* distinct, *V3* and *V4* sometimes disappeared.

Head almost as in *A. juni* sp. n., though more densely finely punctured, with a thin feeble median line on frons; HW/PW 0.80–0.94 (M 0.88) in ♂, 0.71–0.95 (M 0.86) in ♀. Antennae as in *A. juni* sp. n. Pronotum almost as in *A. juni* sp. n.; disc gently convex throughout, especially raised near middle of basal margin, with punctuation



Figures 71–76. Male genitalia of *Amamichlytus yulongi* sp. n.: **71** Median lobe, ventral view **72** ditto, lateral view **73** endophallus **74** tegmen, ventral view **75** ditto, lateral view **76** abdominal segment 8, ventral view.

deeper and slightly large; PL/PW 1.06–1.11 (M 1.09) in ♂, 0.92–1.33 (M 1.08) in ♀, PB/PA 0.93–1.00 (M 0.95) in ♂, 0.80–0.94 (M 0.88) in ♀, PW/EW 0.80–0.90 (M 0.85) in ♂, EL/PL 2.75–3.22 (M 2.93) in ♂, 2.57–3.40 (M 3.04) in ♀, 0.70–0.85 (M 0.79) in ♀. Scutellum as in *A. juni* sp. n. Elytra almost as in *A. juni* sp. n.; sides gently arcuate at a level between basal eighths and apical fourth; disc with sparse but more or less deep punctation; EL/EW 2.48–2.90 (M 2.71) in ♂, 2.34–2.83 (M 2.54) in ♀. Ventral surface almost as in *A. juni* sp. n., though more sparsely punctured on abdomen; anal ventrite in ♂ more or less triangularly produced at middle of apical margin. Legs almost as in *A. juni* sp. n., though exceeding elytral apices at apical tenth.

Male genitalia. Basically similar to those of *A. juni* sp. n., though median lobe more slender, with ventral plate not so strongly pointed apicad. Median lobe 1/3 the length of elytra, gently arcuate in profile; dorsal plate slightly wider than ventral plate in apical 3/5, distinctly narrowed to apex which is slightly pointed; ventral plate almost parallel-sided in basal 2/5 then gently narrowed to apex, and strongly narrowed to apical 1/12, which is sharply pointed at the extremity, shortly exposed from ventral view; median struts slender, almost half the length of median lobe. Endophallus densely covered with minute spinous spicules in apical fifth. Tegmen elongate, slightly shorter than median lobe; parameres relatively wide, nearly 2/5 the length of tegmen, divided in apical fifth, with lobe narrowed in gently arcuate line to apex, approximate and subparallel at inner margins, rather narrowly rounded at apex which is provided with

numerous short and a few very long setae; basal ridge slightly raised; ring part almost approximate and parallel in apical third. Eighth tergite elongated and quadrate, gently narrowed from apical 3/4 to apex which is gently arcuate, provided with numerous long setae. Eighth sternite transverse, nearly equal in width to 8th tergite, apical margin arcuately oblique towards middle.

Female genitalia. Almost as in *A. juni* sp. n., though bursa copulatrix smaller, semi-circular in apical 2/5, moderately narrowed in basal 3/5.

Type series. Holotype ♂, Dalu Forest Road, Wufeng Township, alt. 1,400-1,100m, Hsinchu County, N. Taiwan, 27-IV-2008, Y.-L. Lin leg. Allotype ♀, same data as the holotype. Paratypes (3♂♂, 10♀♀): [Taoyuan County, N. Taiwan] 1♀, Ronghua, Fuxing Township, 7-IV-1971, B.-S. Chang leg.; 1♀, Sihleng, Fuxing Township, 19-III-2000, 1♀, Y.-L. Lin leg. [Hsinchu County, N. Taiwan] 1♀, same locality and collector as the holotype, 19-IV-2008. [Yilan County, N. Taiwan] 1♀, Mingchih, Datong Township, 29-V-1978, J. Ito leg. [Nantou County, C. Taiwan] 1♂, Nanshansi, Ren'ai Township, 19-III-1978, C.-K. Yu leg.; 1♀, Mt. Guandao Shan, Ren'ai Township, alt. 1,500m, 5-V-1985, K. Kusama leg.; 1♂, Lianhuachih, Yuchi Township, 27-III-1980, K. Matsuda leg. [Hualien County, E. C. Taiwan] 1♀, Bilyu, Xiulin Township, 2,200m, 29-V-1978, Y. Oda leg. [Pingtung County, S. Taiwan] 1♀, Mt. Dahan Shan, Chunri Township, alt. 1,200m, 9-III-2006, Y.-L. Lin leg.; 1♂, same locality and collector, 1-III-2007; 1♀, same locality and collector, 9-III-2007; 1♀, Siaoguei Lake, Wutai Township, alt. 1,500m, 2-V-1998, C.-C. Chen leg.; 1♀, same locality and collector, 12-14-V-2008. Holotype and allotype are preserved in NMNS, and paratypes are in EUMJ, HUM, MMNS, NHMO and the private collections of the above collectors.

Geographical distribution. Taiwan.

Comments. *Amamiclytus yulongi* sp. n. is closely related in the external and genitalic morphology to *A. juni* sp. n., but it can be distinguished from the latter by strongly glossy body, more coarsely punctured pronotum, sparse white pubescence on elytral bases, dense minute spinous spicules on the endophallus, gently arcuate apical margin of 8th tergite and not so strongly constricted basal part of bursa copulatrix.

This new species is rather rare among the Taiwanese members of the genus, and sometimes found on the blossoms of *Castanopsis* and the other tree blossoms.

Four female paratypes show very peculiar variation in colour and pubescence as follows: 1) Body black with weak bluish tinge; 2) pronotum, elytra and ventral surface rather densely clothed with pale gray pubescence; 3) *S* and *La* completely joining; 3) *Lp* very wide, almost 4 times as wide as that of normal individuals, completely attaining both external and sutural margins; 4) *A* very wide, almost twice in width to that of normal individuals. These questionable specimens are completely consistent in both external and genitalic morphologies with the type series of *A. yulongi* sp. n. in spite of the peculiar external appearance.

***Amamiclytus hirtipes* (Matsushita, 1940), comb. n.**

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

Figs 4, 22–23, 24–25, 40, 77–82

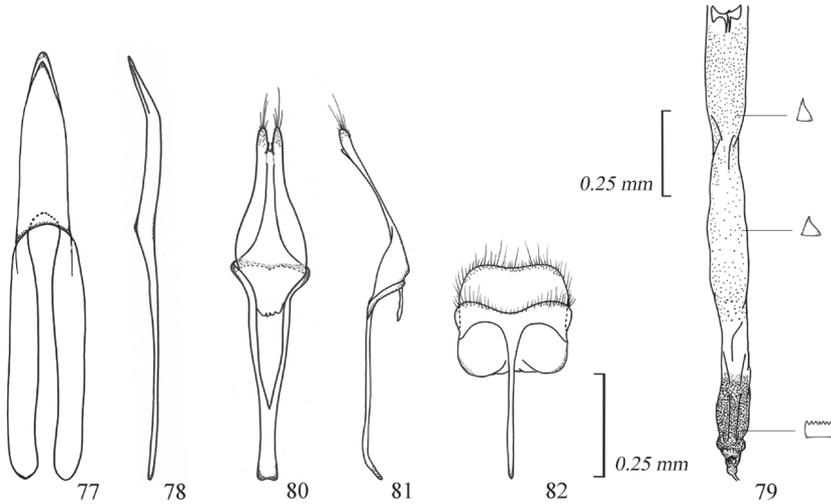
Rhaphuma hirtipes Matsushita, 1940: 52; type locality: Formosa (Hori).

Description. Male and Female. Body length (from vertex to apices of elytra) 4.0–5.8 mm in ♂, 4.4–6.0 mm in ♀. Large and slender species with more or less matted body, long antennae and legs. Colour black, relatively matted especially on elytra, more or less brownish on meso- and metathoraces, antennae and legs, yellowish brown on mouthparts except for black mandibles and anal ventrite. Body densely clothed with fine pale pubescence, sparsely with erect, long, pale hairs on undersides of fore femur, apical 2/5 of mid and hind femora, and all tibiae especially on hind pair; head thinly pubescent, scattered with a few erect, long, pale hairs, densely with pale gray pubescence on frons in ♂ and sparsely so in ♀; antennae with relatively long pale brown hairs along undersides of segments 3–5; pronotum thinly pubescent, largely exposing disc, without erect, pale hairs, rather sparsely with white pubescence at sides of basal margin, not formed conspicuous *Pb*; scutellum with a few pale pubescence; elytra rather densely with pale brown pubescence, without erect, pale hairs, *B* around scutellum relatively sparse, *S* on basal eighth small and longitudinally oblong, *La* on basal 3/10 semicircular, slightly oblique, *Lp* on apical 3/10 almost complete, narrow, weakly arcuate, *A* very narrow; prosternum sparsely with white pubescence near middle, *Msl* and *Mss* distinct, *Mta* rather sparse along posterior margin of metasternum, dense and entire on apical 2/3 of metepisternum; *V1* and *V2* at sides dense though narrowed to middle.

Head across eyes slightly narrower than pronotum, HW/PW 0.89–0.95 (M 0.93) in ♂, 0.85–0.95 (M 0.90) in ♀; frons as long as wide, arcuately dilated apicad, with a fine smooth median line, closely coarsely punctured; clypeus almost flattened; vertex raised towards antennal cavities which are separated from each other by 2/5 the width of occiput; occiput distinctly convex, closely reticulate. Antennae thin and long, not thickened apicad, attaining apical third in ♂ or half in ♀ of elytra, with scape almost cylindrical, 3rd segment 1.4–2.0 times as long as 4th segment, middle segments weakly thickened at apices, terminal segment distinctly elongate in ♂.

Pronotum usually distinctly longer than wide, rather weakly arcuate at sides; PL/PW 1.05–1.38 (M 1.23) in ♂, 1.00–1.40 (M 1.16) in ♀, PB/PA 0.92–0.94 (M 0.93) in ♂, 0.93–0.94 (M 0.93) in ♀, EL/PL 2.85–3.60 (M 3.18) in ♂, 2.77–3.73 (M 3.21) in ♀, PW/EW 0.71–0.90 (M 0.80) in ♂, 0.63–0.88 (M 0.76) in ♀; disc distinctly convex though depressed above, densely provided with uniform large shallow punctures. Scutellum regularly triangular, acute at apex.

Elytra long, slender, nearly or more than three times as long as wide, EL/EW 2.83–3.60 (M 3.10) in ♂, 2.50–3.05 (M 2.80) in ♀; sides with completely rounded humeri, gently arcuate at a level between basal fourth and apical 2/5 then arcuately



Figures 77–82. Male genitalia of *Amamiclytus hirtipes* (Matsushita), comb. n.: **77** Median lobe, ventral view **78** ditto, lateral view **79** endophallus **80** tegmen, ventral view **81** ditto, lateral view **82** abdominal segment 8, ventral view.

narrowed to apices which are obliquely arcuate with blunt teeth at external angles; disc almost evenly convex, closely provided with fine shallow punctures.

Ventral surface almost smooth, provided with a few coarse punctures on prosternum, minute ones on meso- and metathoraces, and abdomen; ♂ anal ventrite 7/10 the length of basal width, weakly arcuate at apical margin.

Legs long and slender; hind legs 1.6–2.0 times as long as elytra, with femur gradually swollen apicad, slightly compressed, exceeding elytral apex at apical fifth, 1st tarsal segment 1.5–2.2 times as long as the following two segments combined.

Male genitalia. Median lobe almost 1/3 the length of elytra, in lateral view almost straight though distinctly bent ventrad in apical 2/5 of apical lobe; dorsal plate almost equal in width to or a little longer than ventral plate, gently narrowed to apex which is bluntly pointed; ventral plate almost parallel-sided in basal 3/4 then gently narrowed to apex which is more or less sharply pointed at the extremity; median struts slender, almost half the length of median lobe. Endophallus sparsely provided with minute spinous spicules behind crescent-like sclerites from basal 1/3 to 7/10, densely covered with minute serrate sclerites in apical fifth. Tegmen elongate, slightly shorter than median lobe; parameres elongate, nearly 2/5 the length of tegmen, divided in apical fifth, with lobe almost parallel-sided, moderately convergent apicad, slightly oblique at inner margins, almost rounded at apices which are provided with numerous short and a few long setae; basal ridge slightly raised; ring part parallel in apical third. Eighth tergite quadrate, arcuate at sides of apical margin which is slightly emarginate, provided with numerous short and long setae. Eighth sternite strongly transverse, rather weakly emarginate at apical margin.

Female genitalia. Coxite lobe ovoid, scattered with a few long and short setae. Stylus almost half in length to coxite lobe, elongate, moderately dilated apicad. Bursa copulatrix more or less large, weakly narrowed in basal half. Spermatheca narrow and strongly arcuate in apical half; gland oblong, attached at apical half; duct thin, short, slightly sinuate, not coiled.

Specimens examined. 1♂ (holotype), Hori, Formosa, 20–II–1939, (HUM). [Taoyuan County, N. Taiwan] 1♂, 1♀, Syuanyuan, Fuxing Township, alt. 800m, 18–IX–2005, Y.-L. Lin leg.; 6♂♂, 8♀♀, same locality and collector, alt. 700m, 17–X–2009. [Hsinchu County, N. Taiwan] 1♂, Dalu Forest Road, Wufeng Township, alt. 1,100–1,400m, 13–VII–2003, Y.-L. Lin leg. [Nantou County, C. Taiwan] 2♂♂, Mt. Lushan, Ren'ai Township, 23–VIII–1987, J.-J. Luo leg.; 10♂♂, 6♀♀, Gaofeng, Ren'ai Township, 19–IX–2006, native collector leg.; 3♂♂, Mt. Hewang, Ren'ai Township, alt. 1,650m, 9–IX–2009, C.-C. Chen leg. [Kaohsiung County, S. Taiwan] 8♂♂, 9♀♀, near Liouguei Township, 5–X–1983, W.-L. Chen leg.; 2♂♂, same locality, 5–X–1984, B.-R. Chin leg.; 15♂♂, 16♀♀, Douna, Maolin Township, 8–IX–2007, W.-S. Lin leg. [Pingtung County, S. Taiwan] 5♂♂, 4♀♀, Mt. Dahan Shan, Chunri Township, alt. 1,200m, 12–X–2003, Y.-L. Lin leg. 1♂, Mt. Dahan Shan, alt. 1,300m, 25–X–2007, W.-S. Lin leg.

Geographical distribution. Taiwan.

Comments. This clytine beetle is formally treated here as a member of the genus *Amamicyltus* Ohbayashi. As was written in “Historical review” on the earlier page, this species was first described under the genus *Rhaphuma* Pascoe (Matsushita 1940), and later was transferred to *Amamicyltus* by misidentification (Kojima et al. 1965). The previous authors, such as Kojima et al. (1965), had never examined the holotype of *Rhaphuma hirtipes*, and confused it as the senior synonym of *Amamicyltus nobuoi* Ohbayashi. We carefully examined the holotype specimen of *R. hirtipes* deposited in the Hokkaido University Museum, Sapporo, and recognized it as actually a member of the genus *Amamicyltus*.

Amamicyltus hirtipes (Matsushita, 1940), comb. n. is easily distinguished in external appearance from the other Taiwanese members of the genus. This species has a more elongate body on average, with the elytra nearly or more than three times as long as wide, and the very long slender antennae attaining the apical third of elytra in male or apical half in female, with less thickened middle segments and a distinctly elongate terminal segment, especially in male. From the sparse arrangement of white pubescence near base of pronotum, this species is easily separable from several similar species which has the distinct white pubescent maculation so called “Pb”. Concerning the morphology of male genitalia, this species is basically similar to those of *A. nobuoi* Ohbayashi, *A. subnitidus* Holzschuh and *A. setiger* sp. n. in spite of its unique external morphology.

It is very interesting that the adults of *A. hirtipes* mainly appear in the autumn season in September and October, and have never been found in springtime as is the case with all of the other members of the genus. The species is not so rare in this season, and usually found on tree blossoms. However two exceptional records are known; one male collected in mid July from Dalu Forest Road in northern Taiwan; the holotype male collected in February in central Taiwan.

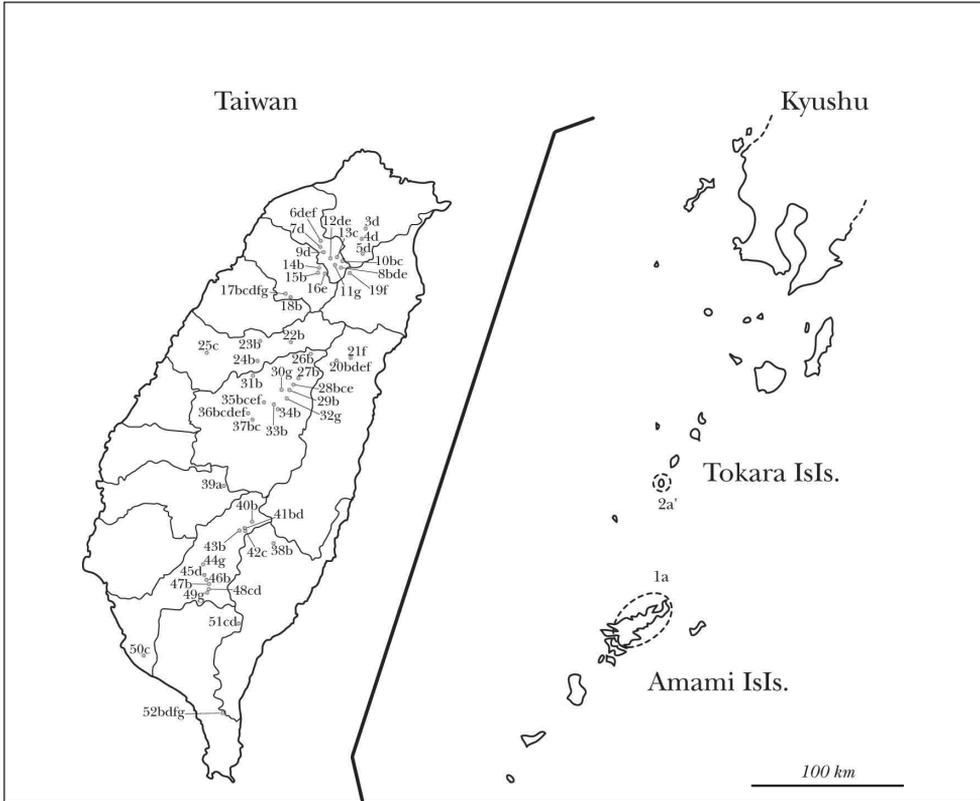


Figure 83. Distribution of species and collecting sites: **a** *A. nobuoi nobuoi* Ohbayashi **a'** *A. nobuoi akuseki-anus* Niisato **b** *A. subnitidus* Holzschuh **c** *A. setiger* sp. n. **d** *A. nubilus* sp. n. **e** *A. juni* sp. n. **f** *A. yulongi* **g** *A. hirtipes* (Matsushita). [N. Ryukyus, Kagoshima Pref., Japan] **1** Amami-Ōshima Is., **2** Akuseki-jima Is., Tokara Is. [Taipei County, N. Taiwan] **3** Wulai Township, **4** Sinsian, Wulai Township, **5** Fushan, Wulai Township [Taoyuan, County, N. Taiwan] **6** Ronghua, Fuxing Township, **7** Baling, Fuxing Township, **8** Sihleng, Fuxing Township, **9** Syuanyuan, Fuxing Township, **10** near Mt. Lala Shan, Fuxing Township, **11** Gaoyi, Fuxing Township, **12** Sule, Fuxing Township, **13** Shangbaling, Fuxing Township [Hsinchu County, N. Taiwan] **14** Mt. Lidong Shan, Jianshi Township, **15** Yufong, Jianshi Township, **16** Shihlei, Jianshi, Township, **17** Dalu Forest Rd., Wufeng Township, **18** Dalu Forest Rd., East Feeder, Wufeng Township [Yilan County, N. Taiwan] **19** Mingchih (new name), Datong Township [Hualien County, E. C. Taiwan] **20** Bilyu, Xiulin Township, **21** Sinbaiyuan [Taichung County, C. Taiwan] **22** Deji Reservoir, Heping Township, **23** Mt. Anma Shan, Heping Township, **24** Lilengsi Forest Rd., Heping Township, **25** Mt. DaKeng, Beitun District, Taichung City, [Nantou County, C. Taiwan] **26**, Bilyusi, Ren'ai Township, **27** Meifong, Ren'ai Township, **28** Cueifong, Ren'ai Township, **29** Songgang-Meifong, Ren'ai Township, **30** Mt. Hewang, Ren'ai Township, **31** Meiyuan, Ren'ai Township, **32** Lushan, Ren'ai Township, **33** Nanshansi, Ren'ai Township, **34** Gaofeng, Ren'ai Township, **35** Mt. Guandao Shan, Ren'ai Township, **36** Lianhuachih, Yuchi Township, **37** Sun Moon Lake, Yuchi Township [Taitung County, C. Taiwan] **38** Siangyang-Liyuan [Chiayi County, S. Taiwan] **39** Jhaoping, Alishan Township [Kaohsiung County, S. Taiwan] **40** Chuyushan Taoyuan Township, **41** Tengjhih, Taoyuan Township, **42** Mt. Sinan, **43** Mt. Pao Shan, **44** near Liouguei Township, **45** Wetuan, Liugui Township, **46** Mt. Shanping, **47** Mt. Nanfenshan, Liouguei Township, **48** Shanping, Maolin Township, **49** Douna, Maolin Township, **50** Fengshan, [Pingtung County, S. Taiwan] **51** Siaoguei Lake, Wutai Township, **52** Mt. Dahan Shan, Chunri Township.

Discussion

In spite of its uniqueness, *Amamicyltus* Ohbayashi shows relationship in external morphology with the genera *Rhaphuma* Pascoe, *Chlorophorus* Chevrolat and *Demonax* Thomson as follows: 1) body including legs and antennae usually elongate; 2) antennae thin and long, almost exceeding apical halves of elytra in male, with segment 3 longer than scape; 3) eyes large and approximate to each other; 4) genae relatively shallow in frontal view; 5) mandible along inner margin smooth; 5) labial and maxillary palpi has a distinct sexual dimorphism in each terminal segment.

Han and Niisato (2009) suggested that the structure of endophallus in male genitalia is one of the important characters to distinguish the genera of the tribe Clytini. *Amamicyltus* is clearly defined by this character and distinguishable from the other genera of the tribe, though it has a close relationship with the genera *Rhaphuma*, *Chlorophorus* and *Demonax*. These three related genera show the following features on the spicules of their endophallus; 1) *Rhaphuma*: usually without any spicules near base of endophallus, or weakly, rather sparsely provided with several kinds of spicules on the whole of endophallus; 2) *Chlorophorus*: densely provided with large-sized sclerotized spicules on the whole of endophallus; 3) *Demonax*: basically similar to those of *Amamicyltus*, though has a pair of sclerotized lines consisting of minute or medium-sized spinous spicules on the apical part of endophallus.

A total of seven species of *Amamicyltus* from Taiwan and the Ryukyu Islands of Southwest Japan are provisionally divided into four morphological groups mainly based on both the male and female genitalia as follows.

Group I: *A. subnitidus* Holzschuh, 1984, *A. setiger* sp. n. and *A. nobuoi nobuoi* Ohbayashi, 1964, *A. nobuoi akusekianus* Niisato, 2005.

Group II: *A. nubilus* sp. n.

Group III: *A. juni* sp. n. and *A. yulongi* sp. n.

Group IV: *A. hirtipes* (Matsushita, 1940), comb. n.

Group I is recognized by small, slightly elongate, glossy (usually strongly) body with sparsely or thinly pubescent elytra, and is provisionally composed of three species. The members of this group share the following features in male genitalia: the long median struts which are 3/5 to 7/10 the length of median lobe, as well as the long parameres which are half the length of tegmen. In female genitalia, they share the distinctly short coxite lobes which are almost equal to the length of stylus, and strongly wholly coiled spermathecal duct in the whole length. *Amamicyltus nobuoi* is provisionally placed in this group and basically identical in the above characters with *A. subnitidus* and *A. setiger*. However, the male genitalia are rather distinctly shortened and similar to those of *A. hirtipes* (Group IV), *A. juni* and *A. yulongi* (Group III). Besides, *A. nobuoi* is provided with a sutural spot on elytra behind scutellum ("S") which is absent in *A. subnitidus* and *A. setiger*.

Group II is composed of a single species, *A. nubilus*, characterized by matted, rather elongate body with dense pubescence on the elytra, and somewhat similar in

general appearance to *A. hirtipes* except for the presence of a distinct basal band on pronotum (“*Pb*”) and the absence of basal bands near elytral bases (“*B*”). Spermatheca of female genitalia is strongly arcuate, with simple, not coiled duct. Also, the male genitalia are basically similar in the proportion of median struts and parameres to the Group I, though the median lobe is not so elongate and the ring part of tegmen is not expanded apicad as in those of Group I.

Group III composed of *A. juni* and *A. yulongi*, is characterized by short, broadened and matted body, rather transverse pronotum with distinctly arcuate sides, without white pubescence near the basal margin. The independence of this group is strongly supported by the structures of both male and female genitalia. In the female genitalia, the coxite lobes are long, about twice the length of stylus, spermathecal duct is strongly coiled in apical third, and bursa copulatrix is very large. It has the shortened male genitalia, of which the median struts are half the length of median lobe, and the parameres are 2/5 the length of tegmen.

Group IV is also monotypic at least in the present sense, composed of a single species, *A. hirtipes*, and is clearly distinguished from the other groups of the genus by very large and slender body on average, with sparse “*Pb*” on the pronotum and without “*B*” on the elytra. However, *A. hirtipes* has close relationship in female genitalia with *A. nubilus*; spermatheca is strongly curved near middle, with gland attached at the middle of spermatheca, and the duct is not coiled, only weakly sinuate throughout. Male genitalia of *A. hirtipes* are also similar to those of *A. nobuoi* (Group I), and *A. juni* and *A. yulongi* (Group III).

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References

- Chou W-I (2004) Iconographical Book of Longicorn Beetles from Taiwan. Owl press, Taipei, 408 pp.
- Han C, Niisato T (2009) Clytine beetles of the genus *Sclethrus* (Coleoptera, Cerambycidae). [Longicornists] Special Bulletin of the Japanese Society of Coleopterology 7: 237–279.
- Holzschuh C (1984) Beschreibung von 24 neuen Bockkäfern aus Europa und Asien, vorwiegend aus dem Himalaya (Coleoptera, Cerambycidae). Entomologica Basiliensia 9: 340–372.
- Holzschuh C (1991) 63 neuen Bockkäfern aus Asien, vorwiegend aus China und Thailand (Coleoptera: Disteniidae und Cerambycidae). FBVA-Berichte 60: 1–71.
- Hua L-Z, Nara H, Samuelson GA, Lingafelter SW (2009) Iconography of Chinese Longicorn Beetles (1406 Species) in Color. San Yat-sen University Press, Gangzhou, 474 pp.
- Kojima K, Hayashi M, Kuniyoshi S, Watanabe H (1965) The longicorn beetles of Ryukyu Islands (Col. Ceramb.). Research Reports of Kôchi University, 14, Natural Science II, 9: 72–104. [In Japanese with English title]
- Matsushita M (1940) Zur Kenntnis des Japanischen Cerambyciden (V). Insecta matsumurana 14: 52–55.
- Ministry of the Environment (Government of Japan) (2007) Insects. Red List. <http://www.env.go.jp/> [accessed 10.10.2010]
- Nakamura S, Makihara H, Saito A (1992) Check-list of Longicorn Beetles of Taiwan. Hiba Society of Natural History, Hiroshima, 126 pp.
- Niisato T (1983) Note on the species *Rhaphuma hirtipes* and *Amamiclytus nobuoi*. The record of 7th annual meeting of the Japanese Society of Coleopterology in 1982. SAYABANE 9: 21. [In Japanese]
- Niisato T (2005) Two new taxa of the Japanese Clytini (Coleoptera, Cerambycidae). Elytra, Tokyo 33: 383–390.
- Niisato T (2007) Illustrated key & description (Cerambycinae). In: Ohbayashi N, Niisato T (Eds) Longicorn Beetles of Japan. Tōkai University Press Hadano, 252–281, 424–512.
- Ohbayashi K (1964) New Cerambycidae from Japan (7). Bulletin of the Japan Entomological Academy 1: 19–26, pls. 4–5.
- Yu C-K, Nara H (1988) Longicorn Beetles of Taiwan. Muh-Sheng Entomological Museum, Taipei, 112 pp.
- Yu C-K, Nara H, Chu Y-I (2002) The Longicorn Beetles of Taiwan (new edition). Muh-Sheng Entomological Museum, Taipei, 151 pp.

Two new species of *Simulium* (*Gomphostilbia*) (Diptera, Simuliidae) from Peninsular Malaysia, with keys to Peninsular Malaysian members of the *Simulium ceylonicum* species-group

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Abstract

Two new species of black flies, *Simulium* (*Gomphostilbia*) *roslihashimi* **sp. n.** and *S.* (*G.*) *lurauense* **sp. n.**, are described on the basis of reared adult, pupal and larval specimens collected from Peninsular Malaysia. These two new species are placed in the *ceylonicum* species-group within the subgenus *Gomphostilbia*. *Simulium* (*G.*) *roslihashimi* **sp. n.** is most distinctive with the male having almost entirely yellow antennae, and *S.* (*G.*) *lurauense* **sp. n.** is characterized in the female by having the elongate sensory vesicle and the yellowish-white hairs on the base of the costal vein and on the stem vein, in the male by the greater number of large upper-eye facets and the spindle-shaped hind basitarsi which are much narrower than the hind tibiae and femora and in the pupa by the small terminal hooks. Keys to species of the *ceylonicum* species-group reported from Peninsular Malaysia are provided for females, males, pupae and mature larvae.

Keywords

black fly, *Gomphostilbia*, Simuliidae, Malaysia

Introduction

The fauna of black flies (Diptera: Simuliidae) in Peninsular Malaysia is represented by 37 named and 3 unnamed species, which are all classified in the genus *Simulium* Latreille s. l. and are further placed in four subgenera: 1 species in *Daviesellum* Takaoka and Adler, 18 species (17 named and 1 unnamed) in *Gomphostilbia* Enderlein, 4 species in *Nevermannia* Enderlein, and 17 species (15 named and 2 unnamed) in *Simulium* Latreille s. str. (Crosskey 1973; Edwards 1928; Takaoka 2000, 2008; Takaoka and Adler 1997; Takaoka and Davies 1995, 1997; Takaoka et al. 2010, 2011).

In recent surveys on pupae and larvae of black flies in Peninsular Malaysia, we collected two new species, both of which are assignable to the subgenus *Gomphostilbia*, redefined by Takaoka (2003), by having a bare pleural membrane and a haired katepisternum in the female and male adults, grapnel-shaped hooklets on each side of the ninth pupal abdominal segment and a hypostoma with smooth lateral margins in the larva, and further, within the subgenus, are placed in the *ceylonicum* species-group by having an enlarged male hind basitarsus, a diagnostic morphological characteristics separating this species-group from other species-groups (Takaoka 2003).

These two new species are very similar in the arrangement of the eight pupal gill filaments, one of the key morphological features most frequently used to identify the species in the pupal stage, but are readily distinguishable in the adult stage from each other. The pupal gills of these two new species bear medium-long common basal stalks (i.e., longer than $3/5$ of the interspiracular trunk but shorter than the latter), as do those of *S. (G.) asakoeae* Takaoka and Davies, 1995, one of the five previously described Peninsular Malaysian species of the *ceylonicum* species-group. However, the medium-long common basal stalk can separate these two new species from the remaining four known species, i.e., *S. (G.) sheilae* Takaoka and Davies, 1995, which has a short common basal stalk (i.e., shorter than $3/5$ of the interspiracular trunk), *S. (G.) hoiseni* Takaoka, 2008, *S. (G.) longitruncum* Takaoka and Davies, 1995 and *S. (G.) softiani* Takaoka and Hashim, 2011, each of which bears a long common basal stalk (i.e., as long as or longer than the interspiracular trunk) (Takaoka and Davies 1995; Takaoka 2008; Takaoka et al. 2011).

These two new species are described here on the basis of female and male adults reared from pupae, pupal exuviae with their cocoons preserved in 80% ethanol and mature larvae preserved in acetic alcohol solution (1 part of acetic acid: 3 parts of 95% ethanol).

Keys to members of the *ceylonicum* species-group reported from Peninsular Malaysia are provided for females, males, pupae and mature larvae.

The methods of collections, descriptions and illustrations as well as terms for morphological features used here follow those of Takaoka (2003).

The holotype and paratypes will be deposited at the Institute of Biological Sciences, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia.

Systematics

Simulium (*Gomphostilbia*) *roslihashimi* Takaoka & Sofian-Azirun sp. n.

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[http://species-id.net/wiki/Simulium_\(Gomphostilbia\)_roslihashimi](http://species-id.net/wiki/Simulium_(Gomphostilbia)_roslihashimi)

Description. Female. Body length 2.2 mm. **Head.** Slightly narrower than width of thorax. Frons black, slightly shiny when illuminated at certain angle of light, densely covered with whitish-yellow scale-like recumbent short hairs interspersed with few dark simple longer hairs along each lateral margin; frontal ratio 1.64:1.00:2.16; frons-head ratio 1.00:4.31. Fronto-ocular area well developed, narrow, directed dorsolaterally. Clypeus black, slightly shiny when illuminated at certain angle of light, densely covered with yellow hairs interspersed with several dark longer hairs on each side. Labrum 0.55 times as long as clypeus. Antenna composed of scape, pedicel and 9 flagellomeres, dark brown except scape, pedicel, and basal 1/2 of 1st flagellomere yellow. Maxillary palp composed of 5 segments, light to medium brown, proportional lengths of 3rd, 4th, and 5th segments 1.00:1.20:2.62; 3rd segment (Fig. 1A) somewhat swollen; sensory vesicle (Fig. 1A) medium-sized (0.26 times as long as 3rd segment), with medium-sized opening. Maxillary lacinia with 12 inner and 13 outer teeth. Mandible with 22 or 23 inner teeth and lacking outer teeth though outer margin with several very low round ridges at some distance from apex. Cibarium (Fig. 1B) medially forming sclerotized plate folded forward from posterior margin, with moderately sclerotized medial longitudinal ridge. **Thorax.** Scutum dark brown except anterolateral calli dark ochreous, with 5 brownish-black longitudinal vittae (1 narrow median, 2 slightly wider submedian and 2 widest lateral), median and submedian vittae united posteriorly to brownish-black prescutellar area, and submedian and lateral vittae united anteriorly to each other near anterior calli on each side; scutum shiny when illuminated at certain angle of light, densely covered with yellow scale-like recumbent hairs except whitish hairs near anterior and lateral margins. Scutellum medium brown, shiny when illuminated at certain angle of light, covered with yellow short hairs and dark brown long upright hairs along posterior margin. Postnotum dark brown, shiny when illuminated at certain angle of light and bare. Pleural membrane bare. Katepisternum medium to dark brown, longer than deep, shiny when illuminated at certain angle of light, moderately covered with fine short hairs. **Legs.** Foreleg: coxa yellow; trochanter yellow except apical portion somewhat darkened; femur light brown (though somewhat darkened toward apex, and extreme apex yellowish); tibia white except apical 1/4 brownish-black, with whitish sheen on outer surface of basal 3/4; tarsus black, with moderate dorsal hair crest; basitarsus moderately dilated, 6.14 times as long as its greatest width. Midleg: coxa medium brown except posterior surface brownish-black; trochanter yellow; femur light to medium brown with base and extreme apical tip yellowish; tibia medium to dark brown with basal 1/3 or little more whitish-yellow,

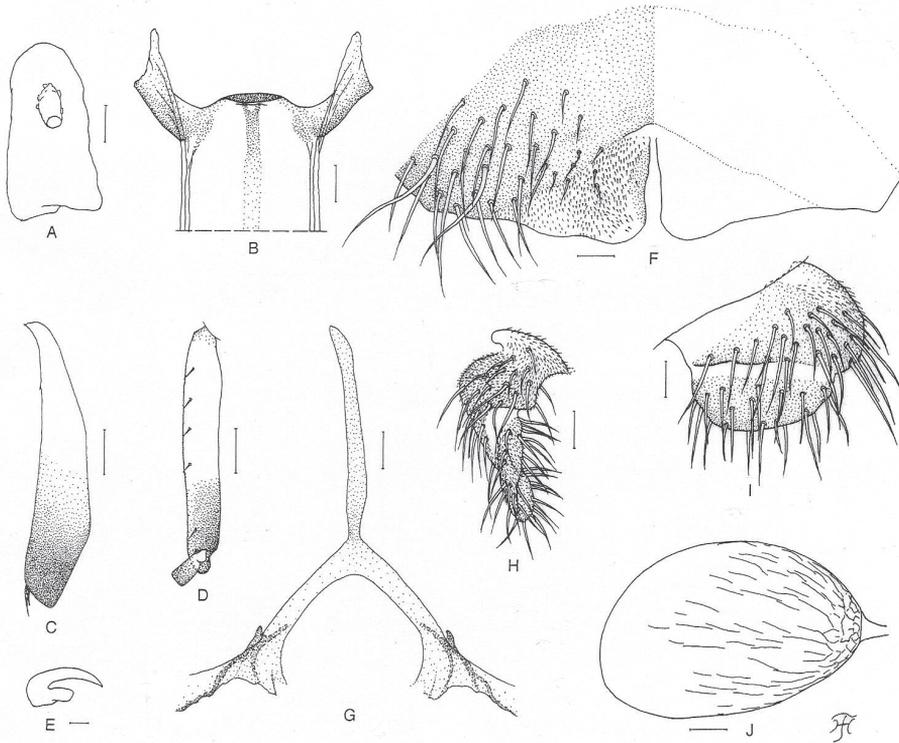


Figure 1. Female of *Simulium* (*Gomphostilbia*) *roslihashimi* sp. n. **A** 3rd segment of right maxillary palp with sensory vesicle (front view) **B** cibarium (front view) **C** left hind tibia (outer view) **D** basitarsus and 2nd tarsomere of left hind leg showing calcipala and pedisulcus (outer view) **E** claw **F** sternite 8 and ovipositor valves (ventral view) **G** genital fork (ventral view) **H, I** right paraprocts and cerci (**H** ventral view **I** lateral view) **J** spermatheca (lateral view). Scale bars. 0.1 mm for C and D; 0.02 mm for A, B and F–J; 0.01 mm for E.

covered with whitish fine hairs on basal 2/3 and white sheen on posterior surface of basal 2/3 when illuminated at certain angle of light; tarsus brownish-black except basal 1/2 of basitarsus dark yellow. Hind leg: coxa light brown; trochanter yellow; femur medium brown with base yellow and apical cap dark brown (though extreme apical tip yellowish); tibia (Fig. 1C) light to dark brown with basal 1/2 white, covered with whitish fine hairs on outer and posterior surfaces of basal 3/4 and white sheen on posterior surface of basal 3/4 when illuminated at certain angle of light; tarsus brownish-black except basal 2/3 of basitarsus (though base light brown) and little less than basal 1/2 of 2nd tarsomere white; basitarsus (Fig. 1D) narrow, nearly parallel-sided, 5.80 times as long as wide, and 0.70 and 0.53 times as wide as greatest width of tibia and femur, respectively; calcipala (Fig. 1D) slightly shorter than width at base, and 0.53 times as

wide as greatest width of basitarsus. Pedisulcus (Fig. 1D) well defined. Claw (Fig. 1E) with large basal tooth 0.50 times as long as claw. **Wing.** Length 1.9 mm. Costa with dark spinules and hairs except hairs on basal portion yellow. Subcosta with dark hairs except near apex bare. Hair tuft on stem vein whitish-yellow. Basal portion of radius fully haired; R_1 with dark spinules and hairs; R_2 with hairs only. Basal cell absent. **Hal-tere.** White except basal stem darkened. **Abdomen.** Basal scale ochreous, with fringe of whitish-yellow hairs. Dorsal surface of abdomen dark brown to brownish-black except basal 1/2 of segment 2 yellow, moderately covered with yellow fine short hairs and dark short to long hairs; tergites of segments 2 and 6–9 shiny when illuminated at certain angle of light. Ventral surface of segments 2 and 3 entirely whitish-yellow, and those of other segments light to dark brown; sternal plate on segment 7 undeveloped. **Genitalia.** Sternite 8 (Fig. 1F) bare medially, with 25 or 26 medium-long to very long hairs together with few slender short hairs on each side. Ovipositor valves (Fig. 1F) tongue-like, thin, membranous, moderately covered with microsetae interspersed with 2 or 3 short hairs; inner margins slightly concave, somewhat sclerotized, and moderately separated from each other. Genital fork (Fig. 1G) of usual inverted-Y form, with slender stem; arms of moderate width, moderately folded medially; lateral plate of each arm with thin lobe directed medioposteriorly and small stout projection directed anterodorsally. Paraproct in ventral view (Fig. 1H) concave anterolaterally, with 3 or 4 sensilla on anteromedial surface; paraproct in lateral view (Fig. 1I) somewhat produced ventrally, 0.61 times as long as wide, with 24–26 medium-long to long hairs on ventral and lateral surfaces. Cercus in lateral view (Fig. 1I) short, rounded posteriorly, 0.38 times as long as wide. Spermatheca (Fig. 1J) ellipsoidal, 1.55 times as long as its greatest width, well sclerotized except duct and small area near juncture with duct unsclerotized, and with many fissures on surface; internal setae absent; both accessory ducts slender, subequal in diameter to major one.

Male. Body length 2.5 mm. **Head.** Somewhat wider than thorax. Upper eye dark brown, consisting of 11 or 12 vertical columns and 12 (rarely 13) horizontal rows of large facets. Face black, grayish-white pruinose. Clypeus black, whitish pruinose, densely covered with golden-yellow scale-like medium-long hairs (mostly directed upward) interspersed with several dark brown simple longer hairs. Antenna composed of scape, pedicel and 9 flagellomeres, pale yellow to yellow though few apical flagellomeres sometimes slightly to somewhat grayish; 1st flagellomere elongate, 1.78 times as long as 2nd one. Maxillary palp light to medium brown, with 5 segments, proportional lengths of 3rd, 4th, and 5th segments 1.00:1.14:2.95; 3rd segment (Fig. 2A) widened apically; sensory vesicle (Fig. 2A) globular, small (0.15 times as long as 3rd segment), and with very small opening. **Thorax.** Scutum nearly as in female except median vitta of 5 dark longitudinal vittae often indistinct and short hairs on scutum golden yellow. **Legs.** Foreleg: coxa yellow; trochanter yellow with some portions light brown; femur light brown though apical tip yellowish; tibia white with subbasal portion on posterior surface grayish and apical 1/4 brownish-black, and covered with yellow hairs on basal 3/4 and white sheen on basal 3/4 when illuminated at certain angle of light; tarsus brownish-black; basitarsus moderately dilated, 6.62–6.83 times as long

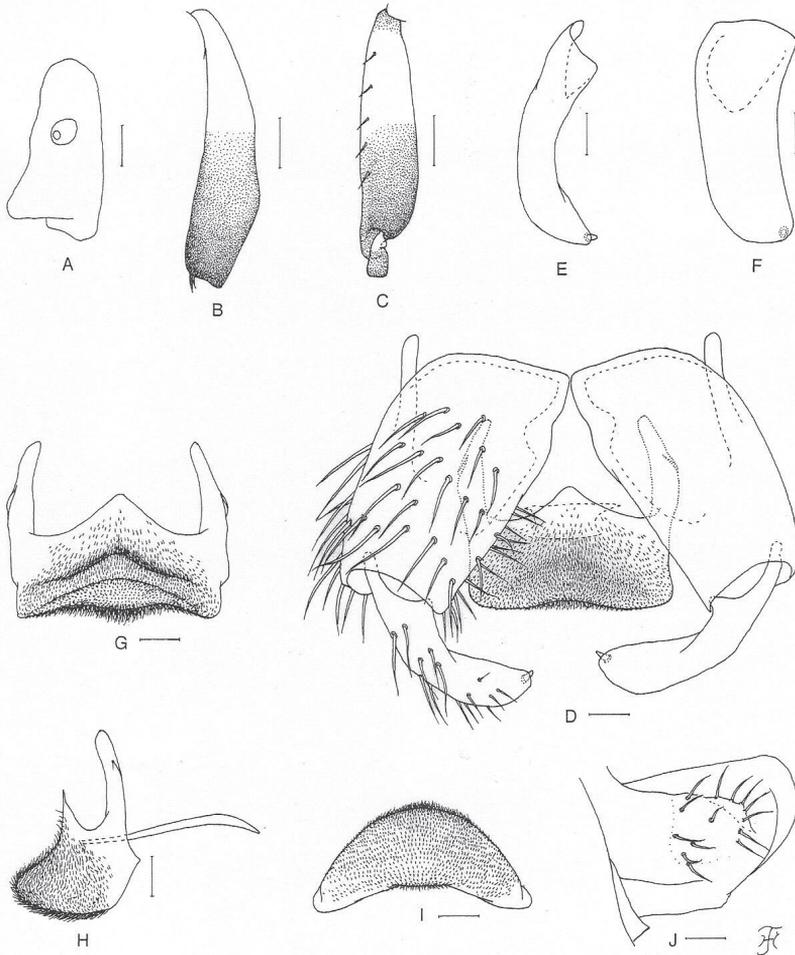


Figure 2. Male of *Simulium* (*Gomphostilbia*) *roslihashimi* sp. n. **A** 3rd segment of left maxillary palp with sensory vesicle (front view) **B** left hind tibia (outer view) **C** basitarsus and 2nd tarsomere of left hind leg showing calcipala and pedisulcus (outer view) **D** coxites, styles, ventral plate and median sclerite (ventral view) **E, F** right styles (**E** medial view **F** ventrolateral view) **G** ventral plate (ventral view, though posterior portion slightly inclined ventrally) **H** ventral plate and median sclerite (lateral view) **I** ventral plate (end view) **J** 10th abdominal segment and cercus (right side and lateral view). Scale bars. 0.1 mm for B and C; 0.02 mm for A and D–J.

as its greatest width. Midleg: coxa medium brown except posterior surface brownish-black; trochanter yellow; femur light brown with base and extreme apical tip yellow; tibia medium brown to brownish-black except basal 1/3 yellow; tarsus dark brown to brownish-black except anterior surface of little less than basal 1/2 of basitarsus dark

yellow to light brown. Hind leg: coxa dark yellow to light brown; trochanter yellow; femur light brown with base yellow and apical cap dark brown (though extreme apical tip yellow); tibia (Fig. 2B) dark brown to brownish-black except basal 1/2 (or little less) yellow; tarsus (Fig. 2C) medium to dark brown except basal 1/2 (or little less) of basitarsus whitish-yellow and little less than basal 1/2 of 2nd tarsomere white; basitarsus (Fig. 2C) enlarged, spindle-shaped, 3.78–4.07 times as long as wide, and 0.88–0.94 and 0.91–0.95 times as wide as greatest width of tibia and femur, respectively; calcipala (Fig. 2C) nearly as long as wide, and 0.35 times as wide as greatest width of basitarsus. Pedisulcus (Fig. 2C) well defined. **Wing.** Length 1.6–1.7 mm. Costa with dark brown spinules as well as dark brown hairs except basal portion with patch of yellowish hairs. Subcosta with or without hairs: i.e., among 7 males examined, 5 males each with 1–4 hairs on each subcosta, 1 male bare on right subcosta and with 1 hair on left subcosta, and 1 male without hair on either right or left subcosta. Hair tuft on stem vein yellow. Basal portion of radius fully haired; R_1 with dark spinules and hairs; R_2 with hairs only. Basal cell absent. **Haltere.** Grayish-white except outer surface ochreous and basal stem darkened. **Abdomen.** Basal scale dark brown, with fringe of light to medium brown hairs. Dorsal surface of abdomen medium brown to brownish-black except segment 2 yellow (though posterior 1/2 of dorsal surface medium brown), covered with dark brown short to long hairs; segments 2 and 5–8 each with pair of shiny dorsolateral or lateral patches; ventral surface of segment 2 yellow, those of segments 3 and 4 yellow except sternites medium brown, and those of other segments medium to dark brown. **Genitalia.** Coxite in ventral view (Fig. 2D) nearly rectangular, 1.64 times as long as its greatest width. Style in ventral view (Fig. 2D) bent inward, slightly tapered from base toward middle, then slightly widened, tapered to round apex and with apical spine; style in medial view (Fig. 2E) 0.84 times as long as coxite, gently bent inward, nearly parallel-sided from base to apical 3/4, then tapered to apex, and with apical spine; style in ventrolateral view (Fig. 2F) very slightly tapered toward apical 3/4, with rounded apex. Ventral plate in ventral view (Fig. 2D) with body transverse, 0.59 times as long as wide, nearly parallel-sided, with anterior margin produced anteromedially, and posterior margin slightly concave medially (though posterior margin slightly convex medially when ventral plate is slightly inclined – Fig. 2G), densely covered with microsetae on ventral surface; basal arms of moderate length, directed forward, then slightly convergent apically; ventral plate in lateral view (Fig. 2H) moderately produced ventrally; ventral plate in end view (Fig. 2I) rounded ventrally, densely covered with microsetae on posterior surface. Median sclerite (Fig. 2D,H) thin, plate-like, wide. Paramere of moderate size, with 3 distinct long and stout hooks and several smaller ones. Aedeagal membrane moderately setose, slightly sclerotized at base but dorsal plate not well defined. Ventral surface of abdominal segment 10 without distinct hairs near posterior margin. Cercus in lateral view (Fig. 2J) small, rounded, with 13 or 14 hairs.

Pupa. Body length 2.4–2.6 mm. **Head.** Integument light yellow, moderately covered with small round tubercles; antennal sheath without any protuberances; face with pair of simple very long trichomes with uncoiled apices, and frons with 3 pairs of simple very long trichomes with coiled or uncoiled apices; 3 frontal trichomes on each

side arising close together, subequal in length to one another and slightly longer than facial one. **Thorax.** Integument yellow, moderately covered with round tubercles, with 3 simple very long dorsomedial trichomes with coiled or uncoiled apices, 2 simple very long anterolateral trichomes (1 with coiled apex, 1 with uncoiled apex), 1 simple medium-long mediolateral trichome with uncoiled apex, and 3 simple ventrolateral trichomes with uncoiled apices (1 medium-long and 2 short) on each side. Gill (Fig. 3A) composed of 8 slender thread-like filaments, arranged in [(2+1) (or 3)+(1+2) (or 3)]+2 filaments from dorsal to ventral, with medium-long common basal stalk having somewhat swollen transparent organ ventrally (often partially broken) at base; common basal stalk 0.66–0.72 times as long as interspiracular trunk; dorsal and middle triplets sharing short stalk; dorsal and middle triplets each composed of 1 individual and 2 paired filaments with short primary stalk and very short to short secondary stalk or 3 filaments arising at same level from short to medium-long primary stalk; ventral paired filaments with medium-long stalk which is 1.11–1.47 times as long as common basal stalk and 0.72–1.06 times as long as interspiracular trunk; stalk of ventral pair 1.07–1.33 times as thick as primary stalk of middle triplet, 1.14–1.33 times as thick as primary stalk of dorsal triplet, and 0.89–1.00 times as thick as common stalk of middle and dorsal triplets; primary stalk of dorsal triplet lying against stalk of lower pair at angle of 60–90 degrees when viewed laterally; all filaments grayish light brown, gradually tapered toward apex; 6 filaments of dorsal and middle triplets subequal in length (1.6–2.0 mm long including their own stalks and basal common stalk) and thickness to one another; 2 filaments of ventral pair subequal in length (2.4–3.0 mm long including their own stalk and common basal stalk) and thickness to each other, and 1.50–1.85 times as thick as those of 6 other filaments when compared basally; cuticle of all filaments with well-defined annular ridges and furrows though becoming less marked apically, densely covered with minute tubercles. **Abdomen.** Dorsally, segments 1 and 2 not pigmented and without tubercles; segment 1 with 1 simple slender medium-long hair-like seta on each side; segment 2 with 1 simple slender medium-long hair-like seta and 5 very short somewhat spinous setae submedially on each side; segments 3 and 4 each with 4 hooked spines and 1 very short somewhat spinous seta on each side; segment 5 lacking spine-combs; segments 6–9 each with spine-combs in transverse row (though those on segment 9 slightly smaller than those on segment 8) (in 1 female pupal exuviae, spine-combs absent on segment 9) and comb-like groups of minute spines on each side; segment 9 with pair of triangular flat terminal hooks of which outer margin is 2.00–3.08 times as long as inner margin and crenulated (Fig. 3B). Ventrally, segment 4 with 1 simple hook and few simple slender very short setae on each side; segment 5 with pair of bifid hooks submedially and few very short simple slender setae on each side; segments 6 and 7 each with pair of bifid inner and simple outer hooks somewhat spaced from each other and few very short simple slender setae on each side; segments 4–8 with comb-like groups of minute spines. Each side of segment 9 with 3 grapnel-shaped hooklets. **Cocoon.** Wall pocket-shaped, thinly and moderately woven, widely extended ventrolaterally; anterior margin somewhat thickly woven, with dorsal portion not or slightly produced anteriorly when viewed dorsally; posterior 1/2 with

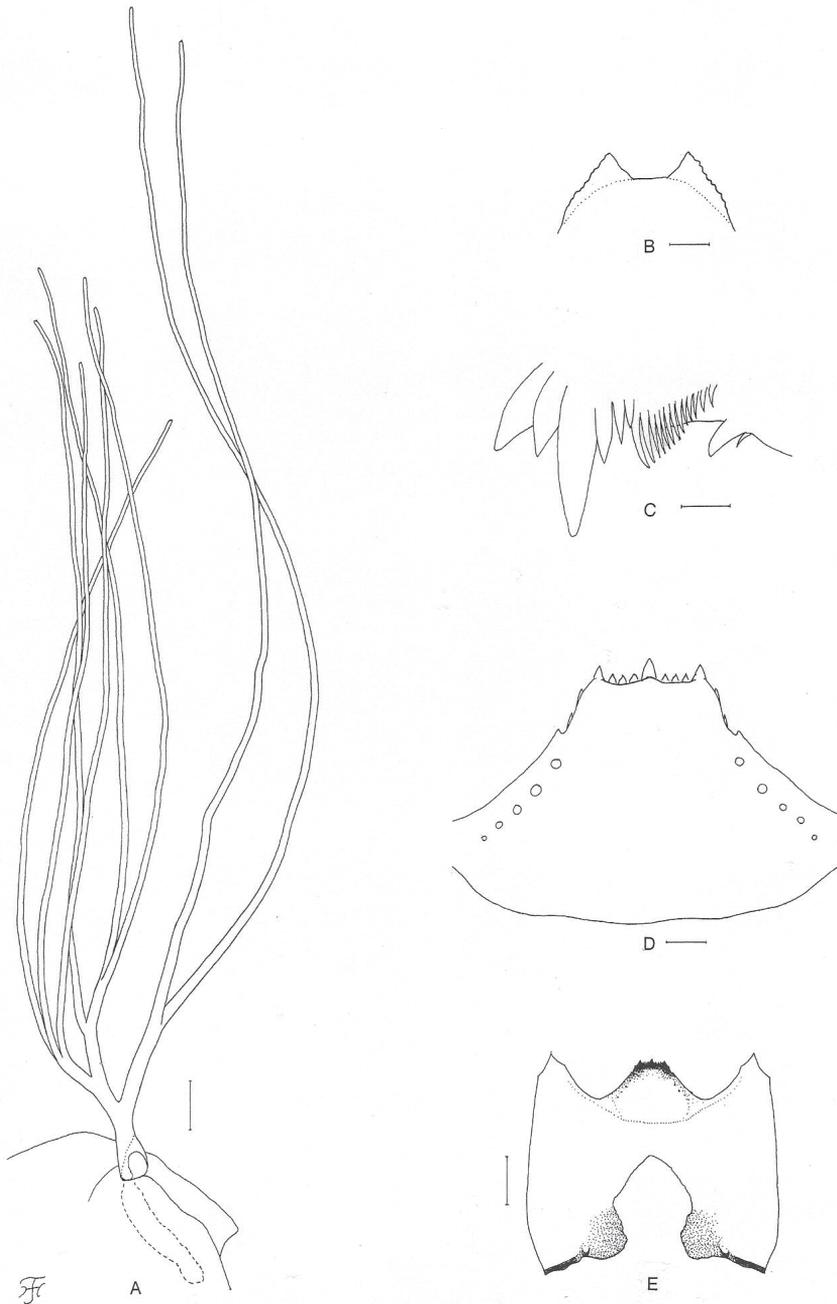


Figure 3. Pupa and larva of *Simulium* (*Gomphostilbia*) *roslihashimi* sp. n. **A, B** pupa **C–E** larva **A** right gill filaments (outer view) **B** terminal hooks (end view) **C** left mandible (lateral view) **D** hypostoma (ventral view) **E** head capsule showing postgenal cleft and hypostoma (ventral view). Scale bars. 0.1 mm for A and E; 0.02 mm for B and D; 0.01 mm for C.

floor roughly or moderately woven; individual threads visible; 3.0–3.5 mm long by 2.2–2.5 mm wide.

Mature larva. Body length 4.5–4.8 mm. Body creamy to light ochreous except proleg grayish, ventral surface of thoracic segments 2 and 3 grayish or ochreous, and abdominal segments 1–4 almost entirely light grayish; body with reddish-brown markings, i.e., thoracic segment 1 encircled with broad transverse band (though disconnected ventrally), abdominal segments 3 and 4 each with dorsolateral spot on each side (though those on segment 3 very faint or absent), abdominal segments 5 and 6 each with W-shaped broad transverse band on dorsal and dorsolateral surfaces of posterior 1/2 of each segment, abdominal segments 7 and 8 each with broad transverse band almost entirely covering dorsal and dorsolateral surfaces, and abdominal segment 7 with transverse band on ventral surface. Cephalic apotome pale yellow, and moderately covered with simple minute setae; head spots indistinct or very faintly positive. Lateral surface of head capsule pale yellow except eye-spot region whitish, and very sparsely covered with simple minute setae; spots indistinct. Ventral surface of head capsule pale yellow except somewhat darkened area near posterior margin on each side of postgenal cleft, and very sparsely covered with simple minute setae. Antenna composed of 3 segments and apical sensillum, somewhat longer than stem of labral fan; proportional lengths of 1st, 2nd, and 3rd segments 1.00:0.79:0.89. Labral fan with 31 main rays. Mandible (Fig. 3C) with 3 comb-teeth decreasing in length from 1st to 3rd; mandibular serration composed of 2 teeth (1 medium-sized and 1 small); major tooth at acute angle against mandible on apical side; supernumerary serrations absent. Hypostoma (Fig. 3D) with row of 9 apical teeth; median and each corner tooth prominent (though median tooth slightly longer than corner teeth) and much longer than 3 intermediate teeth on each side; lateral margin smooth; 5 hypostomal bristles per side lying parallel to lateral margin. Postgenal cleft (Fig. 3E) lanceolate, 3.1 times as long as postgenal bridge. Cervical sclerite composed of 2 very pale small pieces, not fused to occiput, widely separated medially from each other. Thoracic cuticle bare. Abdominal cuticle almost bare except few posterior segments sparsely to moderately covered with simple minute setae dorsally and dorsolaterally and last segment densely covered with colorless simple setae on each side of anal sclerite. Rectal scales absent. Rectal papilla compound, each of 3 lobes with 5–8 finger-like secondary lobules. Anal sclerite of usual X-form, with anterior arms as long as or little longer than posterior ones, broadly sclerotized at base; accessory sclerite absent. Last abdominal segment expanded ventrolaterally forming double bulges on each side, visible as large conical ventral papilla when viewed from side. Posterior cirlet with 96 rows of up to 15 hooklets per row.

Type specimens. Holotype male (with associated pupal exuviae and cocoon) (preserved in 80% ethanol) reared from pupa, collected from a stream (width 0.5–1.0 m, water temperature 23.0°C, shaded, altitude 390 m) moderately flowing in a forest, Kota Gelanggi, Jerantut, Pahang, Malaysia, 6.III.2011, by M. Sofian-Azirun. Paratypes: 2 female, 6 males with associated pupal exuviae and cocoons, 1 pupal exuviae and cocoon, all preserved in 80% ethanol, and 3 mature larvae preserved in acetic alcohol, same data as those of the holotype.

Biological notes. The pupae and larvae of this new species were collected from dead tree leaves in the water. Associated species were *S. (G.) gombakense* Takaoka and Davies, 1995 and *S. (G.) whartoni* Takaoka and Davies, 1995.

Etymology. The species name *roslihashimi* is in honor of Prof. Dr. Rosli Hashim, Head of Institute of Biological Sciences, Faculty of Science, University of Malaya, who greatly contributed to the field of ecology of insects and other animals in the tropics.

Remarks. This new species is most striking with the male having almost entirely yellowish antennae. None of the known species of the *ceylonicum* species-group (of which the male is known) described from Peninsular Malaysia and other countries (Adler and Crosskey 2011; Takaoka et al. 2011) has such yellowish antennae, although *S. (G.) hoiseni* bears yellow to ochreous antennae with the apical 4 or 5 flagellomeres darkened (Takaoka 2008). However, the male of *S. (G.) roslihashimi* sp. n. is easily distinguished from *S. (G.) hoiseni* by having the hind basitarsus (Fig. 2C) narrower than the hind tibia (Fig. 2B) and the ventral plate parallel-sided when viewed ventrally (Fig. 2D,E) (cf., the hind basitarsus is slightly wider than the hind tibia and the ventral plate is widened posteriorly in *S. (G.) hoiseni*).

On the other hand, the female of *S. (G.) roslihashimi* sp. n. is very similar to those of *S. (G.) asakoae* and *S. (G.) longitruncum* in many characteristics including the medium-sized sensory vesicle (Fig. 1A) and the yellow tuft hairs of the stem vein, but is barely distinguished from the latter two species by the outer margin of the mandible without any teeth and the genital fork with a short projection on each arm (Fig. 1G).

This new species is distinguished from other Peninsular Malaysian members of the *ceylonicum* species-group as shown in the keys.

***Simulium* (Gomphostilbia) *lurauense* Takaoka, Sofian-Azirun & Hashim sp. n.**

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[http://species-id.net/wiki/Simulium_\(Gomphostilbia\)_lurauense](http://species-id.net/wiki/Simulium_(Gomphostilbia)_lurauense)

Description. Female. Body length 1.9 mm. **Head.** Slightly narrower than width of thorax. Frons black, very densely covered with whitish-yellow scale-like recumbent short hairs interspersed with 1 dark simple longer hair on upper part near left lateral margin; frontal ratio 1.89:1.00:2.51; frons-head ratio 1.00:4.21. Fronto-ocular area well developed, narrow, directed dorsolaterally. Clypeus black, densely covered with yellow hairs interspersed with several dark longer hairs on each side. Labrum 0.57 times as long as clypeus. Antenna composed of scape, pedicel and 9 flagellomeres, brownish-black except scape, pedicel, and base of 1st flagellomere yellow. Maxillary palp composed of 5 segments, light to medium brown, proportional lengths of 3rd, 4th, and 5th segments 1.00:1.00:2.33; 3rd segment (Fig. 4A) somewhat swollen; sensory vesicle (Fig. 4A) elongate (0.50–0.54 times as long as 3rd segment), with medium-sized opening. Maxillary lacinia with 10 or 12 inner and 14 or 15 outer teeth. Mandible with 28 inner teeth and 6 outer teeth at some distance from apex. Cibarium similar to that of *S. (G.) roslihashimi* sp. n. (Fig. 1B). **Thorax.** Scutum dark brown to brownish-black

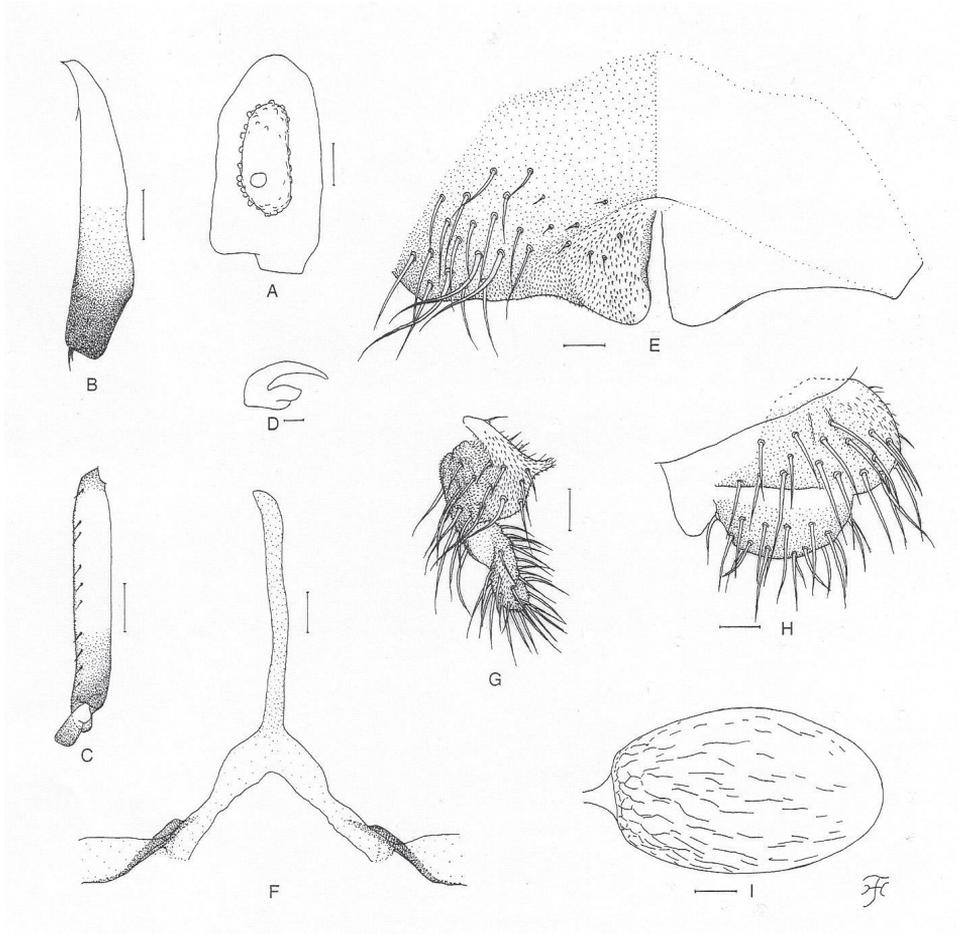


Figure 4. Female of *Simulium* (*Gomphostilbia*) *lurauense* sp. n. **A** 3rd segment of right maxillary palp with sensory vesicle (front view) **B** left hind tibia (outer view) **C** basitarsus and 2nd tarsomere of left hind leg showing calcipala and pedisulcus (outer view) **D** claw **E** sternite 8 and ovipositor valves (ventral view) **F** genital fork (ventral view) **G, H** right paraprocts and cerci (**G** ventral view **H** lateral view) **I** spermatheca (lateral view). Scale bars. 0.1 mm for B and C; 0.02 mm for A and E–I; 0.01 mm for D.

except anterolateral calli ochreous, shiny when illuminated at certain angle of light, with faintly discernible black longitudinal vittae (1 median and 2 submedian), densely covered with whitish-yellow scale-like recumbent hairs. Scutellum dark brown, shiny when illuminated at certain angle of light, covered with whitish-yellow short hairs and dark brown long upright hairs along posterior margin. Postnotum brownish-black, shiny when illuminated at certain angle of light, and bare. Pleural membrane bare. Katepisternum dark brown, longer than deep, shiny when illuminated at certain angle of light, moderately covered with fine short hairs. **Legs.** Foreleg: coxa and trochanter whitish-yellow; femur light brown, somewhat darkened toward apex, and with apical

cap medium brown, and inner surface of basal portion whitish-yellow; tibia white except apical 1/4 brownish-black, with whitish sheen on outer surface of basal 3/4; tarsus brownish-black to black, with moderate dorsal hair crest; basitarsus moderately dilated, 5.66 times as long as its greatest width. Midleg: coxa dark brown; trochanter yellow; femur light to medium brown except basal 1/4 yellowish; tibia medium to dark brown with basal 2/5 whitish, covered with whitish fine hairs on basal 3/4 and white sheen on posterior surface of basal 3/4 when illuminated at certain angle of light; tarsus dark brown to brownish-black except basal 1/3 of basitarsus yellow. Hind leg: coxa medium brown; trochanter yellow; femur medium brown with base yellow and apical cap dark brown (though extreme tip yellowish); tibia (Fig. 4B) light to dark brown with basal 1/2 white to yellowish-white, covered with whitish fine hairs on basal 3/4 and white sheen on posterior surface of basal 3/4 when illuminated at certain angle of light; tarsus dark brown except basal 2/3 of basitarsus (though base medium brown) and basal 1/2 of 2nd tarsomere yellowish-white; basitarsus (Fig. 4C) narrow, nearly parallel-sided, 6.33 times as long as wide, and 0.64 and 0.53 times as wide as greatest width of tibia and femur, respectively; calcipala (Fig. 4C) slightly shorter than width at base, and 0.56 times as wide as greatest width of basitarsus. Pedisulcus (Fig. 4C) well defined. Claw (Fig. 4D) with large basal tooth 0.56 times as long as claw. **Wing.** Length 1.9 mm. Costa with dark spinules and hairs except patch of hairs on basal portion yellowish-white. Subcosta with dark hairs except near apex bare. Hair tuft on stem vein yellowish-white. Basal portion of radius fully haired; R_1 with dark spinules and hairs; R_2 with hairs only. Basal cell absent. **Haltere.** White with basal portion dark brown. **Abdomen.** Basal scale yellowish though somewhat darkened along posterior margin, with fringe of yellowish-white hairs. Dorsal surface of abdomen dark brown to brownish-black except segment 2 yellow though tergal plate and narrow area along posterior margin somewhat darkened, moderately covered with dark short to long hairs; tergites of segments 6–9 shiny when illuminated at certain angle of light. Ventral surfaces of segments 2–4 yellow, and those of other segments medium brown to brownish-black; sternal plate on segment 7 undeveloped. **Genitalia.** Sternite 8 (Fig. 4E) bare medially, with 17–19 medium-long to very long hairs together with few slender short hairs on each side. Ovipositor valves (Fig. 4E) triangular, though rounded medioposteriorly, thin, membranous, moderately covered with microsetae interspersed with 4 short hairs; inner margins straight or very slightly concave, somewhat sclerotized, and moderately separated from each other. Genital fork (Fig. 4F) of usual inverted-Y form, with slender stem; arms wide basally, about twice as wide as apical narrow portion, and moderately folded medially. Paraproct in ventral view (Fig. 4G) shallowly concave anterolaterally, with 5 or 6 sensilla on anteromedial surface; paraproct in lateral view (Fig. 4H) somewhat produced ventrally, 0.63 times as long as wide, with about 20 medium-long to long hairs on ventral and lateral surfaces. Cercus in lateral view (Fig. 4H) short, rounded posteriorly, 0.41 times as long as wide. Spermatheca (Fig. 4I) ellipsoidal, 1.62 times as long as its greatest width, well sclerotized except duct and small area near juncture with duct unsclerotized, and with many fissures on surface; internal setae absent; both accessory ducts slender, subequal in diameter to major one.

Male. Body length 2.5 mm. **Head.** Somewhat wider than thorax. Upper eye medium brown, consisting of 14 or 15 vertical columns and 14 or 15 horizontal rows of large facets. Face dark brown, grayish-white pruinose. Clypeus brownish-black, whitish pruinose, densely covered with golden yellow scale-like medium-long hairs (mostly directed upward) interspersed with several dark brown simple longer hairs. Antenna composed of scape, pedicel and 9 flagellomeres, dark brown except scape, pedicel and little less than basal 1/2 of 1st flagellomere yellow; 1st flagellomere elongate, 1.73 times as long as 2nd one. Maxillary palp light to medium brown, with 5 segments, proportional lengths of 3rd, 4th, and 5th segments 1.00:1.17:2.43; 3rd segment (Fig. 5A) somewhat widened apically; sensory vesicle (Fig. 5A) ellipsoidal, medium-sized, 0.25–0.29 times as long as 3rd segment, and with small opening. **Thorax.** Scutum dark brown to black, shiny and thinly grayish-white pruinose on each shoulder, on broad area along each lateral margin and on prescutellar area when illuminated at certain angle of light; scutum densely covered with golden-yellow recumbent short hairs. Scutellum dark brown, with golden-yellow short hairs and dark brown long upright hairs along posterior margin. Postnotum dark brown and bare. Pleural membrane bare. Katepisternum dark brown, moderately covered with fine hairs. **Legs.** Foreleg: coxa yellow; trochanter light brown except base yellow; femur light brown with apical cap medium brown; tibia light brown except median large portion on outer surface whitish and apical 1/4 dark brown, and with white sheen on outer surface of basal 3/4; tarsus brownish-black; basitarsus moderately dilated, 6.55 times as long as its greatest width. Midleg: coxa medium brown except posterior surface brownish-black; trochanter light brown except basal 1/2 yellow; femur light brown except base yellow and apical cap medium brown (though extreme tip yellow); tibia dark brown except little more than basal 1/3 yellow; tarsus dark brown except base of basitarsus dark yellow. Hind leg: coxa medium brown; trochanter yellow; femur medium brown with base yellow and apical cap dark brown (though extreme tip yellow); tibia (Fig. 5B) dark brown to brownish-black except basal 1/2 yellow; tarsus (Fig. 5C) medium to dark brown except basal 1/2 of basitarsus grayish-white and little less than basal 1/2 of 2nd tarsomere yellowish; basitarsus (Fig. 5C) somewhat enlarged, spindle-shaped, 4.36–4.57 times as long as wide, and 0.81 and 0.71–0.78 times as wide as greatest width of tibia and femur, respectively; calcipala (Fig. 5C) nearly as long as basal width, and 0.36 times as wide as greatest width of basitarsus. Pedisulcus (Fig. 5C) well defined. **Wing.** Length 1.5 mm. Costa with dark brown spinules as well as dark brown hairs except basal portion with patch of yellowish hairs. Subcosta bare (though 1 hair present on left subcosta of 1 male). Hair tuft on stem vein yellow. Basal portion of radius fully haired; R_1 with dark spinules and hairs; R_2 with hairs only. Basal cell absent. **Haltere.** Grayish-white except basal stem darkened. **Abdomen.** Basal scale dark brown, with fringe of light to medium brown hairs. Dorsal surface of abdomen medium brown to brownish-black except anterior and dorsolateral areas of segment 2 light brown, and moderately covered with dark brown short to long hairs; segments 2 and 5–8 with pair of shiny dorsolateral or lateral patches, of which those on segment 5 confined on posterior 1/2 and less dis-

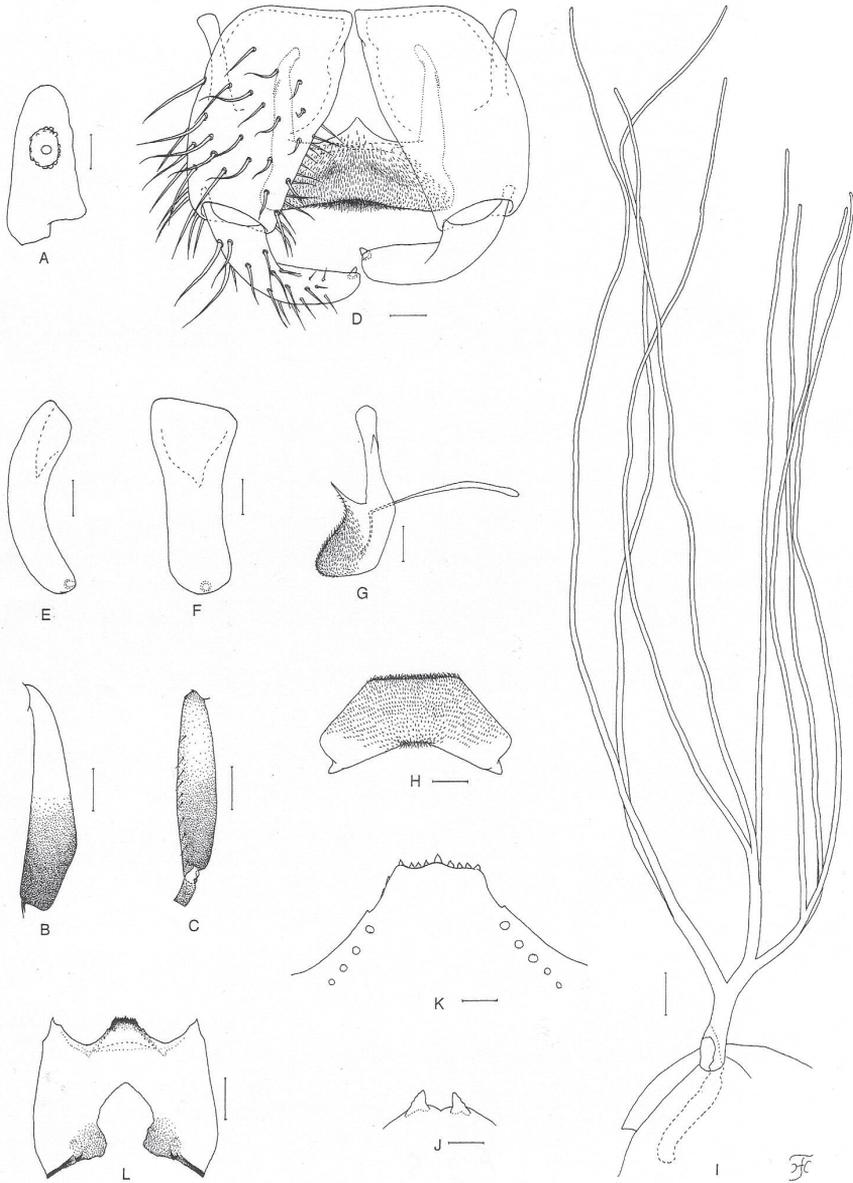


Figure 5. Male, pupa and larva of *Simulium* (*Gomphostilbia*) *lurauense* sp. n. **A–H** male **I, J** pupa **K, L** larva **A** 3rd segment of right maxillary palp showing sensory vesicle (front view) **B** left hind tibia (outer view) **C** basitarsus and 2nd tarsomere of left hind leg showing calcipala and pedisulcus (outer view) **D** coxites, styles, ventral plate and median sclerite (ventral view) **E, F** right styles (**E** medial view **F** ventrolateral view) **G** ventral plate and median sclerite (lateral view) **H** ventral plate (end view) **I** left gill filaments (outer view) **J** terminal hooks (end view) **K** hypostoma showing an abnormally small left corner tooth (ventral view) **L** head capsule showing postgenal cleft and hypostoma which is detached posteriorly from head capsule (ventral view). Scale bars. 0.1 mm for B, C, L and I; 0.02 mm for A–H, J and K.

tinct than those on segments 6 and 7. **Genitalia.** Coxite in ventral view (Fig. 5D) nearly rectangular, 1.81 times as long as its greatest width. Style in ventral view (Fig. 5D) bent inward, slightly tapered from base toward middle, then nearly parallel-sided, rounded apically and with apical spine; style in medial view (Fig. 5E) shorter than coxite (0.80 times as long as coxite), gently bent inward, nearly parallel-sided, with apical spine; style in ventrolateral view (Fig. 5F) moderately tapered from base toward basal 2/5, then nearly parallel-sided and with round apex. Ventral plate in ventral view (Fig. 5D) with body transverse, 0.42 times as long as wide, widened posteriorly, with anterior margin produced anteromedially, and posterior margin slightly concave medially, densely covered with microsetae on ventral surface; basal arms of moderate length, directed forward, then slightly convergent apically; ventral plate in lateral view (Fig. 5G) slightly produced ventrally; ventral plate in end view (Fig. 5H) trapezoidal, though dorsal margin widely concave. Median sclerite (Fig. 5D,G) thin, plate-like, wide. Paramere of moderate size, with 3 distinct long and stout hooks and several smaller ones. Aedeagal membrane moderately setose, slightly sclerotized at base but dorsal plate not well defined. Ventral surface of abdominal segment 10 without distinct hairs near posterior margin. Cercus with 13–17 hairs.

Pupa. Body length 2.6 mm. Nearly as in *S. (G.) roslihashimi* sp. n. except following characteristics. **Thorax.** Gill (Fig. 5I) composed of 8 slender thread-like filaments, arranged as [(1+2) (or 2+1)+(1+2)]+2 filaments from dorsal to ventral; common basal stalk medium-long (0.74–0.92 times as long as interspiracular trunk); dorsal and middle triplets share short stalk; dorsal triplet composed of 1 individual and 2 paired filaments with short to medium-long primary stalk and short secondary stalk, and middle triplet composed of 1 individual and 2 paired filaments and bearing medium-long primary stalk and short secondary stalk; ventral paired filaments with medium-long to long stalk which is 1.02–1.36 times as long as common basal stalk and 0.89–1.04 times as long as interspiracular trunk; stalk of ventral pair 1.00–1.08 and 1.27–1.43 times as thick as primary stalks of middle and dorsal triplets, respectively, but 0.88–0.96 times as thick as common stalk of middle and dorsal triplets; primary stalk of dorsal triplet lying against stalk of lower pair at angle of 60–80 degrees when viewed laterally; 3 filaments of dorsal triplet subequal in length (about 2.0 mm long including their own stalks and common basal stalk) and thickness to one another; 3 filaments of middle triplet subequal in length (2.1–2.3 mm long including their own stalks and common basal stalk) and thickness to one another; 2 filaments of ventral pair subequal in length (2.5–2.6 mm long including their own stalk and common basal stalk) and thickness to each other, and 1.38–1.43 and 1.39–1.43 times as thick as those of middle and dorsal triplets, respectively, when compared basally. **Abdomen.** Dorsally, segments 6–9 each with spine-combs (though those on segment 9 somewhat smaller than those on segment 8) in transverse row and comb-like groups of minute spines on each side; segment 9 with pair of small triangular flat terminal hooks of which outer margin is 1.15 times as long as inner margin and weakly undulated (Fig. 5J). **Cocoon.** Wall pocket-shaped, thinly and rather roughly woven, somewhat extended ventrolaterally; anterior margin not

thickly woven, with dorsal portion not or slightly produced anteriorly when viewed dorsally; 2.5–2.9 mm long by 1.7–1.8 mm wide.

Mature larva. Body length 3.9 mm. Body creamy with color markings as follows: thoracic segment 1 encircled with ochreous broad transverse band (though disconnected ventrally), proleg grayish, thoracic segments 2 and 3 light ochreous dorsally and each with distinct ochreous wide areas ventrally, abdominal segments 1–4 each encircled with grayish broad band, abdominal segment 3 also faintly encircled with reddish-purplish band, abdominal segments 5–8 almost entirely covered by sheet of reddish-purplish pigment on dorsal and dorsolateral surfaces (though anterior portion of abdominal segment 5 narrowly unpigmented), from which colored narrow band extends to various extent either laterally or ventrolaterally or even ventrally on each of segments 5–8 (color of band on segments 5, 6 and 8 reddish-purplish and that on segment 7 grayish), and abdominal segment 7 with reddish-purplish transverse broad band ventrally. Cephalic apotome dark yellow, moderately covered with minute setae; head spots very faintly positive. Lateral surface of head capsule yellow except eye-spot region whitish, sparsely covered with minute setae; spots indistinct. Ventral surface of head capsule yellow except darkened area near posterior margin on each side of postgenal cleft, and sparsely covered with minute setae. Antenna composed of 3 segments and apical sensillum, somewhat longer than stem of labral fan; proportional lengths of 1st, 2nd, and 3rd segments 1.00:0.72:0.92. Labral fan with 30 main rays. Mandible with 3 comb-teeth decreasing in length from 1st to 3rd; mandibular serration composed of 2 teeth (1 medium-sized and 1 small); major tooth at acute angle against mandible on apical side; supernumerary serrations absent. Hypostoma (Fig. 5K) with row of 9 apical teeth; median tooth prominent, right corner tooth nearly as long as inner one of intermediate teeth and slightly longer than remaining outer and median teeth, but left corner tooth shorter than outer and median ones of intermediate teeth (this unexpected short corner tooth as well as lack of 2 lateral teeth on left side suggesting antero-lateral portion of hypostoma on left side abnormally formed); lateral margin smooth; 4 or 5 hypostomal bristles per side lying slightly divergent posteriorly from lateral margin. Postgenal cleft (Fig. 5L) lanceolate, (its length ratio against postgenal bridge is not accurately attainable due to posterior part of hypostoma which is widely detached from head capsule and folded inward, making it difficult to measure length of postgenal bridge). Cervical sclerite composed of 2 yellow small pieces, not fused to occiput, widely separated medially from each other. Thoracic cuticle bare. Abdominal cuticle almost bare except few posterior segments sparsely to moderately covered with simple minute setae dorsally and dorsolaterally and last segment densely covered with colorless simple setae on each side of anal sclerite. Rectal scales absent. Rectal papilla compound (number of secondary lobules not countable because rectal papilla is withdrawn). Anal sclerite of usual X-form, with anterior arms little longer than posterior ones, broadly sclerotized at base; accessory sclerite absent. Last abdominal segment expanded ventrolaterally forming double bulges on each side, visible as large conical ventral papilla when viewed from side. Posterior cirlet with 76 rows of up to 13 hooklets per row.

Type specimens. Holotype male (with associated pupal exuviae and cocoon) (preserved in 80% ethanol) reared from pupa, collected from a river (Sungai Lurau) (width 10–12 m, water temperature 22.0°C, partially shaded, altitude 530 m, 03°18'22.9"N, 101°52'50.0"E) moderately to rapidly flowing, Janda Baik, Pahang, Malaysia, 22. II. 2011, by M. Sofian-Azirun and H. Takaoka. Paratype: 1 female (with associated pupal exuviae and cocoon) (preserved in 80% ethanol), collected from a small stream (width 0.3–0.5 cm, water temperature 23.0°C, exposed to sun, altitude 582 m, 05°33'95.8"N, 101°36'65.2"E), very slowly flowing in a flat bushy area before joining to Selaur River, Temengor, Perak, 26. IV. 2011, by Z. Ya'cob; 1 male (with associated pupal exuviae and cocoon) (preserved in 80% ethanol) and 1 mature larva (preserved in acetic alcohol), collected from a small stream (width 1–3 m, water temperature 22.0°C, shaded, altitude 380 m, 03°43'36.4"N, 101°47'33.9"E), moderately flowing in a natural forest, along the road from Raub to Fraser's Hill, Pahang, 12. IV. 2011, by M. Sofian-Azirun, Z. Ya'cob and H. Takaoka.

Biological notes. In Janda Baik, the pupa of this new species was collected from a tree leaf trailing in the water. Associated species were *S. (S.) hirtinervis* Edwards, 1928, *S. (S.) nobile* de Meijere, 1906 and *S. (S.) tani* Takaoka and Davies, 1995. In the stream between Raub and Fraser's Hill, the other pupa was collected from a trailing grass, and associated species were *S. (S.) bishopi* Takaoka and Davies, 1995, *S. (G.) decuplum* Takaoka and Davies, 1995 and *S. (S.) tani*. In Perak, the pupa was collected from a trailing grass and associated species were *S. (G.) whartoni* and *S. (S.) tani*.

Etymology. The species name *lurauense* refers to the name of the river where this new species was collected for the first time.

Remarks. *Simulium (G.) lurauense* sp. n. is most similar to *S. (G.) sofiani* recently described from Cameron Highland (Takaoka et al. 2011) in sharing the elongate female sensory vesicle (Fig. 4A), the yellowish-white hairs on the base of the costal vein and on the stem vein, the greater number of enlarged male upper-eye facets, the narrow, spindle-shaped male hind basitarsus (Fig. 5C), the trapezoidal male ventral plate when viewed posteriorly (Fig. 5H) and the pupal terminal hook of narrow triangular shape (Fig. 5J). However, this new species is distinguished from *S. (G.) sofiani* in the female by the arms of the genital fork which are wide basally and narrowed apically (Fig. 4F), in the male by the medium-sized sensory vesicle (Fig. 5A), in the pupa by the medium-long common basal stalk of the gill (Fig. 5I) and in the larva by the abdominal segments 5–8 with reddish-purplish markings dorsally (cf., the arms of the female genital fork are narrow throughout its length, the male sensory vesicle is globular and small, 0.15 times as long as the maxillary palpal segment 3, the common basal stalk of the pupal gill is long, 1.0–1.2 times as long as the interspiracular trunk, and the dorsal surfaces of larval abdominal segments 5–8 are faintly greenish in *S. (G.) sofiani*).

This new species is distinguished from the other species of the *ceylonicum* species-group reported from Peninsular Malaysia as shown in the keys.

Among the known species of the *ceylonicum* species-group reported from other Asian countries, *S. (G.) dudgeoni* Takaoka and Davies, 1995, from Hong Kong is similar to *S. (G.) lurauense* sp. n. in having the nearly similar number of enlarged male

upper-eye facets, the spindle-shaped male hind basitarsus, and the ventral plate which is widened posteriorly when viewed ventrally, but is distinguished by the almost dark male hind tibia (Takaoka et al. 1995). In addition, *S. (G.) namense* Takaoka, 1989, from Myanmar shows a similar number of enlarged male upper-eye facets but differs by having the dark brown male scutum with three longitudinal vittae, the wedge-shaped male hind basitarsus and the ventral plate slightly narrowed posteriorly when viewed ventrally (Takaoka 1989).

Keys to three species-groups of the subgenus *Simulium* (*Gomphostilbia*) reported from Peninsular Malaysia

The three species-groups are morphologically indistinguishable from one another in the pupal and larval stages.

Females

- 1 Antenna with 7 or 8 flagellomeres..... *varicorne* species-group
- Antenna with 9 flagellomeres..... 2
- 2 Hind tibia whitish on basal 1/3 to 3/4 and without subbasal dark spot.....
..... *ceylonicum* species-group
- Hind tibia mostly brownish with base whitish, or hind tibia whitish on basal 1/2 or more and with subbasal dark spot *batoense* species-group

Males

- 1 Antenna with 7 or 8 flagellomeres..... *varicorne* species-group
- Antenna with 9 flagellomeres..... 2
- 2 Hind basitarsus enlarged, wedge- or spindle-shaped.....
..... *ceylonicum* species-group
- Hind basitarsus slender, parallel-sided..... *batoense* species-group

Keys to species of the *ceylonicum* species-group of the subgenus *Simulium* (*Gomphostilbia*) reported from Peninsular Malaysia

Females (*Simulium hoiseni* is not included because its female remains unknown)

- 1 Hairs on stem vein black..... *S. sheilae*
- Hairs on stem vein whitish-yellow or yellow 2
- 2 Sensory vesicle elongate, 0.50–0.62 times as long as maxillary palpal segment 3 3
- Sensory vesicle medium-long, 0.22–0.30 times as long as maxillary palpal segment 3 4
- 3 Arms of genital fork narrow throughout its length *S. sofiani*

- Arms of genital fork with wide basal portion, about twice as wide as apical narrow portion *S. lurauense* sp. n.
- 4 Outer margin of mandible without teeth *S. roslibashimi* sp. n.
- Outer margin of mandible with teeth 5
- 5 Hind tibia whitish-yellow on basal 1/2 *S. longitruncum*
- Hind tibia whitish-yellow on basal 2/3 *S. asakoeae*

Males

- 1 Hairs on stem vein black..... *S. sheilae*
- Hairs on stem vein yellow 2
- 2 Hind basitarsus wedge-shaped, and as wide as or little wider than hind tibia... 3
- Hind basitarsus spindle-shaped, and narrower than hind tibia 4
- 3 Antenna yellow to ochreous, though apical 4 or 5 flagellomeres darkened.....
..... *S. hoiseni*
- Antenna brown except scape, pedicel and base of 1st flagellomere yellow.....
..... *S. asakoeae*
- 4 Antenna almost entirely yellow *S. roslibashimi*
- Antenna brown except scape, pedicel and base of 1st flagellomere yellow.... 5
- 5 Hind basitarsus 0.9 times as wide as hind tibia; body of ventral plate slightly narrowed posteriorly when viewed ventrally..... *S. longitruncum*
- Hind basitarsus 0.8 times as wide as hind tibia; body of ventral plate somewhat widened posteriorly when viewed ventrally..... 6
- 6 Sensory vesicle short, 0.15 times as long as maxillary palpal segment 3
..... *S. sofiani*
- Sensory vesicle medium-long, 0.25–0.29 times as long as maxillary palpal segment 3 *S. lurauense*

Pupae

- 1 Gill with 6 filaments *S. hoiseni*
- Gill with 8 filaments 2
- 2 Common basal stalk of gill as long as or longer than interspiracular trunk.. 3
- Common basal stalk of gill shorter than interspiracular trunk..... 4
- 3 Dorsal and middle triplet groups of gill filaments sharing common stalk
..... *S. sofiani*
- Dorsal triplet group of gill filaments arising directly from common basal stalk *S. longitruncum*
- 4 Abdominal segments 1 and 2 dark grayish, with minute tubercles
..... *S. asakoeae*
- Abdominal segments 1 and 2 transparent or light yellow, without tubercles..
..... 5

- 5 Dorsal and middle triplets of gill filaments sharing very short common stalk; common basal stalk shorter than $3/5$ of interspiracular trunk ***S. sheilae***
- Dorsal and middle triplets of gill filaments sharing short to medium-long common stalk; common basal stalk longer than $3/5$ of interspiracular trunk..... **6**
- 6 Terminal hooks narrow, with outer margin slightly longer than inner margin and undulate..... ***S. lurauense***
- Terminal hooks wide, with outer margin over twice as long as inner margin and crenulate ***S. roslibashimi***

Larvae (*Simulium hoiseni* is not included because its larva remains unknown)

- 1 Postgenal cleft very long, with its apex almost reaching posterior border of hypostoma ***S. sheilae***
- Postgenal cleft medium-long, leaving space (i.e., postgenal bridge) between its apex and posterior border of hypostoma..... **2**
- 2 Ventral surface of head capsule darkened around postgenal cleft .. ***S. asakoe***
- Ventral surface of head capsule not darkened around postgenal cleft..... **3**
- 3 Abdominal segments 5–8 with reddish-brown or reddish-purplish markings on dorsal surface **4**
- Abdominal segments 5–8 without such reddish markings on dorsal surface.. **5**
- 4 Dorsal surfaces of abdominal segments 5 and 6 almost entirely reddish-purplish..... ***S. lurauense***
- Dorsal surfaces of abdominal segments 5 and 6 each with reddish-brown W-shaped transverse band..... ***S. roslibashimi***
- 5 Body length 4.2–4.6 mm; posterior circler with 80 rows of up to 12 hooklets per row ***S. sofiani***
- Body length 5.0–5.4 mm; posterior circler with 86–96 rows of up to 15 hooklets per row ***S. longitruncum***

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References

- Adler PH, Crosskey RW (2011) World Blackflies (Diptera: Simuliidae): A Comprehensive Revision of the Taxonomic and Geographical Inventory [2011]. 117 pp., <http://entweb.clemson.edu/biomia/pdfs/blackflyinventory.pdf> [accessed on April 20, 2011]
- Crosskey RW (1973) Family Simuliidae, p. 423–30. In: Delfinado MD, Hardy DE, eds., A catalog of the Diptera of the Oriental Region. Vol. I. Suborder Nematocera. University Press of Hawaii, 616 pp.
- Edwards FW (1928) Diptera Nematocera from the Federated Malay States Museums. Journal of Federated Malay State Museum 14: 1–139.
- Takaoka H (1989) Notes on blackflies (Diptera: Simuliidae) from Myanmar (formerly Burma). Japanese Journal of Tropical Medicine and Hygiene 17: 243–257.
- Takaoka H (2000) Taxonomic notes on *Simulium gombakense* (Diptera: Simuliidae) from Peninsular Malaysia: descriptions of male and pupa, and subgeneric transfer from *Morops* to *Gomphostilbia*. Japanese Journal of Tropical Medicine and Hygiene 28:11–114.
- Takaoka H (2003) *The Black Flies (Diptera: Simuliidae) of Sulawesi, Maluku and Irian Jaya*. xxii + 581 pp., Kyushu University Press, Fukuoka.
- Takaoka H (2008) *Simulium (Gomphostilbia) hoiseni* sp. n. (Diptera: Simuliidae): a new species from Peninsular Malaysia. Medical Entomology and Zoology 59: 9–14.
- Takaoka H, Adler PH (1997) A new subgenus, *Simulium (Daviesellum)*, and a new species, *S. (D.) courtneyi*, (Diptera: Simuliidae) from Thailand and Peninsular Malaysia. Japanese Journal of Tropical Medicine and Hygiene 25: 17–27.
- Takaoka H, Davies DM (1995) *The Black Flies (Diptera: Simuliidae) of West Malaysia*. viii + 175 pp., Kyushu University Press, Fukuoka.
- Takaoka H, Davies DM (1997) *Simulium (Simulium) yongi* sp. n. (Diptera: Simuliidae) from Peninsular Malaysia. Japanese Journal of Tropical Medicine and Hygiene 25: 11–16.
- Takaoka H, Davies DM, Dudgeon D (1995) Black flies (Diptera: Simuliidae) from Hong Kong: taxonomic notes with descriptions of two new species. Japanese Journal of Tropical Medicine and Hygiene 23: 189–196.
- Takaoka H, Otsuka Y, Choochote W, Aoki C, Hayakawa H, Thongsahuan S (2010) Descriptions of the male, pupa and larva of *Simulium (Gomphostilbia) novemarticulatum* (Diptera: Simuliidae) from Peninsular Malaysia and Thailand. Medical Entomology and Zoology 61: 59–67.
- Takaoka H, Sofian-Azirun M, Hashim R (2011) *Simulium (Gomphostilbia) sofiani*, a new species of black fly (Diptera: Simuliidae) from Peninsular Malaysia. Tropical Biomedicine, 28 (in press)

A taxonomic review of *Eucalantica* Busck (Lepidoptera, Yponomeutidae) with descriptions of six new species

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Abstract

The New World genus *Eucalantica* Busck, 1904 is reviewed. It comprises seven species, six of which are described as new: *E. costaricae* Sohn & Nishida, **sp. n.**, *E. ebecatlella* Sohn & Nishida, **sp. n.**, *E. icarusella* Sohn & Nishida, **sp. n.**, *E. powelli* Sohn, **sp. n.**, and *E. pumila* Sohn, **sp. n.**, all five from Costa Rica; *E. vaquero* Sohn, **sp. n.** from southern USA and Mexico. The type species, *E. polita* (Walsingham, 1881), is redescribed and a lectotype and two paralectotypes are designated. Illustrations and keys based on the forewing patterns and the genitalia of each sex are provided. Our review suggests that there remains an undiscovered high diversity of *Eucalantica* in the tropical highlands of Central America.

Keywords

Costa Rica, *Eucalantica*, lectotype, Mexico, new species, taxonomy, USA, *Vaccinium*, Yponomeutidae, Yponomeutoidea

Introduction

The genus *Eucalantica* was proposed by Busck (1904) to account for differences of the type species *Calantica polita* Walsingham, 1881, from other *Calantica* Zeller, 1847, a junior homonym of *Calantica* Gray, 1825, whose replacement name is *Niphonympha*

Meyrick, 1914. Busck suggested that *Eucalantica* is distinguished from *Niphonympha* in having scale tufts on the 3rd segment of labial palpus, $Rs_1 (=R_2)$ and $Rs_2 (=R_3)$ stalked in the forewings, and CuA_2 arising near the middle of the cell in the hindwings. These characteristics are, however, homoplasious over the yponomeutoid lineages. Only their combination may help in distinguishing *Eucalantica* from other genera. The taxonomic position of the genus remains uncertain. Kyrki (1990) placed *Eucalantica* in Yponomeutidae without explanation. We follow this tentative placement. To establish which apomorphic characters define *Eucalantica*, a phylogenetic analysis of the Yponomeutoidea would be necessary but is beyond the scope of this work.

Eucalantica has been regarded as monobasic since the original description. Powell and Opler (2009) first challenged this status when mentioning the presence of species similar to *Eucalantica polita* from the high-elevation forests of Mexico and Costa Rica but they did not describe them. This discovery raised the possibility that the genus is more diverse and widely distributed than previously thought.

The purpose of this paper is to describe six new species of *Eucalantica*, five of which were from Costa Rica and one from southern USA and Mexico, to revise the definition of the genus and to present identification keys to adults based on external features and genitalia.

Materials and methods

Pinned specimens from six institutional collections were examined. The abbreviations of these depositories are as follows:

- BMNH** Natural History Museum (formerly British Museum of Natural History), London, UK;
- EMEC** Essig Museum of Entomology, University of California, Berkeley, USA;
- INBIO** Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica;
- MCZ** Museum of Comparative Zoology, Harvard University, Cambridge, USA;
- UCR** Museo de Zoología, Escuela de Biología, Universidad de Costa Rica, San José, Costa Rica;
- USNM** National Museum of Natural History (formerly United States Museum of Natural History), Washington DC, USA.

Specimen label data are arranged by country, following in order of sex, state/province, specific locality, collecting date, collector and rearing records, if pertinent, and ending with specimen depository in parenthesis. The individuals whose sex cannot be determined are listed as 'ex'.

Selected specimens were dissected for genitalia and abdominal structures, following Clarke (1941), except that chlorazol black was used for staining. Dissected genitalia were mounted on the microscope slides in Euparal resin (BioQuip Products Inc.).

The genitalia slide numbers (GSN) are given for the dissected specimens with the suffix 'USNM' for USNM specimens, 'EMEC-JCS' for EMEC specimens and 'SJC' for INBIO specimens. Unmounted genitalia are stored in glycerin-filled, transparent envelopes which are attached with dissected specimens. Pinned specimens were examined under a Leica MZ APO stereoscope. Slide-mounted specimens were examined under a Leica LETTZ-DMRX microscope.

Terms for genitalia and wing venation follow Klots (1970) and Wootton (1979), respectively. The 7th, 8th, and 9th abdominal segments are abbreviated as A7, A8, A9 respectively in the descriptions; the 7th and 8th sternite of females as S7 and S8.

Taxonomic accounts

Genus *Eucalantica* Busck, 1904

<http://species-id.net/wiki/Eucalantica>

Figs 1–35

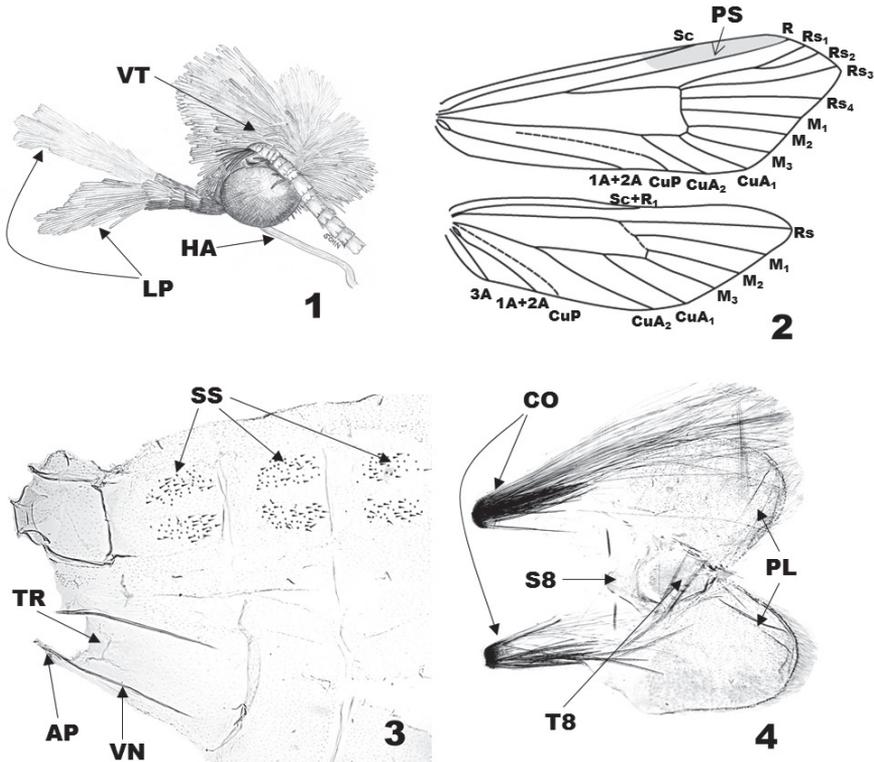
Eucalantica Busck, 1904: 750. Type species: *Calantica polita* Walsingham, 1881, by original designation and monotypy.

Diagnosis. This genus is superficially similar to *Thecobathra* Meyrick, 1922, which also has a silvery white body and forewings, but differs from the latter in having a dark brown costal streak in forewing. The male genitalia of *Eucalantica* are distinguished from those of *Thecobathra* in having three or four spines on socii (none or one spine in the latter) and a lack of dentiform projections on phallus (present in the latter). The female S8 is entirely or almost entirely sclerotized in *Eucalantica*, but not in *Thecobathra*. The female genitalia of those two genera are also different in the shape of the signum, if present: keel-like or discoid plate in *Eucalantica*, cruciform in *Thecobathra*.

Description. When resting, *Eucalantica* moths lay their body parallel to the substrate with their forelegs extended forward (Fig. 5).

Head (Fig. 1). Vertex vestiture rough with white, piliform scales; frons dark brown. Antennae filiform, 3/5 as long as forewing; scape white, with brown pecten; pedicel and first two flagellomeres with two complete whorls of scales per segment, white dorsally, gray ventrally; the remaining flagellomeres with a dorsal cover of gray scales on anterior half, a complete whorl of gray scales on distal half. Labial palpus porrect, 1st segment pale brownish gray, 1/4 as long as 2nd; 2nd segment dark brown, with denser scales distad, as long as eye diameter; 3rd segment white except dark brown on ventrobasal area, with white scale tufts dorsally, as long as 2nd. Maxillary palpus 4 segmented. Proboscis devoid of scales, longer than labial palpus.

Thorax and abdomen. Tegula and mesonotum white. Foreleg lustrous dark brown dorsally, gray ventrally; epiphysis arising at middle. Midleg with coxa to tibia lustrous pale brown dorsally, silvery white ventrally; first tarsus dark brown dorsally, silvery white ventrally; the remaining tarsi brownish gray with dark brown ring on



Figures 1–4. Generic characteristics of *Eucalantica*. **1** head of *E. polita* (lateral view) **2** wing venation of *E. polita* (gray shade – pterostigma) **3** abdominal segment II–IV of *E. costaricae* sp. n. **4** abdominal segment VIII of *E. costaricae* sp. n. Abbreviations: AP = apodeme; CO = coremata; LP = labial palpus; HA = haustellum; PL = pleural lobe; PS = pterostigma; S8 = eighth sternite; SS = spiniform setae; T8 = eighth tergite; TR = transverse ridge; VN = venula.

distal end. Hindleg silvery white, slightly tinged with pale brown ventrally. The forewings (Figs 6–14) white, elongate-triangular, costa straight, apex at anterior 1/3 of termen, obtuse-angled, termen oblique after apex; a black spot at the upper corner of discal cell; scattered black spots on the posterior 1/2 and distal 2/3; a brown or orange dorsal patch; however, the latter two are often reduced, depending on the individual. The forewing venation of *Eucalantica* (Fig. 2) with pterostigma 2/5 of costa before R; Rs_1 and Rs_2 stalked; Rs_4 below apex; M_2 and M_3 at base closer than M_1 ; CuA_1 directed to tornus; CuA_2 ending at posterior margin. The hindwing slightly broader than forewing, pale gray, darkened to apex and anterior margin, termen broadly round, apex narrowly round; venation (Fig. 2) with $Sc+R_1$ ending at the middle of anterior margin; R directed to apex; M_1 , M_2 and M_3 evenly spaced; CuP close to 1A+2A. Abdomen silvery white, slightly tinged with pale brown on basal half; pleural lobe silvery white.

Abdominal sternum II and terga (Fig. 3). Apodeme slender, 1/5 as long as venula; venula slender, 4/5 as long as 2nd sternite; transverse ridge at posterior 1/6 of 2nd

sternite. A pair of spiniform setal zones on tergum II-VII; in *polita*, paired zones expanded, fused with each other.

Male A8 (Fig. 4). A pair of coremata twice as long as pleural lobes; tergite elliptical, with lanceolate caudal end; pleuron expanded posteriorly as lobate; sternite subtriangular, enlarged caudad, posterior margin concave.

Male genitalia (Figs 17–30). Uncus linguiform, convex posteriorly, medially fused with tegumen; in four of the seven species, a pair of lateral humps present near apex; socii elongate, extended from ventrobasal area of uncus, with a row of 3–4 spines ventroterminally. Tuba analis with weakly sclerotized area ventrally (‘subscaphium’), continuous to gnathos; gnathos as a transverse bulge below tuba analis, with narrow, band-like sclerotization along apical edge. Valva obovate or rectangular, setose on the posterior half of the ventral side, with species-specific groove or projections above basal sacculus. Vinculum narrower to saccus; saccus elongate. Aedeagus straight or bent medially; cornuti absent or as a zone of minute spinules.

Female genitalia (Figs 31–35). Papillae anales subtriangular. A pair of hairy humps on the distal margin of S8; interspace between the humps with dense, minute thorns, the thorny area extending above and below S8 humps. Segment S8 entirely or mostly sclerotized, sometimes posterolateral margins forming a semicircular fold (Figs 32 and 35, indicated by asterisk); depending on the species, with a pair of pits (Fig. 35a) or semicircular depression (Fig. 31b) near ostium. Antrum digitate or bowl-shaped, with numerous minute thorns internally; thorny area extending caudally beyond ostium bursae. Ductus seminalis near a connection between ductus and corpus bursae; bulla seminalis as large as (in *polita*) or smaller than corpus or absent (in *costaricae*). Corpus bursae very fragile due to its thin wall; signum absent in two species, present in three species and shaped like a dentate keel or a small scobinate disk.

Species diversity. The distribution of *Eucalantica* as shown in this paper indicates a high diversity of the genus in the Central America. Three of the five Costa Rican species described in this paper were found in the high-elevation oak forests of Cerro de la Muerte region, indicating that multiple species can coexist in a single ecozone. Interestingly, there exists a different group of congeners in the high mountains of Heredia province. This pattern predicts more undescribed species of *Eucalantica* present along the montane systems of Costa Rica and other Central American countries.

Key to the adults of *Eucalantica* species including variants in forewing patterns

Note: External appearance is usually inadequate for species identification of *Eucalantica*. Whenever possible, examination of the genitalia is advised for reliable identifications of the species.

- 1 No patch and suffusion on dorsal area of forewing..... 2
- Dorsal patch and/or suffusion on forewing present (Fig. 6)..... 3
- 2 Black spots scattered on forewing..... *costaricae* sp. n.
- Forewing almost immaculate (except discal spot) *polita* (Fig. 8)
- 3 Dorsal patch on forewing without posterior suffusion..... 4
- Dorsal patch on forewing with posterior suffusion (Fig. 6)..... 6

- 4 Dorsal patch bar-like 5
- Dorsal patch triangular *pumila* sp. n.
- 5 Terminal half of fringe pale grayish brown on forewing *polita* (Fig. 7)
- Terminal 1/4 of fringe pale grayish brown on forewing *vaquero* sp. n.
- 6 Posterior suffusion extending along entire dorsal margin of forewing 7
- Posterior suffusion only on basal 2/3 of dorsal margin of forewing
..... *ehecatlella* sp. n.
- 7 Posterior suffusion with apparent dorsal patch 8
- Posterior suffusion with reduced dorsal patch *powelli* sp. n.
- 8 Black spots on forewing sparse and covering only distal third
..... *icarusella* sp. n.
- Black spots on forewing dense and scattered over entire surface *polita* (Fig. 9)

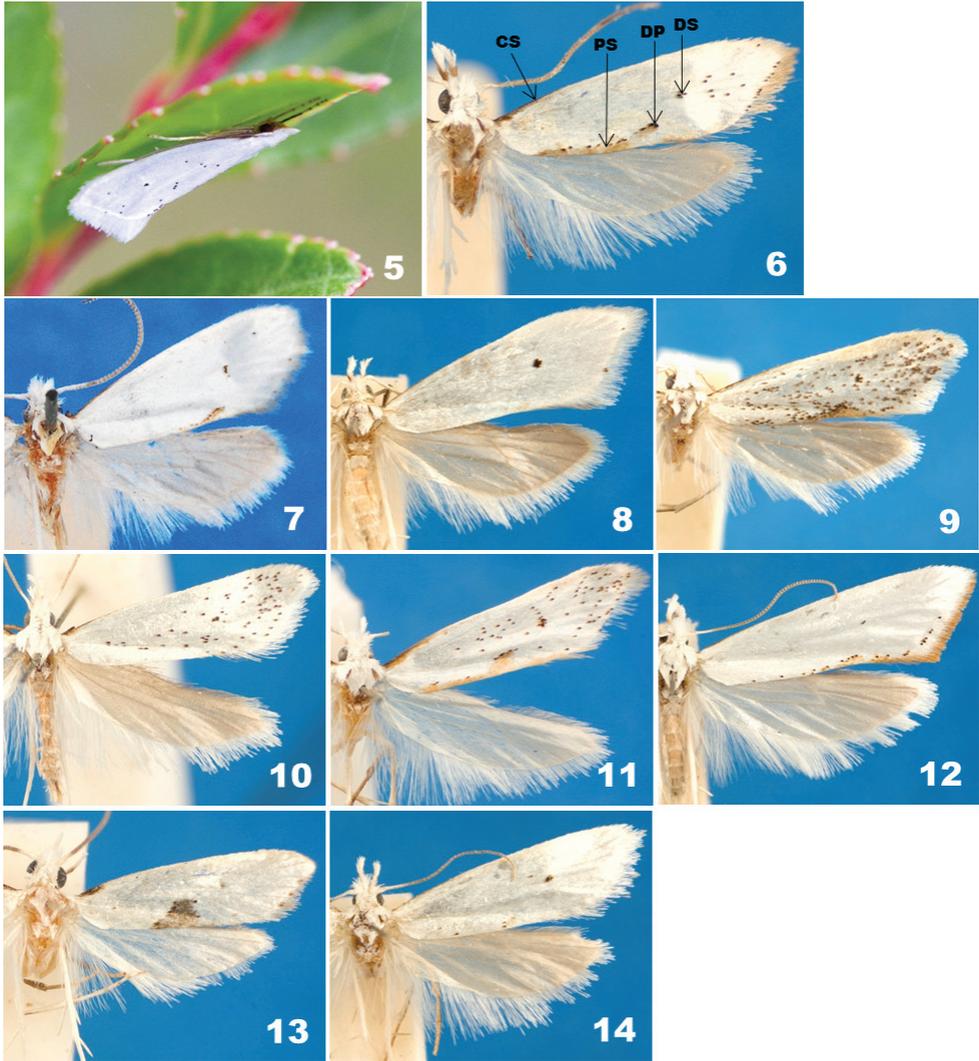
Key to *Eucalantica* species based on male genitalia

- 1 A pair of lateral lobes near uncus apex present 2
- A pair of lateral lobes near uncus apex absent 5
- 2 Aedeagus with swelling at 3/5 (Figs 24e and 28e) 3
- Aedeagus without swelling 4
- 3 Apex of uncus medially markedly convex (Fig. 27a) *vaquero* sp. n.
- Apex of uncus medially nearly flat (Fig. 23a) *icarusella* sp. n.
- 4 Valva with a triangular mound above subbasal saccular region (Fig. 17c)
..... *polita*
- Valva without a mound above subbasal sacculus region (Fig. 25c)
..... *powelli* sp. n.
- 5 Valva obovate 6
- Valva with costal and saccular margin parallel each other in most areas
..... *pumila* sp. n.
- 6 Base of valva with two arched grooves (Fig. 21c) *ehecatlella* sp. n.
- Base of valva with one arched groove (Fig. 19c) *costaricae* sp. n.

Key to *Eucalantica* species based on female genitalia

Note: the females of *E. ehecattlella* and *E. pumila* are unknown

- 1 Signum present 2
- Signum absent 4
- 2 Signum keel-shaped (Figs 34c, 35c) 3
- Signum discoid (Fig. 33c) *costaricae* sp. n.
- 3 A pair of pits present on S8 around ostium bursae (Fig. 35a)
..... *icarusella* sp. n.
- S8 without pits *vaquero* sp. n.
- 4 S8 with a pair of semicircular folds posterolaterally (Fig. 32) *powelli* sp. n.
- S8 without semicircular fold *polita*



Figures 5–14. Adults of *Eucalantica*. **5** *Eucalantica costaricae* sp. n., resting on underside of *Vaccinium floribundum*, Cerro de la Muerte, Costa Rica **6** *E. ebecatlella* sp. n. (male, holotype) **7–9** *E. polita* **7** lectotype (male) **8** pale variant (female) **9** maculate variant (male) **10** *E. costaricae* sp. n. (female, paratype) **11** *E. icarusella* sp. n. (male, holotype) **12** *E. powelli* sp. n. (female, paratype) **13** *E. pumila* sp. n. (male, holotype) **14** *E. vaquero* sp. n. (female, paratype). Abbreviations: CS = costal streak; DP = dorsal patch; DS = discal spot; PS = posterior suffusion.

***Eucalantica polita* (Walsingham, 1881)**

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

Figs 1–2, 7–9, 17–18, 31

Calantica polita Walsingham, 1881: 302, pl. 35: 2.

Eucalantica polita; Busck, 1904: 750.

Types examined. **Lectotype** ♂ (here designated; Fig. 7) – USA: “Lectotype [on a round paper with cobalt blue border]”, “Lake Co./ CALIFORNIA/ 17–19 1871/ Wlsm. [on a rectangular paper]”, “Walsingham/ Collection/ 1910–427 [on a rectangular paper]”, “Calantica/ polita Wlsm/ P.Z.S.Lond.p.302.tf.35'2 1881/ TYPE ♂ [on a rectangular paper with black margins]”, BMNH. **Paralectotypes** 2♂ – USA: “Calantica polita Wl. Cala. [California], Pr.Z.S.1881.p302/ pl.35.f.2 [handwriting on a rectangular paper]”, “Type 14992 [in a red rectangular paper]”, “Wlsm. To Chamb. [handwriting on single line paper]”, MCZ. Walsingham (1881) did not state the exact type locality and the number of specimens for his description of *Calantica polita*. A male specimen from BMNH has a red-bordered round label written “Type”. Two type specimens of *C. polita* from MCZ are duplicates by Walsingham which were sent to Chambers (Miller and Hodges, 1990). Therefore, all three specimens from BMNH and MCZ which hold “Type” label must be syntypes as Miller and Hodges (1990) already indicated. We formally designate a lectotype of *C. polita* amongst these specimens.

Specimens examined. CANADA: 2♂, British Columbia, Vancouver, BC, 3 August 1902 (USNM); 1♂, British Columbia, Vancouver Isl., Wellington, 14 April 1902 (USNM); 3♂, ditto, February 1905, GW Taylor (USNM); 1♂, ditto, 27 April 1904, T Bryant (USNM); 1M, ditto, October 1905, GW Taylor (USNM); 3♂, ditto, November 1905, GW Taylor (USNM); 3♂, ditto, no date, GW Taylor (USNM); 1♂, British Columbia, Vancouver Is., Duncans, 12 April 1892, Hanham (USNM); 1♂, ditto, June 1908, Hanham (USNM); 1♂, ditto, 5 October 1908, Hanham (USNM); 1♂, ditto, April 1909, Hanham (USNM); 1ex, ditto, no date, Hanham (USNM); 1♂1♀, British Columbia, Departure Bay, Bio Station, April 1909 (USNM); 1♂, British Columbia, Goldstream, 18 April 1921, EH Blackmore (USNM). USA: 1♂, Washington, Goldbar, 25 September 1983, DF Bray (USNM); 1♂, Washington, Long Beach, Clarke's Nursery, 24 July 1965, EP Breakey, “reared from *Vaccinium ovatum*”, GSN [USNM-77947] (USNM); 1♂, Washington, Long Beach, 10 December 1964, EP Breakey & EG Tinius, “from larva boring rhododendron twig, emerged on 31 December 1964” (USNM); 2♂2♀, Washington, Tacoma, 20 May 1928, M Clarke (USNM); 1♂, Washington, Lake Crescent, June 1971, EC Zimmerman (USNM); 1ex, Washington, Tiago, 17 June 1918, HK Plank, “on huckleberry [sic]/ winter” (USNM); 1♂, Washington, Seattle, 27 May 1901, GSN [USNM-91608] (USNM); 1♂, ditto, 12 October 1923, JFG Clarke (USNM); 1♂, ditto, 20 April 1931, WMW Baker, “leaf miner in rhododendron” (USNM); 1♂, Washington, Olympic Mts., 12 April 1892 (USNM); 6♂, Washington, Olympic Mts., Barnes Creek, 5–6 August 1936, AF Braun (USNM); 1♂, Washington, Olympic Mts., Hurricane Ridge, alt. 3000ft, 15 June 1955, JFG

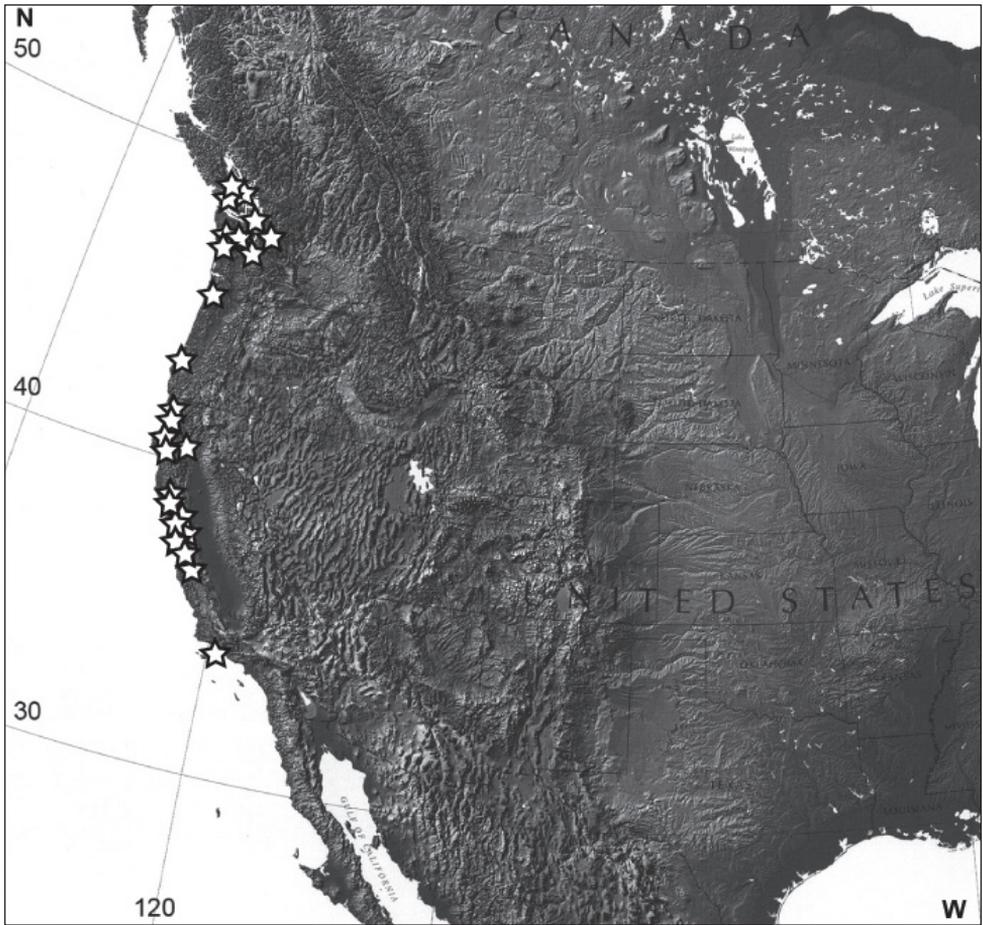


Figure 15. Distribution of *Eucalantica polita* (white star). Map from www.nationalatlas.gov.

Clarke (USNM); 2♂, Washington, Harstine Island, 24 July 1960, EP Breakey, “from larvae (leaf tiers) feeding in tips of huckleberry” (USNM); 1♀, Washington, Hoquiam, Burke Colr., 6 May 1904, Fivino (USNM); 3♂1♀, Washington, San Juan Co., Deer Harbor, Orcas Island, 14 July 2002, J Powell (EMEC); 1♂, Washington, Kitsap Co., Bainbridge Island, Venice District, 3–4 April 2001, J Powell (EMEC). 3♂1♀, Oregon, NW corner Douglas Co., Lake Tahkenitch, 26 August 1969, J Powell (EMEC); 1♂, ditto, [no date & collector info] (EMEC); 1♀, Oregon, Coos Co., Bullards Beach, 2 mi N from Bandon, 24–25 August 1969, J Powell (EMEC). 1♂♀, California, San Francisco, Big Basin, 18 June 1971, E Jäckh (USNM); 1♂, California, Del Norte Co., Redwoods, 23 August 1936, AF Braun (USNM); 1♂, California, Humboldt Co., Fieldbrook, 18 May 1903, HS Barber (USNM); 1♂, ditto, 26 May 1903, HS Barber (USNM); 1♂, California, Humboldt Co., 4 mi S from Fieldbrook, 29 June 1969, J Powell (EMEC); 11♂16♀, California, Humboldt Co., 11 mi NE from Blue Lake, Redwood Summit, 9 May 1961, J Powell (EMEC); 1♂, California, Monterey Co.,

Big Creek Reserve, 8–9 June 2001, J Powell (EMEC); 1♀, ditto, 21–22 July 1992, B Scaccia & R Zuniga (EMEC); 12♂28♀, California, Monterey Co., Big Creek Reserve, Devils Cr. Flat, alt. 120m, Redwood riparian, 23–25 April 1987, J Powell, “JAP no. 87D29: emerged in 16–21 May 1987, reared from *Vaccinium ovatum*” (EMEC); 6♂, California, Humboldt Co., Kneeland, 69 Prairie Lane, 12–14 March 2001, RS Wielgus, GSN [USNM96387] (USNM); 14♂11♀, ditto, 18–20 March 2001, RS Wielgus (EMEC); 1♂, California, Humboldt Co., Arcata, 24 June 1969, J Powell (EMEC); 1♂, ditto, 28 June 1969, J Powell (EMEC); 1♀, California, Humboldt Co., Richardson Grove St. Park, 18 June 1962, CA Toschi (EMEC); 1♂, California, Marin Co., Inverness Ridge, 15 May 1970, J Powell (USNM); 3♂, ditto, alt. 100m, 21–24 May 1995, JA Powell (EMEC); 1♂2♀, ditto, alt. 40–250m, 20 October 1999, JA Powell (EMEC); 1♀, ditto, alt. 270m, 19 September 1998, JA Powell (EMEC); 1♂, ditto, alt. 250–300m, 19–20 May 1998, JA Powell (EMEC); 1♂, California, Marin Co., Inverness Park, alt. 150m, 26–30 September 1999, J Powell (EMEC); 1♂, ditto, 8–14 October 1999, J Powell (EMEC); 1♂1♀, ditto, 15–22 October 1999, J Powell (EMEC); 1♂, ditto, alt. 175m, 13–19 2003, J Powell (EMEC); 1♂, ditto, 20–26 October 2003, J Powell (EMEC); 2♂, California, Marin Co., 2mi SE Inverness Ridge, alt. 700–1100ft, 15–16 May 1970, RE Dietz (EMEC); 1♀, California, Marin Co., Mt. Vision, Inverness Ridge, 24 April 1982, JA Powell, “JAP no. 82D46: reared from *Vaccinium ovatum*” (EMEC); 1♀, California, Marin Co., Palomarin, 7–8 May 1990, P Super (EMEC); 1♂2♀, California, Marin Co., Alpine Lake, alt. 250–350m, 11 April 1992, J Powell, “JAP no. 92D39.1: emerged on 8 May 1992, reared from *Vaccinium ovatum*” (EMEC); 3♂1♀, California, Tomales Bay, Marin Co., 21 January 1959, J Powell (EMEC); 1♂, ditto, 17 February 1961, J Powell (EMEC); 14♂10♀, California, San Mateo Co., San Bruno Mt., 13 April 1981, JA DeBenedictis, “JADeB no. 81103-A: emerged in 6–12 May 1981, reared from *Vaccinium ovatum*” (EMEC); 1♂, ditto, 16 May 1984, JB Whitfield & JA DeBenedictis, “JBW no. 84E31: emerged between 25 May & 4 June 1984, reared from *Vaccinium ovatum*” (EMEC); 1♂1♀, California, San Mateo Co., San Bruno Mt., Radio Tower Road, 16 May 1984, JA Powell, “JAP no. 84E31: emerged on 4 June 1984, reared from *Vaccinium ovatum*” (EMEC); 1♀, California, Sonoma Co., 10–25 May, AH Vachell (USNM); 1♂1♀, California, Sonoma Co., Salt Point St. Park, 20 July 1990, RJ Robertson (EMEC); 4♂5♀, California, Mendocino Co., 2 mi S from Rockport, 1 February 1962, J Powell (EMEC); 1♂1♀, California, Mendocino Co., 5 mi NW from Comptche, Pygmy Forest, 10 April 1981, JA DeBenedictis, “JADeB no. 8100-A: emerged on 29 April & 4 May 1981, reared from *Vaccinium ovatum*” (EMEC); 4♂, California, Del Norte Co., 8 mi N from Klamath, Damnation Cr., 20 July 1969, DP Levin (EMEC); 1♂, California, Santa Barbara Co., Santa Cruz Is., Ridge N of Laguna Canyon, 28 April 1966 (EMEC); 1♀, California, Santa Barbara Co., Santa Cruz Is., Canada de la Cuesta, 15 March 1969, J Powell, “JAP no. 69C39: emerged on 4 April 1969, reared from *Vaccinium ovatum*” (EMEC); 1♀, California, Santa Barbara Co., Santa Cruz Is., Felton, 20–21 July 1991, J Powell (EMEC); 1♂, [no specific locality], 1882, Walsingham, GSN [USNM-91607] (USNM); 1♂, ditto, [no date], Fernald (USNM).

Diagnosis. This species externally resembles *Euceratia castella* Walsingham, 1881, among the described species of North America, but is easily distinguished from the latter in having a dorsal patch on forewings and by in lacking white annulations on the antennae.

Redescription (Figs 7–9). Forewing length 5.5–8mm (mean=7.19mm, n=58); basal 1/4 of costa dark brown; an oblique, bar-like, reddish brown patch on distal 1/3 of posterior margin, surrounded by black speckles; posterior suffusion reddish brown, as long as dorsal patch; posterior suffusion and/or dorsal patch lost and black specks peppering, depending on the individuals; a black spot at the end of discal cell; a black scale on each vein along termen; fringes white on basal half, grayish brown on distal half, or entirely white in some specimens. Hindwing anterior margin 2× longer than maximum width; fringe pale gray on basal half, white on distal half.

Male genitalia (Figs 17, 18) (6 preparations examined). Uncus (Fig. 17a) linguiform, convex posteriorly, with a pair of short, digitate tubercle posterolaterally; socii digitate, as long as saccus, with a row of 4 or 5 short ventral spines terminally, gradually smaller from basal to terminal spine (Fig. 17b). Tegumen parallel-sided; subscaphium (Fig. 17d) strongly bulged ventrad. Valva obovate, saccular margin evenly rounded, 2× longer than tegumen; costa curved at 1/4, narrowly sclerotized in basal 1/4; a small triangular mound above basal 2/5 of saccular margin (Fig. 17c). Saccus slender, as long as socius. Aedeagus (Fig. 18) slender, 3× length of saccus, weakly sinuate; cornutus absent.

Female genitalia (Fig. 31) (5 preparations examined). S8 sclerotized, with a shallow bulge posterior to S8 humps; minute thorns on the bulge; semicircular depression anteriolaterally (Fig. 31b). Apophysis posterioris 2× longer than papillae anales, 2.5× longer than apophysis anterioris excluding basal Y-fork; longer branch of the Y-fork 1.2× longer than shorter branch or apophysis anterioris. Minute thorns on area between S8 humps and ostium bursae. Ductus bursae as long as apophysis posterioris; antrum in posterior 1/5 of ductus bursae, digitate, broadened at ostium, with minute thorns on internal wall (Fig. 31a); bulla seminalis as large as corpus bursae. Corpus bursae ovoid; signum absent.

Distribution (Fig. 15). Pacific side coastal regions of Canada (British Columbia) and United States (Washington, Oregon, California).

Host plant. The larvae feed on flowers and leaves of California Huckleberry, *Vaccinium ovatum* Pursh (Ericaceae) (Powell & Opler, 2009). In the USNM collection, there exist two specimens of *E. polita* reared from “rhododendron”, possibly *Rhododendron pacificum*. These records, however, need to be confirmed. The host record “huckleberry” from USNM must be an error for “huckleberry”. The label data available from museum specimens indicate that the larvae are twig-borers, leaf-miners or leaf-tiers. The larvae of *E. polita* are primarily external feeders which web amongst inflorescences or young vegetative terminals of *Vaccinium ovatum* (Jerry Powell, personal communication). All records of the internal feeding larvae of *E. polita* are associated with “rhododendron”, a host which is yet unverified.

Remarks. *E. polita* shows continuous variations in forewing patterns between two extremes which are very reduced (Fig. 8) or maculate throughout (Fig. 9). Those vari-

ants coexist temporally and spatially, for which no taxonomic consideration is necessary. However, some of the variants can be confused with the new species described in this study. Walsingham (1881) illustrated an individual of *E. polita* whose forewings have only a dorsal patch and discal spot (Fig. 7). We found that this variant is predominant (ca. 87%) amongst the specimens examined in our study. The maculate variants were the rarest (ca. 0.7%).

***Eucalantica costaricae* Sohn & Nishida, sp. n.**

urn:lsid:zoobank.org:act:9D5181DE-7F5C-47B1-AC4E-3F16C72A3CD5

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

Figs 3–4, 10, 19–20, 33

Type material. **Holotype** ♂ – COSTA RICA: Cartago, El Guarco, Macizo de la Muerte, Sector de la esperanza, 9°46'14" N; 83°47'59" W, alt. 2600m, February 2002, R Delgado, BN-INB0003434063, GSN [SJC 640] (INBIO). **Paratypes** (5♂2♀) – COSTA RICA: 2♂, San José, Cerro de la Muerte, Villa Mills, La Georgina, 9°34'N; 83°43'W, alt. 3000m, 20 February 1999, K Nishida (USNM & UCR); 1♀, San José, Cerro de la Muerte, Estación Biológica de la UCR, 9°34'N; 83°45'W, alt. 3050m, 2 February 1999, K. Nishida (BMNH). 1♂, Cartago, Cerro de la Muerte, Georgina, 9°34'N; 83°45'W, alt. 3000m, 23–25 May 1985, J Powell & PA Opler (INBIO); 1♂, ditto (EMEC); 1♂, ditto, 20 June 1988, J Brown & J Powell (EMEC); 1♀, Cartago, Villa Mills, 9°34'N; 83°43'W, alt. 3000m, 3–4 July 1999, J Powell (EMEC).

Diagnosis. This new species is superficially indistinguishable from some variants of *E. polita*. In such cases, examination of genitalia is necessary for reliable identification. *E. costaricae* differs from *E. polita* by the lack of lateral projections near the apex of the uncus in the male genitalia and in having a signum in the corpus bursae of the female genitalia.

Description (Fig. 10). Forewing length 6.5–8mm (mean=7.48mm, n=9); posterior suffusion and dorsal patch absent; in majority of individuals, black spots scattered on distal and posterior half; fringes entirely white. In some specimens, all forewing pattern elements are lost except a discal spot. Hindwing anterior margin 3× longer than the maximum width; fringes entirely white.

Male genitalia (Figs 19, 20) (5 preparations examined). Uncus (Fig. 19a) linguiform apically; socii lunate, as long as saccus, long hairy dorsally, with four terminal spines in a row, third spine from tip longest, followed by second, fourth, and first in order of length (Fig. 19b). Tegumen subtriangular, 1.5× broader than uncus; subscaphium (Fig. 19d) appressed to tegumen. Valva obovate, 2.5× longer than socii, costa slightly incurved at basal 1/3; arched setose area above saccular base (Fig. 19c). Saccus very slender, as long as socius. Aedeagus (Fig. 20) attenuate in distal half, as long as and slightly wider than saccus, bent medially; carina slender, triangular; a zone of minute spinulate cornuti in distal half of aedeagus.

Female genitalia (Fig. 33) (2 preparations examined). S8 sclerotized; minute thorns on semicircular area above S8 humps. Apophysis posterioris 2.5× longer than

apophysis anterioris excluding basal Y-fork; longer branch of Y-fork 5× longer than shorter branch. Ductus bursae as long as corpus bursae; antrum in posterior 1/7 of ductus bursae, cup-shaped, with minute thorns on internal wall (Fig. 33a); bulla seminalis 2/3 as large as corpus bursae. Corpus bursae ellipsoid; signum as a small, scobinate disc (Fig. 33c).

Distribution. Costa Rica (high elevations of Cerro de la Muerte of the Talamanca Mountain Range in Cartago and San José Provinces).

Habitat. The adult specimens have been collected exclusively from the high elevation forests of Cerro de la Muerte where oaks are dominant below 3,300m (Zuchowski, 2007). See Nishida et al. (2002) for more details about the habitats. The second author (KN) observed one individual of this species resting on the underside of a leaf of *Vaccinium floribundum* Kunth (Fig. 1). Given the host association of *E. polita* with another *Vaccinium*, this plant is likely the larval host of *E. costaricae*.

Etymology. The new species is named after Costa Rica, where the type locality is situated.

***Eucalantica ehecatlella* Sohn & Nishida, sp. n.**

urn:lsid:zoobank.org:act:0003EA08-8167-4DF1-BFC9-0B171C4835EE

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

Figs 6, 21, 22

Type material. **Holotype** ♂ – COSTA RICA: Heredia, Volcán Barva, 6 km ENE from Vara Blanca, 10°10'34"N; 84°06'41"W, alt. 1950–2050 m, 16 February 2002, BN-INB0003220413, GSN [SJC 642] (INBIO). **Paratype** ♂ – COSTA RICA: same locality as holotype, 21 March 2002, A Kawahara, BN-INB0003217116, abdomen missing (INBIO).

Diagnosis. This species is very close to *E. icarusella* in the shape of the dorsal patch of the forewing and in having entirely pale gray forewing fringes but differs from the latter by having most of the black dots sparsely scattered beyond the discal cell. *Eucalantica ehecatlella* is further distinguished from *E. icarusella* by the lack of projections near the apex of uncus in the male genitalia.

Description (Fig. 6). Forewing length 5.0–6.2 mm (n=2) with dark brown costal streak in basal 1/4; posterior suffusion on basal half of dorsal margin, reddish brown with an intermittent, black line along upper border; black spots sparsely scattered on distal 1/4; terminal line narrow, black, intermittent; fringes pale orange, paler on tornus. Hindwing anterior margin 2× longer than maximum width; fringes pale gray.

Male genitalia (Figs 21, 22) (1 preparation examined). Uncus (Fig. 21a) elongate, triangular, conical apically; socii bulged dorsally, sharp triangular in terminal 1/5, 1.5× longer than saccus, long-hairy dorsally, with four terminal spines in a row, third spine from tip longest, followed by second, fourth, and first in order of length (Fig. 21b). Tegumen parallel-sided; subscaphium (Fig. 21d) slightly bulged ventrad. Valva obovate, costal margin almost straight, apex broadly round; a semicircular emar-

gination adjoining with a densely setose area and an oblique groove above saccular base (Fig. 21c); a subrectangular emargination near the middle of the base of valva ventrally (Fig. 21c). Saccus elongate, digitate, as long as uncus. Aedeagus (Fig. 22) of even width throughout, strongly curved medially, with a triangular carina terminally and a zone of minute-spinulate cornuti 1/3 as long as aedeagus.

Female. unknown.

Distribution. Costa Rica (Central Volcanic Range in Heredia Province).

Etymology. The specific epithet is derived from 'Ehecatl', a god of wind in Aztec mythology and refers to the windy habitat where the new species was collected.

***Eucalantica icarusella* Sohn & Nishida, sp. n.**

urn:lsid:zoobank.org:act:87237D85-EDA7-4668-ACF0-0D84ED2EB659

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

Figs 11, 23–24, 35

Type material. **Holotype** ♂ – COSTA RICA: San José, Cerro de la Muerte, Estación Biológica de la UCR, 9° 34' N; 83° 45' W, alt. 3050m, 20 February 1999 (K. Nishida), GSN [USNM96397], USNM. **Paratypes** (6♂4♀) – COSTA RICA: 1♂, San José, Cerro de la Muerte, Estación Biológica de la UCR, 9°34'N; 83°45'W, alt. 3100m, 20 December 1998, K Nishida (BMNH); 2♂, San José, Cerro de la Muerte, Estación Los Nimbolos, 9°99'42.30"N; 83°44'27.2"W, alt. 3150m, 24–27 July 2006, JB Sullivan (USNM). 2♀, Cartago, Cerro de Muerte, Pension La Georgina, 9°34'N; 83°45'W, alt. 3000m, 23–25 May 1985, J Powell, GSN [EMEC-JCS 003] (EMEC); 1♀, 7km SE El Canon, 9°40'N; 83°55'W, 28 May 1985 (J Powell), GSN [EMEC-JCS 001] (EMEC). 1♂1♀, Alajuela, Volcán Poás, 10°11'00"N; 84°12'30"W, alt. 2550m, 6–7 June 1988 (J Brown & JA Powell), GSN [EMEC-JCS 004 (♀)] (EMEC). 1♂, Heredia, Volcán Barva, 6 km ENE from Vara Blanca, 10°10'34"N; 84°06'41"W, alt. 1950–2050 m, 20 March 2002, K Nishida, abdomen missing (USNM); 1♂, ditto, 12 April 2002, K Nishida (UCR).

Diagnosis. This species is superficially similar to *E. costaricae*, but differs from the latter in having a posterior suffusion on the forewings and narrower hindwings. In the genitalia, *E. icarusella* is distinguished from *E. costaricae* in having projections (Fig. 23a) near the apex of the uncus in the males and having a pair of pits (Fig. 35a) near ostium bursae in the females.

Description (Fig. 11). Forewing length 5.3–7.9 mm (mean=7.07mm, n=9); costal streak dark brown, broadly spread basally; dorsal patch at the middle of posterior margin, dentiform, orange, with a black line on upper border; posterior suffusion on basal 1/2 of dorsal margin, orange, with an intermittent black line on upper border; black spots peppering in distal 3/4, denser to distal 1/3; fringes pale gray in basal 1/3, brownish gray in distal 2/3. Hindwing anterior margin 2.5× longer than maximum width; fringes pale gray.

Male genitalia (Figs 23, 24) (3 preparations examined). Uncus (Fig. 23a) linguiform, apex slightly protruded, lateral lobes digitate, with transverse edge apically; socii

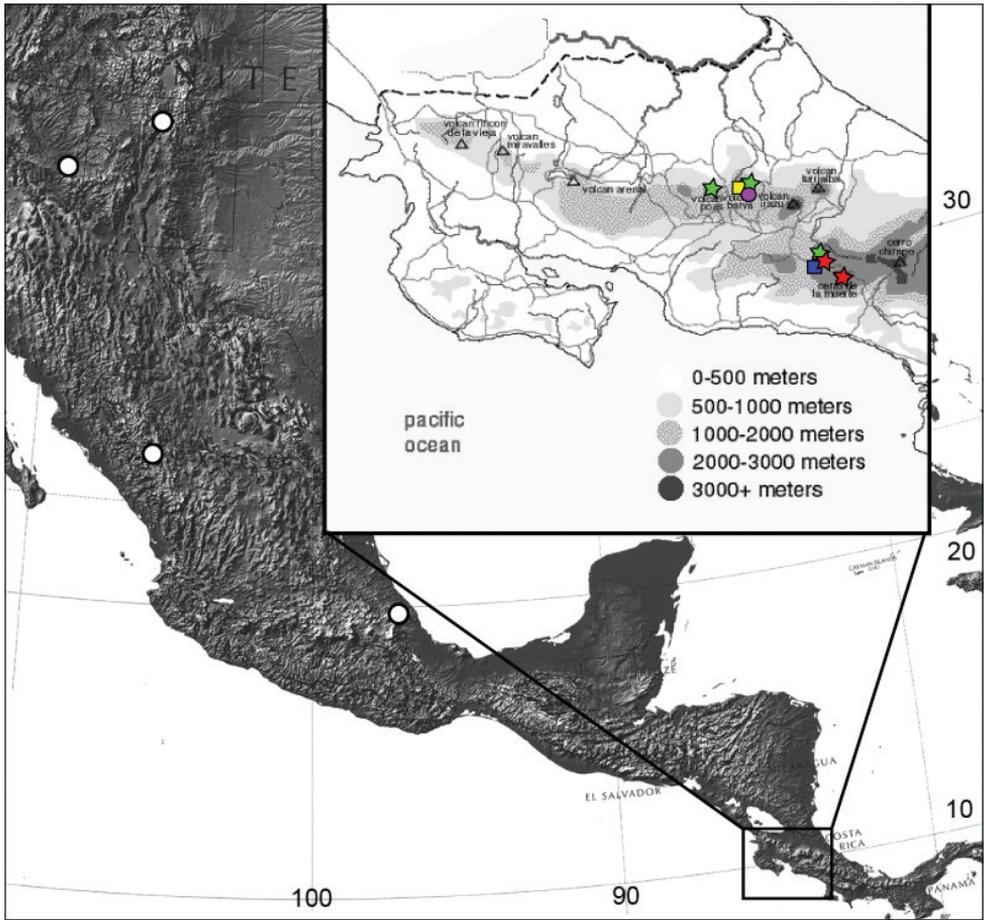


Figure 16. Distribution of *Eucalantica costaricae* sp. n. (red star), *E. ehecatlella* sp. n. (yellow box), *E. icarusella* sp. n. (green star), *E. powelli* sp. n. (blue box), *E. pumila* sp. n. (purple circle), and *E. vaquero* sp. n. (white circle). Maps from www.nationalatlas.gov and www.costa-rica-guide.com.

digitate, narrowly round apically, as long as saccus, long-hairy dorsally, with three terminal spines in a row, all almost same in length (Fig. 23b). Tegumen as long as uncus, subtriangular posteriorly, parallel laterally in anterior half, enlarged in posterior half; subscaaphium (Fig. 23d) appressed to tegumen. Valva elongate, almost of even width throughout, rounded apically, 3.5× longer than saccus; costa slightly bulged at basal 1/5; a semicircular emargination above saccular base, adjoining with a small tubercle at upper end (Fig. 23c). Saccus digitate, robust, broadened to base, as long as socius. Aedeagus (Fig. 24) almost straight, slightly bulged medially (Fig. 24e), 2.5× longer than saccus; a zone of minute-spinulate cornuti 2/5 as long as aedeagus.

Female genitalia (Fig. 35) (4 preparation examined). S8 sclerotized, quadrate, with a pair of semicircular, setose humps posteriorly; minute thorns on and posterior to S8 humps; semicircular, lateral pleats at the middle of S8 area (indicated with an

asterisk in Fig. 35); a pair of pits adjacent to ostium (Fig. 35a). Apophysis posterioris 3.5× longer than apophysis anterioris excluding basal Y-fork; ventral branch of Y-fork fused with posterior margin of S8, dorsal branch 2× longer than apophysis anterioris, slightly sinuous. A zone of minute thorns extended from antrum to S8 pleats. Ductus bursae as long as corpus; antrum cylindrical, 1/6 as long as and 2× wider than ductus bursae, with minute thorns on internal wall (Fig. 35a); bulla seminalis 1/2 as long as ductus bursae. Corpus bursae oval, membranous, cervical area slightly protruding; signum keel-like with denticules on interior surface (Fig. 35c).

Distribution. Costa Rica (high elevations of Cartago, Heredia and San José).

Etymology. The new species is named after the Greek mythological character *Ikaros* (*Icarus* in Latin) and refers to the white forewing with scarlet dorsal suffusion resembling Icarus' waxy wings burnt down by sunlight.

***Eucalantica powelli* Sohn, sp. n.**

urn:lsid:zoobank.org:act:D7AF7609-BE3C-41CE-8F94-8039229CA82E

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

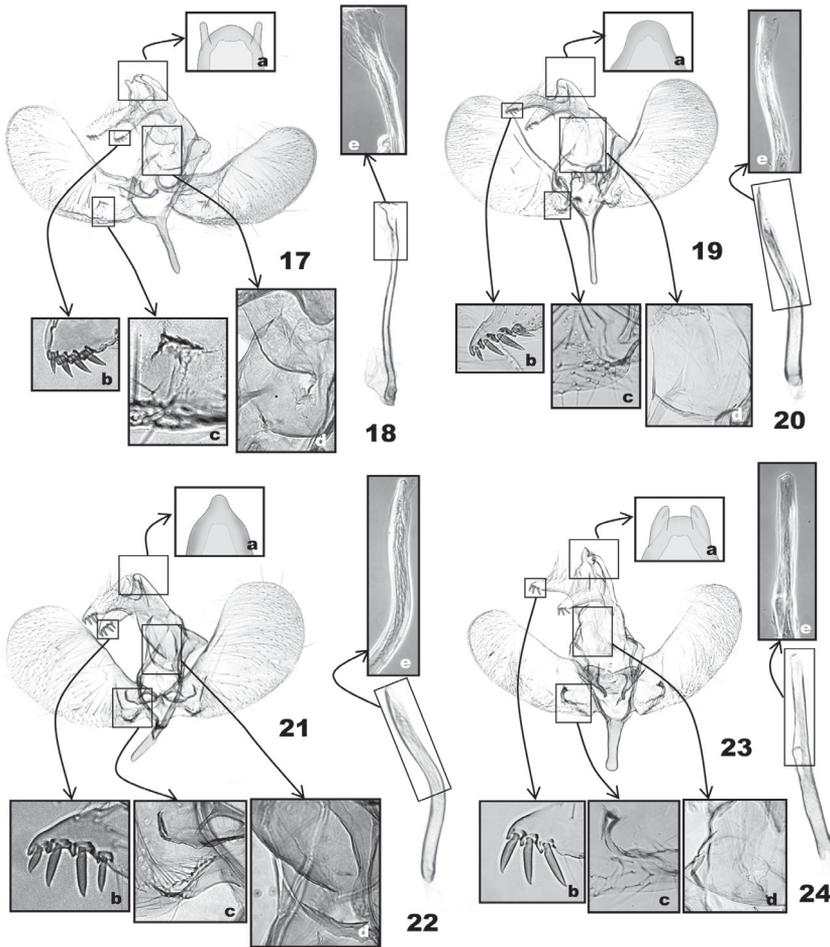
Figs 12, 25–26, 32

Type material. **Holotype** ♂ – COSTA RICA: Cartago, Cerro de la Muerte, La Georgina, 9°34'N; 83°45'W, alt. 3000 m, 23–25 June 1985, J Powell & PA Opler, GSN [EMEC-JCS 012] (EMEC). **Paratypes** (1♂4♀) – COSTA RICA: 1♀, San José, 4.6 km E from Villa Mills, Sendero al Mirador, Est. Cuericí, 9°34'N; 83°43'W, alt. 2640m, 17–22 March 1996, A Picado, GSN [SJC 806] (INBIO). 1♂, Cartago, 7 km SE El Cañón, 9°40'N; 83°55'W, alt. 2500 m, 28 May 1985, J Powell & JT Doyen (EMEC); 3♀, Cartago, Villa Mills, 9°34'N; 83°43'W, alt. 3000 m, 3–4 July 1999, J Powell, GSN [EMEC-JCS 002] (EMEC).

Diagnosis. This new species is similar to immaculate variants of *E. polita* (Fig. 8) but differs from the latter in having posterior suffusion on entire dorsal margin of forewings. They are also distinguished by the male genitalia, i.e. triangular projection on valva closer to sacculus in *E. powelli*, and also by the female genitalia, i.e. the presence of posterolateral semicircular pleats (indicated with an asterisk in Fig. 32) in *E. powelli*.

Description (Fig. 12). Forewing length 7.0–10.0 mm (mean=8.48mm, n=5); dorsal margin with a row of black dots from the base to the basal 1/3; posterior suffusion on distal 2/3 of dorsal margin, sinuate, orange, with an intermittent black line on upper boarder; terminal line on posterior half of termen, black, intermittent; fringes white in basal half, reddish brown in distal half.

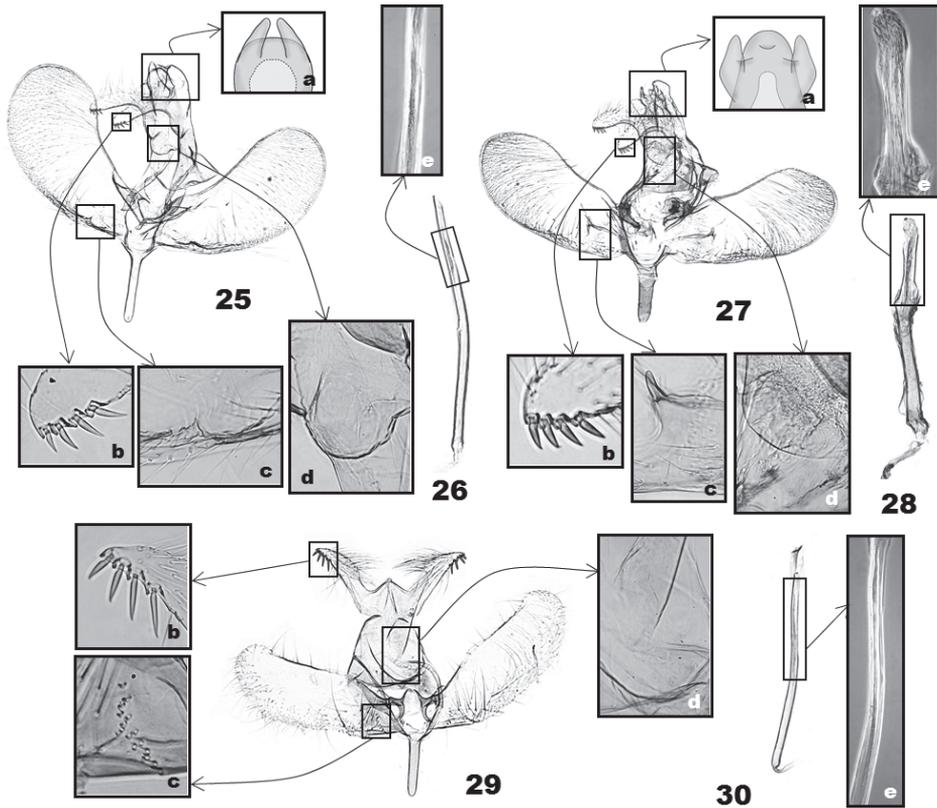
Male genitalia (Figs 25, 26) (2 preparations examined). Uncus (Fig. 25a) elongate, subrectangular, as long as tegumen, with a pair of digitate lobes posterolaterally; socii digitate, as long as saccus, long-hairy dorsally, with four terminal spines in a row, third and fourth spines from top longest, followed by second, first in order of length (Fig. 25b). Tegumen parallel-sided; subsaphium (Fig. 25d) appressed to tegumen. Valva obovate; costa slightly curved at distal 1/3; sacculus with a small triangular



Figures 17–24. Male genitalia of *Eucalantica*. 17–18. *E. polita* 19–20 *E. costaricae* sp. n. (holotype) 21–22 *E. ebecatlella* sp. n. (holotype) 23–24 *E. icarusella* sp. n. (holotype). 18, 20, 22, 24 aedeagus. Close-up boxes: a – apical region of uncus; b – terminal spines on socius; c – grooves or projections above sacculus; d – subsacphium; e – terminal part of aedeagus and cornuti (transmitted light phase contrast image).

bulge at basal 1/3 (Fig. 25c). Saccus digitate. Aedeagus (Fig. 26) slender, of even width throughout, narrower than saccus, apex oblique, slightly bent medially; with a zone of minute-spinulate cornuti 1/5 as long as aedeagus.

Female genitalia (Fig. 32) (2 preparations examined). S8 slightly oblique laterally, weakly sclerotized, with a pair of setose humps posteromedially; interspace between S8 humps with minute thorns; a pair of semicircular pleats lateroposteriorly (indicated with an asterisk in Fig. 32). Apophysis posterioris 4× longer than apophysis anterioris excluding basal Y-fork; longer branch of Y-fork 3× longer than shorter branch, 2.5× longer than apophysis anterioris. Ductus bursae 2× longer than corpus; antrum in posterior 1/6 of ductus bursae, cylindrical, with minute thorns on inner wall (Fig. 32a);



Figures 25–30. Male genitalia of *Eucalantica*. **25–26** *E. powelli* sp. n. (holotype) **27–28** *E. vaquero* sp. n. (holotype) **29–30** *E. pumila* sp. n. (holotype). **26, 28, 30** aedeagus. See figures 17–24 for close-up boxes.

ductus seminalis weakly sclerotized at connection with ductus bursae; bulla seminalis absent. Corpus bursae globular; signum absent.

Distribution. Costa Rica (high elevations of Cartago Province).

Etymology. The new species is named after Dr. Jerry A. Powell, director emeritus of the Essig Museum of Entomology, the University of California, Berkeley, in appreciation of his assistance with the first author's work.

***Eucalantica pumila* Sohn, sp. n.**

urn:lsid:zoobank.org:act:CDA549BA-3817-4A91-A986-AEB63BCED19C

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

Figs 13, 29, 30

Type material. Holotype ♂ – COSTA RICA: Heredia, Volcan Barva, 6 km ENE from Vara Blanca, 10°11' N; 84°07' W, alt. 1950–2050 m, 20 February 2002, BN-INB0003219355, GSN [SJC 808] (INBIO).

Diagnosis. This new species is easily distinguished from all other species of *Eucalantica* by its smaller size and in having a triangular, dark brown dorsal patch on the forewings. The male genitalia of *E. pumila* is similar to *E. costaricae*, but spines on the socii and the aedeagus is slender in the former.

Description (Fig. 13). Forewing length 5.8 mm (n=1); costal streak on basal 1/10 of costal margin, black; dorsal patch subtriangular, dark brown, upper border extended to the lower side of the discal cell; terminal line with three dark brown dots between veins. Hindwing anterior margin 2.2× longer than maximum width, pale gray except dark gray apical area.

Male genitalia (Figs 29, 30). Uncus subpentagonal, convex posteriorly, with a papilliform projection apically; socii semielliptical, straight ventrally, 1.5× longer than saccus, long-hairy dorsally, with four slender terminal spines in a row, gradually smaller from basal to terminal spine (Fig. 29b). Tegumen subtrapezoidal; subscaphium (Fig. 29d) slightly bulged. Valva elongate, of even width throughout, narrowly rounded apically; costa slightly convex at basal 1/3; sacculus ending at basal 1/4 of ventral margin of valva; an arched setal area above basal area of sacculus (Fig. 29c). Saccus slender, 2× longer than uncus. Aedeagus (Fig. 30) slender, narrower in distal half, almost straight, obtuse terminally; a zone of minute-spinulate cornuti 1/2 as long as aedeagus.

Female. unknown.

Distribution. Costa Rica (only known from the type locality).

Etymology. The specific epithet is derived from the Latin *pumilus*, meaning “little”, and refers to its small size relative to other *Eucalantica*.

Eucalantica vaquero Sohn, sp. n.

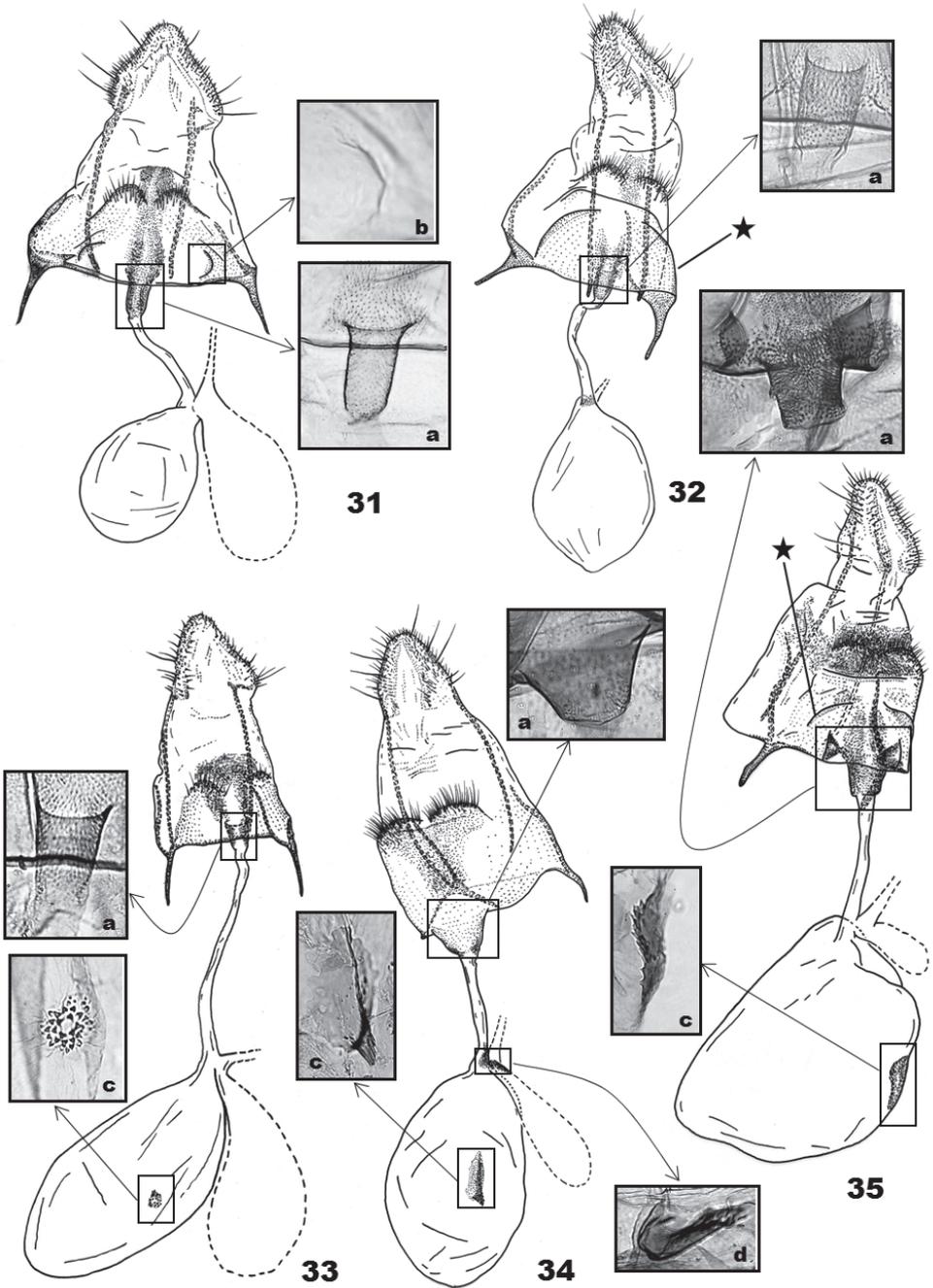
urn:lsid:zoobank.org:act:C77690E1-7618-4E54-B802-19EFFCE72FFC

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

Figs 14, 27–28, 34

Type material. Holotype ♂ – USA: New Mexico, Pecos National Forest, 35°53'N; 105°38'W, alt. 3048 m, 24 August 1916, C Heinrich, GSN [USNM-96389] (USNM). Paratypes (2♂3♀) – USA: 1♀, New Mexico, same as holotype, abdomen missing (USNM). 1♂, Arizona, White Mts., Summit of Mt. Thomas, 33°54'22"N; 109°33'46"W, alt. 11500 ft, 20 August 1925, OC Poling (USNM). MEXICO: 1♀, Tepalcates, 48 km W from Durango, Dgo, 24°01'N; 104°40'W, alt. 2560 m, 4–8 August 1972, J Powell, D Veirs, & CD MacNeill, GSN [EMEC-JCS 011] (EMEC). 1♂, Veracruz, Cañón Las Minas, 13 km NE from Perote, 19°29'52"N; 95°56'W, alt. 2150 m, 19 August 1987, J Brown & J Powell (EMEC); 1♀, Veracruz, 7 km NW from Banderilla, 19°35'N; 95°56'W, alt. 1680 m, 13 July 1974, J Powell & J Chemsak (EMEC).

Diagnosis. This new species is superficially indistinguishable from some variants of *E. polita* and in such cases, examination of the genitalia is necessary for a reliable identification. *E. vaquero* is also similar to *E. costaricae* in having a reduced dorsal patch



Figures 31–35. Female genitalia of *Eucalantica*. **31** *E. polita*. **32** *E. powelli* sp. n. (paratype) **33** *E. costaricae* sp. n. (paratype) **34** *E. vaquero* sp. n. (paratype) **35** *E. icarusella* sp. n. (paratype). Ductus seminalis and bulla seminalis contoured by dotted line. Asterisk = semicircular fold. Close-up boxes: a – antrum and thorny area around ostium; b – semicircular depression on eighth sternite; c – signum; d – sclerite at connection between ductus bursa and bulla seminalis.

on the forewings but differs from the latter by having the fewer black spots on the forewing, mainly around the CuP fold. The male genitalia of *E. vaquero* differ from ones of *E. polita* and *E. costaricae* in having a bulge on apex of the uncus and stouter saccus. In the female genitalia, *E. vaquero* is distinguished from the latter two in having keel-like signum in the corpus bursae.

Description (Fig. 14). Forewing length 7.5–8.0mm (mean=7.65mm, n=4); costal streak on basal 1/3 narrow; dorsal patch reduced to a small, oblique, reddish brown band intermixed with black spots or absent; fringes white in basal 2/3, pale gray in distal 1/3. Hindwing anterior margin 2× longer than maximum width; fringes pale gray.

Male genitalia (Figs 27, 28) (4 preparations examined). Uncus (Fig. 27a) linguiform, bulged dorsoapically, lateral lobes upcurved, digitate; socii digitate, as long as saccus, long-hairy dorsally, with four terminal spines, all of them almost equal in size (Fig. 27b). Tegumen parallel laterally, 2× broader than uncus; tuba analis with minute thorns on inner wall; subsclaphium (Fig. 27d) strongly bulged ventrad. Valva slightly broadened in distal half, narrowly round apically, saccular margin round in distal 1/3, almost straight in basal 2/3; costa slightly concave at middle; sacculus slightly bulged inward at basal 1/3; a semicircular setose area above saccular base; a longitudinal fold at base of valva, adjoining with a small dentiform process (Fig. 27c). Saccus digitate, robust. Aedeagus (Fig. 28) dilated at distal 1/3, almost straight; a zone of minute-spinulate cornuti 1/3 as long as aedeagus.

Female genitalia (Fig. 34) (2 preparations examined). S8 quadrate, sclerotized, with a pair of semicircular, setose humps. Minute thorns on S8 humps and an area connecting S8 humps and ostium bursae. Apophysis posterioris 4× longer than apophysis anterioris excluding basal Y-fork; both branches of Y-fork almost equal in length, 2× longer than apophysis anterioris. Ductus bursae 4/5 as long as corpus; antrum in posterior 1/4 of ductus bursa, conical, with minute thorns internally (Fig. 34a); bulla seminalis as long as ductus bursae; a sclerite at connection between bulla seminalis and ductus bursae (Fig. 34d). Corpus bursae ellipsoid; signum keel-like on middle of corpus, base narrow-elliptical, with a few denticles (Fig. 34c).

Distribution. USA (New Mexico, Arizona) and Mexico.

Etymology. The species name *vaquero* is a noun in apposition, meaning the Mexican cowboy, and refers to the distribution range of the new species roughly matching with the regions under 'vaquero' traditions.

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References

- Busck A (1904) Tineid moths from British Columbia. *Proceedings of the US National Museum* 27: 745–778.
- Clarke JFC (1941) The preparation of slides of the genitalia of Lepidoptera. *Bulletin of the Brooklyn Entomological Society* 36: 149–161.
- Dugdale JS, Kristensen NP, Robinson GS, Scoble MJ (1998) The Yponomeutidae. In: Kristensen NP (Ed) *Lepidoptera, Moths and Butterflies Vol. 1: Evolution, Systematics, and Biogeography. Handbook of Zoology* 4 (35), Walter de Gruyter, Berlin, 119–130.
- Fletcher TB (1929) A list of generic names used for the Microlepidoptera. *Memoirs of the Department of Agriculture of India (Entomology)* 11: 1–244.
- Heppner JB, Duckworth WD (1983) Yponomeutoidea. In: Hodges RW (Ed) *Check List of the Lepidoptera of America North of Mexico*. E. W. Classey Ltd. & The Wedge Entomological Research Foundation, London, 26–28.
- Klots AB (1970) Lepidoptera. In: Tuxen SL (Ed) *Taxonomist's Glossary of Genitalia in Insects*. Munksgaard, Copenhagen, 115–130.
- Kyrki J (1984) The Yponomeutoidea: a reassessment of the superfamily and its supergeneric groups (Lepidoptera). *Entomologica scandinavica* 15: 71–84.
- Kyrki J (1990) Tentative reclassification of holarctic Yponomeutoidea (Lepidoptera). *Nota lepidopterologica* 13(1): 28–42.
- Miller SE, Hodges RW (1990) Primary types of microlepidoptera in the Museum of Comparative Zoology (with a discursion on V. T. Chambers' work). *Bulletin of the Museum of Comparative Zoology* 152: 45–87.
- Nishida K, Rotheray G, Thompson FC (2002) First non-predaceous syrphine flower fly (Diptera: Syrphidae): a new leaf-mining *Allograpta* from Costa Rica. *Studia dipterologica* 9(2): 421–436.
- Powell JA, Opler PA (2009) Superfamily Yponomeutoidea. *Moths of Western North America*. University of California Press, Berkeley, 104–113.
- Walsingham T (1881) On some North-American Tineidae. *Proceedings of the Zoological Society of London*: 301–325.
- Wootton RJ (1979) Function, homology and terminology in insect wings. *Systematic Entomology* 4: 81–93. doi:10.1111/j.1365-3113.1979.tb00614.x
- Zuchowski W (2007) *Tropical Plants of Costa Rica*. A Zona Tropical Publication, San José, 529 pp.

A new species of *Thecadactylus* from Sint Maarten, Lesser Antilles (Reptilia, Squamata, Gekkonidae)

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Abstract

We describe a new species of *Thecadactylus* from the Caribbean island of Sint Maarten. The new species differs from all other species in the genus by having a distinct dorsal pattern of numerous irregular but sharply delimited black spots and blotches on an otherwise almost patternless background.

Keywords

Gekkonidae; Lesser Antilles; new species; Reptilia; Sint Maarten; Squamata; *Thecadactylus*.

Introduction

Turnip-tailed geckos (genus *Thecadactylus*) are moderate-sized to large geckos distributed from southeastern Mexico across most of Central America and mesic tropical South America, and also occupy the Lesser Antilles (Russell and Bauer 2002). Whereas these geckos have traditionally been understood as a monotypic genus (e.g., Peters and Donoso-Barros 1970; Hoogmoed 1973; Avila-Pires 1995), currently two species of

Thecadactylus are recognized (Bergmann and Russell 2007): *T. rapicauda* (Houttuyn, 1782) and *T. solimoensis* Bergmann & Russell, 2007. All *Thecadactylus* populations from the Lesser Antilles have always been considered as conspecific with *T. rapicauda* (Powell et al. 1996, Censky and Kaiser 1999, Malhotra and Thorpe 1999).

In 2010, several specimens of a distinctly spotted *Thecadactylus* were collected on the island of Sint Maarten (also known as Saint Martin), Lesser Antilles, and imported to Germany by a pet trade dealer. In order to verify the geographic origin of these individuals, Stephan Prein and Maciej Oskroba visited Sint Maarten in April 2011. They indeed encountered *Thecadactylus* there and found that all specimens from this island had a distinctly spotted but otherwise patternless dorsum. A research of the pertinent literature revealed that this peculiar form had already been reported and illustrated from Sint Maarten (Breuil 2002, 2003). A comparison with the *Thecadactylus* from many localities across the wide geographic range of these geckos demonstrated that the Sint Maarten population represents an undescribed species and therefore, we describe it as a new species below.

Materials and methods

A list of the comparative specimens examined is provided in the Appendix. Abbreviations for museum collections follow those of Leviton et al. (1985). Furthermore, we have studied and analysed photographic material published in Powell (1996), Breuil (2002), Russell and Bauer (2002), and Powell et al. (2005). Nomenclature of scale characters follows that of Avila-Pires (1995). Subdigital lamellae were counted as suggested by Bergmann and Russell (2003). Scale sizes were measured using the ocular micrometer of a stereo microscope (Leica MZ 12) and rounded to the nearest 0.01 mm. All other measurements were made using precision calipers and were rounded to the nearest 0.1 mm. Head length was measured from the tip of the snout to the anterior margin of the ear opening. Snout length was measured from the tip of the snout to the anterior border of the orbit. Head width was determined as the distance between the oral ricti. Tail height and width were measured at the point reached by the heel of the extended hind leg. Dorsal and ventral scales were counted at midbody along the midline. Abbreviations used are DHL (number of medial dorsal scales in one head length), HL (head length), HW (head width), INL (infralabials), SAM (scales around midbody), SPL (supralabial scales), SVL (snout–vent length), and VHL (number of medial ventral scales in one head length). For the synonymy list, only those works have been included that cite actual specimens from Sint Maarten. Temperature was recorded at the type locality (see below) in the time from 11 – 16 April 2011 using an automatic temperature data logger (HOBO Pendant temp) placed on an upstanding tree trunk about 3 m above the ground in the shade recording at intervals of 2 min.

Results

Thecadactylus oskrobapreinorum sp. n.

urn:lsid:zoobank.org:act:0F9770AC-C296-462A-B23F-F3356ECC4BE5

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

Figs 1–3

Thecadactylus rapicauda: Breuil (2002, 2003; in part.), Bergmann and Russell (2007; in part.).

Holotype. SMF 92120, an adult male from Sint Maarten, near the southern edge of the village of Dawn Beach, 18.042°N, 63.023°W, 45 m elevation; collected 12 April 2011 by Stephan Prein and Maciej Oskroba.

Paratypes. SMF 92194, 92721–29, same collecting data as holotype.

Diagnosis. A species (SVL in largest specimen examined 99 mm) of the genus *Thecadactylus* (sensu Russell and Bauer 2002) that differs from all other species in the genus by having a distinct dorsal pattern of numerous irregular but sharply delimited black spots and blotches on an otherwise almost patternless background. *Thecadactylus oskrobapreinorum* lacks a dorsally directed postocular stripe (such stripe present in most specimens of *T. solimoensis*; see Bergmann and Russell 2007). *Thecadactylus oskrobapreinorum* differs further from *T. rapicauda* in the mean values of several morphometric and pholidotic characteristics, most pronounced in the number of subdigital lamellae and supralabial scales (see Table 1).

Description of the holotype. Adult male as indicated by partially everted hemipenes; SVL 95.5 mm; tail length 75.0 mm, tail complete; tail almost round in cross section, tail height 6.9 mm, width 7.6 mm; axilla to groin distance 37.0 mm; head length 24.5 mm; snout length 12.2 mm; head width 20.5 mm; shank length 16.2 mm. Rostral large, rectangular, about twice as wide as deep, visible from above, and with a long median cleft extending from posterior margin; 2 relatively large, rectangular postrostrals; nostril bordered by rostral, first supralabial, 3 small postnasals and one postrostral; scales on snout and on loreal region granular, mostly keeled; 22 loreal scales in a longitudinal line between rostral and orbit; scales on upper and posterior portions of head slightly smaller than on snout; scales in supraorbital region not differentiated from those on upper part of head; supraciliary flap bordered by a double row of scales, 18 in outer row between anterior border of flap and a point above center of eye, with 7 small spines posteriorly; pupil four-lobed, vertically elongate; 8 supralabials to level below center of eye, total number 10, anterior supralabials subequal in size, below eyes decreasing in size; ear opening obliquely oval, 3.0 x 1.5 mm (length x height) distinctly smaller than eye (eye length 6.1 mm); mental larger than adjacent scales, pentagonal; 2 relatively large postmentals, at each side followed by a row of smooth, polygonal scales, decreasing in size posteriorly, and in contact

Table 1. Selected measurements, proportions and scale characters of *Thecadactylus oskrobapreinorum* and *T. rapicauda*. Range is followed by mean value and standard deviation in parentheses. For abbreviations see text. For tail length, only complete original tails were measured.

		<i>T. oskrobapreinorum</i> ♂ 4 ♀ 4	<i>T. rapicauda</i> ♂ 11 ♀ 9
SVL	♂	86.0–96.5 (90.6 ± 3.83)	74.0–95.0 (85.5 ± 6.87)
	♀	87.0–99.0 (94.0 ± 4.85)	79.0–119.0 (93.9 ± 11.65)
Tail length	♂	75.0–76.0 (75.3 ± 0.47)	65.0–72.0 (68.5 ± 3.50)
	♀	71.0–83.0 (77.0 ± 6.00)	75.0–76.0 (75.3 ± 0.47)
HL	♂	22.6–24.5 (23.5 ± 0.67)	18.2–24.7 (21.5 ± 1.75)
	♀	23.0–25.0 (24.3 ± 0.79)	18.8–28.0 (23.2 ± 2.56)
HW	♂	17.3–20.5 (18.4 ± 1.25)	14.7–19.9 (17.3 ± 1.95)
	♀	17.6–19.1 (18.2 ± 0.58)	13.2–22.9 (17.9 ± 2.74)
Shank length	♂	13.2–16.2 (14.2 ± 1.21)	10.0–14.5 (12.7 ± 1.29)
	♀	14.0–15.9 (14.5 ± 0.81)	10.6–17.2 (14.3 ± 1.95)
Axilla–groin distance	♂	37.0–38.7 (37.6 ± 0.68)	33.0–45.7 (39.1 ± 4.54)
	♀	32.5–43.0 (39.2 ± 4.14)	37.7–49.5 (42.5 ± 3.83)
Tail length / SVL	♂	0.78–0.87 (0.83 ± 0.04)	0.82–0.87 (0.85 ± 0.02)
	♀	0.72–0.90 (0.81 ± 0.09)	0.78–0.87 (0.83 ± 0.04)
HL / SVL	♂	0.25–0.27 (0.26 ± 0.01)	0.24–0.26 (0.25 ± 0.01)
	♀	0.25–0.27 (0.26 ± 0.01)	0.24–0.27 (0.25 ± 0.01)
Shank length / SVL	♂	0.15–0.17 (0.16 ± 0.01)	0.13–0.17 (0.15 ± 0.01)
	♀	0.14–0.16 (0.15 ± 0.01)	0.13–0.17 (0.15 ± 0.01)
Axilla–groin distance / SVL	♂	0.38–0.43 (0.42 ± 0.02)	0.41–0.53 (0.46 ± 0.03)
	♀	0.37–0.43 (0.42 ± 0.02)	0.42–0.49 (0.46 ± 0.02)
Subdigital lamellae of 4th toe		16–20 (18.13 ± 1.17)	18–23 (20.17 ± 1.62)
Subdigital lamellae of 4th finger		16–19 (17.88 ± 1.05)	17–23 (19.67 ± 2.13)
Number of SPL to level below center of eye		6–8 (6.63 ± 0.70)	8–10 (8.62 ± 0.62)
Number of INL to level below center of eye		8–10 (8.63 ± 0.70)	7–8 (7.62 ± 0.49)
Number of postrostrals		2	2
Number of postmentals		2	2
Number of medial dorsal scales in one head length		72–92 (81.25 ± 7.60)	64–88 (75.15 ± 8.24)
Number of medial ventral scales in one head length		44–56 (49.00 ± 4.24)	34–52 (40.62 ± 4.68)

with anterior infralabials; scales on chin granular, mostly pointed; scales on throat small, round, convex, juxtaposed; 8 (right)–7 (left) infralabials to level below center of eye, total number 10; infralabials mostly large, smooth, quadrangular to pentagonal, posterior ones smaller; dorsum of body with convex, juxtaposed to subimbricate scales with rounded posterior margins, about twice as large as scales on snout, largest dorsal scales about 0.35 x 0.29 mm (length x width); about 72 median dorsal scales in

one head length; ventral scales at midbody smooth, juxtaposed to subimbricate with rounded posterior margins, forming oblique rows, about 0.42 x 0.39 mm (length x width); about 45 ventral scales in one head length; a gradual transition between dorsal and ventral scales; 218 scales around midbody; caudal scales smooth, imbricate, with rounded posterior margins, slightly larger ventrally; scales on limbs mostly smooth, subimbricate, with rounded posterior margins, equal to, to larger than dorsals; scales on posterior surfaces of forelimbs and on posterior and upper surfaces of hind limbs small, granular; fingers and toes depressed with a middorsal elevation, connected by a basal web; subdigital lamellae forming two transversely enlarged rows, divided by a median sulcus, 20 under fourth toe, 19 under fourth finger; claw on distal extremity of distal sulcus.

Coloration after one month in preservative (70% ethanol) was recorded as follows: Dorsal surfaces of head, body, limbs, and tail grayish brown with numerous irregular but sharply delimited, black spots and blotches; ventral surfaces of head, body, and



Figure 1. Holotype of *Thecadactylus oskrobapreinorum* (SMF 92120). SVL = 95.5 mm.

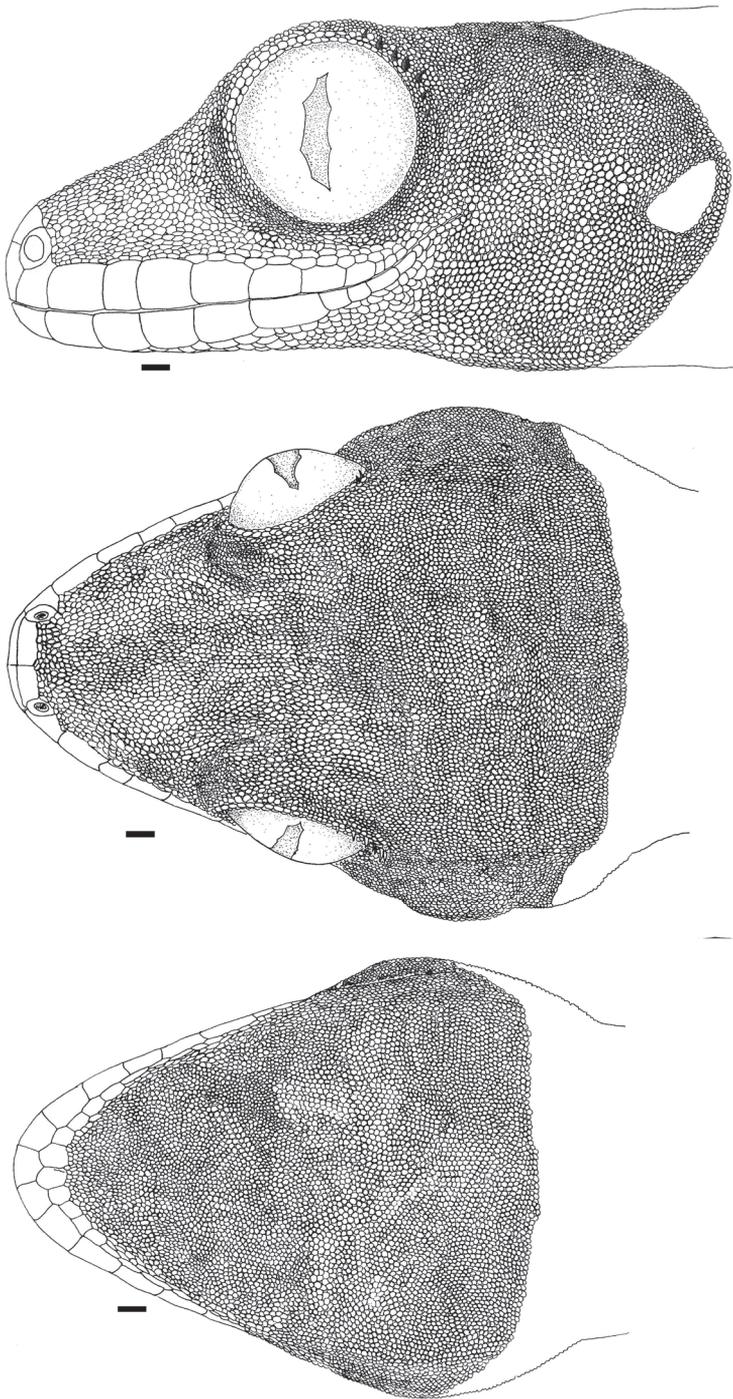


Figure 2. Head of holotype of *Thecadactylus oskrobapreinorum* (SMF 92120). Scale bar equals 1.0 mm.

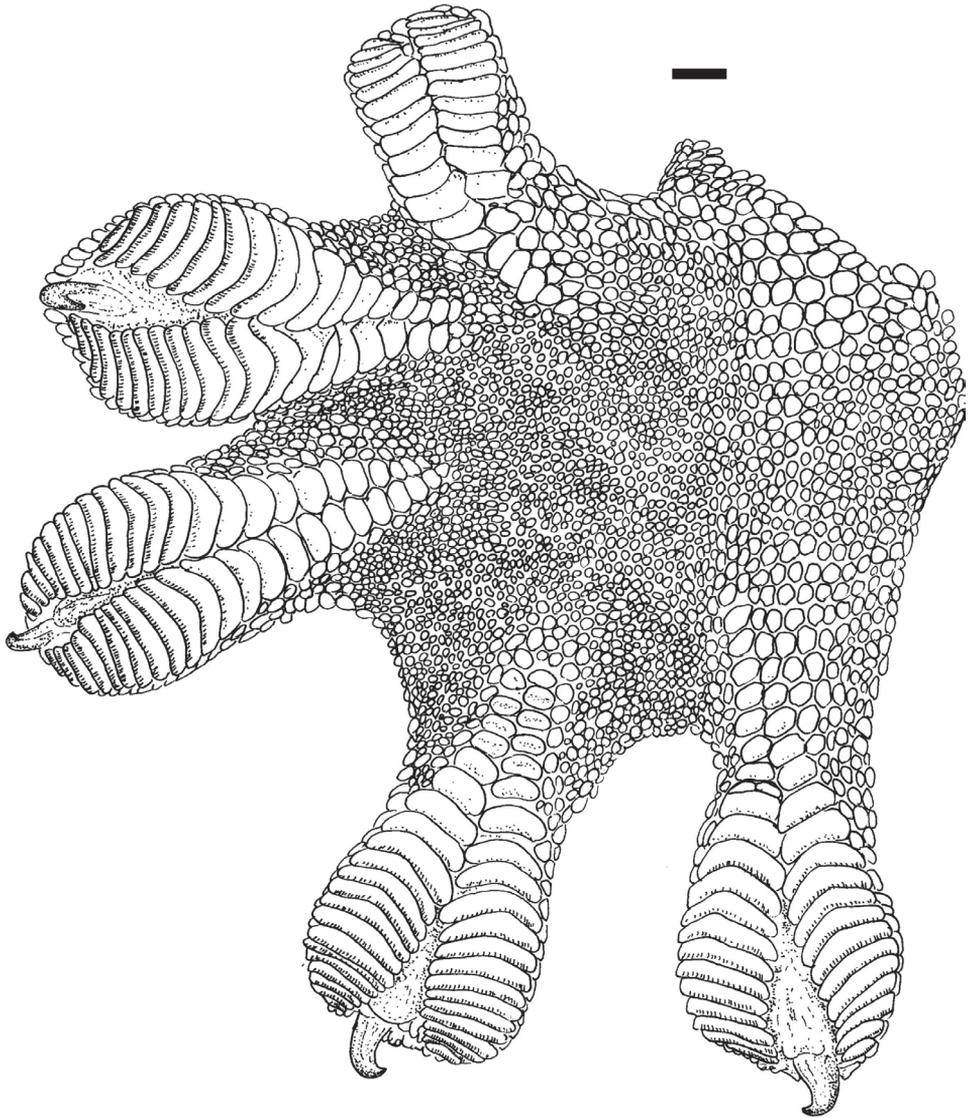


Figure 3. Right hind foot of holotype of *Thecadactylus oskrobapreinorum* (SMF 92120). Scale bar equals 1.0 mm.

limbs cream with gray shading and faint gray reticulations; widened lamellae of fingers and toes gray; ventral surface of tail brown with dark grayish brown reticulations.

Variation. The paratypes agree well with the holotype in general appearance, morphometrics and scalation (see Table 1). Variation of coloration in life is illustrated in Fig. 4. As can be seen, the number and distribution of the dark spots and blotches varies between individuals as does the background color which ranges from pale pearl gray over pale grayish yellow to grayish olive. Scale size differences in certain areas of gular

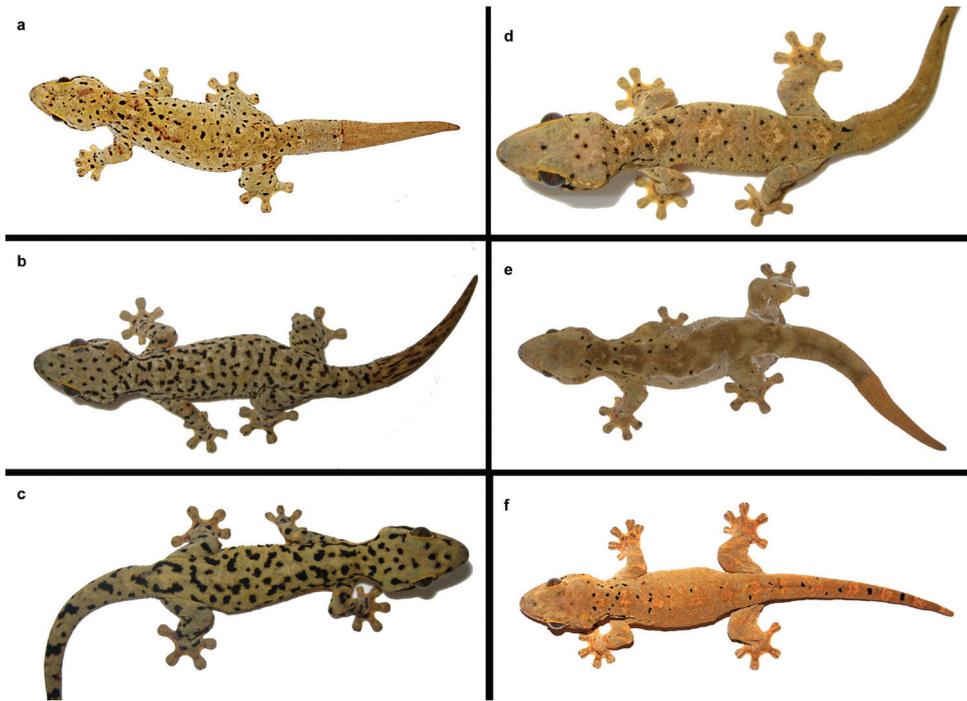


Figure 4. *Thecadactylus oskrobapreinorum* in life (specimens not preserved; all from Sint Maarten, Lesser Antilles). Photos a,e by Gunther Köhler; b,c,d by Stephan Prein, f by Maciej Oskroba



Figure 5. Habitat at the type locality of *Thecadactylus oskrobapreinorum* on Sint Maarten, Lesser Antilles. Photo by Maciej Oskroba

and temporal region of male holotype are probably the result of bites from other males in territorial fights. The damaged parts of the skin are covered by smaller granular scales as it is typical for scar tissue.

Etymology. The name *oskrobapreinorum* is a construction in the genitive plural honoring Maciej Oskroba and Stephan Prein, two German herpetoculturists who directed our attention to this new species and made field observations on this gecko on the island of Sint Maarten.

Natural history notes. All type specimens were collected at night while the lizards were active on the lower parts of the trunks of large living trees within or at the edge of forested areas (see also Fig. 5). From 11–16 April 2011, the air temperature (measured in the shade) varied at the type locality from 21.1–23.7°C (mean 22.7°C) in the morning hours and 24.6–28.2°C (mean 26.6°C) in the afternoon.

Geographic Distribution. As currently known, *Thecadactylus oskrobapreinorum* is restricted to the island of Sint Maarten, Lesser Antilles. Although the type locality is in the Dutch portion of the island, the species is also known from several localities in the French portion (see records in Breuil 2002).

Discussion

The distinctive dorsal pattern in *Thecadactylus oskrobapreinorum* appears to be a fixed character in this species since no individuals without dark spots on a otherwise patternless dorsum have been documented (see also a photo of a specimen of this species in Breuil 2002, 2003). As described and illustrated, individuals of the *Thecadactylus* populations from the nearby islands of St. Eustatius, St. Barthelemy, and Saba show the “normal” dorsal pattern of *T. rapicauda* (Breuil 2002, Powell et al. 2005). However, Breuil (2002) pictures a specimen from the island of La Désiderade which exhibits a strikingly aberrant coloration with a almost white head contrasting with the mostly dark grayish body, limbs, and tail. A more comprehensive survey and analysis of variation, both of molecular genetic and of morphological traits, is needed in order to shed light on the actual species diversity of *Thecadactylus* on the Lesser Antilles.

We have not examined the types of the nominal species placed in the synonymy of *Thecadactylus rapicauda* (following e.g., Peters and Donoso-Barros 1970, Russell and Bauer 2002). However, based on the respective type localities, even given the vague nature of most of them, none of them came from near Sint Maarten, not even from the Lesser Antilles: *Gekko laevis* Daudin, 1802 (type locality: “Amérique méridionale”); *Gekko surinamensis* Daudin, 1802 (type locality: “Surinam”); and *Pachydactylus tristis* Hallowell, 1854 (type locality: “Liberia, west coast of Africa”, in error fide Russell and Bauer 2002). Therefore, none of the aforementioned names can be applied to the species described herein. In the cases of *Gekko laevis* and *Pachydactylus tristis*, the types of both of which are lost and no accurate type locality given, the synonymy assignment to either *T. rapicauda* or *T. solimoensis* remains un-

settled. Also, as pointed out by Bergmann and Russell (2007), additional molecular genetic work with more intensive sampling is needed in order to clarify the geographic boundaries between *T. rapicauda* and *T. solimoensis*.

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References

- Avila-Pires TCS (1995) Lizards of Brazilian Amazonia (Reptilia: Squamata). Zoologische Verhandelingen Leiden 299: 1–706.
- Bergmann PJ, Russell AP (2003) Lamella and scansor numbers in *Thecadactylus rapicauda* (Gekkonidae): Patterns revealed through correlational analysis and implications for systematic and functional studies. Amphibia-Reptilia 24: 379–385. doi:10.1163/156853803322440826
- Bergmann PJ, Russell AP (2007) Systematics and biogeography of the widespread Neotropical gekkonid genus *Thecadactylus* (Squamata), with the description of a new cryptic species. Zoological Journal of the Linnean Society 149: 339–370.
- Breuil M (2002) Histoire Naturelle des Amphibiens et Reptiles Terrestres de l'Archipel Guadeloupéen. Guadeloupe, Saint-Martin, Saint-Barthélemy. Patrimoines Naturels 54: 1–339.
- Breuil M (2003) A la découverte des Amphibiens & Reptiles des Antilles. PLB Éditions, Gosier, Guadeloupe, 64 pp.
- Censky EJ, Kaiser H (1999) The Lesser Antillean fauna. In: Crother, BI (Ed) Caribbean Amphibians and Reptiles. Academic Press, San Diego, 181–221.
- Daudin F (1802) Histoire naturelle générale et particulière des reptiles, Vol. 4. F. Dufart, Paris.
- Duméril AMC, Bibron G (1836) Erpetologie générale ou histoire naturelle complete des reptiles. Vol. 3. Libr. Encyclopédique Roret, Paris, 528 pp.
- Hallowell E (1854) Remarks on the geographical distribution of reptiles, with descriptions of several species supposed to be new, and corrections of former papers. Proceedings of the Academy of Natural Sciences of Philadelphia 1854: 98–105.
- Hoogmoed MS (1973) Notes on the herpetofauna of Surinam IV. The Lizards and amphisbaenians of Surinam. Biogeographica 4: 1–419.
- Houttuyn M (1782) Het onderscheid der salamanderen van de haagdissen in 't algemeen, en van de gekkos in 't byzonder aangetoond. Venhandelingen Uitgegeven door het Zeeuwsch Genootschap der Wetenschappen te Vlissingen, ser. 1, 9: 305–336.

- Kronauer DJC, Bergmann PJ, Mercer JM, Russell AP (2005) A phylogeographically distinct and deep divergence in the widespread Neotropical turnip-tailed gecko, *Thecadactylus rapicauda*. *Molecular Phylogenetics and Evolution* 34: 431–437. doi:10.1016/j.ympev.2004.10.009
- Leviton AE, Gibbs RH, Heal E & Dawson CC (1985) Standards in herpetology and ichthyology: part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia* 1985: 802–832.
- Malhotra A, Thorpe, RS (1999) *Reptiles & Amphibians of the Eastern Caribbean*. Macmillan Education Ltd., 88–92.
- Powell R, Henderson RW, Adler K, Dundee HA (1996) An annotated checklist of West Indian amphibians and reptiles. In: Powell R, Henderson RW (Eds) *Contributions to West Indian Herpetology. A Tribute to Albert Schwartz*. Society for the Study of Amphibians and Reptiles, St. Louis, 51–93.
- Powell R, Henderson RW, Parmelee JS (2005) The reptiles and amphibians of the Dutch Caribbean St. Eustatius, Saba, and St. Maarten. *STENAPA, St. Eustatius*, 191 pp.
- Russell AP, Bauer AM (2002) *Thecadactylus, T. rapicauda*. *Catalogue of American Amphibians and Reptiles* 753: 1–16.

Appendix

Comparative material examined

Thecadactylus rapicauda – **Brazil:** Maranhão: SMF 8378. **Colombia:** Melgar, Tolima: SMF 70233. **Guatemala:** Sitio Arqueológico Quirigua, 76 m: SMF 84018. **Honduras:** Isla de Utila, near Iguana Station: SMF 79871; Isla de Utila, 1 km S Rock Harbour: SMF 77098; west end of Isla de Utila: SMF 77099; Río Platano Biosphere Reserve, vicinity of Río Cuyamel, 15°34.43'N, 85°0.248'W, 170 m: SMF 85940–41; Parque Nacional Patuca, Matamoros, 150 m: SMF 80824–25. **Nicaragua:** Bartola at Río San Juan, 10°58.37'N, 84°20.35'W, 30 m: SMF 82103; Parque Nacional Saslaya, 13°42.84'N, 84°58.66'W, 400 m: SMF 82875–77; Biosphere Reserve Bosawas, near Wiso, 13°59.67'N, 85°19.70'W, 246 m: SMF 78555; El Recreo, S side Río Mico, 25 m: KU 113016. **Panama:** Volante: SMF 89601; Cerro Tebata, Bocas del Toro Province: SMF 83638. **Surinam:** no further data: SMF 8374. **Trinidad:** Hotel Robinson Crusoe, Scarborough: SMF 65848; Alefounder, Grafton Estate: SMF 65849, 66185, 66204; Prospect Estate: SMF 66829. **Trinidad:** no further data: SMF 8376. **Venezuela:** Puerto Caballo: SMF 8375; between Guaramaco and San Fernando: SMF 8377.

Thecadactylus solimoensis – **Ecuador:** Pastaza Province, Arutam Field Station, 700 m east from the Camp (coordinates of the Camp): 1°47.28'S 77°48.31'W, 790 m: SMF 91034.

