



## A new species of *Burmalestes* Tomaszewska & Ślipiński from mid-Cretaceous Kachin amber (Coleoptera: Endomychidae)

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### Abstract

The second species of the extinct genus *Burmalestes* Tomaszewska & Ślipiński, *B. jingruoyaae* Li & Cai **sp. nov.**, is reported from mid-Cretaceous Kachin amber of northern Myanmar. The new species shares characters with both *Burmalestes* (antennomere 5 elongate and procoxae subcontiguous) and *Cretaparamecus* Tomaszewska *et al.* (protibiae toothed and pronotum without basolateral sulci), providing valuable information on the morphological variability of this group.

**Key words:** Endomychidae, *Burmalestes*, *Cretaparamecus*, fossil, Cretaceous, Burmese amber

### Introduction

Leiestinae is one of the nine currently recognized subfamilies in the diverse coccinelloid family Endomychidae (Tomaszewska, 2000a; Shockley *et al.*, 2009; Robertson *et al.*, 2015). The subfamily currently includes seven extant genera: *Leiestes* Chevrolat, *Panaleies* Tomaszewska, *Panamomus* Gorham, *Phymaphora* Newman, *Rhanidea* Strohecker, *Sinopanamomus* Esser and *Stethorhanis* Blaisdell (Tomaszewska *et al.*, 2000b; Esser, 2019), and five extinct genera: *Burmalestes* Tomaszewska & Ślipiński, *Cretolestes* Tomaszewska *et al.*, *Glesirhanis* Shockley & Alekseev, *Palaeoestes* Kirejtshuk & Nel and *Phymaphoroides* Motschulsky (Shockley & Alekseev, 2014; Tomaszewska *et al.*, 2018). Though contradictory to the morphology-based studies (Tomaszewska, 2000a, 2005), the molecular analysis by Robertson *et al.* (2015) suggested that Leiestinae is closely related to Merophysiinae and Pleganophorinae, forming a clade termed as the merophysiine complex.

Many fossils of Endomychidae have been described, especially in the last decade (as listed by Alekseev *et al.*, 2023). The earliest ones were from mid-Cretaceous Kachin amber of northern Myanmar (Tomaszewska *et al.*, 2018, 2022; Li *et al.*, 2022a; Arriaga-Varela *et al.*, 2023). Among them, *Burmalestes* and *Cretolestes* were placed in Leiestinae, *Cretaparamecus* Tomaszewska *et al.*, was placed in Merophysiinae, *Palaeomyces* Tomaszewska *et al.* was placed in Xenomycetinae, *Cretostenotarsus* Tomaszewska *et al.* was placed in Endomychinae, and *Rhomeocalpsua* Li *et al.* was left without subfamilial attribution. In this study, we describe the second species of *Burmalestes* from Kachin amber, extending our knowledge on the morphological variation of this Cretaceous genus.

### Material and methods

The Burmese amber specimen studied herein (Figs 1–4) originated from amber mines near Noiye 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. Widefield fluorescence images were captured with a Zeiss Axio Imager 2 light microscope combined with a fluorescence imaging system. Confocal images were obtained with a Zeiss LSM710 confocal laser scanning microscope, using the 488 nm (Argon) or 561 nm (DPSS 561-10) laser excitation lines (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.

## Systematic palaeontology

### Order Coleoptera Linnaeus, 1758

### Superfamily Coccinelloidea Latreille, 1807

### Family Endomychidae Leach, 1815

### Subfamily Leiestinae Thomson, 1863

### Genus *Burmalestes* Tomaszewska & Ślipiński, 2018

#### *Burmalestes jingruoyaae* Li & Cai sp. nov.

(Figs 1–4)

**Material.** Holotype, NIGP203386.

**Etymology.** The specific name is dedicated to Ms. Ruoya Jing, aiming to inspire her interest in fossil insects and nature in general.

**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.** *Burmalestes jingruoyaae* sp. nov. differs from *B. albertalleni* Tomaszewska & Ślipiński primarily in the absence of sulci on the pronotal disc (Fig. 4F). The abdomen with six visible sternites (Fig. 4C) (also seen in several *Cretaparamecus* specimens; Arriaga-Varela *et al.*, 2023) might be a potential differential character (five in the holotype of *B. albertalleni*), although it might not necessarily be a natural state (like the outstretched genitalia seen in other amber fossils; *e.g.*, Li *et al.*, 2022b, 2022c). The tooth on the inner edge of protibia (Fig. 4G) is also a potential differential character (absent in the holotype of *B. albertalleni*), although it could be only a sexually dimorphic character as well.

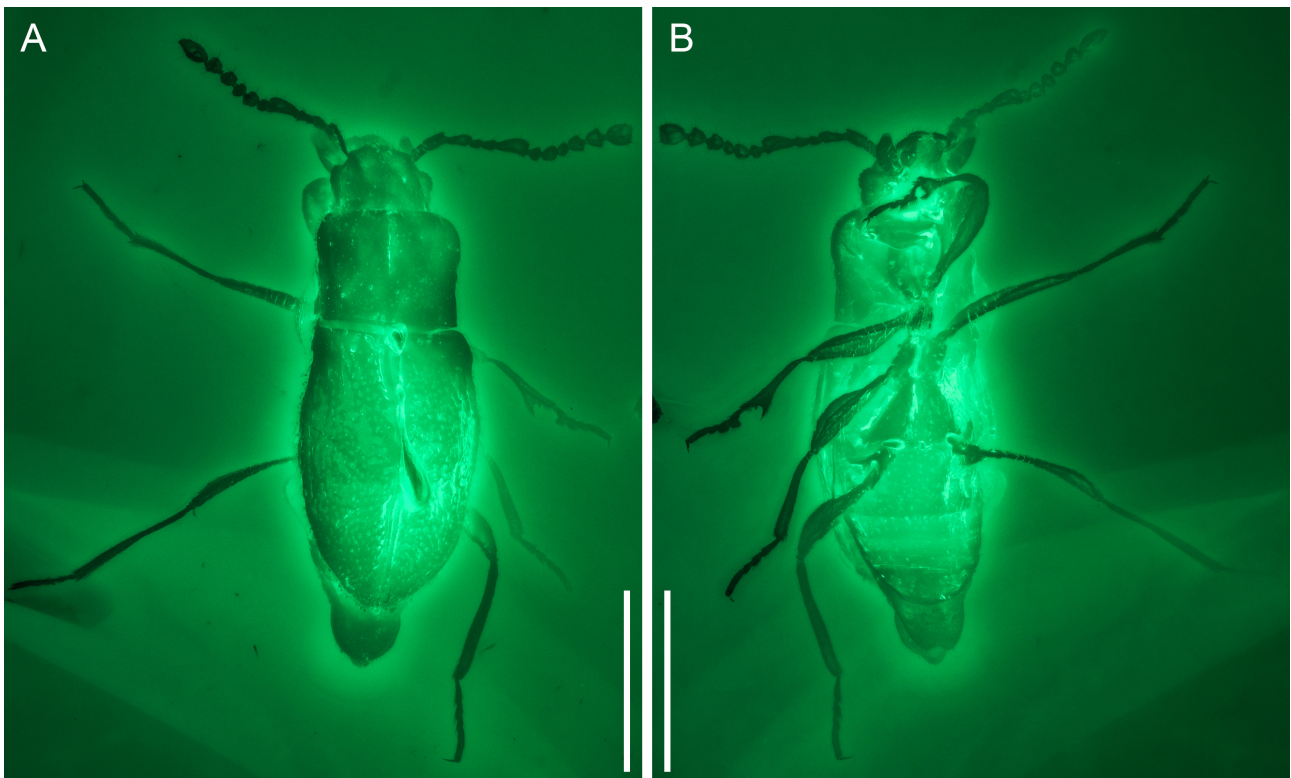
**Description.** Body elongate-oval, about 1.5 mm long (including the protruding abdominal apex), 0.5 mm wide; surface with scattered short hairs.

Head prognathous, not abruptly constricted behind eyes. Eyes moderately protuberant, coarsely faceted; interfacetal setae absent. Antennal insertions widely separated, dorsally concealed. Antennae 11-segmented; antennomeres 1 and 2 elongate; antennomeres 3 and 4 moniliform; antennomere 5 elongate and widened; antennomeres 6–8 moniliform, with antennomere 7 slightly larger than adjacent ones; antennomeres 9–11 forming loose and indistinct club. Mandibles apically bidentate. Apical maxillary palpomere subconical; galea with dense apical setae. Labial palp 3-segmented; apical palpomere subcylindrical, distinctly longer than palpomere 2.

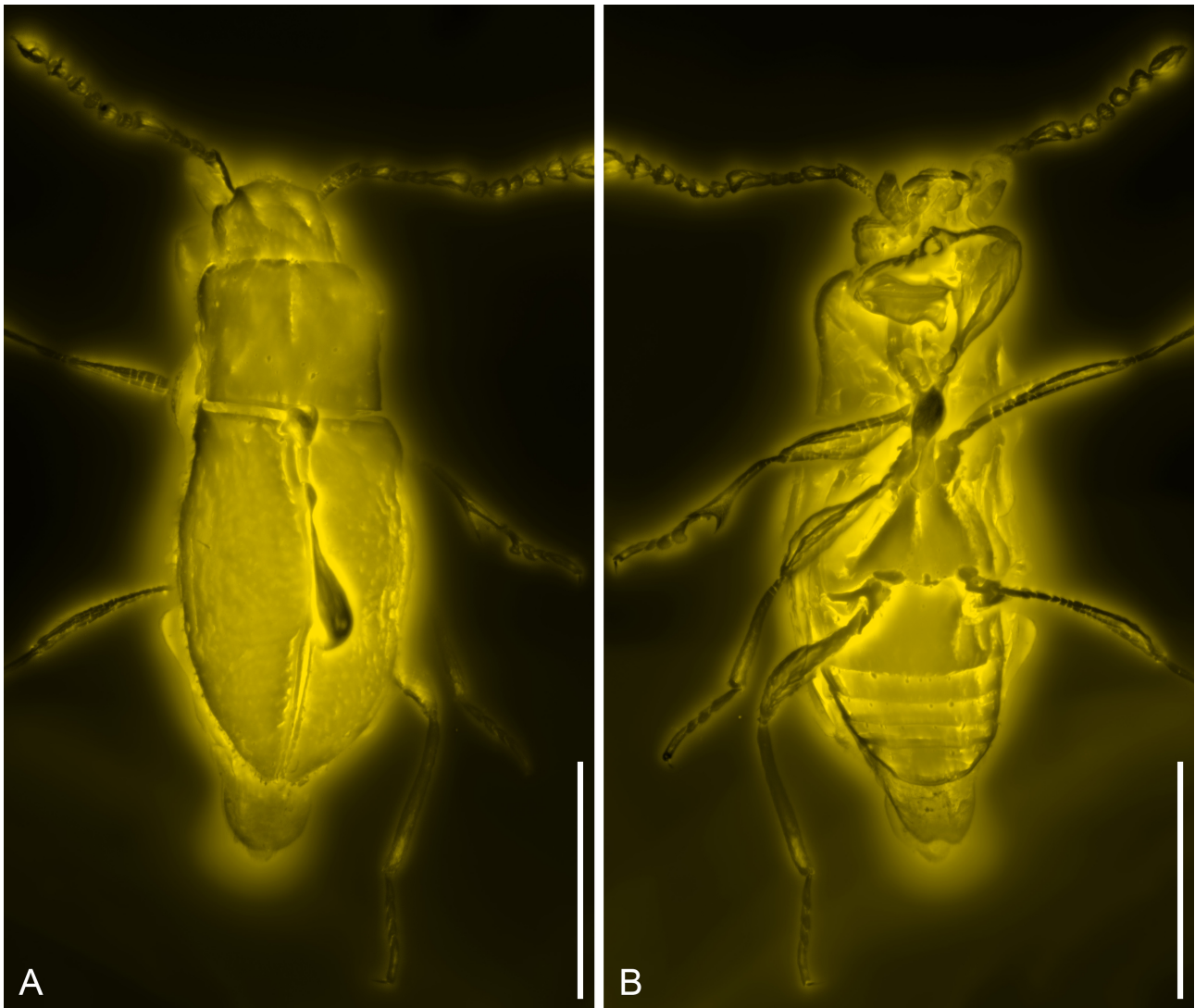
Pronotal disc about 0.8 times as long as wide; widest near anterior 1/4, slightly constricted near basal 1/3; lateral edges sinuate; anterior and posterior edges almost straight; anterior angles broadly rounded; posterior angles nearly right-angled; surface flat, without any clear impressions. Procoxae subcontiguous (or contiguous).



**FIGURE 1.** General habitus of *Burmalestes jingruoyaae* Li & Cai **sp. nov.**, holotype, NIGP203386, under incident light. **A**, Dorsal view. **B**, Ventral view. Scale bars = 500  $\mu$ m.



**FIGURE 2.** General habitus of *Burmalestes jingruoyaae* Li & Cai **sp. nov.**, holotype, NIGP203386, under widefield fluorescence. **A**, Dorsal view. **B**, Ventral view. Scale bars = 500  $\mu$ m.



**FIGURE 3.** General habitus of *Burmalestes jingruoyaae* Li & Cai **sp. nov.**, holotype, NIGP203386, under confocal microscopy. **A**, Dorsal view. **B**, Ventral view. Scale bars = 500  $\mu$ m.

Elytra about 1.5 times as long as width combined, finely and irregularly punctate; epipleuron incomplete apically. Mesocoxae narrowly separated. Metaventricle without clear postcoxal pits. Metacoxae broadly separated.

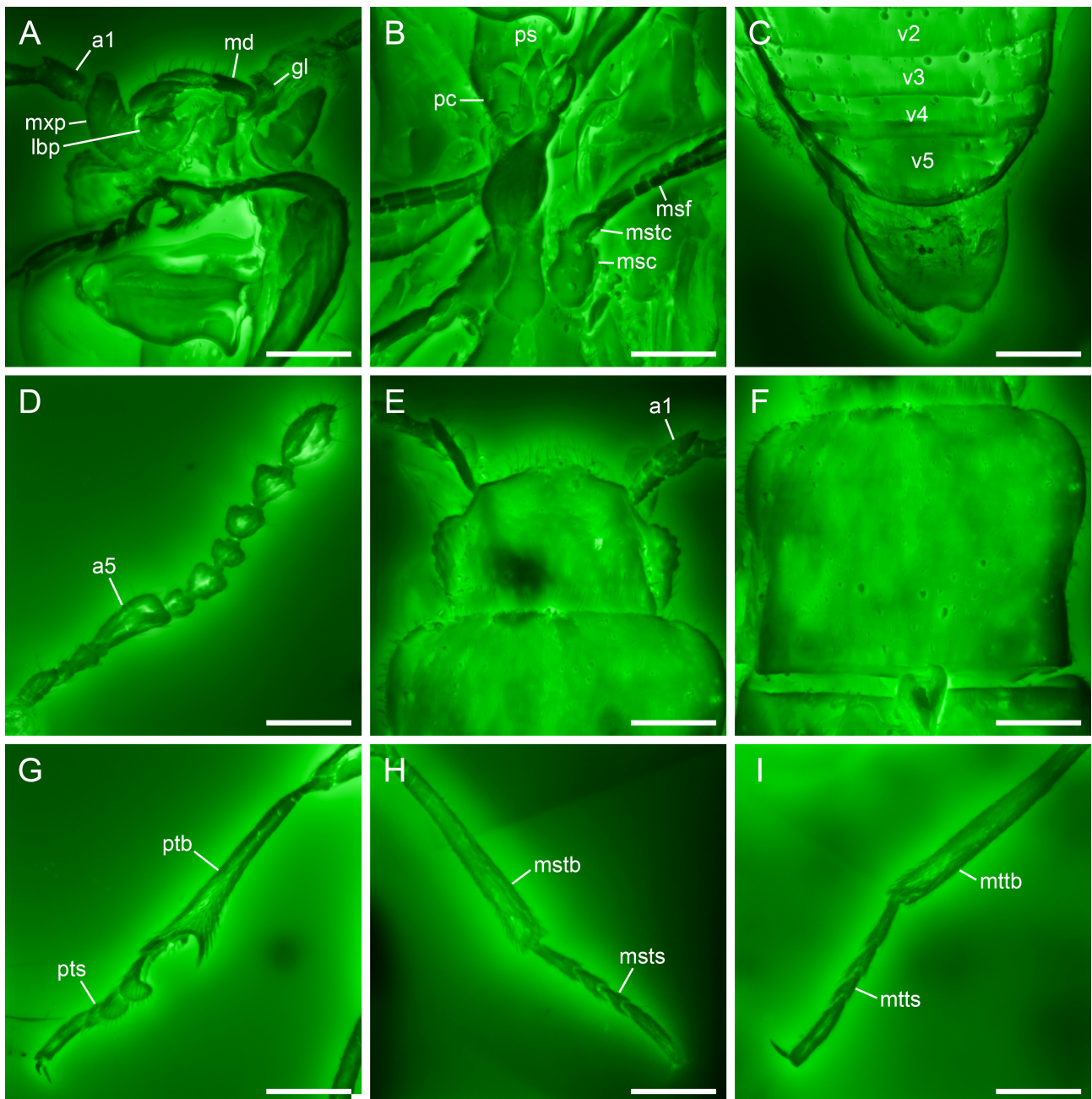
Legs elongate. Protibiae subapically with large tooth on inner edge; tibial spurs absent. Tarsi 4-4-4; protarsus with tarsomeres 1–2 thickened; meso- and metatarsi slender. Pretarsal claws simple.

Abdomen with six freely articulated sternites visible. Ventricle 1 almost as long as ventricles 2–5 combined, without postcoxal lines; intercoxal process broadly truncate. Ventricle 2–4 subequal in length. Ventricle 5 apically broadly rounded. Sternite VIII with apex emarginate.

## Discussion

*Burmalestes jingruoyaae* **sp. nov.** shares many diagnostic characters with the type species of the genera, *B. albertalleni*, including the small body, enlarged and elongate antennomere 5 (Fig. 4D), 3-segmented antennal club with antennomere 9 not grossly enlarged, and subcontiguous procoxae (Fig. 4B) (Tomaszewska *et al.*, 2018). The general body shape also well corresponds with that of *B. albertalleni*. *Burmalestes jingruoyaae* also somewhat resembles *Cretaparamecus* in the enlarged antennomere 5, toothed protibiae, and pronotum without basolateral sulci (Tomaszewska *et al.*, 2018; Arriaga-Varela *et al.*, 2023). However, the procoxae of *C. tarsalis* are clearly separated

(as least as described by Arriaga-Varela *et al.*, 2023), different from both *B. jingruoyaae* and *B. albertalleni*. The overall antennal appearance of *B. jingruoyaae* also more strongly resembles *B. albertalleni* (antennomere 5 less widened compared with *Cretaparamecus*). Thus, we believe that the new species could be placed in the genus *Burmalestes*, although these two genera may nevertheless be closely related (or even synonymous; the line drawings by Tomaszewska *et al.*, 2018 might not be very reliable regarding the state of mesocoxal cavities).



**FIGURE 4.** Details of *Burmalestes jingruoyaae* Li & Cai **sp. nov.**, holotype, NIGP203386, under confocal microscopy. **A**, Head, ventral view. **B**, Pro- and mesothorax, ventral view. **C**, Abdominal apex, ventral view. **D**, Antenna, ventral view. **E**, Head, dorsal view. **F**, Prothorax, dorsal view. **G**, Fore leg. **H**, Mid leg. **I**, Hind leg. Abbreviations: a1–5, antennomeres 1–5; gl, galea; lbp, labial palp; md, mandible; msc, mesocoxa; msf, mesofemur; mstb, mesotibia; mstc, mesotrochanter; msts, mesotarsus; mttb, metatibia; mttS, metatarsus; mxp, maxillary palp; pc, procoxa; pf, profemur; ps, prosternum; ptb, protibia; pts, protarsus; v1–5, ventrites 1–5. Scale bars = 100 µm.

Many leiestines have a pair of more or less distinctly impressed basolateral sulci on the pronotal disc (*e.g.*, Tomaszewska, 2000b, 2015; Shockley & Alekseev, 2014; Esser, 2019). As described by Tomaszewska *et al.* (2018),

the basolateral pronotal sulci of *B. albertalleni* is clearly and deeply impressed. By contrast, there is essentially no trace of sulci on the pronotal disc of *B. jingruoyaae* at all (Fig. 4F). As far as we know, there has not been any report on the sexual dimorphism of pronotal sculpture in Endomychidae (Tomaszewska, 2000b; Bousquet & Leschen, 2002). Therefore *B. jingruoyaae* should represent a valid new species.

In the male of several leiestine genera (*Leiestes*, *Rhanidea* and *Stethorhanis*), the tibiae often show secondary sexual characters such as notch and tooth (Tomaszewska, 2000b). As speculated by Bousquet & Leschen (2002), the modified processes on the legs of many male endomychids are probably used for securing or stimulating females during mating. Based on modification on the antennae and apically subtruncate terminal ventrite of abdomen, Tomaszewska *et al.* (2018) suggested that the holotype of *B. albertallen* is a male, which has simple tibiae without apparent modifications according to the original description. The present discovery provides an alternative possibility that *Burmalestes* also has sexually dimorphic protibiae, and the holotype of *B. albertallen* might represent a female.

## Data availability

The original confocal data are available in Zenodo repository (doi:10.5281/zenodo.10395772).

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