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First record of *Cathartosilvanus* Grouvelle (Coleoptera: Silvanidae) from Baltic amber with description of a new species

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Cathartosilvanus necromanticus sp. nov., the first fossil representative of the extant New World genus, is described and illustrated on the basis of an inclusion in European Eocene amber. The new taxon is characterised by comparatively large body size, pronotum elongate, with weakly produced anterior angles and obtuse basal angles, prosternal process not channeled, and elytra without tuberculate setiferous punctures.

Key words: Tertiary, Eocene, silvanid beetle, fossil

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INTRODUCTION

The genus *Cathartosilvanus* Grouvelle, 1912 includes five described extant species restricted to the New World (Halstead 1973, 1993; Thomas 1993): 1) *C. imbellis* (LeConte, 1854) in Canada and USA; 2) *C. opaculus* (LeConte, 1854) in Southern USA, Mexico, Guatemala, Honduras, Belize, Panama, Ecuador, Brazil, Bolivia, Cuba, Trinidad, Dominican Republic, Jamaica, Grenada, and Guadeloupe; 3) *C. vulgaris* Grouvelle, 1878 in Mexico, Guatemala, Costa Rica, Panama, Colombia, Brazil, and Argentina; 4) *C. tropicalis* (Van Dyke, 1953) in the Galapagos islands; 5) *C. aitkenae* Halstead, 1993 in Costa Rica, Venezuela, Brazil, Bolivia, and Paraguay.

An updated list of known fossil Silvanidae was provided in Alekseev & Bukejs (2016). In the current paper a new additional species of Silvanidae from Eocene Baltic amber, assigned to the recent genus *Cathartosilvanus* Grouvelle, 1912, is described, illustrated, and compared to the recent species.

MATERIAL AND METHODS

A single specimen (holotype) from the private collection of Christel and Hans Werner Hoffeins (Hamburg, Germany) [CCHH] was examined. The amber piece was obtained from a commercial source and will be deposited at Senckenberg Deutsches Entomologisches Institut (Müncheberg, Germany) [SDEI] as part of the amber collection. The amber piece was prepared for examination (cut, polished and embedded in GTS-polyester resin [Voss

Chemie]) following the method described by Hoffeins (2001).

Photographs were taken using a Zeiss AxioCamICc 3 digital camera mounted on a Zeiss Stemi 2000 stereomicroscope. Measurements were taken using an ocular micrometer of the stereomicroscope. Reconstructions were based on free-hand drawings made during examination of the original specimen. Figures were edited using Adobe Photoshop CS8 software. The following sources were used for comparison with recent species: Halstead (1973) and Thomas (1993).

SYSTEMATIC PALAEONTOLOGY

Superfamily Cucujoidea Latreille, 1802
Family Silvanidae Kirby, 1837
Subfamily Silvaninae Kirby, 1837
Genus *Cathartosilvanus* Grouvelle, 1912
***Cathartosilvanus necromanticus* sp. nov.**
(Figs. 1-5)

Material examined. Holotype: No. 1217-3 [CCHH]. Sex unknown. A complete beetle is included in a small yellow amber piece embedded in a block of GTS-polyester resin measuring 15.0 x 6.5 x 5.0 mm. Syninclusions are absent. The beetle inclusion is slightly damaged because of hypothesized thermal processing of the amber piece in an autoclave: The cuticle is charred and fragmented in the lateral part of the left elytra by ventral view; left side of pronotum ventrally seemingly deformed.

Type strata. Baltic Amber, Eocene.

Type locality. Yantarny settlement [Palmnicken], Sambian [Samland] peninsula, Kaliningrad region, Russia.

Differential diagnosis. The specimen No 1217-3 is placed within Silvanidae due to subparallel body form, pentamerous tarsi, closed procoxal cavities, open mesocoxal cavities, and clubbed 11-segmented antennae. The new fossil species shows the combination of characters corresponding to the subfamily Silvaninae: posteriorly closed procoxal cavities, loosely clubbed antennae, finely pubescent dorsum, pentamerous tarsi with the fourth segment being smallest.

The new fossil species is assigned to the genus *Cathartosilvanus* Grouvelle, 1912 due to the following characteristics: lateral margins of pronotum simple, no tarsomeres lobed, tarsomere 3 not incrassate, anterior angles of pronotum located posteriorly to anterior margin, antennae with a 3-segmented club (first club segment not much narrower than second), apical segment not obviously elongate, femoral lines open.

Resembling recent species of *Cathartosilvanus* in visible characteristics, *C. necromanticus* sp. nov. differs by a distinctly larger body size (length of *C. opaculus* comprises 1.7-2.1 mm; length of *C. imbellis* comprises 2.5-2.9 mm; length of *C. tropicalis* comprises 2.7-2.8 mm; length of *C. vulgaris* comprises 2.3-2.8 mm). The newly described fossil species can be distinguished from *C. opaculus* by the elongated pronotum, from *C. imbellis* by the more produced pronotal anterior angles, from *C. tropicalis* by the unicolour body and by the distinctly longer elytra, and from *C. vulgaris* by the smooth prosternal process between coxae, by the elytra without tuberculate setiferous punctures, and by the obtuse posterior angles.

Description. *Body*: elongate, dorsoventrally flattened, nearly parallel-sided, uniformly black; length about 3.5 mm, maximum width 1.0 mm.

Head: **S**lightly transverse; irregularly punctate; narrower across eyes than pronotum across anterior angles. Punctures round, almost as large as facet of eye; distance between punctures 0.5-1.5 × puncture diameter; punctuation sparser and finer medially while coarser and denser towards eyes. Anterior clypeal margin widely rounded.

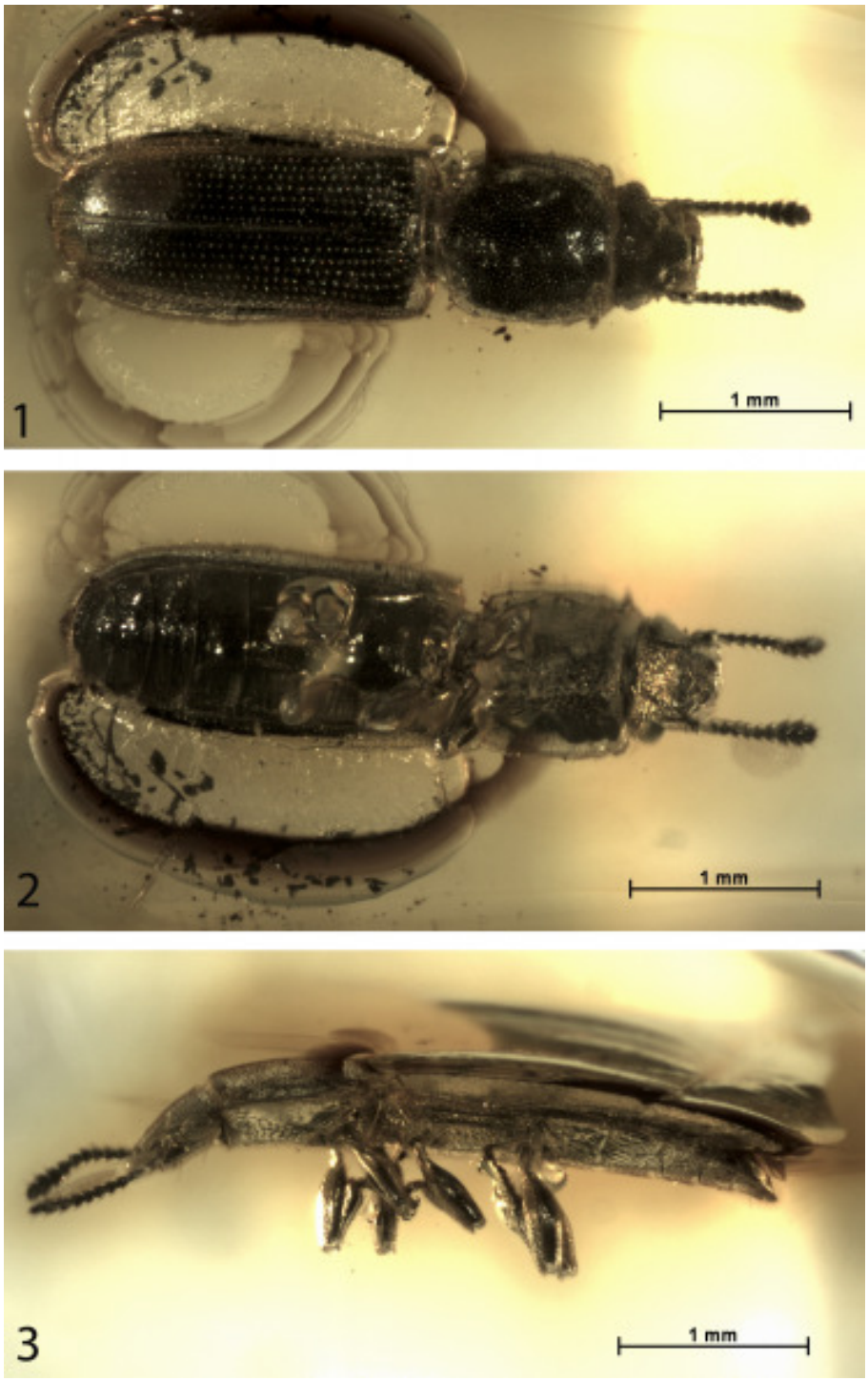

Fig.1-3. *Cathartosilvanus necromanticus* sp. nov. Holotype; No 1217-3 [CCHH]. Habitus: 1 - dorsal view; 2 - ventral view; 3 - lateral view.

Fig. 4. *Cathartosilvanus necromanticus* sp. nov. Habitus dorsally

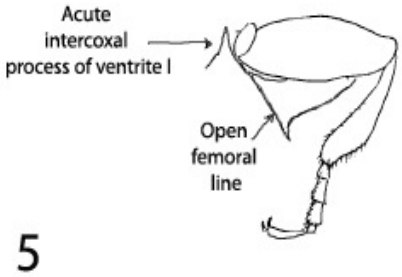

Fig. 5. *Cathartosilvanus necromanticus* sp. nov. Hind leg dorsally

Compound eyes prominent, hemispherical, with coarse facets, pubescent. Temples absent. Antennae stout, gradually thickened to apex; short, extending to apical fourth of pronotum; 11-segmented with loose 3-segmented club, densely covered with fine semierect setae. Scape and pedicel cylindrical; antennomere 3 conical, slightly longer and narrower than pedicel. Antennomeres 4-8 subquadrate; antennomeres 9 and 10 are widest, transverse, almost equal in size; antennomere 11 rounded, as long as wide, narrower than previous segment.

Thorax: Pronotum slightly longer than wide; length 1.0 mm; width 0.9 mm; disc weakly convex. Pronotal surface obviously pubescent, deeply and densely punctate; punctures round, separated by distance 0.3 - 1.5 × puncture diameter. Anterior margin weakly arcuate, sloped backwards to anterior angles. Anterior angles weakly produced, obvious, rounded. Lateral margins subparallel, slightly uneven. Posterior angles obtuse. Posterior margin distinctly arcuate, finely bordered.

Pro-, meso- and metaventrites deeply and densely punctured (distance between punctures equal to 0.3-1.3 × diameter of one puncture). Pro- and mesocoxae nearly round. Procoxal cavities closed, mesocoxal cavities open. All coxae separated: procoxae separated by a distance slightly lesser than procoxal diameter; mesocoxae separated by a distance approximately 0.5 × coxal diameter; metacoxae almost contiguous and separated by very narrow and acute process of ventrite 1. Prosternal process elongate, apically dilated.

Scutellar shield distinct, semicircular, transverse (twice as wide as long). Elytra together 2.1 × as long as wide, elongate, almost subparallel (widest behind middle), at humeri equal to maximal pronotal width, finely pubescent. Humeral angles weakly produced. Each elytron with nine striae of punctures and, in between, rows of interstrial fine setae. Strial punctures small, round, with intervals about 1.0-

2.0 × puncture diameter; scutellary striole not distinct. Epipleura well developed, reaching apex of ventrite 4. Hind wings present.

Abdomen: With five visible, similarly articulated, punctate and finely pubescent ventrites. Relative lengths (medially) of ventrites 1-5 equal to 34-20-16-15-15. All ventrites finely punctured and pubescent; ventrite 5 apically rounded. Intercoxal process of abdominal ventrite 1 thin and acute.

Legs: Robust, short. Femora thick, punctate, finely pubescent; hind femora simple (without denticle or tooth). Tibiae clavate. Tarsal formula 5-5-5. No tarsomeres lobed. Apical tarsomere being longest; tarsomere 4 being smallest; tarsomeres 2 and 3 equal in size. Tarsal claws large, simple, length about one third of tarsomere 5.

Remark. The specimen has no apparent male secondary sexual characteristics (hind legs and first ventrite are without modifications), but sexual dimorphism is not required for the all extant species as it is absent, e.g., in *C. opaculus*. Thereby, the sex of the specimen is considered unknown.

Derivatio nominis. The specific epithet of this new species stems from the Greek word ķåźńļ-ģįķōåßį [Latin: necromantia]. The name refers to some similarity between paleontological studies and ancient magic practice involving communication with the deceased.

DISCUSSION

Most extant *Cathartosilvanus* species apparently prefer warm temperate and humid climates of the Neotropics and Southern Nearctic. Only one species (*C. imbellis*) inhabits the USA and the southern part of Canada. This generally conforms to the assumption of humid and sufficiently warm conditions prevailing during the times of "amber forest" growth in Eocene Europe (Alekseev & Alekseev 2016). In contrast, the temperature preference of extant *Cathartosilvanus* does not exclude the supposed temperate climate in Baltic amber forests (Vitali & Damgaard 2016, Schmidt & Michalik 2017). Representatives of recent *Cathartosilvanus* are found under loose bark of different fallen or felled trees and logs (*Quercus*, *Castanea*, *Primavera*, cedar, or mahogany), on dried fruit (e.g. *Musa*), on withered foliage and dead leaves in leaf litter, in nests of weaver birds, and also in stored or transported products of plant origin (Halstead 1973; Thomas 1993). Fungal spores have been observed in the gut of specimens dissected for genitalia suggesting that molds, which abound in the subcorticolous habitat, may form part of their diet (Halstead 1973). In all likelihood, the fossil *Cathartosilvanus necromanticus* sp. nov. was mycophagous and inhabited the microhabitats under loose bark on different dead trees (without obligate association with a certain plant) and on molds on a variety of plant substrates.

The extant representatives of the genus inhabit the New World only. The present finding suggests that the genus once had a much wider distribution. The presence of a species with clear *Cathartosilvanus* characteristics in the Eocene European ecosystems is significant for future evolutionary and distributional study. The relationship of the Eocene Baltic amber fauna with the recent North, Central, and Southern American zoogeographical regions is interesting. The detection of different genera of beetles distributed in the present-day Western Hemisphere only (*Aneurops*, *Canifa*, *Cathartosilvanus*, *Caulophilus*, *Cymatodera*, *Dicentrus*, *Dorcaschema*, *Electribius*, *Eucrada*, *Heterelmis*, *Micromalthus*, *Oxycraspedus, Pactopus, Smicrips*, and *Stenapion*) in European Eocene is important for possible conclusions concerning extinction processes in Tertiary.

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