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The third mesomegaloprepid damselfly from the mid-Cretaceous Kachin amber (Odonata: Zygoptera)

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Abstract

Mesomegaloprepus liea **sp. nov.**, the third species of the family Mesomegaloprepidae, is described from mid-Cretaceous Kachin amber. To date, this family is only known from the Cretaceous Burma paleo-island (also referred to as the Burmese terrane), although it probably originated in the Gondwana continent during the early Cretaceous. It possibly knew a phenomenon of endemism diversification.

Keywords: Burmese amber, diversity, endemism, Insecta, Mesomegaloprepidae

Introduction

The mid-Cretaceous Burmese amber biota corresponds to a biodiversity hot spot for the Mesozoic Odonata. The diversity of taxa and the number of collected specimens have no equivalent among the other known fossiliferous amber outcrops. Zheng (2021) proposed a catalogue of the Odonata from this amber. To date, one of the most impressive groups only found in this amber is the zygopteran family Mesomegaloprepidae Huang, Azar, Cai, Maksoud & Nel, 2017. These are very large damselflies with patterns of darkened colouration and a unique and highly specialized venation. These large damselflies seem rather frequent in this amber and to date two species have been described.

Here we describe a third species in this family from the same amber, suggesting that this family was rather diverse on the Burma paleo-island during the mid-Cretaceous.

Material and methods

The piece of amber containing the damselfly was collected in the Hukawng Valley (26°29' N, 96°35' E) of Kachin Province, Myanmar (see locality in Kania *et al*., 2015: fig. 1). The re-depositional age of Burmese amber was considered to be 98.79 ± 0.62 Ma (Shi *et al*., 2012). Palynology and an ammonite from the amber-bearing layers suggest a late Albian age (Cruickshank & Ko, 2003).

The amber containing the damselfly is yellow and transparent. The fossil was examined and measured using an incident light stereomicroscope (Olympus SZX7). Photographs were taken using a Zeiss Stereo Discovery V16 stereo microscope.

We follow the wing venation nomenclature of Riek & Kukalová-Peck (1984), emended by Nel *et al*. (1993) and Bechly (1996).

Wing abbreviations are as follows: CuA, cubitus anterior; IR, intercalary radial vein; MA, median anterior; MP, median posterior; N, nodus; RA, radius anterior; RP, radius posterior; Sn, subnodal crossvein.

Systematic palaeontology

Order Odonata Fabricius, 1793
Suborder Zygoptera Selys, 1854

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Family Mesomegaloprepidae Huang, Azar, Cai, Maksoud, Nel & Bechly, 2017

Genus *Mesomegaloprepus* Huang, Azar, Cai, Maksoud, Nel & Bechly, 2017

Type species. *Mesomegaloprepus magnificus* Huang, Azar, Cai, Maksoud, Nel & Bechly, 2017

Other species. *Mesomegaloprepus liae* **sp. nov.**

***Mesomegaloprepus liae* sp. nov.**
(Figs 1, 2)

Material. Holotype NIGP205576 (a forewing and a hind wing in the same piece of amber, with basal fourths and apex of forewing missing), deposited at Nanjing Institute of Geology and Palaeontology, Nanjing.

Etymology. Named after Dr Juan Li, an excellent young sedimentologist from NIGPAS. She passed away during Tibetan field work in July 2023.

Diagnosis. Wing characters only. In forewing, IR1 base 12 cells apart from RP2 base; broad darkened zone from anterior wing margin to level of MP apex and not reaching posterior wing margin. In hind wing, 45 post-nodal crossveins between nodus and pterostigma and 22 crossveins between pterostigma and wing apex; a darkened zone covering wing base up to two-thirds of distance between nodus and pterostigma but not reaching posterior margin of wing, not crossed by any hyaline zone.

Locality and horizon. Tanai Village, Hukawng Valley, Kachin State, northern Myanmar; late Albian to early Cenomanian (mid-Cretaceous).

Description. Basal two-thirds of wings dark brown, not crossed by a hyaline transverse zone, with posterior margin and wing apex hyaline; preserved part of forewing 23 mm long, forewing 8.41 mm wide; nodus in a basal position (although not preserved), numerous post-nodal crossveins not well aligned with *ca*. 47 post-subnodal crossveins; pterostigma present, coloured, short and rectangular, no pterostigmal brace, about 0.9 mm long and 0.8 mm wide; distance between IR1 and RP2 bases about 5.3 mm long; distance between IR1 base and pterostigmal base about 4.65 mm long; bases of RP3/4 and IR2 (mid-fork) basally recessed between arculus and nodus; base of

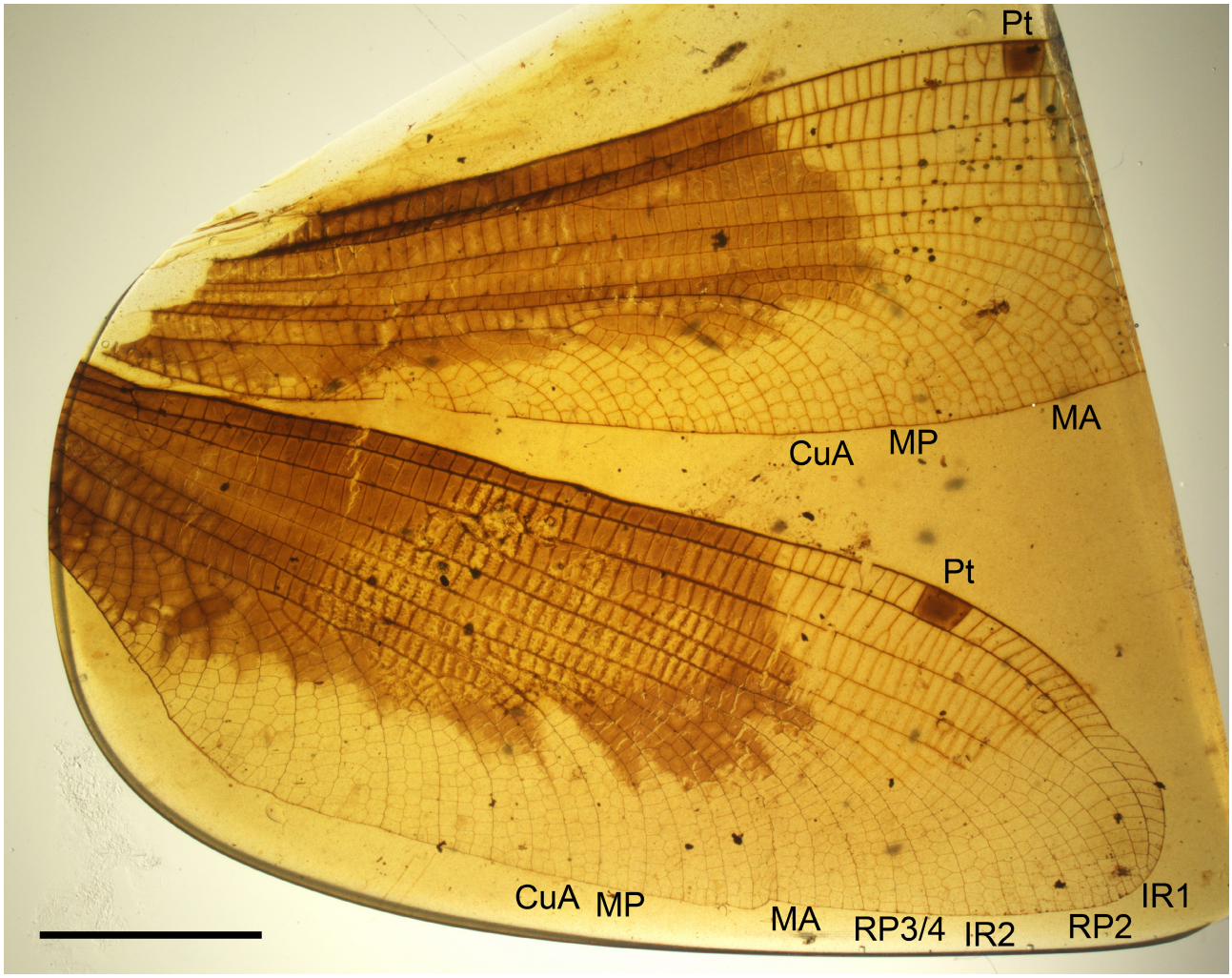

FIGURE 1. *Mesomegaloprepus liae* **sp. nov.**, holotype NIGP205576, photograph of habitus. Scale bar = 5 mm.

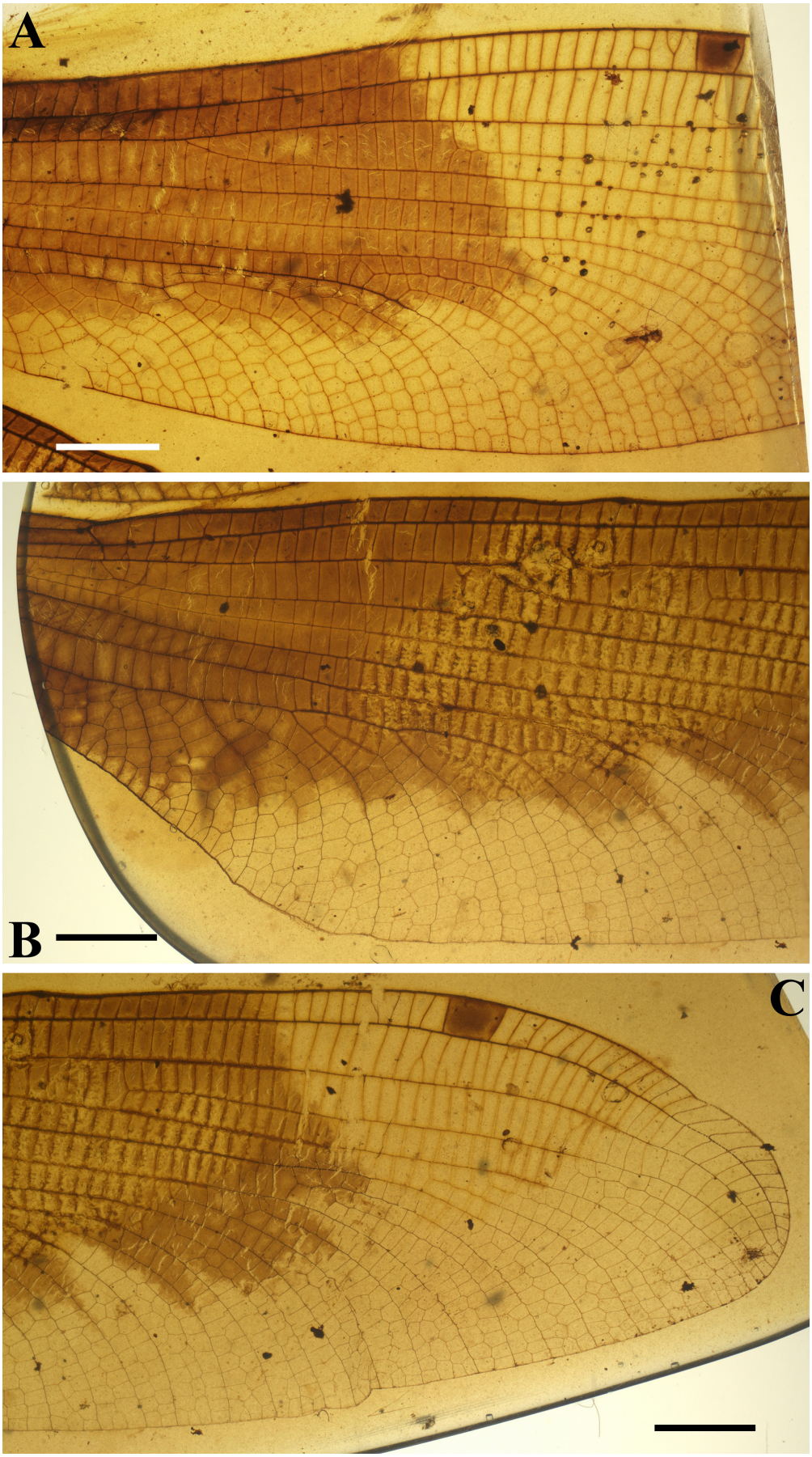

FIGURE 2. *Mesomegaloprepus liae* **sp. nov.**, holotype NIGP205576, photographs. **A**, Midddle part of forewing. **B**, Basal part of hind wing. **C**, Distal part of hind wing. Scale bars = 2 mm.

RP2 far distal from subnodus, with only one row of cells between RP2 and RP1 distad base of RP2; no oblique crossvein; two secondary longitudinal veins between MA and MP in distal part, both apparently emerging from MP; cubital area broad, CuA long with numerous curved posterior branches and characteristically triadic branching pattern of CuA; area between MP and CuA broader than post-discoidal area in their basal parts; no intercalary vein between MP and CuA; hind wing preserved part 26.7 mm long, hind wing 8.5 mm wide; venation nearly identical to that of forewing, except in the broader cubito-anal area; 45 postnodal crossveins between nodus and pterostigma, and 22 distad pterostigma; pterostigma about 1 mm long and 0.8 mm wide; distance from IR1 base to pterostigma base about 6 mm; distance between IR1 and RP2 bases about 4.2 mm; distance from nodus to RP2 base about 7.7 mm long.

Discussion

These two wings correspond to those of a Mesomegaloprepidae, fitting well with the family diagnosis as proposed by Huang *et al*. (2017), especially in the following characters: wings with extensive brown colour pattern and very dense wing venation with a several hundreds of cells; very numerous post-nodal crossveins; post-nodal and post-subnodal crossveins not aligned; base of RP2 far distal of subnodus; bases of RP3/4 and IR2 (mid-fork) basally recessed between arculus and nodus (instead of aligned with subnodus); longitudinal wing veins distally distinctly curved to posterior wing margin; CuA long, extending well beyond mid-wing level, with numerous curved posterior branches and characteristic triadic branching pattern of CuA and apical part of MP (but not MA, which is unbranched); no intercalary veins between MP and CuA; pterostigma in apical position, short and rectangular (parallel-sided); pterostigmal brace reduced; no lestine oblique vein 'O'; absence of several rows of cells between costal margin, RA, and RP1 near wing apex. The shapes of the cubito-anal areas of the two wings are different, one being distinctly narrower than the other. Therefore, they correspond to a forewing and a hind wing respectively.

This family currently comprises two taxa: *Mesomegaloprepus magnificus* and *Cretamegaloprepus zhouae* Zheng, Nel & Wang, 2018. The new fossil strongly differs from the latter in the narrow area between RP1 and RP2 with only one row of cells distad base of RP2 *vs.* very broad with two-three rows of cells in-between (Zheng *et al*., 2018).

The new fossil fits well with the genus *Mesomegaloprepus* in the pattern of venation, with nearly all preserved structures identical to those of *M. magnificus*. Nevertheless, it has many fewer post-nodal crossveins between nodus and pterostigma than in *M. magnificus, viz.* in hind wings, 45 *vs*. 58–60. But it has more post-nodal crossveins between pterostigma and wing apex, *viz.* 22 *vs*. 16. Also, in forewing, the IR1 base is 12 cells apart from RP2 base *vs*. 10 cells apart in *M. magnificus*.

Another obvious difference with *M. magnificus* is the pattern of colouration of the wings: the new fossil has a darkened zone covering the wing base up to the two-thirds of the distance between the nodus and the pterostigma but not reaching the posterior margin of the wing *vs.* covering all the wing surface except for a hyaline transverse band in *M. magnificus*. This obvious difference could be related to sexual dimorphism as it is frequent in the extant Zygoptera, but together with those indicated above, it also supports species separation.

Conclusion

The description of this new Mesomegaloprepidae in the Kachin amber suggests that this family knew a significant diversification on the Burma paleo-island during the mid-Cretaceous. This group is probably of Gondwanan origin but, to date, it is only recorded in this small area, possibly suggesting its endemicity to this area. Only better knowledge of the early Cretaceous Odonata in Africa, Madagascar, and Australia will help to solve this question.

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References

Bechly, G. (1996) Morphologische Untersuchungen am Flügelgeäder der rezenten Libellen und deren Stammgruppenvertreter (Insecta; Pterygota; Odonata), unter besonderer Berücksichtigung der Phylogenetischen Systematik und des Grundplanes der Odonata. *Petalura Special Volume*, 2, 1–402.

Cruickshank, R.D. & Ko, K. (2003) Geology of an amber locality in the Hukawng Valley, northern Myanmar. *Journal of Asian Earth Sciences*, 21 (5), 441–455. https://doi.org/10.1016/S1367-9120(02)00044-5

Huang, D.Y., Azar, D., Cai, C.Y., Maksoud, S., Nel, A. & Bechly, G. (2017) Mesomegaloprepidae, a remarkable new damselfly family (Odonata: Zygoptera) from mid-Cretaceous Burmese amber. *Cretaceous Research*, 73, 1–13. https://doi.org/10.1016/j.cretres.2017.01.003

Kania, I., Wang, B. & Szwedo, J. (2015) *Dicranoptycha* Osten Sacken, 1860 (Diptera, Limoniidae) from the earliest Upper Cretaceous Burmese amber. *Cretaceous Research*, 52, 522–530. https://doi.org/10.1016/j.cretres.2014.03.002

Nel, A., Martínez-Delclòs, X., Paicheler, J.-C. & Henrotay, M. (1993) Les 'Anisozygoptera' fossiles. Phylogénie et classification (Odonata). *Martinia Numéro Hors Série*, 3, 1–311.

Riek, E.F. & Kukalová-Peck, J. (1984) A new interpretation of dragonfly wing venation based upon Early Carboniferous fossils from Argentina (Insecta: Odonatoidea) and basic character states in pterygote wings. *Canadian Journal of Zoology*, 62, 1150–1166. https://doi.org/10.1139/z84-166

Shi, G.H., Grimaldi, D.A., Harlow, G.E., Wang, J., Wang, J., Wang, M.C., Lei, W.Y., Li, Q.L. & Li, X.H. (2012) Age constraint on Burmese amber based on U-Pb dating of zircons. *Cretaceous Research*, 37, 155–163. https://doi.org/10.1016/j.cretres.2012.03.014

Zheng, D.R. (2021) Odonatans in lowermost Cenomanian Kachin amber: updated review and a new hemiphlebiid damselfly. *Cretaceous Research*, 118, 104640. https://doi.org/10.1016/j.cretres.2020.104640

Zheng, D.R., Nel, A., Jarzembowski, E.A., Chang, S.C., Zhou, Z.C. & Wang, B. (2018) The second mesomegaloprepid damselfly (Odonata: Zygoptera) from mid-Cretaceous Burmese amber. *Cretaceous Research*, 90, 131–135. https://doi.org/10.1016/j.cretres.2018.04.018