

UDC 565.76:551.781.4

FOURTH CONTRIBUTION ON LATE EOCENE AMBER SILKEN FUNGUS BEETLES: A NEW BALTIC AMBER SPECIES OF *ATOMARIA* (COLEOPTERA, CLAVICORNIA, CRYPTOPHAGIDAE)

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Fourth Contribution on Late Eocene Amber Silken Fungus Beetles: a New Baltic Amber Species of *Atomaria* (Coleoptera, Clavicornia, Cryptophagidae). Lyubarsky G. Yu., Perkovsky E. E. — *Atomaria gedanica* Lyubarsky et Perkovsky, sp. n., a new cryptophagid species from Baltic amber is described. The new species is the first recorded Eocene Atomariinae. The new species is similar to *A. fuscipes* Gyllenhal. It differs from the latter in having pronotum flat, posterior angles of pronotum obtuse, and antenna short. The record of *A. gedanica* synincluded with *Ceratopogon* biting midge supports the Late Eocene age of the Baltic amber, for the Holarctic affinities of both taxa are incompatible with the paratropical climate characteristic of the Mid-European Middle Eocene.

Key words. Cryptophagidae, *Atomaria*, Late Eocene, Baltic amber, Russia.

Четвертое сообщение о позднеэоценовых скрытноедях: новый вид *Atomaria* (Coleoptera, Clavicornia, Cryptophagidae) из балтийского янтаря. Любарский Г. Ю., Перковский Е. Э. — Описан новый вид криптофагид из балтийского янтаря — *Atomaria gedanica* Lyubarsky et Perkovsky, sp. n. Это первый эоценовый представитель Atomariinae. Новый вид сходен с *A. fuscipes* Gyllenhal, от которого отличается плоским пронотумом с тупыми задними углами и короткими антеннами. Нахождение *A. gedanica* в сининклизе с мокрецом *Ceratopogon* указывает на позднеэоценовый возраст балтийского янтаря, так как голарктическая приуроченность обоих таксонов несовместима с паратропическим климатом среднего эоцена Средней Европы.

Ключевые слова. Cryptophagidae, *Atomaria*, поздний эоцен, балтийский янтарь, Россия.

Introduction

The family Cryptophagidae belongs to the superfamily Cucujoidea (Clavicornia), which contains ca. 30 beetle families. The phylogenetic relationships within this superfamily are still not well understood (Lawrence et al., 2011). Fossil records of Cryptophagidae are scarce, with only a few fossil species known. The family includes about 600 described species of small beetles, placed in 53 genera. Cryptophagidae are mainly free-living and mycophagous.

The family Cryptophagidae contains two subfamilies: Cryptophaginae and Atomariinae (Leschen, 1996). The subfamily Atomariinae includes three tribes: Atomariini, Cryptafricini, and Hypocoprini. The tribe Atomariini contains 10 genera: genus *Atomaria* Stephens, 1829 (about 200 species), *Atomaroides* Lyubarsky, 1989 (1 species), *Chilatomaria* Leschen, 1996 (3 species), *Curelius* Casey, 1900 (3 species), *Ephistemus* Stephens, 1829 (6 species), *Microatomaria* Leschen, 1996 (1 species), *Ootypus* Ganglbauer, 1899 (1 species), *Paratomaria* Leschen, 1996 (1 species), *Sallius* Broun, 1893 (1 species), *Tisactia* Casey, 1900 (1 species). The subfamily can be diagnosed by short body, frons without tubercle, short prosternum in front of coxa, tibia with apical spines.

The genus *Atomaria* is one of the 53 known genera in Cryptophagidae, and currently includes about 200 species. The present fossil represents the family Cryptophagidae and the genus *Atomaria*, as follows from the tarsal formula 5–5–5, tarsomeres not lobed, antennal club 3-segmented, procoxal cavities closed externally, and other relevant characters. Representatives of *Atomaria* are found in all biogeographic realms including 127 species in the Palaearctic Region (Johnson et al., 2007). The genus is rarely recorded in the Baltic amber, with no species name indicated thus far (Willemstein, 1987) and not known from Miocene ambers of New World (Spahr, 1981).

Baltic amber is the world's best-known source of amber dated from Late Eocene. There are also known inclusions from Rovno amber, a southern coeval analogue of the Baltic amber. Fossil records of the family Cryptophagidae from Rovno amber are described by Lyubarsky, Perkovsky (2010, 2011, 2012). The amber collection at the Schmalhausen Institute of Zoology, the National Academy of Sciences of Ukraine, Kyiv (SIZK), contains more than 1000 inclusions of beetles in the Late Eocene Rovno amber (Perkovsky et al., 2010). Among them only three specimens are silken fungus beetles (Lyubarsky, Perkovsky, 2010, 2011, 2012): one of *Micrambe Thomson*, 1863 and two of *Cryptophagus Herbst*, 1863.

The Baltic amber piece containing the fossil under description belongs to the Museum of Amber Inclusions of the Department of Invertebrate Zoology, University of Gdańsk (MAI), and was donated as a part of Wojciech Kalandyk collection of amber from Sambia (Sontag, 2003).

Photographs were taken at the Paleontological Institute, Russian Academy of Sciences (Moscow) by V. A. Kolyada using a Leica M 165 microscope and Leica DFC 425 camera.

FAMILY CRYPTOPHAGIDAE Kirby, 1837

SUBFAMILY ATOMARIINAE LeConte, 1861

Genus *Atomaria* Stephens, 1829

Subgenus *Anchicera* Thomson, 1863

Atomaria gedanicola Lyubarsky et Perkovsky, sp. n.

Material: Holotype, MAI-897, sex unknown; Baltic amber, Late Eocene. Syninclusions: Ceratopogonidae: *Ceratopogon* sp. (E. Sontag det.), Chironomidae, Formicidae (head), Acari (Erythraeidae). The weight of piece 17.2 g.

Description. Length of body 1.65 mm, body elongate (fig. 1, 2), moderately arched, covered with slightly curved but decumbent pale pubescence of moderate length. Body, legs and antennae entirely dark brown.

Antennal structure as in fig. 1 and 3, segments 1st, 2nd, 3rd about 1.5 times as long as broad, segments 4–8 short, about 1.0–1.4 times as long as broad, segment 9th slightly transversal, and 10th subquadrate.

Pronotum distinctly transverse, broadest at or just behind the middle where it is 1.44 times as broad as long. Side borders only visible from above in the basal half; moderately strongly and moderately densely punctured, punctures separated by their diameter. Pronotum widest slightly behind its midlength. Base of the pronotum without depression in the middle; hind angles obtuse; pronotal disk flat; hind margin finely bordered. Pronotum relatively wide, not narrower than the elytra. Tarsal formula 5–5–5 (fig. 3, 4).

Elytra short oval, moderately arched, weakly curved at sides, broadest approx. at first third of length, 2.7 times as long as pronotum, 1.43 times as long as broad combined. Surface shining, moderately closely punctured, punctures in basal part slightly smaller than on pronotal disk, and approximately 1.0–1.5 diameters apart each other; elytral humeri not toothed. Wings present.

Etymology. Species name *gedanicola* is after the Gdańsk city.

Remarks. This species belongs to the subgenus *Anchicera* and to the group of species with decumbent pubescence, pronotum narrowed towards base, and short 1st, 5th, and 7th antennal joints. Therefore this species resembles Palearctic *Atomaria clavigera* Ganglbauer, 1899, *A. sodermani* Sjöberg, 1947, *A. fuscipes* (Gyllenhal, 1808) and *A. subapicalis* Reitter, 1888. It is particularly similar to the two latter species in having 3rd antennal joint less than 2 times as long as wide and 9th joint not transverse.

The new species can be identified using the following key.

Key to Species of *Atomaria*, similar to *A. fuscipes*

Таблица для определения видов *Atomaria*, сходных с *A. fuscipes*

- | | | |
|----|---|-----------------------|
| 1. | Club of antenna transverse, and 3rd joint of antenna strongly elongate, 2 times as long as wide | 2 |
| — | Either 9th and 10th joints of antenna slender, weakly transverse, or 3rd joint of antenna shorter, less than 2 times as long as wide | 3 |
| 2. | 9th joint of antenna slightly transverse, less than 1.5 times as wide as length | <i>A. sodermani</i> |
| — | 9th joint of antenna strongly transverse, more than 1.5 times as wide as length | <i>A. clavigera</i> |
| 3. | 3rd joint longer, more than 2 times as long as wide, 5th joint of antenna longer, more than 1.5 times as long as wide, 9th and 10th joints of antenna slender, elongate | <i>A. subapicalis</i> |

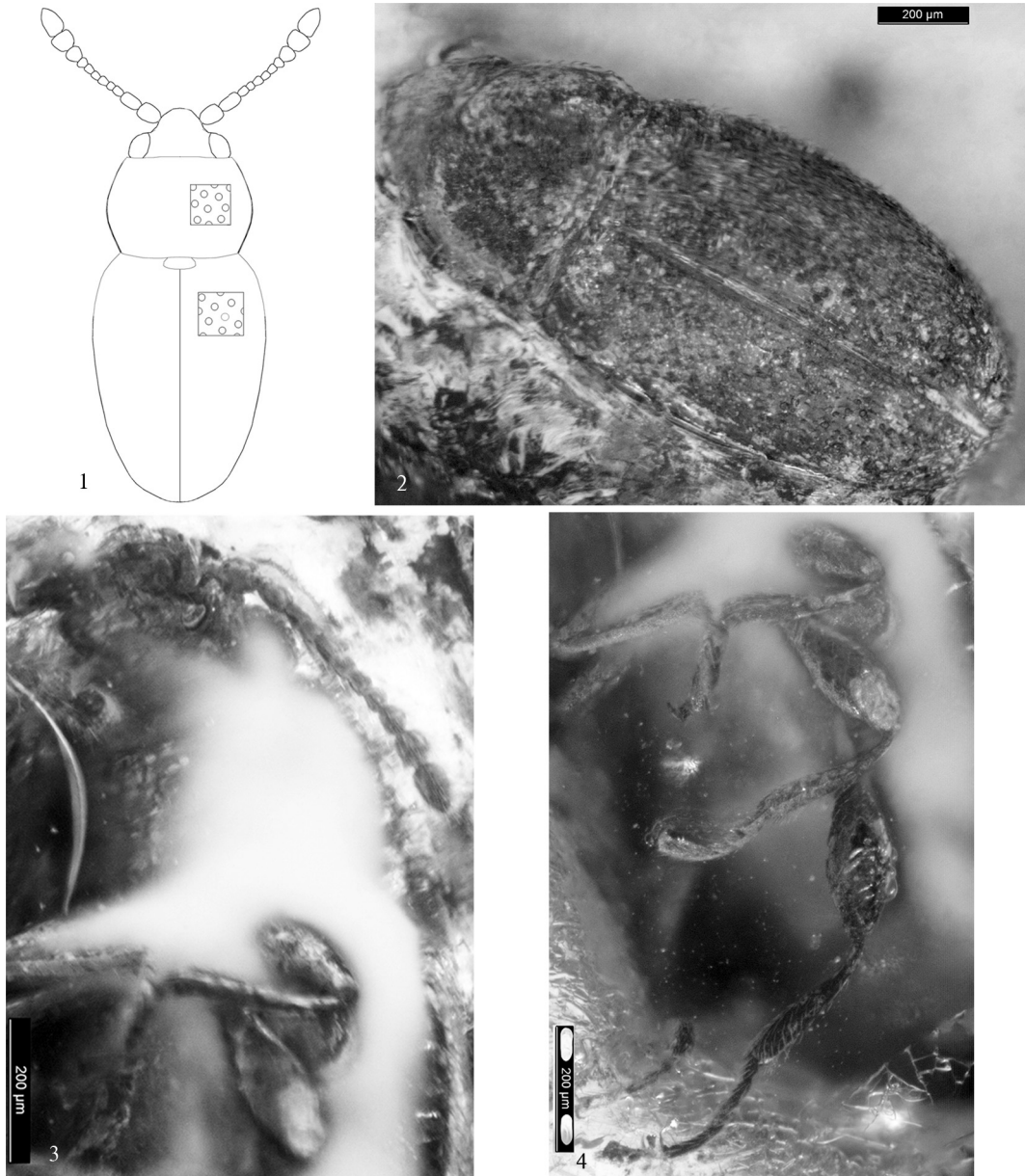


Fig. 1–4. 1 — general view of *Atomaria gedanicola* sp. n.; 2 — general view of *A. gedanicola*; 3 — antenna of *A. gedanicola*; 4 — legs of *A. gedanicola*.

Рис. 1–4. 1 — общий вид *Atomaria gedanicola* sp. n.; 2 — общий вид *A. gedanicola*.; 3 — антенна *A. gedanicola*.; 4 — ноги *A. gedanicola*.

- 3rd joint shorter, less than 2 times as long as wide, 5th joint of antenna shorter, less than 1.5 times as long as wide, 9th and 10th joints of antenna more strongly transverse..... 4
- 4. Pronotum flat, with weak transverse depression. 3rd joint of antenna as long as 5th joint. 3rd joint less than 1.5 times as long as wide. 9th joint of antenna less transverse, less than 1.5 times as wide as length. Posterior angles of pronotum obtuse. Lateral margin of pronotum visible in its posterior half. Pronotum relatively wide, not narrower than the elytra. *A. gedanicola* sp. n.
- Pronotum more convex, with strong transverse depression. 3rd joint of antenna longer than 5th joint. 3rd joint of antenna more than 1.5 times as long as wide. 9th joint of antenna more strongly transverse, more than 1.5 times as wide as length. Posterior angles of pronotum straight. Lateral margin of pronotum visible in posterior quarter of length. Pronotum much narrower than the elytra. *A. fuscipes*

The study of cryptophagids in fossil resins are of particular interest for the generalization of ecological data, which can be helpful in understanding paleoclimates. In this regard it should be noted that *A. fuscipes*, the closest congener of *A. gedanicola* sp. n., is a species, which needs very long extraction time from the soil, more than 3 days, unlike most of the other soil beetles (Krell et al., 2005). In particular, *A. fuscipes* is a soil beetle species, usually found under rotten leaves, in litter, in river sediments and in rotten wood. This species is distributed in most part of Europe (excluding Balkan) and Caucasus. The genus *Ceratopogon* Meigen (dominant genus of Priabonian amber biting midges, found in syn-inclusion with *A. gedanicola*) is now distributed in the Holarctics as well. Hence, the syn-included assemblage as a whole shows Holarctic affinities and so suggests strongly against the paratropical climate characteristic of the mid-European Middle Eocene. The data presented suggest the Late Eocene rather than Middle Eocene age of the Baltic amber.

We are grateful to Alexandr Rasnitsyn for providing access to facilities and continuous help; Victor Kolyada for kindly taking photographs of the specimen. We are much thankful to Prof. Ryszard Szadziewski and Dr. Elżbieta Sontag (University of Gdańsk) for hospitality to the second author in Gdańsk and possibility to work with Wojciech Kalandyk collection of amber from Sambia.

References

- Johnson C., Otero J. C., Leschen R. A. B. Family Cryptophagidae // A catalogue of Palaearctic Coleoptera vol. 4 / Eds I. Löbl, A. Smetana. — Steenstrup : Apollo Books, 2007. — P. 513–531.
- Krell F.-T., Chung Arthur Y. C., DeBoise E. et al. Quantitative extraction of macro-invertebrates from temperate and tropical leaf litter and soil: efficiency and time-dependent taxonomic biases of the Winkler extraction // *Pedobiologia*. — 2005. — **49**. — P. 175–186.
- Lawrence J. F., Ślipiński A., Seago A. E. et al. Phylogeny of the Coleoptera based on morphological characters of adults and larvae // *Annales Zoologici*. — 2011. — P. 1–217.
- Leschen R. A. B. Phylogeny and revision of the genera of Cryptophagidae (Coleoptera: Cucujoidea) // *The University of Kansas. Science Bulletin*. — 1996. — **55**, N 15. — P. 549–634.
- Lyubarsky, G. Yu., Perkovsky, E. E. First Eocene species of the genus *Micrambe* (Cryptophagidae: Coleoptera, Clavicornia) // *Vestnik zoologii*. — 2010. — **44**, N 3. — P. 275–279.
- Lyubarsky G. Yu., Perkovsky E. E. Third contribution on Rovno amber silken fungus beetles: a new Eocene species of *Cryptophagus* (Coleoptera, Clavicornia, Cryptophagidae) // *ZooKeys*. — 2011. — **130**. — P. 255–261.
- Lyubarsky G. Yu., Perkovsky E. E. The first Eocene species of the genus *Cryptophagus* (Coleoptera, Clavicornia, Cryptophagidae) // *Vestnik zoologii*. — 2012. — **46**, N 1. — P. 83–87.
- Perkovsky E. E., Zosimovich V. Yu., Vlaskin A. P. Rovno Amber // *Biodiversity of fossils in amber from the major world deposits* / Ed. David Penney. — Manchester : Siri Scientific Press, 2010. — P. 116–136.
- Sontag E. Animal inclusions in a sample of unselected Baltic amber // *Acta zoologica cracoviensia*. — 2003. — **46** (Suppl. Fossil Insects). — P. 431–440.
- Spahr U. Systematischer Katalog der Bernstein- und Kopal-Käfer (Coleoptera) // *Stuttgarter Beiträge zur Naturkunde Ser. B*. — 1981. — **80**. — S. 1–107.
- Willemstein S. C. An Evolutionary Basis for Pollination Ecology // *Brill Archive. Ser. Botan.* — 1987. — **10**. — 425 p.

Received 22 January 2013

Accepted 20 May 2013