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# A new fossil soldier beetle (Coleoptera: Cantharidae) of the genus *Cacomorphocerus* SCHAUFUSS, 1892 from Baltic amber

GEORGE POINAR & FABRIZIO FANTI

## Abstract

A new fossil soldier beetle, *Cacomorphocerus endecacerus* sp. nov. (Coleoptera: Cantharidae), is described from Baltic amber. Aside from its size (7.3 mm), a unique feature of the new species is the 11-segmented antennae with the second to eighth antennomeres saucer-shaped or irregular and the final 3 antennomeres elongate. All previous species in this genus possess 12 antennomeres. Updates of the description of the genus and tribe are provided.

**Key words:** Soldier beetle, new species, palaeoentomology.

## 1. Introduction

Inclusions of fossil Cantharidae in amber are fairly common (SPAHR 1981; ALEKSEEV 2013, 2017; FANTI 2017a) with the first species described by SCHAUFUSS (1892), and later extinct lineages at the tribal level described by KAZANTSEV (2013) and FANTI & KUPRYJANOWICZ (2018). Various taxa of Cantharidae were described from Baltic, Rovno, Mexican (Chiapas) and Burmese amber as well as from the Brunstatt brown coals of Alsace. Cantharids from the latter deposits were cataloged, along with detailed references, by FANTI (2017a). Recent new fossils have been described from Baltic amber by FANTI (2017b, 2017c, 2018, 2019b), FANTI & CASTIGLIONE (2017), FANTI & KUPRYJANOWICZ (2017, 2018), FANTI & VITALI (2017), FANTI & DAMGAARD (2018), FANTI & MICHALSKI (2018), FANTI & M. J. PANKOWSKI (2018), FANTI & M. K. PANKOWSKI (2018, 2019), KAZANTSEV (2018), BUKEJS et al. (2019), FANTI & SONTAG (2019), KUPRYJANOWICZ & FANTI (2019), and PARISI & FANTI (2019a, 2019b). Additional specimens from other amber sources include those from Sakhalinian amber by KAZANTSEV & PERKOVSKY (2019b); from Spanish amber by PERIS & FANTI (2018); from Agdzhakend amber by KAZANTSEV & PERKOVSKY (2019a); from Bitterfeld amber by FANTI (2019a) and from Burmese amber by FANTI et al. (2018), FANTI & ELLENBERGER (2018), HSIAO & HUANG (2018) and ELLENBERGER & FANTI (2019). Furthermore, specimens without specific attribution were reported from Baltic amber: e.g., KLEBS (1910), BACHOFEN-ECHT (1949), HIEKE & PIETRZENIUK (1984), and KUBISZ (2000, 2001), from Rovno amber by KAZANTSEV & PERKOVSKY (2014), from Dominican amber by WU (1997), from Bitterfeld amber (see FANTI 2019a), from Lebanese amber by KIREJTSHUK & AZAR (2013), and from Burmese amber by RASNITSYN & ROSS (2000 [*sub* Superfamily Cantharoidea]) and POINAR et al. (2007). The present study describes a new species of *Cacomorphocerus* SCHAUFUSS, 1892, in Baltic amber, char-

acterized by 11-segmented antennae. The genus, which occurs in Baltic and Rovno ambers, is only known from the Eocene, where it was extremely widespread and now has the highest number of fossil species in any genus of the Cantharidae. So far eight species, including the new species described below, are known (BUKEJS et al. 2019; FANTI & PANKOWSKI 2019). The genus is highly variable, especially regarding the antennal and pronotal shapes. Unfortunately, very little biological information is known about the genus since none of the specimens were found associated with a food source, whether plant or animal, nor subject to predation, or covered with pollen that could be used to reconstruct their ecology and ethology. However, it is very likely that members of the genus were predators (or omnivores) similar to extant cantharids (RAMSDALE 2002).

## 2. Material and methods

The Baltic amber specimen originated from the Kaliningrad region in Russia. Baltic amber is considered to range between 45 and 50 Mya (WOLFE et al. 2015). The specimen was re-polished in order to highlight details of the antennae and tarsi, then examined and photographed with a Nikon stereoscopic microscope SMA-10-R at 80x and a Nikon Optiphot microscope at 800x. Helicon Focus Pro X64 was used to stack photos for better clarity and depth of field.

## 3. Systematic palaeontology

Family Cantharidae IMHOFF, 1856 (1815)

Subfamily Cantharinae IMHOFF, 1856 (1815)

Tribe Cacomorphocerini FANTI & KUPRYJANOWICZ, 2018

**Type genus:** *Cacomorphocerus* SCHAUFUSS, 1892; by original designation by FANTI & KUPRYJANOWICZ 2018: 150.

Genus *Cacomorphocerus* SCHAUFUSS, 1892  
(= *Hoffeinsensia* KUŠKA & KANIA, 2010;  
synonymized by KAZANTSEV 2013: 289)

Type species: *Cacomorphocerus cerambyx* SCHAUFUSS, 1892.

*Cacomorphocerus endecacerus* sp. nov.

Figs. 1–5

**Etymology:** The specific epithet is from the Greek “ἐνδεκά” (héndeka – endeca) = eleven, and the Latin *-cerus* derived from the Greek “κέρας” (kéras) = antenna. In reference to the number of antennomeres (11).

**Holotype:** Alate male in Baltic amber deposited as accession No. C-7-231 in the Poinar amber collection maintained at Oregon State University. Male, based on antennal length and slender body. Syninclusions: Small dipteran (Sciaridae), botanical remains, air bubbles.

**Type locality:** Russia: Kaliningrad region. Baltic Sea coast.

**Type horizon:** Late Eocene (45–50 Ma).

**Diagnosis:** The emarginate base of the pronotum, very wide scutellum and particularly the 11-segmented antennae distinguish *Cacomorphocerus endecacerus* sp. nov. from other members of the genus. All other known species of the genus *Cacomorphocerus* SCHAUFUSS, 1892 have 12-segmented anten-

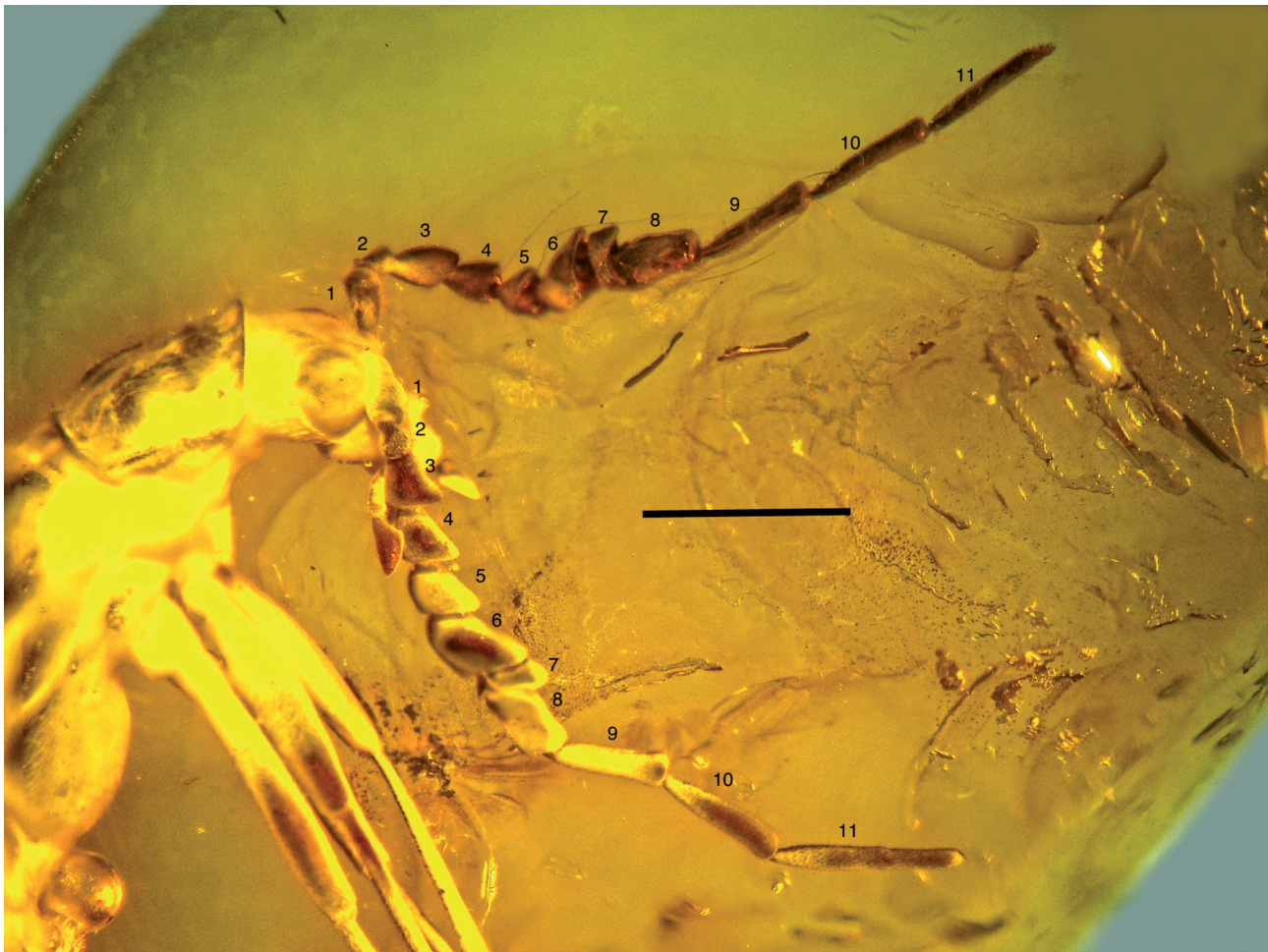
nae. A key to the species can be found in BUKEJS et al. (2019), with the addition of *Cacomorphocerus coleae* FANTI & M. K. PANKOWSKI, 2019 which, in addition to the number and shape of antennomeres, differs from *C. endecacerus* sp. nov. in having slightly smaller dimensions, a more elongate pronotum with rounded corners that is concave in the middle and a straight anterior margin (FANTI & PANKOWSKI 2019).

**Description (male):** Body length, 7.3 mm. Exposed pronotum; head, elytra and legs dark reddish-brown. Head large, 1.8 mm in length, slightly wider than prothorax, equipped with shallow punctuation, and with prominent rounded eyes laterally in the upper part of head. Maxillary palps 4-segmented with last palpomere securiform. Labial palps 3-segmented with last segment triangular and rounded at apex. Antennae elongate, 11-segmented, with antennomeres 2–8 saucer-shaped or irregular, and antennomeres 9–11 elongate. Length of antennomeres: first, 0.380 mm; second, 0.235 mm; third, 0.350 mm; fourth, 0.350 mm; fifth, 0.295 mm; sixth, 0.530 mm; seventh, 0.205 mm; eighth, 0.410 mm; ninth, 0.650 mm; tenth, 0.790 mm; eleventh, 1.0 mm (rounded at apex); all antennomeres slightly pubescent. Pronotum apically convex, 1.0 mm long, slightly narrower than elytral shoulders, with longitudinal striations and some scattered punctuation partially in relief, surface equipped with setae and without concavities, posterior corners evident, basal margin slightly emarginate and slightly bordered, sides almost straight. Scutellum triangular-shaped, wide at base, with roundish apex. Elytra elongate, 6.0 mm in length, surpassing abdominal apex, parallel-sided, rounded at apex, bearing fine, thin, long hairs, basal two thirds with fine broken striations.



**Fig. 1.** Lateral view of *Cacomorphocerus endecacerus* sp. nov. in Baltic amber. Scale bar = 2.2 mm.





**Fig. 2.** Antennae of *Cacomorphocerus endecacerus* sp. nov. in Baltic amber, with numbered antennomeres. Scale bar = 1.1 mm.

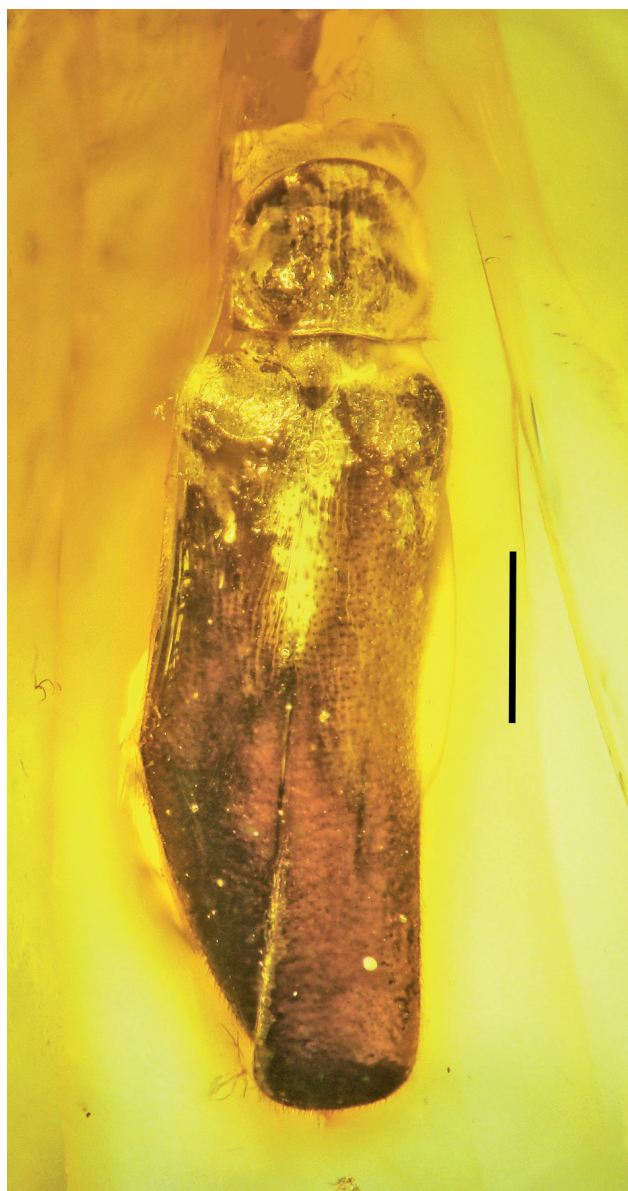
Hind wings covered by elytra. Legs robust, dark reddish-brown; metacoxae massive, all femora slightly thickened. Tibiae elongate, equipped with long hairs and bearing single basal spine. All tarsi five-segmented and pubescent, first tarsomere longest, second tarsomere about 1.8 times shorter than first, third triangular with apical margin straight, fourth segment with large elongate lobes, approximately equal to third, fifth tarsomere extremely elongate. Claws simple with an obtuse denticle at base. Ventral view obscured by white deposit; female unknown.

**Remarks:** Actually, members of the tribe Cacomorphocerini FANTI & KUPRYJANOWICZ, 2018 possess 11–19 antennomeres, with “central articles” saucer-shaped or irregular and last antennomeres filiform (FANTI & DAMGAARD 2018). Only, the genus *Sucinorhagonycha* KUŠKA, 1996, recently tentatively transferred to the tribe Cacomorphocerini has 12-segmented antennae that are filiform or slightly dentated (KUŠKA 1996; FANTI & M. K. PANKOWSKI 2018). Most extant cantharids also possess 11 antennomeres, with the supernumerary articles that are only present in the Australian genus *Heteromastix* BOHEMAN, 1858 (Cantharidae Dymorphocerinae) and in the genus *Pseudosilis* PIC, 1911 (Cantharidae Silinae), that have incidentally species with 11 antennomeres and sometimes (and few species) with 12 articles (PIC 1911; BRANCUCCI 1980; FANTI 2017c; FANTI & PANKOWSKI 2018, 2019).

#### 4. Discussion

Inclusion of the present species in the tribe Cacomorphocerini FANTI & KUPRYJANOWICZ, 2018 and genus *Cacomorphocerus* SCHAUFUSS, 1892, requires a modification of the definition of both taxa. Previously, Cacomorphocerini was distinguished by possessing 12–19 antennomeres with the third to ninth or tenth dilated and saucer-shaped (FANTI & DAMGAARD 2018). The terminal antennomeres were always elongate. Species of *Cacomorphocerus* had 12 articles, with the third to ninth saucer-shaped, with two species recently described with the antennomeres 5–8 slightly modified (BUKEJS et al. 2019; FANTI & PANKOWSKI 2019). The genus *Sucinocantharis* KUŠKA & KANIA, 2010 has 16 articles with the third to tenth saucer-shaped and widened. *Eridanula* FANTI & DAMGAARD, 2018 and *Noergaardia* FANTI & DAMGAARD, 2018 respectively have 17 and 19 antennomeres with the articles 3–9 saucer-shaped or irregular. The body size of these genera ranges between 5.2 and 9 mm (SCHAUFUSS 1892; KUŠKA & KANIA 2010; FANTI & DAMGAARD 2018;





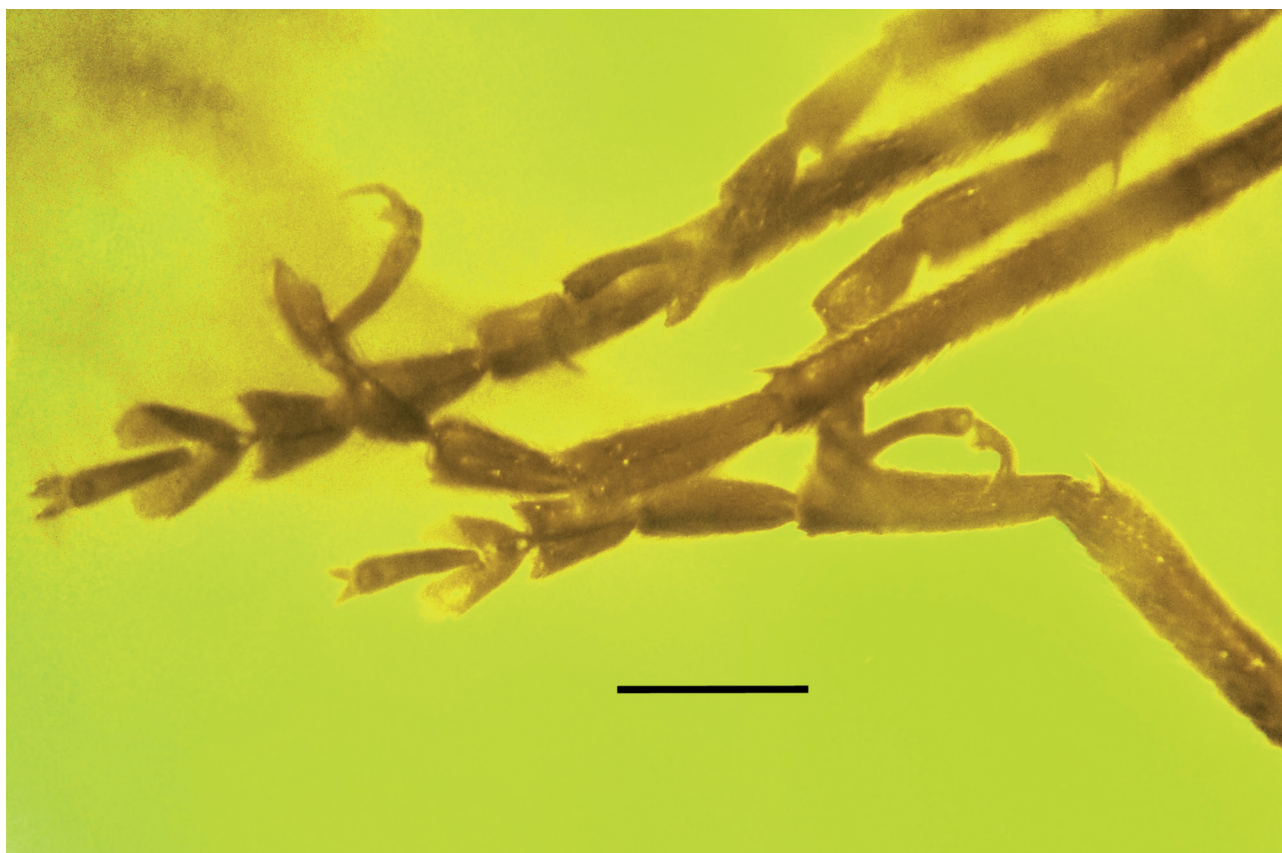
**Fig. 3.** Dorsal view of *Cacomorphocerus endecacerus* sp. nov. in Baltic amber. Scale bar = 1.4 mm.

FANTI & KUPRYJANOWICZ 2018; BUKEJS et al. 2019; FANTI & PANKOWSKI 2019) while *Sucinorhagonycha* KUŠKA, 1996 is smaller with a size of 4.5 mm (KUŠKA 1996; FANTI & M. K. PANKOWSKI 2018). *Cacomorphocerus endecacerus* sp. nov. has a body length of 7.3 mm and antennomeres with the third (the second is irregular) to the eighth saucer shaped or irregular and antennomeres nine to eleven elongate. So, now the tribe Cacomorphocerini is characterized by species with 11–19 antennomeres, and the genus *Cacomorphocerus* is characterized by species with 11–12 antennomeres. Recently, the genus *Sucinorhagonycha* KUŠKA, 1996, which has a filiform or slightly toothed 12-seg-



**Fig. 4.** Pronotum of *Cacomorphocerus endecacerus* sp. nov. in Baltic amber. Arrow shows scutellum. Scale bar = 0.7 mm.

mented antennae (KUŠKA 1996; FANTI & M. K. PANKOWSKI 2018), has been transferred to the tribe Cacomorphocerini (FANTI & PANKOWSKI 2019), and this, combined with the new *Cacomorphocerus* with 11 saucer-shaped antennomeres, suggests and confirms as evidenced by FANTI & PANKOWSKI (2019) that the tribe originates with individuals with a basic antenna of 11 filiform segments, although we cannot totally exclude that it may be polyphyletic. While with the new species, the tribe is more difficult to define, it appears to be a unique and extinct lineage characterized by supernumerary antennomeres, which currently remain in only two genera (see Remarks). It is therefore possible (when additional species are found), that the genera *Electronycha* KAZANTSEV, 2013 with 15 dentate antennomeres, and *Michalskantharis* FANTI, 2017 with 17 inflated antennomeres (KAZANTSEV 2013; FANTI 2017c) might be placed in the future in the tribe Cacomorphocerini. The genus *Katyacantharis* KAZANTSEV & PERKOVSKY, 2019, from Cretaceous Agdzhakend amber with presumably 14 antennomeres, needs further study to better define its taxonomic position, since it has several other unusual features rarely found in Cantharidae, such as elytra with elongate cells (KAZANTSEV & PERKOVSKY 2019a). This would



**Fig. 5.** Tarsi of *Cacomorphocerus endecacerus* sp. nov. in Baltic amber. Scale bar = 440  $\mu$ m.

suggest an independent and repeated occurrence of super-numerary articles in the course of the evolution of the Cantharidae. *Cacomorphocerus endecacerus* sp. nov. with just 11 antennomeres makes it difficult to understand the origin of the various antennal types in soldier beetles (Cantharidae). The entire tribe Cacomorphocerini has at least the last three segments filiform and all the species have a normal scape and pedicel (more or less irregular), so it is evident that the reduction or addition of articles involves the “central antennomeres” 3–9.

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#### 5. References

- ALEKSEEV, V. I. (2013): The beetles (Insecta: Coleoptera) of Baltic amber: the checklist of described species and preliminary analysis of biodiversity. – *Zoology and Ecology*, **23** (1): 5–12.
- ALEKSEEV, V. I. (2017): Coleoptera from the middle-upper Eocene European ambers: generic composition, zoogeography and climatic implications. – *Zootaxa*, **4290** (3): 401–443.
- BACHOFEN-ECHT, A. F. (1949): *Der Bernstein und seine Einschlüsse*. 204 pp.; Wien (Springer).
- BOHEMAN, C. H. (1858–1859): Coleoptera. In: VIRGIN, C. (ed.): *Kongliga Svenska Fregatten Eugenies Resa omkring jorden under befäl af C. A. Virgin, Åren 1851–1853. Vetenskapliga Iakttagelser på H. M. Konung Oscar Den Förstes befallning utgifna af K. Svenska Vetenskaps Akademien. II. Zoologi. 1. Insecta: 1–112 [1858], 113–218 [1859]*; Uppsala & Stockholm (Norstedt & Söner, Almqvist et Wiksells).
- BRANCUCCI, M. (1980): Morphologie comparée, évolution et systématique des Cantharidae (Insecta: Coleoptera). – *Entomologica Basiliensia*, **5**: 215–388.
- BUKEJS, A., FANTI, F. & MCKELLAR, R. C. (2019): A new species of *Cacomorphocerus* SCHAUFUSS, 1892 (Coleoptera: Cantharidae) from Baltic amber with a key to known species. – *Palaeontologia Electronica*, **22.2.28A**: 1–7.
- ELLENBERGER, S. & FANTI, F. (2019): New Cretaceous soldier beetle (Cantharidae) from Burmese amber with preserved coloration on the elytra. – *Zootaxa*, **4609** (3): 594–600.
- FANTI, F. (2017a): Catalogo Cantharidae fossili del mondo. – *Fossils & Minerals Review*, **2**: 1–18 [abbreviated Italian version, available: 12 March 2017] / World catalog of fossil Cantharidae. – *Fossils & Minerals Review*, **2** (Special Issue): 1–52 [extended English version, available: 25 May 2017].



- FANTI, F. (2017b): *Malthodes michalskii*: a new species of Cantharidae from Baltic amber (Coleoptera). – *Giornale italiano di Entomologia*, **14** (62): 685–690.
- FANTI, F. (2017c): New fossil Cantharidae genus and species from Baltic amber (Insecta Coleoptera). – *Giornale italiano di Entomologia*, **14** (62): 709–714.
- FANTI, F. (2018): *Malthodes meriae* sp. nov.: a new fossil *Malthodes* KIESENWETTER, 1852 from the Eocene Baltic forests (Coleoptera: Cantharidae). – *Studies and Reports, Taxonomical Series*, **14** (2): 243–248.
- FANTI, F. (2019a): First fossil soldier beetles (*Coleoptera Cantharidae*) from Bitterfeld amber, Germany. – *Zitteliana*, **93**: 89–96.
- FANTI, F. (2019b): New fossil *Malthodes* KIESENWETTER, 1852 of the subgenus *Libertimalthodes* KUPRYJANOWICZ & FANTI, 2019 from Baltic amber (Coleoptera: Cantharidae). – *Palaeodiversity*, **12**: 65–68.
- FANTI, F. & CASTIGLIONE, E. (2017): Description of a new genus and species of Cantharidae from Eocene Baltic amber (Insecta, Coleoptera). – *Palaeodiversity*, **10**: 123–127.
- FANTI, F. & DAMGAARD, A. L. (2018): Fossil soldier beetles from Baltic amber of the Anders Damgaard amber collection (Coleoptera: Cantharidae). – *Baltic Journal of Coleopterology*, **18** (1): 1–32.
- FANTI, F., DAMGAARD, A. L. & ELLENBERGER, S. (2018): Two new genera of Cantharidae from Burmese amber of the Hukawng Valley (Insecta, Coleoptera). – *Cretaceous Research*, **86**: 170–177.
- FANTI, F. & ELLENBERGER, S. (2018): A new fossil genus of soldier beetles (Coleoptera: Cantharidae) from mid-Cretaceous Burmese amber: A probable case of adaptive convergence. – *Cretaceous Research*, **92**: 201–204.
- FANTI, F. & KUPRYJANOWICZ, J. (2017): A new soldier beetle from Eocene Baltic amber. – *Acta Palaeontologica Polonica*, **62** (4): 785–788.
- FANTI, F. & KUPRYJANOWICZ, J. (2018): Discovery of a new fossil soldier beetle in Eocene Baltic amber, with the establishment of the new tribe Cacomorphocerini. – *Annales de Paléontologie*, **104**: 149–153.
- FANTI, F. & MICHALSKI, A. R. (2018): An unusual fossil *Malthodes* with long elytra (Insecta Coleoptera Cantharidae). – *Giornale italiano di Entomologia*, **15** (63): 127–132.
- FANTI, F. & PANKOWSKI, M. J. (2018): A new fossil soldier beetle (Coleoptera, Cantharidae, Silinae) from Eocene Baltic amber. – *Zootaxa*, **4370** (2): 189–193.
- FANTI, F. & PANKOWSKI, M. K. (2018): Three new species of soldier beetles from Baltic amber (Coleoptera, Cantharidae). – *Zootaxa*, **4455** (3): 513–524.
- FANTI, F. & PANKOWSKI, M. K. (2019): A new soldier beetle of the extinct tribe Cacomorphocerini Fanti & Kupryjanowicz, 2018. – *Zootaxa*, **4651** (3): 589–595.
- FANTI, F. & SONTAG, E. (2019): A new fossil soldier beetle (Coleoptera: Cantharidae: Malthininae) from Baltic amber. – *Zootaxa*, **4629** (4): 583–588.
- FANTI, F. & VITALI, F. (2017): Key to fossil Malthininae, with description of two new species in Baltic amber (Coleoptera Cantharidae). – *Baltic Journal of Coleopterology*, **17** (1): 19–27.
- HIEKE, F. & PIETRZENIUK, E. (1984): Die Bernstein – Käfer des Museums für Naturkunde, Berlin (Insecta, Coleoptera). – *Mitteilungen aus dem Zoologischen Museum in Berlin*, **60** (2): 297–326.
- HSIAO, Y. & HUANG, C.-L. (2018): Taxonomic revision on the genus *Ornatomalthinus* POINAR and FANTI (Coleoptera: Cantharidae), with description of a new species from the Cretaceous Burmese amber. – *Cretaceous Research*, **92**: 257–263.
- IMHOFF, L. (1856): Versuch einer Einführung in das Studium der Koleoptern. xxxi + [2] + 114 + [2] + 272 pp.; Basel (Schweizerhaus).
- KAZANTSEV, S. V. (2013): New taxa of Baltic amber soldier beetles (Insecta: Coleoptera: Cantharidae) with synonymic and taxonomic notes. – *Russian Entomological Journal*, **22** (4): 283–291.
- KAZANTSEV, S. V. (2018): New Baltic amber soldier beetles (Coleoptera, Cantharidae, Cantharinae). – *Eurasian Entomological Journal*, **17** (2): 146–152.
- KAZANTSEV, S. V. & PERKOVSKY, E. E. (2014): A new *Malthodes* and some other interesting soldier beetles (Coleoptera: Cantharidae) from Late Eocene Rovno amber. – *Russian Entomological Journal*, **23** (2): 113–116.
- KAZANTSEV, S. V. & PERKOVSKY, E. E. (2019a): The first Cretaceous beetle from Azerbaijan: *Katyacantharis zherikhini* gen. et sp. n. (Coleoptera, Cantharidae) from Cenomanian Agdzhakend amber. – *Palaeoentomology*, **2** (1): 7–12.
- KAZANTSEV, S. V. & PERKOVSKY, E. E. (2019b): A new genus of soldier beetles (Insecta: Coleoptera: Cantharidae: Cantharinae) from Sakhalinian Amber. – *Paleontological Journal*, **53** (3): 84–87 [in Russian].
- KIREJTSHUK, A. G. & AZAR, D. (2013): Current knowledge of Coleoptera (Insecta) from the Lower Cretaceous Lebanese amber and taxonomical notes for some Mesozoic groups. – *Terrestrial Arthropod Reviews*, **6**: 103–134.
- KLEBS, R. (1910): Über Bernsteineinschlüsse im allgemeinen und die Coleopteren meiner Bernsteinsammlung. – *Schriften der Physikalisch-ökonomischen Gesellschaft zu Königsberg in Preußen*, **51** (3): 217–242.
- KUBISZ, D. (2000): Fossil beetles (Coleoptera) from Baltic amber in the collection of the Museum of Natural History of ISEA in Kraków. – *Polskie Pismo Entomologiczne*, **69**: 225–230.
- KUBISZ, D. (2001): Beetles in the collection of the Museum of Amber Inclusions, University of Gdańsk, with description of *Colotes sambicus* sp. n. (Coleoptera: Melyridae). – *Polskie Pismo Entomologiczne*, **70**: 259–265.
- KUPRYJANOWICZ, J. & FANTI, F. (2019): New subgenus and three new species of soldier beetles from the Eocene of Baltic amber. – *Palaeontologia Electronica*, **22.2.22A**: 1–13.
- KUŠKA, A. (1996): New beetle species (Coleoptera: Cantharidae, Curculionidae) from the Baltic amber. – *Prace Muzeum Ziemi*, **44**: 13–18.
- KUŠKA, A. & KANIA, I. (2010): New soldier beetles (Coleoptera, Cantharidae) from the Eocene Baltic amber. – *Zootaxa*, **2400**: 49–56.
- PARISI, F. & FANTI, F. (2019a): A new fossil species of the extinct tribe Mimoplatycini KAZANTSEV, 2013 (Coleoptera Cantharidae). – *Annales de Paléontologie*, **105** (2): 119–122.
- PARISI, F. & FANTI, F. (2019b): A new fossil *Malthodes* KIESENWETTER, 1852 from the Eocene Baltic amber (Coleoptera Cantharidae). – *Zootaxa*, **4652** (1): 189–195.
- PERIS, D. & FANTI, F. (2018): *Molliberus albae* gen. et sp. nov., the oldest Laurasian soldier beetle (Coleoptera: Cantharidae) from the Lower Cretaceous Spanish amber. – *Cretaceous Research*, **91**: 263–268.
- PIC, M. (1911): Trois nouveaux genres de Malacodermes Voisins de «Silis» Latr. – *L'Échange, Revue Linnéenne*, **27** (313): 101–102.
- POINAR JR., G. O., MARSHALL, C. J. & BUCKLEY, R. (2007): One hundred million years of chemical warfare by insects. – *Journal of Chemical Ecology*, **33** (9): 1663–1669.

- RAMSDALE, A. S. (2002): Family 64. Cantharidae IMHOFF 1856. In: ARNETT, R. H. JR., THOMAS, M. C., SKELLEY, P. E. & FRANK, J. H. (eds.): *American Beetles*, 2. Polyphaga: Scarabaeoidea through Curculionoidea: 202–218; Boca Raton (CRC Press).
- RASNITSYN, A. P. & ROSS, A. J. (2000): A preliminary list of arthropod families present in the Burmese amber collection at The Natural History Museum, London. – *Bulletin of The Natural History Museum of London (Geology Series)*, **56** (1): 21–24.
- SCHAUFUSS, C. F. C. (1892): Preussens Bernstein-Käfer. Neue Formen aus der Helm'schen Sammlung im Danziger Provinzialmuseum. – *Berliner Entomologische Zeitschrift*, **36** (1): 53–64.
- SPAHR, U. (1981): Systematischer Katalog der Bernstein- und Kopal-Käfer (Coleoptera). – *Stuttgarter Beiträge zur Naturkunde, Serie B*, **80**: 1–107.
- WOLFE, A. P., MCKELLAR, R. C., TAPPERT, R., SODHI, R. N. S. & MUEHLENBACHS, K. (2015): Bitterfeld amber is not Baltic amber: Three geochemical tests and further constraints on the botanical affinities of succinite. – *Review of Palaeobotany and Palynology*, **225**: 21–32.
- WU, R. J. C. (1997): *Secrets of a Lost World: Dominican Amber and its Inclusions*. 222 pp.; Santo Domingo, Dominican Republic (Privately published).

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