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Dryophthorine weevils in Dominican amber (Coleoptera: Curculionidae)

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Two new species of dryophthorine weevils (Curculionoidea: Curculionidae: Dryophthorinae: Dryophthorini) are described and figured from remains preserved in Early Miocene (Burdigalian) amber from the Dominican Republic. *Stenommatus pulvereus* n. sp. and *Dryophthorus acarophilus* n. sp. are distinguished from each other as well as modern congeners. These are the first, described amber fossils of the subfamily Dryophthorinae and the fourth and fifth definitive fossil records for the Dryophthorini. Like many modern species of dryophthorines the fossils have been found in association with mites (Acari), indicating that this likely phoretic interaction is at least 19 million years old.

Keywords: Caribbean, Dryophthorinae, paleontology, Polyphaga, taxonomy, Tertiary.

Introduction

Weevils of the tribe Dryophthorini are relatively small and distinctive from other tribes of the subfamily Dryophthorinae (*sensu* Anderson, 2002) by the antennal funicle being composed of four segments. The tribe comprises three modern genera – *Dryophthorus* Germar, 1824; *Stenommatus* Wollaston, 1873; and *Psilodryophthorus* Wollaston, 1873. Traditionally, the tribe was recognized as a subfamily and was placed near Rhynchophorinae and Orthognathinae in the Brachyceridae or was united with the aforementioned subfamilies into a family of its own, as Dryophthoridae. More modern classifications, however, have expanded the concept of Curculionidae to include the dryophthorids as a distinct, relatively-basal subfamily, with the constituent subfamilies demoted to tribal rank therein. The biology of Dryophthorini has not been intensively investigated. Species generally live in decaying wood and tend to be relatively strong flyers. Interestingly, a species of *Dryophthorus* has been found in associationwith nests of the termite *Reticulitermes speratus* (Kolbe) in Japan (Iwata and Banno, 1995).

The fossil record of Dryophthorini is exceptionally poor. Only three prior records exist for the tribe, all as compressions with little or no relief – *Lithophthorus rugosicollis* Scudder (1893) from the Eocene-Oligocene boundary of Florissant, Colorado; and *Dryophthorus superbus* (Piton, 1935) and *D. incertus* (Théobald *In* Piton and Théobald, 1935) from Lac Chambon (Puy-de-Dôme), France and Aix-en-Provence, France, respectively. Other genera and species have been described as dryophthorines (*e.g.*, Scudder, 1893; Voss, 1953) but have been transferred to other subfamilies (*e.g.*, Kuschel, 1992; Zherikhin, 2000). In addition, Klebs (1910) reported an undescribed *Dryophthorus* from middle Eocene Baltic amber but, as noted by Zherikhin (2000), this record is quite dubious. Given the taxonomic conventions of the era we must await the future discovery of new

Figures 1–3. Photomicrographs of Dominican amber dryophthorine weevils. 1. Lateral aspect of holotype of *Stenommatus pulvereus*, new species (USNM 502681) (length of specimen 2.6 mm, including rostrum). 2. Ventral aspect of holotype of *S. pulvereus*. 3. Dorsal aspect of holotype of *D. acarophilus*, new species (USNM 502865) (length of specimen 1.9 mm, including rostrum). Arrows point out the positions of the associated mites.

material and a more definitive identification before the Baltic record can be granted any credence. Another record is a putative *Dryophthorus* elytron from the middle Miocene of Belarus (Nazarov, 1989) but as diagnostic traits for the genus are not to be found in the elytra this record must also be considered doubtful (*e.g.*, Zherikhin, 2000).

The only other available records are those of modern species recovered as subfossils from Holocene peat bogs in Finland and Sweden, Pleistocene mud in eastern England, and late Pliocene deposits in east-central Alaska (Koponen and Nuorteva, 1973; Matthews and Telka, 1997; Keen *et al*., 1999; Olsson, 2006).

Herein we nearly double the available fossil data for the tribe by describing two recently identified dryophthorines in Early Miocene (Burdigalian) amber from the Dominican Republic (Figs. 1–3). The two species are representative of *Stenommatus* and *Dryophthorus*, respectively. *Stenommatus* can be separated from *Dryophthorus* by the compound eyes that stretch ventrally under the head, where the latter has eyes that are more ovoid and positioned laterally on the head. The format for the descriptions generally follows that employed elsewhere for fossil weevils (*e.g*., Davis and Engel, 2006a, 2006b). The age and origin of Dominican amber has been reviewed by Grimaldi (1994), Itturalde-Vinent and MacPhee (1996), and Grimaldi and Engel (2005), while the overall geological history of Curculionidae is reviewed by Gratshev and Zherikhin (2003) and Grimaldi and Engel (2005).

Like many modern dryophthorines, the two fossil species presented herein are associated with mites. The interaction between modern dryophthorines and mites has never been investigated in regard to the nature of their association individuals of the tribe are frequently collected with mites attached. Many of the modern mites (those of the Mesostigmata, particularly of the family Uropodidae) are actually phoretic on the weevils. Such instances of insect-mite association are not uncommon among Dominican amber inclusions (*e.g*., mites phoretic on augochlorine bees: Engel, 1996), and it is interesting that these first documented amber dryophthorines should also preserve this biological interaction. The first of the weevil species described herein has a small, circular, dorso-ventrally flattened mite grasping the posterior surface of the right profemur of the holotype (Fig. 2). Similarly, the second species has four mites attached to its legs. The mites of the second species are similar in overall morphology to that of the first weevil species, but are grasping the metafemora (Fig. 3). There are two on each metafemur – one dorsal, the other ventral. These are similar positions in which mites may be found on modern dryophthorines, although mites can also be found on other regions of the body difficult for the weevil to groom. Unfortunately, the ventral surfaces of the mites cannot be viewed owing to their positions relative to the weevils and their smooth, circular dorsal carapaces preserve little to permit authoritative identification (they do have an appearance similar to many Mesostigmata suggesting phoresy). Regardless, the presence of mites on these fossils attests to the longevity of this association which must be at least 19 million years old. It would of great interest to study the interaction between modern dryophthorines and their associated mites, the results of which would also provide greater insight into the paleobiology of species documented herein.

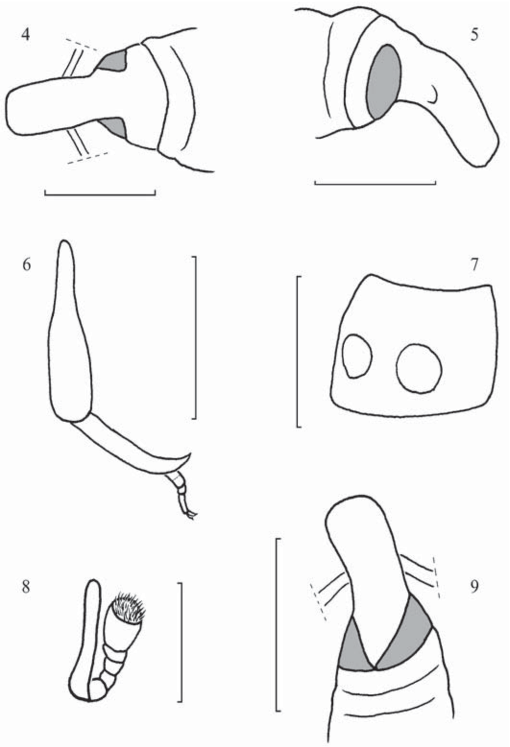
SYSTEMATIC PALEONTOLOGY

Stenommatus pulvereus, new species (Figs. 1–2, 4–9)

Diagnosis: Integument with a white, dust-like covering. Antennae with scape projecting to hind margin of compound eye; club composed of two distinguishable sections, basal three-fourths glabrous, apical fourth setose. Scrobe very shallow. Rostrum about as long as pronotum.

DESCRIPTION

Total body length (including rostrum) ca. 2.6 mm; maximal width ca. 1.3 mm; elytral length ca. 0.8 mm. Integument black, without

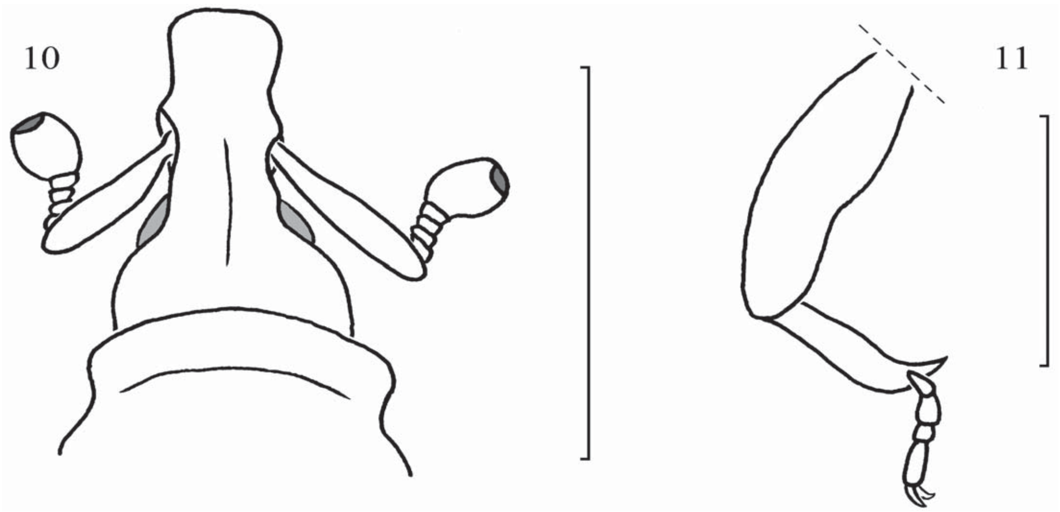


Figures 4–9. Line illustrations of *Stenommatus pulvereus*, new species (USNM 502681), drawn as preserved. 4. Dorsal aspect of head and anterior prothorax. 5. Lateral aspect of head and anterior prothorax. 6. Hind leg. 7. Ventral aspect of prothorax showing position of procoxae (prosternal depression omitted). 8. Antenna. 9. Ventral aspect of head and anterior prothorax. All scale bars = 0.5 mm, except 0.25 mm for figure 8.

maculations, largely covered by a crust-like, dusty, white deposit (also present in some modern species) (Figs. 1–2). Compound eyes oblong, length approximately thrice width; lower borders of compound eyes nearly meeting ventrally (Fig. 9); interocular distance approximately equal to width of rostrum in dorsal view; two small, broad protuberances at interocular region. Rostrum granulate, more or less impunctate; rostrum approximately subequal in length to that of pronotum; broadly curved, curvature mostly along basal half (Fig. 5); rostrum width subequal along its length, widened slightly beyond antennal insertion in dorsal view (Fig. 4). Antenna inserted approximately at or immediately before mid-length of rostrum; scrobe shallow; scape reaching outer margin of compound eye; scape one-half length of rostrum; funicle narrow, composed of four antennal articles; club divided into two distinct regions, basal portion glabrous, apical portion setose and occupying approximately one-fourth length of club (Fig. 8). Vertex glabrous with dense covering of irregularly-sized punctures. Pronotum glabrous, length subequal to width; slightly wider at mid-length and broadly rounded, with anterior portion constricted; integument with large, deep punctures, punctures separated by distance 0.5 times or less than a puncture diameter; lateral margins broadly rounded. Prosternum with shallow depression between procoxae; irregularly sculptured with rugae and scattered punctures. Mesoscutellum reduced, miniscule. Elytra each with approximately ten striae; punctures of elytral striae large, deep, and quadrate, separated by distance approximately 0.5–1 times a puncture width; humeri rounded. Metasternum and abdominal ventrites irregularly sculptured with scattered, shallow punctures. Procoxae separated by slightly more than 0.5 times diameter of individual coxa (Fig. 7); femora widest slightly past mid-length and with small, shallow punctures; tibiae subequal in width along length, slightly expanded medially; tibiae with apical uncus large (Fig. 6), approximately equal to length of tarsomere IV; no other smaller denticles present apically; pretarsal ungues (*i.e.*, claws) widely separated.

Etymology

The specific epithet is the Latin word *pulvereus*, meaning “dusty,” and is a reference to the dust-like covering on the integument.



Figures 10–11. Line illustrations of *Dryophthorus acarophilus*, new species (USNM 502865), drawn as preserved. 10. Dorsal aspect of head and anterior of prothorax (scale bar = 0.5 mm). 11. Hind leg (scale bar = 0.25 mm).

TYPE MATERIAL

Holotype (Figs. 1–2): USNM 502681 (Woodruff #5454b). Paratype: USNM 505478 (Woodruff #9927). Both specimens are deposited in the Department of Paleobiology, United States National Museum of Natural History, Smithsonian Institution, Washington, D.C.

COMMENTS

The new species appears most similar to the extant *Stenommatus sulcifrons* Champion, 1909 but the latter has a short, deep antennal scrobe, as opposed to the shallow scrobe of the fossil.

Dryophthorus acarophilus, new species (Figs. 3, 10–11)

Diagnosis: Integument without a white, dust-like covering. Antenna with scape projecting beyond hind margin of compound eye; club composed of two distinguishable parts, basal glabrous part composing most of the club, setose part occupying the extreme apical area. Scrobe short and deep, partially visible dorsally. A shallow groove dorsally from middle of rostrum to vertex. Rostrum three-quarters length of pronotum.

DESCRIPTION

Total body length (including rostrum) ca. 1.9 mm; maximal width ca. 1.0 mm; elytral length ca. 0.5 mm. Integument black, without maculations, without white, dust-like covering (Fig. 3). Compound eyes subcircular, length approximately equal to width; interocular distance approximately equal to width of rostrum in dorsal view. Rostrum with small, shallow punctures, punctures separated by 0.5–1 times a puncture diameter; rostrum three-quarters length of pronotum; broadly and uniformly curved along entire length; rostrum width subequal along length, slightly widened apically in dorsal view (Fig. 10); rostrum with dorsal, elongate groove, extending from about mid-length to vertex (Fig. 10). Antennae inserted immediately before mid-length of rostrum; scrobe short and well developed, partially visible in dorsal view. Scape relatively long, extending approximately slightly less than one-third length of scape beyond posterior margin of compound eyes; scape three-quarters length of rostrum; funicle narrow, composed of four articles; club divided into two distinct regions, basal portion glabrous and comprising most of club area, apical portion setose and occupying only extreme apex. Vertex glabrous with small, shallow punctures. Pronotum glabrous, length approximately 1.3 times width, slightly wider at mid-length and broadly rounded, with anterior portion constricted, forming somewhat of a collar at border with head such that integument of head and pronotum are not contiguous; large, deep punctures present, punctures separated by one-half puncture diameter or less; lateral margins broadly rounded. Prosternum without shallow depression between procoxae; moderate, shallow punctures present, slightly smaller than those of pronotum, punctures separated by 0.5–1 times a puncture diameter. Mesoscutellum reduced, miniscule. Elytra each with approximately 9–10 striae; punctures of elytral striae large, deep, and quadrate, separated by approximately 0.5 times a puncture diameter; humeri rounded. Metasternum and abdominal ventrites with moderate, shallow punctures present, similar to those on prosternum. Femora widest slightly past mid-length and with small, shallow punctures; tibiae subequal in width along length, slightly expanded medially; tibiae with apical uncus large (Fig. 11), approximately equal to length of tarsomere IV; no other smaller denticles present apically; pretarsal ungues (*i.e.*, claws) widely separated.

TYPE MATERIAL

Holotype (Fig. 3): USNM 502865 (Woodruff #5648). Deposited in the Department of Paleobiology, United States National Museum of Natural History, Smithsonian Institution, Washington, D.C.

ETYMOLOGY

The specific epithet is a reference to the association of this species, and many dryophthorines in general, with mites.

COMMENTS

The combination of features in the diagnosis (vide supra) serves to segregate the species from the five North and Central American species described. It is not presently clear to which species the fossil is most closely allied and, indeed, there are several undescribed species from Central America to which the fossil might potentially be related. Once a new monograph of *Dryophthorus* has been completed the specific affinities of the fossil will need careful consideration.

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