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Microzavaljus, a second extinct genus of pleasing fungus beetles (Coleoptera: Erotylidae) from Bitterfeld Amber

Microzavaljus, второй вымерший род жуков-грибовиков (Erotylidae: Coleoptera) из саксонского янтаря

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KEY WORDS: Erotylidae, Xenoscelinae, *Microzavaljus,* taxonomy, Late Eocene, Bitterfeld amber.
КЛЮЧЕВЫЕ СЛОВА: Erotylidae, Xenoscelinae, *Microzavaljus,* таксономия, поздний эоцен, саксонский янтарь.

ABSTRACT. Based on a fossil specimen from the Late Eocene Bitterfeld amber, *Microzavaljus saxonicum* **gen.n.**, **sp.n.**, is described. The new genus belongs to subfamily Xenoscelinae Ganglbauer, 1899 (Coleoptera: Erotylidae). The new genus is similar to the extinct genus *Warnis* Lyubarsky, Perkovsky et Alekseev, 2016, differing in submetacoxal lines absent, and similar to extant genus *Zavaljus* Reitter, 1880, differing in body size, supraocular lines present, and pronotal sides smooth, not serrate. Eocene fauna of Xenoscelinae is now composed of 4 genera: *Xenochimatium* Lyubarsky et Perkovsky, 2012 from Rovno amber, *Xenophagus* Lyubarsky et Perkovsky, 2017 and *Warnis* Lyubarsky et al., 2016 from Baltic amber, and the new genus from Bitterfeld amber.

РЕЗЮМЕ. Из позднеэоценового саксонского янтаря описан новый род жуков *Microzavaljus saxonicum* **gen.n.**, **sp.n.** из подсемейства Xenoscelinae Ganglbauer, 1899 (Coleoptera: Erotylidae). Новый род во многом схож с родом *Warnis* Lyubarsky, Perkovsky et Alekseev, 2016 из балтийского янтаря, отличается от него отсутствием субметакоксальных линий. Сходен с современным родом *Zavaljus* Reitter, 1880, отличается размером, наличием супраокулярных линий, отсутствием слабой зазубренности на боковом крае переднеспинки. Эоценовая фауна Xenoscelinae представлена 4 родами: *Xenochimatium* Lyubarsky et Perkovsky, 2012 из ровенского янтаря, *Xenophagus* Lyubarsky, Perkovsky, 2017 и *Warnis* Lyubarsky et al., 2016 из балтийского янтаря, и новым родом из саксонского янтаря.

Introduction

A study of the collection of Christel and Hans Werner Hoffeins (CCHH) revealed a new genus of beetles. The new genus belongs to the family Erotylidae, since it has the following characters: epimera long, reaching the 3rd abdominal segment; 1st segment of abdomen relatively short, about 1.3 times longer than 2nd; punctation of elytra situated in rows. The family Erotylidae is a group of small and medium size beetles with about 3500 described species in almost 300 genera, represented in all continents except Antarctica [Węgrzynowicz, 2002, 2007; Leschen, 2003; Leschen et al., 2010]. The family belongs with the superfamily Cucujoidea.

The phylogenetic position of the Erotylidae is described in Robertson et al. [2004, 2015]. The classification of the family was most recently revised by Leschen [Leschen, Węgrzynowicz, 1998; Leschen, 2003]. The family Erotylidae includes six subfamilies (Xenoscelinae, Pharaxonothinae, Loberinae, Languriinae, Cryptophilinae, and Erotylinae). The family has not been sufficiently studied, many subfamilies are identified as paraphyletic, generic and species diagnostics of many subfamilies have not been insufficiently studied.

Palaeontological data

Palaeontological data concerning the family Erotylidae were reported by Węgrzynowicz [2002]. There are quite a few findings of the Xenoscelinae Ganglbauer, 1899 subfamily. Recent studies discovered samples of

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the Xenoscelinae dating from the Cretaceous period [Kirejtshuk, Azar, 2013]. The specimen found had body size at least 2.0 mm, diffusely punctured and finely pubescent elytra, 4-segmented loose antennal club and widely lobed tarsomeres 1–3. Recently described erotylids from Late Eocene Baltic, Bitterfeld and Rovno ambers [Alekseev 2014, 2017; Lyubarsky, Perkovsky 2012, 2017a, 2017b; Lyubarsky et al. 2016] were placed in Erotylinae Latreille, 1802 (*Triplax contienensis* Alekseev, 2014), Languriinae Crotch, 1873 (*Serramorphus rasnitsyni* Lyubarsky et Perkovsky, 2017), and Xenoscelinae Ganglbauer, 1899 (*Xenochimatium rovnense* Lyubarsky et Perkovsky, 2012; *Warnis tvanksticus* Lyubarsky, Perkovsky et Alekseev, 2016; *Xenophagus popovi* Lyubarsky et Perkovsky, 2017), and for the first time Pharaxonothinae Crowson, 1952 from Baltic amber, *Cycadophila mumia* Alekseev, 2017. The new genus belongs to Xenoscelinae, which makes Xenoscelinae the most diverse subfamily in the Late Eocene ambers. In the three erotylid faunas from Late Eocene ambers no common genera have been found so far.

Photographs were taken at the Schmalhausen Institute of Zoology (Kiev, SIZK) using the microscope Leica MZ 16 and in Paleontological Institute (Moscow, PIN) using a Leica M 165 microscope equipped with a Leica DFC 425 camera.

Figs 1–2. Holotype *Microzavaljus saxonicum* **sp.n.**, habitus (photo): 1 — dorsal view; 2 — ventral view.
Рис. 1–2. Голотип *Microzavaljus saxonicum* **sp.n.**, общий вид (фотография): 1 — сверху; 2 — снизу.

Taxonomy

Order Coleoptera

Superfamily Cucujoidea Latreille, 1802

Family Erotylidae Latreille, 1802

Subfamily Xenoscelinae Ganglbauer, 1899

Microzavaljus gen.nov.

Type species: *Microzavaljus saxonicum.*

DESCRIPTION**.** Body elongated, narrow. Antennae with 11 antennomeres and a 3-segmented club. Frontoclypeal suture absent. Antennal insertion hidden in dorsal view. Labial palpus 2-segmented, second segment of palpus much longer than first segment. Supraocular line present.

Pronotum nearly parallel-sided, slightly narrowed in posterior third of its length. Pronotum without callosities in anterior angles. Posterior edge with medial lobe. Pronotal puncturation confused. Basal pronotal pits absent, basal groove absent. Scutellum normal in size, trapezoidal, with small punctures, width of scutellum less than length of eye. Procoxal process between procoxal cavity narrower than width of procoxa. Procoxal cavity internally closed and externally open. Width of mesoventral process narrower than mesocoxa. Submesocoxal lines absent. Metacoxal cavity narrowed. Longitudinal line in metasternum present.

Legs slender, tibia without spurs in apex. Tarsi 5-5-5, longest tarsomere 5 with long serrated claw. Length of tarsomere 1 greater than tarsomere 2. Tarsomeres without lobes, with long setae from below.

Elytral length 2.2x that of width. Elytra completely covering the abdomen. Epimere almost complete, reaching 3rd segment of the abdomen. Wings present.

Abdomen with 5 segments; segment 1 less than twice as long as the next, only about 1.3 times longer. Submetacoxal lines absent.

DIAGNOSIS. Pronotal pits absent; pronotum parallel-sided; submesocoxal lines absent; submesocoxal lines absent; length of tarsomere 1 greater than tarsomere 2.

ETYMOLOGY. The genus name is grammatically masculine. It is compounded from *micro-* and the name of genus, *Zavaljus*.

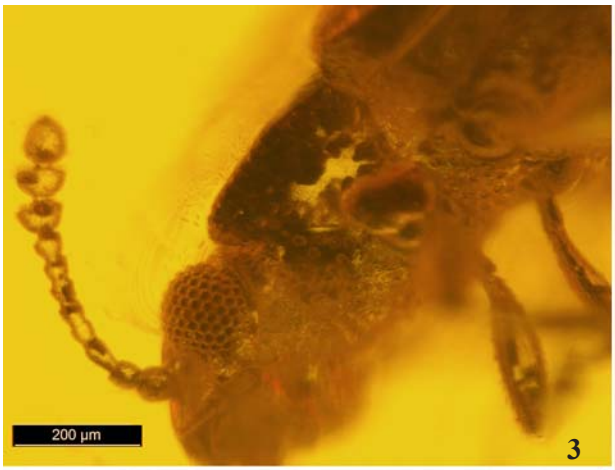
Microzavaljus saxonicum sp.n.

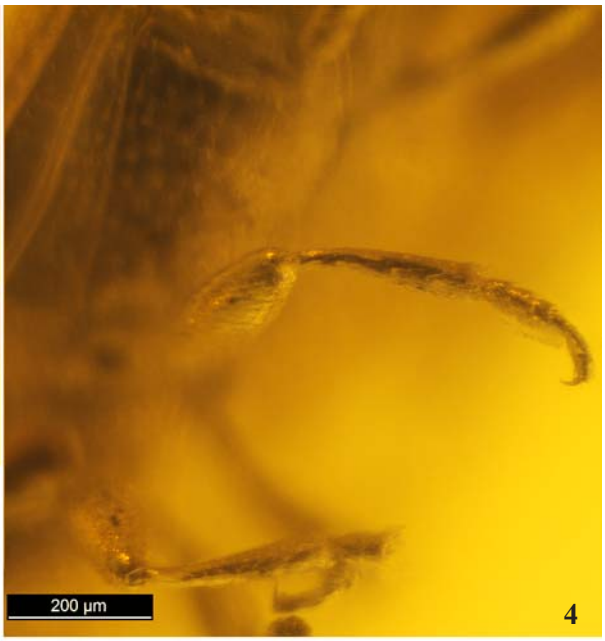
Figs 1–6.

MATERIAL. Holotype: 1223-1, in collection of Christel and Hans Werner Hoffeins (Hamburg), Bitterfeld amber. Type will be deposited at the amber collection of Senckenberg Deutsches Entomologisches Institut, Müncheberg (SDEI), Germany. Collection code: CCHH.

DESCRIPTION**.** Body parallel-sided, with white hairs, length of body 2.1 mm, maximal width 0.7 mm (Fig. 1).

Head with hemispherical eyes. Eyes relatively large, length of eye equal to half length of head. Facets medium size, approximately equal to diameter of puncture. Punctuation of head: punctures medium in size, distance between neighboring punctures equal to or a bit greater than one diameter of puncture. Frons weakly convex, punctuate. Antennae relatively short, not reaching beyond hind edge of pronotum (Fig. 2). Antennal club asymmetrical, slightly





Figs 3–5. Holotype *Microzavaljus saxonicum* **sp.n.** (photo): 3 — head and prothorax, ventral view; 4 — mesotarsus; 5 — meso- and metatarsus.

Рис. 3–5. Голотип *Microzavaljus saxonicum* **sp.n.**: (фотография): 3 — голова и переднегрудь снизу; 4 — средняя лапка; 5 — средняя и задняя лапки.

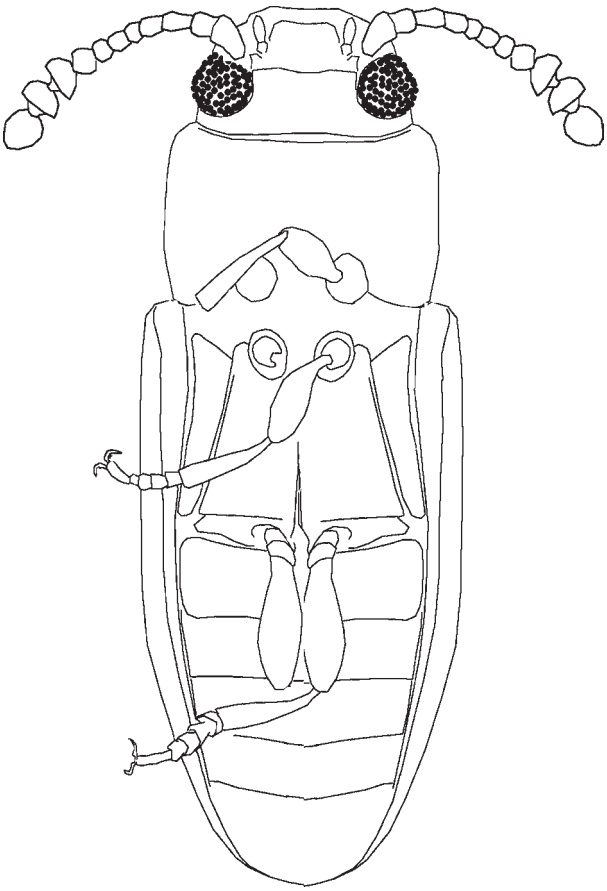


Fig. 6. Holotype *Microzavaljus saxonicum* **sp.n.**, ventral view, drawing.

Рис. 6. Голотип *Microzavaljus saxonicum* **sp.n.**, снизу, реконструкция.

flattened. 1st antennomere longest, elongated (Figs 3, 6). 3rd antennomere longest of the segments of flagellum, and other segments of flagellum approximately equal, slightly elongate. 9th and 10th antennomeres conical, transverse, twice as wide as flagellum. Terminal antennomere rounded. Antennal furrows absent.

Pronotum almost parallel-sided, without callosity and teeth, length of pronotum equal to 0.8 of its width, length of pronotum equal to 0.3 length of elytra. Punctation moderately strong, distance between neighboring punctures equal to one diameter of puncture. Anterior margin slightly convex. Lateral margins without cants. Posterior margin with basal lobe, without basal depression, basal pits absent. Posterior angles acutangular.

Prosternum in front of procoxae long. Distance between metacoxae much less than diameter of metacoxa. Pre-, meso-, and metasternum strongly and not densely punctated (Fig. 2). Legs slender, tibia not dilated apically (Figs 4–5). Tarsomeres slightly elongated. Tarsomeres 1–4 about equal in length (1st tarsomere a little longer than the others), the longest being tarsomere 5, which is shorter than all other taken together (Figs 4–5).

Scutellum transverse, its width 1.5 times greater its length, width equal to width of eye.

Punctuation of elytra: punctures medium in size, arranged in rows, distance between neighboring punctures 1–1.5 diameter of puncture. Punctures in rows include 9 rows of larger dots, and intermediate rows of weaker points between them. Elytra covered with short light hairs arranged in rows. Hairs only slightly raised and a little overlaying each other. Surface of the elytra shagreenate.

Ventrites weakly pubescent, irregularly punctured.

ETYMOLOGY. The species is named *saxonicum*, because it was found in Bitterfeld amber (Saxony-Anhalt).

REMARKS. The specimens considered here were assigned to the subfamily Xenoscelinae based on a combination of the following visible external morphological characters: antennal insertion hidden in dorsal view; supraocular line present; pronotum parallel-sided; anterior angles of pronotum poorly developed; pronotal pits absent (present in *Protoloberus* and *Zavaljus*); internal closure of procoxal cavity closed (open in *Loberonotha*); external closure of procoxal cavity open; width of mesoventral process narrower than mesocoxa; submesocoxal lines absent; length of tarsomere 1 greater than tarsomere 2; tarsomere 3 not lobed, tarsomere 4 reduced as in all xenoscelines except *Zavaljus* and *Microzavaljus* and exposed in ventral view; elytral punctation striate. Thus, the characters of the new genus fit this diagnosis of subfamily Xenoscelinae.

Subfamily Xenoscelinae includes the following genera: *Loberonotha* (1 species; New Zealand), *Macrophagus* (1 species; Asia and Europe), *Othniocryptus* (1 species; Neotropical), *Protoloberus* (1 species; Australia), *Xenocryptus* (2 species; Africa and Australia), *Xenoscelis* (1 species; Mediterranean), *Zavaljus* (1 species; Northern Europe), and extinct monotypic genera *Xenohimatium* from the Late Eocene Rovno amber (Ukraine), *Warnis* and *Xenophagus* from Late Eocene Baltic amber.

Key to genera of subfamily Xenoscelinae

1. Submetacoxal lines present. Tarsi without lobes 2
— Submetacoxal lines absent. Tarsi with or without lobes. 4
2. Sides of pronotum not parallel, pronotum widest in middle. Elytra blue–green, covered by rows of punctures. Ovipositor dilated, with a sclerotised, hook-like gonostyle with basal setae. Recent, Central Africa .... *Arrowcryptus* Leschen et Węgrzynowicz, 2008
— Sides of pronotum parallel. Elytra dark or testaceus. Ovipositor not dilated. Extinct, Baltic amber. 3
3. Elytral puncturation confused. .... *Xenophagus* Lyubarsky et Perkovsky, 2017
— Elytra covered by rows of punctures .... *Warnis* Lyubarsky, Perkovsky et Alekseev, 2016
4. Pronotum completely parallel-sided 5
— Pronotum widest within apical one third 6
5. Lateral carina on elytra present. Pronotum considerably elongated. Recent, Mediterranean .... *Xenoscelis* Wollaston, 1864
— Lateral carina on elytra absent. Pronotum transversal. Extinct, Baltic amber. .... *Xenohimatium* Lyubarsky et Perkovsky, 2012
6. Elytral punctuation confused 7
— Elytral punctuation arranged in rows 9
7. Epipleura short, widened to level of metathorax. Recent, New Zealand .... *Loberonotha* Sen Gupta et Crowson, 1969
— Epipleura long, widened to 3rd ventrite or elytral tips. Tarsi with lobes 8

8. Unicolorous, light brown. Recent, Central and Eastern Europe, Caucasus, Central Asia .... *Macrophagus* Motschulsky, 1875
— Body with two colors, light background with dark mottles. Recent, Central America ..... *Othniocryptus* Sharp, 1900
9. Tarsi seem 4–segmented, because of reduced tarsomere 4. Supraocular line present. Recent, Australia .... *Protoloberus* Leschen, 2003
— Tarsi 5–segmented, tarsomere 4 not reduced 10
10. Antennae long, reaching beyond posterior edge of pronotum. Length 4.2-4.8 mm. Pronotal sides slightly crenulate. Supraocular line absent. Recent, Northern and Eastern Europe. ..... *Zavaljus* Reitter , 1880
— Antenna short, reaching only middle of pronotum. .. 11
11. Legs short, tibia dilated, tarsomeres a little flattened, weakly lobed below. Length 4.5 mm. Recent, Australia, South Africa ..... *Xenocryptus* Arrow, 1929
— Legs normal in length, tibia slender, tarsomeres not flattened, not lobed. Pronotal sides smooth. Supraocular line present. Length 2.1 mm. Extinct, Bitterfeld amber .... *Microzavaljus* **gen.n.**

Discussion

Wolfe et al. [2016] demonstrated that the source of Bitterfeld amber had much lower paleolatitude than the source of coeval Baltic amber. Our previous studies of ants [Perkovsky, 2011, 2016], corethrellids [Baranov et al., 2016], phalacrids [Lyubarsky, Perkovsky, 2016] and erotylids [Lyubarsky, Perkovsky, 2017a] demonstrated that the share of thermophilous elements in Bitterfeld amber is much higher than in the Baltic one. Tropical Ceratopogoninae are more common in Bitterfeld amber than in Baltic amber as well [Perkovsky, 2017]. The finding of a new genus of the largely extra-holarctic subfamily Xenoscelinae in Bitterfeld amber is a further evidence of the relative abundance of the thermophilic elements in Bitterfeld amber.

The new genus belongs to Xenoscelinae, which makes Xenoscelinae the most diverse subfamily in the Late Eocene ambers. While some Xenoscelinae are strictly phytophagous on living tissues, other xenoscelines are associated with decaying plant material and may be saprophagous, mycophagous (on spores and hyphae of microfungi), or pollen feeding; the transition to association with dead wood in *Zavaljus* is derived from phytophagy [Leshen, Buckley, 2007]. So far, no common erotylid genera have been found in the three Late Eocene amber faunas. The fact that none of the four genera of the Eocene Xenoscelinae is known from more than one amber fauna is an evidence of geographically different sources of Bitterfeld, Baltic and Rovno amber.

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