

A FOSSIL APHID (HEMIPTERA: STERNORRHYNCHA) IN DOMINICAN AMBER

O. E. HEIE AND GEORGE O. POINAR, JR.

(OEH) Biological Department, DLH, Emdrupvej 101, DK-2400 Copenhagen NV, Denmark; (GOP) Department of Entomology, Oregon State University, Corvallis, OR 97331-2907, U.S.A. (e-mail: poinarg@bcc.orst.edu)

Abstract.—*Dominicaphis succini*, n. gen., n. sp. is described from Dominican amber as a member of the Hormaphididae (Hemiptera: Sternorrhyncha). It resembles *Aleurodaphis blumeae* van der Goot (Hormaphididae) but also has characters in common with some members of the Eriosomatidae and may be close to the common ancestor of the two families.

Key Words: Dominican amber, fossil aphid, Hormaphididae, Eriosomatidae

Dominican amber contains numerous insects and other arthropods (Poinar 1992) but very few aphids. Only one aphid species has previously been described from this source, namely *Mindazierius dominicanus* Heie and Poinar (1988) (Drepanosiphidae: Lizerini). A second species representing a parthenogenetic viviparous female has now been found and is described below.

MATERIALS AND METHODS

The fossil specimen, which occurs in a small piece of transparent yellow amber, is well preserved and undamaged (Fig. 1). A binocular Zeiss-Winkel microscope with a 10× objective was used for the description. Placing the amber piece in mineral oil facilitated microscopic observation.

The specimen is believed to have originated from mines in the Cordillera Septentrional of the Dominican Republic. These mines are in the El Mamey Formation (Upper Eocene), which is a shale-sandstone interspersed with a conglomerate of well-rounded pebbles (Eberle et al. 1980). The exact age of the amber is unknown, and estimates based on various microfossils and

chemical analyses provide a range from 15–20 million years (Iturralde-Vincent and MacPhee 1996) to 30–45 years (Cepek in Schlee 1990). Dominican amber originated from leguminous trees of the genus *Hymenaea*, especially *H. protera* (Poinar 1991).

Dominicaphis Heie and Poinar, new genus

Description.—Antenna 5-segmented, with ring-shaped rhinaria. Fore wing with one media fork and cubitus-branches departing from main vein at same point. Hind wing with two well separated oblique veins. Mesothoracic lobes rather distinctly developed.

Type-species.—*Dominicaphis succini*, n. sp.

Etymology.—Derivation of name: Genus name derived from “Dominican” and *Aphis*.

Dominicaphis succini Heie and Poinar, new species

Description (all measurements in mm).—Alate specimen, probably a parthenogenetic viviparous female. Body 1.30 long, head

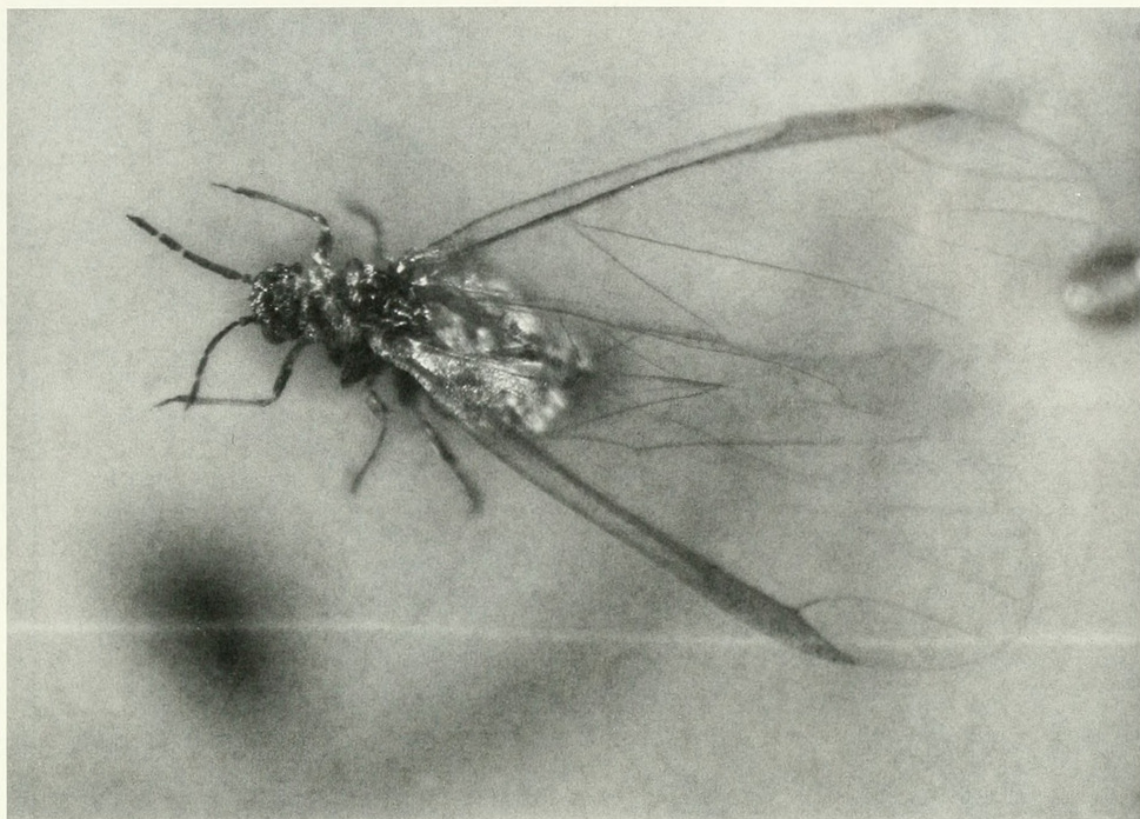


Fig. 1. *Dominicaphis succini* in dorsal view (length of body 1.3 mm).

0.22 long, abdomen 0.74 long, fore wing 1.90 long, hind wing 1.10 long. Head and thorax black, abdomen rather pale with some slightly darker fields; hairs apparently very short; frons straight; width of head across eyes 0.27, longitudinal diameter of compound eyes 0.10, ocular tubercles rather large, situated behind compound eyes, longitudinal diameter 0.04; antenna dark, 5-segmented, 0.50 long; lengths of segments: III = 0.19, IV = 0.09, V = 0.11; rhinaria linear to narrowly ring-shaped, primary and secondary rhinaria apparently similar, III with 14, IV with 5, V with 6 or perhaps 7; rostrum difficult to see, apparently very short, reaching to middle of prothorax. Mesothoracic lobes distinctly visible; femora black with paler bases, tibia with dark tips; lengths: fore femur 0.25, middle femur 0.27, hind femur 0.29, fore tibia 0.30, middle tibia 0.29, hind tibia 0.31, tarsi about 0.06–0.07; fore wing with slender, pointed pterostigma, radial sector departing from its distal half close to middle, media weaker than other veins, its basal part invisible, dis-

tance between point of media fork and cubitus branches and base of fore wing 0.54; hind wing with two well separated oblique veins; apical oblique vein rather long and forming a small angle with main vein. Abdomen rather broad in middle, width 0.50; details not distinctly visible; siphuncular pores invisible, perhaps present; cauda apparently rounded; a slightly visible pointed projection about 0.10 long situated below cauda.

Holotype.—Accession number HO-4-43, deposited in the Poinar Amber Collection maintained at Oregon State University, Corvallis, Oregon.

Etymology.—Derivation of specific name: *succini* means “from amber.”

DISCUSSION

The wing venation, 5-segmented antenna, shape of the rhinaria and the general habitus suggests that the fossil species belongs in the family Hormaphididae. The presence of distinctly visible mesothoracic lobes is, however, not typical of Hormaphi-

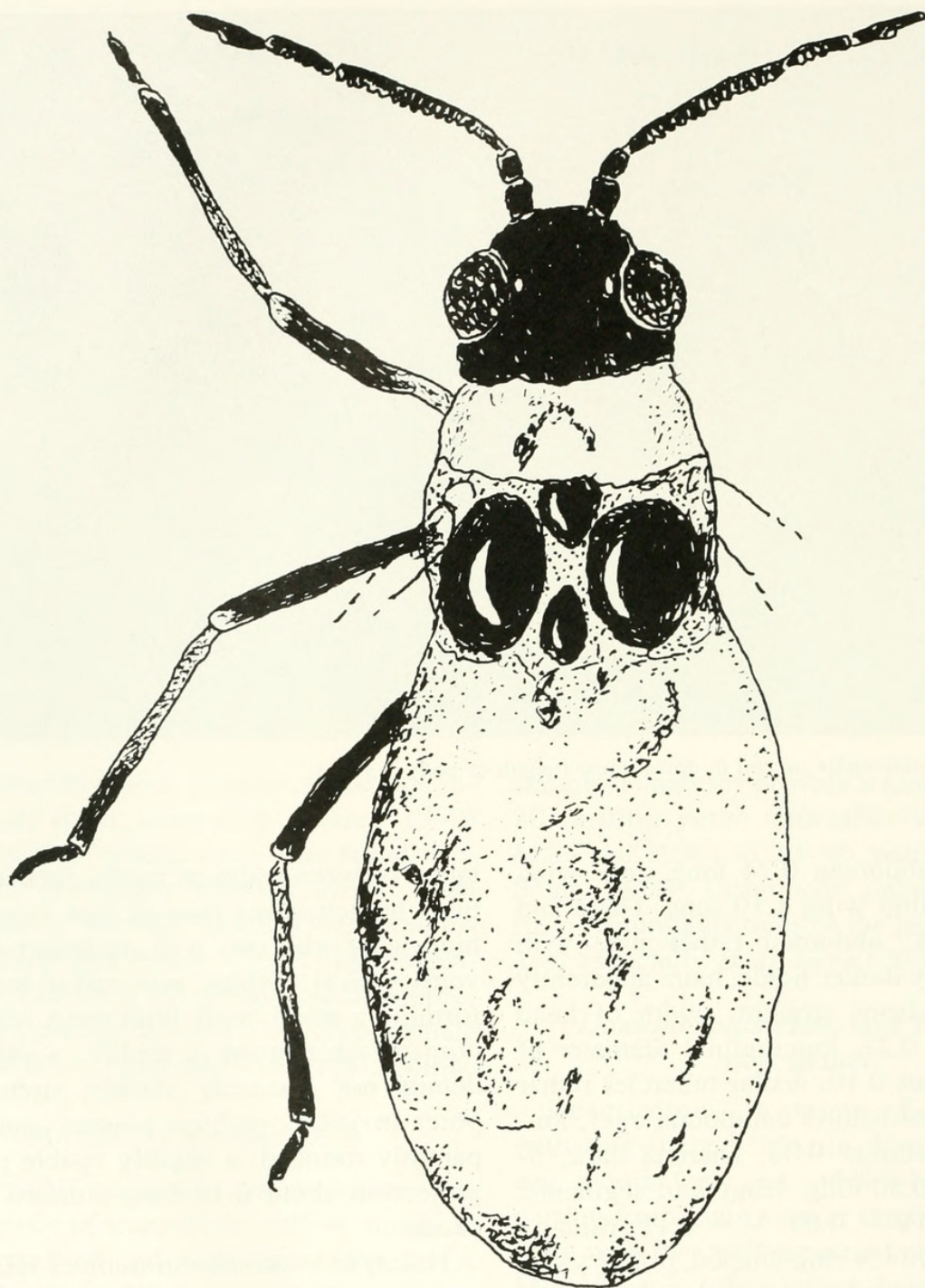


Fig. 2. Dorsal view of body of *Dominicaphis succini* (scale = 1 mm).

didae. The pattern in this family is a rather flat mesothorax with the wings flat in repose. Usually distinctly visible mesothoracic lobes indicate that the wings are held roof-like in repose. In this respect *D. succini* differs from all known species of Hormaphididae. Dr. Aoki kindly sent us a slide with an alate viviparous female of *Aleurodaphis blumeae* van der Goot and stated

that Moritsu (1983: 200) reported that alatae of this latter species keep their wings roof-like in repose. However Moritsu (1983) also shows two color photos of *A. blumeae* (see page 14), in which the wings clearly are flat in repose. The mesothorax of *A. blumeae* shows sutures separating the lobes, however less distinctly than in the fossil. The two species are similar in some

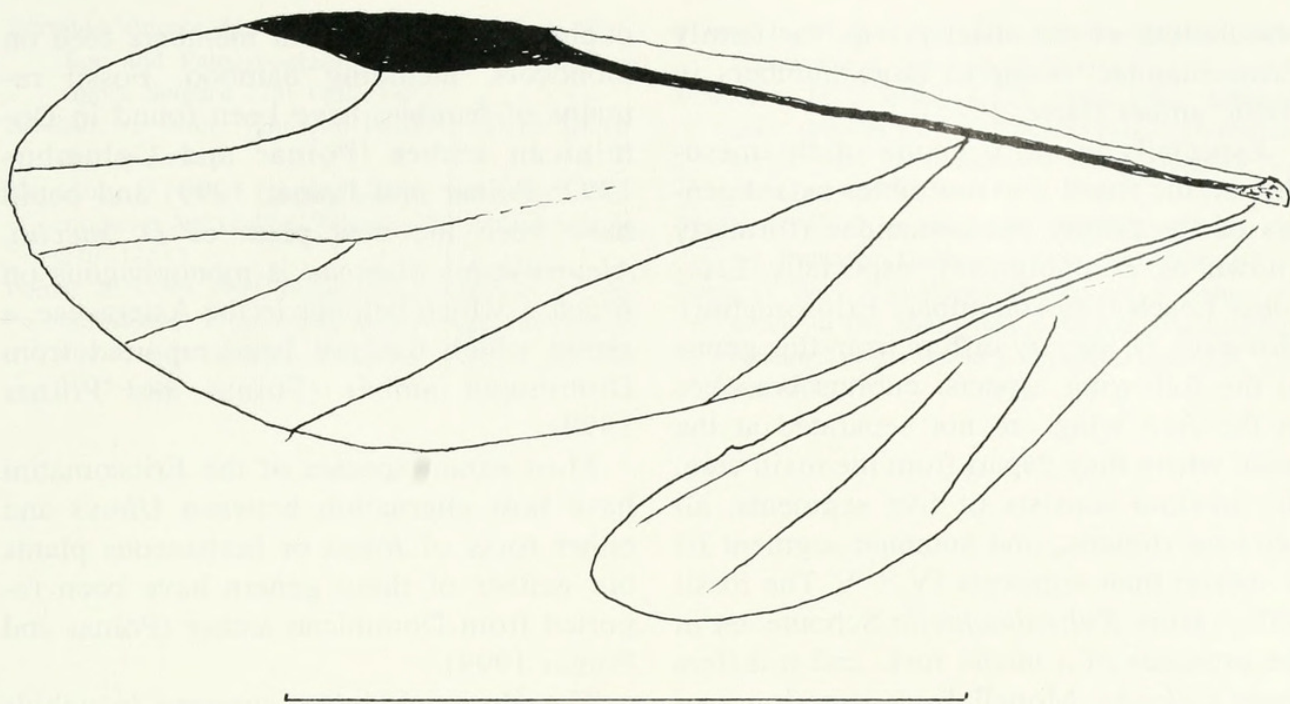


Fig. 3. Wings of *Dominicaphtis succini* (scale = 1 mm).

features such as wing venation, body length and length of antennae. In addition, antennal segment III is 2.1 times as long as segment IV in *D. succini* and 1.7–3.0 in *A. blumeae*, 1.7 times as long as segment V in the former and 1.4–2.2 in the latter, and the number of secondary rhinaria in *D. succini* lies within the range of those in *H. blumeae* which are; segment III with 11–17, IV with 4–6 and V with 1–7 (Noordam 1991). However *A. blumeae* has a knobbed cauda while *D. succini* has a rounded cauda and the siphuncular pores of *A. blumeae* are surrounded by dark sclerites, which apparently are absent from *D. succini*, so the two species are probably not closely related.

The pointed projection below the posterior end of the abdomen in *D. succini* is a structure unknown in Hormaphididae and in all other families within the extant Aphidoidea. It resembles an ovipositor, but this is strange since representatives of the superfamily Aphidoidea with oviparous parthenogenetic females have not been found later than the Cretaceous, and the fossil specimen definitely belongs to an extant family of the Aphidoidea.

Previously, *Aleurodaphis* had been considered as belonging to the tribe Cerataphidini, but Stern (1994: 206) stated: “Surprisingly, *Aleurodaphis blumeae*, which has been placed in the Cerataphidini, based on morphological evidence, appears distantly related to the other cerataphidines, and may represent a lineage basal to all remaining Hormaphididae.” Stern’s phylogenetic tree was based on DNA spanning the mitochondrial cytochrome oxidase I and II genes, and he used the eriosomatid species *Pemphigus microsetosus* as the outgroup. The fossil species may have split off from the base of the hormaphidid lineage before the character “wings flat in repose” evolved, perhaps close to the point where the eriosomatid and the hormaphidid lineages separated.

The fossil is the first alate specimen of a Hormaphididae described from the mid-Tertiary, although an apterous specimen of another species. *Electrocornia antiqua* Heie, was described from Baltic amber (Heie 1972). The family must have originated somewhat earlier, probably close to the Cretaceous-Tertiary boundary since rep-

representatives of the sister group, the family Eriosomatidae, occur in large numbers in Baltic amber (Heie, 1985).

Especially in the structure of the mesothorax, the fossil also resembles extant genera of the family Eriosomatidae (formerly known as Pemphigidae), especially *Eriosoma* Leach (Eriosomatinae: Eriosomatini). However, *D. succini* differs from this genus in the following aspects: cubitus branches in the fore wing are not separated at the point where they depart from the main vein, the antenna consists of five segments, all carrying rhinaria, and antennal segment III is shorter than segments IV + V. The fossil differs from *Kaltenbachiella* Schouteden in the presence of a media fork, and it differs from *Colopha* Monell by possessing two oblique veins in the hind wing. All eriosomatine alatae have six antennal segments except at least one, *Colophina clematicola* (Shinji), which has 5-segmented antennae. As the other species of the genus *Colophina* Börner have alatae with 6-segmented antennae, it is likely that *C. clematicola* has only recently acquired the 5-segmented antennae, so this similarity to *Dominicaphis succini* is no proof of a close relationship. Dr. Aoki most kindly loaned us a specimen *C. clematicola*, and it differs from the fossil in having broader ring-shaped rhinaria, a shorter antennal segment IV and a shorter distance between the bases of the cubitus branches.

BIOLOGY

It is impossible to determine the host plant of *Dominicaphis succini*, but it is reasonable to assume that it was a woody angiosperm since most extant members of the Hormaphididae feed on these plants. The amber-producing tree, *Hymenaea protera* Poinar (1991) need not be the host plant since the fossil is alate and could have flown or been blown into the resin.

Some species of Hormaphididae alternate between two woody hosts (I: *Styrax*, *Distylum* a.o., II: *Betula*, *Quercus* a.o.) and have a two-year-cycle, while others are mo-

nophagous. Some extant members feed on monocots, including bamboo. Fossil remains of bamboo have been found in Dominican amber (Poinar and Columbus 1992; Poinar and Poinar 1999) and could have been the host plant of *D. succini*. *Aleurodaphis blumeae* is monophagous on *Blumea*, which belongs to the Asteraceae, a group which has not been reported from Dominican amber (Poinar and Poinar 1999).

Most extant species of the Eriosomatini have host alternation between *Ulmus* and either roots of *Ribes* or herbaceous plants but neither of these genera have been reported from Dominican amber (Poinar and Poinar 1999).

The Hormaphididae, contrary to aphids in general, including the Eriosomatidae, is mainly a tropical family with most species in eastern and southeastern Asia, but also several in America.

ACKNOWLEDGMENTS

The authors thank Dr. S. Aoki for taxonomic comments and loaning slides of *Colophina clematicola* and *Aleurodaphis blumeae* and Dr. R. L. Blackman for informing us about the photographs of *A. blumeae* in Moritsu (1983).

LITERATURE CITED

- Cepek, P. 1990. Pp. 53 In Schlee, D., Das Bernstein-Kabinett. Stuttgarter Beiträge für Naturkunde, Ser. C. No. 28: 1–100.
- Eberle, W., W. Hirdes, R. Muff, and M. Pelaez. 1980. The geology of the Cordillera Septentrional. Proceedings of the 9th Caribbean Geological Conference. August 1980, Santo Domingo, pp. 619–632.
- Heie, O. E. 1972. Some new fossil aphids from Baltic amber in the Copenhagen collection (Insecta, Homoptera, Aphididae). Steenstrupia 2: 247–262.
- Heie, O. E. 1985. Fossil aphids. A catalogue of fossil aphids, with comments on systematics and evolution. Proceedings of the International Aphidological Symposium on Evolution and Biosystematics of Aphids in Jablonna, 5–11 April, 1981. Polska Akademia Nauk, Warszawa, pp. 101–134.
- Heie, O. E. and G. O. Poinar, Jr. 1988. *Mindazerius dominicanus* nov. gen., nov. sp., a fossil aphid (Homoptera, Aphidoidea, Drepanosiphidae) from Dominican amber. Psyche 95: 153–165.

- Iturralde-Vincent, M. A. and R. D. E. Macphee. 1996. Age and Paleogeographic origin of Dominican amber. *Science* 273: 1850–1852.
- Moritsu, M. 1983. Aphids of Japan in colors. Tokyo. [In Japanese.]
- Noordam, D. 1991. Hormaphidinae from Java (Homoptera: Aphididae). *Zoologische Verhandlungen* 270: 1–515.
- Poinar, Jr., G. O. 1991. *Hymenaea protera* sp. n. (Leguminosae, Caesalpinoideae) from Dominican amber has African affinities. *Experientia* 47: 1075–1082.
- Poinar, Jr., G. O. 1992. *Life in Amber*. Stanford University Press, Stanford, California.
- Poinar, Jr., G. O. and J. T. Columbus. 1992. Adhesive grass spikelet with mammalian hair in Dominican amber: first fossil evidence of epizoochory. *Experientia* 48: 906–908.
- Poinar, Jr., G. O. and R. Poinar. 1999. *The amber forest*. Princeton University Press, Princeton, NJ.
- Stern, D. 1994. A phylogenetic analysis of soldier evolution in the aphid family Hormaphididae. *Proceedings of the Royal Society of London B*, 256: 203–209.



Heie, Ole E. and Poinar, George O. 1999. "A FOSSIL APHID (HEMIPTERA : STERNORRHYNCHA) IN DOMINICAN AMBER." *Proceedings of the Entomological Society of Washington* 101, 816–821.

View This Item Online: <https://www.biodiversitylibrary.org/item/54810>

Permalink: <https://www.biodiversitylibrary.org/partpdf/55290>

Holding Institution

Smithsonian Libraries and Archives

Sponsored by

Smithsonian

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Entomological Society of Washington

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.