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ARTICLE



The extant telephone-pole beetle genus *Micromalthus* discovered in mid-Cretaceous amber from northern Myanmar (Coleoptera: Archostemata: Micromalthidae)

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ABSTRACT

The telephone-pole beetle family Micromalthidae has attracted the attention of entomologists and biologists because of its enigmatic morphology, systematic position, and complex life cycle. With only a single extant and four extinct species, the micromalthid beetles are a small but important lineage within the primitive suborder Archostemata. Fossil micromalthids, known mainly from different amber deposits, are not commonly found. Here, I report the first Mesozoic fossil of the sole extant micromalthid genus *Micromalthus* in the mid-Cretaceous Kachin amber from northern Myanmar. Due to its rather poor preservation, this provisional new species remains unnamed, tentatively identified as *Micromalthus* sp. The newly found specimen is about 46 Ma older than an Eocene *Micromalthus* fossil from the Oise amber of France. My study greatly expands our knowledge of the origin and early evolution of *Micromalthus* beetles.

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Introduction

With nearly 400,000 described species, Coleoptera (beetles) is by far the largest order of organisms in terms of species richness, demonstrating remarkable morphological and ecological diversity (Crowson 1981; Grimaldi and Engel 2005). The majority of this diversity is in Polyphaga, one of the four suborders of Coleoptera, which accounts for over 90% of all beetle species. By contrast, Archostemata is a small relict group comprised of four (Lawrence 2016) or five families (Hörschmeyer 2016, including Jurodidae) with only about 40 extant species (Yavorskaya et al. 2018). However, there are diverse and abundant fossil records from the Mesozoic for this group; thus, it is apparent that the archostematan were much more diverse than they are now. The systematic position of Archostemata remains unresolved, and morphological and molecular studies have yielded conflicting results (e.g. Lawrence et al. 2011; McKenna et al. 2015; Beutel et al. 2019). Nevertheless, it has retained many ancestral features and constitutes an important subgroup of Coleoptera (e.g. Beutel et al. 2008; Friedrich et al. 2009). Therefore, it is clearly a key taxon for understanding the early evolution of the mega-diverse beetles (Yan et al. 2019).

The archostematan family Micromalthidae, or telephone-pole beetles, represents a tiny fraction within the suborder Archostemata. In fact, *Micromalthus debilis* LeConte, 1878 is the only extant species in this family. Nevertheless, *M. debilis* has attracted the attention of entomologists and biologists, mainly because of its unusual, distinct morphology, ancestral position, and highly complex life cycle. This species is currently distributed globally, but it has been limited only to

some specific areas in the world (as summarised in Ruzzier and Colla 2019; Figure 2). The native range is thought to be the eastern part of the USA and possibly also Central America (Philips 2001; Philips and Young 2001). This current wider distribution of *M. debilis* is considered to be the result of human activities, globalisation, and the international timber trade, rather than merely dispersal events (e.g. Ruzzier and Colla 2019).

In general appearance, *Micromalthus* beetles are quite different from the much more speciose, core archostematan families Cupedidae and Ommatidae. Nonetheless, the phylogenetic affinity of *M. debilis* with Ommatidae is supported by morphological characters (Hörschmeyer 2009) and molecular evidence (McKenna et al. 2015). The adults of *M. debilis* are very small (~2.5 mm), narrowly elongated, and only weakly sclerotised; they have smooth and shortened elytra, and superficially resemble some rove beetles (Staphylinidae) (Paterson 1938; Philips and Young 2001; Yan et al. 2019). The larvae of *M. debilis* are wood borers that feed on, or develop in, decaying oaks, chestnuts, hemlock, and others (Philips and Young 2001; Grimaldi and Engel 2005). *M. debilis* has the most complicated and idiosyncratic life cycle of all beetles, including thelytoky, arrhenotoky, vivipary, matrophagy, hypermetamorphosis, and paedogenesis, with several markedly different larval types (Philips and Young 2001; Pollock and Normark 2002; Normark 2013; Hörschmeyer 2016; Perotti et al. 2016). Micromalthidae (*M. debilis*) is the only family of Coleoptera defined by the presence of haploid males, although such males are found in some bark beetles (Curculionidae: Scolytinae) within Coleoptera (Normark 2003).

Another interesting feature of *M. debilis* is that it is a ‘living fossil’; a presumed-extinct *Micromalthus* species (Perkovsky 2007) in the early Middle Miocene Dominican amber (ca. 16 Ma) was later regarded as the same taxon as *M. debilis* (Hörschemeyer et al. 2010). Like other extant archostematan, the occurrence of *M. debilis* is rare and sporadic (Philips and Young 2001; Yavorskaya et al. 2018). Extinct micromalthids are also rare in spite of much diverse and abundant taxa of the other extinct archostematan families and also despite its peculiar body form, which attracts palaeontologists and entomologists. However, its small size and weak sclerotisation make fossilisation difficult, particularly with respect to impression fossils (Yan et al. 2019). All but one micromalthid fossils are either Cenozoic or Mesozoic amber inclusions, which include larval and adult forms in the Middle Miocene Dominican amber (Lawrence and Newton 1995; Perkovsky 2007; Hörschemeyer et al. 2010), a larval form in the Miocene Mexican amber (Rozen 1971), larval and adult forms in the Upper Eocene Rovno amber (Perkovsky 2016), a larval form in the Upper Eocene Baltic amber (Lawrence and Newton 1995), an adult form in the Lower Eocene Oise amber from France (Kirejtshuk et al. 2010), and a larval form in the Lower Cretaceous Lebanese amber (described as an extinct genus; Kirejtshuk and Azar 2008). Recently, the oldest micromalthid fossil was found in the Upper Permian Babi Kamen’ locality in Siberia, and was described as a second extinct genus in the family (Yan et al. 2019). Consequently, a total of four extinct micromalthid species has been described, namely two extinct *Micromalthus* species (Perkovsky 2007, 2016; Hörschemeyer et al. 2010; Kirejtshuk et al. 2010) and two monotypic extinct genera (Kirejtshuk and Azar 2008; Yan et al. 2019). Nevertheless, very little is known about the origin and early evolution of telephone-pole beetles.

Here, I report the first adult inclusion of Micromalthidae in Mesozoic amber from the mid-Cretaceous of northern Myanmar. It is the first and oldest fossil of the extant genus *Micromalthus* from the Mesozoic.

Material and methods

The new specimen described herein is a relatively poorly preserved, seemingly complete, adult fossil in the mid-Cretaceous Burmese amber from northern Myanmar (burmite; also known as Kachin amber, see Zheng et al. 2018). The specimen was mined from amber deposits in the Hukawng Valley, Myitkyina District, Kachin State, northern Myanmar (Burma). This locality is well known as a site of commercial mining of Kachin amber, and it has been mapped in Cruickshank and Ko (2003) and Kania et al. (2015). The currently estimated age of Kachin amber is the mid-Cretaceous (late Albian to early Cenomanian, see Mao et al. 2018). Shi et al. (2012) suggested the earliest Cenomanian (98.79 ± 0.62 Ma) age based on U–Pb (Uranium–lead) dating of zircon crystals obtained from the volcanic sedimentary matrix containing the amber. Other recent studies suggest slightly older ages, from the late Albian to the Albian–Cenomanian boundary (e.g. Cruickshank and Ko 2003; Mao et al. 2018). The palaeoclimate of the forest that produced the Kachin amber is

believed to have been tropical (Grimaldi et al. 2002). It is currently considered that the amber-producing forests were located near a seashore or coastline (Mao et al. 2018; Yu et al. 2019). The beetle inclusions in Kachin amber are remarkably diverse, comprising 207 species in 159 genera and 80 families as of the end of 2018 (Ross 2019).

The original amber piece was spherical, but the author (SY) later polished the specimen using emery papers differing in grain size and a plastic buffing cloth. This process yielded a thin, flattened amber piece, allowing detailed observations. When it was observed or photographed, the amber was completely submerged in clove oil (Wako Pure Chemical Industries, Osaka, Japan; refractive index, 1.52–1.55), to avoid extra reflections and improve the visibility of the beetle fossil from multiple angles. Observations were made using a Leica MZ16 stereomicroscope (Leica Microsystems, Wetzlar, Germany). Photographs (Figures 1, 2, 3(e), 4) were taken using an 80D digital camera (Canon, Tokyo, Japan) with an MP-E 65 mm macro lens (F2.8, 1–5 ×; Canon) and an MT-24EX Macro Twin Lite Flash (Canon). Additional photos (Figures 3(a–d), 5, 6) were obtained with the Dun Ink BK PLUS Lab System (Dun, Palmyra, VA, USA) mounted on a 6D digital camera (Canon) with a 10 × lens. The images were stacked using the automontage software Helicon Focus 7.5.4 (Helicon Soft, Kharkiv, Ukraine). All images were edited and arranged with Photoshop® Elements 15 (Adobe Systems, San Jose, CA, USA). The sole specimen is deposited in the entomological collection of the Gantz Family Collections Centre, Field Museum of Natural History (FMNH), Chicago

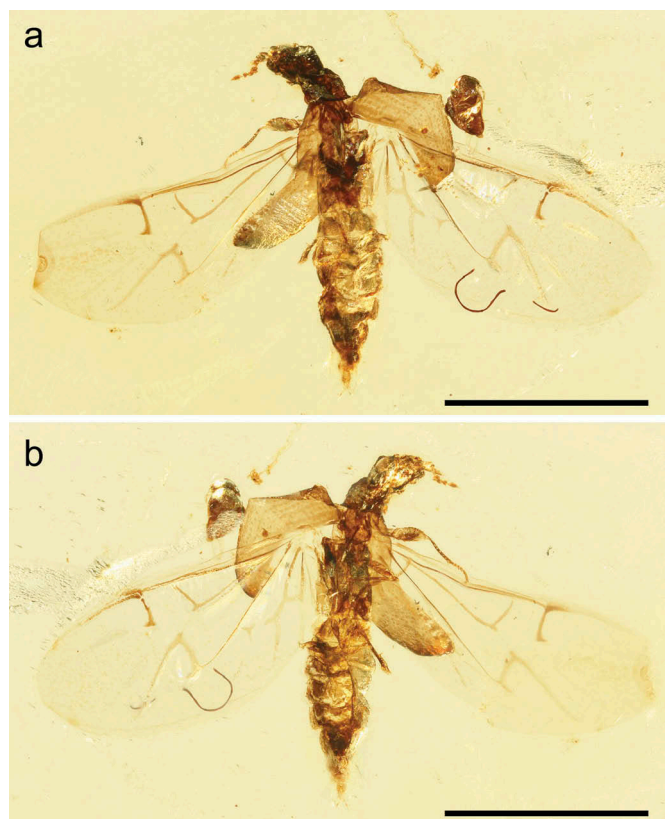


Figure 1. *Micromalthus* sp., female, FMNHINS-3966038. (a) Habitus, dorsal view. (b) Habitus, ventral view. Scale bars: 1.5 mm.



Figure 2. *Micromalthus* sp., female, FMNHINS-3966038. (a) Habitus excluding hindwings, dorsal view. (b) Habitus excluding hindwings, ventral view. Scale bars: 1.0 mm.

(IL, USA) under the assigned number FMNHINS-3966038. The morphological terminology generally follows that of Yavorskaya et al. (2018) and Yan et al. (2019). The terminology for the hindwings used by Hörnschemeyer et al. (2010) was adopted herein.

Systematic palaeontology

Order **Coleoptera** Linnaeus, 1758.
Suborder **Archostemata** Kolbe, 1908.
Family **Micromalthidae** Barber, 1913.

Genus *Micromalthus* LeConte, 1878: 613.

Type species: *Micromalthus debilis* LeConte, 1878.

Remarks

The specimen is unambiguously placed in Micromalthidae on the basis of the following combination of the characters (Philips and Young 2001; Hörnschemeyer 2016): general habitus agrees well with *Micromalthus*, the type genus of Micromalthidae; body small, ca. 2.5 mm, narrowly elongate, uniformly only weakly sclerotised; head large, quadrate to trapezoid, larger than pronotum, with slightly depressed anterior portion; eyes conspicuous, bulging, projecting laterally; antennae 11-segmented, moniliform, short, as long as head width; apical

maxillary palpomere notably enlarged, with obliquely pointed apical half, bearing with long sensillae; elytron apparently thin, slender, moderately shortened, resulting in potentially exposing several abdominal segments; hindwing with peculiar pattern of reduced venations (see Hörnschemeyer et al. 2010; Hörnschemeyer 2016); metaventrite elongate, large; and 5-5-? tarsal formula.

It cannot be placed in the extinct monotypic genus *Archaeomalthus* Yan et al. 2019 from the Upper Permian of Siberia, based on the following features (Yan et al. 2019): body much larger (only ca. 1.2 mm in *Archaeomalthus synoriacos* Yan et al. 2019); antennal insertions located laterally, concealed by frontal projections (antennal sockets visible from above in *A. synoriacos*); elytra with rounded apices (truncated in *A. synoriacos*); and propleuron not visible (exposed in *A. synoriacos*). Another fossil monotypic genus, *Cretomalthus* Kirejtshuk and Azar, 2008, is known from the Lower Cretaceous Lebanese amber, but it was described solely based on a larval fossil (Kirejtshuk and Azar 2008). All characters of the specimen agree well with those of *Micromalthus*, and no significant genus level difference was found in my morphological observations. Consequently, the fossil can be classified as a member of *Micromalthus*.

As mentioned above, *Micromalthus* comprises a single extant species (*M. debilis*) and two extinct species. This new specimen is easily distinguished from *M. debilis* by the presence of an elongate mesoscutellum with a rounded apex; slender antennae with an elongate antennomere 3 and conical, longer terminal antennomere; very acute apex of the terminal maxillary palpomere; basally wide pronotum; smooth dorsum of the elytra without longitudinal grooves; lateral margin of elytron with a row of fringe-like projections comprised of much thicker setae (Figure 3(e), arrows; they are much more slender in *M. debilis*); much stronger tibial spur, at least on the foretibiae; and slightly different venation of the hindwings (i.e. acute angle, rather than rounded, formed by m-Cu and M₂; and much more strongly expanded Rs at apex). The new specimen can be separated from *M. priabonicus* Perkovsky, 2016, known from the Upper Eocene Rovno amber, exclusively by the elongate mesoscutellum and slender antennae with a less elongated terminal antennomere. Finally, compared with *M. eocenicus* Kirejtshuk et al. 2010, which was described from the Lower Eocene Oise amber of France, the new fossil is readily distinguished by the less transverse head and pronotum; basally wide pronotum; more anteriorly produced frontal areas of the head; and very broadly rounded, or nearly truncated, apex of the mesoscutellum (Kirejtshuk et al. 2010).

The combination of character states for this fossil listed above suggests it represents a new species, which is congruent with its geological and geographical background compared with known micromalthid fossils. Nevertheless, due to the rather poor preservation of the fossil, I refrain from naming it as a new species, and instead leave it as *Micromalthus* sp.

Micromalthus sp.

Material

FMNHINS-3966038, a complete but rather poorly preserved female adult, deposited in FMNH. The fossil specimen is embedded in a flattened, oblong piece of transparent

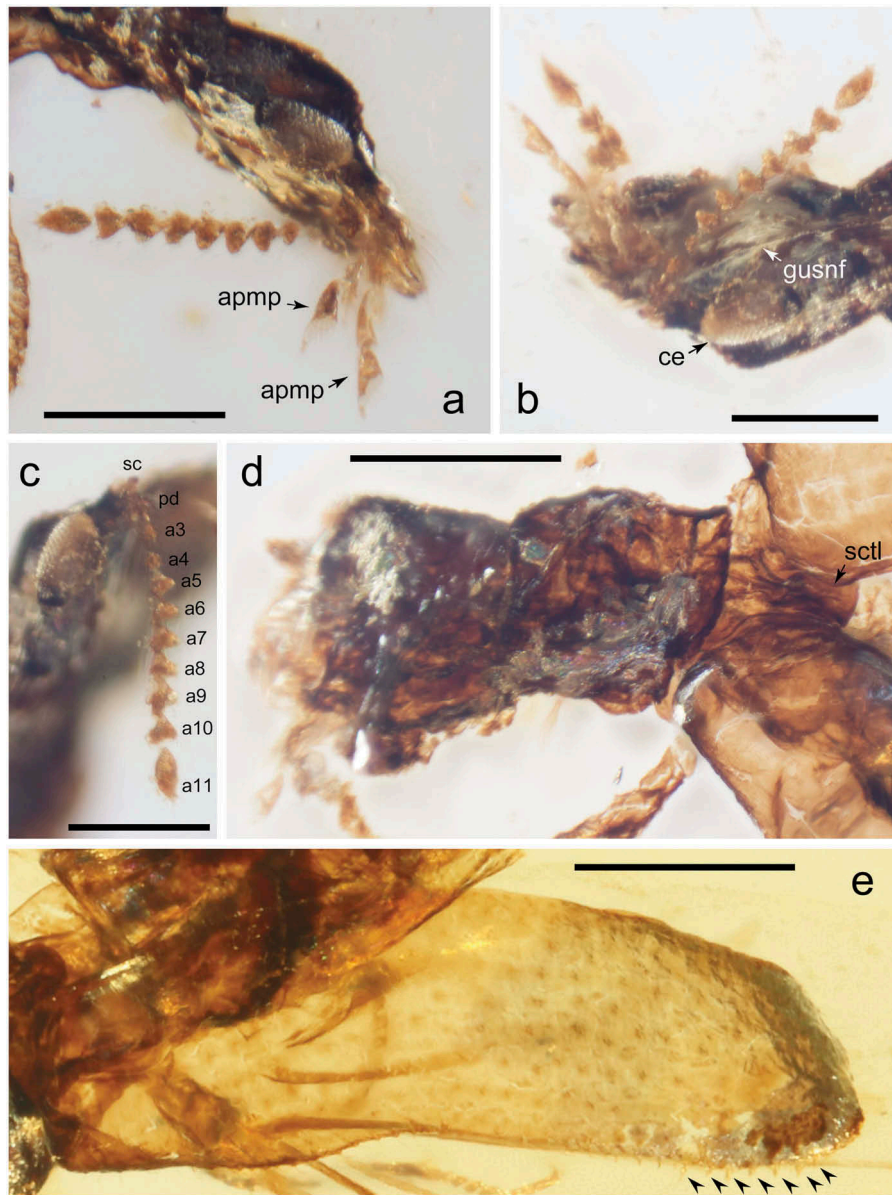


Figure 3. *Micromalthus* sp., female, FMNHINS-3966038. (a,b) Head, ventrolateral views. (c) Antenna, right. (d) Forebody, dorsal view. (e) Elytron, left, dorsal view, arrows showing a row of thick, fringe-like setae located along lateral margin of elytron. Scale bars: 0.2 mm (a–c), 0.3 mm (d,e). Abbreviations: a3–11, antennomere 3–11; apmp, apical palpomere of maxillary palpus; ce, compound eye; gusnf, gula-submental furrow; pd, pedicellus; sc, scapus; sctl, mesoscutellum.

yellowish amber ($15.3 \times 12.4 \times 2.1$ mm). Although the beetle fossil is completely visible from both the dorsal and ventral views, its ventral side is poorly preserved, preventing precise description of characters such as the meso- and metaventrite, and the detailed structure of the hindlegs.

Syninclusion

A tiny polyphagan beetle (possibly Eucinetidae) is also embedded, adjacent to the right elytron of the *Micromalthus* fossil.

Locality and horizon

Kachin amber from the Hukawng Valley ($26^{\circ}21'33.41''\text{N}$, $96^{\circ}43'11.88''\text{E}$), Myitkyina District, Kachin State, northern Myanmar; late Albian to early Cenomanian, mid-Cretaceous (see Mao et al. 2018).

Description

Female. Body small (2.51 mm, measured from dorsal view, excluding genital segments), narrowly elongate, subparallel-sided, slender, dorsally slightly flattened. Colour dark brown to pale brown; head, pronotum and abdominal apex darker. Surface uniformly moderately to strongly deformed due to rather poor preservation and its potentially fragile, presumably only weakly sclerotised body; dorsum with sparse vestiture of fine hairs, but lacking recognisable scales, punctures or tubercles.

Head (Figure 3(a–d)) partially, but noticeably, crushed, especially for left area of basal half; prognathous, quadrate to trapezoid, weakly transverse, large (0.32 mm long, 0.40 mm wide, as preserved), clearly larger than pronotum, markedly, ca. 1.29 times, wider than prothorax, gradually narrowing posteriorly; anterior part of frons moderately produced

antieriad. Temporal region posterior to eyes very long, more than half of head length. Labrum seemingly fused with clypeus. Compound eyes (Figure 3(a–c), *ce*) bulging, conspicuous, rather strongly projecting laterally. Ocelli absent. Antennal insertions, or antennal sockets (*sensu* Yan et al. 2019), not fully visible from dorsal view, concealed by frontal projections, located anterolaterally in front of eyes. Antennae (Figure 3(a–c)) with heavily deformed left antenna; right antenna with 11 antennomeres, slender, moniliform, short, as long as head width (probably slightly longer than head width), each antennomere moderately setose with microsetae: scapus and pedicellus robust, elongate, distinctly larger than antennomere 3 (*a3*), but details not visible; *a3* elongate, small; *a4* weakly transverse, wider than *a3*; *a5*–*a10* (Figure 3(c)) strongly dilated apically, much wider than *a4*, each with similar width and length; *a11* (Figure 3(c)) conical, or even fusiform, little more than twice as long as wide, widest in middle, slightly shorter than *a9* and *a10* combined together. Maxillary palpi (Figure 3(a,b)) rather long, but basal areas not visible; apical (terminal) palpomere (Figure 3(a), *apmp*) large, expanded, with very acute apex, bearing dozens of long sensillae. Labial palpi moderately developed, but not well visible. Gula-submental furrow (*sensu* Yavorskaya et al. 2018; Figure 3(b), *gunsnf*) complete, separated, moderately curved.

Pronotum (Figure 3(d)) dorsally crushed and deformed, preventing detailed observation; disc small, almost quadrangular, as long as wide (0.29 mm long, 0.31 mm wide, as preserved), much smaller than head, widest near base, moderately narrowed anteriorly. Propleuron not visible. Prosternum (Figure 5(b)) small, transverse. Procoxal cavities opened posteriorly. Mesoscutellum (Figure 3(d), *sctI*) elongate, not strongly widened before broadly rounded apex. Elytra (Figures 1, 2, 3(e), 4) deformed, likely due to their lightly sclerotisation; thin, slender, elongate, apparently shortened and reduced (right elytron 0.36 mm wide, as preserved), potentially exposing several abdominal segments, although much longer than head and pronotum combined; each elytron markedly elongate, with rounded, somewhat inclined apex; surface smooth without longitudinal furrows or grooves (traces only), with at least ten setigerous rows of punctures; elytral base seemingly distinctly wider than base of pronotum, outer margins moderately infolded; elytral shoulders rounded. Hindwings (Figures 1, 4) entire, fully developed; venation of alae markedly reduced, but seemingly slightly less reduced than in modern *Micromalthus* (see Hörnschemeyer et al. 2010; Hörnschemeyer 2016); m-Cu and *M*₂ forming acute angle, rather than rounded (Figure 4); *Rs* strongly expanded at apex (Figure 4). Metaventrite (Figure 5(b), *mv*) large, moderately elongate, gradually narrowed anteriorly.

Legs (Figures 1, 5, 6) long, very slender; surface smooth. Procoxae (Figure 5, *prc*) subconical, long, oriented downwards, nearly contiguous; protrochanters (*ptr*) long and large; profemora clavate, robust; protibiae (Figure 5(a), *pti*) rod-like, very slender (left protibia 0.32 mm long), with strongly projecting preapical spur; protarsi 5-segmented, slender, moderately exceeding half of protibiae (left protarsus 0.19 mm long, under weakly curved condition), all protarsomeres simple, protarsomere 2–4 (*pt2*–*4*) subequal in length,

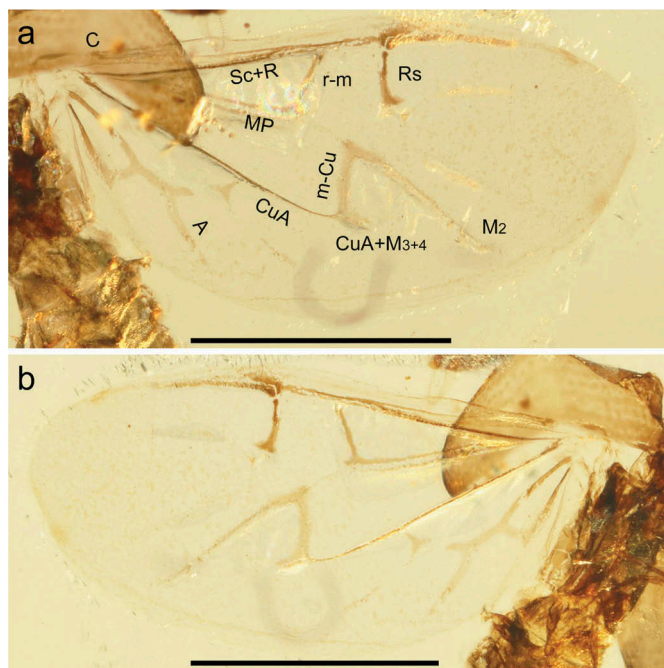


Figure 4. *Micromalthus* sp., female, FMNHINS-3966038. (a) Hindwing, right, dorsal view. (b) Hindwing, right, ventral view. Scale bars: 1.0 mm. Abbreviations: A, anal; C, costa; CuA, cubitus anterior; M, media; m-Cu, medio-cubital cross vein; MP, media posterior; R, radius; r-m, radiomedial cross-vein; Rs, radius sector; Sc, subcosta.

each slightly shorter than *pt1*, *pt5* longest and about as long as *pt1*–*4* combined. Mesocoxae (Figure 5(b), *msc*) oblique, oval, seemingly moderately separated each other; mesofemora slenderer than profemora; mesotibiae similar to protibiae, with strongly projecting preapical spur; mesotarsi 5-segmented, moderately longer than half of protibiae. Hindleg poorly preserved; metacoxae (Figure 5(b), *msc*) not well visible, transverse, nearly contiguous, reaching lateral edges of metaventrite; metatibiae similar shape to mesotibiae; metatarsi with segmentation not recognisable. Pretarsal claws (Figure 5(a), *ptc*) simple, lacking conspicuous basal teeth.

Abdomen (Figures 1, 2, 6) parabolic, only lightly sclerotised, with six completely exposed ventrites; sides evenly narrowing posteriorly. Female genitalia partly exposed, with developed gonocoxites and rather long styli (Figure 6(a), *sty*).

Discussion

For the first time, the extant telephone-pole beetle genus *Micromalthus* is recorded from the Mesozoic (late Albian to early Cenomanian, see Mao et al. 2018), representing the first known *Micromalthus* fossil in Asia and the first discovery of the family Micromalthidae from the mid-Cretaceous Kachin amber. The archostematan fauna of the Kachin amber is diverse and abundant (e.g. Jarzembowski et al. 2017a, 2017b, 2017c; Yamamoto 2017), although these records are limited to Cupedidae and Ommatidae, two core families of the suborder. Micromalthidae is recognised by several highly derived, unusual characters in Archostemata (Hörnschemeyer 2009, 2016). Based on its peculiar body form and unique characters, its systematic placement within Coleoptera had long been

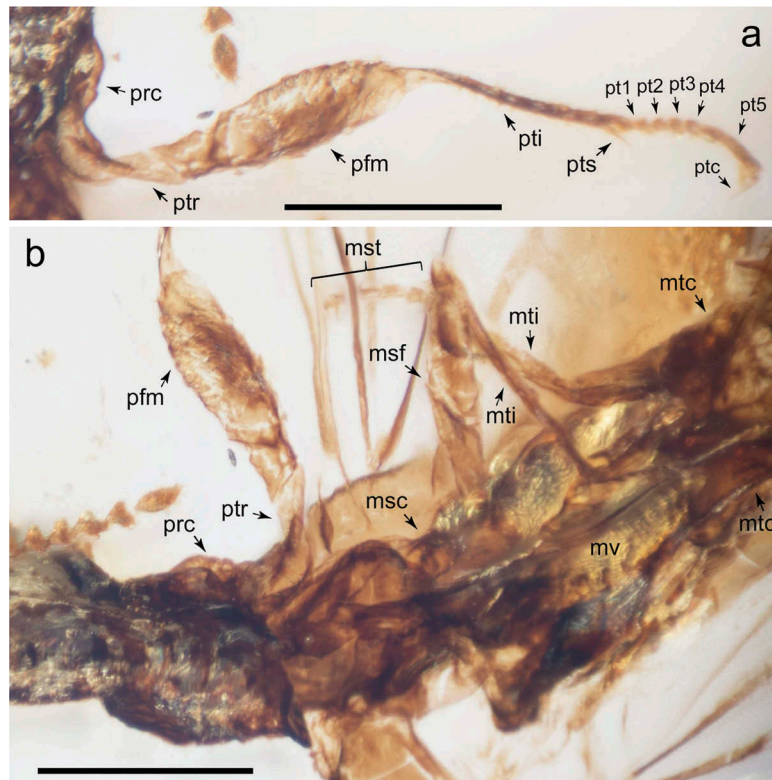


Figure 5. *Micromalthus* sp., female, FMNHINS-3966038. (a) Foreleg, left, ventral view. (b) Pro-, meso- and metathorax, ventral view. Scale bars: 0.3 mm. Abbreviations: msc, mesocoxa; msf, mesofemur; mst, mesotarsus; mtc, metacoxa; mti, mesotibia; mv, metaventrite; prc, procoxa; pfm, profemur; pt1–5, protarsomere 1–5; ptc, pretarsal claw; pti, protibia; ptr, protochanter; pts, protibial spur.

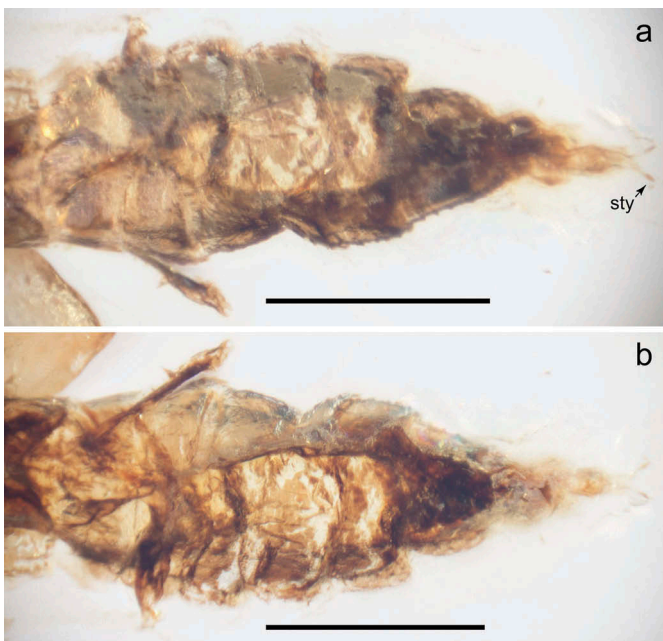


Figure 6. *Micromalthus* sp., female, FMNHINS-3966038. (a) Abdomen, dorsal view. (b) Abdomen, ventral view. Scale bars: 0.5 mm. Abbreviation: sty, stylus.

disputed (see Kirejtshuk et al. 2010). However, despite the controversy, it is currently unambiguously treated as a member of Archostemata (e.g. McKenna et al. 2015; Hörnschemeyer 2016; Lawrence 2016). Therefore, the new fossil reported here is of great significance for finding

a peculiar archostematan lineage from the Mesozoic as a morphologically informative amber inclusion by the first time in adult form.

The current known distribution of *Micromalthus debilis*, the only extant representative of Micromalthidae, is probably the result of globalisation and international trade (Ruzzier and Colla 2019). The native distribution of this species is probably the eastern part of the USA and Central America (Philips 2001; Philips and Young 2001). If this assumption is correct, then the records of *M. debilis* from other parts of the world can be explained by unintentional introduction via human activities. However, several fossil records of *Micromalthus* suggest that this genus potentially had a wider native range in the past. Such evidence is found from various Cenozoic ambers, as mentioned in the Introduction, namely the Dominican, Mexican, Rovno, Baltic, and Oise ambers (summarised in Hörnschemeyer et al. 2010). Two extinct monotypic micromalthid genera are known from the Lower Cretaceous Lebanese amber and Upper Permian of Siberia (Kirejtshuk and Azar 2008; Yan et al. 2019). Therefore, the past distribution of the family may have been wider than, or different from, that of the present day. A similar pattern of contradictory ranges is already known from a series of beetle fossils in Kachin amber (i.e. Thayer et al. 2012; Cai and Huang 2017; Jąłoszyński et al. 2017; Jarzembowski et al. 2017a, 2017b; Yu et al. 2018; Wu et al. 2018; Cai et al. 2019; Yamamoto et al. 2019; Liu et al. In press). My discovery of the *Micromalthus* fossil in Kachin amber is interesting, shedding light on the origin and past distribution of the genus.

Another finding was that no distinct, generic-level morphological difference was found in this fossil. The specimen can be clearly differentiated from the extinct monotypic genus *Archaeomalthus* from the Upper Permian of Siberia by its much larger body, dorsally concealed antennal sockets, rounded apices of the elytra, and non-exposed propleuron (Yan et al. 2019). The other extinct micromalthid genus *Cretomalthus* from the Lower Cretaceous Lebanese amber is known only from fossils of the first instar larva (Kirejtshuk and Azar 2008), and the comparison with the new specimen here described is impossible. Consequently, the placement of the new material within *Micromalthus* is provisionally reasonable based on the general similarity with *Micromalthus*. However, some distinctive species-level features were also found in the fossil, namely the structures of the head, pronotum, antennae, terminal maxillary palpomere, mesoscutellum, elytra, tibial spur, and hindwings (see Remarks). The combination of these characters suggests that it is actually a new species of *Micromalthus*, but the fossil taxon remains unnamed here due to its poor state of preservation.

This new discovery is about 46 Ma older than the previously known Eocene-aged fossil from the Oise amber of France (Kirejtshuk et al. 2010), greatly pushing back the origin of *Micromalthus* and broadening our knowledge of the early evolution of the genus. Note that Hörnschemeyer et al. (2010) also found the extant species *M. debilis* as fossils in Dominican amber (ca. 16 Ma) after a careful, detailed study. This is one of the most important studies for indicating the existence of a single insect species along with a geological time scale. Although the new fossil is apparently a different species from *M. debilis*, prolonged morphological stasis was again supported as well as some beetle fossils in Kachin amber (e.g. Clarke and Chatzimanolis 2009; Yamamoto et al. 2017; Cai et al. 2019; Yamamoto and Takahashi 2019). Such morphological stability has also been known from the other Cretaceous ambers (Chatzimanolis et al. 2013; Jąłoszyński and Perkovsky 2016; Peris and Háva 2016). The close morphological similarity with its extant counterpart suggests that the Kachin amber *Micromalthus* reported here may have lived in similar woody microhabitats in the mid-Cretaceous.

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Disclosure statement

No potential conflict of interest was reported by the author.

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