

A New Species of Micromalthidae (Coleoptera) from the Rovno Amber: 1. Adult Morphology

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Abstract—*Micromalthus priabonicus* sp. nov. from the Late Eocene Rovno amber (Ukraine) is described. The new species is readily distinguished from *M. eocenicus* Kirejtshuk et al., 2010 from the Early Eocene amber of Oise in France by the shorter body, unequal length of antennomeres 3 and 4, ovate terminal antennomere, less transverse head, transverse scutellum, and by the considerably shortened adsutural elytral margin.

Keywords: Micromalthidae, *Micromalthus*, amber, symbionts, climate, Late Eocene, Early Eocene, Ukraine, France

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INTRODUCTION

This is my second publication on fossil Micromalthidae in a series; the first such publication (Perkovsky, 2007) provided detailed data on the life cycles and features of biology and history of the study of Micromalthidae. I described the first species of fossil Micromalthidae from the Middle Miocene Dominican amber (Perkovsky, 2007); it was later synonymized under the single extant species of Micromalthidae (Hörschemeyer et al., 2010). Another fossil representative of the genus *Micromalthus* was later described from the Lowermost Eocene Oise amber (Kirejtshuk et al., 2010). In addition, a new genus of Micromalthidae was described from a larva from the Early Cretaceous Lebanese amber (Kirejtshuk and Azar, 2008). Fossil records of Cenozoic micromalthids are scanty (Hörschemeyer et al., 2010) and none of them refers to adults found together with larvae. A total of 76 micromalthid inclusions (two adults and 74 larvae) found in a single piece of Late Eocene Rovno amber are described here as a new species. The second part of this study provides a description of the larva of this species and discusses the variation of Cenozoic Micromalthidae.

SYSTEMATIC PALEONTOLOGY

Family Micromalthidae Barber, 1913

Genus *Micromalthus* LeConte, 1878

Micromalthus priabonicus Perkovsky, sp. nov.

Plate 12, figs. 1 and 2

Etymology. From the Priabonian.

Holotype. SIZK, K-7760, female; Klesov, Rovno amber; Upper Eocene. Visible in ventral view (head visible also in dorsal and front views).

Description (Fig. 1). The beetle is small, dark brown. The proventrite, sternites medially, legs, and appendages are lighter. The head is transverse, without protruding temples, clearly wider than the pronotum, 1.4 times as wide as long. The eyes are large, protruding beyond the head outline. The frons is weakly convex, with the anterior margin weakly protruding anteriorly in the middle and the anterior margin of the clypeus weakly protruding anteriorly. The mandibles have darkened apices and two large visible teeth. The apex of the terminal maxillary palpomere is narrowly pointed; the dilated portion of this palpomere terminates in an obliquely truncated platform with receptors. The mentum is strongly transverse, trapezoid, approximately as wide as antennomeres 1 and 2 taken together. The terminal labial palpomere is dilated at the base and papilliform apically. The maximum distance between angular sutures is in line with the posterior margins of eyes; this distance is getting markedly smaller posteriorly. The antennae are almost as long as the distance between their bases and the procoxae. Antennomere 1 has transverse microsculpture, clearly elongate; antennomere 2 is approximately as long as wide; antennomere 3 is longitudinal, 1.5 times as long as wide; antennomere 4 is markedly shorter than antennomere 3, almost as long as wide, antennomeres 5–10 are transverse; antennomere 11 is oval, apically rounded. The terminal antennomere is longer than (Pl. 12, fig. 1b), or as long as (Pl. 12, fig. 2b), the two previous antennomeres together. The pronotum has an impression in front of the base. The head is 1.3 times as wide as the prothorax, which narrows towards the base. The proventrite is half as long as the head; the procoxae are set widely apart, protruding. The metaventrite is 1.25 times as long as the proventrite and mesoventrite taken together. Most of the

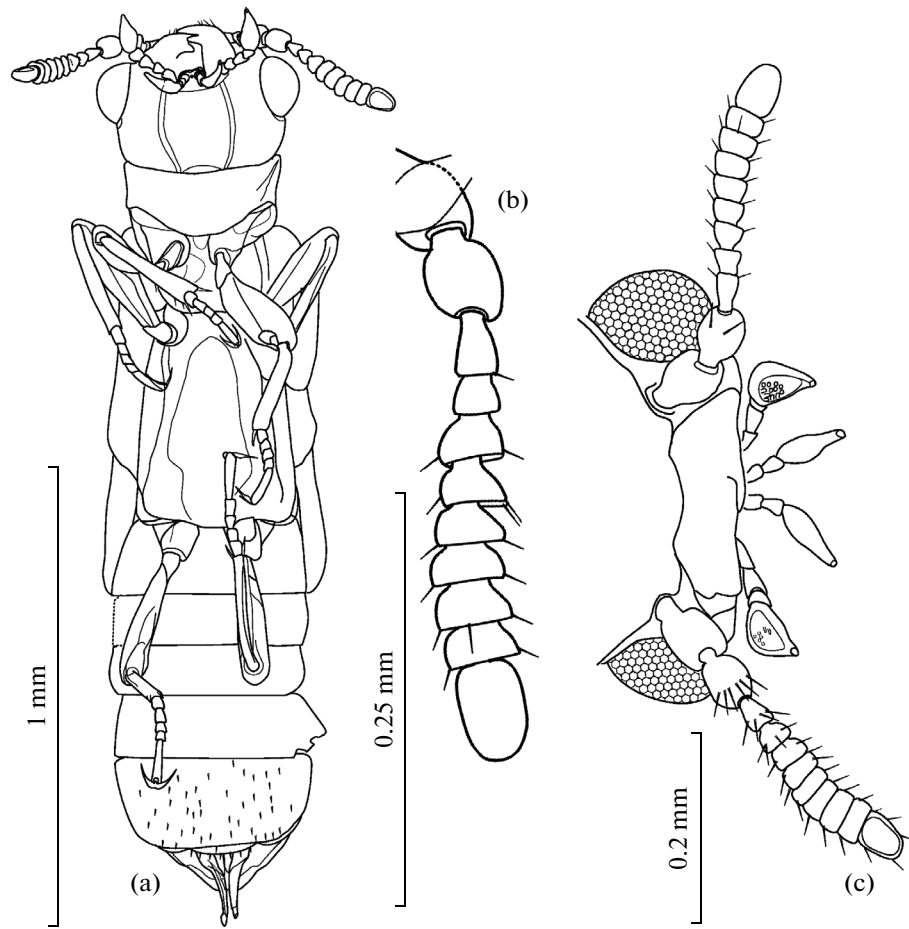


Fig. 1. *Micromalthus priabonicus* sp. nov., holotype SIZK, no. K-7760, female; Klesov, Rovno amber; Late Eocene: (a) habitus, ventral view; (b) antenna, ventral view; (c) head, dorsal view.

metaventricle (except for the lateral margins and posterior margin) has a broad and deep trapezoid impression. The scutellum is transverse, with a straight posterior margin. The elytra have traces of venation, especially distinct at the apex, which are difficult to examine in more detail because of mycelium (Pl. 12, fig. 2b); three last abdominal tergites (paratype) remain completely open and have a deep sutural notch 0.15 times as long as the elytra. The wings are developed. The procoxae are conical; the procoxal cavities are open. The mesocoxae are oval; the distance between the mesocoxae is somewhat smaller than the distance between the metacoxae. The metacoxae are triangular, half as long as the first visible abdominal sternite. The profemora are twice as long as the procoxae; the length of the mesofemora is much smaller

than the width of the metaventricle. The profemora are wide, with the anterior margin weakly curved, thrice as long as wide. The tibiae are rather long and narrow; the protibia has strong dark spurs; in the distal third, it is weakly curved; the protibia is eight times as long as wide. At least the metafemora have superficial grooves that can encase the tibiae. The protibiae are 1.5 times as long as the protarsi. All tarsomeres are simple; tarsomeres 2–4 are subequal in length; tarsomere 5 without claws is as long as tarsomeres 2–4 taken together. The claws are strong, darkened. The abdomen has six visible sternites. The penultimate abdominal sternite is 1.3 times as long as the preceding sternite. The apices of gonocoxites with a strong seta at the base of the stylus (paratype) and rather long styli are visible at the apex of the abdomen.

Explanation of Plate 12

Figs. 1 and 2. *Micromalthus priabonicus* sp. nov.: (1) holotype SIZK, no. K-7760, female: (1a) habitus, ventral view; (1b) anterior portion of body, ventral view; (1c) head, dorsal view; (2) paratype SIZK, no. K-7758g, female: (2a) habitus, lateral view, (2b) anterior portion of body, lateral view; Klesov, Rovno amber; Upper Eocene.

Fig. 3. *Micromalthus debilis* LeConte, female (recent): (3a) habitus, dorsal view; (3b) anterior portion of body, ventral view; (3c) antenna.



M e a s u r e m e n t s, mm. Holotype: body length, 2.05; head length, 0.32; head width, 0.46; antennal length, 0.34; proventrite length, 0.17; proventrite width, 0.34; abdomen length, 0.76. Paratype: pronotum length, 0.23; elytral length, 0.89 (visible only in lateral view; the abdomen is strongly curved, making it impossible to measure the total length).

C o m p a r i s o n. The new species is markedly shorter than *M. eocenicus* Kirejtshuk et al., 2010 (body is 2.5 mm long) and can readily be distinguished from it by the less transverse head, antennomeres 3 and 4 unequal in length (almost equal in length in *M. eocenicus*), the strongly transverse scutellum, relatively shorter metaventrite, and by the much deeper sutural notch of the elytra. The new species is clearly distinguished from the extant species *M. debilis* by the longer antennae with antennomere 3 elongate and antennomere 4 not transverse, the straight posterior margin of the scutellum, the stronger tibial spurs, and different shape of the apical maxillary palpomere.

M a t e r i a l. In addition to the holotype, paratypes SIZK, K-7758g, female; Klesov, Rovno amber; Upper Eocene; 74 larvae from the same amber piece (K-7757–K-7763); K-1069a, larva from the same locality.

DISCUSSION

The haplodiploidy of *Micromalthus* beetles, unique among beetles (at least at the family level) as well as the obligatory cannibalism of males can be explained by their coevolution with male-killing endosymbiotic bacteria (Normark, 2004). These bacteria are present at all stages of the life cycle; they are abundant in the fat body and in the hemolymph; their presence in ovarioles and developing eggs has been shown (Normark, 2003). *Micromalthus* beetles coevolved with their endosymbionts at least since the Early Cretaceous, which is indicated by the morphology (very typical of micromalthids) of the larva from the Lower Cretaceous Lebanese amber (Kirejtshuk and Azar, 2008).

At the same time, genome reduction that accompanies long coevolution of endosymbionts with their host (Perkovsky, 2012) often results in their inability to survive overheating (Dunbar et al., 2007; Perkovsky, 2012). This probably explains the fact that the distribution of the only extant species of Micromalthidae is limited to the area of temperate climate in the eastern Nearctic. It is likely that the immediate ancestors of extant micromalthid species were also confined to extratropical areas, while the climate of Western Europe in the Ypresian was undoubtedly macrothermal, which is confirmed, among other things, by the absence of any Holarctic elements in the amber, in particular, in the myrmecofauna, of Oise (Aria et al., 2011). At the same time, the climate of the Rovno amber forest was undoubtedly extratropical (Perkovsky, 2012), probably equable (Archibald and Farrell, 2003) and largely similar to the climate of the southern part of the range of *Micromalthus debilis*. In addition,

the female morphology of *Micromalthus debilis* is rather strongly different from that of *M. eocenicus* (Kirejtshuk et al., 2010), but very similar to that of the new species.

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