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RESEARCH ARTICLE

Two new species and new findings of Curculionoidea (Insecta: Coleoptera) in Baltic amber

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Two new species, *Succinometrioxena attenuata* Legalov et Poinar, sp. n. (Belidae: Oxycoryninae: Metrioxenini) and *Tachyerges hyperoche* Legalov et Poinar, sp. n. (Curculionidae: Curculioninae: Rhamphini) from Baltic amber are described. *Succinometrioxena attenuata* Legalov et Poinar, sp. n. is close to *Succinometrioxena bachofeni* Legalov, 2013 but differs in the larger body size and large punctation of elytra. *Tachyerges hyperoche* Legalov et Poinar, sp. n. differs from *Tachyerges stigma* (Germar, 1821) in the scutellum lacking white scales, the larger body size, tibiae with mucro, the distances between points on the pronotum equal to the diameter of the points, and elytral interstriae without hairs. New findings of *Glaesotropis* (*Glaesotropis*) *weitschati* Gratshev et Zherikhin, 1995, *Electrotribus theryi* Hustache, 1942, *Synommatodes patruelis* (Voss, 1953) and *Caulophilus sucinopunctatus* (Kuska, 1992) are recorded. Key to species of the subfamily Cossoninae is given. It is the first record of the genus *Tachyerges* Schoenherr, 1825 in the fossil state.

Keywords: Insecta; Coleoptera; Curculionoidea; New Findings; Key; Eocene; Baltic Amber

Introduction

Curculionoidea is an important group of phytophagous beetles. The superfamily includes more than 62000 described species in the modern fauna (Oberprieler et al., 2014). The composition and taxonomic status of groups assigned to this superfamily is debatable (Morimoto, 1962; Sanborne, 1981; Thompson, 1992; Kuschel, 1995; Alonso-Zarazaga, Lyal,1999; Legalov, 2006, 2015, 2018; Oberprieler et al., 2014; Alonso-Zarazaga et al., 2017; etc.). We accept 11 families (Legalov, 2018). The families Nemonychidae, Anthribidae, Belidae, Rhynchitidae, Brentidae, Curculionidae, Platypodidae, Scolytidae are noted in Baltic amber (Legalov, 2015, 2020; Peris et al., 2017). Attelabidae is not known in Eocene amber, but a leaf-tube chewed off by a beetle of this family was found in Baltic amber. The oldest Nemonychidae was recorded from Middle Jurassic of China (Yu et al., 2019) and Middle-Late Jurassic of Kazkhstan (Martynov, 1926; Arnoldi, 1977, Gratshev, Zherichin, 1995; Gratshev, Legalov, 2014; Legalov, 2012c, 2015), Anthribidae from Middle-Late Jurassic of Kazkhstan (Legalov, 2011, 2012c, 2013b, 2015), Belidae from Berriasian–Barremian of Spain (Legalov, 2012c, 2015), Scolytidae from Neocomian of Lebanon (Kirejtshuk et al., 2009; Legalov, 2012c), Curculionidae from Aptian of Mongolia (Legalov, 2012c, 2014), Brentidae from Aptian–Albian of Brazil (Zherikhin, Gratshev, 2004; Legalov, 2012c), Rhynchitidae from Cenomanian of Botswana (Legalov, 2012c, 2015), and Platypodidae from Cenomanian of Myanmar (Poinar et al., 2019). The fauna of Curculionoidea from Baltic amber was studied for a long time (Schedl, 1947; Voss, 1953, 1972; Zherikhin, 1971; Gratshev, Perkovsky, 1995; Kuska, 1996; Yunakov, Kirejtshuk, 2011; Riedel, 2010; Legalov, 2012a, 2012b, 2012c, 2013a, 2016a, 2016b, 2018b, 2019, 2020; Riedel et al., 2012; Legalov, Bukejs, 2014, 2015, 2018a, 2018b; Bukejs, Legalov, 2019b, 2019d; Kania, Legalov, 2019; Bukejs et al., 2020) and is known better than the fauna of Eocene Oise (Kirejtshuk et al., 2015; Legalov et al., 2019) and Rovno ambers (Gratshev, Perkovsky, 2008; Petrov, Perkovsky, 2008; Nazarenko, Perkovsky, 2009; Nazarenko et all., 2011; Legalov et al., 2018, 2019; Bukejs, Legalov, 2019a, 2019c; etc.). Many curculionid species are known only from holotypes or small numbers of specimens. Therefore, new findings are important for understanding the previous range and diversity of the Curculionoidea.

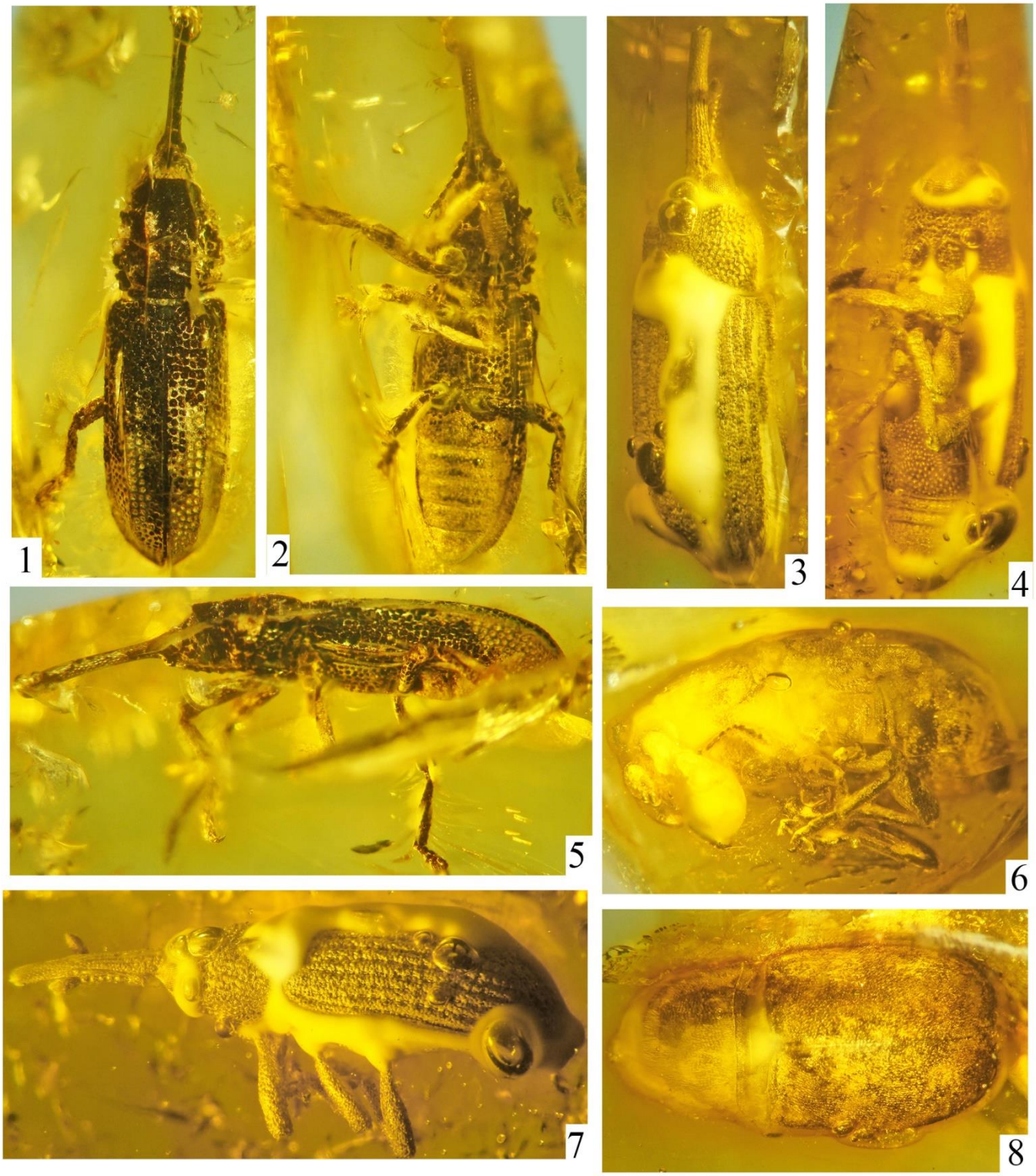
Materials and Methods

The weevil fossils originate from Baltic amber, one of the largest known deposits of amber located along the Baltic Sea coast in the Kaliningrad Oblast, Russia and near Gdansk, Poland. This amber was probably produced by a species of *Sciadopitys* sp. from the family Sciadopityaceae (Sadowski et al., 2016). Baltic amber from this Prussian Formation dates Bartonia of middle Eocene (Bukejs et al., 2019).

Studed specimens are deposited in the Poinar amber collection maintained at Oregon State University (PACO, Corvallis, OR, USA), the Institute of Systematics and Ecology of Animals (ISEA, Novosibirsk, Russia) and Zoological Museum, University of Copenhagen (Denmark: Copenhagen).

Results and Discussion

Family **Anthribidae** Billberg, 1820
Subfamily **Anthribidae** Billberg, 1820
Tribe **Zygaenodini** Lacordaire, 1866
Genus **Glaesotropis** Gratshev et Zherikhin, 1995
Subgenus **Glaesotropis** s. str.



Figures 1-8. Curculionoidea from Baltic amber: 1 - *Succinometrioxena attenuata* sp. n., holotype, body, dorsal; 2 - *S. attenuata* sp. n., holotype, body, ventral; 3 - *Electrotribus theryi*, body, dorsal; 4 - *E. theryi*, body, ventral; 5 - *Succinometrioxena attenuata* sp. n., holotype, body, lateral; 6 - *Glaesotropis weitschati*, body, ventro-lateral; 7 - *Electrotribus theryi*, body, lateral; 8 - *Glaesotropis weitschati*, body, dorsal.

Glaesotropis (***Glaesotropis***) ***weitschati*** Gratshev et Zherikhin, 1995, Figures 6 and 8.
Material examined. Specimen,adult female, PACO # 5, Baltic amber, Middle Eocene.
Remarks. The body length (without rostrum) is 4.8 mm.

Family **Belidae** Schoenherr, 1826
Subfamily **Oxycoryninae** Schoenherr, 1840
Supertribe **Oxycorynitae** Schoenherr, 1840
Tribe **Metrioxenini** Voss, 1953
Subtribe **Zherichinixenina** Legalov, 2009
Genus **Succinometrioxena** Legalov, 2012

Succinometrioxena attenuata Legalov et Poinar, **sp. n.** Figures 1-2 and 5.
urn:lsid:zoobank.org:act:89174A19-60FC-4E7A-B35D-2FB21576D1CB.

Etymology. Specific epithet from the Latin "tenuis" = thin in reference to the narrow elytra.

Description. Female. Body length (without rostrum) 6.3 mm. Rostrum length 1.9 mm.

Body black; rostrum cylindrical, long, 1.2 times as long as pronotum, 8.8 times as long as wide at apex, and 10.0 times as long as wide at mid-rostrum and 4.7 times as long as its wide at base, almost straight, finely punctuate; forehead quite wide, flattened, without horn-like tubercles on either side; eyes small, oval, 0.8 times as long as wide, convex. Vertex weakly flattened, densely punctuate; temples elongated, 1.4 times as long as length of eyes, punctuate; antennae inserted near base of rostrum ventrally, under small convexities; antennae long, almost reaching base of elytra; scape 2.5 times as long as wide; funicle 7-segmented; antennomeres: 2 – 1.8 times as long as wide, 0.7 times as long as and subequal in wide to scape; 3-6 – subequal in wide; 3 and 4 – subequal in length; 3 – 1.7 times as long as wide, 0.9 times as long as and 0.9 times as wide as antennomere 2; 5 – 1.8 times as long as wide, 1.1 times as long as antennomere 4; 6 – 1.5 times as long as wide, 0.8 times as long as antennomere 5; club not compact; pronotum bell-shaped, 1.9 times as long as width at apex, 1.1 times as long as width in middle, 1.6 times as long as width at base; disk narrowed at apex and at base, densely punctuate; punctures round and large; distances between points smaller than diameter of points; pronotal groove distinct; sides of pronotum with carinae consisting of six convexities; scutellum small, triangular; elytra elongated and flattened, 2.4 times as long as wide at base, 2.1 times as long as wide in middle, 2.7 times as long as wide in apical quarter, 2.2 times as long as pronotum, with two long carinae; humeri weakly convex; scutellar striole not distinct; punctured striae irregular and not distinct; punctures rounded, large and dense; distance between punctures smaller than their diameter. Interstriae between punctures weakly convex; epipleuron distinct; apices of elytra separately obtuse, lacking elongated teeth; margin of elytra sharp, carinate; prothorax larger and more coarsely punctuate; precoxal portion of prosternum elongate, 1.8 times as long as procoxae; procoxal cavities round, narrowly separated by prosternal process; postcoxal portion of prosternum short, 0.4 times as long as procoxae; mesocoxal cavities rounded, widely separated; metepisternum narrow, about 6.0 times as long as wide, coarsely punctuate; metaventrite 2.1 times as long as metacoxae, flattened, coarsely punctuate; metacoxal cavities transverse, narrowly separated by apices of 1st ventrite; abdomen convex, finely punctuate; ventrite 1 1.3 times as long as metacoxae; ventrite 2 0.8 times as long as ventrite 1; ventrite 3 0.9 times as long as ventrite 2; ventrite 4 0.9 times as long as ventrite 3; ventrite 5 1.4 times as long as ventrite 4; legs long; femora weakly clavate, punctuate; profemora length/width = 3.9; metafemora length/width = 4.1; trochanter triangular; tibiae almost straight, weakly flattened, weakly oblique at apices, with apical dark setose fringe; protibiae length/width = 5.2; metatibiae length/width = 5.7; tarsi long, with pulvilli on underside; tarsomere 1 trapezoidal; tarsomere 2 widely bilobed; tarsomere 3 elongate, bilobed; tarsomere elongate; claws large, contiguous, without teeth; mesotarsi: tarsomere 1 0.8 times as long as wide; tarsomere 2 0.6 times as long as wide, 1.1 times as long as and 1.5 times as wide as tarsomere 1; tarsomere 3 0.8 times as long as wide, 1.9 times as long as and 1.4 times as wide as tarsomere 2; tarsomere 5 3.4 times as long as wide, 1.1 times as long as and 0.3 times as wide as tarsomere 1.

Material examined. Holotype, adult female, PACO # 7, Baltic amber, Middle Eocene.

Comparison. The new species is similar to *Succinometrioxena bachofeni* Legalov, 2013 but differs in the larger body sizes, large punctation of elytra and narrower elytra.

Family **Curculionidae** Latreille, 1802
Subfamily **Molytinae** Schoenherr, 1823
Tribe **Acicnemidini** Lacordaire, 1866
Genus ***Electrotribus*** Hustache, 1942

Electrotribus theryi (Hustache, 1942)
Figures 3-4 and 7.

Material examined. Specimen, adult male, PACO # 2, Baltic amber, Middle Eocene.

Remarks. The body length (without rostrum) is 7.2 mm.

Subfamily **Cossoninae** Schoenherr, 1825
Tribe **Dryotribini** Le Conte, 1876

Key to species of the subfamily Cossoninae in Baltic amber

1. Funicle 4- or 5-segmented. 2
—Funicle 6- or 7-segmented. 3
2. Funicle 4-segmented. ..... *Necrodryophthorus inquilinus* Voss, 1953
—Funicle 5-segmented. ..... *Synommatodes patruelis* (Voss, 1953)
3. Funicle 6-segmented. ..... *Electrocossonus kirejtshuki* Legalov, 2020
—Funicle 7-segmented. 4
4. Rostrum thick and straight. ..... Ampharthropelma decipiens Voss, 1972
—Rostrum slender and curved. 5
5. Body covered with setaceous scales ..... *Caulophilus squamosus* Legalov, 2016
—Body covered with narrow scales. 6
6. Rostrum slender, distinctly curved; pronotum distinctly narrower than base of elytra. ..... *Caulophilus rarus* Legalov, 2016
—Rostrum robust, weakly curved; pronotum a little narrower than base of elytra. ..... *Caulophilus sucinopunctatus* (Kuśka, 1992)

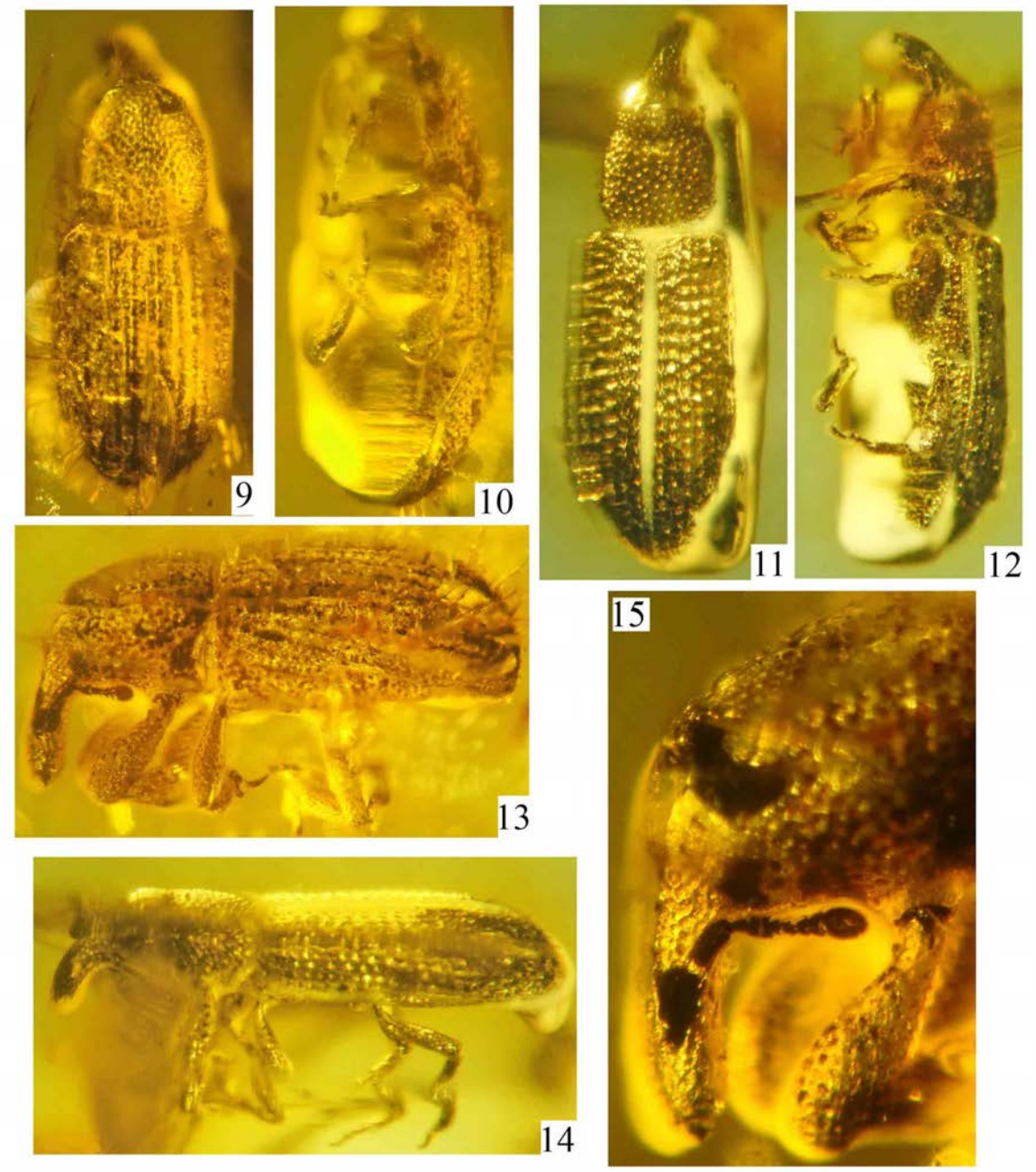
Genus **Synommatodes** Voss, 1953

Synommatodes patruelis (Voss, 1953)
Figures 1, 9-10 and, 15.

Material examined. Specimen, adult, PACO # 1, Baltic amber, Middle Eocene.

Remarks. The body length (without rostrum) is 3.2 mm.

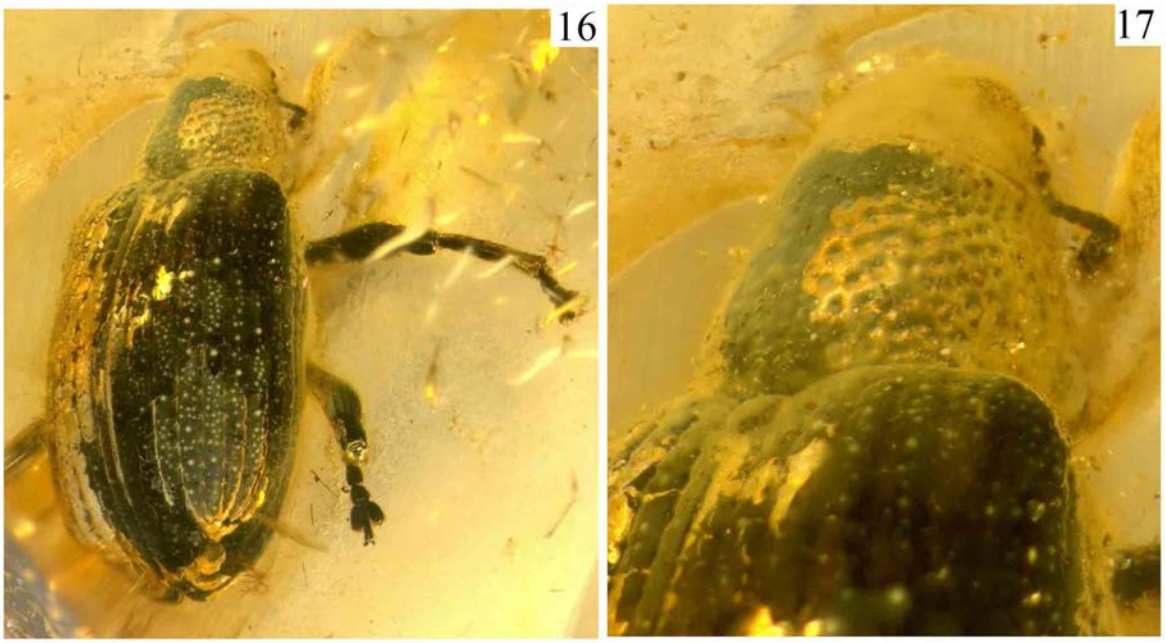
Genus ***Caulophilus*** Wollaston, 1854
Caulophilus sucinopunctatus (Kuska, 1992)
Figures 11-12 and 14.
Material examined. Specimen, adult, PACO # 9, Baltic amber, Middle Eocene.
Remarks. The body length (without rostrum) is 2.5 mm.



Figures 9-15. Curculionoidea in Baltic amber: 9 - *Synommatodes patruelis*, body, dorsal; 10 - *S. patruelis*, body, ventral; 11 - *Caulophilus sucinopunctatus*, body, dorsal; 12 - *C. sucinopunctatus*, body, ventral; 13 - *Synommatodes patruelis*, body, lateral; 14 - *Caulophilus sucinopunctatus*, body, lateral; 15 - *Synommatodes patruelis*, fore-body, lateral.

Subfamily **Curculioninae** Latreille, 1802
Tribe **Rhamphini** Rafinesque, 1815
Genus***Tachyerges*** Schoenherr, 1825
Tachyerges hyperoche Legalov et Poinar, **sp. n.** Figures 16-17.
urn:lsid:zoobank.org:act:7ACAC6AF-DAD2-42D4-9C42-578FAC541C7A.
Etymology. Specific epithet from the Greek "hyperoche" = projection in reference to the mucro on the tibia.
Description. Female. Body length (rostrum absent) 5.1 mm. Body black, bare; eyes large, weakly convex, subcontiguous; antennomeres: 2-8 (funicle) – conical; 2 – about 1.9 times as long as wide; 3 – 1.7 times as long as wide, 0.7 as long as and 0.8 times as wide as antennomere 2; 4 – 1.3 times as long as wide, 0.7 as long as and 0.8 times as wide as antennomere 3; 5 – 1.2 times as long as wide, subequal in length and 1.1 times as wide as antennomere 4; 6 – subequal in length and width, 0.9 times as long as and little wider than antennomere 5; 7 – subequal to antennomere 6; 8 – 0.8 times as long as wide, 0.9 as long as and 1.1 times as wide as antennomere 7; antennal club compact; pronotum bell-shaped, 0.8 times as long as wide apically, 0.7 times as long as wide in middle and basally; sides weakly rounded, without erect setae; disc densely punctuate; distances between points on pronotum equal to diameter of points; scutellum convex, 1.6 times as long as wide, not covered with white scales; elytra immaculate, rather wide and weakly convex, 4.1 times as long as pronotum, 1.8 times as long as wide basally,

1.5 times as long as wide in middle, 2.0 times as long as wide in apical quarter; sides lacking erect setae; humeri weakly convex; striae deep, distinct, regular and narrow; stria 9 short, fused with stria 10 at level of metacoxae; interstriae wide, weakly convex, 5.0-9.0 times as long as width of striae; elytral apices rounded separately; prothorax lacks postocular lobes, coarsely punctuate; pre- and postcoxal parts of prosternum short, subequal in length; procoxal cavities rounded, contiguous; mesocoxal cavities rounded and separated; metathorax weakly convex, punctuate; metacoxal cavities dilated, separated by apex of ventrite 1; abdomen weakly convex; ventrites 1 and 2 weakly elongate; ventrite 1 1.1 times as long as metacoxae; ventrite 2 0.9 times as long as ventrite 1; posterior margins of ventrites 2–4 curved weakly posteriad on lateral sides; ventrite 3 0.9 times as long as ventrite 2; ventrite 4 equal in length to ventrite 3; ventrite 5 1.2 times as long as ventrite 4; legs long; femora clavate, with tooth in apical third; tibiae almost straight, weakly flattened, weakly widened apically; with mucro; tarsi long, with pulvilli on underside; tarsomere 1 conical; tarsomere 2 widely conical; tarsomere 3 widely bilobed; tarsomere 5 elongated; claws large, diverging, free, with small teeth.



Figures 16-17. *Tachyerges hyperoche* sp. n., holotype in Baltic amber: 16 - body, dorso-lateral; 17 - fore-body, dorso-lateral.

Material examined. Holotype, adult female, ISEA, no. BA2018/2, Poland, Gdansk city area at the Wisla River Estuary, Baltic amber, Middle Eocene.

Comparison. The new species differs from other species of the genus in the scutellum lacking white scales. It is similar to *Tachyerges stigma* (Germar, 1821) but differs in the larger body sizes, tibiae with mucro, the distances between points on the pronotum equal to the diameter of the points, and elytral interstriae without hairs.

Remarks. The large eyes with narrow forehead, tibia without uncus, the posterior margins of ventrites 2–4 curved posteriad on lateral sides show the specimen belong to the tribe Rhamphini. The 7-segmented flagellum and pronotum without erect setae confirm the assignment of the new species to the genus *Tachyerges* .

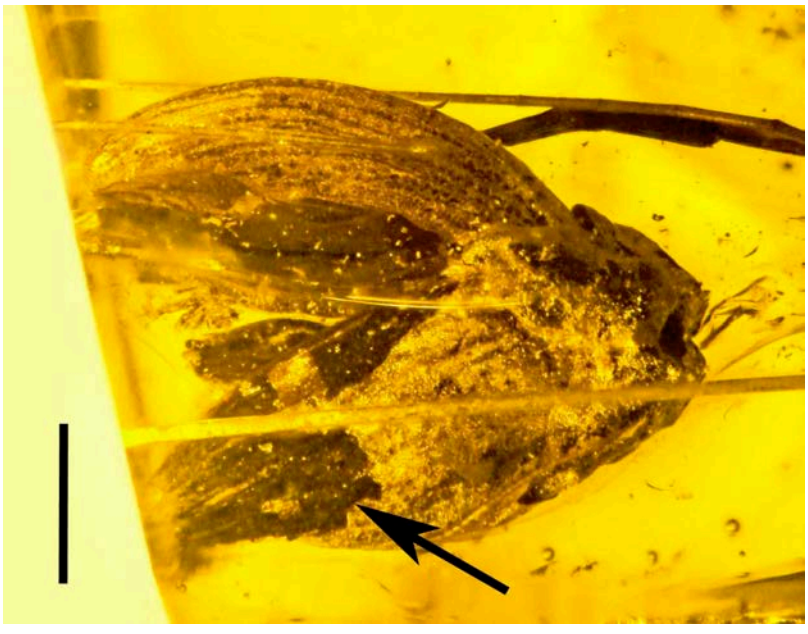


Figure 18. A palm flower (Poinar amber collection) in Baltic amber. Arrow shows insect damage that could have been made by a *Succinometrioxena* belid weevil. Scale bar=2.6 mm.

Conclusion

Six species of Curculionoidea discussed in the present work represent members of several family and subfamily lineages. The family Anthribidae is represented by *Glaesotropis weitschati* of the tribe Zygaenodini. As with modern Zygaenodini and other fungus weevils, *Glaesotropis* probably lived in tree branches and twigs where it fed on bark and developed on hard or polypore fungi. The bark weevils, *Synommatodes patruelis* and *Caulophilus sucinopunctatus* were probably associated with the sapwood of hardwoods or conifers, specially dead and dying trees killed by bark beetles, as occurs with modern Cossoninae. *Electrotribus theryi* may have also been associated with woody vegetation like modern Acicnemidini, however many Molytinae also feed and develop on herbaceous angiosperms. All species of the tribe Metrioxenini are associated with palm trees (Arecaceae) (Marvaldi at al., 2006). The belid, *Succinometrioxena attenuata* sp. n. may have developed on one of the species of palm trees that were recorded in Baltic amber (Weitschat, Wichard, 2002, Sadowski, 2017). In the Poinar amber collection is a Baltic amber palm flower showing insect damage (Figure 18) that could have been made by a *Succinometrioxena* belid weevil. Species of the genus *Tachyerges* develop in mines on the leaves of *Salix*, *Populus* (Salicaceae), *Betula* and *Alnus* (Betulaceae) (Smreczynski, 1976; Anderson, 1989). These plant genera are known in Baltic amber (Weitschat, Wichard, 2002, Sadowski, 2017). It can be assumed that *Tachyerges hyperoche* sp. n. also developed on these plants. New weevil species and the presence of their preferred food sources in the same amber deposits are of great interest for the reconstruction of trophic links.

Acknowledgments

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