A journal of world insect systematics

INSECTA MUNDI

0912

New fossil false click-beetles from the Americas (Coleoptera: Eucnemidae)

Jyrki Muona

Finnish Museum of Natural History
P.O. Box 17
FIN-00014 University of Helsinki
Helsinki, Finland

Robert E. Woodruff Festschrift Contribution
Date of issue: February 24, 2022

Center for Systematic Entomology, Inc., Gainesville, FL

Muona J. 2022. New fossil false click-beetles from the Americas (Coleoptera: Eucnemidae). Insecta Mundi 0912: 1–11.

Published on February 24, 2022 by
Center for Systematic Entomology, Inc.
P.O. Box 141874
Gainesville, FL 32614-1874 USA
http://centerforsystematicentomology.org/

Printed copies (ISSN 0749-6737) annually deposited in libraries

Florida Department of Agriculture and Consumer Services, Gainesville, FL, USA
The Natural History Museum, London, UK
National Museum of Natural History, Smithsonian Institution, Washington, DC, USA
Zoological Institute of Russian Academy of Sciences, Saint-Petersburg, Russia

Electronic copies (Online ISSN 1942-1354) in PDF format

Archived digitally by Portico
Florida Virtual Campus: http://purl.fcla.edu/fcla/insectamundi
University of Nebraska-Lincoln, Digital Commons: http://digitalcommons.unl.edu/insectamundi/
Goethe-Universität, Frankfurt am Main: http://nbn-resolving.de/urn/resolver.pl?urn:nbn:de:hebis:30:3-135240

0912: 1–11 **INSECTA MUNDI** 2022

New fossil false click-beetles from the Americas (Coleoptera: Eucnemidae)

Jyrki Muona
Finnish Museum of Natural History
P.O. Box 17
FIN-00014 University of Helsinki
Helsinki, Finland
jyrki.muona@helsinki.fi
ORCID: https://orcid.org/0000-0003-2771-1171

Abstract. One new genus and three new false click-beetle species (Coleoptera: Eucnemidae) are described from American fossil resins: *Neusiokia* **new genus**, type species *Neusiokia appalachiensis* **new species** (North Carolina resin), *Thambus woodruffi* **new species** (Dominican resin) and *Asiocnemis colombicus* **new species** (Colombian resin).

Key words. Resin fossils, United States, Colombia, Dominican Republic.

ZooBank registration. urn:lsid:zoobank.org:pub:E80F6A2A-2E1A-479F-BBEF-A5E3BB84E7C9

Introduction

Seventy-two fossil species are included in the family Eucnemidae presently. Half of them, 36, are based on Baltic amber materials (Muona 1993a; Muona 2021), 22 are from Myanmar amber deposits (Li et al. 2020; Muona 2020; Otto 2019) and 10 are mineral fossils, nine of these from China (Chang et al. 2016; Muona et al. 2020; Li et al. 2021) and one from Australia (Oberprieler et al. 2016). The remaining four valid fossil eucnemid species have been described from the Americas, one from Dominican amber (Poinar 2012) and three from the Florissant beds (Wickham 1916).

The purpose of the present work is to describe three new American fossil species from different types of resins. The oldest sample from Goldsboro, North Carolina is dated to Upper Cretaceous, 83.6 to 72.1 Ma (Mickle 1996). The sample from Hispaniola came from an unknown site and cannot be dated more precisely than being 20 to 40 Ma old. The third sample was obtained as Colombian "copal" and the dating of this type of resin remains problematic. Some sources insist that the Colombian resins are basically recent, but ages up to 2.5 Ma have been suggested as well. The analysis of Ragazzi et al. (2003) suggested that the Colombian resin they studied was "not recent". Kosmowska-Ceranowitz (1999) came to the conclusion that their Colombian sample was at least "older than 60.000 years". Much has been written about Colombian resin but we still do not know for sure. As to the question whether it is "amber", I take the opportunity to cite the person we are honoring with this publication, Dr. R. Woodruff (2004): "Age is relative, the old man said, but old is not necessarily better. To call the Colombian material anything other than amber is a misnomer! Logically, we should just call everything "resin", with qualifying adjectives of origin or geological formation."

It appears clear that disregarding Colombian resin samples as "copal and thus recent" is not a useful approach. Fossils trapped in resin are a wonderful source of phylogenetic information and all material available should be studied. Knowing the taxa well and having an analytically obtained hypothesis of their phylogeny is the key for being able to evaluate the systematic position samples, whether extant or paleontological.

This treatment follows the higher classification of Eucnemidae based on analyses including most of the extant genera (Muona 1993b; Lawrence et al. 2007; Muona and Teräväinen 2020) and as far as possible, stresses the evolutionary novelties in placing taxa. Terminology used is standard for Coleoptera (e.g. Lawrence and Slipinski 2013). In the descriptions the actual three-segmented structure of the antennae is stressed throughout: scape, pedicel and flagellum with nine flagellomeres. For brevity, flagellomeres are referred to as "f" plus a number from 1 to 9.

The images were taken by the author with the equipment available at the Finnish Biodiversity Information Facility (FBIF) at Zoological Museum, University of Helsinki, Finland. The actual resin samples have been

digitized as well and these images will be available at the FBIF. The holotypes of the species described here are part of the collections of the Finnish Museum of Natural History (MZH), ex. JMC (Jyrki Muona amber collection).

It is a pleasure to contribute to this Festschrift honoring Dr. R. Woodruff. In addition to being a splendid coleopterist, Bob liked resins and Dominican amber especially. I am delighted to have an opportunity to describe my few American resin fossil eucnemids in this Festschrift and name the Dominican resin species after him.

Systematic Paleontology

Order Coleoptera Linnaeus, 1758
Superfamily Elateroidea Leach, 1815

Family Eucnemidae Eschscholtz, 1829

Subfamily Macraulacinae Fleutiaux 1922

Tribe Orodotini Muona, 1993

Neusiokia Muona, new genus

Etymology. Named after the Native American people once inhabiting the Neuse River area of North Carolina.

Type species. *Neusiokia appalachiensis* new species

Diagnosis. Elateroidea (*sensu stricto*) synapomorphy: pro-mesocoxal clicking mechanism present.
Eucnemidae synapomorphies: pedicel attached subapically to scape, labrum hidden.
Eucnemidae other characters: all abdominal ventrites connate (Fig. 1).

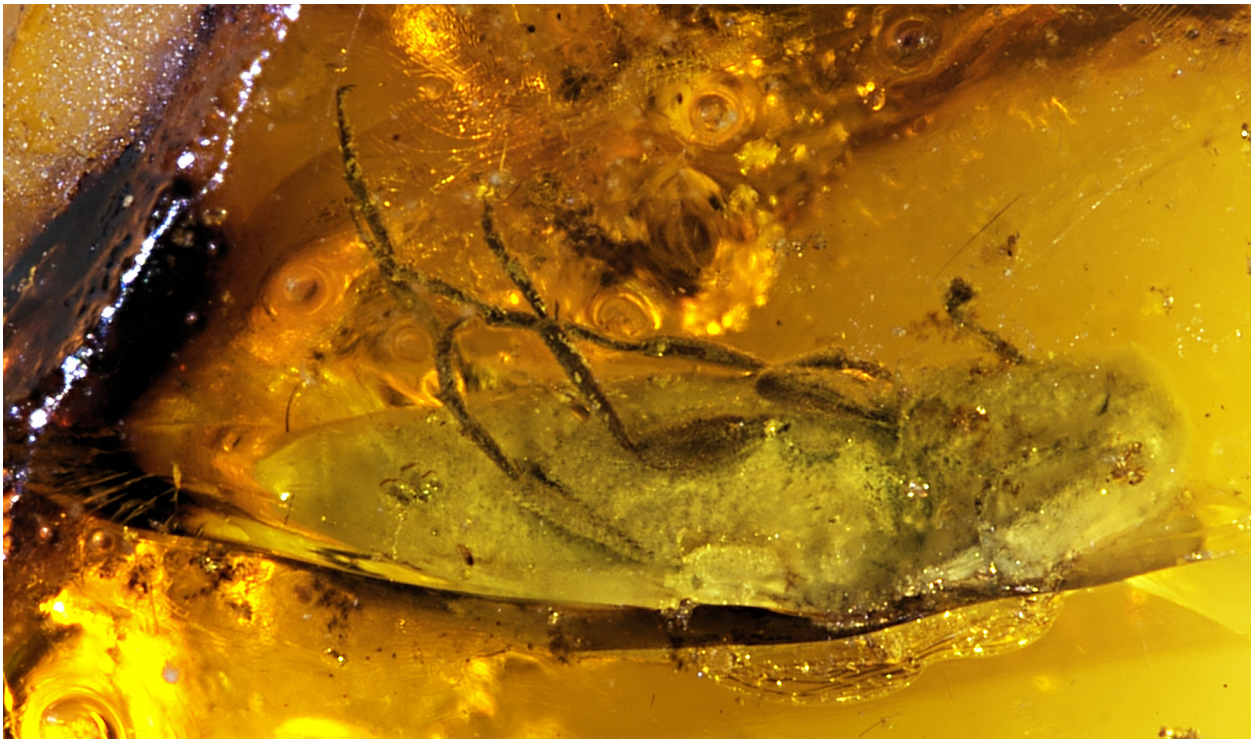

Figure 1. *Neusiokia appalachiensis* **n. sp.**, holotype, ventrolateral view.

The combination of protibiae with two apical spurs and f7–f9 being enlarged and flattened exists in only one extant species [*Palaeoxenus dohrni* (Horn)], and one Baltic amber species, [*Erdaia bispinulosa* Muona]. Of these two, *Neusiokia* resembles *E. bispinulosa* in size and general appearance, but has stronger antennae, much stronger legs with pronounced spine-combs on meso- and metatibiae and a more rounded general appearance. *Palaeoxenus* species are much larger, parallel-sided, and flat, with elevated median prosternal keel and proportionately much smaller head

Description. Elateroidea synapomorphy: pro-mesocoxal clicking mechanism present.

Eucnemidae synapomorphies: pedicel attached subapically to scape, labrum hidden.

Form narrowing more caudad than craniad (Fig. 1, 2). Head rounded, eyes medium sized, frontoclypeal region wide, mandibles elongated with simple apex (Fig. 4, 5). Pronotum about as wide as long, lateral and frontal margins simple, scutellum wider than long, elytra with rounded sides, striae distinct, sutural ones strong apically with excretory punctures (Fig. 2). Antennal fairly short, f7–f9 forming loose, fattened club (Fig. 4,5). Hypomeron simple, metasternum without mesocoxal lines. Metacoxal plates elongate, about twice as wide at midline as on sides. Legs long with well-developed spine-combs, tarsomere 4 simple, claw simple, protibial apex with two spurs.

Neusiokia appalachiensis Muona, new species

Figures 1–5.

Etymology. Named after the eastern Cretaceous part of the North American continent.

Holotype. Embedded in a triangular North Carolina resin piece, 17 × 10 × 9 mm, sex unknown. Found from locality 34 in Goldsboro, a Cretaceous Black Creek Formation exposure along the Neuse River (Carter et al. 1988).

Diagnosis. Characterized by the enlarged f7–f9 in combination with two protibial spurs and small size.

Figure 2. *Neusiokia appalachiensis* **n. sp.**, holotype, dorsal view.

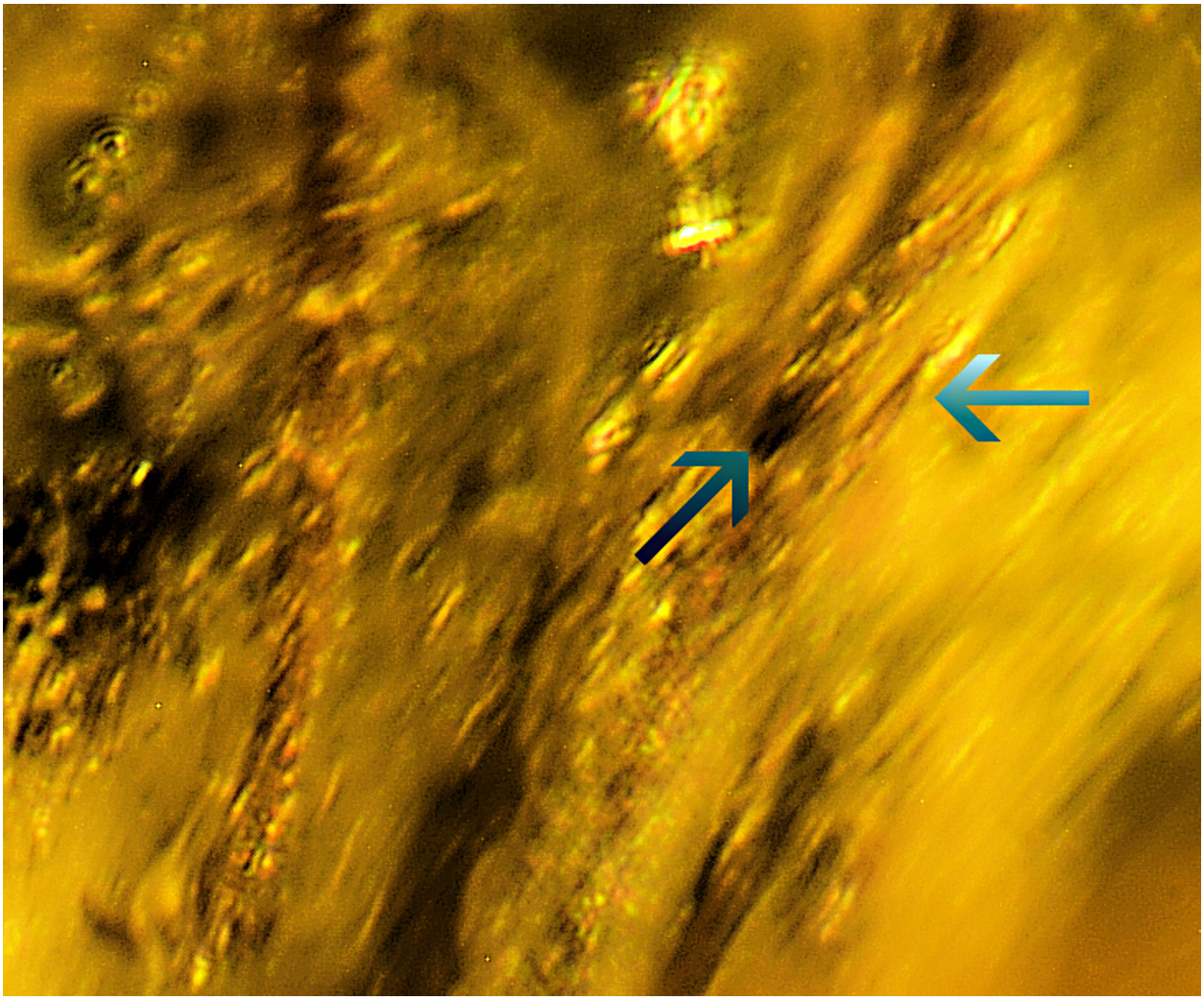

Figure 3. *Neusiokia appalachiensis* **n. sp.**, holotype, ventral view of tips of protibiae and protarsi. Left arrow points at the divided protibial spur, right arrow points at the second protibial spur.

Description. Length 4.5 mm. Elateroidea synapomorphy: pro-mesocoxal clicking mechanism present.

Eucnemidae synapomorphies: pedicel attached subapically to scape, labrum hidden and sutural striae with excretory punctures apically. Head rounded, very densely punctate, eyes medium sized, frontoclypeal region wide, about 1.5 times as wide apically as between antennal sockets, apical margin straight with caudally projecting lateral apices, mandibles elongated with simple apex (Fig. 5). Pronotum about as wide as long, sides evenly and strongly narrowing craniad, with rounded hind angles, lateral and frontal margins simple, scutellum wider than long, bluntly pointed caudad, parallel-sided on basal half, elytra with rounded sides, striae distinct, sutural ones strong apically with excretory punctures, interstices nearly flat, moderately densely punctate (Fig. 2). Antennal fairly short, f9 reaching pronotal hind angles, scape elongate, nearly as long as pedicel and f1–f2 combined, f2–f6 twice as long as wide, apically expanded, f7–f9 forming loose, fattened club (Fig. 4, 5).

Hypomera simple, smooth, widely and shallowly grooved, delimited by notosternal suture medially and pronotal ridge laterally, prosternal peg wide, short, prosternum narrow, metasternum densely punctate, without mesocoxal lines. Metacoxal plates densely punctate, elongate, widest close to midline, here about twice as wide as on sides (Fig. 1). Legs long, femora stout, fairly short, meso- and metatibiae long, strongly built, with well-developed spine-combs, meso- and metatarsi shorter than tibiae, protibia short, powerful, apically expanded, apex with two spurs, dorsal apical spur split in two (Fig. 3), first protarsomere without sex-comb, fifth protarsomere

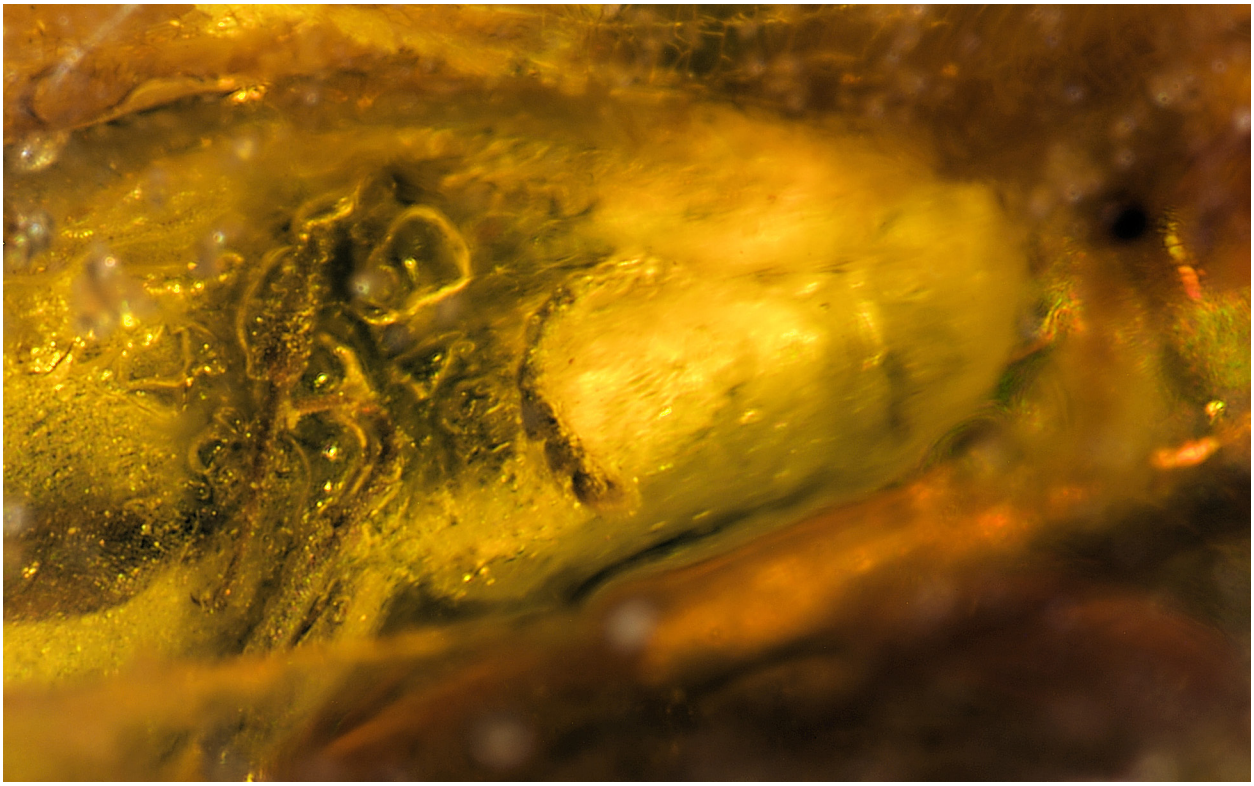

Figure 4. *Neusiokia appalachiensis* **n. sp.**, holotype, ventral view of head, pro- and mesothorax.

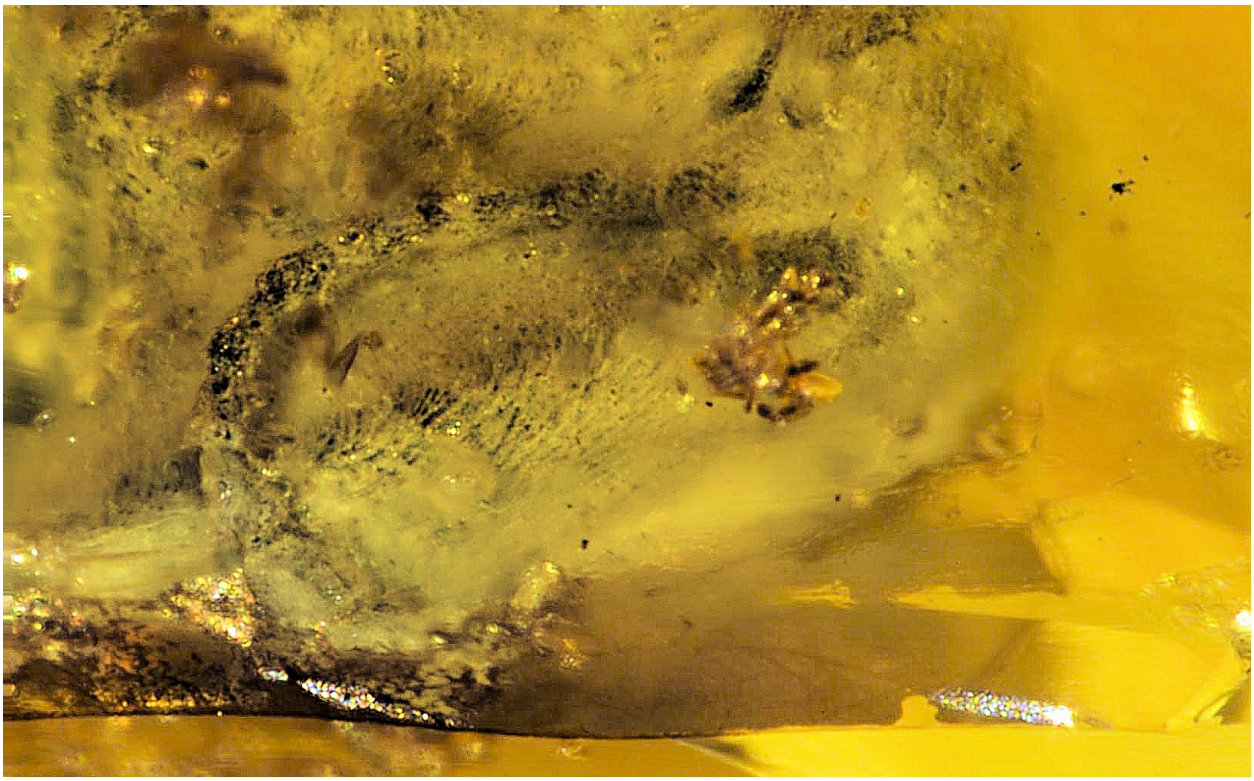

Figure 5. *Neusiokia appalachiensis* **n. sp.**, holotype, ventrolateral view of pronotum and head.

exceptionally long (Fig. 4), all tarsomeres 4 simple, claws simple (Fig. 1, 3, 4). Abdominal ventrites connate, densely punctate (Fig. 1).

Remarks. *Neusiokia appalachiensis* challenges the present classification, partly in the same manner as *Erdaia bisipnulosa* did (Muona 2021). On the basis of the presently accepted synapomorphies, they both appear to belong in the subfamily Palaeoxeninae. As a new analysis is needed to clarify this question, I have chosen to place *Neusiokia* provisionally in Orodotini.

Family Eucnemidae Eschscholtz, 1829

Subfamily Macraulacinae Fleutiaux, 1922

Tribe Macraulacini Fleutiaux, 1922

Thambus woodruffi Muona, new species

Figures 6, 7.

Etymology. Named in honor of the late Robert E. Woodruff, whose many interests included fossil resins and especially the Dominican amber fauna.

Holotype. Embedded in flat, rectangular Dominican resin piece with broadly rounder corners, 17 mm × 11 mm, female. The same piece includes an unidentified throscid beetle as well as other insects (Fig. 7).

Diagnosis. The length/width ratio of all other *Thambus* species is 2.4–2.8, in this species it is about 2.1.

Description. Elateroidea synapomorphy: pro-mesocoxal clicking mechanism present. Eucnemidae synapomorphies: pedicel attached subapically to scape, labrum hidden, elytral striae apically grooved with excretory punctures (Fig. 6). Eucnemidae other characters: abdominal ventrites connate (Fig. 7). Macraulacinae synapomorphy: hypomera with basally open lateral antennal grooves (Fig. 7). Macraulacini other characters: hypomera without excretory pits, metasternum without tarsal grooves.

Length 3.0 mm. Form very wide, ratio L/W about 2.1 (Fig. 6). Pronotum wider than long and wider than elytra with slightly expanded, acute non-carinate hind angles, evenly and densely punctate (Fig. 6). Scutellum

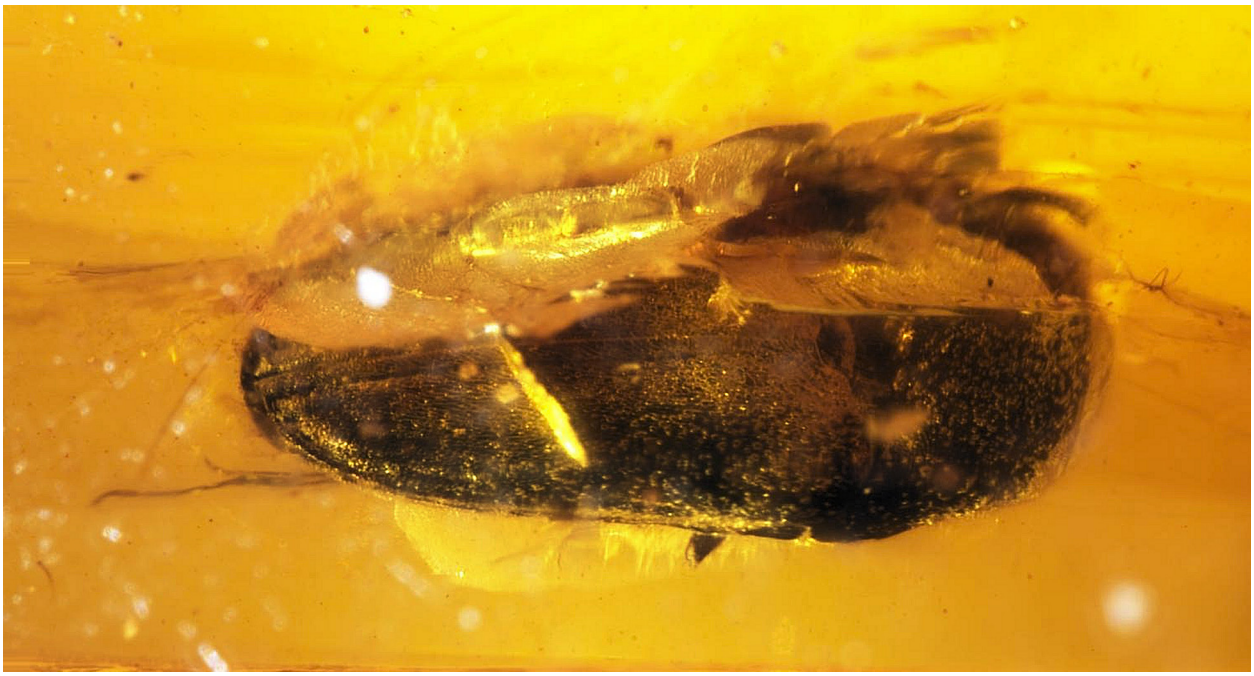

Figure 6. *Thambus woodruffi* **n. sp.**, holotype, dorsal view.

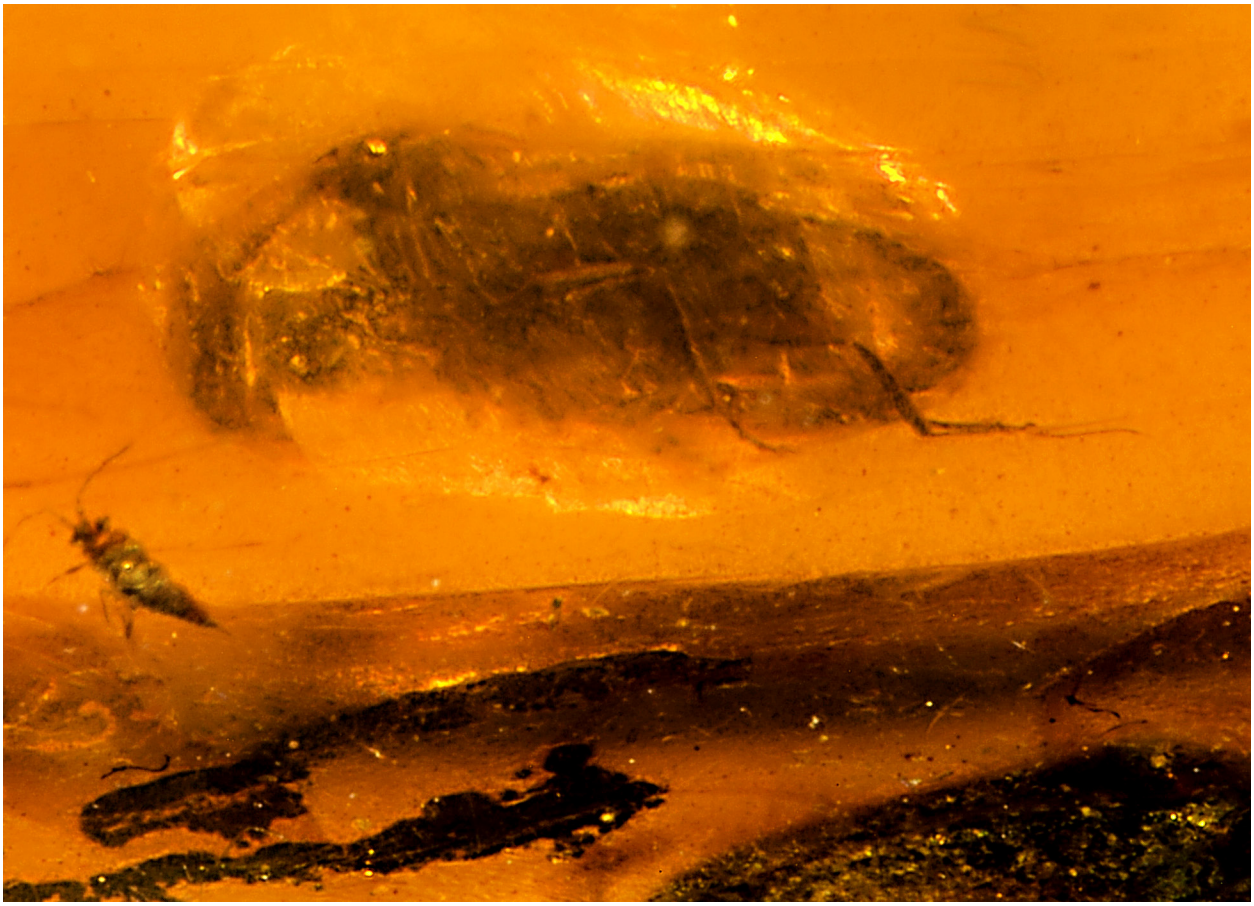

Figure 7. *Thambus woodruffi* **n. sp.**, holotype, ventral view.

transverse, widely triangular, apex cut off, elytra with sharp, complete sutural striae with deep apical excretory groove continuing around to lateralmost striae, densely and finely punctate, other striae faint but present (Fig. 6). Head rounded, densely punctate, eyes large, flat, frons wide, without carinae, frontoclypeus apically about 1.3 times as wide as between antennal sockets, mandibles short, bifid (Fig. 7). Antennae fairly short, reaching slightly past the hind angles, scape as long as pedicel plus f1 and f2 combined, f2–f3 feebly serrate, f4–f7 not visible, f9 1.4 times as long as f8, both longer than wide. Hypomeron with sharply defined, basally open lateral antennal grooves, about triangular, sparsely punctate, without excretory pits (Fig. 7). Prosternum wide, moderately densely punctate, prosternal peg long, triangular, acute, deeply marginate, metasternum wide and long, densely punctate, without tarsal grooves, elytral epipleura simple. Metacoxal plates triangular, widest close to midline, angle tightly rounded and there less than times as wide as on sides, densely punctate. Legs long and delicate, meso- and metatarsi shorter than tibiae, meso- and metatarsomere 1 slightly shorter than the others combined, fourth apically narrowly bilobed, excavated, claw simple (Fig. 6, 7).

Abdominal ventrites connate, densely and finely punctate (Fig. 7).

Remarks. *Thambus* Bonvouloir is a primarily tropical American genus, with additional species known from Europe (1), China (1), Japan (1) and North America (1). The species are small, have a basally wide pronotum with sides strongly converging craniad. In addition to their shape and small size, *Thambus* species are characterized by round pit-like areas laterally on the prosternum. This feature varies between species from faint (e.g. *T. deyrollei* Bonvouloir) to conspicuous (e.g. *T. friwaldskyi* Bonvouloir). These pits are not visible in the present sample, but the other characters listed place it to Macraulacini and within this tribe the correct placement is clearly *Thambus*.

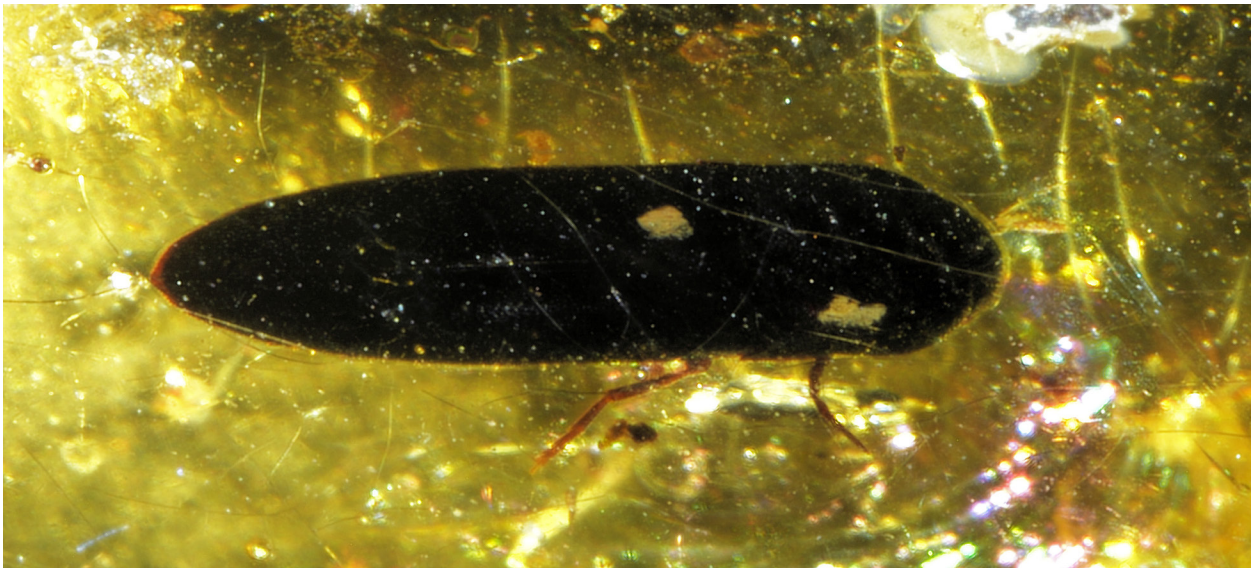

Figure 8. *Asiocnemis colombicus* **n. sp.**, holotype, dorsal view.

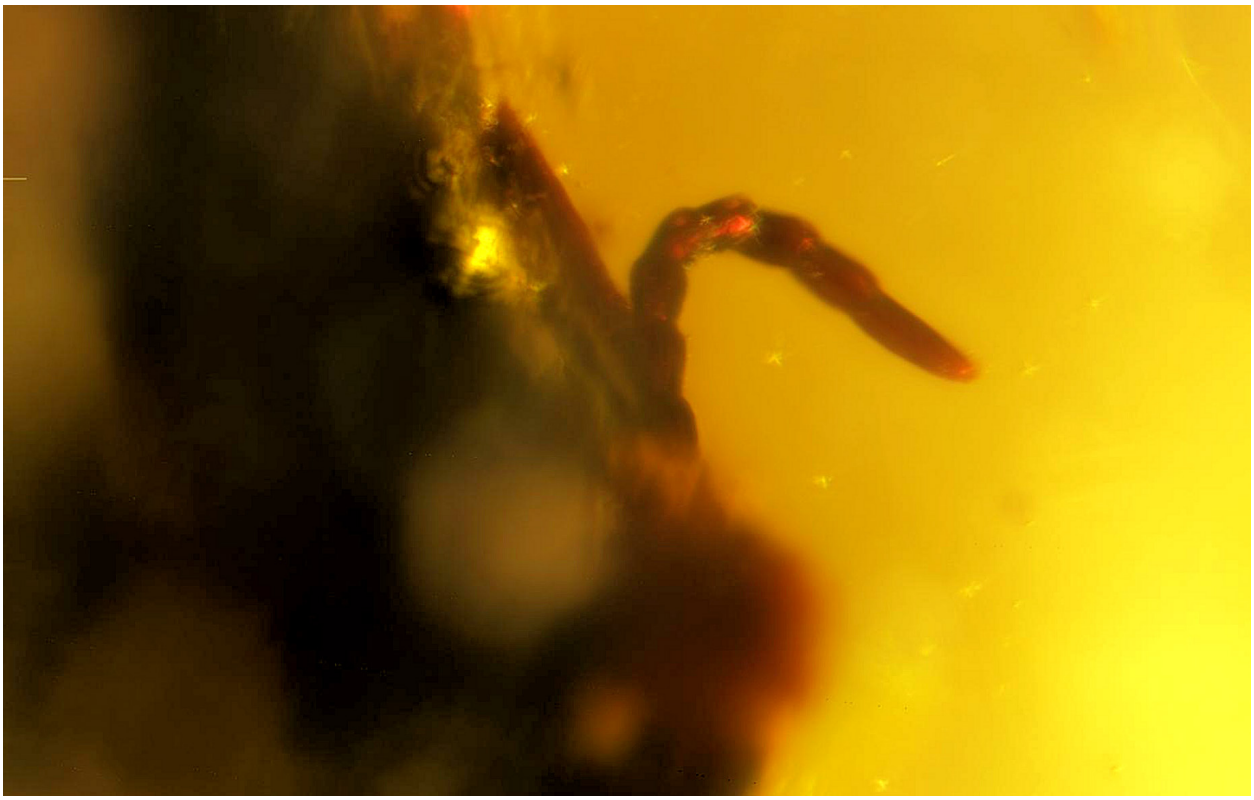

Figure 9. *Asiocnemis colombicus* **n. sp.**, holotype, ventral view of side of fore body showing flagellomeres 2–9 and the basally open, medially sharply defined antennal groove.

Family Eucnemidae Eschscholtz, 1829

Subfamily Macraulacinae Fleutiaux, 1922

Tribe Macraulacini Fleutiaux, 1922

Asiocnemis colombicus Muona, new species

Figures 8–11.

Etymology. Named after the Republic of Colombia.

Holotype. Embedded in a flat, quadratic Colombian resin piece, 55 mm × 30 mm, 4 mm thick, female.

Diagnosis. The elongated, parallel-sided and flat shape, wide smooth frontoclypeal area, slender tarsi with tarsomere 4 feebly bilobed, simple, minute claw and slender antennae separate this species from all previously known neotropical *Dromaeolus* species as well as all American *Asiocnemis* Mamaev species.

Description. Length 5.5 mm. Elateroidea synapomorphy: pro-mesocoxal clicking mechanism present.

Eucnemidae synapomorphies: pedicel attached subapically to scape, labrum hidden, elytral striae with apical excretory punctures. Macraulacinae synapomorphy: hypomera with basally open lateral antennal grooves (Fig. 9). Macraulacini diagnostic other characters: tibiae with lateral spine-combs.

Form narrow, parallel sided, flat (Fig. 8). Head rounded, densely punctate, eyes medium-sized, frontoclypeal region wide, 1.3 times as wide apically as between antennal sockets, apical margin slightly rounded, mandibles short, bifid. Pronotum elongated, about as wide as long, with short, deep basal median groove converging craniad and ending before middle, with acute non-carinate hind angles, roughly and very densely punctate, scutellum strongly transverse, fairly large, parallel-sided, slightly bilobed caudally, elytra densely and roughly punctate with strong sutural striae and apical excretory punctures, disk without striae. Antennal sockets round, antennae moderate long, slender, f8–f9 reaching past pronotal hind angles, scape long, elongate, pedicel shorter than f1, all flagellomeres longer than wide, becoming more elongated towards apex, f4 twice as long as wide, f9 longest of all,

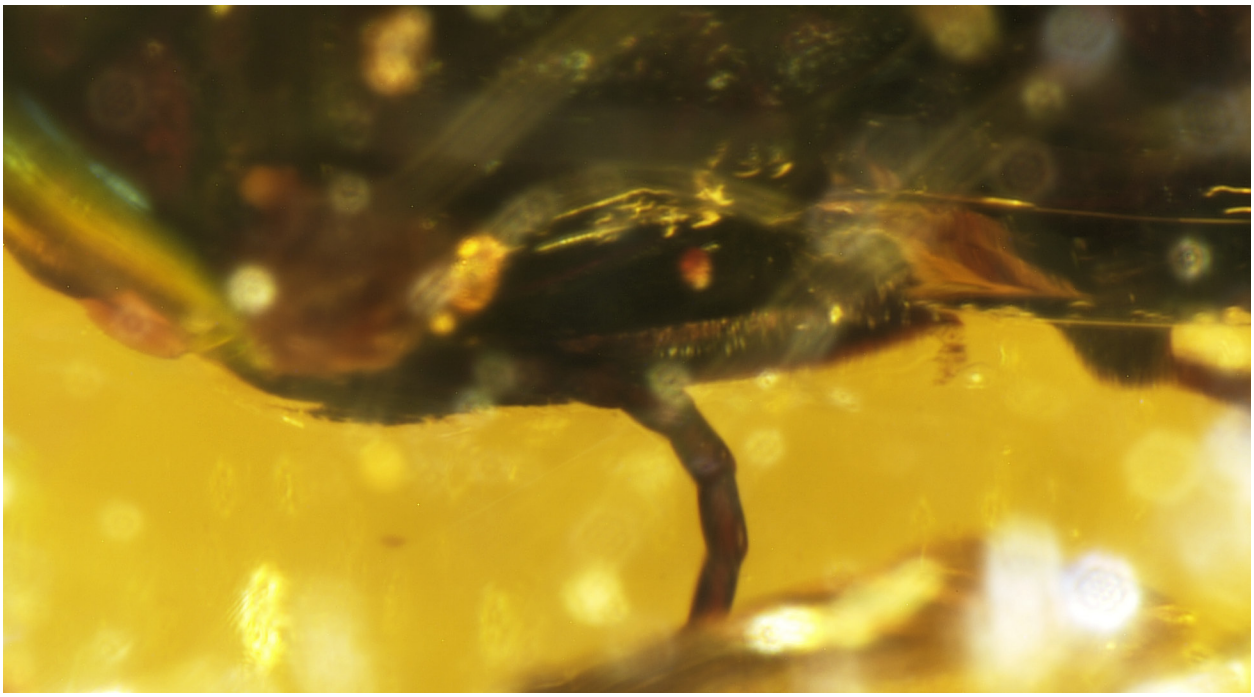

Figure 10. *Asiocnemis colombicus* **n. sp.**, holotype, ventral view of side of fore body showing scape, pedicel and flagellomeres 1–7 and the basally open, medially sharply defined antennal groove.

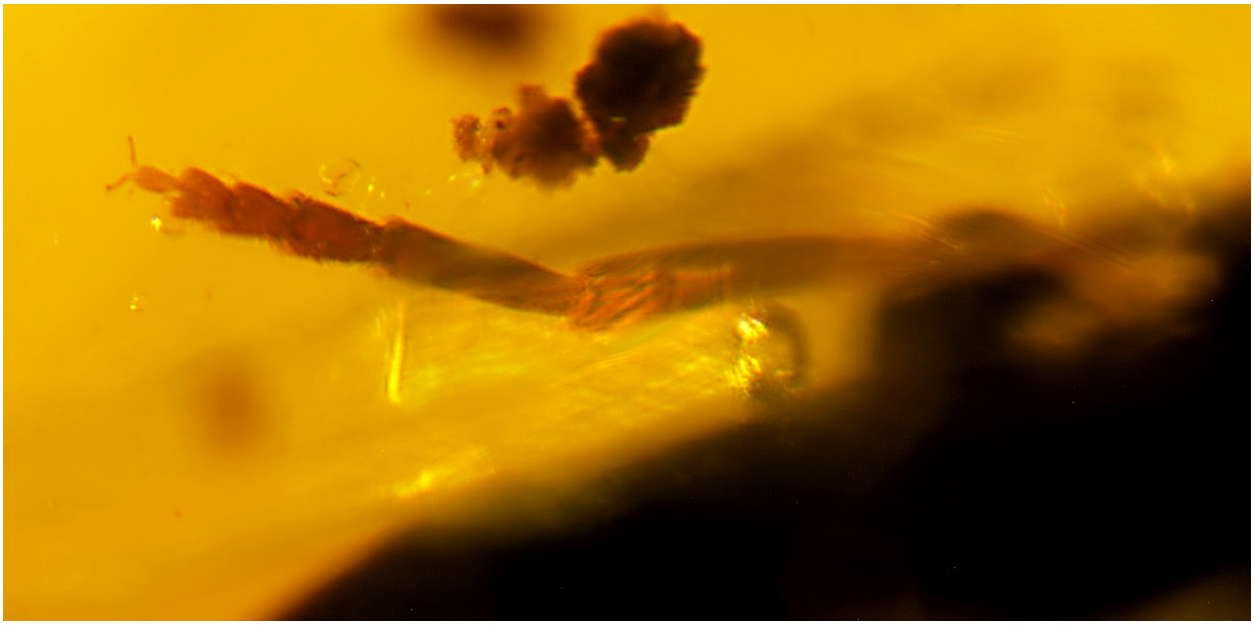

Figure 11. *Asiocnemis colombicus* **n. sp.**, holotype, dorsal view of mesotibia and mesotarsus. Because of the shooting angle of the image tibia appears shorter than tarsus, right proportions are shown in Figure 8.

1.5 times longer than f8 (Fig. 9, 10). Hypomeron densely punctate with sharply delimited non-punctate lateral antennal grooves (Fig. 9, 10), prosternal peg parallel-sided, apically pointed, prosternum very densely punctate, metasternum very densely and roughly punctate. Metacoxal plates triangular, very densely punctate, widest close to midline, three times as wide as on sides, less so at midline, caudal angle rounded. Legs long, elongate, protarsi shorter than protibiae, tarsomeres 2–4 increasingly narrower and tarsomere 5 small, delicate, meso- and metatibiae long, slender, longer than tarsi, with strong spine-combs on lateral surfaces, meso- and metatarsomere 1 as long 2–4 combined, 4 excavated, slightly wider than previous one, claws small, simple (Fig. 11). Abdominal ventrites connate, very densely punctate.

Remarks. As pointed out by Muona (2000), *Dromaeolus* is an artificial assemblage of species waiting for a phylogenetic analysis. Such an attempt requires the inclusion of all Macraulacini genera, a gargantuan task. The present species does not fit any previously known *Dromaeolus* in the only "complete" key available (Bonvouloir 1871), nor does it fit any species described from South America. It is also clear that it is not congeneric with the European *Dromaeolus barnabita* Villa, the type-species of this genus (Muona 1987). The genus *Asiocnemis* differs from *Dromaeolus* by conspicuous larval characters but it has not been satisfactorily defined with external adult characters. The present species with slender, parallel form, delicate tarsi, basally strongly grooved elongate pronotum and rough surface sculpture fits the known species well and it has been placed in *Asiocnemis*. There are seven previously reported *Asiocnemis* species from the Americas, distributed in the western mountains from Washington to Ecuador and French Guiana. It is assumed that several South American slender black *Dromaeolus* species belong here as well. Whether this newly described species is a recent one or an extinct creature from the past, cannot be determined at this time. A somewhat similar one, *Asiocnemis* sp., was reported from Baltic amber (Muona 1993a).

Acknowledgments

For reviewing the manuscript, I thank R. Otto (Shawano, WI, USA) and Paul Johnson (Insect Biodiversity Lab, South Dakota State University, Brookings, SD, USA).

Literature Cited

Bonvouloir HA de. 1871. Monographie de la Famille des Eucnémides, 1st part. Annales de la Société entomologique de France 40(Supplement) 1–288 + 21 pls.

Carter JG, Gallagher PE, Valone RE, Rossbach TJ. 1988. Fossil collecting in North Carolina. Bulletin 89. Department of Natural Resources and Community Development; Raleigh, NC. 86 p.

Chang H, Muona J, Hanyong P, Li, X, Chen W, Teräväinen M, Dong R, Qiang Y, Xingliao Z, Songhai J. 2016. Chinese Cretaceous larva exposes a southern Californian living fossil (Insecta, Coleoptera, Eucnemidae). Cladistics 32: 211–214.

Kosmowska-Ceranowicz B. 1999. Succinite and some other fossil resins in Poland and Europe (deposits, finds, features and differences in IRS). Estudios del Museo de Ciencias Naturales de Alava 14: 73–117.

Lawrence JF, Muona J, Teräväinen M, Ståhls G, Vahtera V. 2007. *Anischia*, *Perothops* and the phylogeny of Elateroidea (Coleoptera: Elateriformia). Insect Systematics & Evolution 38: 205–239.

Lawrence JF, Slipinski A. 2013. Australian beetles. Volume 1, morphology, classification and keys. CSIRO Publishing; Collingwood, Australia. 566 p.

Li H, Chang H, Muona J, Zhao Y, Ren D. 2021. Subfamily Anischiinae (Coleoptera: Eucnemidae) in early Cretaceous of Northeast China. Insects 12: 105.

Li YD, Tihelka E, Liu ZH, Huan D, Cai CJ. 2020. *Muonabuntor* gen. nov., a new genus of false click beetles from mid-Cretaceous Burmese amber (Coleoptera: Elateroidea: Eucnemidae). Paleoentomology 003(4): 399–406.

Mickle JE. 1996. *Grexlupus carolinensis*, a new probable lauraceous fruit from the late Cretaceous of North Carolina. Journal of the Elisha Mitchell Scientific Society 112: 1–6.

Muona J. 1987. The generic names of the beetle family Eucnemidae (Coleoptera). Entomologica Scandinavica 18: 79–92.

Muona J. 1993a. Eucnemidae and Throscidae from Baltic amber (Coleoptera). Entomologische Blätter für Biologie und Systematik der Käfer 89: 15–45.

Muona J. 1993b. Review of the phylogeny, classification and biology of the family Eucnemidae (Coleoptera). Entomologica Scandinavica Supplement 44: 1–133.

Muona J. 2000. A revision of the North American Eucnemidae. Acta Zoologica Fennica 212: 1–106.

Muona J. 2020. The late Cretaceous amber Eucnemidae fossils from Myanmar. Entomologische Blätter für Biologie und Systematik der Käfer 116: 27–55.

Muona J. 2021. False click-beetles from Baltic amber (Coleoptera, Eucnemidae). Entomologische Blätter für Biologie und Systematik der Käfer 117: 90–113.

Muona J, Chang H, Ren D. 2020. The clicking Elateroidea from Chinese Mesozoic deposits (Insecta, Coleoptera). Insects 11: 875.

Muona J, Teräväinen M. 2020. A re-evaluation of the Eucnemidae larval characters (Coleoptera). Papéis Avulsos de Zoologia; v.60.special-issue: e202060 (s.i.).28.

Oberprieler R, Ashman L, Friese M, Slipinski A. 2016. The first elateroid beetles (Coleoptera: Polyphaga: Elateroidea) from the Upper Jurassic of Australia. Zootaxa 4147: 177–191.

Otto RL. 2019. Descriptions of two new elateroid beetles (Coleoptera: Eucnemidae, Elateridae) from Burmese amber. Insecta Mundi 702: 1–6.

Poinar G. 2012. *Discoclavata dominicana* n. gen., n. sp., (Coleoptera: Bostrichidae) and *Lissantauga epicrana* n. gen., n. sp. (Coleoptera: Eucnemidae) in Dominican amber. Historical Biology: An International Journal of Paleobiology 25: 107–113.

Ragazzi E, Roghi G, Giaretta A, Gianolla P. 2003. Classification of amber based on thermal analysis. Thermochimica Acta 404: 43–54.

Wickham HF. 1916. The fossil Elateridae of Florissant. Bulletin Museum Comparative Zoology 60: 493–527 + 7 pls.

Woodruff R. 2004. Amber versus Copal. Available at http://www.fossilmall.com/Science/AmberCopal.htm (Last accessed January 2022.)

Received December 28, 2021; accepted January 12, 2022.
Review editor Oliver Keller.