

A new species of the extant genus *Bulasconotus* from mid-Cretaceous Kachin amber (Coleoptera: Zopheridae: Colydiinae)

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Abstract. A fossil species of the extant colydiine genus *Bulasconotus* Ślipiński & Lawrence, *B. carinisternus* Li, Ślipiński & Cai **sp. nov.**, is reported from mid-Cretaceous Kachin amber of northern Myanmar. The new species shares with extant *Bulasconotus* the 3-segmented antennal club, externally open procoxal cavities, and similar sculpture on the pronotum and elytra, but could be recognized by the medially carinated prosternal process. The present discovery provides a valuable example of morphological stasis in the cylindrical bark beetles.

Keywords. Zopheridae; Colydiinae; Fossil; Cretaceous; Kachin amber.

INTRODUCTION

Colydiinae, or the cylindrical bark beetles, is a moderately diverse group currently included in the tenebrionoid family Zopheridae (Ślipiński & Lawrence, 2010). This group had long been treated as an independent family (Colydiidae) in the earlier works (e.g., Pope, 1961; Dajoz, 1977, 1980; Stephan, 1989; Ivie & Ślipiński, 1990). Ślipiński & Lawrence (1999) merged Colydiidae into Zopheridae based on a morphological phylogenetic analysis, although the analysis suffered from potential defects in taxon sampling and character coding (Ivie *et al.*, 2016). The close relationship between Colydiinae and Zopherinae has been supported by molecular studies (McKenna *et al.*, 2019; Cai *et al.*, 2022). The enigmatic *Rhizonium* Sharp may also be associated with Colydiinae (Cai *et al.*, 2022; see also notes from the morphological aspect by Lawrence *et al.*, 2010 and Ivie *et al.*, 2016). There is a serious regional imbalance in the study of colydiine taxonomy. For example, the New Zealand colydiine fauna has been well studied, with at least 156 species known (Lord & Leschen, 2014; Leschen & Lord, 2017). By contrast, only about 27

species have been recorded in China (including Taiwan) (Liang, 2013; Makita, 2017a, 2017b; Aoki & Narukawa, 2019; W.-J. Li *et al.*, 2021), which is clearly a result of insufficient study, as at least 44 species are known in the adjacent Japan (Aoki, 2012, 2017, 2018).

As listed by Bullis (2020), all pre-Quaternary fossils of Colydiinae were discovered from amber deposits, with the earliest ones from mid-Cretaceous Kachin amber. Most of the colydiines from Eocene Baltic amber were assigned to extant genera (Alekseev & Lord, 2014; Alekseev, 2015; Alekseev & Bukejs, 2016; but see also Alekseev & Alekseev, 2019; Alekseev & Pankowski, 2020). By contrast, all previous reported colydiines from Kachin amber were placed in extinct genera (e.g., Deng *et al.*, 2017; Poinar Jr. & Vega, 2020; Cheng *et al.*, 2021; Y.-D. Li *et al.*, 2021).

Here we describe a new colydiine species from Kachin amber, which could be placed in the extant genus *Bulasconotus* Ślipiński & Lawrence. As noted by Yamamoto (2024), many beetle taxa with high-level of morphological stasis are likely associated with the “cryptic” microhabitats, such as in leaf litter and soil or under bark (e.g., Cai

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et al., 2018, 2019; Liu et al., 2020; Yamamoto, 2021, 2024; Li et al., 2024). The current finding offers a valuable example of long-term morphological stasis in the cylindrical bark beetles.

MATERIAL AND METHODS

The Kachin amber (Burmese amber) specimen studied herein (Figs. 1-3) originated from amber mines near Noije Bum (26°20'N, 96°36'E), Hukawng Valley, Kachin State, northern Myanmar. The amber specimen is deposited in the Nanjing Institute of Geology and Palaeontology (NIGP), Chinese Academy of Sciences, Nanjing, China. The amber piece was trimmed with a small table saw, ground with emery paper of different grit sizes, and finally polished with polishing powder.

Photographs under incident light were taken with a Zeiss Discovery V20 stereo microscope. Confocal images were obtained with a Zeiss LSM710 confocal laser scanning microscope, using the 488 nm Argon laser excitation line (Fu et al., 2021). Images were stacked with Helicon Focus 7.0.2, Zerene Stacker 1.04 and Adobe Photoshop CC, and were further processed in Adobe Photoshop CC to adjust brightness and contrast.

RESULTS

Systematic Paleontology

Order Coleoptera Linnaeus, 1758

Superfamily Tenebrionoidea Latreille, 1802

Family Zopheridae Solier, 1834

Subfamily Colydiinae Erichson, 1842

Tribe Sychitini Erichson, 1845

Genus *Bulasconotus* Ślipiński & Lawrence, 1997

Bulasconotus carinisternus Li, Ślipiński & Cai sp. nov.
(Figs. 1-3)

Material: Holotype, NIGP203566.

Locality and horizon: Amber mine located near Noije Bum Village, Tanai Township, Myitkyina District, Kachin State, Myanmar; unnamed horizon, mid-Cretaceous, Upper Albian to Lower Cenomanian.

Diagnosis: *Bulasconotus carinisternus* sp. nov. could be separated from extant *B. solomon* Ślipiński & Lawrence and *B. scaccarius* Bernard & Gillett primarily by its medially carinated prosternal process (Fig. 3C). In the latter two the prosternal process is generally flat, without median carina (Fig. 4B; Bernard & Gillett: fig. 2B). *Bulasconotus carinisternus* additionally differs from them in the much more slender body, less produced anterior pronotal angles and shorter antennomere 3 (antennomere 3 longer than antennomere 2 in *B. solomon* and *B. scaccarius*).

Description: Body elongate, parallel-sided, about 2.3 mm long, 0.6 mm wide, covered with distinct setae.

Head prognathous, without distinct neck; temples absent; frontal ridges raised above antennal insertions. Compound eyes lateral, entire; interfacetal setae short, scale-like. Antennal grooves absent. Antennal insertions ventrolaterally located. Antennae 11-segmented, short; antennomeres 3-8 subequal in size, about as long as wide or slight wider than long, each narrower and shorter than antennomere 2; antennomeres 9-11 forming loose club. Maxillary palps 4-segmented; terminal palpomere apically flattened, with oblique apical edge. Labial palps 3-segmented; apical palpomere cylindrical. Mentum transverse, parallel-sided, basally with large subtriangular shallow impression. Gular region with short, widely separated and anteriorly convergent sutures.

Pronotal disc subquadrate; anterior angles weakly produced; posterior angles almost right-angled; surface with two pairs of carinae (admedian and sublateral); admedian carinae complex, forked anteriorly and posteriorly. Hypomera without antennal grooves or impressions. Notosternal sutures complete. Prosternum not produced anteriorly; prosternal process with median carina, apically with median carina extending slightly beyond lateral parts. Procoxal cavities externally open.

Scutellar shield slightly longer than wide; lateral margins slightly converging anteriorly. Elytra elongate, parallel-sided, with puncture rows and longitudinal costae; scutellary striole present. Hind wings well developed. Mesocoxae separated by less than one coxal cavity width. Metaventrite with long discrimen. Metacoxae separated by intercoxal process.

Protibiae apically with two spurs and several smaller spines. Tarsi 4-4-4; tarsomeres 1-3 similar in form, together shorter than tarsomere 4. Pretarsal claws simple, with basal dilation.

Abdomen with five ventrites; ventrites 1 to 3 more solidly fused together than 4 and 5. Ventrite 1 with long and acute intercoxal process. Ventrite 5 with deep and narrow preapical groove parallel to apex.

Etymology: The specific name refers to the medially carinate prosternal process of the new species.

Remarks: *Bulasconotus* is known in the Recent fauna as two described species living in the Melanesian islands (Ślipiński & Lawrence, 1997; Bernard & Gillett, 2020). The presence of *B. scaccarius* in Hawaii was thought to be invasive. Extant *Bulasconotus* can be found among the galleries of ambrosia beetles, and has been suggested as a potential predator of ambrosia beetles (Bernard & Gillett, 2020).

DISCUSSION

According to the keys provided by Lawrence (1980), Ślipiński & Burakowski (1988) and Ivie et al. (2016), the new fossil can be easily ruled out from all other colydiine tribes except Sychitini, based on characters including body surface with recumbent setae, antennae 11-segmented with 3-segmented club, procoxal cavities open,

metanepisterna narrow, and tibiae simple. The fossil can be further keyed to the entry of *Bulasconotus* with the key provided by Ślipiński & Lawrence (1997), although this key was designed for Australo-Pacific taxa only.

In fact, the fossil shows striking similarity with extant members of *Bulasconotus*. It shares with extant *Bulasconotus* the absence of antennal grooves, not strongly projected frons, distinctly 3-segmented antennal club, externally open procoxal cavities, and similar sculpture on the pronotum and elytra (Ślipiński & Lawrence, 1997; Bernard & Gillett, 2020). Several synchitina genera also have an overall similar appearance. Among them, however, *Bitoma* Herbst and *Microprius* Fairmaire have a 2-segmented antennal club, *Paha* Dajoz has a 1-seg-

mented antennal club, and *Lasconotus* Erichson has externally closed procoxal cavities (Lord, 2013). Although some species of *Bitoma* may be described as having a 3-segmented antennal club, their antennomere 9 is usually distinctly smaller than 10 (unlike the fossil which has subequal antennomeres 9 and 10). As such, under the current classification scheme, the fossil can be confidently placed in *Bulasconotus*.

However, problems remain in the current systematics for *Bitoma*-like genera. As mentioned above, although *Bitoma* mostly has a clearly 2-segmented antennal club, some members assigned to *Bitoma* may have a somewhat 3-segmented antennal club (Lord, 2013). Similarly, although *Lasconotus* is generally recognized as having

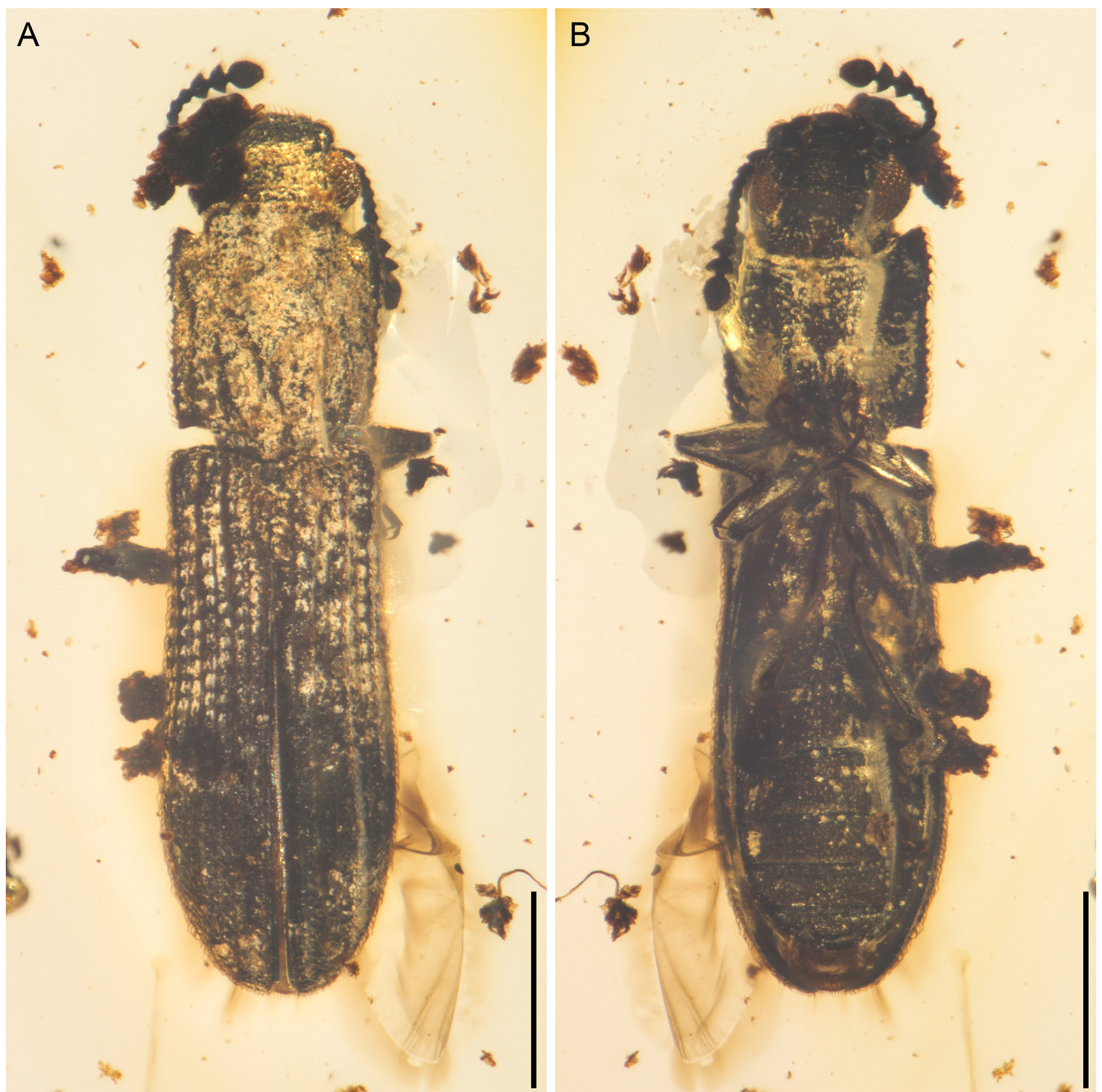


Figure 1. General habitus of *Bulasconotus carinisternus* Li, Ślipiński & Cai sp. nov., holotype, NIGP203566, under incident light. (A) Dorsal view. (B) Ventral view. Scale bars: 500 μ m.



Figure 2. General habitus of *Bulasconotus carinisternus* Li, Ślipiński & Cai **sp. nov.**, holotype, NIGP203566, under confocal microscopy. (A) Dorsal view. (B) Ventral view. Scale bars: 500 μ m.

procoxal cavities closed by mesad extension of hypomeron, the procoxal cavities may be narrowly open in a few members assigned to *Lasconotus* (e.g., Kingsolver *et al.*, 2006). In the phylogeny of New Zealand Zopheridae by Buckley *et al.* (2020), *Bitoma* was rendered as paraphyletic. In the phylogenies by Lord (2013), some members within *Bitoma* and *Microprius* were even distantly related. Although these studies used only a few gene fragments, they nevertheless indicate that the current generic classification system may require extensive revision.

DATA AVAILABILITY

The original confocal data are available in the Zenodo repository (<https://doi.org/10.5281/zenodo.10850384>).

AUTHORS' CONTRIBUTIONS: Y.-D.L.: Data Curation, Visualization, Writing – original draft; C.-Y.C: Supervision; D.-Y.H., C.-Y.C: Funding acquisition, Resources; Y.-D.L, C.-Y.C: Conceptualization; Y.-D.L, Z.-Y.J., A.S., C.-Y.C: Investigation; Y.-D.L, Z.-Y.J., A.S., D.-Y.H., C.-Y.C: Writing – review & editing.

CONFLICT OF INTEREST: We declare that we have no conflicts of interest.

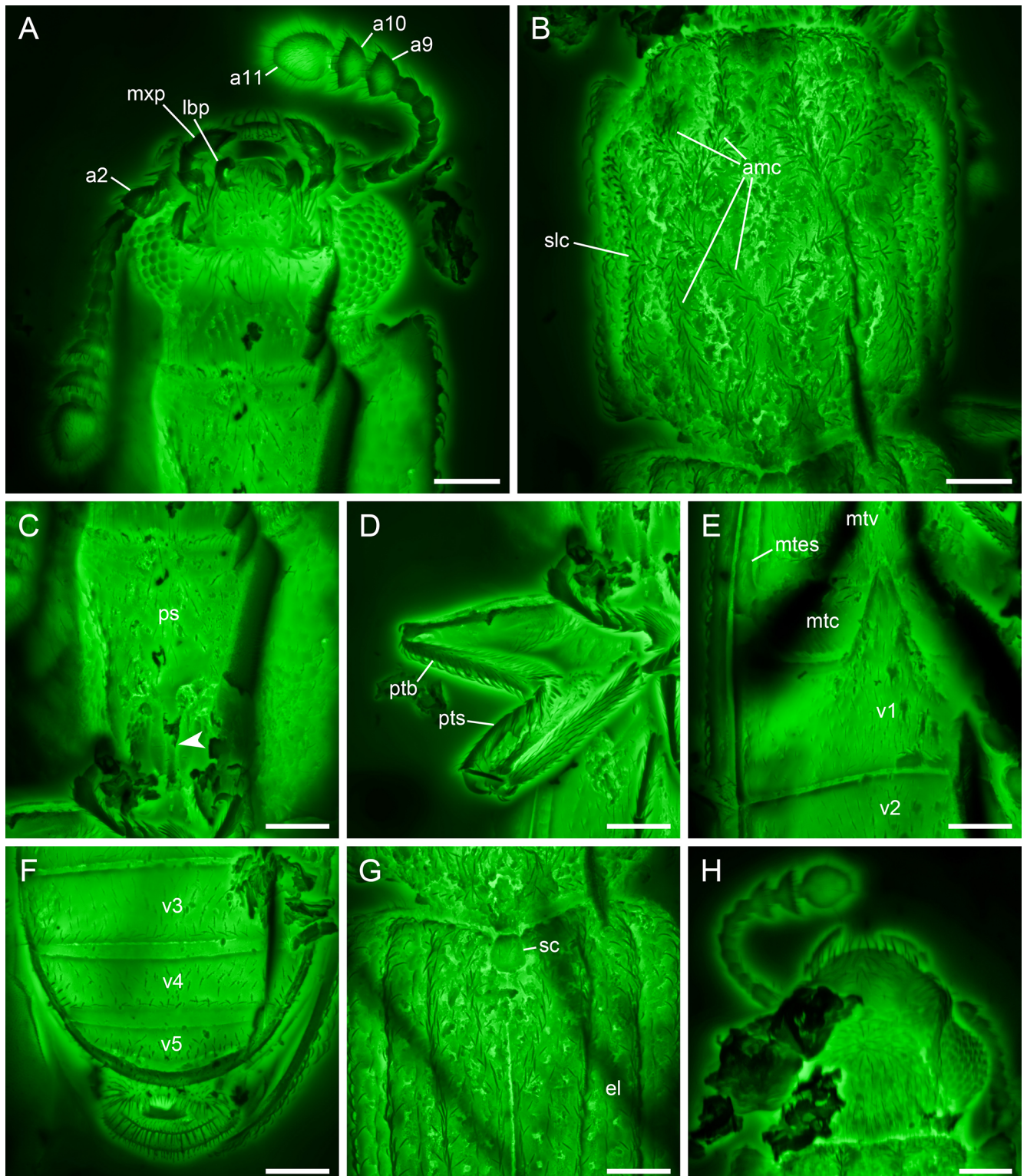


Figure 3. Details of *Bulasconotus carinisternus* Li, Šlipiński & Cai **sp. nov.**, holotype, NIGP203566, under confocal microscopy. (A) Head, ventral view. (B) Prothorax, dorsal view. (C) Prothorax, ventral view, with arrowhead indicating the median carina on the prosternal process. (D) Fore leg. (E) Abdominal base, ventral view. (F) Abdominal apex, ventral view. (G) Elytral base, dorsal view. (H) Head, dorsal view. Abbreviations: a2-11 = antennomeres 2-11; amc = admedian carina; el = elytron; lbp = labial palp; md = mandible; mtc = metacoxa; mtes = metanepisternum; mtv = metaventrite; mxp = maxillary palp; ps = prosternum; ptb = protibia; pts = protarsus; sc = scutellum; slc = sublateral carina; v1-5 = ventrites 1-5. Scale bars: 100 μ m.

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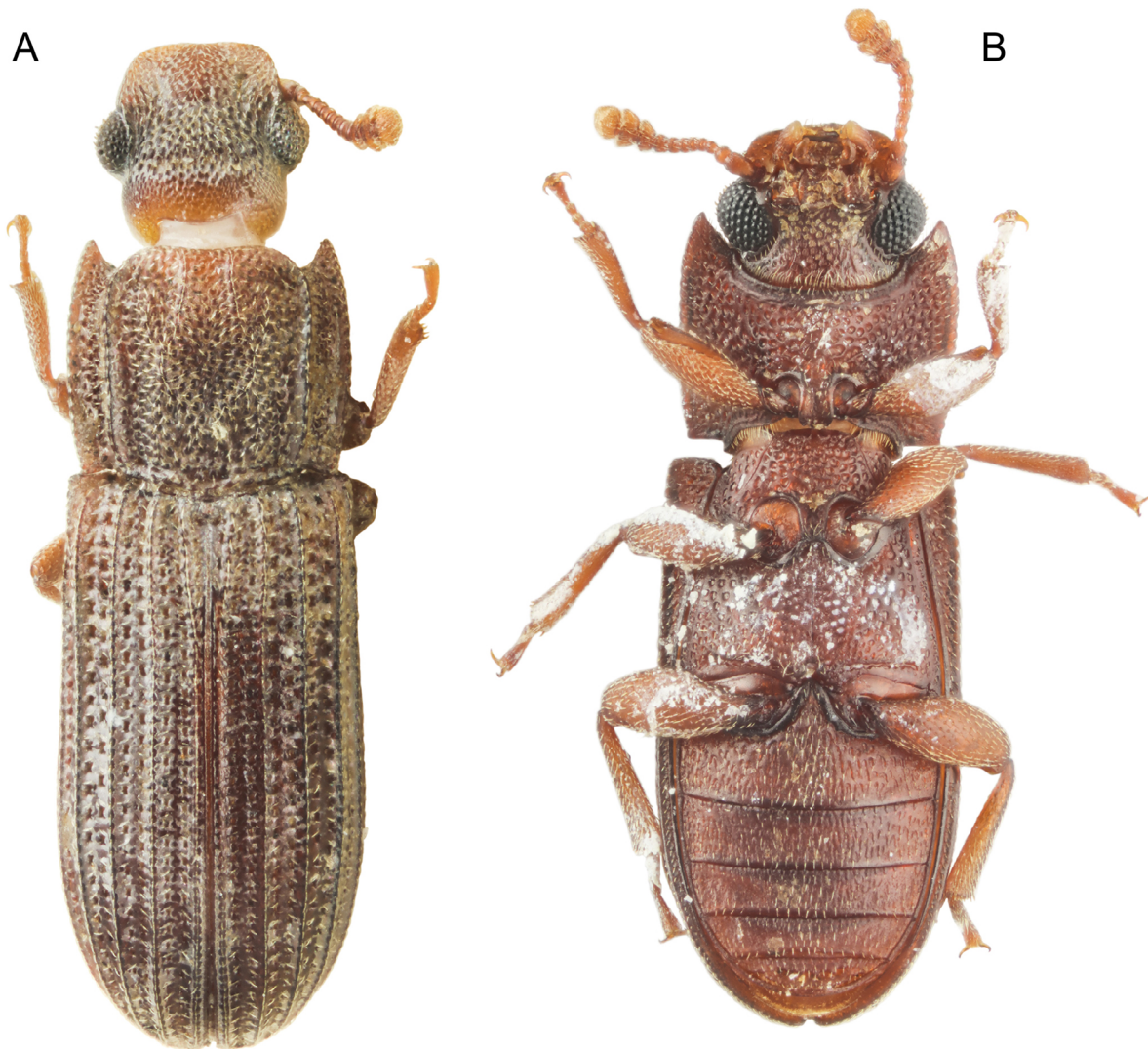


Figure 4. Extant *Bulasconotus solomon* Ślipiński & Lawrence. (A) NHMUK015543699, holotype, dorsal view. (B) NHMUK015543700, paratype, ventral view. Photography by Keita Matsumoto. © Natural History Museum, London, licensed under CC BY 2.0.

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