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New cylindrical bark and ironclad beetles (Coleoptera: Zopheridae) from Baltic amber

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Two extinct zopherid beetles *Pycnomerus simukovi* sp. nov and *Bitoma glaesisepulta* sp. nov. are described and figured on the basis of inclusions in Baltic amber.

Key words: Tertiary, Eocene, fossils, *Pycnomerus*, *Bitoma*, new species.

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INTRODUCTION

The family Zopheridae Solier, 1834 has a worldwide distribution and includes 1700 species and 190 genera (Ślipiński et al. 2011) in two subfamilies (Bouchard et al. 2011): Colydiinae Billberg, 1820 (cylindrical bark beetles, 9 tribes) and Zopherinae Solier, 1834 (ironclad beetles, 6 tribes). Zopheridae occur throughout forested areas of the world. Although many species inhabit the tropics, the temperate zones are also well represented.

Fossil zopherid beetles are generally very poorly known. Three species (*Phloeonemites miocenus* Wickham 1912, *Rhagoderidea striata* Wickham, 1914 and *Cicones oblongopunctata* Wickham, 1914) are described from shales of Florissant Formation [Upper Eocene]. At least nine extant genera of the subfamily Colydiinae are reported by different authors (Helm 1896, Klebs 1910, Larsson 1978, Spahr 1981, Kubisz 2000) from Baltic succinite: *Rhopalocerus* Redtenbacher, 1842; *Coxelus* Dejean, 1821; *Diodesma* Latreille, 1829; *Synchita* Hollowig, 1792; *Cicones* Curtis, 1827; *Xylolaemus* Reitter, 1882; *Endophloeus* Dejean, 1834; *Colydium* Fabricius, 1792; *Bitoma* Herbst, 1793. Only one extinct species of the recent genus *Xylolaemus*, *X. sakhnovi* Alekseev and Lord (2014) has been described from Baltic amber till now. No representatives of the Zopherinae have been known from Baltic amber (Alekseev 2013).

In the current paper, two new species – *Pycnomerus simukovi* sp, nov. and *Bitoma glaesisepulta* sp. nov. – are described from Baltic amber. The tribe Pycnomerini is reported from Baltic amber for the first time.

MATERIAL AND METHODS

Two single specimens were examined during the study. The types belong to the following collections: CCHH – private collection of Christel and Hans Werner Hoffeins (Hamburg,

Germany), CVIA – author's private collection (Kaliningrad, Russia).

The amber piece of CCHH (Nr. 731-2) was obtained from commercial sources in Kaliningrad and registered in collection in 2012. The amber will be given to the Senckenberg Deutsches Entomologisches Institut in Müncheberg, Germany (SDEI) as part of the institute's amber collection. The amber piece of CVIA (Nr. AWI-010) was obtained in Kaliningrad in December 2012 and originated from the surf zone on the Baltic seacoast (vicinity of Yantarny settlement, Kaliningrad region, Russia; 54°51'28''N 19°56'05''E). The amber will be given to the Paleontological Institute of Russian Academy of Sciences (Moscow, Russia) for permanent preservation.

The CCHH piece was prepared manually and embedded in block of polyester resin (Hoffeins 2001). The photos were taken with a Nikon Coolpix 4500 Nikon digital camera, attached to a Wild M3Z stereo-microscope. The CVIA amber with inclusion was polished by hand to enhance the dorsal, ventral and frontal views of the included specimen. Photos were taken with a Zeiss AxioCamICc 3 digital camera mounted on a Zeiss Stemi 2000-stereomicroscope.

Reconstructions were made based on free-hand drawings during examination of the original specimens. The figures were edited using Adobe Photoshop CS8.

The following papers are used for the generic attribution and comparison with recent species: Pope (1955), Stephan (1989), Ślipiński & Lawrence (1999), Ivie & Ślipiński (2000).

Measurements were taken as follows: total length (TL) from apical margin of clypeus to the elytral apex; elytral length (EL) along suture including scutellum; elytral width (EW) across maximum combined width; pronotal width (PW) across maximum width; pronotal length (PL) along mid line from anterior to posterior margin.

SYSTEMATIC PART

Family Zopheridae Solier, 1834
Subfamily Zopherinae Solier, 1834
Tribe Pycnomerini Erichson, 1845
Genus *Pycnomerus* Erichson, 1842
***Pycnomerus simukovi* sp. nov.**
(Figs. 1-2)

Material examined: Holotype Nr. 731-2 [CCHH], sex unknown. The beetle is included in a polished piece of transparent amber, orange in color, thermally processed in an autoclave. The amber piece is embedded in a block of polyester resin with dimensions 9 x 9 x 3 mm. The syninclusions are represented by numerous fagaceous stellate hairs and by three phoretic mites (Acari: Acariformes) attached to the hind femora of the beetle.

Type strata: Baltic Amber. Eocene.
Type locality: Yantarny settlement [formerly Palmnicken], the Kaliningrad region, Russia.

Differential diagnosis: The new species can be assigned to *Pycnomerus* due to following morphological characters: tarsi 4-segmented; procoxal process expanded at apex; procoxal cavities externally closed, pro- and metacoxae widely separated; sparse antennal setation; glabrous parallel-sided body, eyes rounded and extending onto dorsal surface of the head; elytron with 10 striae; hypomeron lacking antennal cavities; expanded outer apical angle of protibia. *Pycnomerus simukovi* sp. nov. differs from the recent congeners in the following combination of characters: small body size (less than 3 mm); protibiae with outer apical angle expanded into a short tooth; 2-segmented antennal club; flattened pronotum without distinct median longitudinal depressions or sulci; pronotal punctuation having more or less uniform size; anterior and posterior angles of pronotum rounded and not produced; lateral margins of pronotum finely bordered; elytral intervals broader than striae.

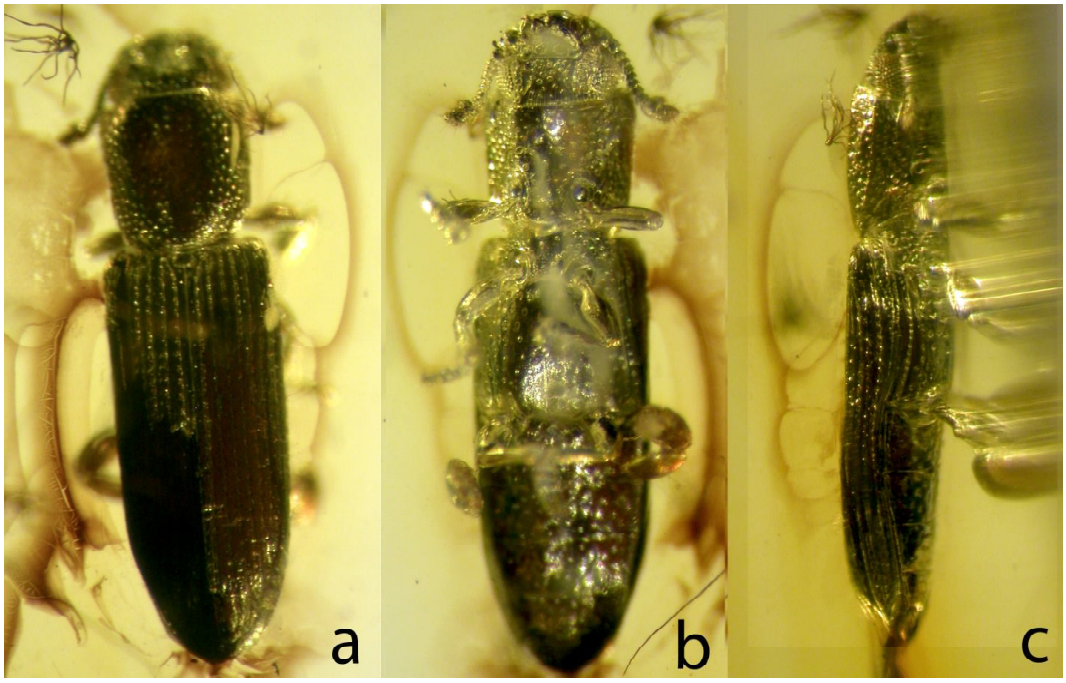

Fig. 1. *Pycnomerus simukovi* sp. nov. Habitus.: a) Dorsal view; b) Ventral view; c) Lateral view.

Description:
Body: TL = 2.9 mm, EW = 0.8 mm, elongate (TL/EW = 3.6), shiny, glabrous, subdepressed, uniformly dark brown (Fig. 1–2).

Head: twice wider than long; retracted into prothorax up to hind margins of the eyes; subantennal grooves absent; anterior clypeal margin rounded; forehead with a pair of pits. Head densely and irregularly punctured; punctures 2–3 times as large as ommatidia, separated by a space approximately 0.3–1 as wide as their diameter. Eyes entire, large, well-developed, finely faceted. Interfacetal setae not apparent (by x56 magnification). Antennae 11-segmented, moderately long (~0.5 mm), reaching the basal third of pronotum, stout, with a 2-segmented distinct club and a sparse setation.

Prothorax: PL = 0.75 mm, PW = 0.7 mm, subquadrate (PL/PW =1.1); sides weakly

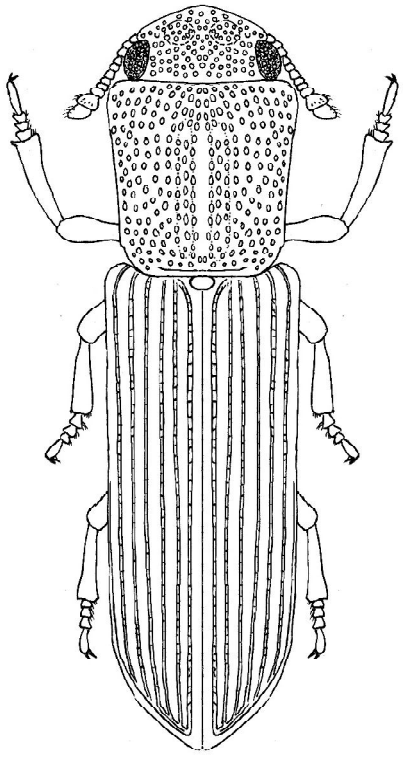

Fig. 2. *Pycnomerus simukovi* sp. nov. Dorsal habitus, reconstruction

converging to base from just behind frontal angles; lateral margins smooth, very finely bordered; anterior angles narrowly rounded; posterior angles rounded, nearly obsolete; anterior margin straight, unmodified; posterior margin arcuate, finely grooved. Disc flattened, with a coarse dense simple almost uniformly oval punctuation, narrowly unpunctuated medially. The flattened area in the central part of the disc with two extremely shallow and poorly discernible longitudinal depressions. Hypomeron with dense, large and rounded punctures. Prosternum more scarcely punctuated, especially medially; with a dense row of long and fine hairs distally.

Scutellum: rounded, oval, transverse (1.5 times wider than long), without punctures.

Elytra: EL = 1.9 mm, EW = 0.8 mm, parallel-sided; each elytron with 10 distinct longitudinal striae, without visible punctures; scutellary striole absent; intervals smooth, broader than striae; apices not flattened. Hind wings not apparent.

Abdomen: with five visible similarly articulated ventrites having relative lengths 20-17-17-14-11. Surface without apparent (possibly absent) setation and with irregular punctuation; punctures slightly smaller and sparser medially, intervals between punctures 1–3 times wider than their diameter. Intermetacoxal apophysis (intercoxal process of the ventrite I) widely rounded.

Legs: procoxal cavities rounded and externally closed, meso- and metacoxal cavities closed. Metacoxae widely separated, separation greater than metacoxal length. Femora strongly thickened apically (clavate); protibiae with the outer angle expanded and produced into a short tooth. Tarsal formula 4-4-4. Length of apical protarsomere equal to combined length of protarsomeres I–III; length of apical meso- and metatarsomeres slightly shorter than combined length of the respective tarsomeres I–III; tarsal claws simple, large, equal in size, one-third as long as the apical tarsomere.

Derivatio nominis: Patronymic, the species-group epithet is devoted to Mikhail A. Simukov (Kaliningrad, Russia), specialist in Baltic amber.

Subfamily Colydiinae Billberg, 1820
Tribe Synchitini Erichson, 1845
Genus *Bitoma* Herbst, 1793
***Bitoma glaesisepulta* sp. nov.**
(Figs. 3–4)

Material examined: Holotype Nr. AWI-010 [CVIA], sex unknown. The beetle is included in a polished piece of transparent amber, orange in color (measurements 15 mm x 6 mm x 4.5 mm). The amber was not subject to any fixation. The syninclusions are represented by four fagaceous stellate hairs.

Type strata: Baltic Amber. Eocene.
Type locality: Baltic Sea coast, Yantarny settlement [formerly Palmnicken], the Kaliningrad region, Russia.

Differential diagnosis: The specimen under study is assigned to the tribe Synchitini due to the following morphological characters: metacoxae narrowly separated; tarsi without dilated segments; antennae glabrous, lacking scale-like setae, 11–segmented with distinct club; procoxal cavities open; femora punctuated; apex of the protibiae without spine. The following characters correspond to the genus *Bitoma*: parallel-sided cylindrical body; 2–segmented antennal club; dorsal surface without setae; subequal antennomeres III and IV; non-produced anterior pronotal angles; elytra without tubercles. *Bitoma glaesisepulta* sp. nov. can be distinguished by the longitudinal pronotum with subparallel sides and three shallow depressions, the longitudinally rugose head and anterior pronotal margin, the absence of elytral costae and the reduced interfacetal setae. The new species differs from all extant congeners of Palaearctic and Nearctic in the non-carinate pronotal disc.

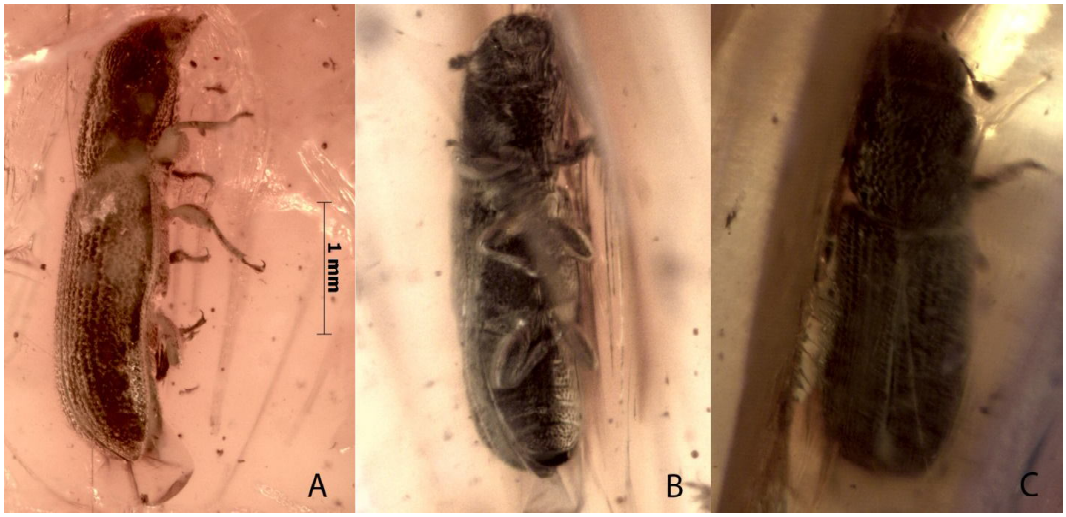

Fig. 3. *Bitoma glaesisepulta* sp. nov. Habitus.: a) Lateral view; b) Ventral view; c) Dorsal view

Description:
Body: TL = 2.75 mm, EW = 0.84 mm, elongate (TL/EW = 3.2), glabrous, cylindrical, uniformly dark brown (Fig. 3–4).

Head: 2.5 times wider than long; anterior clypeal margin densely coarse and irregular sculptured, rounded. Surface covered with longitudinal rugosity. Eyes entire, medium-sized, well-developed, finely faceted. Interfacetal setae not apparent (by x56 magnification). Antennae 11–segmented, short, reaching the basal angles of the pronotum, with 2–segmented distinct club and thickened cylindrical scape and pedicel.

Prothorax: PL = 0.9 mm, PW = 0.7 mm, elongate (PL/PW = 1.3); sides subparallel, margined laterally and basally; anterior and posterior angles rounded, nearly obsolete; anterior and posterior margins arcuate; lateral margin slightly flattened. Pronotal disc convex; longitudinally rugose apically; coarsely, densely punctuated on the middle, with a longitudinal shallow impression medially and a pair of shallow impressions laterally before the middle.

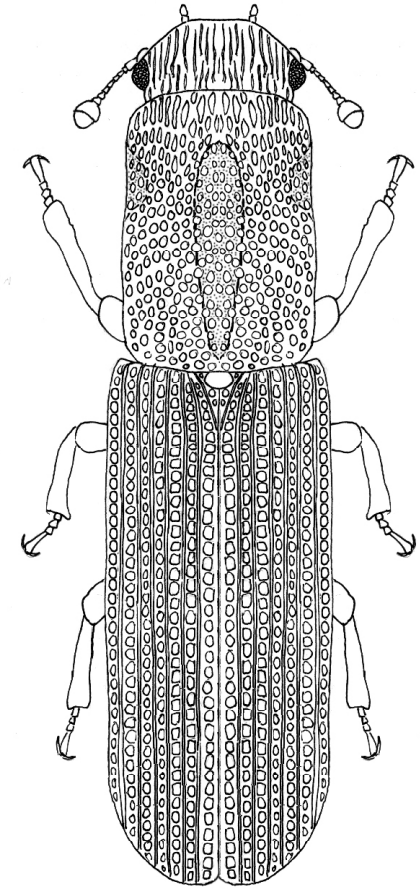

Fig. 4. *Bitoma glaesisepulta* sp. nov. Dorsal habitus, reconstruction

Hypomeron and prosternum with dense large coarse rounded punctures.

Scutellum: rounded, oval, transverse (almost twice wider than long), without distinct punctures.

Elytra: EL = 1.63 mm, EW = 0.85 mm, elongate, nearly parallel-sided, wider than pronotum, jointly rounded apically, with longitudinal striae dorsally and irregular punctuation laterally. Each elytron with 8 rows of strial punctures, their intervals narrow; each puncture large, rounded, separated by a distance 0.3–0.4 times as wide as diameter; scutellary striole present. Outer margins of elytra flattened. Epipleura present, well developed, wide, reaching the elytral apex. Hind wings present.

Abdomen: with five visible, similarly articulated ventrites having relative lengths 10-10-7-6-10. Surface without apparent setation, with irregular dense punctuation; intervals between punctures 1–2 times as wide as their diameter. Intercoxal process of the ventrite I triangular, narrow.

Legs: short, robust. Procoxal and mesocoxal cavities rounded and externally open, metacoxal cavities transverse, closed. Metacoxae narrowly separated. Femora wide. Tarsal formula 4-4-4. Length of apical tarsomeres equal to combined length of tarsomeres I–III; tarsal claws simple, large, equal in size, almost one-half as long as the apical tarsomeres.

Derivatio nominis: The epithet of the new species is a combination of Latin “glaesum” [amber] and “sepultus, -a, -um” [buried], that is “buried in amber”.

DISCUSSION

Ironclad and cylindrical bark beetles are usually found under barks of dead or dying trees or in the tunnels of platypodine and scolytine ambrosia beetles. The beetles are sapro- and mycophagous on rotten plant material and fungal fruiting bodies or hyphae, or predaceous on larvae and adults of wood-boring insects. For the fossil species, a similar biology (subcortical, arboreal in forest habitats) is assumed.

Extant *Pycnomerus* species are commonly collected under the bark of dead rotting woods (oak, hickory and pines) but tiny species, such as *P. thrinax* Ivie et Ślipiński, 2000 or *P. infimus* (Grouvelle, 1902), inhabit rotting palm fronds. There are data about myrmecophily for the recent *P. terebrans* (Olivier, 1790) too. The well-known presence of different pinaceous and fagacean as well as palm trees in the Eocene amber forests and our fragmentary knowledge about the biology of the recent species makes it difficult to draw precise conclusions about fodder plants or bionomy of this fossil. But small body size and flattened habitus of *Pycnomerus simukovi* sp. nov. might be indicative for habitats with palms, as for extant congeners.

Pycnomerus Erichson, 1842 is the largest genus within ironclad beetles, with many undescribed species in collections and the indication of many more to be discovered. No worldwide revision is available yet (Ivie & Ślipiński 2000). Members of the genus are found in all major zoogeographical regions of the world, but most species occur in the tropics of Southern Hemisphere. Out of more than 70 species of the worldwide fauna (Ślipiński & Lawrence 1999), only seven inhabit the Palaearctic region: *Pycnomerus terebrans* (Olivier 1790); *P. lucidus* Dajoz, 1975; *P. italicus* (Ganglbauer, 1899); *P. fuliginosus* Erichson, 1842; *P. inexpectus* Jaquelin du Val, 1859; *P. sculpturatus* Sharp, 1885; *P. vilis* Sharp, 1885.

Bitoma Herbst is a large cosmopolitan genus too. The overall generic concept is still questionable, many aberrant forms being currently included in this taxon. A worldwide revision of the genus and of the Synchitini is needed. Four species are known in the

Palaearctic so far: *B. crenata* (Fabricius, 1775); *B. iranica* Mařan, 1954; *B. siccana* (Pascoe, 1863); *B. turcica* Dajoz, 1973.

The current tropical and subtropical species richness of *Pycnomerus* and *Bitoma* and the specificity of described species suggest that both described fossils were thermophilic elements of the Eocene Baltic fauna.

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