

Redescription of *Laemoglyptus taihorinensis* (Coleoptera: Cantharidae), with Contribution to Female Morphology and Description of Copulation

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Abstract: *Laemoglyptus taihorinensis* WITTMER, 1984 is redescribed, with a supplementary description of the female morphology. The eighth abdominal sternite of the female is illustrated for the first time. Furthermore, the copulatory behaviour was observed and described. We assume that the male possibly provides material from its pronotum for the female to ingest during copulation.

Keywords: Coleoptera, Cantharidae, *Laemoglyptus taihorinensis*, female, copulation

Introduction

Most of the species of the genus *Laemoglyptus* FAIRMAIRE, 1886 are distributed in the Oriental Region and some species are found in the central and eastern Palearctic Region (ŠVIHLA, KOPETZ 2012). To date, eight species of *Laemoglyptus* from Taiwan have been described (WITTMER 1984). The sexual dimorphism of the *Laemoglyptus* spp. is notable. The antennae of the males are pectinate while the females have serrate antennae. The pronota of the males are considerably protruding laterad, with posterolateral oval emarginations, but the pronota are subelliptical in females. It is very difficult to identify the females because of their similar morphology. The eighth abdominal sternite of the female is one of the useful characters for identification but the females of most species are unknown.

Laemoglyptus taihorinensis Wittmer, 1984 was described based only on male specimens, while the female was unknown. In order to complete the information on the morphology of this species, we describe the female and redescribe the male in de-

tail using a specimen collection of large number of specimens. Recently a couple of alive specimens of *L. taihorinensis* were collected. This allowed us to study its copulatory behaviour. As a result, we discovered that the copulation in this species is characterised by a female-above mating position and the female clasps the male pronotum during copulation.

Material and Methods

All the material is deposited in Y. Hsiao's private collection (YHC) and a couple of specimens will be deposited in the National Museum of Natural Science, Taichung, Taiwan (NMNS).

The terminology of the aedeagus and integumentary structures used in the descriptions follow that of ŠVIHLA, KOPETZ (2012). The methods follow HSIAO, YANG (2014) and OKUSHIMA (2005). The pronotum was dehydrated and dried, then sputter coated with gold for examination with the JEOL JSM-5600 scanning electron microscope.

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Results

Laemoglyptus taihorinensis Wittmer, 1984

Figs. 1-6

Material Examined: **Taiwan** - Dahan-Bridge, Northern Cross Island Highway 49.2 K, Taoyuan Hsien, 15. IV. 2014, 1♂, Wei-Ren Liang leg. (NMNS); same date, 1♂ (YHC); Fonghuanshan, Lugu Dist., Nantou Hsien, 1700 m, 29. III. 2014, 1♂, Po-Wei Hsu leg. (YHC); Shenmuhsi, Nantou Hsien, 1350 m, 31. III. 2014, 1♀, Po-Wei Hsu leg. (NMNS); same date, 1♀(YHC); same locality, 24. III. 2014, 3♂, 1♀, Yun Hsiao leg. (YHC); same locality and date, 1♂, Tien Hsieh leg. (YHC); Shitou, Lugu Dist., Nantou Hsien, 22. III. 2014, 2♂, 1♀, Wei-Ren Liang leg. (YHC); Fonghuanshan, Lugu Dist., Nantou Hsien, 30. III. 2013, 1♂, Yu-Tang Wang leg. (YHC); Baedawushan (Mt. North Dawu), Pingtung Hsien, 28. II. 2013, 1♂, 1♀, Ren-Hou Liou leg. (YHC); Malunshan, Taichung City, 13. II. 2012, 1♀, Yun Hsiao leg. (YHC)

Redescription:

Male (Fig. 1a): Head, antennae, elytra, meso- and metaventrites, and legs sooty to black. Head surface semilustrous, finely and sparsely punctate,

with fine, scattered, recumbent grey pubescence. Eyes protruding, ratio of eye diameter to interocular space 1 : 1.60. Mandibles simple, brownish black, brownish orange in the apical half. Clypeus trapezoid, terminal margin slightly rounded, with five to ten black hairs on the terminal part of the disc (Fig. 2a). Antennae pectinate, nearly extending to about elytral midlength, antennomeres 3–10 with obvious projections, which are distinctly longer than each antennomere (Fig. 3).

Pronotum 1.19 times as wide as the head, 0.64 times as long as wide; anterior margin rounded, lateral margins protruding laterad in the middle part; posterolateral oval emarginations open, situated far from base; posterior margin nearly straight, slightly rounded and sinuate; anterior angles indistinct, posterior angles rounded; dorsal to anterolateral region with pore at tip of slightly elevated area (Fig. 4a,b,c). Anterolateral to posterolateral region and inner surface of emargination wrinkled (Fig. 4c, d); surface of pronotum punctate like that of head, with sparse and fine brownish pubescence, much denser near pore and emarginations. Prothorax reddish- orange.

Scutellum sooty and slightly brownish in the basal part or entirely brownish orange. Elytra con-

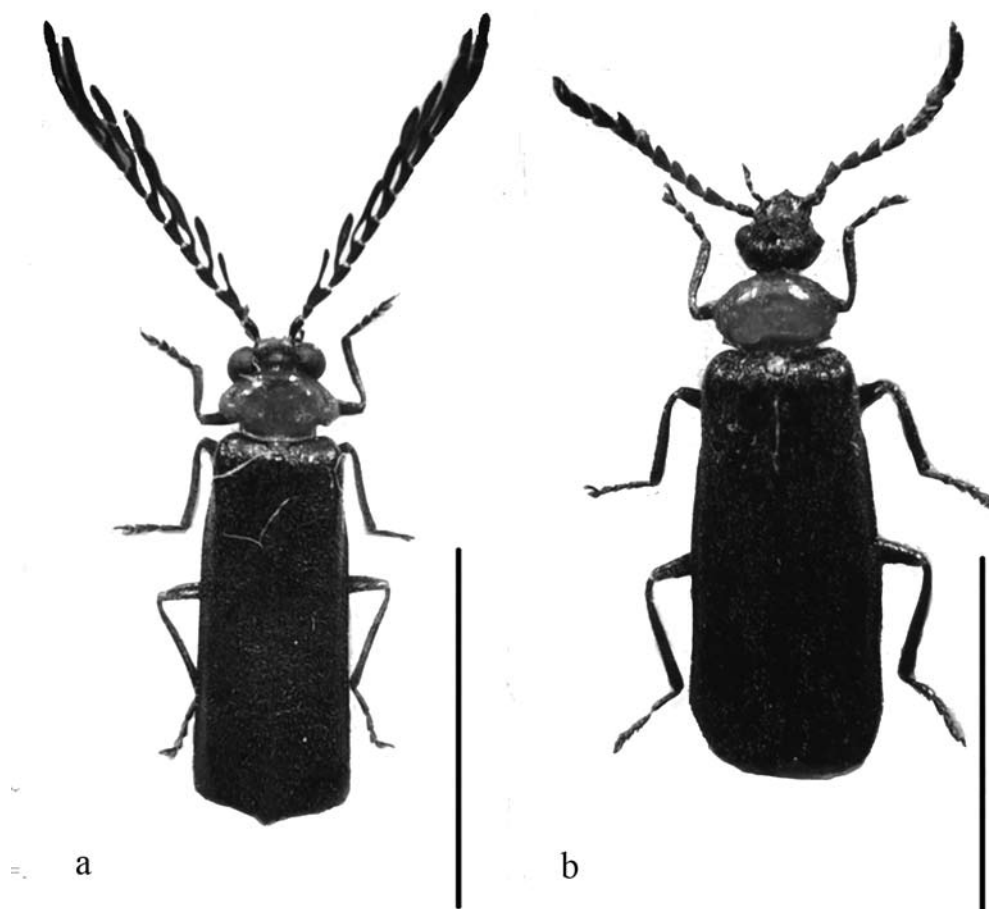


Fig. 1. Habitus of *Laemoglyptus taihorinensis*: a – male; b – female. Scale bar = 5 mm

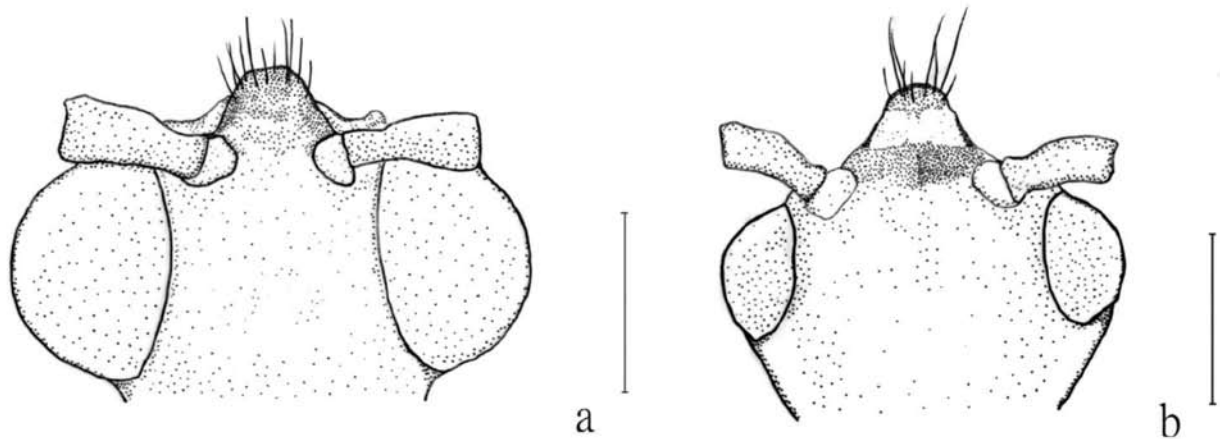


Fig. 2. Clypeus: a – male; b – female. Scale bar = 0.5 mm



Fig. 3. Left antenna of male. Scale bar = 1 mm

jointly 1.31 times as wide as the pronotum, 2.40 times as long as wide, moderately widening posteriorly; surface semilustrous, rugulose-lacunose, with fine, grey, short semierect pubescence. Abdomen sepia, seventh and eighth sternites darker; terminal parts of lateral margins of second to sixth sternites slightly paler. Aedeagus stout, fused ventral parameres broad, moderately widened in the middle, terminal margin subtruncated and slightly rounded, more or less longer than dorsal plate (Fig. 6a); fused laterophyses, distinctly divided terminally; terminal margin of dorsal plate nearly straight and slightly sinuate, concave in the middle, with denser hairs on upper lateral margins and both sides of terminal margin (Fig. 6b).

Body length 7.13-7.98 mm (6.50 mm in original description of the holotype); width 2.17-2.78 mm.

Female (Fig. 1b): Coloration same as in male, except disc of the clypeus which is pale at basal two-thirds; punctuation and pubescence resemble male. Eyes much smaller and less protruding than in male, ratio of eye diameter to interocular space 1 : 4.02. Mandibles simple, larger than in male. Clypeus trapezoid, longer than in male, lateral margins slightly emarginated in the middle; terminal margin rounded, with five to six black hairs on terminal part of the disc (Fig. 2b). Antennae serrate, shorter than in male, extending to the basal one-third length of elytra. Pronotum subelliptic, 1.48 times as wide as the head, 0.70 times as long as wide; anterior margin rounded, lateral margins arcuate, distinctly constricted before posterior angles, posterior margin rounded and faintly sinuate; anterior angles rounded and indistinct, posterior angles acute; dorsal to anterolateral region with a pore (Fig. 5a, b). Elytra conjointly 1.55 times as wide as the pronotum, 2.24 times as long as wide, gradually widening posteriorly.

Eighth abdominal sternite (Fig. 6c) with a pale subtriangular region at the basal part, but indistinct in some specimens. Lateral margins more or less straight and angular; terminal margin emarginated in the middle, shape of emargination more or less variable from V-shaped to U-shaped.

Body length 7.52-8.35 mm; width 2.75-3.04 mm.

Diagnosis: *Laemoglyptus taihorinensis* is similar to *L. grandis* Pic, 1921, from which it differs by the black head and legs, the trapezoid clypeus and pronotum, more elongate body, the structure of aedeagus and the obvious emargination in the middle of terminal margin of the eighth abdominal sternite of females.

Notes: While comparing with other *Laemoglyptus* spp. from Taiwan, we could conclude

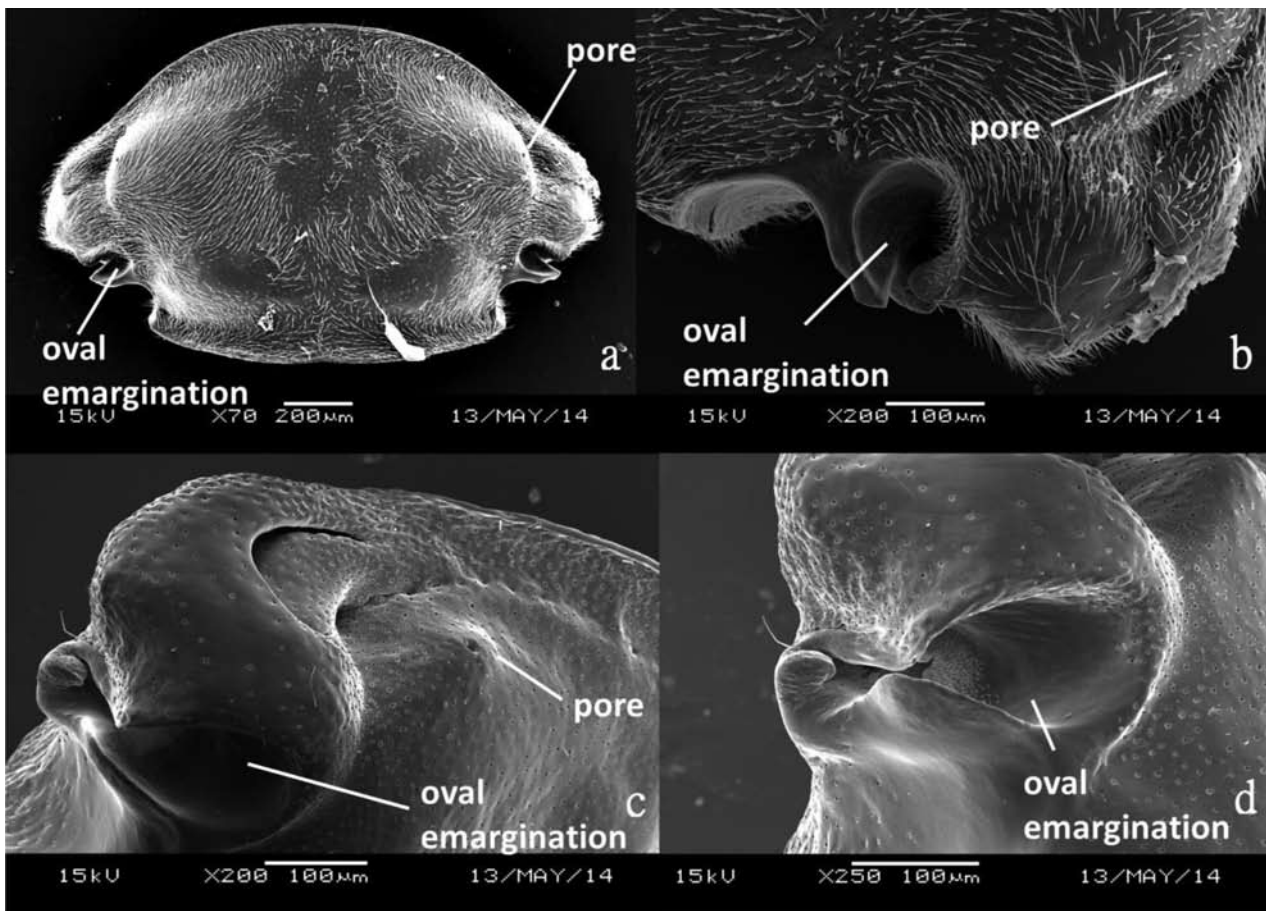


Fig. 4. SEM images of the male pronotum: a – dorsal view; b-d – lateral view. Scale bar in μm

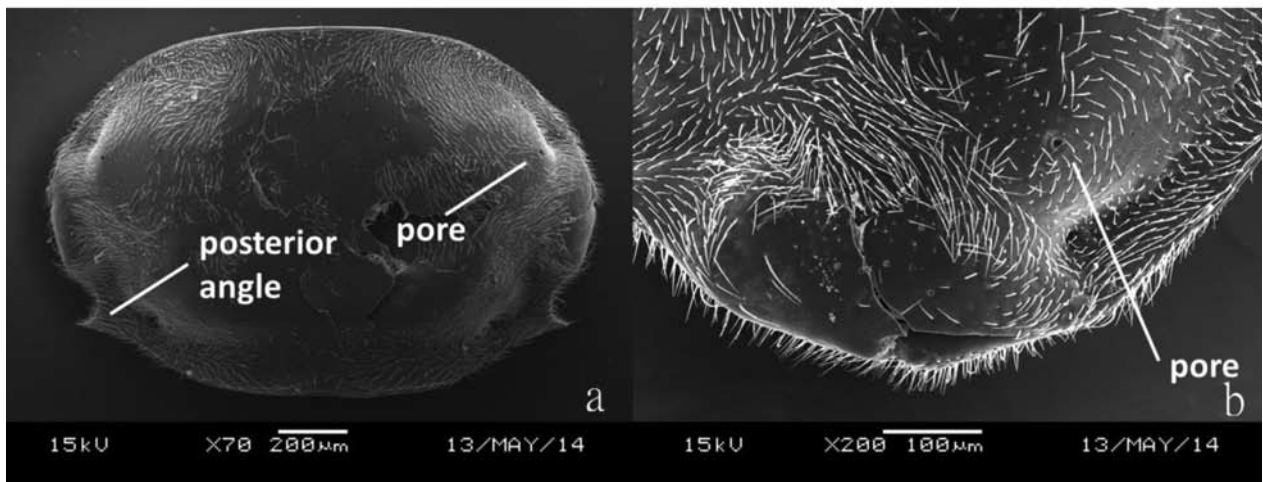


Fig. 5. SEM images of the female pronotum: a – dorsal view; b – lateral view. Scale bar in μm

that the shape and colour of clypeus should be a useful character for identifying *L. taihorinensis*. According to the available data, this species is widely distributed in Taiwan at an altitude between 680 to 1,700 meters and mainly appears between late February and April. The first author observed during the field-trip that the individuals fly in the forest and most of them

rest on the leaves of *Ficus pumila* var. *awkeotsang*, but whether the plant is associated with its ecology or not remains unclear. We also discovered that the copulation is characterised by a female-above mating position and the female clasped the male pronotum during copulation (Fig. 7), which differed from the common pattern of other soldier beetles.

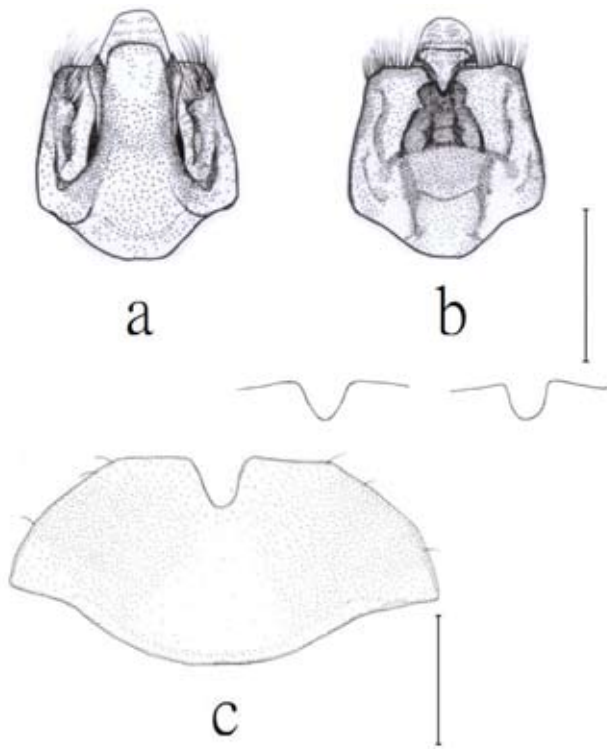


Fig. 6. Aedeagus (a – ventral view; b – dorsal view) and eighth abdominal sternite (c) of female. Scale bar = 0.5 mm

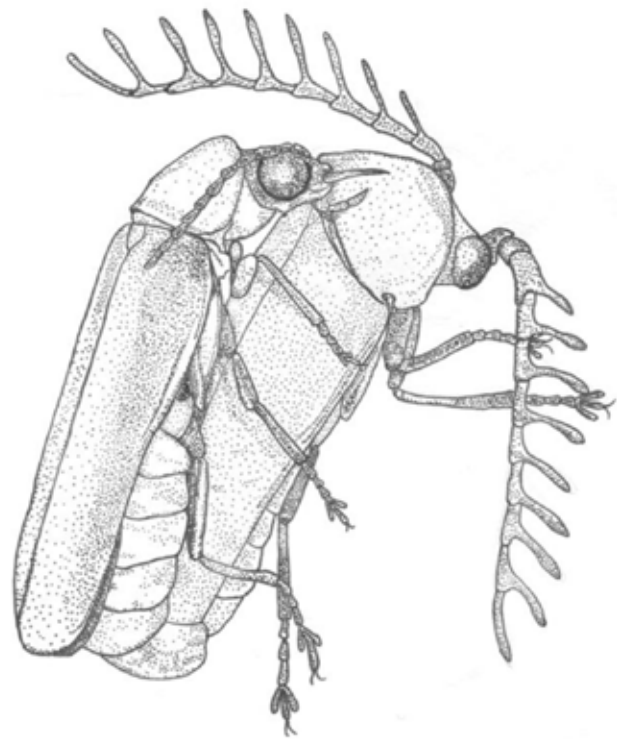


Fig. 7. Illustration showing the female-above mating position of *Laemoglyptus taihorinensis* and the female claspng the male pronotum

Discussion

According to the classification of ŠVIHLA, KOPETZ'S (2012), *Laemoglyptus taihorinensis* should be attributed to the *L. bomfordii* species-group based on the structure of the lateral emarginations of the pronotum, but the classification of subgroup remained unsure because the aedeagal characters is not in accordance with any subgroup proposed in the latter study.

On the other hand, EBERHARD (2006) reported that the female of *Ditemnus acantholabus* (Champion, 1915) would seize and keep one portion of the modified male pronotum inside its buccal cavity during copulation, likely because this particular behaviour functions as a mechanism to induce the secretion from the male pronotum for the female to ingest. Similarly, we can propose three suggestions explaining the mating behaviour of *L. taihorinensis*: (1) the locations of the pores on the pronotum are close to that of *D. acantholabus* and near the region female claspng by mandibles; (2) the female mandibles are obviously larger than those of male, which are possibly modified to seize the male pro-

notum, hence induce the secretion; and (3) the wrinkled surface around the male's pore is a typical type of surface with the function of dispersing liquids in other insects (EBERHARD 2006; SCHUH, SLATER 1995; JOHANSSON, BRÄTEN 1970). However, the function of female's pronotum pores remains unknown; these pores differ from those of male by the surrounding surface without distinct wrinkled region. The functional properties of pores on the pronotum also remain unclear since the lack of more direct evidence and, therefore, further studies are needed.

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