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Research Article

New genera and species of Ripipterygidae (Orthoptera, Tridactyloidea) from mid-Cretaceous Kachin amber

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https://zoobank.org/510CDD4C-55BA-496A-9457-C0275FC7EBDF

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Abstract

Two new genera and species of Ripipterygidae Ander, 1939 are described from mid-Cretaceous Kachin amber of Northern Myanmar. *Ozymandipteryx campana* **gen. et sp. nov.** is remarkable for its absent or very reduced metatarsus. In modern species of Tridactyloidea, a reduced metatarsus can only be found in the Tridactylidae Brullé, 1835 genera *Ellipes* Scudder, 1902 and *Xya* Latreille, 1809, but not in Ripipterygidae. *Magnidactylus robustus* Xu et al., 2020, type species of the genus, is found to share the character of a fully reduced metatarsus (apical spurs were previously misinterpreted as metatarsus), but *M. robustus* differs from *O. campana* in several important characters and hence remains a separate genus. However, a new genus *Yakkhapipteryx* is erected to include the other two former *Magnidactylus* species *M. mirus* Gu et al., 2022 (*Yakkhapipteryx mirus* **comb. nov.**) and *M. gracilis* Gu et al., 2022 (*Yakkhapipteryx gracilis* **comb. nov.**), which both have a metatarsus in normal condition. Another newly described taxon is *Ciconipteryx bidactylus* **gen. et sp. nov.** This species is the first fossil Ripipterygidae with only two dactyls on its protibia, a feature it shares with the modern species *Mirhipipteryx pulicaria* (Saussure, 1896). *Ciconipteryx bidactylus* stands out due to its long mid- and hindlegs in relation to its body size. This character may have enabled it to perform very efficient jumps. The new species add to the diversity of Ripipterygidae from Kachin amber, expanding our knowledge of this little studied family and raising new possibilities for interpreting their evolutionary history.

Key Words

Caelifera, fossil, jumping behavior, mud crickets, pygmy mole crickets, taxonomy

Introduction

Alongside the more diverse and well-known Acrididea Targioni-Tozzetti, 1882, Tridactylidea Brullé, 1835 is one of the two infraorders of the Caelifera Ander, 1936, the short-horned grasshoppers, which include more than 40% of modern-day orthopteran diversity (Cigliano et al. 2025). However, next to their grasshopper relatives, which are larger, more conspicuous, and generally gain more attention both from science and laypersons alike, the Tridactylidea are a group with many aspects of their behavior and ecology still poorly understood (Ugolini 2021).

Systematically, Tridactylidea consist of two superfamilies, the Dzhajloutshelloidea Gorochov, 1994 (entirely fossil, 9 species) and the Tridactyloidea Brullé, 1835 (257 species, both extant and fossil). A third taxon, the enigmatic Burmecaelidae Uchida et al., 2024, is currently considered Tridactylidea *incerta sedis* (Schall et al. 2025). Within Tridactyloidea are three families. The Cylindrachetidae Giglio-Tos, 1914 are exclusively found in Argentina, Australia and Papua New Guinea, and are heavily adapted to an underground lifestyle. Their habitus has become almost worm-like with completely reduced or absent wings and ovipositor and very shortened legs. There is no fossil record of this family as of yet. The other two families are the Tridactylidae Brullé, 1835 and the Ripipterygidae Ander, 1939. In modern representatives, Ripipterygidae can be differentiated from Tridactylidae by 1) their cerci being one-segmented (two-segmented in Tridactylidae), 2) their mesotibiae being of roughly the same width as their mesofemora (in Tridactylidae the mesotibiae are distinctly inflated and wider than the mesofemora), 3) visible valves of the ovipositor (the ovipositor is reduced to the point where it is invisible in Tridactylidae), and 4) paraproctal lobes apically with a distinct array of setae (distinct apical setae not present in Tridactylidae) (Gorochov 2010; Heads 2010; Gu et al. 2022). Tridactylidae have a cosmopolitan distribution (except for Antarctica), whereas Ripipterygidae are only known from South and Central America (Cigliano et al. 2025).

The fossil record of Tridactylidae and Ripipterygidae is not very extensive, but several findings have been made during recent years in Kachin amber from the mid-Cretaceous of Myanmar which has revealed a stunning diversity of these groups (Zhao et al. 2024). Other localities with reported occurrences of fossil Tridactylidae and Ripipterygidae are the Crato Formation of Brazil (Lower Cretaceous) (Martins-Neto 1990), amber from the Dominican Republic (Miocene) (Heads 2010; Poinar 2018), France (Eocene) (Azar and Nel 2008), Great Britain (Lower Cretaceous) (Gorochov et al. 2006), Russia (Lower Cretaceous) (Gorochov in Kopylov et al. 2020; Sharov 1968) and Mongolia (Lower Cretaceous) (Gorochov 1992) (for a comprehensive table of the known fossil record of Tridactyloidea see Zhao et al. 2024). The Tridactyloidea found in amber from Myanmar are especially important for understanding the evolution of the superfamily, because they are very diverse (ca. 50% of fossil Tridactyloidea have been found in Kachin amber) and are often preserved with almost life-like detail.

In this study, we describe three new genera and two new species of Ripipterygidae from mid-Cretaceous Kachin amber. Both exhibit an intriguing combination of characters which provide important insights into the evolutionary history that led to the distinct modern clades Ripipterygidae and Tridactylidae.

Materials and methods

The amber pieces presented in this study are housed in the collection of the Leibniz Institute for the Analysis of Biodiversity Change (Hamburg) (collection numbers GPIH07209 and GPIH07210). They originate from Myanmar and were discovered at a mining site either near Tanai village or Hkamti village. The age of the two amber sites differs by ca. 10 my.; amber from Tanai is estimated to be 98.79 ± 0.62 My old (Shi et al. 2012), whereas amber from Hkamti is ca. 110 My old (Xing and Qiu 2020). Tragically, political instability and enforcement of human rights continue to be problematic in Myanmar. Unfortunately, we do not know the year the amber pieces in this study were originally obtained, i. e. pre- or post-2017. However, after considering the local situation in Myanmar as described in Peretti (2020) and Peretti (2021), we think that stopping scientific amber research (as demanded by Engel (2020)) is unjustified.

Imaging of the specimens was conducted using a DUN. Inc. stacking system with a Canon EOS 5Dsr Camera. We used a 65 mm lens and a magnification of 2.5×. Individual pictures were taken with VD Passport and Capture One program (Capture One A/S, Denmark) and stacked with Zerene Stacker (Zerene Systems LLC, Washington, USA). They were edited with Photoshop CS6 Extended application by Adobe Inc. (USA; https://www.adobe.com). Further modifications (e. g. scale-bars) and creation of image collections were done in Inkscape (v. 1.3.2) (the INKSCAPE Team 2025). Drawings were created in GIMP (v. 2.10.30) (the GIMP Team 2025).

The jitter plot featured in the comparison of leg lengths of Tridactyloidea Brullé, 1835 species in the discussion was created with PAST5 (Hammer et al. 2001) and Inkscape.

The taxonomy in this study follows the Orthoptera Species File (OSF) (https://orthoptera.speciesfile.org/, Cigliano et al. 2025).

Systematic paleontology

Order Orthoptera Olivier, 1789
Suborder Caelifera Ander, 1936
Infraorder Tridactylidea Brullé, 1835
Superfamily Tridactyloidea Brullé, 1835
Family Ripipterygidae Ander, 1939

Genus *Ozymandipteryx* gen. nov.

https://zoobank.org/A66BF25D-834A-4457-97B9-6419485A66E8

Type species. *Ozymandipteryx campana* sp. nov.

Etymology. Named after Ozymandias, a poem by Percy Bysshe Shelley (1818) about the loss of greatness and forgetting of glory by the passing of time. It refers to the state of absent/very reduced metatarsi in the genus, which can be found in the modern-day Tridactylidae genera *Ellipes* Scudder, 1902 and *Xya* Latreille, 1809, but is not present in any extant Ripipterygidae.

Diagnosis. Absence or almost complete reduction of the metatarsus. Protibiae without dactyls. Mesotibiae not inflated. Cerci one-segmented, cylindrical, with long hairs. Forewing and hindwing present. Metafemur with two small apical protrusions. Dorsal metatibial ridge distally with slight serration. Apical spurs of metatibia much longer (4×) than subapical spurs.

Ozymandipteryx campana sp. nov.

https://zoobank.org/49DE4348-1B1C-4B44-B2FC-9087CACB8272

Figs 1, 2

Etymology. The species' name is Latin for "bell". It is meant to refer to the "Great Bell of Dhammazedi", a treasure lost in time.

Locality and horizon. The specimen was included in amber found in Hkamti, Sagaing Division, Myanmar or Tanai, Kachin State Burma, Myanmar, two nearby amber mining locations. The amber from Hkamti is ca. 110 My and the amber from Tanai is ca. 99 My old.

Holotype. Sex unknown. Specimen part of the LIB-Hamburg collection; collection number GPIH07209 (ex collection Martin Husemann MH0082).

Diagnosis of species. As for genus (monotypic).

Description. Preservation of complete specimen, unfortunately with some parts obscured by structural damage inside the amber.

Measurements: Some measurements could not be precisely made, because the corresponding feature was somewhat obscured. Such measurements are indicated with a "ca.". Body length ca. 1.72–1.76 mm (head to abdominal apex). Forewing length ca. 0.72 mm. Hindwing length ca. 1.26 mm. Head height ca. 0.5 mm. Mesofemur length 0.89 mm. Mesotibia length 0.72 mm. Mesofemur width/mesotibia width 1.18 (both at max. width). Pronotum length (dorsal) 0.42 mm. Metafemur length 1.18 mm, width 0.54 mm. Metatibia length 1.17 mm, width 0.09 mm. Length of subapical spurs 0.08 mm and of apical spurs 0.32 mm. Cercus length ca. 0.24 mm.

Head: Antennae 10-segmented (including scape and pedicel). 10th antennomere larger than previous and bean shaped. Compound eyes protruding from head. Ocelli not visible.

Thorax: Pronotum not prolonged over abdomen, with elevation from thorax. Both forewings and hindwings present. Hindwings not prolonged over abdomen.

Legs: Prothoracic leg: Tibia inflated. Dorsal margin with four evenly spaced hairs. No dactyls present. Tarsus very slender, with two claws.

Mesothoracic leg: Femur without hair or appendages. Tibia not inflated, with hairs on ventral margin along the entire length and also on dorsal margin towards apex. Tarsus two-segmented, bearing two claws.

Metathoracic leg: Femur greatly inflated along its entire length. Two small protrusions apically. Dorsal tibial ridge distally with slight serration proximal to subapical spurs. Two subapical and two apical spurs present. Apical spurs much longer than subapical spurs. Metatarsus not visible, either absent or too vestigial to be seen.

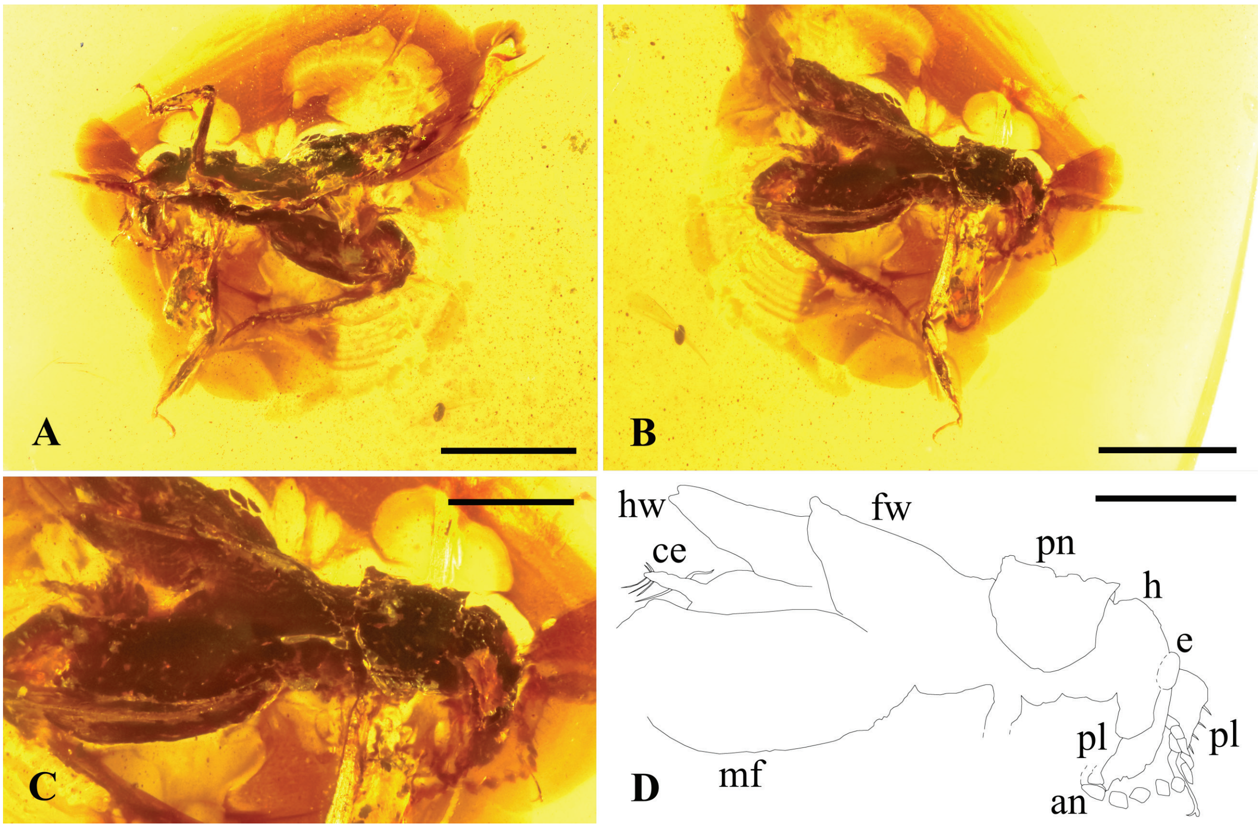

Figure 1. *Ozymandipteryx campana* gen. et sp. nov. holotype (sex unknown), collection number GPIH07209. **A.** Specimen, left; **B.** Specimen, right; **C, D.** Detail of body excluding legs as image and schematic drawing. **Abbreviations:** hw = hindwing; ce = cercus; fw = forewing; pn = pronotum; h = head; e = compound eye; pl = prothoracic leg; an = antenna; mf = metafemur. Scale bars: 1 mm (**A**, **B**); 0.5 mm (**C**, **D**).

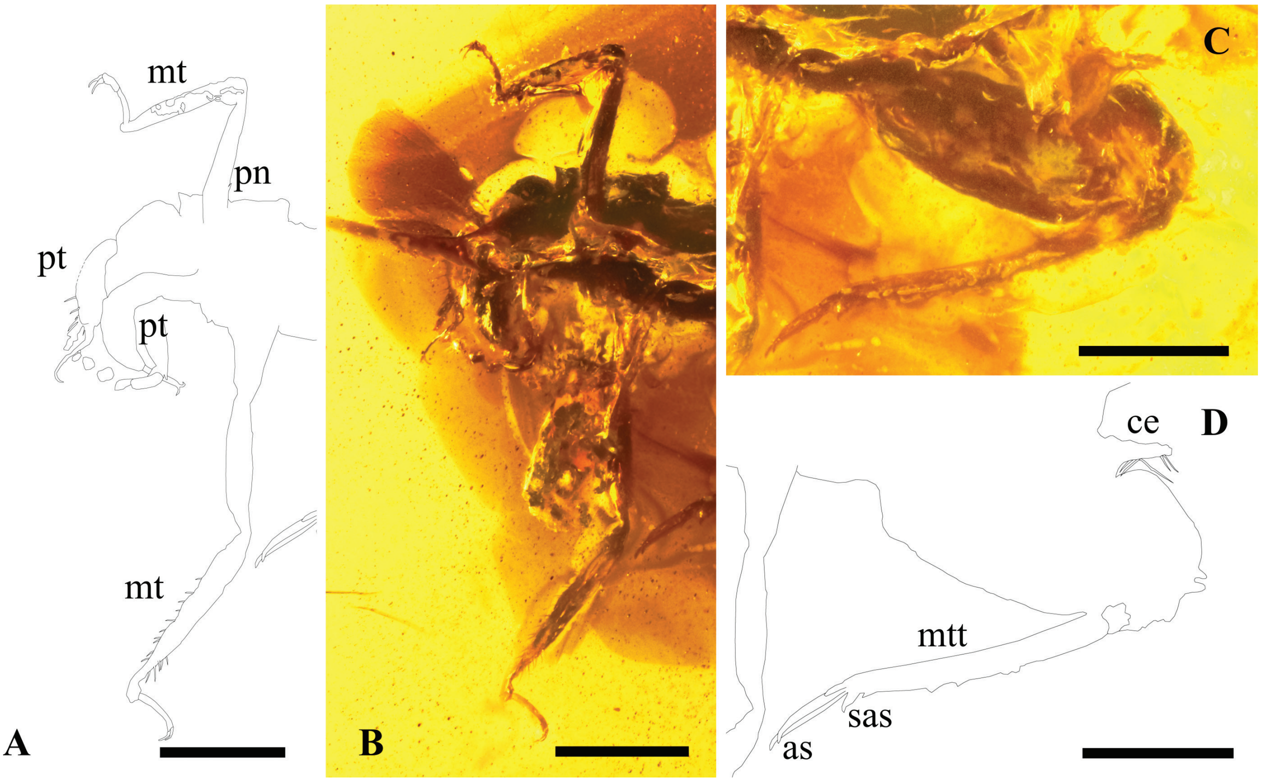

Figure 2. *Ozymandipteryx campana* gen. et sp. nov. holotype (sex unknown), collection number GPIH07209. **A, B.** Detail of head, prothoracic- and mesothoracic legs as image and schematic drawing. **Abbreviations:** pt = protibia; mt = mesotibia; pn = pronotum; **C, D.** Detail of metathoracic leg and cercus as image and schematic drawing. **Abbreviations:** as = apical spurs; sas = subapical spurs; mtt = metatibia; ce = cercus. Scale bars: 0.5 mm.

Abdomen: Only one cercus visible, one-segmented and cylindrical in shape. Setulose with long hair.

Remarks. The new species can be assigned to the Ripipterygidae based on the following characters: 1) Cercus one-segmented and 2) mesotibiae not inflated. In this family, it differs from the other members found in Kachin amber by an absent or very vestigial metatarsus, a protibia without dactyls and two small protrusions on the apex of its metafemur. The protibia without dactyls is a character the new species shares with some members of fossil Tridactylidae: *Burmadactylus grimaldii* Heads, 2009, *Paraxya hui* Cao et al., 2019 and *Ellipes dominicana* Poinar, 2020. Likewise, a vestigial metatarsus is also present in some extant Tridactylidae, namely the genera *Ellipes* Scudder, 1902 and *Xya* Latreille, 1809 (Günther 1977; Heads 2010).

Based on our current understanding of Tridactyloidea morphology, the presence of characters only known from Tridactylidae among the extant fauna in a fossil specimen that should be placed in Ripipterygidae, suggests four possible conclusions: 1) Our understanding of Tridactyloidea morphology is not complete. 2) A fully reduced metatarsus and protibia without dactyls were present for some time in the ancestors of modern Ripipterygidae, but this lineage was subsequently lost. 3) *Ozymandipteryx* does not actually belong to the Ripipterygidae but is instead a member of a stem-group Tridactyloidea occurring prior to the split of Tridactylidae and Ripipterygidae. 4) *Ozymandipteryx* is part of a separate lineage of Tridactyloidea not yet described. If one of the last two hypotheses is true, attribution of fossil Tridactyloidea from the Cretaceous may have to be reconsidered; however, this can only be validated by future findings.

Interestingly, *O. campana* is not the first fossil species with a fully reduced metatarsus. In the description of *Magnidactylus robustus* Xu et al., 2020, the apical spurs of the specimen were interpreted as the metatarsus. But in fact, the metatarsus appears to be absent in *M. robustus* just like in *O. campana*. This finding may suggest a closer phylogenetic relationship between the two species. However, *M. robustus* differs from *O. campana* by the presence of four dactyls on its protibia, no hairs on the cerci and no apical protrusions on the metafemur. Further, *M. robustus* is more than three times the size of *O. campana* (Xu et al., 2020). With this re-interpretation of the morphology of *M. robustus*, the species does not belong to the same genus as *Magnidactylus mirus* Gu et al., 2022 and *M. gracilis* Gu et al., 2022, which both possess a normal (for Tridactyloidea) metatarsus. We propose *Yakkhapipteryx* gen nov. as a new genus to house *M. mirus* and *M. gracilis*.

Genus *Yakkhapipteryx* gen. nov.

https://zoobank.org/CB55611A-D029-4FB1-A374-7154C54C006B

Type species. *Yakkhapipteryx mirus* comb. nov. (Gu et al., 2022)

Included species. *Yakkhapipteryx mirus* comb. nov., *Y. gracilis* comb. nov. (Gu et al., 2022)

Etymology. Named after the Yakkha (Sanskrit: Yaksha), guardians of buried treasures (in reference to amber) from Burmese mythology.

Diagnosis. As provided by Gu et al. (2022) for *Magnidactylus*, which the authors based on the specimens now assigned to *Yakkhapipteryx*.

Genus *Ciconipteryx* gen. nov.

https://zoobank.org/984DDC59-027C-466D-8AF0-7C2A8758B3C4

Type species. *Ciconipteryx bidactylus* sp. nov.

Etymology. The new genus is named after its long legs. Ciconi- is derived from the bird family Ciconiidae, the storks.

Diagnosis. Very small body. Interocular distance larger than width of compound eye. Protibia with two dactyls. Mesothoracic leg longer than body (head to abdominal apex) and very slender along entire length (femur and tibia not much wider than tarsus). Metafemur as long as body. Forewings present, four to five veins visible. Cercus somewhat longer than paraproctal lobes. Both structures setulose; setae more prominent on paraproctal lobes. Valves of ovipositor visible, much shorter than paraproctal lobes.

Ciconipteryx bidactylus sp. nov.

https://zoobank.org/209312AD-9098-4290-A0F6-ED5A0D9D2814

Figs 3–6

Etymology. The species' name refers to the protibia with (only) two dactyls.

Locality and horizon. The specimen was included in amber found in Hkamti, Sagaing Division, Myanmar or Tanai, Kachin State Burma, Myanmar, two nearby amber mining locations. The amber from Hkamti is ca. 110 My and the amber from Tanai ca. 99 My old.

Holotype. Female. Specimen part of the LIB-Hamburg collection, collection number GPIH07210 (ex collection Martin Husemann MH0093).

Diagnosis of species. As for genus (monotypic).

Description. The specimen is relatively well preserved, but unfortunately the apical region of the metatibia and the metatarsus are missing.

***Measurements*:** Body length (head to abdominal apex) 1.4 mm. Head height 0.6 mm. Eye height 0.21 mm, width 0.11 mm. Interocular distance (mid-eye level) ca. 0.2 mm. Protibia 0.24 mm long. Longest dactyl 0.05 mm long. Mesofemur 0.67 mm long. Mesotibia 0.59 mm long. Mesotarsus 0.27 mm long. Metafemur 1.4 mm. Cercus 0.12 mm long. Paraproctal lobes 0.1 mm long.

***Head*:** Antennae not preserved. Interocular distance wider than compound eye width. Eyes somewhat tear-shaped, laterally protruding from head. Ocelli not visible.

***Thorax*:** Pronotum with posterior margin straight (not rounded or pointed), covering base of forewings. Pronotum without elevation. Forewings present with four or five simple veins visible. Hindwings present, shorter than abdomen.

***Legs*:** Prothoracic leg: Femur and tibia setulose with long hairs. Tibia only slightly inflated with two relatively long dactyls. Tarsus with two claws.

Mesothoracic leg: Very long and slender along entire length. Femur inconspicuous. Tibia not inflated. With 8–11 fine spines on the ventral margin of the distal half and five hairs subapically on the dorsal side. Tarsus two-segmented with first segment much shorter than second. Bulbous apical lobe on first tarsal segment. Second tarsal segment with two claws.

Metathoracic leg: Femur long and inflated along its entire length. Only ca. proximal third of metatibia preserved.

***Abdomen*:** Cercus one-segmented, cylindrical in shape with some hairs. Paraproctal lobes one-segmented, sligthly clavate and slightly shorter than cercus; setulose with long hair, especially apically. From a dorsal view apices of ovipositor valves just visible between paraproctal lobes.

Figure 3. *Ciconipteryx bidactylus* gen. et sp. nov. holotype female, collection number GPIH07210. **A, B.** Specimen in frontal view. Scale bars: 1 mm.

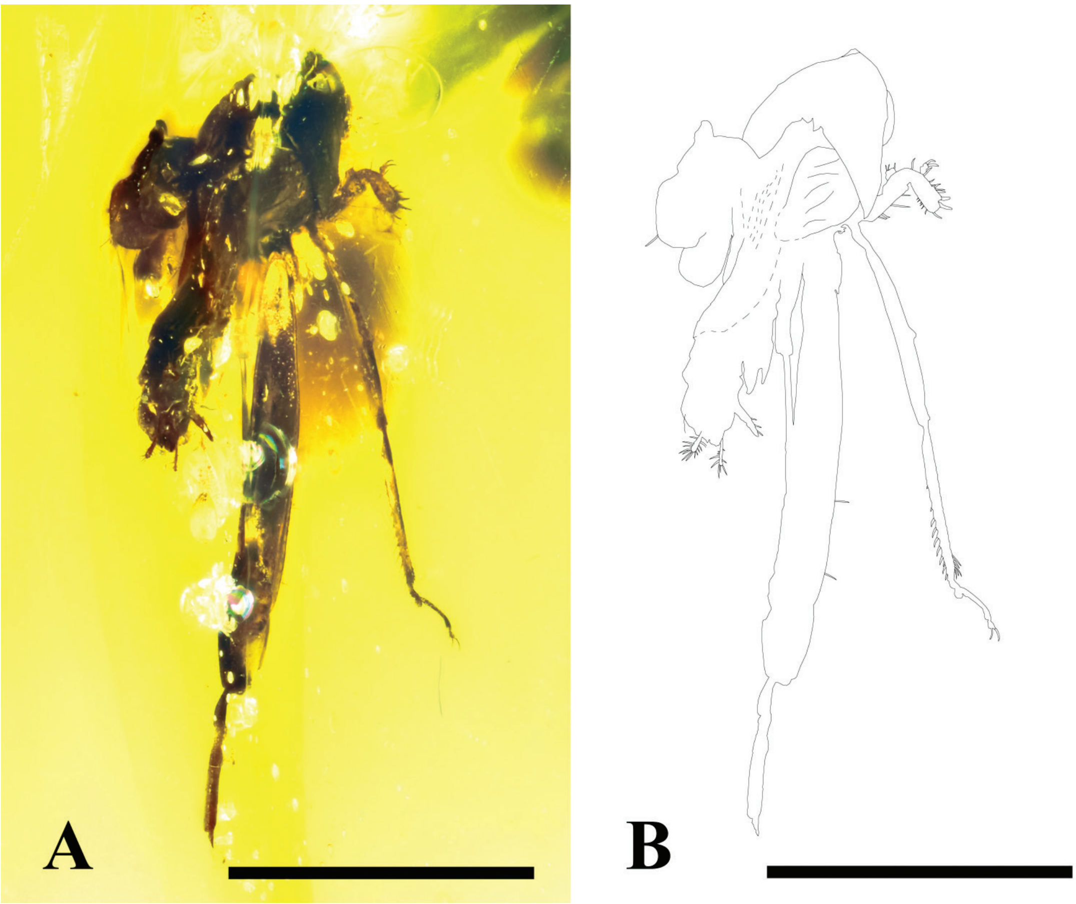

Figure 4. *Ciconipteryx bidactylus* gen. et sp. nov. holotype female, collection number GPIH07210. **A, B.** Specimen in dorsal view. Scale bars: 1 mm.

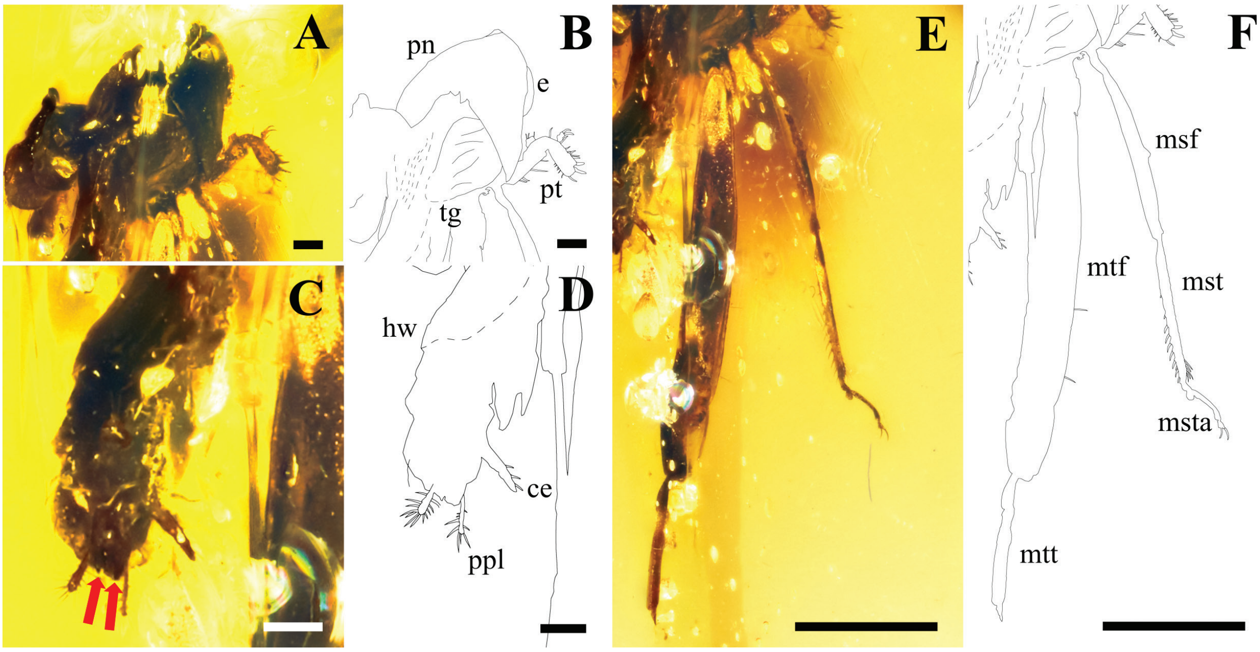

Figure 5. *Ciconipteryx bidactylus* gen. et sp. nov. holotype female, collection number GPIH07210. **A, B.** Detail of head region in dorsal view as image and schematic drawing. **Abbreviations:** pn = pronotum; tg = tegmen; e = eye; pt = prothoracic leg; **C, D.** Detail of abdominal region in dorsal view as image and schematic drawing. Red arrows in C mark valves of ovipositor just visible between paraproctal lobes. **Abbreviations:** hw = hindwing; ppl = paraproctal lobe; ce = cercus; **E, F.** Detail of meso- and metathoracic leg in dorsal view as image and schematic drawing. **Abbreviations:** mtt = metatibia; mtf = metafemur; msf = mesofemur; mst = mesotibia; msta = mesotarsus. Scale bars: 0.1 mm (**A–D**); 0.5 mm (**E, F**).

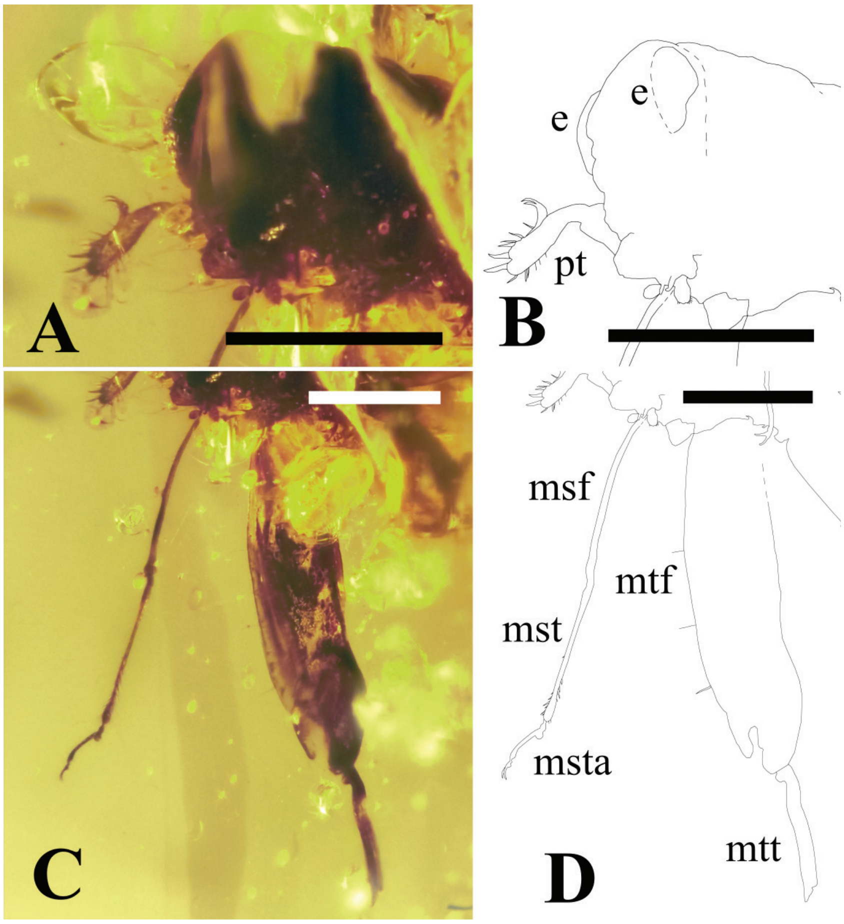

Figure 6. *Ciconipteryx bidactylus* gen. et sp. nov. holotype female, collection number GPIH07210. **A, B.** Detail of head and prothoracic leg in frontal view as image and schematic drawing. **Abbreviations:** e = compound eye; pt = prothoracic leg; **C, D.** Detail of meso- and metathoracic leg in frontal view as image and schematic drawing. **Abbreviations:** msf = mesofemur; mst = mesotibia; msta = mesotarsus; mtf = metafemur; mtt = metatibia. Scale bars: 0.5 mm.

Remarks. *Ciconipteryx bidactylus* gen. et sp. nov. is assigned to Ripipterygidae based on the following characters: 1) Cercus one-segmented. 2) Mesotibiae not inflated. 3) Ovipositor visible. 4) Paraproctal lobes with distinct array of setae. It differs from previously described genera of Kachin amber Ripipterygidae by its two dactyls on the protibia (in other species from this locality and horizon there are either four dactyls or 0, as in *Ozymandipteryx campana* gen. et sp. nov.) and the markedly longer mesothoracic leg and metafemur which are longer or just as long as the body, respectively. The two dactyls on the protibia represent a character shared between *Ciconipteryx* and some species of the fossil as well as extant genus *Mirhipipteryx* Günther, 1969. While certain species of this genus, such as *M. antillarum* Heads, 2010, are reported to have three protibial dactyls (Heads 2010), some modern species such as *M. pulicaria* (Saussure, 1896) are said to have only two (Baena-Bejarano et al. 2018), as in *C. bidactylus*. However, *Ciconipteryx* can be differentiated from *Mirhipipteryx* by its proportionally longer legs (in *M. pulicaria* the mesothoracic leg length is only ca. 60% of the total body length) and its interocular distance between the compound eyes, which is wider than the compound eye width in *Ciconipteryx*, but significantly shorter in *Mirhipipteryx* (Heads 2010; Baena-Bejarano 2018). Species of the other extant Ripipterygidae genus, *Ripipteryx* Newman, 1834, are much larger than *Ciconipteryx* and *Mirhipipteryx* (Heads 2010).

Discussion

In this study, we described two new members of Ripipterygidae Ander, 1939 from mid-Cretaceous Kachin amber from Myanmar, *Ozymandipteryx campana* gen. et sp. nov. and *Ciconipteryx bidactylus* gen. et sp. nov. Both taxa stand out from previously described fossil ripipterygids as well as extant representatives due to their unique combination of morphological characters. These findings have intriguing implications for the diversity and evolution of Ripipterygidae and also Tridactyloidea Brullé, 1835. Numerous findings during recent years (Xu et al. 2020a, 2020b; Gu et al. 2022; Zhu et al. 2023; Zhao et al. 2023, 2024) strongly suggest that the diversity of ripipterygids was high in the Myanmar amber forest. Not only were numerous species present, these taxa also show a surprising variation of characters, many of which cannot be found in modern members of the family, but are present in members of the sister family Tridactylidae Brullé, 1835. These include the presence of a vestigial metatarsus (fossil: *O. campana*, *Magnidactylus robustus* Xu et al., 2020 – Ripipterygidae; extant: *Xya* Latreille, 1809, *Ellipes* Scudder, 1902 – Tridactylidae), the inflation of the mesotibia (fossil *Kallosripipteryx zhangi* Zhao et al., 2024 – Ripipterygidae; extant: Tridactylidae (an inflated mesotibia is diagnostic of all modern tridactylids) and the presence of a subapical denticular process of the metatarsus, which can be found in fossil members of Ripipterygidae (e. g. Gu et al. 2022; Zhao et al. 2023) and Tridactylidae (Heads 2009; Fan et al. 2023), but is exclusively present in the latter family in the extant fauna.

The presence of several characters in fossil Ripipterygidae that were previously considered to be diagnostic of certain groups within Tridactylidae (or in the case of an inflated mesotibia for Tridactylidae as a whole) presents both a problem and an opportunity for resolving phylogenetic relationships within both families. Ideally, attempts towards this endeavor should either be based on molecular data (which cannot be fooled by the conflicting presence/absence of certain morphological characters in fossil vs. extant forms) or, better still, should incorporate as much of the fossil diversity of pygmy mole crickets and mud crickets as possible.

An aspect of morphology that is not known from any extant or fossil form and, therefore, currently completely unique, is the disproportionate relationship of mid- and hindleg length compared to body length of *Ciconipteryx bidactylus* gen. et sp. nov. Noticeably, it is not the legs itself that are unusually long in the new species, but rather the body seems to be strangely short in relation to them (Table 1, Fig. 7). The extant species *Ripipteryx guacharoensis* Baena-Bejarano & Heads, 2015 shares the character of extensively long mesothoracic legs in relation to body length, but the species has normal-sized metafem-

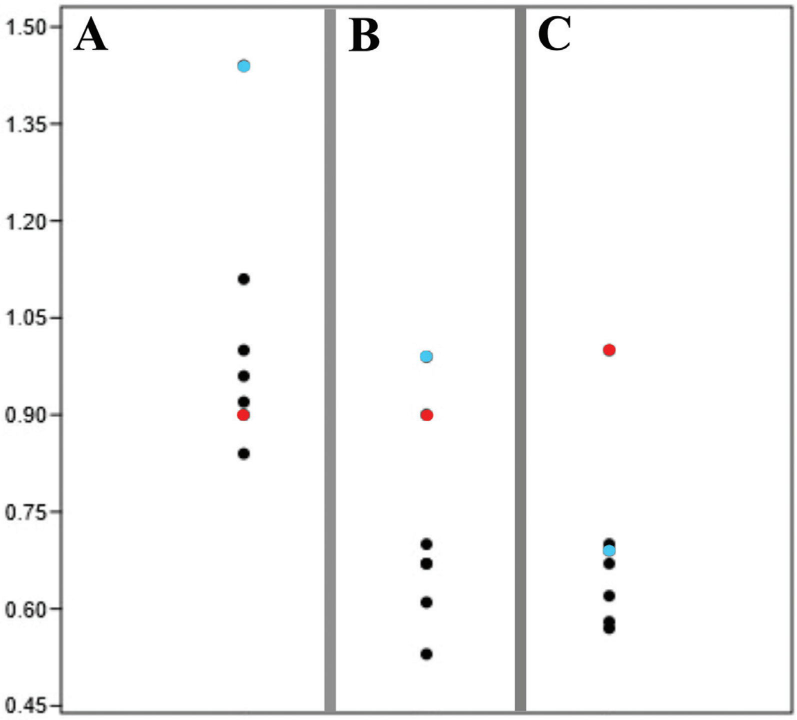

Figure 7. Data from Table 1 as jitter plot. **A.** Mesothoracic leg/metafemur length; **B.** Mesothoracic leg/body length; **C.** Metafemur/body length. *Ciconipteryx bidactylus* gen. et sp. nov. marked by red dots. *Ripipteryx guacharoensis* Baena-Bejarano & Heads, 2015 marked by blue dots.

Table 1. Some length ratios of Tridactyloidea Brullé, 1835. For the mesothoracic leg only the length of the mesofemur and mesotibia was combined for each species, as other parts were sometimes difficult to observe.

Family	Species	Mesothoracic leg/ metafemur length	Mesothoracic leg/body length	Metafemur/ body length	Reference
Ripipterygidae Ander, 1939	*Kallosripipteryx zhangi* Zhao et al., 2024	0.96	0.67	0.7	Zhao et al. 2024
	Ripipteryx gorgonaensis Baena-Bejarano & Heads, 2015	1.11	0.7	0.62	Baena-Bejarano and Heads 2015
	Ripipteryx guacharoensis Baena-Bejarano & Heads, 2015	1.44	0.99	0.69	Baena-Bejarano and Heads 2015
	Mirhipipteryx pulicaria (Saussure, 1896)	0.92	0.53	0.58	Baena-Bejarano et al. 2018
	Ciconipteryx bidactylus gen. et sp. nov.	0.9	0.9	1	herein
Tridactylidae Brullé, 1835	*Xya sichuanensis* Cao et al., 2018	0.84	0.61	0.57	Zhang et al. 2022
	Burmadactylus tenuicerci Fan et al., 2023	1	0.67	0.67	Fan et al. 2023

ora in comparison to the over proportionate metafemora of *C. bidactylus*. Tridactyloidea are generally thought to exhibit a four-legged walking behaviour, whereby they use only their fore- and mid-legs and the hind legs are kept completely off the ground (Zhang et al. 2022). To compensate for the posteriorly shifted center of gravity due to their heavy hindlegs, tridactylids use the abdomen as a fifth fulcrum for support during walking (Zhang et al. 2022). Perhaps the proportionally long mid-legs and shorter abdomen allowed *C. bidactylus* to walk without dragging the abdomen, as the center of gravity was shifted anteriorly. This may have led to an increase in mobility.

The hindlegs and strong femora of tridactylids enable them to be among the most efficient jumpers within Orthoptera and the insect world (Burrows and Picker 2010). Because they serve no function in walking, it is likely that they evolved to be specialized for jumping (Zhang et al. 2022). As the metafemora of *C. bidactylus* are the largest currently known for any tridactyloid, it is possible that this species may have been the best jumper of the taxon.

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