

***Clypastraea primainterparens* sp. nov. - the first fossil minute hooded beetle (Coleoptera: Coccinelloidea: Corylophidae) from Baltic amber (Eocene, Tertiary)**

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A new minute hooded beetle species identified as representative of the *orientalis* group of the genus *Clypastraea* Haldeman, 1842 is described and illustrated from Baltic amber. This finding proves the existence and distribution of this genus in the Eocene at least in the Fennosarmatian part of Laurasia. Three additional specimens of Corylophinae are reported from Baltic and Bitterfeld ambers.

Key words: Tertiary, Eocene, Baltic amber, new species, *Clypastraea*, Parmulini, Corylophinae

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INTRODUCTION

The oldest known Corylophidae are reported from fossil resin of the Late Cretaceous (Rasnitsyn & Quicke 2002). The fossil record of minute hooded beetles from Eocene Baltic amber is very sparse, consisting of only two specimens ascribed to this family (Klebs 1910; Larsson 1978; Spahr 1981; Hieke & Pietrzeniuk 1984; Kulicka & Ślipiński 1996). Corylophidae are very rare in museum and private collections, no species from Eocene ambers has been described so far. *Corylophus* sp. was identified to genus level only (Klebs 1910). This inclusion of the historic Königsberg amber collection, now partly housed at the museum of the Geoscience Centre of the University of Göttingen (GZG), was not found (A. Gehler pers. comm.).

The modern Corylophidae are a small, cosmopolitan family of diminutive sized beetles placed in the superfamily Coccinelloidea (Robertson et al. 2015) with 285 described species in 27 genera (Robertson et al. 2013). Two subfamilies are recognized: Corylophinae LeConte, 1852 and Periptyctinae Ślipiński et al., 2001. Corylophids are microphagous fungivores as larvae and adults, feeding on fungal spores and hyphae. The beetles are typically encountered in habitats where moulds and other fungi are common, under bark and in decaying plant matter. (Robertson et al. 2013).

In the present paper the description of a new species and additional reports of Corylophidae found in Eocene Baltic and Bitterfeld ambers are provided. This new species is the first

formally described fossil representative of the family from Tertiary amber.

Institut (Müncheberg, Germany) as part of the institute amber collection.

MATERIAL AND METHODS

Four specimens were examined during the study. The material is deposited in Christel and Hans Werner Hoffeins (Hamburg, Germany) [CCHH] and the author's private collection (Kaliningrad, Russia) [CVIA]. The amber pieces from the CCHH have been prepared manually and embedded in a block of GTS-polyester resin (Hoffeins 2001). The pieces from the CVIA were polished by hand only.

Photographs were taken with a Zeiss AxioCamICc 3 digital camera mounted on a Zeiss Stemi 2000 stereomicroscope. The measurements were made using an ocular micrometer in a stereoscopic microscope. Reconstructions were made based on free-hand drawings during examination of the original specimen. The figures were edited using Adobe Photoshop CS8.

SYSTEMATIC PALEONTOLOGY

Superfamily Coccinelloidea Latreille, 1807
Family Corylophidae LeConte, 1852
Subfamily Corylophinae LeConte, 1852
Tribe Parmulini Poey, 1854
Genus *Clypastraea* Haldeman, 1842

C. primainterparens sp. nov.
 (Figs. 1 - 4)

Material examined. Holotype No. 1615-3 [CCHH], adult, possibly female (evenly curved apical sternite). Inclusion in a small yellow amber piece, embedded in a block of GTS-polyester resin measuring 15 x 7 x 4 mm. Syninclusions are absent.

The amber piece was obtained from a commercial source and will be deposited at the Senckenberg Deutsches Entomologisches

Type strata. Baltic Amber, Eocene.

Type locality. Yantarny settlement, Sambian peninsula, Kaliningrad region, Russia.

Differential diagnosis.

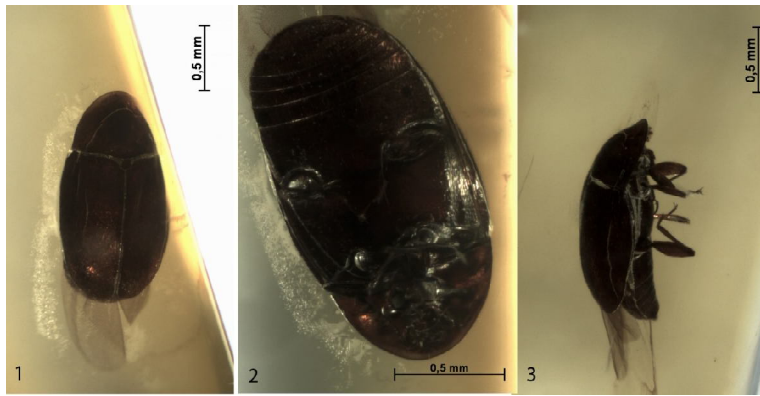
The specimen under study corresponds to the diagnosis of the subfamily Corylophinae and the tribe Parmulini (Ślipiński et al. 2009). However, mandibles, labial palps, details of head, internal characters of abdomen and venation of hind wings are invisible in this specimen. The characters of the genus (Bowstead 1999) are well discernible: anterior margin of prosternum sharply emarginated by antennal slots, leaving a truncate median plate; antennae 11-segmented, with well-formed club. These characters and the large body fit with the genus *Clypastraea* Haldeman, 1842.

The narrow sutural interval indicates the probable placement of the newly described species into the *orientalis* group. *C. primainterparens* sp. nov. differs from *C. maderae* (Kraatz, 1869) in the smooth interspaces between punctures and from *C. palmi* Bowstead, 1999 in the fully developed hind wings and the comparatively long elytra. The Eocene beetle shows a distinctly larger body length than the recent south-European *C. orientalis* (Reitter, 1877), which is only 1.1 - 1.46 mm long.

Description.

Habitus. Large (body length 1.67 mm, maximal body width 0.91 mm, maximal body height 0.57 mm), elongate, oval, moderately depressed, shortly pubescent. Color: entirely brown, slightly darker at center of the pronotal disc.

Head. Concealed, completely covered by the pronotum. Eyes large, oval. Mentum subquadrate. Submentum very short and broad. Antennae doubly geniculate in repose, 11-segmented, with a 3-segmented, weakly asymmetrical club. Pedicel and scape subequal in length. First and second segments of the club



Figures 1-3.
Clypastraea primainterparens sp. nov. Holotype; No. 1615-3 [CCHH]. Habitus: 1 - Dorsal view; 2 - Ventral view; 3 - Lateral view.

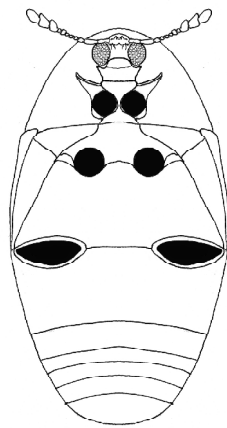
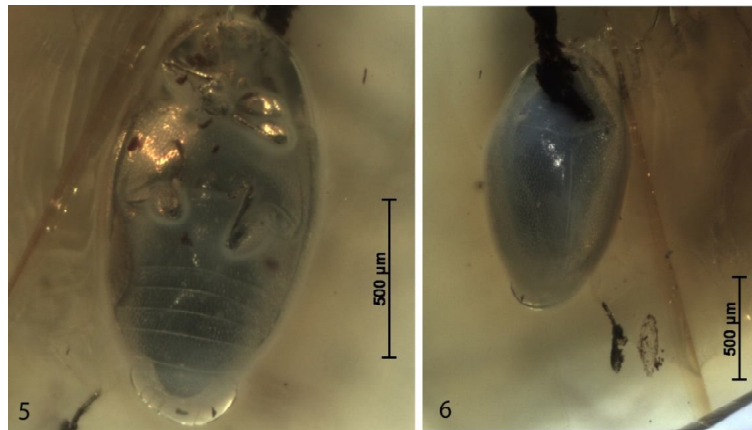


Figure 4. *Clypastraea primainterparens* sp. nov. Habitus ventrally, reconstruction.



Figures 5-6. Corylophinae. Specimen No 1303-2 [CCHH]. Habitus: 1 - Ventral view; 2 - Dorsal view.

subtriangular; apical segment of the club oval, broad and rounded apically. Ratio of antennomere lengths: 5.0: 5.0: 2.0: 1.0: 1.0: 1.0: 2.0: 1.0: 4.0: 4.0: 5.0.

Thorax. Pronotum finely bordered; transverse (median length 0.48 mm; basal width 0.85 mm), with broadly arcuate anterior margin and slightly bisinuate posterior margin. Anterior angles absent, posterior angles straight. Pronotal punctuation dense, distinct (especially basally), round, separated by distance almost equal to that of a puncture diameter. Prosternal process flat, narrow between coxae, expanding posteriorly into a triangle meeting postcoxal projections. Anterior margin of the prosternum emarginated

by antennal slots, leaving a truncate median plate. Mesepisternum and mesepimeron not separated by a suture. Sinuate line at base of the mesosternum not visible due to position of legs. Metepisternum narrowly triangular, slightly shorter than epipleuron, reaching the metacoxal cavities. Postcoxal lines absent. Scutellum triangular, rounded apically, transverse (1.4 times as wide as long).

Wings. Elytra broadest in anterior third; almost as wide as pronotal base anteriorly; elongate (sutural length 1.14 mm, maximal width 0.91 mm), separately rounded apically; irregularly punctured and recumbently pubescent. Puncture of elytra longitudinally oval, fine and

comparatively sparse, separated by distance 1.5-2 times as diameter of punctures, with a long pubescence overlapping the next row of punctures, interspaces smooth and shining. Sutural stria long (two-thirds of the elytral length apically, not discernible in the basal third). Sutural interval narrow, with one row of punctures. Epipleura present, widest at humeral area; reaching the first ventrite. Metathoracal wings fully developed, partially exposed.

Legs. Pro- and mesocoxae rounded; procoxae narrowly separated by the prosternal process; distance between mesocoxae twice broader than mesocoxal diameter; metacoxae strongly transverse, separated by distance 4 x that of the metacoxal diameter. Femora broad, flattened. Tibiae slender. Tarsi 4-segmented; last metatarsomere as long as tarsomeres 1 - 3 combined. Claws simple, long (three times shorter than metatarsomere 4), curved, symmetrical.

Abdomen. With six visible ventrites. Ratio of ventrite lengths: 22.0-5.0-4.0-5.0-7.0-7.0. Basal ventrite without femoral lines. Last ventrite widely rounded apically.

Derivatio nominis. The specific epithet is derived from “primus inter pares” (feminine: prima inter pares), a Latin phrase meaning “first among equals”. The name is used as noun in apposition and refers to the habitual similarity to the recent congeners and Tertiary origin of the fossil specimen.

Additional three new reports of fossil Corylophinae LeConte, 1852 from Eocene ambers.

1. Specimen No 1303-2 [CCHH]. Figs. 5 - 6. Baltic amber. A comparatively well visible, complete beetle included in a small yellow amber piece embedded in a block of GTS-polyester resin (size 7 x 6 x 2 mm). Total body length 1.25 mm. Dark. Distinctly punctured and sparsely pubescent dorsally. Hind wings exposed. Head completely covered by the pronotum. Antennae with 3-segmented club. Pronotum transverse (0.75 as long as wide) with

non-produced posterior angles. Scutellum slightly transverse. Sutural stria incomplete basally. Abdomen fully covered by elytra, with 6 visible ventrites. Tarsal formula 4-4-4. Antennal segmentation and prothoracal details not clearly visible.

2. Specimen AWI-112 [CVIA]. Bitterfeld amber (Germany, Sachsen-Anhalt). A complete beetle included in a small orange polished amber piece (size 14 x 11 x 2.5 mm) without any additional fixation. Total body length 1.25 mm. Dark brown. Distinctly punctured and sparsely pubescent dorsally. Head completely covered by the pronotum. Antennae clubbed. Elytra not covering the last abdominal tergite. Tarsi tetramerous. Metacoxae widely separated. Pro- and mesothorax covered by dense milky-white coating, antennae partly invisible.

3. Specimen AWI-114 [CVIA]. Bitterfeld amber (Germany, Sachsen-Anhalt). A complete beetle included in a small orange polished amber piece (size 12 x 8 x 3 mm) without any additional fixation. Total body length 1.1 mm. Dark brown. Distinctly punctured and sparsely pubescent dorsally. Head completely covered by the pronotum. Tarsal formula probably 4-4-4. Abdomen with 6 visible ventrites. Ventral side scarcely visible, antennae concealed.

Remarks. The diagnostic characters of these 3 specimens do not allow a precise assignment to any tribal and generic level at the moment and need further studies. However, these three inclusions clearly differ from *Clypastraea primainter pares* sp. nov. in the general body shape, body size and dorsal punctuation.

DISCUSSION

Spermathecal shape and the internal armature of penis provide the only reliable means for the determination of recent *Clypastraea* species (Bowstead 1999). In fossils, such internal structures rarely are preserved or visible; thus, for the description of the amber specimen, only external characters were used. Further investigations by micro-computer tomography

could help to reveal even internal genital features in Coleoptera inclusions, as it was recently published in case of Diptera (Kehlmaier et al. 2014).

The genus *Clypastraea* Haldeman is cosmopolitan and related to subcortical habitats (Cit.). Preferred habitats for the West Palaearctic *Clypastraea* according to Bowstead (1999) are following: around old deciduous trees, in litter and fungoid twigs, and in faggots [*C. brunnea* (Bris.), *C. lata* (Reitt.), *C. reitteri* Bowstead]; under bark of spruce and pine, especially trees damaged by fire [*C. pusilla* (Gyll.)]. For the fossil species, a similar biology (subcortical in forest habitats with numerous over-matured trees, abundance of rotten logs, trunks, and twigs of different coniferous and broadleaf trees) can be assumed.

The family Corylophidae most likely has been far more common in the Baltic amber forest than the few findings indicate. *Clypastraea primainterparens* sp. nov. is the first Tertiary record of corylophid Coleoptera, but a wider generic diversity of this family in Eocene amber is evident as shown by three specimens that remained unnamed in this study. The "rarity" of corylophid inclusions primarily seems to be a matter of small size in connection with habitat preferences near the ground of trees producing resin and not on the trunks itself, as other abundant arthropods in amber.

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