



Taxonomic revision of *Dachibangus* (Fulgoromorpha: Mimarachnidae) and the description of new species from Cretaceous Kachin amber

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Abstract

Mimarachnidae is an enigmatic Cretaceous planthopper family with remarkable taxonomic and morphological diversity documented from the mid-Cretaceous Kachin amber of Myanmar. We expand knowledge of the genus *Dachibangus* Jiang, Szwedo & Wang, 2018 through the description of three new species: *D. pallidus* **sp. nov.**, *D. partialis* **sp. nov.**, and *D. pouilloni* **sp. nov.** These new species permit an emended diagnosis of *Dachibangus* and support the synonymization of the recently described genus *Trichotomus* Wang, Zhuo, Luo & Chen, 2025 with *Dachibangus*, resulting in the new combination *Dachibangus zhuoyuanshengi* **comb. nov.** Our study indicates that the branching pattern of MP is more variable than previously recognized and cautions against its use as a diagnostic feature.

Keywords: Hemiptera, planthopper, fossil record, new species, Burmese amber

Introduction

Mimarachnidae Shcherbakov, 2007 is an extinct family of planthoppers (Hemiptera: Fulgoromorpha) known exclusively from the Cretaceous of Eurasia (e.g., Jiang *et al.*, 2018; Jiang *et al.*, 2023; Fabrikant *et al.*, 2024a). The family is characterized by simplified forewing venation, irregular networks of veinlets, weakened basal cells, and paired median carinae on the mesonotum in adults (Shcherbakov, 2007; Jiang *et al.*, 2018). Recent classifications place Mimarachnidae within the

euclixioidian lineage of Fulgoromorpha (Bourgoin & Szwedo, 2022). Preliminary phylogenetic analyses of Fulgoromorpha support this phylogenetic position as an ‘early-diverging branch’ of planthoppers, as the sister lineage of Perforissidae (Bucher, 2024), pushing back the estimated origin of the family to the Early Jurassic, whereas Bayesian inferences based on the fossil record have estimated an Early Cretaceous origin (Boderau *et al.*, 2025). Despite uncertainties in its phylogenetic position and timing of diversification, the family exhibits remarkable morphological disparity and represents a significant component of Cretaceous fulgoromorph diversity (Jiang *et al.*, 2018, 2019; Jiang *et al.*, 2023; Zhang *et al.*, 2018; Fu & Huang, 2021; Liu *et al.*, 2024; Fabrikant *et al.*, 2024b).

Over the past decade, the known diversity of Mimarachnidae has increased rapidly, with numerous new species described from the mid-Cretaceous Kachin amber of northern Myanmar. This deposit has yielded a diverse fulgoromorph fauna and currently preserves representatives of thirteen families (Wang *et al.*, 2025; Tang *et al.*, 2026). *Dachibangus* Jiang, Szwedo & Wang, 2018 was established on the basis of *D. trimaculatus* Jiang, Szwedo & Wang, 2018 from Kachin amber and represents one of the largest known species of Mimarachnidae (Jiang *et al.*, 2018). Subsequently, a second species, *Dachibangus formosus*, was described (Fu *et al.*, 2019); however, Jiang *et al.* (2023) later suggested that it differed sufficiently from the type species to warrant placement in a separate genus, *Xiaochibangus* Jiang, Chen & Szwedo, 2023. More recently, Wang *et al.* (2025) established *Trichotomus* Wang, Zhuo, Luo & Chen, 2025 with two included species from

Kachin amber, *T. zhuoyuanshengi* Wang, Zhuo, Luo & Chen, 2025 and *T. zhuowenxii* Wang, Zhuo, Luo & Chen, 2025. The genus shares many morphological features with *Dachibangus* and was distinguished primarily by the branching pattern of MP, particularly the number of terminal branches in MP₁₊₂ and MP₃₊₄.

In this study, we expand knowledge of the diversity of *Dachibangus* by describing three new species from the mid-Cretaceous Kachin amber of northern Myanmar. Based on the newly available material, we re-evaluate the diagnostic characters of *Dachibangus* and propose *Trichotomus* as a junior synonym of *Dachibangus*.

Material and methods

The specimens studied herein are preserved in Kachin amber from an amber mine near Noiye Bum, Hukawng Valley, Kachin State, northern Myanmar. Kachin amber preserves one of the most diverse Cretaceous terrestrial palaeobiotas, with an exceptionally rich insect fauna (Ross, 2025, 2026). Available data suggest a mid-Cretaceous age for the Kachin amber deposit (Cruickshank & Ko, 2003; Shi *et al.*, 2012; Rasnitsyn *et al.*, 2016; Mao *et al.*, 2018). The specimens NIGP210910–NIGP210913 are deposited in the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China. The specimen JMP-BU-094 will be permanently deposited in the amber collection of the Geological Department and Museum of the University of Rennes, France. The specimen SMNH-TAU In.492699 is deposited in the insect collection of the Steinhardt Museum of Natural History, Israel National Center for Biodiversity Studies, Tel Aviv University, Israel.

The amber pieces containing the inclusions were polished using different grades of sandpaper and finished using rare-earth polishing powder. Photographs were taken using a Zeiss AxioZoom V16 stereoscope and a Keyence VHX-6000 digital microscope. Line drawings were drafted with CorelDRAW Graphics Suite 2024. Wing venation terminology follows Nel *et al.* (2012), Bourgoin *et al.* (2015), and Schubnel *et al.* (2019), as proposed for Acercaria and applied to Fulgoromorpha. Venation abbreviations are as follows: CA costa anterior; CP costa posterior; PC praecosta; RA radius anterior; RP radius posterior; MP media posterior; CuA cubitus anterior; CuP cubitus posterior; PCu postcubitus; and A₁ first anal vein.

Systematic palaeontology

Order Hemiptera Linnaeus, 1758

Suborder Fulgoromorpha Evans, 1946

Family Mimarachnidae Shcherbakov, 2007

Genus *Dachibangus* Jiang, Szewo & Wang, 2018 (= *Trichotomus* Wang, Zhuo, Luo & Chen, 2025)

Type species. *Dachibangus trimaculatus* Jiang, Szewo & Wang, 2018.

Emended diagnosis (revised after Jiang *et al.*, 2018). Morphology most similar to that of *Multistria*, *Xiaochibangus*, *Trichotomus*, and *Jaculistilus*. *Dachibangus* shares with *Multistria* and *Jaculistilus* a Y-shaped median carination on pronotum, whereas in tegminal construction, it is most comparable to *Xiaochibangus* and *Trichotomus*, sharing simple ScP+RA and RP and proliferated MP, which branches into at least five terminals. Furthermore, *Dachibangus* shares a basal metatibial spine with *Multistria*, *Jaculistilus*, and *Xiaochibangus*.

Dachibangus can be further differentiated by the following combination of characters: width of postcostal cell subequal to that of cell C1 at wing midlength (postcostal cell about twice as wide as cell C1 in *Jaculistilus*, *Multistria*, and *Xiaochibangus*); stem MP subparallel to costal margin of tegmen (stem MP diverging from anterior margin towards wing apex in *Jaculistilus*, *Multistria*, and *Xiaochibangus*); stem MP situated in the anterior third of tegmen (MP slightly anterior to the median in *Multistria* and *Xiaochibangus*); MP with 5–6 terminals (3–4 terminals in *Jaculistilus* and *Multistria*); CuA₁ and CuA₂ diverge at a 45° angle (curved and then subparallel in *Multistria*, *Jaculistilus*, and *Xiaochibangus*); CuA₁ bowed anteriorly (straight in *Jaculistilus*, *Multistria*, and *Xiaochibangus*); CuA₂ strongly sinuate, with distal portion bowed anteriorly (slightly curved or straight in *Jaculistilus*, *Multistria*, *Trichotomus*, and *Xiaochibangus*); PCu flat at junction with A₁ (PCu distinctly curved anteriorly in *Multistria*); and unfused section of A₁ overlapping with stem CuA for about half its length (marginal overlap in *Multistria* and *Xiaochibangus*).

Tegmina with distinctive colour pattern: longitudinal dark stripes adhering to the terminals of MP, and darker and lighter patches on the pigmented portions of tegmen (pigmentation is of a uniform shade in *Jaculistilus*, *Multistria*, and *Xiaochibangus*).

Remarks. Until now, the presence of a Y-shaped carina on the pronotum and a basal metatibial spine have been recognized only in the genus *Jaculistilus* and have been considered diagnostic traits (Zhang *et al.*, 2018). We found that these characters also occur in the genera *Dachibangus*, *Xiaochibangus*, and *Multistria*. The holotype of *Dachibangus trimaculatus* was re-examined and the presence of both characters was confirmed (Jiang *et al.*, 2018, Figs. 5B, 6A). The specimens of *Multistria irregularis* and *M. juanae* were also re-examined and the presence of a basal metatibial spine was confirmed

(Fabrikant *et al.*, 2024a, Figs. 1C, 2B). Furthermore, a Y-shaped carina on the pronotum is recognizable in the holotype of *M. orthotropa* (Zhang *et al.*, 2021, Fig. 1B) and *M. juanae* (Fabrikant *et al.*, 2024a, Fig. 2C). Additionally, a basal metatibial spine is present in numerous undescribed specimens attributed to *Xiaochibangus* (personal observation by Dolev Fabrikant).

Justification for synonymy

Trichotomus Wang, Zhuo, Luo & Chen was established on the basis of two species from Kachin amber, with *T. zhuoyuanshengi* designated as the type species (Wang *et al.*, 2025). However, the tegmen of *T. zhuoyuanshengi* is conspicuously similar to that of the type species of *Dachibangus* (*D. trimaculatus*), sharing the following unique characters: width of the postcostal cell subequal to the width of cell C1 at wing midlength; stem MP subparallel to the costal margin of the tegmen; stem MP situated in the anterior third of the tegmen; MP with 5–6 terminals; CuA₁ and CuA₂ diverge at a 45° angle; CuA₁ bowed anteriorly; CuA₂ strongly sinuate, with distal portion bowed anteriorly; PCu flat at junction with A₁; unfused section of A₁ overlapping with stem CuA for about half its length; and the presence of pigmented longitudinal stripes adhering to the MP terminals.

Wang *et al.* (2025) distinguished *Trichotomus* from *Dachibangus* primarily by the pattern of MP, which consists of two terminals in MP₁₊₂ and a simultaneous trifurcation of MP₃₊₄. Simultaneous vein trifurcations are unknown in other mimarachnids and are highly unusual in insect wing venation; although they occur in some damselflies, insect wing venation generally consists of bifurcating or reticulated networks rather than trifurcating nodes. The additional specimens described herein attributed to *T. zhuoyuanshengi* display two closely spaced bifurcations of MP₃₊₄. It is therefore considered more likely that the observed trifurcation in the type specimen is composed of two closely spaced bifurcations. Additionally, previous studies and the new specimens studied herein illustrate that MP terminal number and branching pattern may vary even between the left and right tegmina of the same individual; therefore, we consider the specific MP branching pattern of the type specimen to be non-diagnostic.

Given the presence of several shared features and the observed variability in MP branching order in *Dachibangus*, we suggest that this character is insufficient to justify the erection of a separate genus for *T. zhuoyuanshengi* or its separation from *Dachibangus*. We therefore regard *Trichotomus* as a junior synonym of *Dachibangus*, and transfer *Trichotomus zhuoyuanshengi* to *Dachibangus* as *Dachibangus zhuoyuanshengi* **comb. nov.**

Following the emended diagnosis of *Dachibangus*, *Trichotomus zhuowenxii* cannot be placed within this

genus due to the following differences: postcostal cell about twice as wide as C1 at the tegmen midlength; stem MP diverging from the anterior margin toward the wing apex; CuA₁ and CuA₂ diverge at an angle less than 45°; CuA₁ almost straight; CuA₂ slightly curved, without marked sinuation; and PCu distinctly curved at junction with A₁. The species is thus temporarily treated as incertae sedis within Mimarachnidae.

Dachibangus trimaculatus Jiang, Szewo & Wang, 2018

Emended diagnosis. Anterior margin of pronotum slightly concave (convex in *D. partialis* and *D. pouilloni*); posterolateral angle of pronotum rounded and subacute (sharp and acute in *D. partialis*, *D. pouilloni*, and *D. zhuoyuanshengi*); mesonotum width 6.8 mm (only about 4.5 mm in *D. partialis* and *D. pouilloni*); tegmen length 27.5 mm (only about 20 mm in *D. pouilloni* and *D. zhuoyuanshengi*); tegmen length-to-width ratio about 2.7 (narrower in *D. pouilloni* at about 3.7); base of stem MP very curved, then subparallel to RP (straight, then gradually diverging away from RP in *D. pouilloni*; slightly curved, then gradually diverging away from RP in *D. pallidus* and *D. zhuoyuanshengi*); MP terminals oriented obliquely posteriorly relative to anterior wing margin at midlength (MP terminals parallel to anterior wing margin in *D. pouilloni* and *D. pallidus*); CuA₁ single (forked in *D. pallidus*); tornus convex (almost flat in *D. pouilloni*, *D. pallidus*, and *D. zhuoyuanshengi*); two prominent eyespots near the base of radial and medial cells (absent in *D. partialis*, *D. pouilloni*, and *D. pallidus*, but located near wing apex in *D. zhuoyuanshengi*); narrow stripes of dark pigmentation along each terminal branch of MP (absent in *D. pouilloni*, *D. pallidus*, and *D. zhuoyuanshengi*).

Dachibangus pouilloni sp. nov.

(Fig. 1A–C)

Material. Holotype, JMP-BU-094, a complete specimen. The holotype specimen is temporarily housed in the private collection of Jean-Marc Pouillon (Nivolas-Vermelle, France) and will be deposited in the amber collection of the Geological Department and Museum of the University of Rennes, France.

Etymology. Named after Jean-Marc Pouillon, who kindly provided the specimen for study and is to be treated as a noun in the genitive case.

Diagnosis. Can be distinguished from other species of *Dachibangus* by the following characters: coryphe wider than long (longer than wide in *D. partialis*); mesonotum width 4.7 mm (almost 7 mm in *D. trimaculatus* and *D. pallidus*); tegmen length 19.2 mm (almost 30 mm in *D. trimaculatus* and *D. pallidus*); tegmen length-to-width

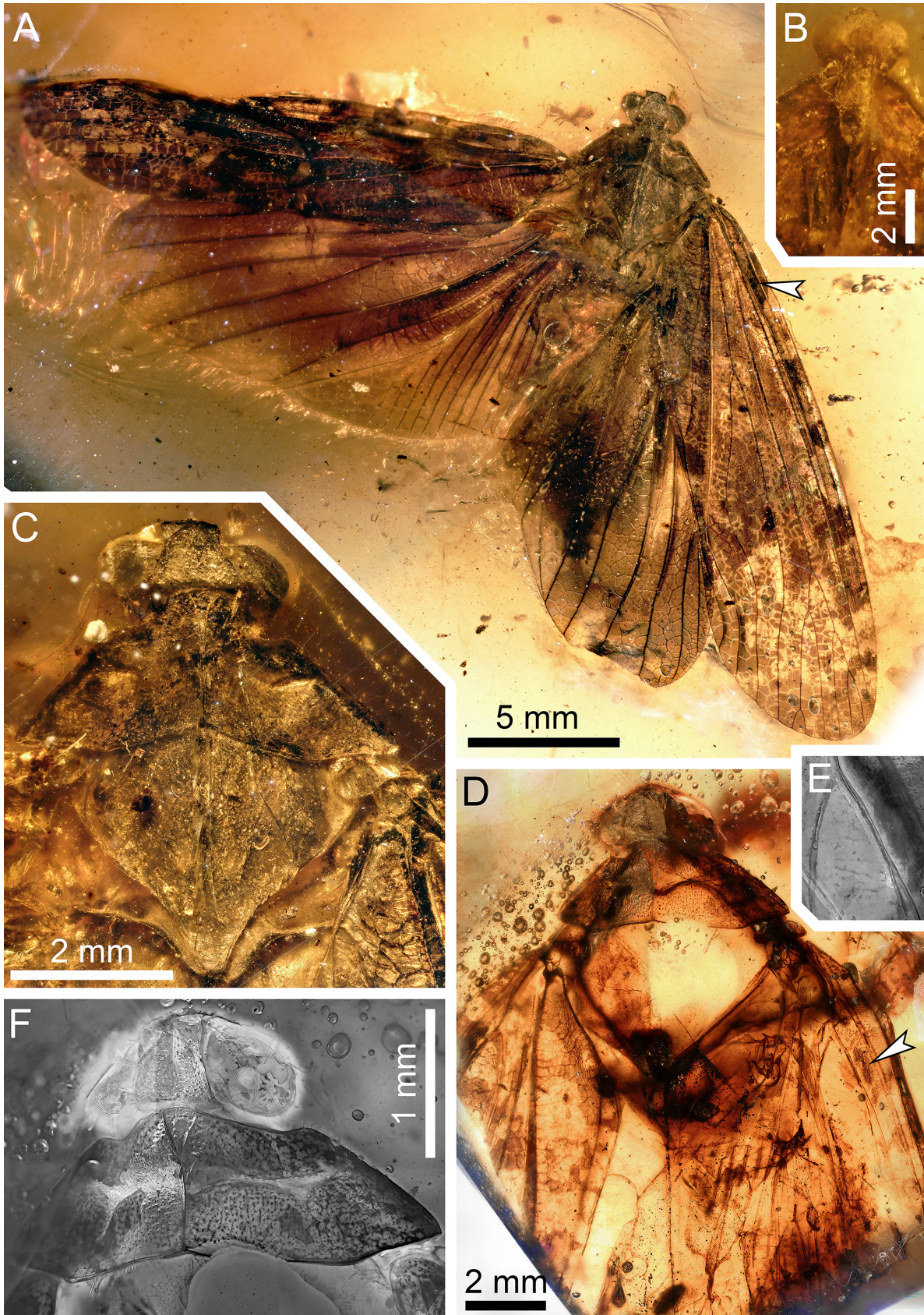


FIGURE 1. Photographs of *Dachibangus*. **A**, *Dachibangus pouilloni* sp. nov., general habitus, dorsal view. **B**, *Dachibangus pouilloni* sp. nov., head, ventral view. **C**, *Dachibangus pouilloni* sp. nov., head, pronotum, and mesonotum, dorsal view. **D**, *Dachibangus partialis* sp. nov., general habitus, dorsal view. **E**, *Dachibangus partialis* sp. nov., detail of forewing. **F**, *Dachibangus partialis* sp. nov., head, pronotum, and mesonotum, dorsal view. **A–D** under light microscopy; **E**, **F** under fluorescence microscopy. Arrows indicate eyespots in **A**, **D**.

ratio about 3.7 (about 3.0 or lower in *D. trimaculatus* and *D. zhuoyuanshengi*); base of stem MP straight, then gradually diverging away from RP (very curved, then subparallel to RP in *D. trimaculatus* and *D. partialis*; slightly curved, then gradually diverging away from RP in *D. pallidus* and *D. zhuoyuanshengi*); MP terminals oriented parallel to anterior wing margin at midlength (MP terminals obliquely oriented posteriad in *D. trimaculatus* and *D. zhuoyuanshengi*); CuA_1 single (forked in *D. pallidus*); tornus almost flat (convex in *D. trimaculatus*); the only eyespot on tegmen located near the base of postcostal cell (*D. trimaculatus* with two additional proximal eyespots, and *D. zhuoyuanshengi* with two distal eyespots).

Description. The specimen mostly complete, with both mesotarsi and right metatarsus missing. Body robust, 16.8 mm in total length.

Head (Fig. 1A, B). Head small, 1.1 mm long, 2.4 mm wide in dorsal view; compound eyes hemispherical, large and laterally bulging; coryphe pentagonal, wider than long; surface granular, without distinct median carina; lateral margins carinate, posterior margin shallowly concave and located posterior to the eye median in dorsal view. Frons elongate; acrometope shaped as two triangular facets (trigons) touching at their apices; eumetope with a single median carina and two lateral carinae; postclypeus without a median carina; anteclypeus narrow; rostrum long, reaching abdominal sternite V.

Thorax (Fig. 1A, C). Pronotum subtriangular, about 1.6 mm long and 5.7 mm wide; surface with irregularly arranged granules and short linear punctures; median carina Y-shaped, doubled anteriorly, then fusing in posterior two-thirds; pronotum deeply divided by a transverse sinuous furrow anterior of the median. Anterior margin convex, protruding anteriorly; lateral margins keeled; posterior margin slightly concave; anterolateral angles rounded, covered in short bristles, posterolateral angles sharp and acute; posterior angles obtuse and widely rounded. Coloration mottled. Mesonotum about 3.1 mm long and 3.8 mm wide; mesonotum surface covered in sparsely distributed granules, median carinae paired and parallel, lateral carinae bowed laterally and converging anteriorly; mesoscutellum small with transverse wrinkles; tegula wider than long, without bristles; mesonotum coloration irregularly mottled. Legs slender and slightly setose with longitudinal carinae; segment lengths (femur/tibia/tarsus): prothoracic legs 4.1 mm / 4.9 mm / 1.5 mm; segment lengths of mesothoracic legs 4.6 mm / 5.8 mm / ? mm; protarsus and mesotarsus two-segmented and bearing prominent hooked claws; segment lengths of metathoracic legs 3.9 mm / 6.3 mm / 2.8 mm; metatibia bearing basal spine; metatibial pecten asetigerous, armed with 6 teeth; each metatarsomere with six teeth.

Tegmen (Fig. 1A). Tegmen damaged by a transverse line across its median; length 19.2 mm and width 5.2 mm, about 3.7 times as long as wide; tegmen surface covered in polygonal meshwork of delicate veinlets, costal margin arched, anteroapical angle rounded, posteroapical angle broadly rounded, tornus bowed, posterior margin straight; tegmen costal area narrow, narrowing distally and almost reaching tegmen apex; veins ScP+RA and RP simple and parallel to costal margin; apices of ScP+RA and RP attenuated, and curve posteriad to parallel tegmen margin; radial cell about as wide as median cell; stem MP subparallel to costal margin; MP with 5–6 terminals, forked about one-third from tegmen apex, branching into MP_{1+2} and MP_{3+4} ; MP_{1+2} forked slightly distal to MP_{3+4} ; MP_{1+2} reaching margin with three terminals (MP_{1a} , MP_{1b} , and MP_2). MP_{3+4} reaching margin with 2–3 terminals; MP_4 forked very late in right wing, but not forked in left wing. CuA forked deeply, about one-third from wing base; CuA_1 and CuA_2 diverge at a 45° angle; CuA_1 slightly bowed anteriorly; CuA_2 markedly sinuate, with distal portion bowed anteriorly; CuP simple, slightly sinuate; PCu and A_1 fused at basal half of tegmen, PCu flat at junction with A_1 ; unfused section of A_1 overlapping with stem CuA for about half its length. Tegminal coloration consists of mostly uniform mottled coloration with the exception of four dark rectangular bands restricted to costal margin of wing; colour bands separated by light areas; pigmented areas are crossed by light-coloured crossveins and possess darker and lighter pigmented spots; wing apex with more light spots than the proximal section; a single small eyespot 0.7 mm wide with a central highlight located at base of postcostal cell.

Hind wing (Fig. 1A). Hind wing about 13.5 mm long and 8.0 mm wide, membranous, slightly shorter than forewing, covered in a uniform meshwork of delicate veinlets forming larger polygonal cells than in forewing; costal margin proximally straight and distally arched at an angle; posterior margin convex; ScP+R forked, RP and MP simple; CuA forked once proximally; CuP and PCu slightly sinuous; about 10 anal veins. Hind wing dark, with two rounded light spots near posterior margin and two light spots placed longitudinally across wing midlength.

Abdomen. Abdomen 10.4 mm long and 5.3 mm wide; terminalia obscured.

***Dachibangus pallidus* sp. nov.**

(Fig. 2A–C)

Material. Holotype, NIGP210910.

Etymology. The species name is derived from the Latin *pallidus* (“pale”), referring to its relatively light wing coloration.

Diagnosis. Can be distinguished from other species of *Dachibangus* by the following combination of characters: mesonotum width 6.7 mm (6.8 mm in *D. trimaculatus*, 4.3 mm in *D. partialis*, and 4.7 mm in *D. pouilloni*); tegmen length 29.2 mm (27.5 mm in *D. trimaculatus*, 19.2 mm in *D. pouilloni*, and 18–21 mm in *D. zhuoyuanshengi*); base of stem MP slightly curved, then gradually diverging away from RP (strongly curved, then subparallel to RP in *D. trimaculatus* and *D. partialis*; straight, then gradually diverging away from RP in *D. pouilloni*); MP terminals oriented parallel to anterior wing margin at midlength (MP terminals obliquely oriented posteriad in *D. trimaculatus* and *D. zhuoyuanshengi*); CuA₁ forked (single in *D. trimaculatus*, *D. pouilloni*, and *D. zhuoyuanshengi*); tornus almost flat (convex in *D. trimaculatus*); the only eyespot on tegmen is located near the base of postcostal cell.

Description. Macropterous adult; incomplete specimen with pronotum, mesonotum, and right wings preserved. Pronotum mostly obscured by cracks; lateral margins keeled.

Thorax (Fig. 2A). Mesonotum about 6.5 mm long and 6.7 mm wide; mesonotum surface covered in sparsely distributed granules; mesonotum median carinae paired and parallel, lateral carinae bowed laterally and converging anteriorly; mesoscutellum small with transverse wrinkles; tegula distinct. Mesonotum coloration light brown.

Tegmen (Fig. 2B, C). Tegmen damaged in a transverse line across its median; length 29.2 mm and width 8.6 mm, about 3.4 times longer than wide; tegmen surface covered in polygonal meshwork of delicate veinlets, costal margin arched, anteroapical angle rounded, posteroapical angle broadly rounded, tornus bowed, posterior margin straight; tegmen costal area narrow, narrowing distally and almost reaching tegmen apex; veins ScP+RA and RP simple and subparallel to costal margin; apices of ScP+RA and RP attenuated, and curve posteriad to parallel tegmen margin; radial cell about as wide as median cell; stem MP subparallel to costal margin; MP with six terminals, forked about one-third from tegmen apex, branching into MP₁₊₂ and MP₃₊₄; MP₁₊₂ and MP₃₊₄ fork at about same level; MP₁₊₂ reaching margin with three terminals (MP_{1a}, MP_{1b}, and MP₂); MP₃₊₄ reaching margin with three terminals (MP_{3a}, MP_{3b}, and MP₄); MP₃ forked late; MP_{3a} distally attenuated and follows shape of polygonal veinlet meshwork; CuA forked deeply, about one-third from wing base; CuA₁ and CuA₂ diverge at a 45° angle; CuA₁ slightly bowed anteriorly; CuA₂ markedly sinuate, with distal portion bowed anteriorly; CuP simple, slightly sinuate; PCu and A₁ fused at basal half of tegmen, PCu flat at junction with A₁; unfused section of A₁ overlapping with stem CuA for about half its length. Tegmen coloration consists of four irregularly shaped pigmented bands that separated by light areas near tegmen margins; pigmented areas are

crossed by light-coloured crossveins and possess darker and lighter pigmented spots; wing apex lighter in colour and with more light spots than proximal section; single small eyespot 0.7 mm wide with central highlight located at base of postcostal cell.

Hind wing (Fig. 2C). Hind wing about 22.1 mm long and 8.6 mm wide, membranous, slightly shorter than forewing, covered in a uniform meshwork of delicate veinlets forming larger polygonal cells than in forewing; costal margin straight proximally and angularly arched distally; posterior margin convex; ScP+R forked, RP and MP simple; CuA forked once proximally; CuP and PCu slightly sinuous; about 12 anal veins. Hind wing dark with two rounded light spots near posterior margin and two light spots placed longitudinally across wing midlength.

Dachibangus partialis sp. nov.

(Fig. 1D–F)

Material. Holotype, NIGP210911, incomplete specimen.

Etymology. The specific epithet *partialis* (Latin, meaning “partial”) refers to the incompletely preserved specimen.

Diagnosis. Can be distinguished from other species of *Dachibangus* by the following combination of characters: coryphe longer than wide (wider than long in *D. pouilloni*); anterior margin of pronotum convex (concave in *D. trimaculatus*); posterolateral angle of pronotum sharp and acute (rounded and subacute in *D. trimaculatus*); mesonotum width 4.3 mm (almost 7 mm in *D. trimaculatus* and *D. pallidus*); base of stem MP strongly curved, then subparallel to RP (straight, then gradually diverging from RP in *D. pouilloni*; slightly curved, then gradually diverging away from RP in *D. pallidus* and *D. zhuoyuanshengi*); tornus almost flat (convex in *D. trimaculatus*); base of radial and medial cells without eyespots (present in *D. trimaculatus*).

Description. Macropterous adult; incomplete specimen with head, pronotum, mesonotum, and proximal portions of wings preserved.

Head (Fig. 1D, F). Head small, 1.2 mm long, 2.9 mm wide in dorsal view including eyes; compound eyes hemispherical, large and laterally bulging; coryphe pentagonal, longer than wide; surface granular, without distinct median carina; lateral margins carinate, posterior margin shallowly concave and located posterior to the eye median in dorsal view. Frons elongate; acrometope shaped as two triangular facets (trigons) touching at their apices; ventral portion of head missing.

Thorax (Fig. 1D, F). Pronotum subtriangular, about 2.0 mm long and 6.1 mm wide; surface with irregularly arranged granules and short linear punctures; median carina Y-shaped, doubled anteriorly, then fusing in posterior two-thirds; pronotum deeply divided by a

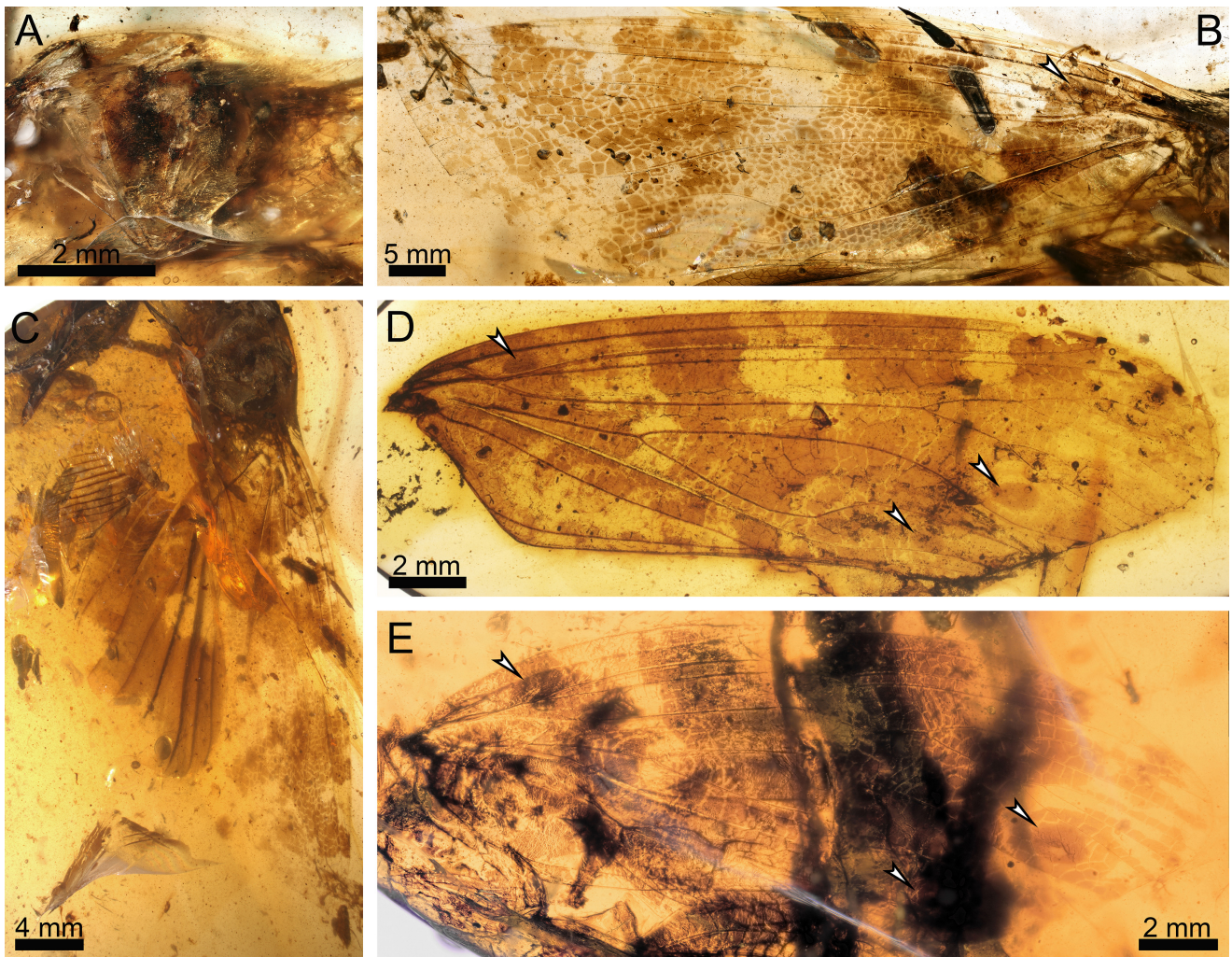


FIGURE 2. Photographs of *Dachibangus*. **A**, *Dachibangus pallidus* sp. nov., mesonotum. **B**, *Dachibangus pallidus* sp. nov., forewing. **C**, *Dachibangus pallidus* sp. nov., general habitus. **D**, *Dachibangus zhuoyuanshengi* (Wang et al., 2025), NIGP210912, forewing. **E**, *Dachibangus zhuoyuanshengi* (Wang et al., 2025), SMNHTAU In.492699, forewing. Arrows indicate eyespots in **B**, **D**, and **E**.

transverse sinuous furrow anterior of the median. Anterior margin convex, protruding anteriorly; lateral margins keeled; posterior margin slightly concave; anterolateral angles rounded, covered in short bristles, posterolateral angles sharp and acute; posterior angles obtuse and widely rounded. Coloration mottled. Mesonotum about 5.4 mm long and 4.3 mm wide; surface covered in sparsely distributed granules; median carinae paired and parallel, lateral carinae bowed laterally and converging anteriorly; mesoscutellum small with transverse wrinkles; tegula wider than long, without bristles; mesonotum coloration irregularly mottled. Legs obscured.

Tegmen (Fig. 1D). Tegmen 7.2 mm wide, with distal portion missing; tegmen surface covered in polygonal meshwork of delicate veinlets, costal margin arched, anteroapical angle rounded, posteroapical angle broadly rounded, tornus bowed, posterior margin straight; tegmen costal area narrow, narrowing distally and almost reaching

tegmen apex; veins ScP+RA and RP simple and parallel to costal margin; apices of ScP+RA and RP attenuated, and curve posteriorly to parallel tegmen margin; radial cell about as wide as median cell; stem MP basally very curved, then parallel to costal margin; CuA forked deeply, with CuA₁ and CuA₂ diverging at a 45° angle; PCu and A₁ fused at basal half of tegmen, PCu flat at junction with A₁; unfused section of A₁ overlapping with stem CuA for about half its length. Tegminal coloration mottled with patches of light and dark pigmentation; clear dark bands not observed in the preserved wing section; pigmented areas vary in level of pigmentation and are crossed by dark-coloured crossveins; single small eyespot 0.7 mm wide with central highlight located at base of postcostal cell, while eyespots near base of radial and medial cells absent (Fig. 1D, E).

Remarks. Despite the fragmentary nature of the specimen, we consider the novel character combination

present in this specimen sufficient for the description of a new species owing to the apparent stability of eyespot placement within species in Mimarachnidae and the reduced utility of the branching pattern of the MP terminals.

***Dachibangus zhuoyuanshengi* comb. nov.**

(Fig. 2D, E)

Material. NIGP210912 and SMNHTAU In.492699.

Emended diagnosis. Can be distinguished from other species of the genus *Dachibangus* by the following combination of characters: tegmen length about 19–24 mm (almost 30 mm in *D. trimaculatus* and *D. pallidus*); tegmen length-to-width ratio about 2.9–3.0 (about 3.7 in *D. pouilloni*); base of stem MP slightly curved, then gradually diverging away from RP (very curved, then subparallel to RP in *D. trimaculatus* and *D. partialis*; straight, then gradually diverging away from RP in *D. pouilloni*); MP terminals oriented obliquely posteriad relative to anterior wing margin at midlength (MP terminals parallel to anterior wing margin in *D. pouilloni* and *D. pallidus*); tornus almost flat (convex in *D. trimaculatus*); eyespots near apexes of medial and cubital cells (eyesspots near base of radial and medial cells in *D. trimaculatus*); narrow stripes of dark pigmentation along each terminal branch of MP (absent in *D. pouilloni* and *D. pallidus*).

Remarks. The tegmen length of the type specimen of *D. zhuoyuanshengi* was reported as 24 mm, which is slightly larger than the sizes of the new specimens, 21 mm and 18 mm for NIGP210912 and SMNHTAU In.492699, respectively. The length of the latter specimen was likely shortened during taphonomy by the prominent crease present in the middle portion of the wing. Additionally, the remaining size discrepancy is small but should be reviewed in future studies, as the proper size of the holotype could not be confirmed from the scale bars provided by Wang *et al.* (2025), which show high variance and place the tegmen length between 24 and 27 mm.

Despite differences in the branching pattern of MP, the two additional specimens described herein can be recognized as conspecific with the type specimen of *D. zhuoyuanshengi*. Based on their consistent tegminal colour patterns. This is indicated particularly by the presence of longitudinal dark stripes adhering to the terminals of MP (also present in *D. trimaculatus*) and by the unique arrangement of eyespots on the tegmen surface, with two eyespots placed near the apexes of the medial (larger) and cubital cells (smaller).

Description of specimen NIGP210912

Tegmen (Fig. 2D). Isolated tegmen 21 mm in length and 6.9 mm in width, about 3.0 times longer than wide;

tegmen surface covered in polygonal meshwork of delicate veinlets, costal margin arched, anteroapical angle rounded, posteroapical angle broadly rounded, tornus bowed, posterior margin straight; tegmen costal area narrow, narrowing distally and almost reaching tegmen apex; veins ScP+RA and RP simple and parallel to costal margin; apices of ScP+RA and RP attenuated, and curve posteriad to parallel tegmen margin; radial cell about as wide as median cell; stem MP basally curved, then subparallel to costal margin; MP with six terminals, forked about one-third from tegmen apex, branching into MP₁₊₂ and MP₃₊₄; MP₁₊₂ forked at about same level as MP₃₊₄; MP₁₊₂ reaching margin with three terminals (MP_{1a}, MP_{1b}, and MP₂); MP₃₊₄ reaching margin with three terminals (MP_{3a}, MP_{3b}, and MP₄); CuA forked deeply, about one-third from wing base; CuA₁ and CuA₂ diverge at a 45° angle; CuA₁ slightly bowed anteriorly; CuA₂ markedly sinuate, with distal portion bowed anteriorly; CuP simple, slightly sinuate; PCu and A₁ fused at basal half of tegmen, PCu flat at junction with A₁; unfused section of A₁ overlapping with stem CuA for about half its length.

Tegminal coloration consists of four dark irregularly shaped transverse bands; colour bands are anteriorly separated at wing margins by light areas; pigmented areas are crossed by light-coloured crossveins and possess darker and lighter spots; wing apex with a series of narrow longitudinal dark stripes adhering to terminals of MP; three eyespots on tegmen surface, a small eyespot 0.9 mm wide at base of postcostal cell, an eyespot 0.9 mm wide near apex of cubital cell, and a prominent eyespot 1.4 mm wide situated near the apex of medial cell; all eyespots present on pigmented bands and consist of a main dark disc with central highlight.

Description of specimen SMNHTAU In.492699.

Macropterous adult; incomplete specimen with part of pronotum, dorsal mesonotum, and wings preserved.

Thorax (Fig. 2E). Pronotum mostly missing, lateral margins keeled, posterolateral angle sharp and protruding laterally; coloration finely mottled. Mesonotum incomplete, about 3.9 mm long, surface covered in sparsely distributed granules; mesonotum median carinae paired and spreading posteriorly, lateral carinae bowed laterally and converging anteriorly; mesoscutellum small with transverse wrinkles; tegula distinct. Coloration consists of fine irregular mottling.

Tegmen (Fig. 2E). Tegmen damaged in a transverse line across its median; length 18.8 mm and width 6.5 mm, about 2.9 times longer than wide; tegmen surface covered in polygonal meshwork of delicate veinlets, costal margin arched, anteroapical angle rounded, posteroapical angle broadly rounded, tornus bowed, posterior margin straight; tegmen costal area narrow, narrowing distally and almost reaching tegmen apex; veins ScP+RA and RP simple

and parallel to costal margin; apices of ScP+RA and RP attenuated, and curve posteriad to parallel tegmen margin; radial cell about as wide as median cell; stem MP basally curved, then subparallel to costal margin; MP with five terminals, forked about one-third from tegmen apex, branching into MP_{1+2} and MP_{3+4} ; MP_{1+2} forked at about same level as MP_{3+4} ; MP_{1+2} reaching margin with two terminals (MP_1 and MP_2); MP_{3+4} reaching margin with three terminals (MP_{3a} , MP_{3b} , and MP_4); CuA forked deeply, about one-third from wing base; CuA_1 and CuA_2 diverge at a 45° angle; CuA_1 slightly bowed anteriorly; CuA_2 markedly sinuate, with distal portion bowed anteriorly; CuP simple, slightly sinuate; PCu and A_1 fused at basal half of tegmen, PCu flat at junction with A_1 ; unfused section of A_1 overlapping with stem CuA for about half its length.

Tegminal coloration consists of four dark irregularly shaped transverse bands; colour bands are separated at anterior wing margin by light areas; pigmented areas are crossed by light-coloured crossveins and possess darker and lighter spots; wing apex with a series of narrow longitudinal dark stripes adhering to terminals of MP; three elliptical eyespots on tegmen surface, a small eyespot 1.3 mm wide at base of postcostal cell, an eyespot 0.8 mm wide near apex of cubital cell, and a prominent eyespot 1.6 mm wide situated near apex of medial cell; all eyespots present on pigmented bands and consist of a main dark disc with central highlight.

Discussion

The specimens described in this study can be assigned to Mimarachnidae based on the following characters: pronotum and mesonotum with paired median carinae, simplified wing venation, tegmen surface covered in a polygonal meshwork of veinlets, and a weakly defined basal cell (Shcherbakov, 2007).

Understanding the variability of structural traits among species is imperative for a robust morphology-based systematic assessment of any taxon. This is especially true for fossil organisms, for which morphology is often the only means of extracting taxonomically useful character traits. Previously, most species of Mimarachnidae were described based on a single specimen, thus limiting the assessment of character stability to the differences observed within the same organism, such as changes in venation between the right and left wings.

The specimens examined in this study are attributed to the genus *Dachibangus* (see emended diagnosis), expanding the known morphological disparity of the genus and providing additional information about the intra- and interspecific variability of character states. In mimarachnid planthoppers, tegminal venation has often

been used to diagnose new taxa. The branching pattern of MP was particularly relied upon in generic diagnoses but was later shown to have high intra- and interspecific variability, sometimes even differing in the right and left wings of the same individual (Jiang *et al.*, 2020; Fabrikant *et al.*, 2024a, b). As such, previous studies have cautioned against using the exact arrangement of MP terminals as a primary distinction between taxa (Jiang *et al.*, 2020; Fu & Huang, 2021; Fabrikant *et al.*, 2024a). However, some genera of Mimarachnidae with simplified venation, such as *Burmissus* and *Cretodorus*, show considerable intrageneric stability in the distal venation of the tegmen, possibly suggesting that venation plasticity varies across the family (He *et al.*, 2022, Fig. 1). Our study supports these observations and further explores the stability of tegminal characters in *Dachibangus* by describing multiple congeneric and conspecific specimens.

The newly described specimens of *Dachibangus* display marked intraspecific variation in the branching patterns of MP terminals (Fig. 3). Variation among individuals of the same species is demonstrated by multiple specimens of *D. zhuoyuanshengi* **comb. nov.** (Fig. 3), whereas variation within a single individual is evident in the holotype of *D. pouilloni* **sp. nov.**, which differs in the number of terminals between the left and right wings (Fig. 1A).

Furthermore, in the holotype of *Dachibangus pallidus* **sp. nov.**, the MP_{3a} terminal is distally attenuated and follows the shape of the polygonal veinlet meshwork, unlike all other MP terminals, which are straight and well defined throughout their entire length. The underdeveloped morphology of the vein may suggest incomplete morphogenesis and further supports variation in the branching architecture of MP in *Dachibangus*. Variation in terminal branching patterns in *Dachibangus* is further supported by the presence of a forked CuA_1 vein in *D. pallidus*, the first occurrence reported for Mimarachnidae. The intraspecific variability of this particular trait is unclear, but it is tentatively considered as a diagnostic character for the species.

Additional differences observed in the wings of the examined specimens include variation in wing shape and slight changes in colour patterns. For example, the concavity of the tornus is conspicuous in *D. trimaculatus* but much less pronounced in all other species of this genus. Additionally, the shape of the wing apex appears to vary from more angular to more rounded between species and remains of unclear diagnostic value.

Unlike the distal venation in this genus, the tegminal colour patterns, particularly the placement and number of eyespots, appear to be stable within species, as illustrated by the identical coloration of all three known specimens of *D. zhuoyuanshengi*. This is consistent with previous

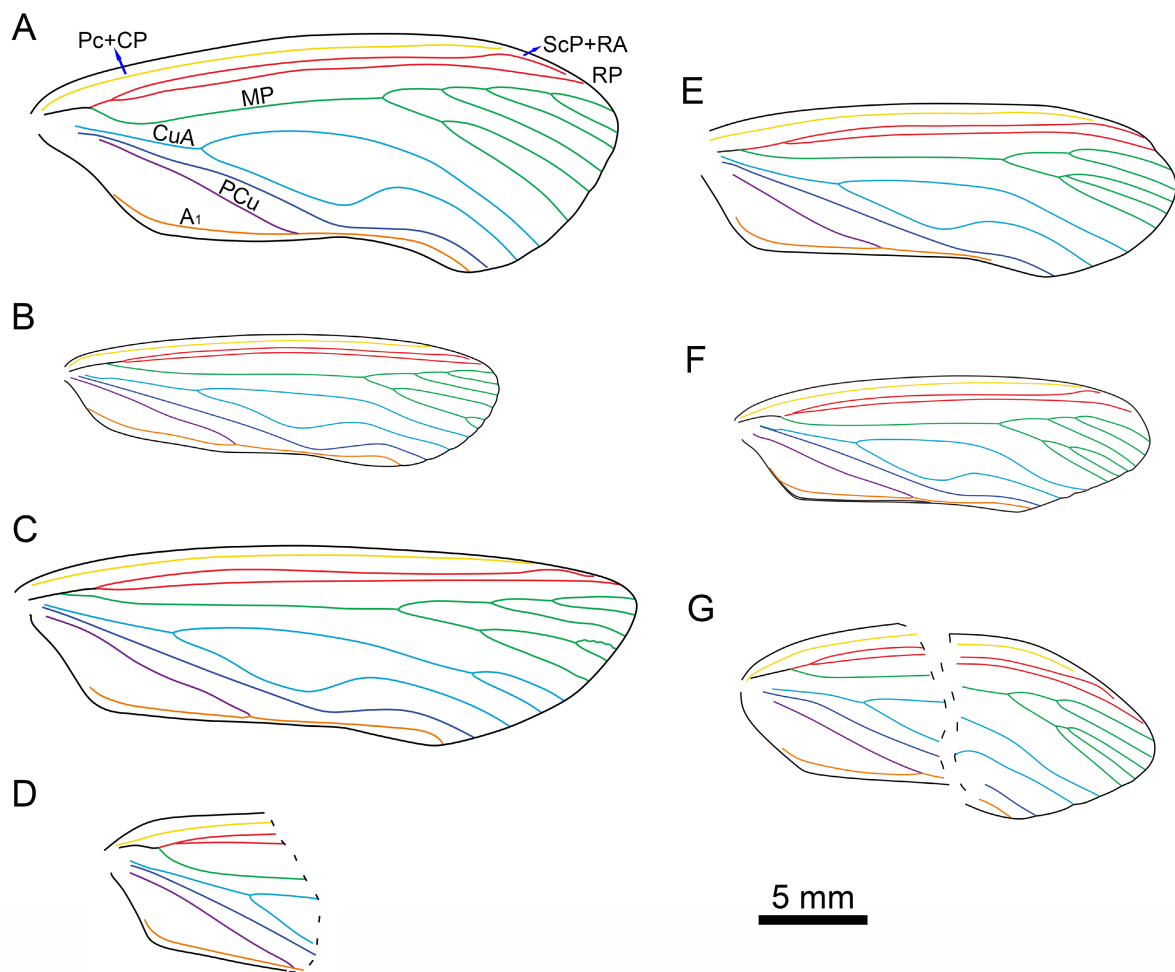


FIGURE 3. Line drawings of *Dachibangus*. **A**, *Dachibangus trimaculatus* Jiang *et al.*, 2018. **B**, *Dachibangus pouilloni* **sp. nov.**, JMP-BU-094. **C**, *Dachibangus pallidus* **sp. nov.**, NIGP210910. **D**, *Dachibangus partialis* **sp. nov.**, NIGP210911. **E**, holotype of *Dachibangus zhuoyuanshengi* (Wang *et al.*, 2025). **F**, new specimen of *Dachibangus zhuoyuanshengi*, NIGP210912. **G**, new specimen of *Dachibangus zhuoyuanshengi*, SMNHTAU In.492699.

observations of colour-pattern stability in species of Mimarachnidae for which multiple specimens are known (e.g., *Mimaeurypterus* and *Mimarachne*).

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