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“*Attagenus*” *burmiticus* from mid-Cretaceous amber reinterpreted as a member of Orphilinae (Coleoptera: Dermestidae)

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Various dermestids have been reported from mid-Cretaceous Burmese amber (e.g., Deng *et al.*, 2017; Háva & Damgaard, 2017; Háva, 2020, 2021). Among them, *Attagenus burmiticus* Cai *et al.* was the first adult described from this deposit (Cai *et al.*, 2017). This fossil was originally attributed to the extant genus *Attagenus* in subfamily Attageninae. However, an important character was overlooked when they made this placement. *Attagenus burmiticus* has metacoxae meeting elytral epipleura laterally, which are unknown in any other Dermestidae except subfamily Orphilinae (Háva, 2004; Lawrence & Ślipiński 2005). In this study, we re-examine the holotype of *A. burmiticus* and transfer it into genus *Nothattagenus* Li & Cai **gen. nov.** in Orphilinae, as *Nothattagenus burmiticus* **comb. nov.**

Materials and methods

The holotype of *Attagenus burmiticus* (NIGP164890; Figs 1–3), deposited in the Nanjing Institute of Geology and Palaeontology (NIGP), Chinese Academy of Sciences, Nanjing, China, was re-examined. The specimen was derived from amber mines near Noije Bum Village (26°20'N, 96°36'E), Hukawng Valley, Kachin State, northern Myanmar (Cai *et al.*, 2017).

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 (Cai & Huang, 2014; Fu *et al.*, 2021). Images under incident light were stacked in Helicon Focus 7.0.2. Confocal images were semi-manually stacked with Helicon Focus 7.0.2 and Adobe Photoshop CC. Microtomographic data were obtained

with a Zeiss Xradia 520 Versa 3D X-ray microscope at the micro-CT laboratory of NIGP and analysed in VGStudio MAX 3.0. Scanning parameters were as follows: isotropic voxel size, 2.7017 µm; power, 3 W; acceleration voltage, 40 kV; exposure time, 2.5 sec; projections, 2501. Images were further processed in Adobe Photoshop CC to adjust brightness and contrast.

Systematic palaeontology

Order Coleoptera Linnaeus, 1758

Superfamily Bostrichoidea Latreille, 1802

Family Dermestidae Latreille, 1804

Subfamily Orphilinae LeConte, 1861

Tribe Ranolini Háva, 2014

Genus *Nothattagenus* Li & Cai **gen. nov.**

Type species. *Attagenus burmiticus* Cai, Háva & Huang, 2016 (*in* Cai *et al.*, 2017)

Etymology. The generic name is derived from the Greek “*nothos*”, false, and the generic name *Attagenus* Latreille. The name is masculine in gender.

Composition. Only *Nothattagenus burmiticus* (Cai, Háva & Huang, 2016 *in* Cai *et al.* 2017) **comb. nov.**

Diagnosis. Dorsal surface pubescent (Figs 1A, 2E). Antennomere 11 abruptly narrowed in apical half (Fig. 2A, B). Mandibular apex normally situated (rather than displaced proximally) (Fig. 2A). Metacoxae strongly transverse, reaching elytral margins laterally (Fig. 2C). Abdominal ventrites completely lined by sharp outer carina (Fig. 2D).



FIGURE 1. General habitus of *Nothattagenus burmiticus* (Cai *et al.*) **comb. nov.**, holotype, NIGP164890, under incident light. **A**, Dorsal view. **B**, Ventral view. Scale bars: 1 mm.

Discussion

As the basal-most lineage of Dermestidae (Kiselyova & McHugh, 2006; Lawrence & Ślipiński, 2005; Motyka *et al.*, 2022; Zhou *et al.*, 2022), Orphilinae can be easily separated from other dermestid subfamilies based on the presence of secondary mesal articulations on both pro- and mesocoxae, the metacoxae extending laterally to meet the elytra, and the abdominal ventrites completely bordered by sharp outer carina (Lawrence & Ślipiński, 2005). The state of procoxal and mesocoxal articulations cannot be clearly determined in “*Attagenus*” *burmiticus*. However, as described by Cai *et al.* (2017), “*A.*” *burmiticus* has strongly transverse metacoxae which reach the elytral margins laterally (Fig. 2C). Besides, “*A.*” *burmiticus* also has the sharp outer carina on the abdominal ventrites (Fig. 2D). Thus, we believe that “*A.*” *burmiticus* can be confidently placed in the extant subfamily Orphilinae.

Orphilinae is a small subfamily, with only two valid extant genera (*Orphilus* Erichson and *Ranolus* Blair) (Zhou *et al.*, 2022). *Ranolus* had long been placed in Attagenini (Attageninae) (e.g., Háva & Kalík, 2005), and was transferred to Orphilinae only recently (Háva in Zahradník & Háva, 2014). *Orphilodes* Lawrence & Ślipiński, discovered from the Australasian region (Lawrence & Ślipiński, 2005; Háva, 2015), has been suggested as a junior synonym of *Ranolus* (Háva & Lawrence, 2017).

“*Attagenus*” *burmiticus* differs obviously from *Orphilus* in having dorsal surface pubescent (Figs 1A, 2E) and elytral epipleura not visible in lateral view (Fig. 3C) (dorsal surface glabrous and elytral epipleura visible in lateral view in *Orphilus*; Lawrence & Ślipiński, 2005; see also Háva, 2010; Háva & Kadej, 2014). The other orphiline genus, *Ranolus*, has a more similar appearance to “*A.*” *burmiticus* (e.g., Lawrence & Ślipiński, 2005; Háva, 2014). However, “*A.*” *burmiticus* has a normally situated mandibular apex (Fig. 2A), whereas according to Lawrence & Ślipiński (2005), at least in Australian *Ranolus*, the mandibles are distorted

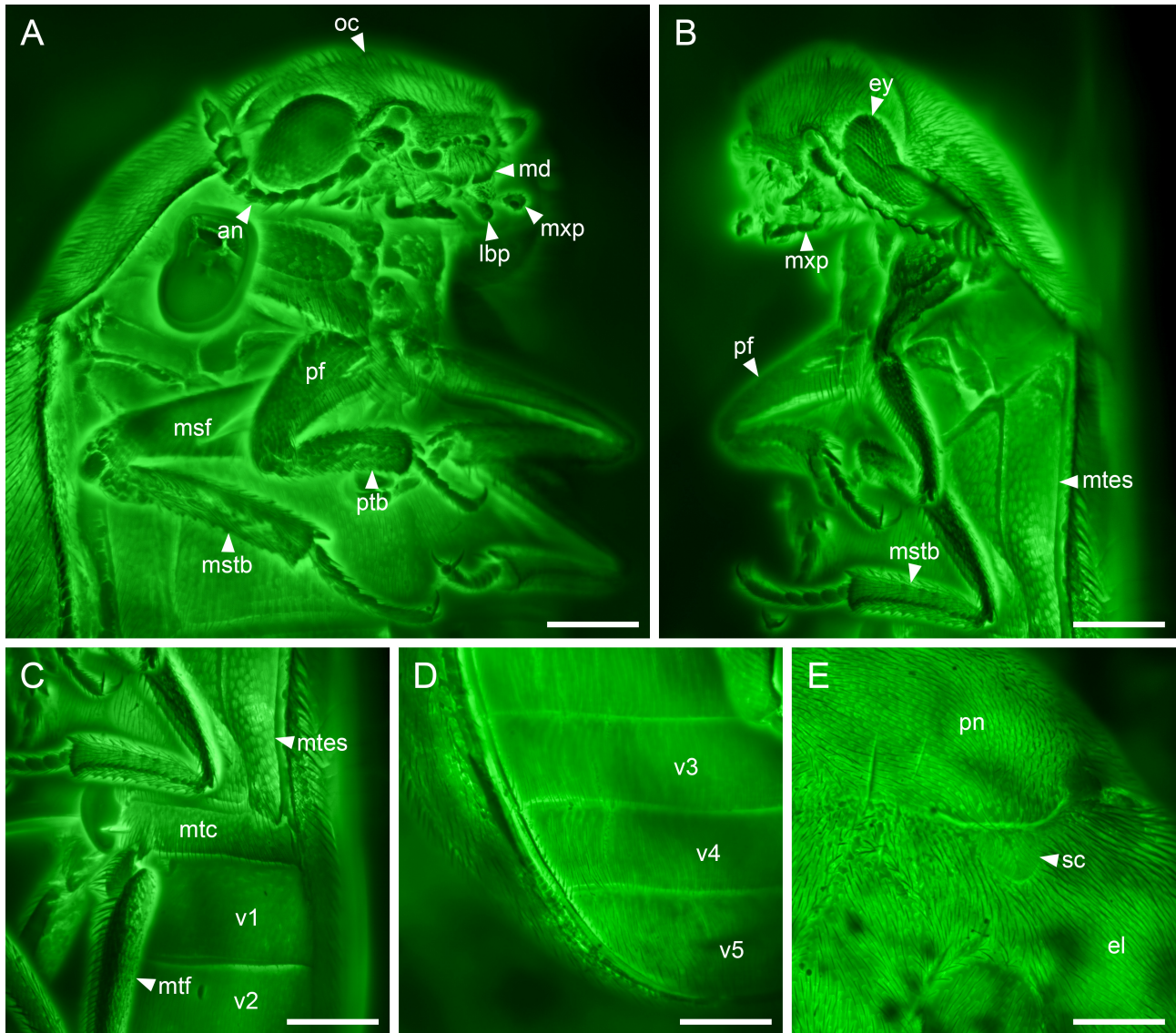


FIGURE 2. General habitus of *Nothattagenus burmiticus* (Cai *et al.*) **comb. nov.**, holotype, NIGP164890, under confocal microscopy. **A**, Head and thorax, ventral view. **B**, Head and thorax, ventrolateral view. **C**, Abdominal base, ventrolateral view. **D**, Abdominal apex, ventral view. **E**, Scutellum, dorsal view. Abbreviations: an, antenna; el, elytron; ey, compound eye; lbp, labial palp; md, mandible; msf, mesofemur; mstb, mesotibia; mtc, metacoxa; mtes, metanepisternum; mtf, metafemur; mxp, maxillary palp; oc, ocellus; pf, profemur; pn, pronotum; ptb, protibia; v1–5, ventrites 1–5. Scale bars: 300 μ m.

so that the apex is displaced proximally (although the mandibles might be somewhat variable in *Ranolus*; J. Háva, pers. comm.). “*Attagenus*” *burmiticus* additionally differs from both extant genera in the antennomere 11 abruptly narrowed in the apical half (Fig. 2A, B; Cai *et al.*, 2017: fig. 4). Therefore, we propose that it is well justified to establish a new genus, *Nothattagenus* **gen. nov.**, to accommodate the mid-Cretaceous species, “*A.*” *burmiticus*.

Data availability

The original confocal and micro-CT data of *Nothattagenus*

burmiticus are available in the Zenodo repository (<https://doi.org/10.5281/zenodo.6358619>).

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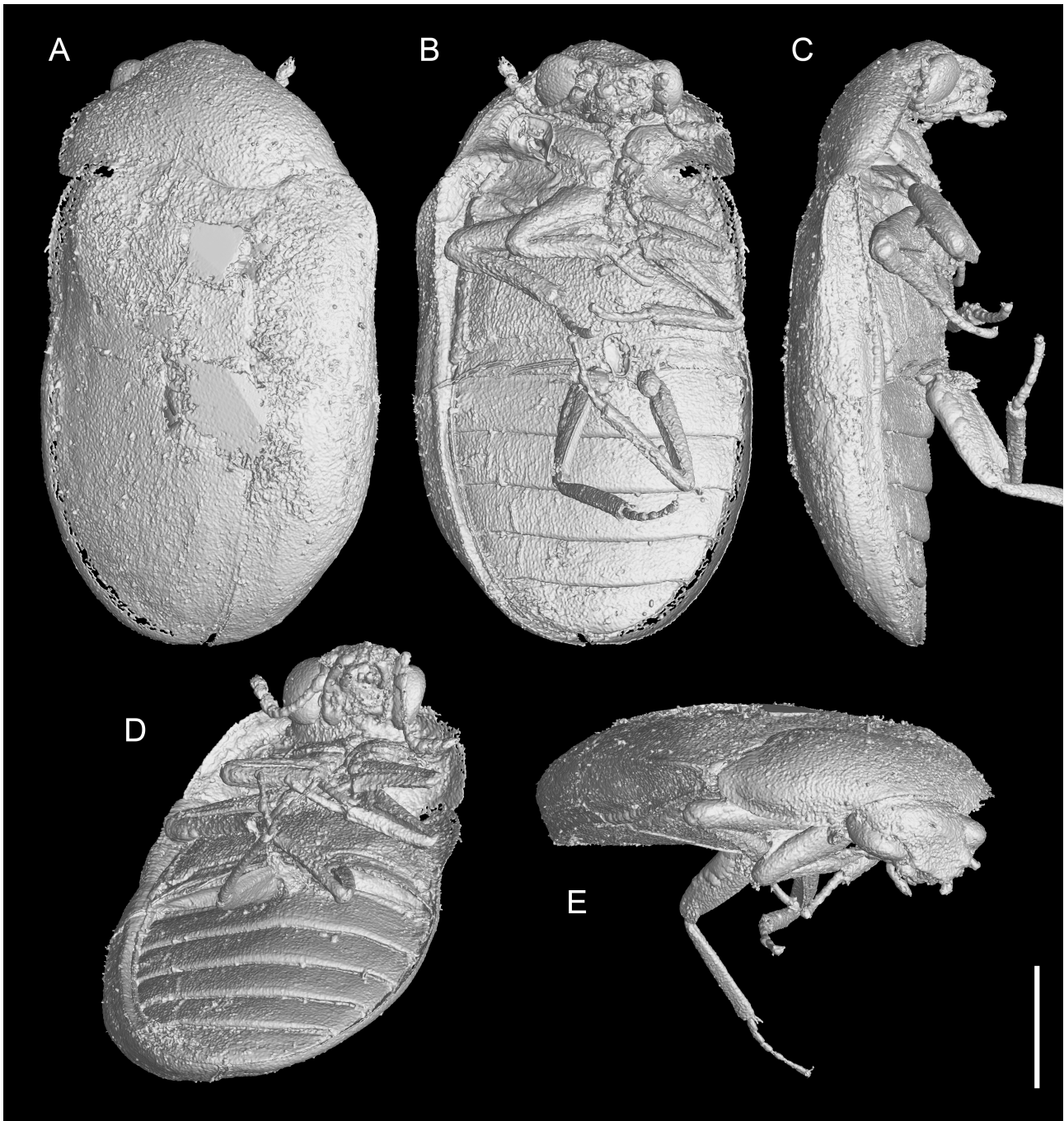


FIGURE 3. X-ray microtomographic reconstruction of *Nothattagenus burmiticus* (Cai *et al.*) **comb. nov.**, holotype, NIGP164890. **A**, Dorsal view. **B**, Ventral view. **C**, Lateral view. **D**, Posteroventral view. **E**, Anterolateral view. Scale bar: 500 μ m.

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