A New Eocene Free-Living Cheyletid Mite from Baltic Amber

Authors: Bochkov, Andre V., and Sidorchuk, Ekaterina A.
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A new Eocene free-living cheyletid mite from Baltic amber

ANDRE V. BOCHKOV and EKATERINA A. SIDORCHUK

A new species of predaceous mite, Cheletominus (Hemicheyletia) crinitus sp. nov. (Acariformes: Cheyletidae), is described from Eocene Baltic amber based on a fossil female. Among species of the genus, it belongs to the C. (H.) wellsi species group (16 extant species) and differs from the closely morphologically related species, C. greenwoodi by the following features. In C. crinitus sp. nov., setae d2 are situated on the hysteronotal shield (vs. off this shield in C. greenwoodi), the propodonotal and hysteronotal shields each bear five pairs of median setae (vs. 3 and 1 pairs of median setae, respectively), setae h1 and h2 are subequal in width to other lateral hysteronotal setae (vs. half the width of other hysteronotal setae).

Introduction

The mite family Cheyletidae Leach, 1815 (Acariformes: Cheyletoida) is cosmopolitan and includes more than 440 species in 75 genera (Zhang et al. 2011). Most of these mites are free-living predators, though representatives of several taxonomic groups are permanent ectoparasites of small mammals and birds (Bochkov 2004, 2009). Fossil finds of cheyletids are extremely scarce and described inadequately: one specimen is known from Baltic amber (Koch and Berendt 1854) and another, from Cretaceous Burmese amber (Cockerell 1917).

Recently developed preparation techniques (Sidorchuk 2011, 2013) allow for much closer observation of amber inclusions, especially if the amber is transparent, as was the case for our piece. It was therefore possible to assess the morphological traits normally used for description of extant mites.

In the present paper, we describe a new species of cheyletid from Baltic amber based on a female belonging to the genus Cheletominus Oudemans, 1904 (Oudemans 1904b) in tribe Cheletini Leach, 1815. This genus is represented by about 36 extant species of the free-living predators, commonly inhabiting leaves of plants. They are known from all the continents except Antarctica, but mostly from the warmer climatic regions (Fain et al. 2002).

Institutional abbreviations.—CCHH, the private collection of Christel and Hans-Werner Hoffeins, Collection Christel & Hans-Werner Hoffeins, Hamburg, Germany; SMF, Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt, Germany.

Other abbreviations.—1a–c, 2c, 3a–c, 4a–c, coxal setae of coxae 1–4, respectively; a, antelateral leg tarsus seta; acm, anteroculminal palpal eupathidia; ag1–3, aggenital setae; b.s., bush-like seta; c2, d2, e2, f2, h1–h3, dorsal setae associated with body segments C, D, E, F, H, respectively; d, dorsal seta; ele, supracoxal seta; emp, empodium; F, femur; ft, fastigial leg tarsus seta; G, genu; g1–2, genital setae; l, lateral seta; m, medial subcapitular seta; oc, ocellus; p, proral leg tarsus seta; per, peritreme; ps1–3, pseudanal setae; se, scapular external prodorsal seta; si, scapular internal prodorsal seta; sul, subulimal palpal eupathidium; tc, tectal leg tarsus seta; Ti, tibia; t.i.c., tibial claw; u, unguinal leg tarsus seta; ul, ultimal palpal eupathidium; v, ventral seta; ve, vertical external prodorsal seta; vi, vertical internal prodorsal seta; vs, ventroasgitall leg tarsus seta; ω, tarsal solenidion; φ and ′′ refer to position of seta in pseudosymmetrical pair on appendage: anterior or posterior, respectively.

Material and methods

The piece of Baltic amber (SMF Be 2537, originally CCHH # 448-1), originally ca. 5 × 5 × 10 mm, was affixed with double-side sticky tape to a plastic rod and trimmed with a diamond disk saw using a Proxxon GG 12 tool. Then it was polished on four sides with the help of pit holders and an OpenScience MiniPolly polisher, as described by Sidorchuk (2013), to obtain a rectangular piece ca. 1 × 0.3 × 0.3 mm. The piece is stored in an o-ring 2 ml centrifuge tube in an aqueous solution of Thymol (2 drops of saturated Thymol solution per 1 ml of water).

Individual focal planes were taken using a Nikon Eclipse 800 microscope in brightfield mode with water immersion lenses (40× and 60×). In some cases, a green interference filter was used to reduce chromatic aberration. Clarity-enhanced and noise-reduced stacks of images (focal planes) were taken with an AmScope MU 900, and then processed with Adobe Photoshop Lightroom 5. Layers were combined with Helicon Focus Pro 4 and 5.3 software, always with some manual addition of significant details from the individual focal planes to the combined images. Micropanoramas were created with GIMP software, with correction of the colour levels when necessary.

Drawings were made using a phase contrast Leica microscope with a camera lucida. In the descriptions below, the idiosomal chaetotaxy follows Grandjean (1939) as adapted for Prostigmata by Kethley (1990). The nomenclature for leg setae follows that of Grandjean (1944). All measurements are in micrometers (μm).

Fig. 1. Cheyletid mite Cheletomimus crinitus sp. nov., female holotype (SMF Be 2537, ex. CCHH 448-1) from Baltic amber (Baltic Sea coast, most likely Sambian Peninsula, middle to upper Eocene, 37–54.5 Mya), reconstruction (leg positions altered for clarity). Dorsal (B) and ventral (C) views, right palp (A) and left tibia and tarsus I (D) in dorsal views, left tarsus I in ventral view (E). Abbreviations: 1a–c, 2c, 3a–c, 4a–c, coxal setae of coxae 1–4, respectively; c2, d2, e2, f2, h1–h3, dorsal setae, associated with body segments C, D, E, F, H, respectively; ′ and ″ refer to position of seta in pseudosymmetrical pair on appendage: anterior or posterior, respectively.
Systematic palaeontology

Class Arachnida Lamarck, 1801
Order Acariformes Zakhvatkin, 1952
Family Cheyletidae Leach, 1815
Tribe Cheyletini Leach, 1815
Genus Cheletomimus Oudemans, 1904

Type species: Cheletes berlesei Oudemans, 1904; Recent, Italy.

Subgenus Hemicheyletia Volgin, 1969

Type species: Paracheyletia bakeri Ehara, 1962; Recent, Japan.

Cheletomimus (Hemicheyletia) crinitus sp. nov.

Figs. 1–3.

Etymology: From Latin *crinitus*, fluffy; in reference to numerous bush-like median setae on the dorsal shields of the idiosoma; masculine gender.

Holotype: Female, SMF Be 2537 (originally CCHH # 448-1).
Type locality: Baltic Sea coast, most likely Sambian Peninsula.

Type horizon: Middle to upper Eocene in amber, 37–54.5 Mya (Poinar 1992; Weitschat and Wichard 2010).

Diagnosis.—This new species belongs to the C. (H.) wellsi species group (16 species) of the subgenus Hemicheyletia Volgin, 1969. In females of this group, dorso-median setae of the idiosoma are aberrant, strongly different from lateral setae, and the hysteronotal shield is entire. Among species of this group, female of C. (H.) crinitus sp. nov. morphologically similar to those of C. greenwoodi Fain, Bochkov, and Corpuz-Raros, 2002 known from England (Fain et al. 2002). In these species, tibia I bears five setae (excluding solenidion), seta l″Ti on the palpal tibia is thickened serrate, the hysteronotal shield bears median bush-like setae and lateral fan-like setae, including h1 and h2, seta ft of tarsus I present. Female of the new species differs from those of C. greenwoodi by the following features. In C. crinitus sp. nov., setae d2 are situated on the hysteronotal shield (vs. off this shield in C. greenwoodi), the propodonotal and hysteronotal shields each bear five pairs of median setae (vs. 3 and 1 pairs of median setae, respectively), setae h1 and h2 are subequal in width to the other lateral hysteronotal setae (vs. half the width of other hysteronotal setae).

Description.—Female (holotype, SMF Be 2537). Body 435 long and 225 wide at the level of setae c2.

Gnathosoma: 135 long from the rostral apex to posterior margin of subcapitulum from ventral side and 90 wide at the...

**Idiosoma**: 315 long. Lateral setae of the idiosoma fan-like, subequal in size, about 25 long and maximum 23 wide; median setae of the idiosoma aberrant, bush-like. Length of propodonotal shield 135 along midline and 175 wide at level of the posterior margin; bearing four pairs of lateral setae and five pairs of median setae. Setae c2 fan-like, 45 long. Hysteronotal shield well developed, length 125 along midline, 170 wide at the level of the anterior margin, and 65 wide at level of the posterior margin; bearing five pairs of lateral setae, including d2 and h1, and five pairs of median setae. Setae h1 situated posterior to the level of setal bases h2. Distance between propodonotal and hysteronotal shields 10. Setae h3 fan-like, 35 long, situated terminally off the hysteronotal shield. Setae psI fan-like, 12 long, other pseudoanal setae filiform.

**Legs**: Solenidion oI 22 long, companion seta ft present, 12 long. Tibia I with five setae and solenidion φ (three fan-like setae, d′, l′, φ and two smooth filiform setae, v′, v′′); tibia II with two lanceolate setae, two smooth filiform setae and solenidion φ; tibiae III and IV each with two fan-like setae, one lanceolate seta, and one smooth filiform seta. Genua I–IV with two fan-like setae each (genu I with solenidion σ). Femur I with one fan-like seta and one smooth filiform seta; femora II and III with one fan-like seta and one barbed seta each; femur IV with one fan-like seta. Coxal seta 3b strongly barbed. Legs I 220 long; legs IV 155 long.

*Geographic and stratigraphic range.—* Type locality and horizon only.

**Discussion**

According to rough estimates made with a molecular clock (18S rDNA), the family Cheyletidae diverged with the Syringodermidae (Acari: Oribatida). Molecular phylogeny of extant cheyletid species in detail. Its specialized structures (aberrant dorso-median setae of the idiosoma, granulated rostrum, leg setation, etc.) are comparable to those of any modern genera of the morphologically derived C. (H.) wellsi group, and this species has no plesiomorphic character states that would allow us to put it to the base of the wellsi group phylogeny. We speculate, therefore, that the genus *Cheletomimus* probably appeared earlier than 50 Mya, and that many modern genera of free-living cheyletids existed in the Eocene.

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**References**


