

## Fossil soldier beetles of the Anders Damgaard amber collection. Fourth update

**Fabrizio Fanti, Anders Leth Damgaard**

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With this fourth update of the soldier beetles (Coleoptera, Cantharidae) of the Anders Damgaard amber collection, we are providing descriptions of a new genus and seven new fossil species. From the Baltic amber: *Cantharis (Cantharis) kviumi* sp. nov. and *Podistra (Absidia) mattheseni* sp. nov. From the Burmese amber: *Elektrokleinia steffenseni* sp. nov., *Poinarelektronmiles ellenbergeri* gen. et sp. nov., *Sanaungulus lethi* sp. nov., *Sanaungulus morellii* sp. nov., and *Sanaungulus rosenzweigi* sp. nov.

Key words: paleoentomology, Cretaceous, Eocene, insects, Cantharidae.

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### INTRODUCTION

Three contributions have already been published concerning the Cantharidae family preserved in the Anders Damgaard's vast amber collection (Fanti et al. 2018; Fanti & Damgaard 2018, 2019) which currently includes over 1000 pieces with coleopteran inclusions. These pieces come from various resources of this resin, such as Baltic amber, Burmese amber, Dominican amber, Mexican amber, and New Jersey amber. With this note, we therefore want to describe two new species from the Eocene Baltic amber and five new species, plus a new genus, from the Cretaceous Burmese amber of this collection. The study of numerous materials allows to advance the biological, taxonomic and morphological knowledge of these arthropods but also to deepen the ecology and biogeography in general, as well as, at least

in these cases, it also has an important cultural value and which has given rise to a permanent exhibition in Denmark (Amber Exhibition at GeoCenter MønsKlint).

### MATERIALS AND METHODS

The specimens were cut, cleaned, and polished. They were then studied under a stereomicroscope and compared with the descriptions and information present in the world scientific literature. The photographs were made using an Imaging Source DFK 72AUC02 camera attached to a trinocular microscope. The plates were made using PhotoImpact Viewer SE. The holotypes are preserved in the amber collection of Anders Damgaard (ALDC) at Holstebro (Denmark), and subsequently will be deposited in the Zoologi-

cal Museum, University of Copenhagen, Denmark (ZMUC). Subfamily, tribe, genera and species are listed in systematic alphabetical order.

#### SYSTEMATIC PALEONTOLOGY

**Order Coleoptera Linnaeus, 1758**

**Superfamily Elateroidea Leach, 1815**

**Family Cantharidae Imhoff, 1856 (1815)**

**Subfamily Cantharinae Imhoff, 1856 (1815)**

**Tribe Cantharini Imhoff, 1856 (1815)**

**Genus *Cantharis* Linnaeus, 1758**

**Subgenus *Cantharis* Linnaeus, 1758**

***Cantharis (Cantharis) kviumi* sp. nov.**

(Figs. 1 - 2)

**Holotype.** Female, in Baltic amber, accession No. ALDC0567/ALD.Ba.Can.28

**Type locality.** Russia, Kaliningrad Region, Sambian Peninsula, amber quarry near Yantarny (previously known as Palmnicken).

**Type horizon.** Middle Eocene (Lutetian) (47.8-41.2 MY) to Late Eocene (Priabonian) (37.8-33.9 MY). Prussian Formation.

**Differential diagnosis.** The pronotal shape is characteristic and it is not present in any fossil species of the genera *Cantharis*, *Podistra* and *Lycocerus*.

**Description.** Adult, winged, slender. Female, defined on the basis of the short antennae and the transverse and rounded apically last ventrite. Body length about 6.4 mm. Entirely brown.

Head completely exposed, rounded, covered with shallow punctuation. Eyes large, prominent, roundish, inserted in the lateral-upper part of the head, inter-ocular dorsal distance about 3.4 times greater than the eye diameter. Mandibles short, falciform. Maxillary palps 4-segmented with the last palpomere strongly securiform with thinner apex in a kind of tip rounded apically. Labial palps 3-segmented with the last palpomere securiform.

Antennae 11-segmented, short, surpassing the humeral zone and not reaching the half of elytra, filiform, with scattered setae; scape robust, cylindrical, club-shaped; antennomere II very short, triangular-shaped, about 3.5 times shorter than scape; antennomere III about 1.8 times longer than antennomere II; antennomeres IV-X robust, sub-equal, as long as antennomere III with antennomeres IX-X very slightly shorter; antennomere XI filiform, about 1.6 times longer than previous ones, rounded apically. Pronotum elongate, longer than wide, slightly wider than head, equipped by a long pubescence and slightly wrinkled, surface irregular and convex depressed laterally, anterior margin very slightly rounded, posterior margin almost straight, sides straight and enlarged close to the posterior margin, posterior corners obtuse, propleura roundish. Scutellum triangular-shaped. Elytra wider than pronotum, robust, elongate, parallel-sided, covering the last abdominal segments, equipped by numerous sparse and long setae, surface strongly wrinkled, suture slightly bordered, rounded apex. Posterior wings covered by elytra and slightly longer. Metasternum sub-quadrate. Ventriles transverse with short pubescence, last ventrite wide and rounded apically. Legs robust, pubescent; coxae short, robust; trochanters elongated and rounded apically; femora enlarged, slightly curved; protibiae cylindrical and shorter than profemora, meso- and metatibiae as long as meso- and metafemora. Tarsi 5-segmented; first tarsomere elongated; second tarsomere about 1.3 times shorter than first tarsomere; third tarsomere as long as second tarsomere; fourth bilobed at sides; fifth tarsomere thin, flat, curved and elongated; claws simple without tooth at the base and only with a small and obtuse thickening. Male unknown.

**Etymology.** Named in honor of the Danish artist Michael Otto Albert Kvium (Horsens, 15 November 1955).

**Syninclusions.** Botanical remains and debris.

**Remarks.** The amber piece measures approximately 36 x 16 mm and the surface is partially

wrinkled. The inclusion is complete and prominent.

**Genus *Elektrokleinia* Ellenberger & Fanti, 2019**

***Elektrokleinia steffenseni* sp. nov.**

(Figs. 3 - 4)

**Holotype.** Sex undefined, in Burmese amber, accession No. ALDC0571/ALD.Bu.214

**Type locality.** Myanmar: Kachin state, Myitkyina District, Tanai Township, Hukawng Valley.

**Type horizon.** Lowermost Cenomanian ( $98.79 \pm 0.62$  Ma), mid-Cretaceous.

**Differential diagnosis.** The new species is distinguishable from the other known species: *Elektrokleinia picta* Ellenberger & Fanti, 2019 for the last smaller urites with the last more rounded apically and for the narrower pronotum forward (Ellenberger & Fanti 2019). Instead, the genus *Burmomiles* Fanti, Damgaard & Ellenberger, 2018 has pectinate antennae, pronotum more enlarged at sides and the last urites not concave (Fanti et al. 2018; Fanti & Damgaard 2019).

**Description.** Adult, winged, robust. Sex undefined. Body length about 3.4 mm. Entirely brown with eyes darker (blackish).

Head short, transverse, very slightly triangulate behind the eyes, partially covered by the pronotum, fitted with shallow punctuation. Eyes prominent, elliptical-elongated, covering almost the entire lateral part of the head, inter-ocular dorsal distance about 1.8 times greater than the eye diameter. Mandibles elongated and thin. Maxillary palps 4-segmented with the last palpomere securiform and almost truncate anteriorly with rounded external margin. Labial palps 3-segmented, with the last palpomere securiform. Antennae 11-segmented, filiform, relatively short, reaching the half of elytra and al-

most reaching the half of abdomen, antennal insertion not particular close to the eyes and in the upper part of the head; scape very elongated, club-shaped, enlarged apically; antennomere II globular, short, and about 4.1 times shorter than scape; antennomeres III-X about 3.0 times longer than second; antennomere XI elongated with rounded apex; all antennomeres with very short pubescence. Pronotum transverse, wider than head, anterior margin slightly rounded and strongly bordered, posterior margin almost straight and bordered, sides almost straight and bordered and narrower near the apical part, posterior corners obtuse, pronotum disc with small and short pubescence. Scutellum triangular-shaped, rounded at apex. Elytra wider than pronotum, elongated, not covering the last two abdominal segments, parallel-sided, suture and sides strongly bordered, rounded at apex, surface with coarse punctuation gathered in longitudinal striae. Posterior wings transparent, covered by the elytra. Sternum sub-quadrangle, ventrites transverse and pubescent, last tergite small and rounded, last ventrite small and slightly concave apically. Legs relatively robust, short, covered with short pubescence; coxae massive; trochanters elongated, with rounded apex; femora slightly curved, more robust than tibiae; tibiae thin, with an apical spur, pro- and mesotibiae shorter than pro- and mesofemora, metatibiae as long as metafemora. Tarsal formula 5-5-5; first tarsomere elongated; second tarsomere about 1.9 times shorter than first; third tarsomere triangular-shaped; fourth strongly bilobed; fifth tarsomere elongated, thin, flat, curved; claws simple with an obtuse lobe.

**Etymology.** Named in honor of the Danish radio and television host Mads Foldberg Steffensen (Aalborg, 8 June 1970).

**Syninclusions.** Air bubbles, botanical remains, a specimen not well visible of Hemiptera.

**Remarks.** The amber piece has a teardrop shape and is flat. It measures approximately 30 x 15 mm. The inclusion is complete, but the ventral part is

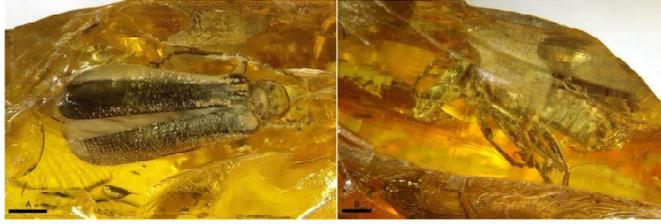


Fig. 1. *Cantharis (Cantharis) kviumi* sp. nov. ALDC0567/ALD.Ba.Can.28 in Baltic amber. A: Holotype, dorsal view, bar = 1.0 mm; B: Holotype, ventral view, bar = 1.0 mm.

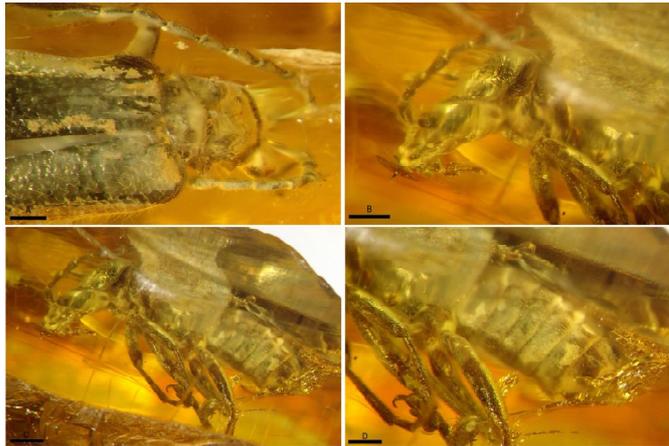


Fig. 2. *Cantharis (Cantharis) kviumi* sp. nov. ALDC0567/ALD.Ba.Can.28 in Baltic amber. A: Holotype, detail of head and pronotum, bar = 0.4 mm; B: Holotype, detail of head and palps (lateral view), bar = 0.2 mm; C: Holotype, ventral view (detail), bar = 1.0 mm; D: Holotype, detail of legs and last ventrites, bar = 0.5 mm.



Fig. 3. *Elektrokleinia steffenseni* sp. nov. ALDC0571/ALD.Bu.214 in Burmese amber. Holotype, dorsal view, bar = 0.5 mm.

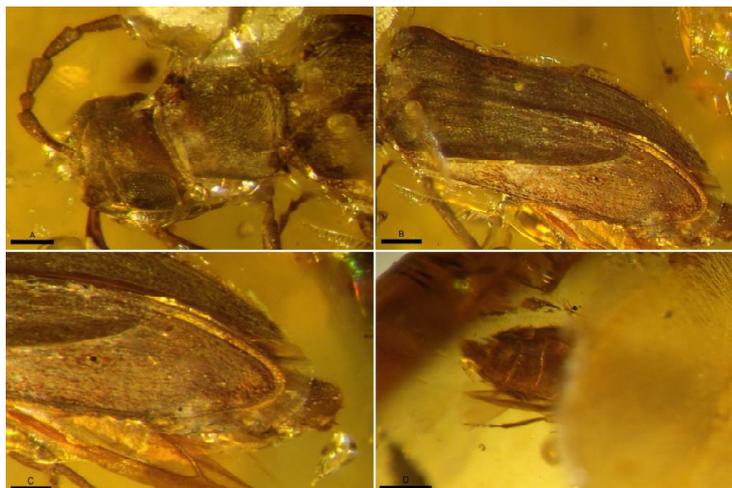


Fig. 4. *Elektrokleinia steffenseni* sp. nov. ALDC0571/ALD.Bu.214 in Burmese amber. A: Holotype, detail of head and pronotum, bar = 0.2 mm; B: Holotype, detail of elytra, bar = 0.3 mm; C: Holotype, detail of last tergite, bar = 0.2 mm; D: Holotype, detail of last ventrites, bar = 0.2 mm.

difficult to photograph because the surface of the amber has an extensive and thin patina.

**Genus *Podistra* Motschulsky, 1839**

**Subgenus *Absidia* Mulsant, 1862**

***Podistra (Absidia) mattheseni* sp. nov.**

(Figs. 5 - 6)

**Holotype.** Male, in Baltic amber, accession No. ALDC0566/ALD.Ba.Can.27

**Type locality.** Russia, Kaliningrad Region, Sambian Peninsula, amber quarry near Yantarny (previously known as Palmnicken).

**Type horizon.** Middle Eocene (Lutetian) (47.8-41.2 MY) to Late Eocene (Priabonian) (37.8-33.9 MY). Prussian Formation.

**Differential diagnosis.** Kazantsev (2020) says that the genera *Podistra* and *Lycocerus* are difficult to determine, especially in fossils. This aspect is certainly and undoubtedly the reality, but evidently it would be for all the species described in these two genera (*i.e.*, Fanti & Damgaard 2018,

2019; Kazantsev 2018, 2020; Fanti 2020; present work) and not the dubious generic attribution only for *Podistra (Absidia) klovedali* Fanti & Damgaard, 2018 as in Kazantsev (2020). For a taxonomic shift we need valid and convincing arguments, not visible in fossils (the aedeagus for example). *Podistra klovedali* Fanti & Damgaard, 2018 has, in particular, a pronotum identical to the living *Podistra* and not present in *Lycocerus*, character of the pronotum that Kazantsev himself highlights in the text of an article (Kazantsev 2018) to be diagnostic. The doubt of congenericity and / or a possible synonymy with *Lycocerus christelae* Kazantsev, 2018 suggested by Kazantsev (2020) for the evident and deep differences in the pronotum, in the size and in the length of the antennomeres, should be totally rejected.

*Podistra mattheseni* sp. nov. is tentatively assigned to the subgenus *Absidia* for the claws with tooth at the base (Constantin, 2014). This new species is distinguishable from the others fossil *Podistra* and *Lycocerus* by the whole pronotal shape and especially for the slightly sinuous sides, and the slightly pointed posterior corners.

**Description.** Adult, winged, slender. Male, defined on the basis of the long antennae and the last triangular-shaped ventrite. Body length 5.2 mm. Entirely dark brown - blackish.

Head partially exposed, slightly pubescent, covered with some granules. Eyes very large, promi-

nent, roundish, inserted in the lateral-upper part of the head, inter-ocular dorsal distance about 2.1 times greater than the eye diameter. Mandibles thin, elongated, falciform. Maxillary palps 4-segmented with the last palpomere securiform. Labial palps 3-segmented with the last palpomere elongated and securiform. Antennae 11-seg-



Fig. 5. *Podistra (Absidia) mattheseni* sp. nov. ALDC0566/ALD.Ba.Can.27 in Baltic amber. A: Holotype, dorsal view, bar = 1.0 mm; B: Holotype, ventral view, bar = 1.0 mm; C: Holotype, detail of elytral apex and claw, bar = 0.2 mm; D: Holotype, detail of last ventrites, bar = 0.2 mm.

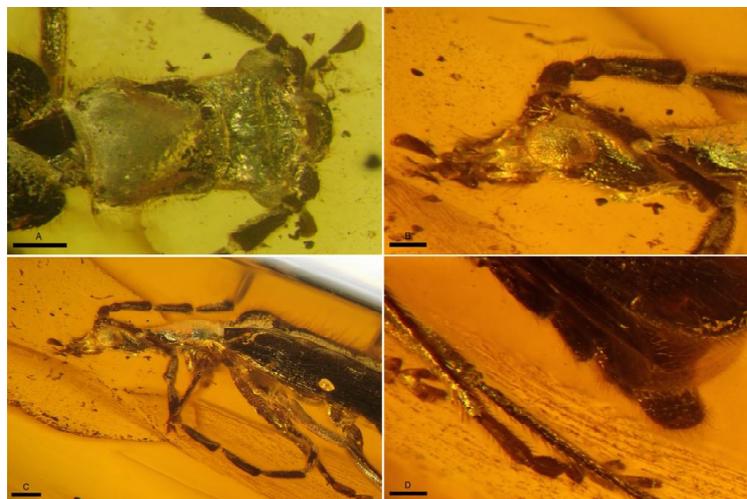


Fig. 6. *Podistra (Absidia) mattheseni* sp. nov. ALDC0566/ALD.Ba.Can.27 in Baltic amber. A: Holotype, detail of head and pronotum, bar = 0.5 mm; B: Holotype, detail of head and palps (lateral view), bar = 0.3 mm; C: Holotype, detail of left antenna, bar = 0.5 mm; D: Holotype, detail of tarsomeres and last tergite, bar = 0.2 mm.

mented, long, surpassing the half of elytra and not reaching the apex, filiform, with scattered setae; scape robust, cylindrical; antennomere II short, globular, one-third as long as scape; antennomere III about 2.7 times longer than antennomere II; antennomere IV slightly longer than antennomere III; antennomeres V-IX filiform, very elongated, subequal; antennomeres X-XI thinner than previous ones; antennomere XI very slightly longer than antennomere X, and with rounded apex. Pronotum longer than wide, rectangular (typical of *Podistra*), slightly wider than head, equipped by a long and erected pubescence and a very small punctuation, surface irregular, anterior margin rounded, posterior margin almost straight, sides slightly sinuous and slightly concave in the middle, posterior corners very slightly pointed, margins bordered, propleura roundish. Scutellum triangular, elongated. Elytra much wider than pronotum, elongate, covering the last abdominal segments, equipped by numerous sparse setae and small punctuation, parallel sided, with rounded apex. Posterior wings covered by elytra and visible only at the apex. Metasternum elongated, sub-rectangular. Ventrites transverse with short pubescence, last ventrite small and triangular-shaped. Legs long, pubescent; coxae short, robust; trochanters elongated with rounded apex; femora enlarged, slightly curved externally; tibiae thin, cylindrical, pro- and mesotibiae very slightly shorter than pro- and mesofemora, metatibiae as long as metafemora. Tarsi 5-segmented; first tarsomere thin and elongated; second tarsomere about 1.8 times shorter than first tarsomere; third tarsomere shorter than the previous one; fourth strongly bilobed at sides; fifth tarsomere thin, flat and very elongated; claws simple with small tooth at the base. Female unknown.

**Etymology.** Named in honor of the Danish stand-up comedian, actor, and rapper Anders Matthesen, pseudonym “Anden (The Duck)” (Copenhagen, 6 July 1975).

**Syninclusions.** Botanical remains, very few (two-three) and small air bubbles.

**Remarks.** The amber piece is sub-quadrate, and measures approximately 23 x 21 mm. The view of the inclusion is perfect, and only the right front leg is missing.

**Genus *Poinarelektronmiles* Fanti & Damgaard gen. nov.**

**Type species.** *Poinarelektronmiles ellenbergeri* sp. nov. The genus is at present monotypic.

**Etymology.** This genus is named in honor of George O. Poinar (Corvallis, Oregon State University, USA), specialized in amber inclusions, + the Ancient Greek *ηλεκτρον* (*elektron*) = amber, + the Latin noun *mīlēs* = soldier. Gender: masculine.

NOTE: George Poinar was one of the first (together with Francesco Vitali), to trust the knowledge about fossil soldier beetles of one of us (Fanti). While, with the ending “*miles*” already exists the genus *Burmomiles* Fanti, Damgaard & Ellenberger, 2018 and could be used as a classic ending to indicate the representative of the family Cantharidae (soldier beetles), like “*myia*” for Diptera, for example.

**Diagnosis.** This genus is characterized by unequal maxillary palpomeres with the last palpomere very elongated and slightly securiform, head rounded behind the eyes with small depressions anteriorly, pronotum smooth without depressions or thickening, long elytra covering and very slightly surpassing the abdomen, and the pectinate antennae with the antennomeres III-IX equipped with a long antennal process. The only other genus from Burmese amber with long elytra covering the abdomen: *Myamalycocerus* Fanti & Ellenberger, 2016 has serrate antennae, the last maxillary palpomere strongly securiform, and a very different pronotum with depressions and thickening (Fanti & Ellenberger 2016).

***Poinarelektronmiles ellenbergeri* sp. nov.**

(Figs. 7 - 8)

**Holotype.** Male, in Burmese amber, accession No. ALDC0578/ALD.Bu.221

**Type locality.** Myanmar: Kachin state, Myitkyina District, Tanai Township, Hukawng Valley.

**Type horizon.** Lowermost Cenomanian (98.79 ± 0.62 Ma), mid-Cretaceous.

**Differential diagnosis.** No other species of this genus is currently known. See diagnosis of the new genus.

**Description.** Adult, winged, slender. Male, defined on the basis of the last ventrite elongated and emarginate apically, with larger and rounded apically last tergite. Body length about 3.2-3.4 mm (the head is folded). Brown-testaceous with blackish elytra.

Head rounded, not constricted posteriorly, with small depressions anteriorly, fitted with shallow punctuation. Eyes prominent, large, globular and roundish, inserted in the lateral part of the head. Mandibles short, falciform, apparently without teeth. Maxillary palps 4-segmented with the last palpomere very elongated and slightly securiform, rounded apically. Labial palps 3-segmented, with the last palpomere securiform. Antennae 11-segmented, pectinate, relatively short, reaching the half of elytra, antennal insertion in the upper part of the head (on the clypeus after the eyes); scape elongated, robust, club-shaped; antennomere II short, globular, about 2.5 times shorter than scape; antennomere III slightly longer than second, robust and apically equipped with a long and thin antennal process inserted ventrally; antennomeres IV-IX sub-equal, elongated and thin, each apically equipped with an antennal process which is very long and thin and rounded apically; antennomere X filiform, without rami, as long as the previous ones; antennomere XI filiform, rounded apically; all the antennomeres with short pubescence. Pronotum sub-quadrate, flat, slightly wider than head, an-

terior margin rounded and bordered, posterior margin straight and bordered, sides straight, posterior corners obtuse, pronotum disc smooth. Scutellum triangular-shaped, rounded at apex. Elytra long, covering and slightly surpassing the last abdominal segments, wider than pronotum, humeral zone very slightly larger, parallel-sided posteriorly, thin apically and rounded, surface with punctures in relief and arranged in confused striae. Posterior wings slightly infusate, as long as elytra. Sternum elongated, rounded apically, ventrites wide and transverse and rounded at sides, last tergite wide and rounded apically, last ventrite elongated and emarginate apically. Legs thin, covered with little pubescence; coxae massive; trochanters triangular-shaped, with rounded apex; femora slightly curved, slightly robust than tibiae; tibiae thin, cylindrical, without spur near the apex, as long as femora. Tarsal formula 5-5-5; first tarsomere long; second tarsomere shorter than first; third tarsomere almost triangular; fourth strongly bilobed; fifth tarsomere elongated, thin, flat and curved; claws simple.

**Etymology.** Named in honor of Sieghard Ellenberger (Kassel, Germany), our friend.

**Syninclusions.** Air bubbles and few botanical remains.

**Remarks.** The amber piece has a half-moon shape and measures approximately 15 x 9 mm. The inclusion is complete with folded legs.

**Genus *Sanaungulus* Fanti, Damgaard & Ellenberger, 2018**

***Sanaungulus lethi* sp. nov.**

(Figs. 9 - 10)

**Holotype.** Probably male, in Burmese amber, accession No. ALDC0570/ALD.Bu.213

**Type locality.** Myanmar: Kachin state, Myitkyina District, Tanai Township, Hukawng Valley.

**Type horizon.** Lowermost Cenomanian ( $98.79 \pm 0.62$  Ma), mid-Cretaceous.

**Differential diagnosis.** Only *Sanaungulus fabriciusi* Fanti & Damgaard, 2019 has antennomeres III-IX equipped with long rami but the new species here described has different pronotal shape (Fanti & Damgaard 2019). The genus *Burmomiles* Fanti, Damgaard & Ellenberger, 2018 has the same number of rami but has longer and wider elytra, the shorter legs

and roundish head (Fanti et al. 2018; Fanti & Damgaard 2019).

**Description.** Adult, winged, slender. Probably male, defined on the basis of the last ventrite triangular-shaped. Body length about 3.0 mm. Entirely brown with darker head (dark brown-red-dish).

Head transverse, constricted and triangular-shaped behind the eyes, fitted with shallow punc-

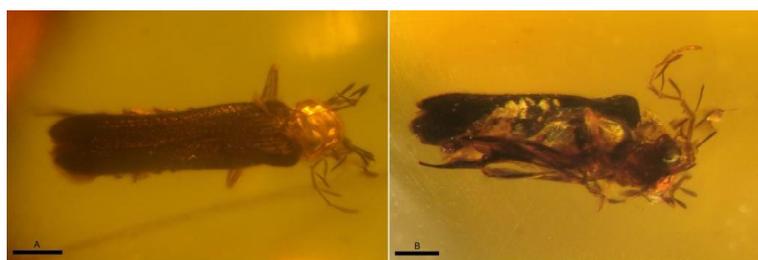


Fig. 7. *Poinarelektronmiles ellenbergeri* gen. et sp. nov. ALDC0578/ALD.Bu.221 in Burmese amber. A: Holotype, dorsal view, bar = 0.5 mm; B: Holotype, ventral view, bar = 0.5 mm.

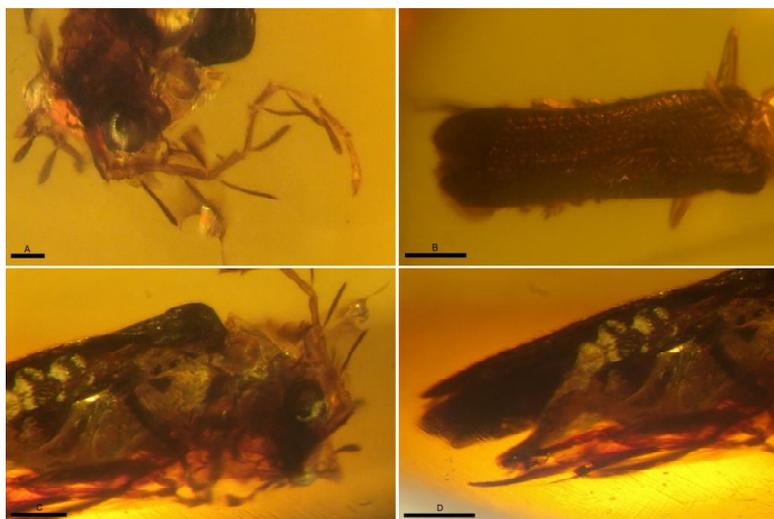


Fig. 8. *Poinarelektronmiles ellenbergeri* gen. et sp. nov. ALDC0578/ALD.Bu.221 in Burmese amber. A: Holotype, detail of antennae, bar = 0.3 mm; B: Holotype, detail of elytra, bar = 0.5 mm; C: Holotype, detail of pronotum (ventral view) and metasternum, bar = 0.3 mm; D: Holotype, detail of last ventrites, bar = 0.3 mm.

tuation. Eyes prominent, very large, roundish, inserted in the lateral part of the head, inter-ocular dorsal distance about 3.1 times greater than the eye diameter. Mandibles elongated and thin. Maxillary palps 4-segmented with the last palpomere slightly securiform and rather rounded. Labial palps 3-segmented, with the last palpomere slightly securiform. Antennae 11-segmented, pectinate, rather short, slightly surpassing the half of the elytra and reaching half of the abdomen, antennal insertion in the eyes proximity; scape stout, rather short, club-shaped;

antennomere II about 2.2 times shorter than scape; antennomeres III-IX longer than second and each equipped with a thin, cylindrical, long and rounded at apex antennal process inserted in the ventral-apical part; antennomeres X-XI filiform with the XI which is slightly pointed at apex; all antennomeres very slightly pubescent. Pronotum transverse, wider than head, anterior margin strongly rounded and slightly bordered, posterior margin almost straight and strongly bordered, sides slightly rounded, posterior corners obtuse, pronotum disc smooth and lustrous.

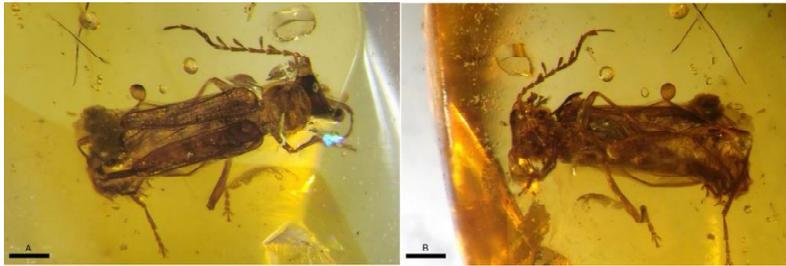


Fig. 9. *Sanaungulus lethi* sp. nov. ALDC0570/ALD.Bu.213 in Burmese amber. A: Holotype, dorsal view, bar = 0.5 mm; B: Holotype, ventral view, bar = 0.5 mm.

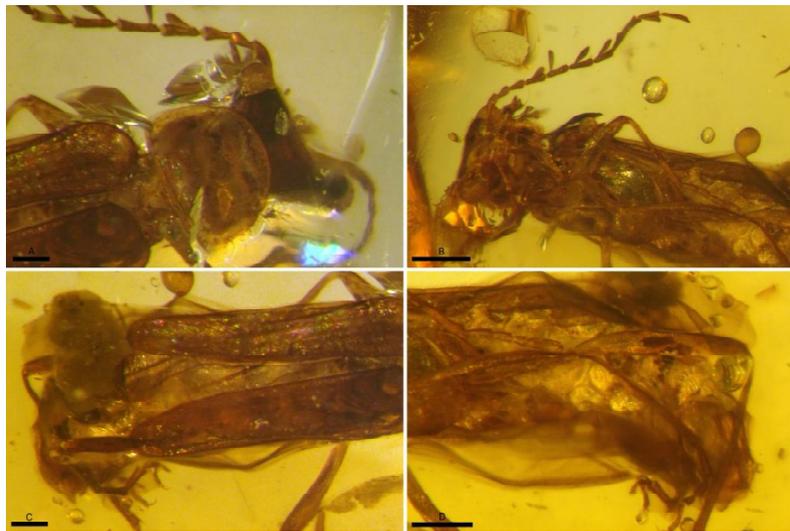


Fig. 10. *Sanaungulus lethi* sp. nov. ALDC0570/ALD.Bu.213 in Burmese amber. A: Holotype, detail of head and pronotum, bar = 0.2 mm; B: Holotype, detail of antenna and metasternum, bar = 0.5 mm; C: Holotype, detail of elytral apex, bar = 0.2 mm; D: Holotype, detail of last ventrites, bar = 0.2 mm.

Scutellum triangular-shaped, rounded at apex. Elytra short which reveals various abdominal segments, as wide as the pronotum in the humeral zone and narrower posteriorly, elytra deiescent, rounded apices, surface with punctures very slightly in relief and apparently arranged in six longitudinal striae. Posterior wings transparent and slightly surpassing the elytra. Sternum elongated and rounded posteriorly, ventrites large and transverse, last tergite triangular-shaped, last ventrite small and triangular with rounded apex. Legs thin, long, covered with pubescence; coxae massive; trochanters elongated, with rounded apex; femora curved, flattened, more robust than tibiae; tibiae thin, approximately as long as femora, with a spur near the apex. Tarsal formula 5-5-5; first tarsomere extremely long; second tarsomere shorter than first (metatarsomere II about 1.9 times shorter than metatarsomere I); third tarsomere shorter than the previous one; fourth strongly bilobed; fifth tarsomere elongated, thin, flat; claws simple, with a very small and obtuse denticle at the base.

**Etymology.** Named in honor of the Danish inventor, exhibition designer and engineer Henrik Bangshøj Leth. Among other things, he has been a key figure in the construction of the new Danish amber exhibition at GeoCenter MønsKlint in 2020.

**Syninclusions.** Air bubbles and few botanical remains.

**Remarks.** The small amber piece measures approximately 12 x 7 mm and the surface has some fractures. The inclusion is complete.

***Sanaungulus morellii* sp. nov.**  
(Figs. 11 - 12)

**Holotype.** Male, in Burmese amber, accession No. ALDC0568/ALD.Bu.211

**Type locality.** Myanmar: Kachin state, Myitkyina District, Tanai Township, Hukawng Valley.

**Type horizon.** Lowermost Cenomanian (98.79 ± 0.62 Ma), mid-Cretaceous.

**Differential diagnosis.** *Sanaungulus morellii* sp. nov. differs from *Sanaungulus ruicheni* (Hsiao & Huang, 2018), for the pronotum more transverse, the last ventrite long and triangular-shaped, and for the last tergite with elongated lobes, as well as the sturdier antennae.

**Description.** Adult, winged, slender. Male, defined on the shape of the last urites and on the basis of the short antennae. Body length 4.0 mm. Entirely brown.

Head transverse, strongly constricted (triangular-shaped) behind the eyes, fitted with very scarce and very shallow punctuation. Eyes prominent, very large, roundish, inserted in the lateral part of the head, inter-ocular dorsal distance about 3.0 times greater than the eye diameter. Mandibles elongated and thin. Maxillary palps 4-segmented with the last palpomere securiform. Labial palps 3-segmented, with the last palpomere slightly securiform. Antennae 11-segmented, filiform, almost globular, short and slightly surpassing the humeral zone of the elytra, antennal insertion in the eyes proximity; scape elongated, stout, curved; antennomere II very short, globular, about 3.2 times shorter than scape; antennomeres III-X filiform, almost globular, short, stout, enlarged; antennomere XI rounded at apex and thinner than previous ones; all the antennomeres with dense and very short pubescence. Pronotum transverse, wider than head, anterior margin rounded and bordered, posterior margin almost straight and bordered, sides slightly sinuous, posterior corners acute, pronotum disc smooth and lustrous. Scutellum triangular-shaped, posteriorly in a long and thin tip, rounded at apex. Elytra very short which reveals various abdominal segments, wider than pronotum, humeral zone large, posteriorly narrower and parallel-sided, rounded apices, surface slightly pubescent with punctures arranged in longitudinal striae. Posterior wings transparent and slightly surpassing the elytra. Sternum sub-quadrate and pubescent, ventrites narrow

and transverse, last tergite with a small central tip and with a lobe on each side which is elongated and very thin and apically divergent, last ventrite very small and rounded apically. Legs thin, pro- and mesolegs short, metathoracic legs long and covered with pubescence; coxae massive; trochanters elongated, with rounded apex; femora nearly straight, more robust than tibiae, cylindrical; tibiae slightly flattened, thin, without spur near the apex, pro- and mesotibiae almost as long as pro- and mesofemora, metatibiae longer than metafemora. Tarsal formula 5-5-5; first

tarsomere long, almost as long as the second; third tarsomere short; fourth strongly bilobed; fifth tarsomere elongated, thin, flat and curved; claws simple, without denticle at the base.

**Etymology.** Named in honor of Alessio Morelli (Pianella, Abruzzo, Italy), expert on Psychodidae, and an excellent naturalistic designer.

**Syninclusions.** Botanical remains, air bubbles, insect leg, and a dypteran.

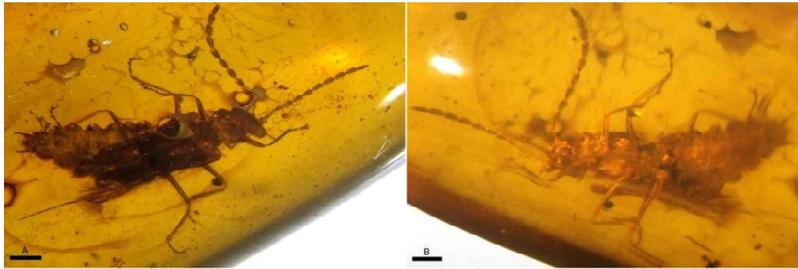


Fig. 11. *Sanaungulus morellii* sp. nov. ALDC0568/ALD.Bu.211 in Burmese amber. A: Holotype, dorsal view, bar = 0.5 mm; B: Holotype, ventral view, bar = 0.5 mm.

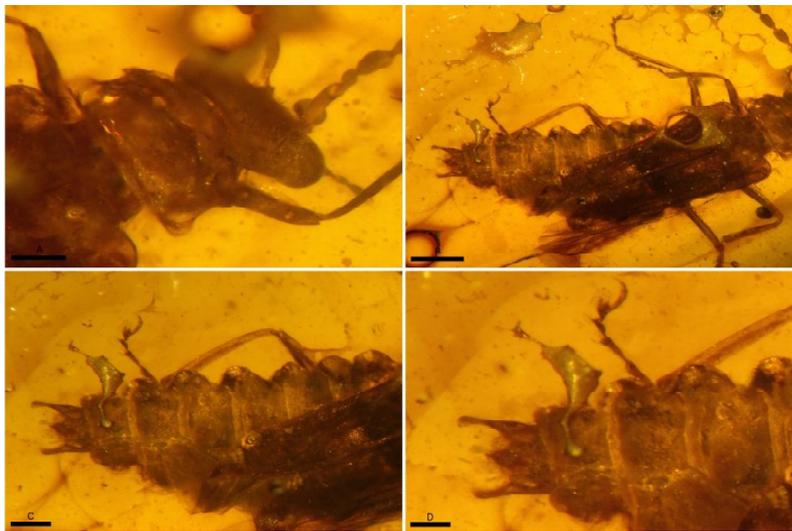


Fig. 12. *Sanaungulus morellii* sp. nov. ALDC0568/ALD.Bu.211 in Burmese amber. A: Holotype, detail of head and pronotum, bar = 0.3 mm; B: Holotype, detail of elytra and legs, bar = 0.5 mm; CD: Holotype, detail of last tergites, bars = 0.2 mm.

**Remarks.** The amber piece measures approximately 18 x 7.5 mm. The inclusion is complete and well visible.

***Sanaungulus rosenzweigi* sp. nov.**

(Figs. 13 - 14)

**Holotype.** Male, in Burmese amber, accession No. ALDC0577/ALD.Bu.220

**Type locality.** Myanmar: Kachin state, Myitkyina District, Tanai Township, Hukawng Valley.

**Type horizon.** Lowermost Cenomanian ( $98.79 \pm 0.62$  Ma), mid-Cretaceous.

**Differential diagnosis.** *Sanaungulus rosenzweigi* sp. nov. differs from *Sanaungulus ruicheni* (Hsiao & Huang, 2018), and *Sanaungulus morellii* sp. nov., the only other *Sanaungulus* with filiform antennae (Fanti 2018; Hsiao & Huang 2018; Fanti & Damgaard 2019), for the different shapes of the last urites, antennomeres and pronotum.

**Description.** Adult, winged, slender. Male, defined on the basis of the long antennae and the last ventrite triangular-shaped. Body length about 4.9-5.0 mm. Entirely testaceous with brown elytra. Head transverse, strongly constricted (triangular-shaped) behind the eyes, fitted with very scarce and shallow punctuation. Eyes prominent, very large, roundish, inserted in the lateral part of the head, inter-ocular dorsal distance about 3.8 times greater than the eye diameter. Mandibles elongated, thin, falciform, without teeth. Maxillary palps 4-segmented with the last palpomere securiform and thinner apically. Labial palps 3-segmented, with the last palpomere securiform. Antennae 11-segmented, filiform, long, slightly surpassing the elytra, not reaching the last abdominal segments, antennal insertion in the eyes proximity; scape elongated, enlarged basally, thinner apically; antennomere II short, about 2.5 times shorter than scape; antennomere III slightly longer than second; antennomeres IV-IX sub-equal, very long and thin;

antennomeres X-XI shorter than previous ones and slightly sturdier; all the antennomeres with pubescence. Pronotum slightly transverse, as wide as head, anterior margin strongly rounded and slightly bordered, posterior margin straight and slightly bordered, sides rounded, posterior corners obtuse, pronotum disc smooth and lustrous. Scutellum triangular-shaped, rounded at apex. Elytra very short which reveals various abdominal segments, wider than pronotum, humeral zone large, posteriorly slightly narrower, parallel-sided, elytra not deiescent, rounded apexes, surface with punctures slightly in relief and arranged in longitudinal striae. Posterior wings transparent and surpassing the elytra, not reaching the last abdominal segments. Sternum sub-quadrated, ventrites wide and transverse, last tergite very long and wide with emarginate apex, penultimate ventrite apically with two short lobes, last ventrite triangular-shaped and rounded apically. Legs thin, covered with little pubescence; coxae massive; trochanters elongated, with rounded apex; femora curved, more robust than tibiae, cylindrical; tibiae thin, cylindrical, without spur near the apex, protibiae shorter than profemora, meso- and metatibiae longer than meso- and metafemora. Tarsal formula 5-5-5; first tarsomere long; second tarsomere about 1.8 times shorter than first; third tarsomere short; fourth strongly bilobed; fifth tarsomere elongated, thin, flat and slightly curved; claws simple, without denticle at the base.

**Etymology.** Named in honor of the Danish artist Tal Rosenzweig, known as Tal R.

**Syninclusions.** Air bubbles, few botanical remains, a dypteran (Diptera Brachycera Empidoidea).

**Remarks.** The circular amber piece measures approximately 13 x 4.5 mm. The inclusion is complete but rather convoluted.

## DISCUSSION

The evolution of Cantharidae occurred precisely in the Cretaceous and after the KT Boundary mass extinction of 66 Mya (Cohen et al. 2013 updated [2020]) many of the current genera present in Europe were already well diversified

into various species in the Eocene (Kazantsev 2013). In fact, now over 80 species and 26 genera including some of the latter extinct (Kuška & Kania 2010; Kazantsev 2013; Fanti & Damgaard 2018) are known from the Baltic amber. While only 14 species and 7 genera (completely extinct) are currently known from the Burmese amber (Poinar & Fanti 2016; Fanti et al. 2018; Fanti & Damgaard 2019; Ellenberger & Fanti 2019). With the exception of some specimens attempting to mate or a species with a mite in its abdomen (Kazantsev 2020), unfortunately all the other species are incorporated in amber with no trace of predation,

traces of pollen or food and anything else that can allow us to deduce further information on the environment or the reasons of their extinction. The development of research and the discovery of numerous other specimens, also of the entire Cantharidae family, is therefore extremely important. In addition, to a purely taxonomic fact and for the knowledge of morphological diversity, also to understand the causes and forces that have allowed the survival of genera and the extinction of others that however lived and thrived in the same environment and in the absence of total disturbance and anthropogenic

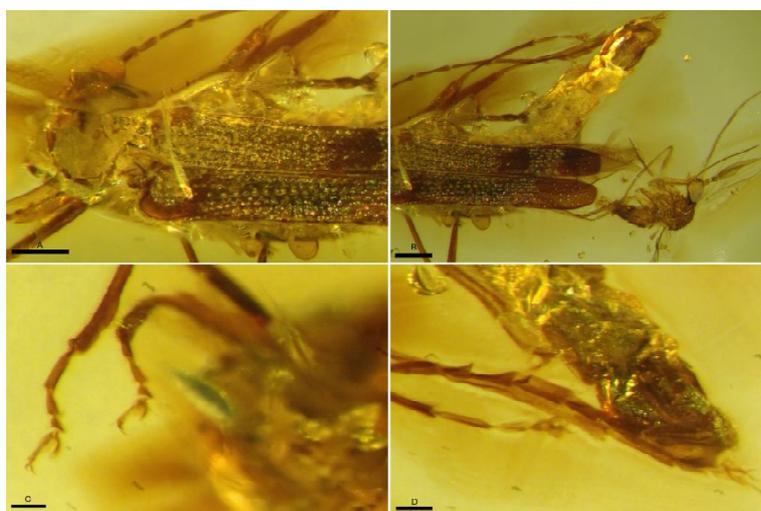


Fig. 13. *Sanaungulus rosenzweigi* sp. nov. ALDC0577/ALD.Bu.220 in Burmese amber. A: Holotype, detail of pronotum, bar = 0.5 mm; B: Holotype, detail of elytral apex, and last tergites, bar = 0.5 mm; C: Holotype, detail of prolegs, bar = 0.2 mm; D: Holotype, detail of last ventrites, bar = 0.2 mm.



Fig. 14. *Sanaungulus rosenzweigi* sp. nov. ALDC0577/ALD.Bu.220 in Burmese amber. A: Holotype, dorsal view, bar = 1.0 mm; B: Holotype, ventral view, bar = 1.0 mm.

pollution. And therefore understand the environmental risks in which living species encounter and improve their protection and conservation.

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