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Two new *Pogonocherus* species (Coleoptera: Cerambycidae) from Baltic amber

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Two new fossil cerambycids, *Pogonocherus minimus* sp. n. and *Pogonocherus scutellaris* sp. n. (Lamiinae: Pogonocherini) are described based on specimens preserved in Baltic amber. Morphological comparison is made with the extant congeners. Phylogenetic and palaeobiological remarks on the genus *Pogonocherus* Dejean, 1821 are added.

Key words: Lamiinae, Pogonocherini, fossil, systematics, palaeontology.

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INTRODUCTION

Pogonocherus Dejean, 1821 includes more than thirty small species widespread in the Holarctic region. Their exact number is questioned by the presence of many, often monophagous, poorly-known taxa with doubtful characters (e.g., *P. marcoi* Sama, 1993) or with limited (e.g., *P. pepa* Verdugo & Torres-Méndez, 2010; *P. ovatoides* Rapuzzi & Sama, 2014) or unusual distribution (e.g., *P. taygetanus* Pic, 1903, *P. perroudi brevipilosus* Holzschuh, 1993), whose exact taxonomic value might change in future. Some Asian species, currently even belonging to other tribes, i.e., *Trichorondonia* Breuning, 1965 (Acanthocinini) might also be transferred to *Pogonocherus* (cf. Lazarev, 2021).

Two subgenera are sometimes recognized, namely the nomotypical one (= *Strophinus* Gistl, 1856, *Eupogonocherus* Linsley, 1935) and *Pityphilus* Mulsant, 1862, based on the shape of the elytral apex: dentate/spined vs. rounded/truncate, respectively. Nonetheless, the presence of intermediate characters, which led authors to place the same species in different subgenera or even to synonymize species belonging to different subgenera (Bousquet et al., 2017), suggests avoiding this taxonomy (Sama, 1988; 2002; Brustel et al., 2002, Sanchez Sobrino, 2003; Verdugo-Paéz, 2004; Verdugo & Torres-Mendez, 2010; Rapuzzi & Sama, 2014).

Until now, only one fossil species, namely *Pogonocherus jaekeli* Zang, 1905 from Baltic amber, is known (Vitali, 2009). In this paper, two further fossil species from Baltic amber are described.

MATERIAL AND METHODS

The specimen FS66BS36 is preserved inside a prismatic piece of amber measuring 11.9 x 6.4 x 5.9 mm. The beetle lies with the left side on a denser layer. Syninclusions are represented by few stellate fagacean trichomes and a minute fairyfly (Hymenoptera Mymaridae).

The specimen FS85BS53 is preserved inside a prismatic piece of amber measuring 15 x 10.6 x 2.8 mm. Due to the cut of the amber, the beetle is missing the right antenna from the half of antennomere III and part of the left antenna (antennomeres X–XI). The ventral side is entirely covered by turbidity. No syninclusions are present.

Observations on the fossil were made using a stereomicroscope Antares Geminar 3 with 20-40x eyepieces equipped with a micrometer system. Photos were kindly furnished by Marius Veta (Palanga, Lithuania), seller of the ambers. The reconstruction of the habitus was obtained with mixed traditional and computer graphic techniques. The reconstruction of the elytra of *Pogonocherus jaekeli* was realised improving the original drawing using computer graphic techniques.

SYSTEMATIC PART

Cerambycidae Latreille, 1802
Lamiinae Latreille, 1825
Pogonocherini Mulsant, 1839
***Pogonocherus* Dejean, 1821**

***Pogonocherus minimus* n. sp.**
(Fig. 1, 4)

Holotype. Baltic amber, "Cerambycidae Lamiinae prob. *Parmenops*", ex coll. M. Veta, n° 210927, author's coll. FS85BS53.

Differential diagnosis. Both specimens were identified as members of Lamiinae Pogonocherini due to the following combination of characters: frons vertical, small body size, scape without apical cicatrix and feebly club-shaped; antennae fringed; pronotal tooth conical, mesosternum not shortened and claws opposite. Among worldwide Pogonocherini (Breuning, 1975), clavate femora, furrowed mesotibiae, pronotum with lateral but without discal tubercles, and antennomere IV incurved and longer than III point out to the genus *Pogonocherus*.

Zang (1905) provided the first modern descriptions of fossil beetles: description and differential diagnosis of *P. jaekeli* are so precise that it is possible to compare this species with all congeners of the Recent, though we could not manage to directly observe the holotype. Accordingly, *P. jaekeli* is closely related to *P. ovatus* (Goeze, 1777), *P. decoratus* Fairmaire, 1855 (which Zang already mentioned) and *P. zubovi* Danilevsky, 2015, from which it differs in the elytra separately rounded at apex and without hair fascicles. Both characters are also present in the species described here.

Additional characters are the elytra with three feeble post-median dorsal ridges not reaching the apex, the humeral one reaching the humerus, the basal third crossed from humerus to suture by an oblique band of coarse punctures and erect setae (Fig. 4) and finally, the pronotum without bulges but four dimples delimiting a square.

Pogonocherus minimus n. sp. is characterised by pronotum unpunctuated, elytra densely covered with a fine recumbent pubescence, regular rows of oblique setae and four regular rows of coarse punctures (pre-sutural one on the basal third; discal, pre-humeral and humeral ones on the basal two-thirds, the pre-humeral the longest). These characters are sufficient to separate this species from all fossil and extant congeners.

Description. Body length 2.3 mm. Habitus minute, stout.

Labium densely covered with long arched pubescence; frons parallel-sided, convex and sparsely covered with long erect setae, twice as long as those on the elytra; eyes strongly reniform and

finely facetted; lower eyes-lobes transverse, barely shorter than genae; genae transversally ridged; vertex wide, covered with some erect setae as long as those on the elytra.

Antennae almost thick, a bit shorter than body (female), antennomeres I–VI internally fringed with sparse erect setae; scape almost club-shaped; pedicle twice as long as wide; antennomere III feebly bowed, one-eight shorter than scape; antennomere IV the longest, about one-fourth longer than scape; antennomere V about one-half of the previous; antennomere VI four-fifth as long as III, antennomeres VII–VIII equal two-fifth as long as III; antennomere proportions according to the formula: 3.4: 1.0: 3.0: 4.2: 2.4: 1.8: 1.2: 1.2: 1.6?: ?: ?.

Pronotum convex; apical margin finely furrowed; base with two transverse furrows; sides armed with a small obtuse conical tooth in the middle; surface with some sparse punctures at sides and on the base, covered with a dense fine uniform pubescence and some erect setae, as long as those on the elytra, on the base. Scutellum small, shaped as an equilateral triangle.

Elytra short (each elytron about twice as long as wide at base), ovoid, dorsally convex; humeri almost prominent; apices widely rounded; disc densely covered with a fine recumbent pubescence, four regular rows of coarse punctures (pre-sutural one on the basal third; discal, pre-humeral and humeral ones on the basal two-thirds, the pre-humeral the longest) and numerous sparse oblique setae; suture finely furrowed; lateral margin fringed with semi-recumbent setae.

Legs relatively short covered with a short pubescence and some semi-recumbent setae; femora club-shaped; protibiae straight; meta- and mesotibiae sinuate; mesotibiae with pre-apical furrow; tarsi short; claws opposite.

Ventral side not observable.

***Pogonocherus scutellaris* n. sp.**
(Figs. 2–4)

Holotype. Baltic amber, "*Parmenops longicornis*", ex coll. M. Veta, n° 2348, author's coll. FS66BS36.

Differential diagnosis. *Pogonocherus scutellaris* n. sp. is characterised by pronotum completely unpunctuated and elytra smooth except for: 1) a dense velvet patch at each side of the scutellum; 2) five regular rows of coarse punctures (sutural and pre-sutural ones on the basal third, discal one on the basal half and both pre-humeral and humeral ones reaching the apical third); 3) three feeble ridges (humeral, pre-humeral and pre-discal) on the basal two-thirds. These characters are sufficient to separate this species from all fossil and extant congeners.

Description. Body length 4.1 mm. Habitus minute, stout; integuments black.

Mouthparts not detectable; frons parallel-sided, flat and seemingly smooth; eyes strongly reniform and finely facetted; lower eyes-lobes transverse, one-half as long as genae.

Antennae almost thick, as long as body, antennomeres I–IV internally fringed with sparse erect setae; scape almost club-shaped; pedicle elongate, twice as long as wide; antennomere III feebly bowed, as long as scape; antennomere IV the longest, nearly one-third longer than III; antennomere V one-fourth shorter than III; antennomeres VI–VII sub-equal, barely longer than V; antennomeres VIII–XI decreasing in length toward apex; antennomere XI barely shorter than IX; antennomere proportions according to the formula: 2.9: 1.0: 2.9: 4.0: 2.2: 2.3: 2.3: 2.0: 1.9: 1.6: 1.8.

Pronotum feebly transverse; apical margin finely furrowed; base with two transverse strong furrows; sides armed with a small obtuse conical tooth in the middle; surface unpunctuated, covered with a dense fine uniform pubescence and some long erect setae on the disc. Scutellum small, elongated, rounded at apex.

Fig. 1. *Pogonocherus minimus* n. sp.

Fig. 2. *Pogonocherus scutellaris* n. sp. dorsal side.

Fig. 3. *Pogonocherus scutellaris* n. sp. ventral side.

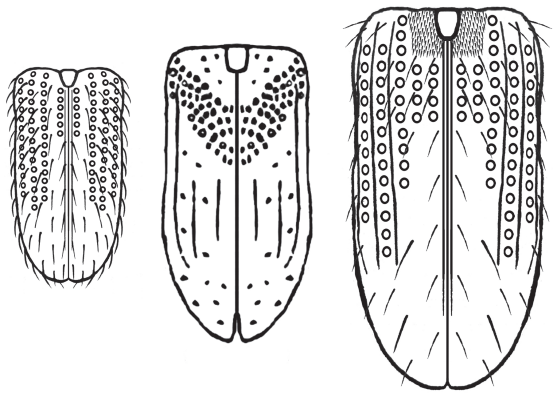

Fig. 4. From left to right, elytral structure of *P. minimus* n. sp., *P. jaekeli* Zang, 1905 and *P. scutellaris* n. sp. (proportions according to the respective body size).

Elytra short (each elytron about twice as long as wide at base), ovoid, dorsally flat; humeri almost prominent; apices widely rounded; disc smooth except for a dense velvet patch at each side of the scutellum, five regular rows of coarse punctures (sutural and pre-sutural ones on the basal third, discal one on the basal half and both pre-humeral and humeral ones on the basal two-thirds), three feeble ridges (humeral, pre-humeral and pre-discal) on the basal two-thirds and some sparse erect long setae; suture finely furrowed.

Legs relatively short covered with long raised pubescence; femora club-shaped; protibiae straight; meta- and mesotibiae sinuate; mesotibiae with pre-apical furrow; tarsi short; claws opposite.

Abdominal segment subequal; last visible urite largely rounded at apex.

Partial key to fossil and extant *Pogonocherus*

1. Elytral apex spined or dentate …… extant *Pogonocherus*
– Elytral apex rounded or truncated …… …… 2.

2. Elytra with tufts of black hairs on the apical half …… extant *Pogonocherus* (gr. *ovatus*)
– Elytra without tufts of black hairs on the apical half (fossil *Pogonocherus*) …… 3.

3. Elytra with uniform recumbent pubescence and regular rows of oblique short setae; disc with 4 rows of punctures reaching the base (2.3 mm) …… *P. minimus* n. sp.
– Elytra mostly smooth, with some erect setae …… 4.

4. Elytra with a v-shaped basal band; disc with 3 dorsal ridges, the humeral one reaching the base (2.9 mm) …… *P. jaekeli* Zang, 1905
– Elytra with a patch of pubescence at each side of the scutellum (4.1 mm) …… *P. scutellaris* n. sp.

DISCUSSION

Fossil *Pogonocherus* lack teeth or spines at the elytral apex, looking closely related to *P. ovatus*, *P. decoratus* and *P. zubovi* (formerly *Pityphilus*). All Pogonocherini, except for the Vancouverian *Lophopogonius* Linsley, 1935 and most of the extant *Pogonocherus*, share this character, which should be considered as archaic.

Larvae of fossil *Pogonocherus* are unknown, but larvae of *P. ovatus* and the first stadia of *P. decoratus* lack the chitinous plate on the abdominal tergum IX (Sama, 2002). This character is peculiar of all other *Pogonocherus* (Craighead, 1923; Klausnitzer, 2001), while *Poliaenus* Bates, 1880 and *Ecyrus* LeConte, 1872 show an apical spine (Craighead, 1923; Linsley, 1935). Thus, *P. ovatus* and *P. decoratus* can indeed be considered as the most archaic living species of the genus.

Fossil *Pogonocherus* differ from all extant congeners in the elytra without tufts of hairs, obviously another specialised character. Thus, the absence of all previously mentioned specialised characters implies that they are truly the most archaic species of the genus.

Larvae of the most basal *Pogonocherus* of the Recent are exclusively, or predominantly, associated with cryophilic Pinaceae (*Pinus*, *Abies*, *Picea*), especially in Northern Europe (Sama, 2002; Danilevsky, 2015). In Nearctic, the most archaic species is the Vancouverian *P. penicillatus* LeConte, 1850, as well associated with Pinaceae (*Pinus*, *Picea*). In the specialised Central European, Mediterranean and Alleghenian *Pogonocherus*, the dependence on conifers is still observable, but they tend to depend, sometimes exclusively, on broadleaf trees (Linsley & Chemsak, 1984; Klausnitzer, 2001; Trocoli, 2020).

Analogously, Vancouverian *Poliaenus* are associated with cryophilic Pinaceae (almost exclusively, *Abies*), while Sonoran and Central American *Poliaenus* tend to depend only on subtropical broadleaf trees (Anacardiaceae, Burseraceae, Malvaceae). Finally, no *Ecyrus* is associated with conifers (Linsley & Chemsak, 1984).

Consequently, it is possible to suppose that archaic *Pogonocherus* and *Poliaenus* were originally associated with cryophilic Pinaceae (*Abies*?) and the adaptation to broadleaf trees occurred afterwards, depending on warmer conditions.

The presence in Rovno amber of fossil *Poliaenus* closely related to Vancouverian congeners associated with cryophilic *Abies* (Vitali & Perkovsky, 2022) seems to support the first hypothesis.

However, the association with conifers is currently observable for both *Pogonocherus* and *Poliaenus* in both cold and warm habitats: in Northern Europe as in North Africa or Turkey, and in Alaska as in California. Thus, it is also possible to suppose that archaic Pogonocherini adapted on thermophilic conifers (*Abies*?) in warm habitats but they were originally associated with broadleaf trees. This adaptation on conifers allowed them to subsequently adapt on cryophilic conifers and to colonise colder habitats.

Correspondingly, *P. ovatus*, the most archaic species of the Recent, is polyphagous: though the preferred host is *Abies alba* Mill., the larva can also bore *Castanea sativa* Mill. and other broadleaf trees (Sama, 2002).

Two needles of an undescribed *Abies* have been recently found in Baltic amber (Sadowski et al., 2017); nonetheless, *Abies* was established in Europe only since Late Oligocene (Mai, 1967). Consequently, we can suppose that *Abies* was still very rare in Baltic amber and archaic *Pogonocherus* were mainly associated with other hosts. This fact explains their relative rarity as inclusions in Baltic amber. Currently, two species of *Castanea* are accepted from Baltic amber (Iljinskaja, 1982; Sadowski et al., 2020); thus, this tree might be the original or the preferential host of *Pogonocherus*.

In all cases, the close affinity of the fossil *Pogonocherus* with *P. ovatus* seems to imply a dependence on mesophilous mixed forests (*Castanea*, *Quercus*, *Abies*, *Pinus*), as it is possible to find in South-Central Europe today. This suggests that the Baltic amber dating has to be referred to periods extremely close to the transition Priabonian / Rupelian (Early Oligocene), as confirmed by the research on the carbon isotopes of C3 (Tappert et al., 2013).

In all evidence, archaic *Pogonocherus* originally shared the same habitat of *Nothorhina granulicollis* Zang, 1905 (Vitali, 2006). The permanence of this kind of habitat in Europe allowed the survival of this genus, contrary to *Dicentrus* LeConte, 1880 and to *Paratimia* Fisher, 1915, for which the primitive exclusive association with *Calocedrus* (Vitali & Damgaard 2016) or with particular types of pines (Vitali, 2020) was hypothesised to support their extinction in Eurasia.

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