

## Two new *Malthodes* and a new *Podistra* from Eocene Baltic amber (Coleoptera, Cantharidae)

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In the present paper, *Malthodes* (*Libertimalthodes*) *headsii* sp. nov., *Malthodes* (*Libertimalthodes*) *jaredi* sp. nov. and *Podistra* (*Pseudoabsidia*) *guthriei* sp. nov. from the Eocene Baltic amber are described. Furthermore, origin and evolution of both genera are briefly discussed. *Archaeomalthodes* Hsiao, Ślipiński & Pang, 2016 originally described in the subfamily Malthininae and later transferred to the subfamily Dymorphocerinae, is retransferred to Malthininae (comb. rest.).

Key words: *Malthodes*, *Podistra*, Eocene, Gdańsk Bay, fossils, new taxa.

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### INTRODUCTION

*Malthodes* Kiesenwetter, 1852 is widespread in Europe, Asia, North Africa and North America. It is an interesting genus of soldier beetles (Insecta, Coleoptera, Cantharidae) characterized by small body size (2-5 mm, rarely 6 mm) and blackish short elytra, tendentially (except for the major part of fossil species) equipped with a yellow roundish spot at each apex (Porta 1929). In the Holarctic zone (Delkeskamp 1977), it is widely variable, giving rise to many endemic species. Extant taxa tend to be spring species, but a small number of them are found at high altitude, indicatively over 800 masl in August-September (Liberti 2017), and a few other ones have a flight period in November-December (Liberti & Poggi 2018).

The genus is well-known in the fossil record as inclusions in Eocene ambers, with numerous species in Baltic amber (e.g., Fanti & Sontag 2019; Parisi & Fanti 2019, 2020), two species in Bitterfeld amber (Fanti 2019a, 2019b), and two in Rovno

amber (Kazantsev 2010; Kazantsev & Perkovsky 2014). A single species is known as a compression fossil in the Oligocene Brunstatt brown coals (Förster 1891), as well as a taxon from the Middle Miocene deposits of Vlădiceni, Romania (Pintilioaie et al. 2021).

*Podistra* Motschulsky, 1839 is a small Holarctic genus (Ramsdale 2002), to which are added some species as *incertae sedis* (Kazantsev & Brancucci 2007). This genus was recently found in Baltic amber with three species (Fanti & Damgaard 2018, 2020; Fanti 2020) and some specimens identified at the generic level (Fanti 2020). One species has been described from the Oligocene of Rott, Germany (Fanti & Walker 2019).

In this paper, a new fossil *Podistra*, tentatively assigned to the subgenus *Pseudoabsidia* Wittmer, 1969, and two new *Malthodes* species of the subgenus *Libertimalthodes* Kupryjanowicz & Fanti, 2019 are described.

## MATERIALS AND METHODS

The amber pieces come from the Gdańsk Bay, Poland, the area within the Kaliningrad region that supplies most of samples of this particular resin. The succinite horizon was mainly formed during the Priabonian (Bukejs et al. 2019). The specimens were re-polished in order to highlight the entire inclusions and were donated by me to the Center for Paleontology at the Illinois Natural History Survey, University of Illinois at Urbana-Champaign, USA. The photographs were taken by Artur Robert Michalski (Wrocław, Poland) with a Canon EOS 600D digital camera mounted on a Bresser microscope, with the addition of focus stacking software. Figures were then reprocessed using the PhotoImpact Viewer SE program.

## SYSTEMATIC PALEONTOLOGY

**Order Coleoptera Linnaeus, 1758**

**Superfamily Elateroidea Leach, 1815**

**Family Cantharidae Imhoff, 1856**

**Subfamily Cantharinae Imhoff, 1856**

**Tribe Cantharini Imhoff, 1856**

**Genus *Podistra* Motschulsky, 1839**

**Subgenus *Pseudoabsidia* Wittmer, 1969**

***Podistra (Pseudoabsidia) guthriei* sp. nov.**

(Figs. 1 - 2)

**Holotype.** Female, in Baltic amber, deposited under accession number INHSP-18000.

**Type locality.** Poland, Baltic Sea coast, Gdańsk city area, Wisła River estuary.

**Type horizon.** Middle Eocene: Lutetian (47.8–41.2 Mya) to late Eocene: Priabonian (37.8–33.9 Mya).

**Differential diagnosis.** The last maxillary palpomere securiform, the long elytra and the rectangular pronotum allow this taxon to be ascribed to the genus *Podistra*. The new species is easily distinguishable from the other *Podistra* for the absence of the basal tooth of

claws, a typical character of the subgenus *Pseudoabsidia* Wittmer, 1969. It is also recognizable for the blackish head and the peculiar pronotal (slightly narrower than head, with a transversal strong concavity near the basal margin) and propleural shape.

**Description.** Adult, winged, slender. Female, defined on the basis of the short antennae and the last sternite rounded and wide. Body length: about 5.7 mm, elytra 4.2 mm. Dark brown with blackish head.

Head completely exposed, short, rounded, equipped with punctation and rugosity. Eyes large, convex, perfectly rounded, inserted in the lateral-upper part of the head; inter-ocular dorsal distance about 2.5 times greater than eye diameter. Maxillary palpi 4-segmented; last palpomere securiform, very elongated and rounded apically. Labial palpi 3-segmented; last palpomere securiform. Antennae 11-segmented, filiform, strongly pubescent, inserted close to the eyes, very short, slightly surpassing the humeral zone and not reaching the half of elytra; scape club-shaped, strongly elongate and robust apically; antennomere II short, about 2.0 times shorter than scape; antennomere III about 1.5 times longer than antennomere II; antennomeres III–X subequal, antennomere VI slightly longer than others; antennomere XI longer than previous ones and rounded apically. Pronotum longer than wide, rectangular, slightly narrower than head, almost flat, with a transversal strong concavity near the basal margin; surface equipped with long setae; apical margin almost straight; basal margin straight and bordered; sides straight and slightly bordered; propleura triangular-elongate with rounded wide base. Scutellum triangular. Elytra wider than pronotum, elongate, parallel-sided, rounded apically, hardly reaching the last abdominal segments (Fig. 2), wrinkled and equipped with long setae. Hind wings slightly infusate, almost completely covered by the elytra. Legs robust, densely pubescent; coxae robust, elongate, triangular; trochanters elongate with rounded apex; femora enlarged, very slightly curved; tibiae thin, cylindrical, with a robust apical spur; protibiae



Fig. 1. *Podistra (Pseudoabsidia) guthriei* sp. nov. INHSP-18000 in Baltic amber. A: Holotype, dorso-lateral view, bar = 1.0 mm; B: Holotype, ventro-lateral view, bar = 1.0 mm.



Fig. 2. *Podistra (Pseudoabsidia) guthriei* sp. nov. INHSP-18000 in Baltic amber. Holotype, detail of elytral apex and last tergites, bar = 0.2 mm

shorter than profemora; mesotibiae almost as long as mesofemora; metatibiae longer than metafemora; tarsal formula 5-5-5; tarsomere I very elongate; tarsomere II short, about 2 times shorter than I; tarsomere III as long as II; tarsomere IV lobed; tarsomere V thin, elongate and curved; claws simple, without tooth at base. Metasternum sub-rectangular; abdominal urosternites transverse and pubescent; last urosternite short and rounded. Male unknown.

**Etymology.** Named in honour of my friend Scott Guthrie (Fort Guthrie, Washington, USA), an excellent fossil hunter.

**Syninclusions.** Air bubbles, and very few detritus.

**Remarks.** The amber piece measures 21 x 12 mm. Three legs of the inclusion are preserved up to the tarsomere IV, II, and I respectively. The right antenna is preserved up to the fifth antennomere.

**Subfamily Malthininae Kiesenwetter, 1852**

**Tribe Malthodini Böving & Craighead, 1931**

**Genus *Malthodes* Kiesenwetter, 1852**

**Subgenus *Libertimalthodes* Kupryjanowicz & Fanti, 2019**

***Malthodes (Libertimalthodes) headsi* sp. nov.**

(Figs. 3 - 5)

**Holotype.** Male, in Baltic amber, deposited under accession number INHSP-18001.

**Type locality.** Poland, Baltic Sea coast, Gdańsk city area, Wisła River estuary.

**Type horizon.** Middle Eocene: Lutetian (47.8–41.2 Mya) to late Eocene: Priabonian (37.8–33.9 Mya).

**Differential diagnosis.** The last maxillary palpomere globular and distally pointed, the long elytra and the last urites little differentiated, allow this taxon to be ascribed to the genus *Malthodes* and its subgenus *Libertimalthodes* (Fanti & Michalski 2018; Fanti 2019c; Kupryjanowicz & Fanti 2019). The species is easily distinguishable by the last sternite elongated, concave in the centre with at the sides a lobe bent upwards.

**Description.** Adult, winged, slender. Male defined on the basis of the last sternite elongated and with the sides apically bent upwards. Body length: about 4.0 mm, elytra 3.0 mm. Entirely dark brown.

Head not completely exposed, rounded, wide, almost smooth. Eyes large, rounded, convex, inserted laterally and in the upper part of the head; interocular dorsal distance about 3.1 times greater than eye diameter. Mandibles not well visible. Maxillary palpi 4-segmented; first palpomere short and robust, second elongated, third shorter than second, fourth globular and distally pointed. Labial palpi 3-segmented; last palpomere globular and pointed. Antennae presumably 11-segmented, filiform, inserted close to the eyes, slightly pubescent with numerous short setae; scape club-shaped, very robust and enlarged apically; antennomere II short, about 2.1 times shorter than scape; antennomeres III–VI subequal, filiform and very elongated. Pronotum transverse, narrower than head; surface almost flat, equipped with very short setae, apical margin slightly rounded and bordered; basal margin straight and bordered; sides straight and slightly bordered, propleura rounded and wide. Scutellum triangular. Elytra wider than pronotum, parallel-sided, rounded apically, very elongate, surpassing the last abdominal segments, strongly wrinkled, with semi-recumbent short setae. Hind wings transparent, almost completely covered by the elytra. Legs relatively short, rather robust; coxae robust and very elongated; trochanters elongated and rounded apically; femora robust, subcylindrical, slightly curved, equipped with many setae; tibiae shorter than femora especially the metatibiae, cylindrical, thin, without spurs at

apex and equipped with setae; tarsal formula 5-5-5; tarsomeres slender; tarsomere I elongated; tarsomere II about 1.3 times shorter than I; tarsomere III slightly shorter than II and sturdier; tarsomere IV strongly bilobed, with curved lobes; tarsomere V elongated and flat; claws simple, without lobes or teeth. Metasternum squadrate and robust; abdominal segments transverse, short, with sparse setae; last urotergite and penultimate urosternite very large and wide; last urosternite obovate, elongate, concave in the middle, with two short lobes strongly bent upwards at apex (Fig. 5).

Female unknown.

**Etymology.** Named in honour of my friend, the great palaeontologist and entomologist Sam W. Heads (Illinois Natural History Survey, University of Illinois at Urbana-Champaign, USA).

**Syninclusions.** Very few botanical remains and air bubbles.

**Remarks.** The amber piece is transparent, measures 35 x 11 mm and shows the apex much thinner. The right metatibia is detached between the femur and tibia but still present; the right antenna is preserved up to the second antennomere and part of the third, and the left antenna is preserved up to the sixth antennomere.

*Malthodes (Libertimalthodes) jaredi* sp. nov.  
(Figs. 6 - 7)

**Holotype.** Male, in Baltic amber, deposited under accession number INHSP-18002.

**Type locality.** Poland, Baltic Sea coast, Gdańsk city area, Wisła River estuary.

**Type horizon.** Middle Eocene: Lutetian (47.8–41.2 Mya) to late Eocene: Priabonian (37.8–33.9 Mya).

**Differential diagnosis.** The last maxillary palpomere globular and distally pointed, and the last urites (both urotergites and urosternites) modified, allow this taxon to be ascribed to the genus *Malthodes*. The species is easily distin-



Fig. 3. *Malthodes (Libertimalthodes) headsi* sp. nov. INHSP-18001 in Baltic amber. Holotype, dorso-lateral view, bar = 1.0 mm



Fig. 4. *Malthodes (Libertimalthodes) headsi* sp. nov. INHSP-18001 in Baltic amber. Holotype, detail of legs, bar = 0.2 mm

guishable by the last sternite elongated, broad at base and with the apex narrower in an undulating manner. This species, unlike the others of subgenus *Libertimalthodes*, shows the last urites slightly modified, with intermediate characters between the subgenera *Malthodes* and *Libertimalthodes*.

**Description.** Adult, winged, slender. Male defined on the basis of the last urites modified. Body length: about 4.0 mm, elytra 3.1 mm. Entirely dark brown.

Head completely exposed, rounded, wide, with shallow punctation and short setae. Eyes large, rounded, convex, inserted laterally and in the upper part of the head. Mandibles falciform, pointed apically. Maxillary palpi 4-segmented, first palpomere short and robust, second elongated, third shorter than second, fourth globular and distally pointed. Labial palpi 3-segmented; last palpomere globular and pointed. Antennae 11-segmented, filiform, inserted close to the eyes, strongly pubescent with many long setae, not particularly long and almost reaching the half of elytra; scape club-shaped, very robust; antennomere II short, about 1.9 times shorter than scape; antennomeres III–X sub-equal and filiform; antennomere XI elongated and rounded apically. Pronotum transverse, slightly narrower

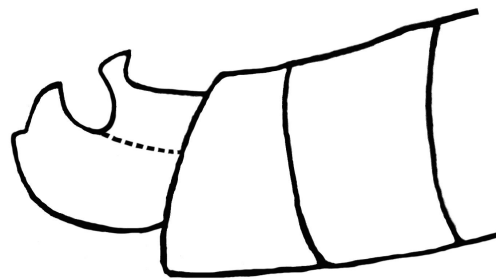


Fig. 5. *Malthodes (Libertimalthodes) headsi* sp. nov. INHSP-18001 in Baltic amber. Drawing of last urites (lateral view)



Fig. 6. *Malthodes (Libertimalthodes) jaredi* sp. nov. INHSP-18002 in Baltic amber. A-B: Holotype, lateral views, bars = 0.5 mm

than head; surface almost flat and equipped with very short setae; apical and basal margins straight and slightly bordered; sides straight and slightly bordered; propleura rounded and wide. Scutellum triangular. Elytra wider than pronotum, very elongate, parallel-sided, rounded apically, reaching the last abdominal segments; surface wrinkled, with several short setae. Hind wings slightly infusate, almost completely covered by the elytra. Legs relatively short, rather robust; coxae robust; trochanters elongated, thin, rounded apically; femora robust, subcylindrical, slightly curved, equipped with many short setae; pro- and mesotibiae shorter than pro- and mesofemora; metatibiae longer than metafemora, cylindrical, thin, pubescent, without spurs at apex; tarsal formula 5-5-

5; tarsomeres slender; tarsomere I elongated; tarsomere II about 0.8 times shorter than I; tarsomere III slightly shorter than II; tarsomere IV strongly bilobed, with slightly curved lobes; tarsomere V elongated and flat; claws simple, without lobes or teeth. Metasternum subquadrate with sinuous posterior margin; abdominal segments transverse, pubescent; last urotergite short, elongated and rounded apically; last urosternite elongated, wide, with the posterior margin narrower at the sides and a little protruded in the middle, forming a wide, rounded, very short lobe (Fig. 7). Female unknown.

**Etymology.** Named in honour of my friend, and manager of palaeontological laboratory M. Jared Thomas (Illinois Natural History Survey, University of Illinois at Urbana-Champaign, USA).

**Syninclusions.** Very few botanical remains and air bubbles.

**Remarks.** The amber piece measures 16 x 10 mm. The surface is rough and has several superficial fractures. The inclusion is complete.

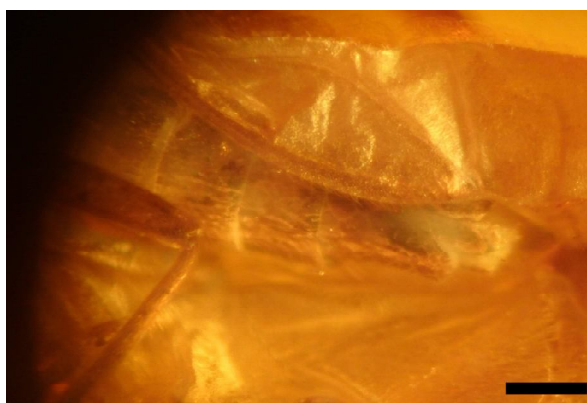


Fig. 7. *Malthodes (Libertimalthodes) jaredi* sp. nov. INHSP-18002 in Baltic amber. Holotype, detail of last sternites, bar = 0.2 mm

## DISCUSSION

*Malthodes* appears to have originated and evolved after the end-Cretaceous mass extinction event, having been found, until now, only from the Eocene (Fanti 2017). A seemingly similar Cretaceous genus, *Archaeomalthodes* Hsiao, Ślipiński & Pang, 2016 has been described from mid-Cretaceous Burmese amber (Hsiao et al. 2016). This genus, however, shows characters, *i.e.*, punctured elytra, a sort of pygidium and the absence of the last modified urites, which make it morphologically dissimilar from *Malthodes*. Moreover, it was recently moved to the subfamily Dysmorphocerinae Brancucci, 1980 based on the morphology of the maxillary palpi (Hsiao et al. 2021). The pointed maxillary palps are seldom present in Dysmorphocerinae, which also shows long elytra. Therefore, the attribution of *Archaeomalthodes* to this subfamily (Hsiao et al. 2021) is insufficiently supported and rejected here. *Archaeomalthodes* is transferred again to the subfamily Malthininae; nonetheless, it is also possible that it be more closely related to other known Cretaceous species and, therefore, belong to Cantharinae or even to a new subfamily. Further detailed study is required to resolve this issue.

Cladistic analyses suggest that Malthininae seem to be quite recent in the Cantharidae panorama, Malthinini being probably the first evolved tribe, from which Malthinini and Malthodini would be derived (Brancucci 1980). In fact, Malthinini show long elytra and unmodified urites, the primitive condition for the entire subfamily. It is interesting to remark that during the Eocene, *Malthodes* species with short elytra and strongly modified urites (*e.g.*, *Malthodes gedanicus* Fanti & Sontag, 2019; *Malthodes tognettii* Parisi & Fanti, 2019; and many others) cohabited with *Malthodes* species with long elytra and / or little modified urites (*e.g.*, subgenus *Libertimalthodes*; *Malthodes caenozoicus* Fanti & Vitali, 2017). These findings support the hypothesis that the brachelytry of the genus *Malthodes* is just a character that evolved from species with long elytra (Parisi & Fanti 2019) for adaptation to particular

environmental conditions and ecological isolation, sometimes favoured by the orogenesis.

In the genus *Podistra*, it is currently difficult to make hypotheses on the origin and biogeography through the known fossils (Fanti 2020), due to the uncertain attribution of various extant species and the questionable rank of the current subgenera (Ramsdale 2002). In addition to the already provided hypotheses (Fanti 2020), it is possible that the fossils currently attributed to *Podistra* Motschulsky, 1839, *Lycocerus* Gorham, 1889, and *Themus* Motschulsky, 1858 (Kazantsev 2013, 2018, 2020; Fanti & Damgaard 2018, 2019, 2020; Fanti 2020) are in reality only morphologically extremely similar but not identical to the extant genera. This is due to the uniformity of many extant genera, which are often distinguishable by unstable characters, such as claws' teeth. However, the fossil species of *Podistra* cannot be included in *Lycocerus*, as Kazantsev (2020) proposed, due to the different pronotum, which is more elongated and not so sub-squared. Moreover, in case of synonymy, *Podistra* would take precedence over *Lycocerus*.

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