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**New genera and species of Jumping Ground Bugs (Hemiptera: Schizopteridae) in
Dominican and Burmese amber, with a description of a meloid (Coleoptera:
Meloidae) triungulin on a Burmese specimen**

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Abstract

New genera and species of Jumping Ground Bugs (Hemiptera: Schizopteridae) are described in Dominican and Burmese amber. In Dominican amber are described: *Hypselosoma dominicana* Poinar and Brown sp. n., *Schizoptera dominicana* Poinar sp. n. and *Schizoptera hispaniolae* Poinar sp. n. In Burmese amber are described: *Lumatibialis burmitis* Poinar gen. et sp. n. and *Hexaphlebia burmanica* Poinar gen. et sp. n. A triungulin attached to the dorsum of the abdomen of *Lumatibialis burmitis* is described as *Microentomus epibatus* Poinar gen. n., sp. n. in the family Meloidae (Coleoptera). This specimen represents the oldest known triungulin and the first fossil phoretic association of a triungulin and hemipteran.

Key words: Burmese amber; Dominican amber; Fossil jumping ground bugs; Mid-Tertiary; fossil meloid triungulin

Introduction

Jumping Ground Bugs (Hemiptera: Schizopteridae), also called “bowing” bugs because they typically have their heads inclined downward at a 33°-90° angle, are miniscule globally distributed Hemiptera of no known economic importance. However they are interesting because for their size, the forewing venation is rather complex, more so than many of the larger Hemiptera. Schizopterids appear to be ancient insects, possibly dating back at least to the Permian, although the earliest described fossils occur in Early Cretaceous Lebanese amber (Azar and Nel 2010). Other fossil Jumping Ground Bugs have been described from Myanmar and France (Perrichot et al, 2007). In the present study, we describe additional species from Dominican and Burmese amber.

Materials and Methods

The Dominican amber specimens originated from mines in the Cordillera Septentrional mountain range in the northern portion of the Dominican Republic. Dating of Dominican amber is controversial with the latest proposed age of 20-15 mya based on foraminifera (Iturralde-Vinent and MacPhee 1996) and the earliest of 45-30 mya based on coccoliths (Cêpek in Schlee 1999). What makes dating the amber difficult is that it is secondarily deposited in turbiditic sandstones of the Upper Eocene to Lower Miocene Mamey Group (Draper et al. 1994). The plant species that formed the amber is a member of the legume family (*Hymenaea protera* Poinar 1991) and the original environment was similar to a present day moist tropical forest (Poinar and Poinar 1999).

The Burmese amber specimens were obtained from a mine first excavated in 2001, in the Hukawng Valley, southwest of Maingkhwan in Kachin State (26°20'N, 96°36'E) in Burma (Myanmar). This Noiye Bum 2001 Summit Site was assigned to the Early Cretaceous, Upper Albian, on the basis of paleontological evidence (Cruickshank and Ko 2003), placing the age at 97 to 110 mya. Nuclear magnetic resonance (NMR) spectra and the presence of araucaroid wood fibers in amber samples from the Noiye Bum 2001 Summit site indicate an araucarian (possibly *Agathis*) tree source for the amber (Poinar et al. 2007). Observations, drawings, and photographs were made with a Nikon SMZ-10 R stereoscopic microscope and Nikon Optiphot compound microscope with magnifications up to 600X.

The classification and most wing abbreviations used in the present study follows that of Emsley (1964) and Schuh and Slater (1995). Some less common terms are: cor = corium, vf = vannal fold (or claval suture); tc = trapezoidal cell; iv= first vannal vein and v= vannus (or clavus).

Systematics

Hemiptera

Schizopteridae Reuter 1891

Hypselosoma Reuter 1891

The following species is placed in the genus *Hypselosoma* because of its large, protruding eyes and wing venation with 5 main veins meeting the margin (Emsley 1964).

Hypselosoma dominicana Poinar and Brown, sp. n. male (Figs. 1, 2)

Description: Holotype length, 1.1 mm, greatest width, 390 μm ; length forewing, 0.9 mm.

Head: Head strongly declivous, transverse, length, 128 μm , width, 333 μm ; eyes large, protruding, overlapping anterolateral edge of pronotum; ocelli not observed; first two antennal segments short, thick, terminal two elongate, slender; segment lengths, first, 50 μm , second, 35 μm , third, 290 μm , fourth, 250 μm ; beak 3-segmented, with blunt tip, with one outward-pointing spine on middle ventral surface of basal segment, one outward-pointing spine on upper third of ventral surface of second segment and reflexed dorsal spine on upper surface of apex of second segment; terminal segment lacking spines, length beak, 400 μm .

Pronotum. Transverse, dark brown, antero-lateral margins angulate; basal margin concave; length, 250 μm , width, 320 μm .

Scutellum. Dark brown, about 1/3 width of pronotum.

Legs: With short, thick femora and long, narrow tibia; length mesotibia, 360 μm ; length mesotarsus, 130 μm . All tarsi 3-segmented; claws paired, with small basal tooth, arolia absent.

Wings: Forewing with 5 veins meeting margin, A vein not meeting M2; four basal cells, tc and cor cells heptagonal. Hind wing with well developed basal R vein, faint M vein reaching wing margin and straight Cu vein reaching wing tip; spur at base of Cu vein represents basal origin of M vein. Length forewing, 0.9 mm, greatest width, 0.5mm; length hindwing, 0.8mm, greatest width, 0.3mm.

Abdomen. Composed of 8 glabrous sternites, including asymmetrical pygofer; right palpifer papillae-like, left palpifer recurved, frayed at tip; aedeagus blade-like.

Type: Holotype deposited in the Poinar amber collection (accession # He-4-75A)

maintained at Oregon State University, Corvallis, Oregon.

Type locality: Amber mine (La Búcara) (19° 13' N; 70° 40' W) in the northern region of the Dominican Republic.

Etymology: The specific epithet indicated the origin of the fossil.

Diagnosis: The large protruding eyes, arrangement of the spines on the beak, relatively short first costal cell, distinct vein connecting R4+5 with M1 in the forewing, a complete A vein not reaching M2 in the forewing and the M vein meeting the wing margin in the hind wing distinguish *Hypselosoma dominicana* from other extant and extinct members of the genus (Emsley 1964; McAtee and Malloch 1926). Members of the genus *Glyptocombus* Heidemann also have a similar wing venation but species in this genus have small to moderate-sized eyes.

Hemiptera

Schizopteridae Reuter 1891

Schizoptera Fieber, 1860

The following specimens are placed in the genus *Schizoptera* because of their small to moderate eye size, the fore wing with the first costal cell larger than the second and the R1 vein meeting the costa at nearly a right angle (Emsley 1964; McAtee and Malloch 1925).

There are three specimens in two separate pieces of amber, one from La Toca mine with 2 individuals and the third specimen in a piece of amber from La Búcara mine. The two specimens described below in “La Toca” amber are considered conspecific. The figures in parenthesis refer to measurements of the paratype that is positioned near the edge of the amber piece.

Schizoptera dominicana Poinar, sp. n. (Figs. 3-5)

Description: Both females; Holotype length, 0.8 (0.9) mm; wing length, 0.6 (0.6) mm.

Head: Head strongly declivous, transverse, length, 105 μ m, width, 260 μ m; eyes small, flattened against head, not overlapping pronotum; 3 ocelli, with lateral ocelli located on roundish protuberances; first two antennal segments short, thick, last 2 elongate, slender; segment lengths, first, 36 μ m, second, 36 μ m, third, 180 μ m, fourth, 180 μ m; beak 3-segmented, with outward-pointing spine on lower third of apical segment, length beak, 130 μ m.

Pronotum. Transverse, lacking longitudinal carinae, antero-lateral margins rounded; basal margin slightly concave; length, 170 (150) μ m, width, 400 (400) μ m.

Scutellum. Small, width, 107, length, 100, approximately 1/4 width of pronotum.

Legs: Femora short, thick; tibia long, narrow; length metafemur, 156, length metatibia, 234, length metatarsus, 104; All tarsi 3-segmented; claws paired, with small basal tooth, arolia present.

Wings: Elytra with 4 veins meeting margin; A straight, falling considerably short of margin; first costal cell over twice as long as second; three basal cells, tc and cor cells trapezoidal. Hind wing not visible. Length forewing, 0.6 (0.6) mm, greatest width, 0.3 (0.3) mm.

Abdomen. With 8 glabrous sternites. Spiracles visible on first 6 segments; ovipositor reduced.

Type: Holotype deposited in the Poinar amber collection (accession # HE-4-75B) maintained at Oregon State University, Corvallis, Oregon.

Type locality: Amber mine (La Toca) (19° 13'N; 70°40'W) in the northern region of the Dominican Republic.

Etymology: The specific epithet indicates the origin of the fossil.

Diagnosis: This species is characterized by an elongate first costal cell, short straight A vein, protruding lateral ocelli and a flat median ocellus.

Schizoptera hispaniolae Poinar, sp. n. (Fig. 6-8)

Description: Holotype length, 1.1 mm; Length forewing, 1.0 mm. male.

Head: Head strongly declivous, transverse, length, 150 µm, width, 310 µm; eyes medium sized not overlapping pronotum, flattened against head, bearing short hairs; 2 ocelli, first two antennal segments short, thick, last 2 elongate, slender; segment lengths, first, 62 µm, second, 60 µm, third, 310 µm, fourth, 250 µm; beak short, 3-segmented, length, 190 µm.

Pronotum. Transverse, lacking longitudinal carinae, antero-lateral margins rounded; basal margin slightly wavy; length, 200 µm, width, 550 µm.

Scutellum. basal width 100 µm, approximately 1/5 width of pronotum.

Legs: With short, thick femora and long, narrow tibia; length of legs: profemur, 250 µm, protibia, 310 µm, protarsus 113 µm; mesofemur, 250 µm, mesotibia, 440 µm, mesotarsus, 125 µm: metafemur, 310 µm, metatibia, 460 µm, metatarsus, 140 µm, All tarsi 3-segmented; claws paired, with long, thin arolia.

Wings: Elytra with 5 veins meeting margin; A curved, reaching wing margin; first costal cell over twice as long as second; three basal cells, tc and cor cells trapezoidal; length forewing, 1.0 mm. Hind wing not visible.

Abdomen. With 8 glabrous sternites and asymmetrical pygofer; right palpifer elongate, blade-like, left palpifer blade-like, curved near base, aedeagus blade-like.

Type: Holotype deposited in the Poinar amber collection (accession # HE-4-75C) maintained at Oregon State University, Corvallis, Oregon.

Type locality: Amber mine (La Búcara) (19° 13' N; 70° 40' W) in the northern region of the Dominican Republic.

Etymology: The specific epithet indicates the origin of the fossil.

Diagnosis: This species can be distinguished from other members of the genus, including *S. dominicana*, by its narrow scutellum, two non-protruding lateral ocelli and curved A vein reaching the wing margin.

Hemiptera

Schizopteridae Reuter 1891

Lumatibialis Poinar gen. n.

Type species: *Lumatibialis burmitis* Poinar

Diagnosis: Forewing with 5 veins reaching margin; A vein not meeting M vein; protarsus constricted, 3-segmented, mesotarsus 4-segmented; metatarsus 5-segmented; tip of fore tibia widened.

Lumatibialis burmitis Poinar, gen et sp. n. (Figs. 9-12)

Description: Holotype male; length, 0.74 mm.

Head: Head strongly declivous, transverse; eyes large, protruding, ommatidia (at least some) cone-shaped; ocelli not observed; first two antennal segments short, thick, last 2

elongate, slender; segment lengths, first, 68 μm , second, 63 μm , third, 294 μm , fourth, 294 μm ; beak 3-segmented, with pointed tip, length beak, 200 μm .

Pronotum. Transverse, dark brown, lacking longitudinal carinae, antero-lateral margins rounded; length, 145 μm , width, 326 μm .

Scutellum. Dark brown, about 1/3 width of pronotum.

Legs: With short, thick femora and long, narrow tibia; length of legs: profemur, 189 μm , protibia, 266 μm , protarsus 49 μm ; mesofemur, 189 μm , mesotibia, 238 μm , mesotarsus, 56 μm ; metafemur, 252 μm , metatibia, 231 μm , metatarsus, 126 μm ; apex of foretibia widened with edge opposite tarsus prolonged and bearing a long seta at its tip. protarsi 3-segmented; mesotarsi 4 segmented, metatarsi 5-segmented; claws paired, short, arolia reduced.

Wings: Fore wing with 5 veins meeting margin, only spurious extension of A vein meeting M2; three basal cells, tc cell pentagonal, elongate. Hind wing with well developed basal R vein, faint M vein reaching wing margin and straight Cu vein reaching wing tip; spur at base of Cu vein represents basal origin of M vein. Length forewing, 0.9 mm, greatest width, 0.5mm; length hindwing, 0.8mm, greatest width, 0.3mm.

Abdomen. Composed of 8 glabrous sternites, including asymmetrical pygofer; right palpifer papillae-like, left palpifer recurved, frayed at tip; aedeagus blade-like.

Type: Holotype deposited in the Poinar amber collection (accession # B-He-24A) maintained at Oregon State University, Corvallis, Oregon.

Type locality: Amber mine at the Noiye Bum 2001 Summit Site in the Hukawng Valley, southwest of Maingkhwan in Kachin State (26°20'N, 96°36'E) in Burma (Myanmar).

Etymology: The specific epithet is taken from the Latin luma = thorn and the Latin *tibia* = of the tibia, in reference to the spine at the tip of the swollen fore tibia.

Diagnosis: The 3,4 and 5 tarsal formula, together with the widened tips of the foretibia, venation of the elytra and hind wing and structure of the pygofer separate this genus from previous extant and fossil forms. The wing venation of *L. burmitis* shows some similarities with that of the Burmese amber fossil, *Tanaia burmitica* Perrichot, Nel & Néraudeau (2007), however the former species has a 5 sided rectangular tc cell rather than a 4 sided square one as in *T. burmitica*. Also the A vein in *L. burmitis* does not fully meet the M vein as it does in *T. burmitica*. In addition, *T. burmitica* has a 3/3/3 tarsal formula and a straight corium, not curved as in *L. burmitis*. The elytra with 5 veins meeting the margin separate the new genus from *Voragocoris* Weirauch (2012). While 5 veins also meet the margin in the forewing of *Williamsocoris* Carpintero and Dellape (2006), in this latter taxon, vein A connects with vein M1, the protarsus is not constricted, the metatarsus is 3-segmented and in the hind wing, R extends half of the wing length and iv does not meet the wing margin.

Hemiptera

Schizopteridae Reuter 1891

Hexaphleba Poinar, gen. n.

Type species: *Hexaphlebia burmanica* Poinar

Diagnosis: Elytra with 6 veins meeting margin; 6 basal cells; circular plate with 6 peripheral ocelli and one central ocellus on vertex.

Hexaphlebia burmanica Poinar, gen et sp. n. (Figs. 13-15)

Description: Holotype length, 0.75 mm; forewing length, 0.56 mm. Male.

Head: Head strongly declivous, transverse, width, 240 μm ; eyes small, protruding; circular plate on vertex with six peripheral ocelli and seventh central ocellus (Fig. 14); first two antennal segments short, thick, last 2 elongate, slender; segment lengths, first, 70 μm , second, 70 μm , third, 260 μm , fourth, 246 μm ; beak obscure.

Pronotum. Transverse, dark brown, antero-lateral margins angulate; basal margin straight; width, 400 μm .

Scutellum. Obscure.

Legs: With short, thick femora and long, narrow tibia; length protibia, 300 μm ; length mesotibia, 487 μm ; length protarsus, 105 μm ; length mesotarsus, 130 μm ; pro and mesotarsi 3-segmented; metatarsi 4 segmented; claws paired, with small basal tooth, arolia absent.

Wings: Elytra with 6 veins meeting margin, four basal cells, tc cell pentagonal; oblique vein at base of four major wing cells; length forewing, 560 μm , greatest width, 285 μm ; hind wing not visible.

Abdomen. Composed of 8 glabrous sternites, including asymmetrical pygofers; right palpifer blade-like, recurved; remaining genitalia obscure.

Type: Holotype deposited in the Poinar amber collection (accession # B-He-24B) maintained at Oregon State University, Corvallis, Oregon.

Type locality: Amber mine at the Noiye Bum 2001 Summit Site in the Hukawng Valley, southwest of Maingkhwan in Kachin State (26°20'N, 96°36'E) in Burma (Myanmar).

Etymology: The specific epithet is taken from the Greek *hex* = six and the Greek *phlebos* = vein, in reference to the 6 longitudinal wing veins.

Comments: The circular plate on the vertex with six peripheral ocelli and a seventh central ocellus (Figs. 13,14) is an enigma. Further comments on this structure are presented in the Discussion below. The above mentioned character and the elytra with 6 veins meeting the margin separate the new genus from *Voragocoris* Weirauch (2012) and *Williamsocoris* Carpintero and Dellape (2006).

Triungulin on abdomen of *Lumatibialis burmitis*.

A triungulin in the family Meloidae (Coleoptera) attached to the dorsum of the abdomen of *Lumatibialis burmitis* is described below.

Coleoptera L., 1758

Meloidae Gyllenhal, 1810

Microentomus Poinar, gen. n.

Type species: *Microentomus epibatus* Poinar, gen. n., sp. n.

Diagnosis: Body extremely small, fusiform with segmentation distinct, broadest in thoracic region; abdomen narrowed at tip.

Microentomus epibatus Poinar, gen. n., sp. n. (Figs. 16, 17A)

Description: Body length, 127 µm.

Head: As long as wide, eyes oval, palps 2-segmented; antennae not discernable; length, 20 µm.

Thorax: Three-segmented, almost as long as abdomen; dorsum of prothorax at same level as head; length, 47 μm .

Abdomen: Nine-segmented with terminal segment pointed; length, 60 μm .

Legs: Fairly long, femora wider at base; tibia moderately long; tarsi not visible.

Type: Holotype deposited in the Poinar amber collection (accession # B-He-24B) maintained at Oregon State University, Corvallis, Oregon.

Type locality: Amber mine at the Noiye Bum 2001 Summit Site in the Hukawng Valley, southwest of Maingkhwan in Kachin State (26°20'N, 96°36'E) in Burma (Myanmar).

Etymology: The generic name is from the Greek “micros”= small and the Greek “entomon” = insect. The specific epithet is from the Greek “epibates” = rider.

Comments: Consultations with various specialists ruled out the possibility that *M. epibatus* is a mite, strepsipteran larva or dryinid triungulin. Triungulins of the Ripiphoridae (Coleoptera) are of the planidium type with flattened, smoothly tapered bodies, which is not the case with the present fossil (Clausen 1962). The small size of *M. epibatus* separates it from all extant and extinct meloid triungulins, whose lengths are over 500 μm (Bologna and Pinto 2001; Engel 2005; Poinar 2009). The body shape of *M. epibatus* is similar to that of some extant meloid triungulins, especially the apoid parasite, *Tricrania sanguinipennis* Say (Parker and Bövine 1924)(Fig. 17B). Members of the Apoidea are the most common hosts for meloids and a possible host for *M. epibatus* could be the primitive bee, *Melittosphex burmensis* Poinar and Danforth, which occurred in the same habitat as *M. epibatus* (Danforth and Poinar 2011). Having a small host would explain the reduced size of *M. epibatus* since *M. burmensis* is a small apoid only 2.95 mm in length. Meloids are considered to have evolved during the Early Cretaceous

(Bologna et al, 2008), which is in accordance with the presence of *M. epibatus* in Burmese amber.

The head of *M. epibatus* is appressed to the surface of the abdomen of *L. burmitis* and it is possible that the mouthparts are inserted into the host (Fig. 16). Apparently some Old World species of *Meloe* burrow into the body of their carrier and may take up host fluid (John Pinto, person correspondence). It is likely that one of the hatching juveniles of *M. epibatus* attached itself to *L. burmitis* during its search for a developmental host. Meloid triungulins are known to attach to various objects, including non-host arthropods (Clausen 1962; Pinto and Bologna 1993; Poinar 2009). The present discovery represents the oldest known triungulin and the first fossil phoretic association between a triungulin and Hemipteran.

Discussion

The Schizopteridae occur on all continents but the family is most diverse in the tropics and subtropics. Even so, there are no records of this family in Hispaniola (Perez-Gelabert 2008). While representatives had been noted in Dominican amber, none have been described up to the present (Poinar and Poinar 1999). While Jumping Ground Bugs occur in litter and a range of soil environments, especially those that are moist, they also occur in arboreal habitats, which would explain their presence in amber. Dominican and Burmese amber was deposited in tropical-subtropical forests. The Dominican amber source tree was a legume (Poinar 1991) while Burmese amber was formed by an Araucariaceae (Poinar et al. 2007). While little is known of the behavior of these predatory bugs. When disturbed they are said to use a jumping and flying escape

behavior, instead of running like many other hemipterans (McAtee & Malloch 1926; Emsley 1946).

There are several interesting features on the Burmese amber specimens. The widened, flattened tips of the protarsi with a small hook on the inner margin of *Lumatibialis burmitis* appear to be a unique feature. The extremely short 3-segmented protarsi appear as if they could be withdrawn into the cavity bordered by the hook. The forewing venation of *Hexaphlebia burmanica* is also unique with 6 main veins meeting the outer margin of the wing and A extended to the wing margin. Again, such a venational pattern apparently has not been observed on any other extant or extinct member of the family.

The strange configuration of the 6 ocelli arranged in a circle on the vertex of *H. burmanica*, with a larger seventh ocellus in the middle (Fig. 14) is a character unique to this species and possibly to all adult Heteroptera that have ocelli situated between or slightly behind the compound eyes (Schuh and Slater 1995). In *H. burmanica*, the ocellar circle is on the vertex. Similar arrangements of ocelli occur on larval holometabolous insects that possess from 1 to 7 ocelli on each side of their heads, with the lateral group often arranged in a circle (Snodgrass 1935). For instance, the larva of some beetles, caddis flies and Lepidoptera have 6 main ocelli and one rudimentary ocellus on each side of their head. Also some adult insects possess groups of ocelli. In adult silverfish of the genus *Lepisma* (Thysanura: Lepismatidae), the lateral eyes are composed of a group of 12 ocelli separated by pigmented epidermal cells (Snodgrass 1935). However the nymphs of many Heteroptera possess from 4 to many simple ommatidia so perhaps this arrangement on *H. burmanica* is a carryover from the nymphal stage.

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Figure legends

Figure 1. *Hypselosoma dominicana* Poinar and Brown, sp. n. in Dominican amber. Scale bar = 370 μm .

Figure 2. Wings of *Hypselosoma dominicana* Poinar and Brown sp. n. in Dominican amber.

Figure.3. Dorsal view of *Schizoptera dominicana* Poinar sp. n. in Dominican amber. Scale bar = 200 μm .

Figure 4. Lateral view of *Schizoptera dominicana* Poinar, sp. n. in Dominican amber. Note head bumps. Scale bar = 270 μm .

Figure 5. Forewing of *Schizoptera dominicana* Poinar, sp. n. in Dominican amber.

Figure 6. Dorsal view of *Schizoptera hispaniolae* Poinar, sp. n. in Dominican amber.

Scale bar = 380 μm .

Figure 7. Lateral view of *Schizoptera hispaniolae* Poinar, sp. n. in Dominican amber.

Scale bar = 370 μm .

Figure 8. Forewing of *Schizoptera hispaniolae* Poinar, sp. n. in Dominican amber.

Figure 9. *Lumatibialis burmitis* Poinar, gen et sp. n. in Burmese amber. Scale bar = 280 μm .

Figure 10. Ventral view of *Lumatibialis burmitis* Poinar, gen. et sp. n. in Burmese amber.

Scale bar = 370 μm .

Figure 11. Flattened tip of fore tibia of *Lumatibialis burmitis* Poinar, gen. et sp. n. in

Burmese amber. Scale bar = 65 μm .

Figure 12. Wings of *Lumatibialis burmitis* Poinar, gen. et sp. n. in Burmese amber.

Figure 13. *Hexaphlebia burmanica* Poinar, gen. et sp. n. in Burmese amber. Note series of 6 ocelli arranged in a circle on the vertex with a larger seventh ocellus in the middle of the circle (arrow). Scale bar = 290 μm .

Figure 14. Drawing of the plate with a circle of 6 ocelli with one central ocellus on the vertex of *Hexaphlebia burmanica* Poinar, gen. et sp. n. in Burmese amber.

Figure 15. Forewing of *Hexaphlebia burmanica* Poinar, gen. et sp. n. in Burmese amber.

Figure 16. *Microentomus epibatus* Poinar, gen. et sp. n. attached to the abdomen of *Lumatibialis burmitis* gen. et sp. n. in Burmese amber. Scale Bar = 90 μm .

Arrowhead shows dark area surrounding head of *M. epibatus*, which could be melanized hemolymph.

Figure 17. Comparison of body structure of *Microentomus epibatus* with the triungulin of *Tricrania sanguinipennis*. A. *Microentomus epibatus*. Bar = 33 μm .
B. Triungulin of *Tricrania sanguinipennis* (modified from Parker and Bövine 1924). Bar = 200 μm .