

FOSSIL LABIDOSTOMATID MITES (PROSTIGMATA: LABIDOSTOMMATIDAE) FROM BALTIC AMBER

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ABSTRACT — Unequivocal fossil records of the mite family Labidostommatidae (Acari: Prostigmata: Trombidiformes) are described from Eocene Baltic amber. These two modern-looking specimens can be assigned to the extant genus *Labidostomma* Kramer, 1879 and are formally described here as *Labidostomma paleoluteum* **sp. nov.** Interestingly, the fossil specimens are associated in the amber piece with collembolans — a group on which modern labidostomatids readily prey — and other arthropods inhabiting upper soil layers.

KEYWORDS — Acari; labidostomatid mite; taxonomy; fossil; Eocene; Baltic amber

INTRODUCTION

Fossil mites are fairly rare, although perhaps not as rare as would be expected. A complete list of published records of fossil mites and other arachnids was recently made available as an online, and regularly updated, catalogue (Dunlop *et al.* 2011). There are undoubtedly further fossil mites - particularly in amber - which have yet to be formally described. Here, we focus on the Labidostommatidae, a trombidiform mite family. With respect to their fossil record, their presence in Baltic amber was mentioned by both Sellnick (1931) and Magowski and Tobolewski *in* Kosmowska-Ceranowicz, (2001); although neither study formally named the specimens nor included figures which would allow us to verify these identifications. Wunderlich (2002, fig. 3) figured an apparently predatory mite as "?Labidostemmidae" - the family name has under-

gone a number of historical spelling variants - in Baltic amber, apparently in the process of attacking and/or feeding upon the opisthosoma of a theridiid spider. The same figure was reproduced in Wunderlich (2004, p. 127) as "Labidostommidae?".

Labidostommatidae is a distinctive and cosmopolitan group of heavily armoured, fast-moving, predatory mites (Walter *et al.* 2009); with about fifty extant species. Feider and Vasiliu (1969), then Bertrand (1990) revised the family, which is organized in a number of directions by adaptations to ecological conditions. Epi- or hemiedaphic species often show a wide distribution: i.e. most species of the genera *Labidostomma* or *Eunicolina* Berlese, 1911. Examples of species under eu-edaphic conditions include the genus *Akrostomma* Robaux, 1977 and troglophilous species like *Labidostomma motasi* Iavorschi, 1992. The distribution of the genera is

wide. They may be cosmopolitan (i.e. *Labidostomma*) or widespread but typically Gondwanan, like the genera *Sellnickiella* Feider and Vasiliu, 1969 or *Atyeonella* Feider and Vasiliu, 1969. This can be interpreted as a consequence of the result of successive fragmentation of ancient and large areas.

In the fossil previously described (Wunderlich 2002), the disposition of the figured forelegs and the author's remarks about a heavily sclerotized cuticle are consistent with a labidostommatid: however, the published drawings are not of sufficient quality to confirm its assignment to any particular higher mite taxon (see also Discussion). Here, we describe unequivocal fossil representatives of Labidostommatidae based on two well-preserved inclusions in Baltic amber. These we recognise as a new species of the extant genus *Labidostomma* Kramer, 1879.

MATERIALS AND METHODS

The fossils described here originate from the Jörg Wunderlich amber collection and bear the inventory number F2152/BB/AC/CJW. Both mites are enclosed within in a single rectangular (ca 19 x 9 mm) piece of clear, yellow amber (Fig. 1), together with a staphylinid beetle, another mite (Eupodoidea) and some large collembolans as syninclusions. Other mites from the Wunderlich collection have been deposited in the Senckenberg Museum für Naturkunde Görlitz, Germany - and the present specimens may eventually be deposited here too (J. Wunderlich, pers. comm.). The fossils were drawn using a stereomicroscope with a camera lucida attachment and photographed under a stereomicroscope running the software package Leica Application Suite. A series of photographs were taken at different focal planes and combined into a single, final image using AutoMontage®. A Wild Leitz 20EB microscope with modified lighting (reflect light) was used in Montpellier (10x6.4 or x16 or 25x6.4 or x16).

A precise type locality for the specimens is not available, but much of the recently collected Baltic amber stems from the Kaliningrad region of the Baltic coast of Russia. Amber is difficult to date accurately, but Baltic amber is usually assigned to a

Palaeogene (Eocene) age of about 45 Ma. The fossils were compared to descriptions of modern taxa in the literature, together with extant labidostommatid material in MB's collection.

LABIDOSTOMATIDES

Labidostomatides

Lindquist, Krantz & Walter, 2009

(= suborder Labidostommina Evans, 1992)

Family Labidostommatidae Oudemans, 1904

Genus *Labidostomma* Kramer, 1879

Remarks — Bertrand (1990) recognised four labidostommatid genera: the Holarctic *Eunicolina* Berlese, 1911 characterized by multiplication of pustules and *Akrostomma* Robaux, 1977, with a dense reticulate cuticular pattern and characterized by body shape and cheliceral morphology, the southern hemisphere *Sellnickiella* Feider and Vasiliu, 1969 - see also Bertrand (1997) - with loss of the gland-like organ, and the world-wide distributed *Labidostomma*. The latter was considered 'primitive' because of the retention of the main (plesiomorphic) characters shared by other representatives of the family, e.g. a primitive famulus, eyes, a pair of gland-like organs, chelicerae not modified; although some species acquired specialized characters that are considered as adaptations (neotaxy of gland-like organs, eye reduction, development of genual of PI, neotrichy, etc). For further taxonomic accounts of modern *Labidostomma* see, e.g., Bertrand (1981), Bertrand and Theron (1990), Iavorschi (1992) or Bertrand and Corpuz Raros (1997).

Note on the family and genus nomenclature: Etymology of the generic name *Labidostomma* refers to both Latin and Greek with *Labidos* referring to the large chelicerae and *Stoma*, *stomatos*, mouth. Berlese, Oudemans, Grandjean, and others selected the orthography with a single 'm' — which is etymologically correct — whereas other authors imposed an erroneous orthograph (see e.g. the large mandibles of *Labidostomis* Chevrolat, 1837 (Insecta, Chrysomelidae)). Returning to the original generic description of Kramer (1879), we are forced to retain

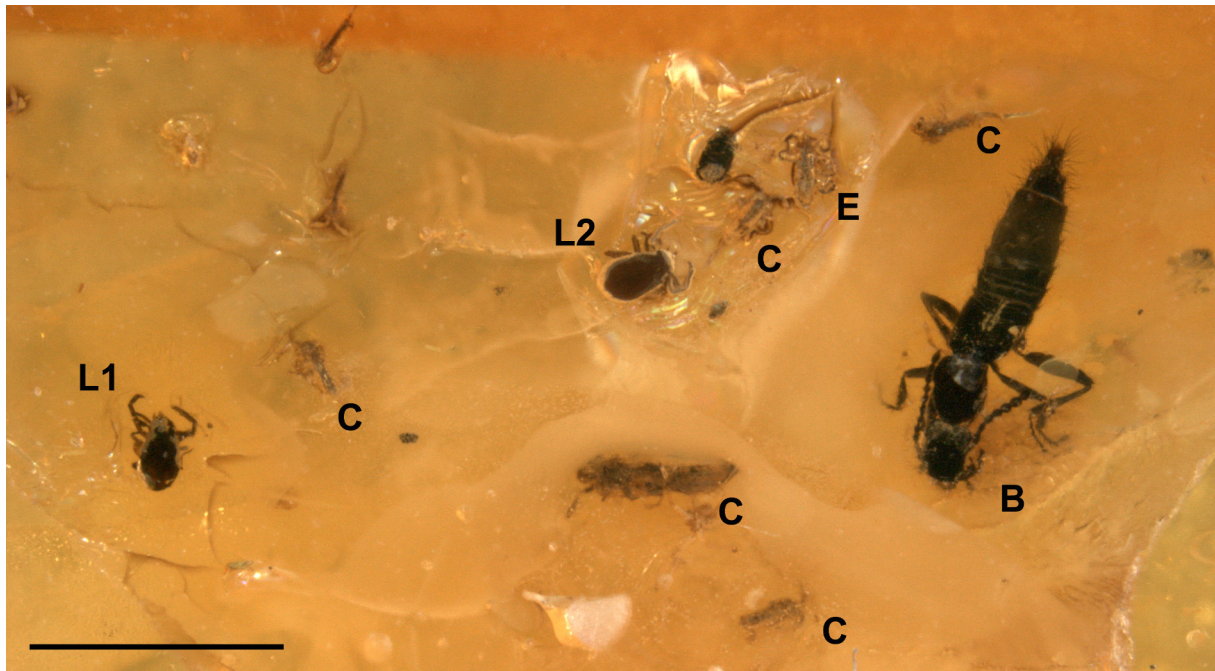


FIGURE 1: Overview of the amber piece including the two labidostommatid mites (L1: holotype; L2: paratype), both described here as new; a eupodoid mite (E), a number of collembollans (C) and a staphylinid beetle (B). The association of the mites with one of their typical prey items (collembollans) is noteworthy. Scale bar equals 2 mm.

his initial orthographic mistake, i.e. *Labidostomma*, and treat Labidostommatidae (with a double 'm') as the valid family name. Note that this does not apply to the more recently established higher taxon (cohort) Labidostomatides.

***Labidostomma paleoluteum* sp. nov.**
(Figures 1–4)

Etymology

From the Greek *palaíos* (Παλαιός) 'old' and the suffix *luteum* derived from a similar-looking, and perhaps closely related, Recent species *Labidostomma luteum* Kramer, 1879.

Material

F21521/BB/AC/CJW. Two specimens (here designated as a holo- and paratype) within a single piece of amber (Fig. 1); together with a staphylinid beetle, one eupodoid mite and some collembollans as syninclusions. Baltic amber, precise locality not recorded; Palaeogene (Eocene).

Description

Notation follows F. Grandjean (1942). Dorsal view only visible in both specimens; body cuticle distinctly sclerotized, with alveolate ornamentation, clearly visible anteriorly, in central zone and in lateral fields on the opisthosoma (Figs 2–3). Anteriorly the body is rounded with a terminal eye clearly visible in a frontal position. Dorsal setation is distinguished and visible via the setae themselves or by the insertion points of missing setae: two pairs of trichobothria (*boa* and *bop*), rather long, each with at least two or three branches. Aspidosomal setae: *ga* (long), *ge*, *gm*, *gr* as in *L. luteum*. Laterally the gland-like organ (pustule) is visible at least on the left side near the seta *gr* which is long. Perturbation in ornamentation near the base of *gr* interpreted here as the lateral eye. Opisthosomal setae: usual files of simple setae, lateral and dorsal *da* to *de* and *la* to *le*.

A lateral cuticular accident on the posterior end of the dorsal shield could be a supplementary pustule (similar to *L. jacquemarti* Coineau, 1964 or *vialeae* Bertrand, 1981), in a postero-lateral position

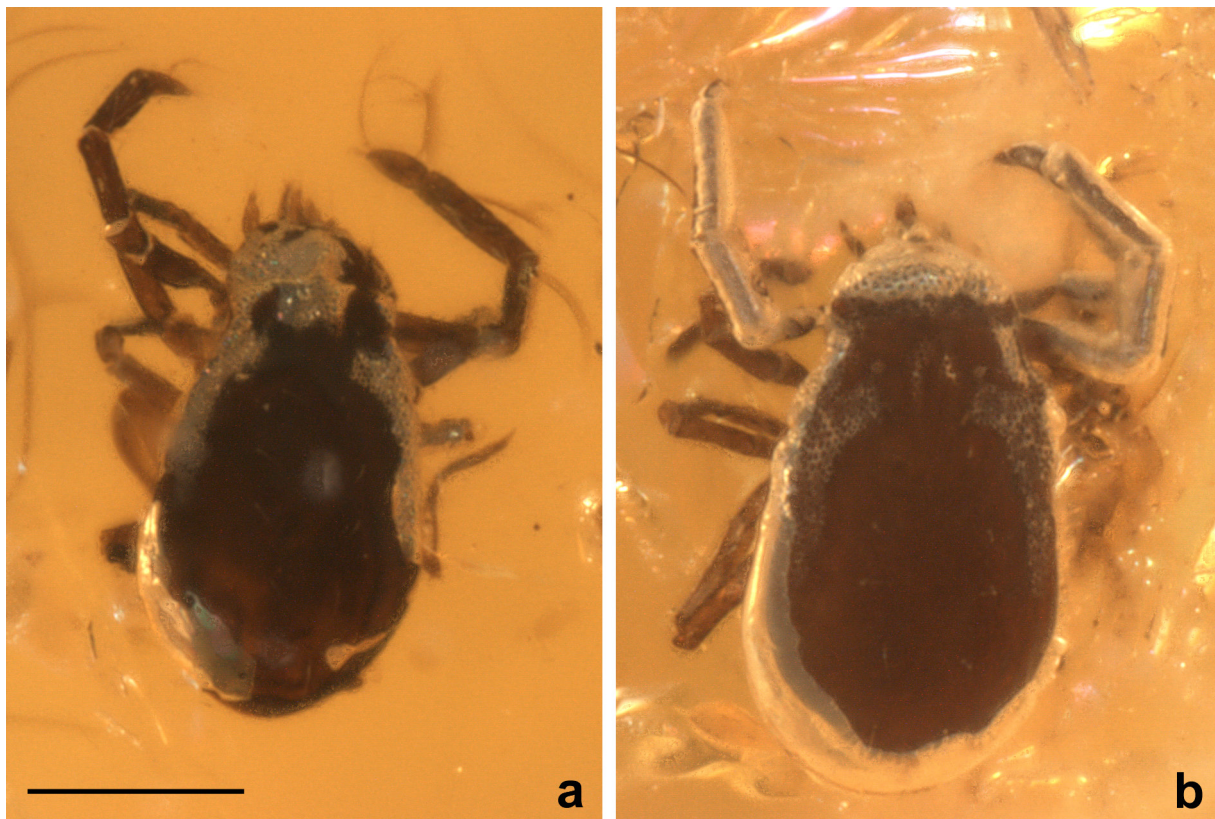


FIGURE 2: *Labidostoma paleoluteum* sp. nov. a – Holotype. b – Paratype. From Baltic amber (Palaeogene: Eocene). Both in dorsal view; scale bars equal 0.2 mm.

on the dorsal shield. However, it could be an artefact; several Recent species express changes in cuticular cells in this same zone. Cuticle: when well-visible reticulate with polygons. Ornamentation poorly visible on remainder of the dorsal shield which could be punctate or granulate. In recent labidostommids the cuticular polygons often vanish into granular, or increasingly less visible foveate, ornamentation from the peripheral to central dorsal shield.

Gnathosoma — Only visible in dorsal view. Fixed digit: extremity as in *L. luteum* or *integrum* dorsal subterminal setae *chb* was not visible. Setae *cha* long, proximally inserted on a tubercle (base hidden by dorsal shield). Palp visible from tibia to tarsus: habitual form, some unbroken setae present, especially the terminal seta that forms the terminal eupathidia characteristic of the family; a small lateral seta could represent the tarsal solenidion. Rest

of setation compatible with usual pattern (1, 1, 3, 4+ ω).

Legs — The legs show habitual division into tripartite femora, and on the first pair articular function is devoted to telofemur-genu junction rather than to genu-tibia junction, as in the Recent species. PII-PIV claws not visible. PI: claw with two ungues, with long tarsal setae (simple setae). Terminal lateral setae long corresponding to the tarsal eupathidia described from extant labidostommids. Chaetotaxy: Tibia: the usual setae are found; i.e. the long dorsal or ventral setae (terminal and median) and dosolateral and ventrolateral files. Tarsus poorly visible, but dorsally three hard to interpret anomalies could represent two dorsal tarsal solenidia, and the famulus that could be *luteum*-like; a barely visible rounded mass seems to be lightly discernible but would need more precise examination to confirm its identity.

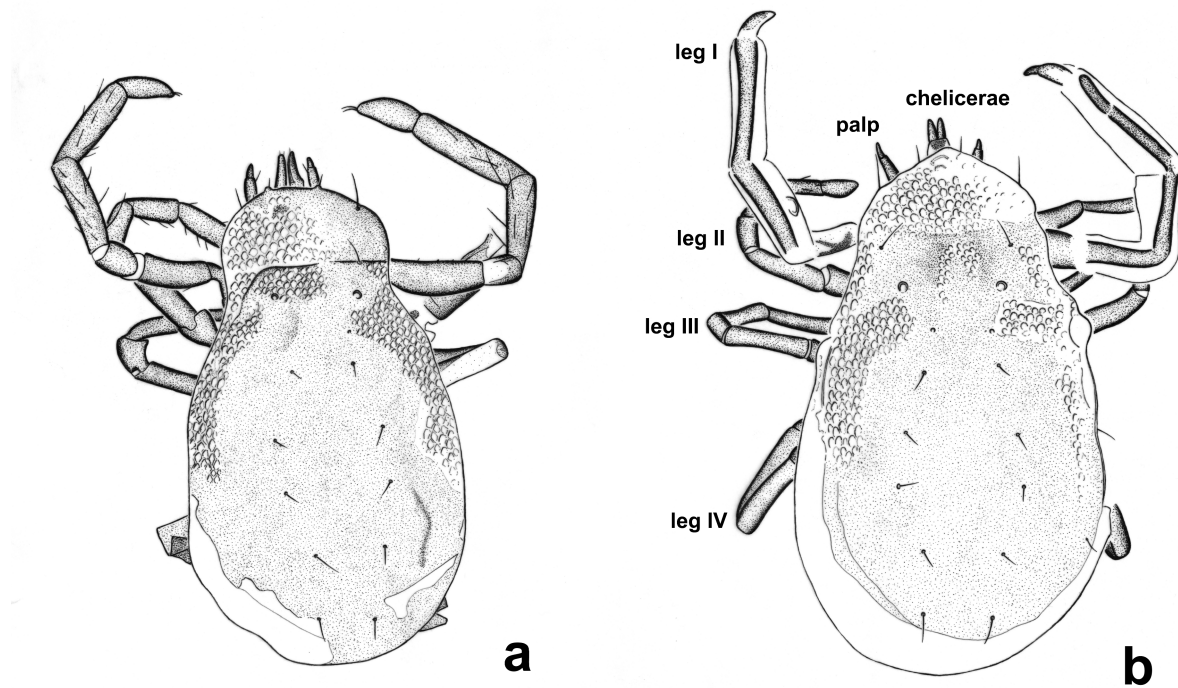


FIGURE 3: Interpretative *camera lucida* drawings of the specimens shown in Fig. 2. a – Holotype. b – Paratype. Both in dorsal view; scale bar equals 0.2 mm.

Dimensions (all in μm) — Total length 610. Dorsal shield = 550 long, 320 wide.

Frontal eye 30 diameter; gland-like organ: diameter 27 – 30, setae: trichobothria length 60 – 70, dorsal setae length about 50 – 60. PI: tarsus length 65 (without claws); tibia length 150 – 160; genual length about 120; Femur: length 125. Cheliceral proximal seta length 75. Terminal palpal seta length 40 – 50.

Diagnosis

Although examination is only possible in dorsal view, the general morphology of this species corresponds to the pattern of the genus *Labidostomma*. It could not be confused with *cornuta* Canestrini et Fanzago, 1877 neither with the group of species related to *L. integrum* which are characterized by subterminal anterior eye, or cuticular pattern, length of tibia, development of lateral gland-like organ. Among the described species *L. (Nicolettiella) paleoluteum* n. sp. resembles *L. luteum* or *L. denticulata*

lata Schrank, 1781 and should be classified in the same subgenus. Close to *luteum* in terms of size, dorsal ornamentation and appendages ornamentation, it differs from it and *denticulata* by absence of the frontal projections (cornua) that characterize these species. Lengths of articles in the first pair of leg are very similar to *L. luteum*, which is the most widely distributed species in Europe occurring from Mediterranean climates to Finland.

DISCUSSION

The Baltic amber deposit is the richest single source of fossil mites, probably since it has been intensively sampled for over 150 years. As in many other cases of Baltic amber mites (e.g. Bolland and Magowski 1990; Coineau and Magowski 1994; Witaliński 2000; Judson and Wunderlich 2003; Norton 2006), the fossils are essentially modern-looking and can be referred with some confidence to an extant genus. Labidostommatidae, and *Labidostomma*, thus date

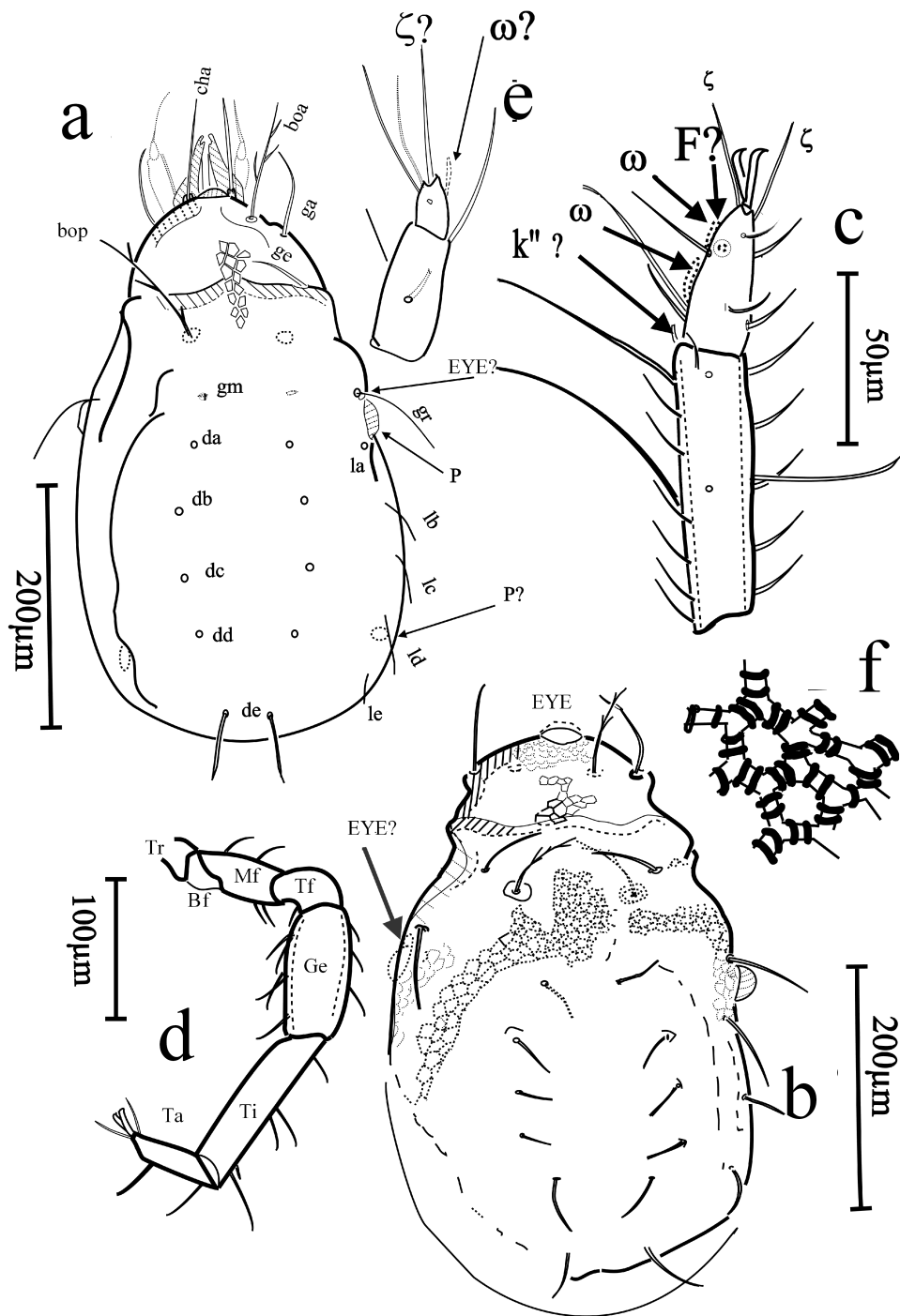


FIGURE 4: Morphological details. a-b – Dorsal view, specimen 1 and 2; c – P1 tibia and tarsus; d – P1; e – Palp terminal articles. f – Detail of anterodorsal sculpture. Abbreviations: ζ eupathidium, ω tarsal solenidion, *boa-bop*: trichobothria, *cha*: proximal cheliceral seta, *F*: famulus, *ga*, *ge*, *gm*, *gr*: aspidosomal dorsal setae, *k''*: tibial famulus, *la* to *le* and *da* to *de*: lateral and dorsal files of setae, *P*: posterolateral cuticular irregularity of dorsal shield. *Tr*, *Bf*, *Mf*, *Tf*, *Ge*, *Ti*, *Ta*: articles of PI (trochanter, basi, medio, telo femora, genu and tarsus)

from at least the Eocene and show a strong degree of stasis; i.e. little morphological change over long periods of geological time. The modernity of the fossils suggests the group originated much earlier. The presence of large collembolans - and a large Eupodina mite - as syninclusions in the amber piece is of interest, characterizing the assemblage as an epigeic surface fauna, on which the carnivorous labidostommids could presumably have fed.

Wunderlich's (2002, 2004) observation of a putative labidostomid attacking a spider seems to us unlikely. Predatory behaviour of this nature is not known for modern labidostommids. Phoresy would be a possibility, but in general a mite attached by its mouthparts to a spider would be more consistent with the larva of something like an erythraeid or trombidid mite (both Parasitengona). We hoped to examine the original specimen on which this observation was based, but it could not be traced either in Wunderlich's own collection, or among the material originally from his collection now deposited in Görlitz (Axel Christian, pers. comm. 2011).

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