# A new Babinskaiidae from the mid-Cretaceous Burmese amber (Insecta, Neuroptera, Myrmeleontoidea)

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ABSTRACT

We describe *Parababinskaia douteaui* sp. nov., first representative of its genus in the 'mid'-Cretaceous Burmese amber. This genus was only known after a compression fossil from the Brazilian Crato Formation. The five other Burmese amber genera of Babinskaiidae are currently endemic to this area. This early Cretaceous antlion family remains unrecorded after the Cenomanian.

Keywords

Insecta

Myrmeleontoidea

gen. nov.

sp. nov.

Paleobiogeography

## 1. Introduction

The small Mesozoic neuropteran family Babinskaiidae, placed within the superfamily Myrmeleontoidea (Makarkin et al., 2017), comprises 13 described species in 10 genera, which are only known from three localities, i.e., the Lower Cretaceous Brazilian Crato (three genera) and Transbaikalian Zaza (one genus) Formations, and the 'mid'-Cretaceous Burmese amber (six genera) (Martins-Neto and Vulcano, 1989; Martins-Neto, 1992; Ponomarenko, 1992; Lu et al., 2017; Makarkin et al., 2017; 2019; Hu et al., 2018; Huang et al., 2019; Makarkin and Staniczek, 2019; Ross, 2019a,b, 2020). Till now there was no genera shared by two of these outcrops. The current maximum of diversity for this family is found in the Burmese amber. Here we describe a new Babinskaiidae found in piece of Burmese amber. It belongs to a genus already known from the Crato Formation.

## 2. Material and methods

The specimen is in a small piece of Burmese amber, 3.5x2.5x1.0 cm, together with a small Psocoptera also belonging to a new genus and species that will be described elsewhere. The amber piece was cut, shaped, and polished. The specimen was examined with a Nikon SMZ 1500 and a Nikon SMZ25. Photographs were taken with a Nikon D800 digital camera mounted on the stereomicroscopes lenses; photographs were processed using the image editing software Adobe Photoshop CS. Helicon focus software was used for stacking the different photographs. Line drawings of the venation were prepared directly with the aid of a camera lucida and drawn with Inkscape Software.

The piece of Burmese amber was found in deposits in the Hukawng Valley (Kachin) of Myanmar (Dong et al., 2015: fig. 1). The age of amber is confirmed by radiometric analysis of zircons as earliest Cenomanian, ca. 99 Ma. (Shi et al., 2012).

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The nomenclature of the babinskaiid wing venation used in this paper is based on the relatively 'traditional' interpretation of Lu et al. (2017) that slightly differs from that of Makarkin et al. (2017) in the position of the hind wing vein MA (fused with RP vs. separated from it). Abbreviations used for wing veins are: A, anal vein; C, costa; Cu, cubitus; CuA, cubitus anterior; CuP, cubitus posterior; M, media; MA, media anterior; MP, media posterior; R, radius; RA, radius anterior; RP, radius posterior; ScP, subcosta posterior; ps, presectoral crossveins (i.e., r-mp crossveins).

## 3. Systematic palaeontology

Order Neuroptera Linnaeus, 1758

Superfamily Myrmeleontoidea Latreille, 1802

Family Babinskaiidae Martins-Neto and Vulcano, 1989

Type genus: *Babinskaia* Martins-Neto and Vulcano, 1989.

Genus *Parababinskaia* Makarkin et al., 2017

Type species. *Parababinskaia elegans* Makarkin et al., 2017, other species. *Parababinskaia douteaui* sp. nov.

*Parababinskaia douteaui* Ngô-Muller, Garrouste and Nel sp. nov.

Figures 1-3

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Material. Holotype MNHN.F.A71317 (1/2) (coll. Douteau 01, 1/2), deposited in the Muséum national d'Histoire naturelle, Paris, France.

*Locality and horizon.* Burmese amber (Burmite), Lower Cretaceous, earliest Cenomanian; Noije Bum 2001 Summit Site, Hukawng Valley, south-west of Maingkhwan in Kachin State (26°20'N, 96°36'E) in Burma (Myanmar).

Etymology. Named after Mr. Julien Douteau, who allowed us to study the type specimen.

Diagnosis. Fore wing: base of RP slightly more distal than apex of CuP; in hind wing: base of RP distinctly more basal than apex of CuA; CuA slightly longer with seven posterior branches; six mp2-cua crossvein present; six branches of RP.

Description. Body 12.6 mm long (Fig. 1). Head orthognathous, subtriangular, 0.82 mm long. Compound eyes large, semi-globular; ocellus absent. Antenna filiform, incompletely preserved, very long, with 27 preserved antennomeres, antennomeres with dense and rather long setae; scape, pedicel and first two flagellomeres yellow in dorsal parts, more distal flagellomeres darker; scape two times as wide as and longer than pedicel; first two flagellomeres as long and broad as pedicel, more distal ones much narrower than pedicel; mouthparts chewing mandibulate; labrum invisible, labial palps long, pointed; mandibles discernible, acutely pointed distad; maxilla discernible, maxillary palp long.

Thorax 2.86 mm long; prothorax 0.99 mm long, longer than head but distinctly narrower; meso- and metathorax robust.

Wings (Figs 2-3A) elongated, transparent, immaculate; multiple trichosors present along costal and hind margins in distal thirds of wings; crossveins between branches of RP in outer gradate series present in both wings. Fore wing 10.2 mm long, 2.9 mm wide; costal space about three times as wide as subcostal space, but much narrower than radial space, with 32 simple crossveins; subcostal crossveins absent; six presectoral crossveins present; RP+MA originated

from R 3.74 mm from wing base, basal of termination of CuP; MA diverging from RP 2.75 mm distal base of RP+MA; five branches of RP+MA; MP long and nearly straight, with 14 crossveins between MP and CuA, no oblique vein (i.e., stem of MP2) present; CuA and CuP diverging near wing base; CuA long, feebly zigzagged along its stem and pectinately branched (12 branches present), max. distance between CuA and posterior wing margin 0.8 mm; CuP has two curved branches and is 'prolonged' by a gradate series of five veinlets and three cells; six cua-cup crossveins present; A1 simple, one cup-a1 crossvein present; A2 and A3 simple, well separated.

Hind wing 9.07 mm long, 1.92 mm wide; costal space two times as wide as subcostal space, with 24 simple crossveins; subcostal crossveins absent; RP originated from R 3.79 mm from wing base, basal of termination of CuA, with six branches; three presectoral crossveins present; four crossveins between stem of RP and MP1; MP1 and MP2 diverging near wing base; MP1 almost straight, with eight simple short branches; MP2 stem long, distally zigzagged, with 10 simple branches; max. distance between MP2 and posterior wing margin 0.77 mm; 11 mp1-mp2 crossveins present between MP1 and MP2; branches of MP2 much longer than mp1-mp2 crossveins; CuA rather long, with five simple branches, six mp2-cua crossvein present; CuP and A1 fused as CuP+A1, short and with two posterior branches. Legs slender, with dense short setae; no specialized setae present; tarsus five-segmented; tarsomeres not flattened; tarsomere 1 the longest, but distinctly shorter than total length of tarsomeres 2+5. Abdomen deformed, 8.92 mm long, slender; genitalia poorly visible.

Discussion. *Parababinskaia douteaui* sp. nov. has all the characters of the diagnosis of the family Babinskaiidae, as proposed by Makarkin et al. (2017): small myrmeleontoid; antennae with elongate stout scapus; in both wings, several presectoral crossveins present; RP originating very far from wing base; multiple trichosors present along costal and hind margins; forewing, 1r-m lost; MP single, pectinately branched distally; not fused with CuA; CuA very long,

strongly pectinate; CuP slightly pectinate; AA1 forked or simple; AA2, AA3 simple; hind wing MA pectinate; MP strongly pectinate; CuA pectinate; CuP, AA1 simple, distad fused; AA2, AA3 reduced. Only the character 'antennae longer than half of forewing length' cannot be ascertained because the antennae are incomplete in our fossil.

After the key to babinskaiid genera of Makarkin et al. (2017), *Parababinskaia douteaui* sp. nov. would fall in the genus *Parababinskaia* because of the following characters: hind wing normal, ovate, not strongly narrowed; RP originating basal of termination of CuP in fore wing; RP originating basal of termination of CuA in hind wing; branches of MP2 much longer than crossveins between MP1 and MP2 in hind wing; crossveins between branches of RP in outer gradate series present in both wings; four crossveins between stem of RP and M1 in hind wing.

*Pseudoneliana* Huang et al., 2019 and *Gigantobabinskaia* Makarkin and Staniczek, 2019 were described after Markarkin et al. (2017)'s paper. *Pseudoneliana* differs from *Parababinskaia douteaui* sp. nov. in the very short hind wing CuA and CuP, and less number of branches of RP in both wings (Huang et al., 2019). *Gigantobabinskaia* differs from *Parababinskaia douteaui* sp. nov. in the quite larger wings with much more branches of RP, and much reduced hind wing CuP.

*Parababinskaia douteaui* sp. nov. differs from *Parababinskaia elegans* in few venation characters, viz. the base of the fore wing RP is slightly more distal than in *P. elegans*; the hind wing base of RP is distinctly more basal than apex of CuA, while they are opposite in *P. elegans*; the hind wing CuA is slightly longer with seven posterior branches instead of five-six; six mp2-cua crossvein present instead of 4-5 in hind wing; six branches of RP in hind wing, instead of five.

Remark. Some characters in the venation of the holotype of *Parababinskaia elegans* are uncertain, viz. the exact number of the fore wing presectoral crossveins; and the exact nature

of the hind wing CuP. *Parababinskaia douteaui* sp. nov. helps to precise these points, especially for the fusion of AA1 and CuP and the complete reduction of AA2 and AA3 in the hind wing.

## 4. Conclusion

The genus *Parababinskaia* gen. nov. was previously only known after compression fossils from the Crato Formation in Brazil (Upper Aptian). Its discovery in the 'mid'-Cretaceous Burmese amber shows that this genus survived in the 'Burmese island' of the Tethys Ocean well after its separation from the Gondwana.

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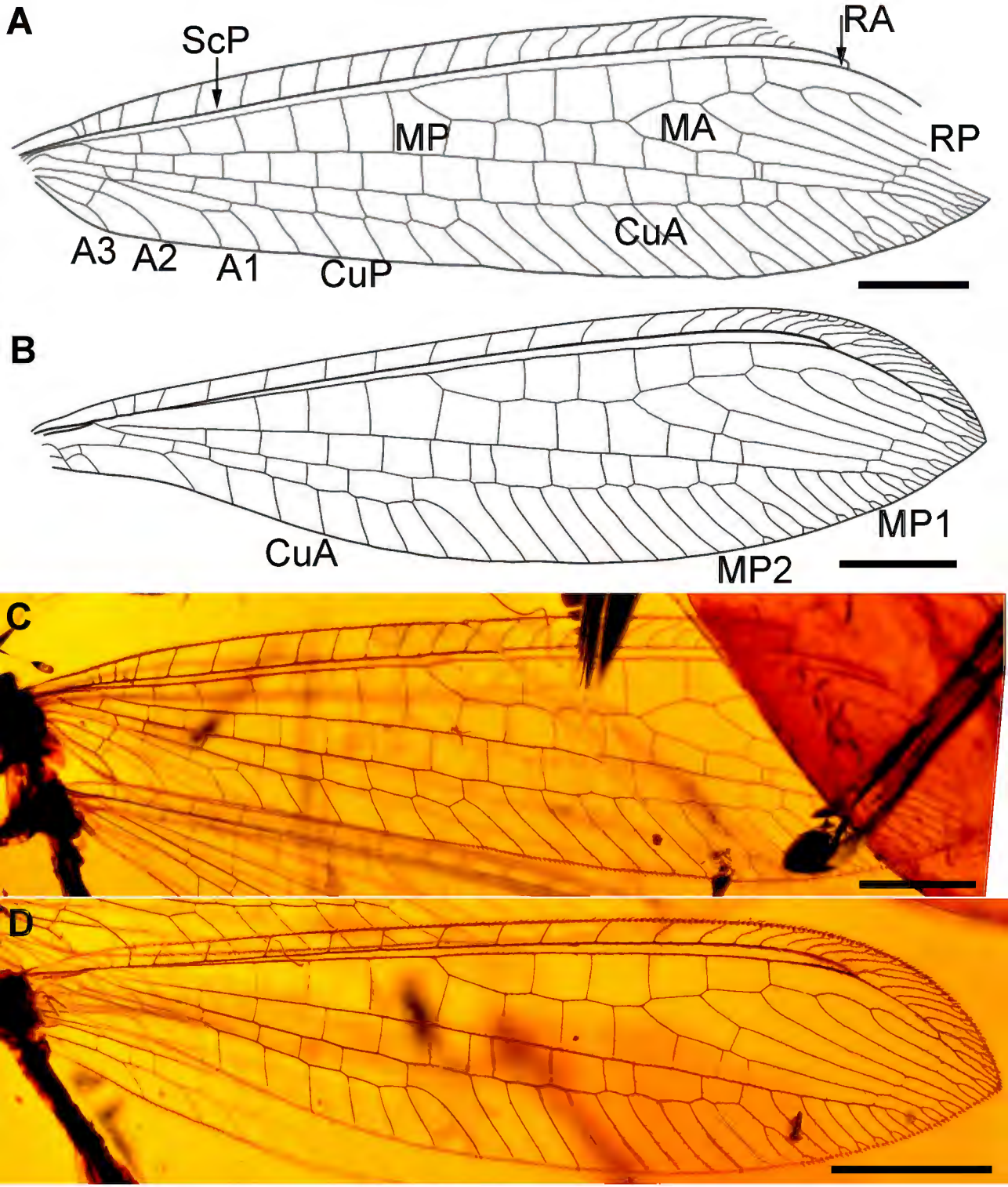
Fig. 1. *Parababinskaia douteaui* Ngô-Muller, Garrouste and Nel sp. nov., holotype MNHN.F.A71317 (1/2). General habitus. Scale bar represents 2 mm.

Fig. 2. *Parababinskaia douteaui* Ngô-Muller, Garrouste and Nel sp. nov., holotype MNHN.F.A71317 (1/2). Wings. A, forewing reconstruction; B, hind wing reconstruction; C, forewing photograph; D, hind wing photograph. Scale bars represent 1 mm.

Fig. 3. *Parababinskaia douteaui* Ngô-Muller, Garrouste and Nel sp. nov., holotype MNHN.F.A71317 (1/2). Head with base of antenna. Scale bars represent 0.5 mm.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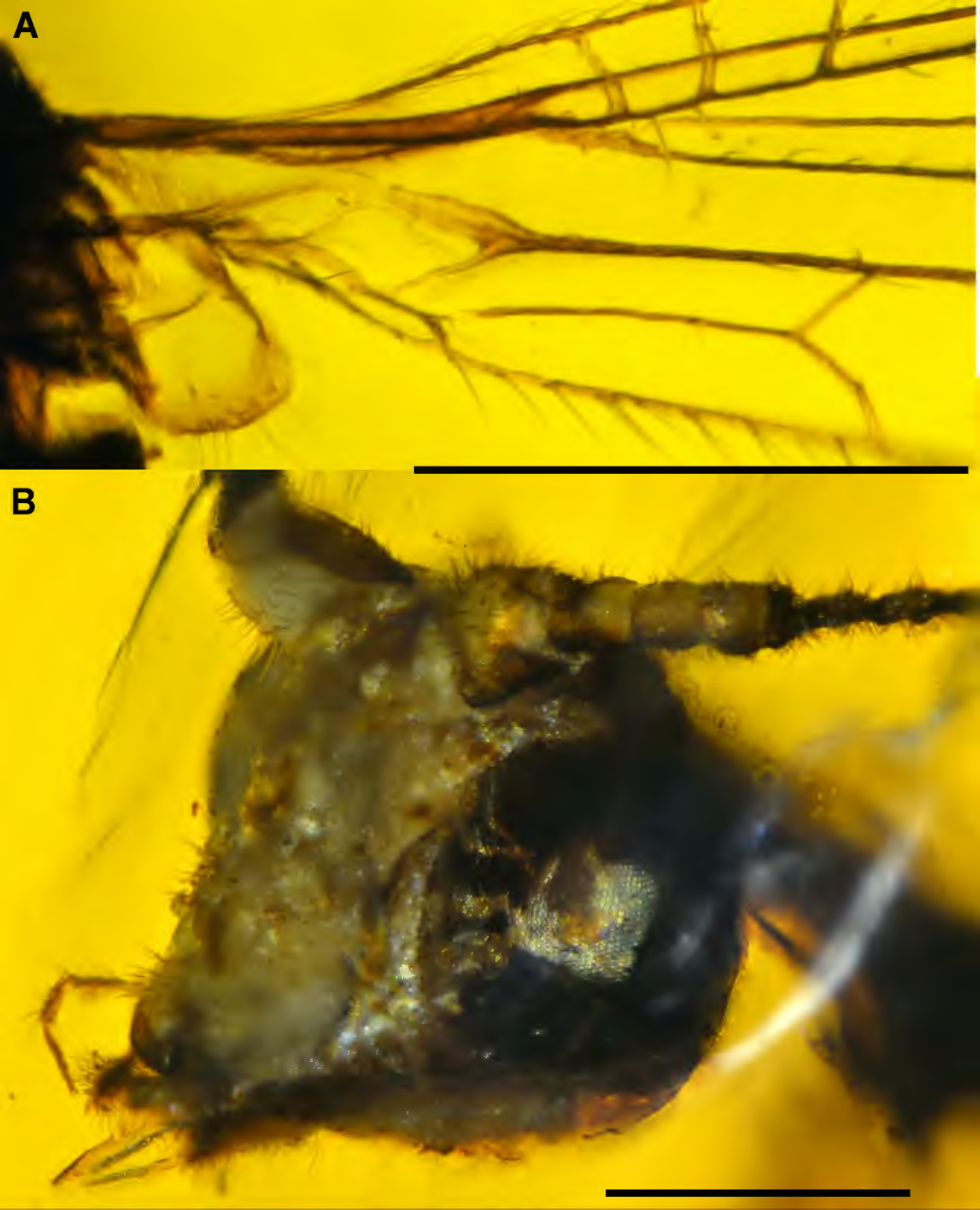
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