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Original article

A new augochlorine bee species in Tertiary amber from the Dominican Republic (Hymenoptera: Halictidae)

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Abstract – A new species of the bee genus *Oligochlora* Engel is described and figured from two females preserved in a single piece of Miocene Dominican amber. The species is proposed as *Oligochlora marquettorum* Engel & Rightmyer sp. nov., and is the fourth member of this extinct genus of the tribe Augochlorini.

Apoidea / Miocene / *Oligochlora* / paleontology / extinct species / taxonomy

1. INTRODUCTION

Although bees are common as inclusions from Tertiary amber sites in the Dominican Republic, they are mostly represented by a single species, and the study of this fauna has only recently begun in earnest. The first bee described from Dominican amber was the stingless bee *Proplebeia dominicana* [20], a common inclusion often sold in gem stores. The next bee, however, was not described for over three decades [3]. Today bees in Dominican amber include members of the tribes Augochlorini [3–5], Chilicolini [10, 17], Euglossini [8, 18], Halictini [17], Megachilini [9], Meliponini [2, 16, 20], and Protandrenini [19], and our knowledge of this paleofauna continues to grow. One of us (MSE) is presently involved in monographic studies of the fossil bees of the world, and it is hoped that a new catalogue of the fossil bees will be presented in the near future.

Augochlorini, a strictly New World tribe of the subfamily Halictinae, consists of species most noted for their brilliant metallic coloration which is frequently green, but can vary dramatically. Although the tribe is distributed from southern Canada to northern Argentina and Chile, its greatest diversity is in the tropics of South America and the southern regions of Mesoamerica [6]. Few augochlorine genera are found in the West Indies today; the group is predominantly

represented by the nominate genus *Augochlora*. The genus *Oligochlora* was only recently proposed for two enigmatic augochlorine species in Dominican amber [4]. A third species was later discovered [5], and the genus newly diagnosed [5, 6]. Although it was speculated that *Oligochlora* had close affinities to the widely distributed genus *Neocorynura* [4], a recent cladistic analysis of the tribe supported a *Thectochlora* + *Oligochlora* clade [6, 7]. *Thectochlora* is a small, monotypic genus restricted to South America and has a mutualistic relationship with a single, monotypic genus of acarid mites [12]. This node was, however, weakly supported and it is presently unknown whether this grouping reflects a true historical relationship, or is an artifact of insufficient character information for species of *Oligochlora* (particularly in the absence of information for the male). Herein we present the description of a fourth species for this group based on two females preserved in a single block of amber, and provide new information on this remarkable genus of extinct bees.

2. MATERIALS AND METHODS

Morphological terminology generally follows that proposed by Michener [15], while the format for the description follows that used for other augochlorine bees [1, 5, 11]. In the description, the abbreviations F, S, T, and OD are used for flagellomere, sternum, tergum, and ocellar diameter (based on the median ocellus), respectively. Measurements were made using an ocular micrometer on a Leitz microscope. These metrics should be considered approximate, since the optimal view of a given feature was not always possible through the amber. The Early Miocene (c. 21 Mya) age for Dominican amber is based on the recent stratigraphic work by Iturralde-Vinent and MacPhee [13, 14].

3. SYSTEMATIC PALEONTOLOGY

3.1. *Oligochlora marquettorum* Engel & Rightmyer sp. nov.

3.1.1. Diagnosis

The new species differs from other *Oligochlora* most notably in the absence of an acarinarium on the first metasomal tergum, the obtuse pronotal lateral angle, the basitibial plate rimmed on all borders, the imbricate sculpturing on the basal area of the propodeum, the rounded pronotal lateral ridge, and the larger body dimensions. This combination of characters serves to distinguish *O. marquettorum* from all other *Oligochlora*, and the structure of the first metasomal tergum and basitibial plate are unique features in the genus.

3.1.2. Description

The description of the female is as follows: total body length 8.5 mm; forewing length 5.4 mm. Head length 2.0 mm, width 2.1 mm. Interocellar distance 0.3 mm, ocellocular distance 0.4 mm. Intertegular distance 1.9 mm. Subapical tooth of mandible moderately well developed, apex pointed, projecting away from body of mandible at acute angle and gently curving towards labrum (Fig. 1); mandibular apex pointed;

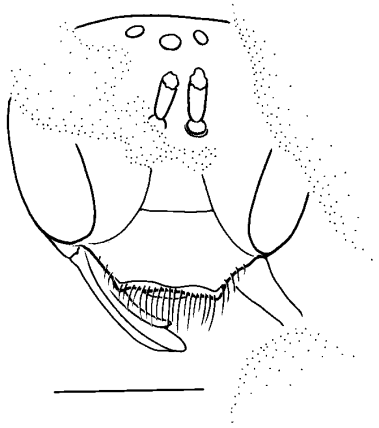

Figure 1. *Oligochlora marquettorum* Engel & Rightmyer sp. nov.; female holotype; head, frontal aspect. Scale bar = 1mm.

acetabular groove running to point where subapical tooth distends from mandible, outer groove running to mandibular apex, acetabular carina reaching base of mandible. Clypeus relatively flat and non-protuberant, clypeal margin depressed, lateral apices weakly protuberant; distal two-thirds of clypeus extending below lower tangent of compound eyes. Epistomal sulcus forming a slightly obtuse angle opening towards compound eye (Fig. 1), forming straight line between subantennal sutures. Supraclypeal area 1.25 times length of clypeus, two-thirds wider than long, gently raised at midpoint, not protuberant. Upper inner margin of compound eye weakly emarginate; compound eye basally convergent above clypeus. Antennal sockets below emargination; about one antennal socket distance between antennal sockets, and slightly more than two antennal socket distances between antennal sockets and inner margin of compound eyes. Median ocellus separated from lateral ocellus by one-half of its width; lateral ocelli separated from each other by slightly greater than one and one-half times width of median ocellus. Median ocellus separated from upper tangent of antennal sockets by three and one-half times its width; lateral ocellus separated from inner margin of compound eye by one median ocellus width. Vertex short, about one and one-half times median ocellus width; unmodified (lacking ridges, protuberances, and furrows). Preoccipital area rounded and unmodified. Gena width slightly less than width of compound eye. Pronotal dorsal ridge weakly carinate; pronotal lateral ridge rounded; pronotal dorsal angle slightly rounded, obtuse, and not protuberant. Mesoscutum broadly rounded anteriorly; parapsidal line weakly impressed. Ovoid tegula. Scutellum two times length of metanotum. Basal area of propodeum slightly shorter than scutellum. Ovoid vellum with apical outer margin slightly extended; malus pectinate, length approximately equal to length of vellum; first malar tooth three-fourths as high as vellum width, with malar teeth decreasing in height towards apex of spur. Inner hind tibial spur pectinate, with five teeth decreasing in length towards apex (Fig. 2). Outer hind tibial spur longer than inner hind tibial spur (Fig. 2). Metatibial basal plate rounded at apex, bordered on all sides. Basal vein distad cu-a by two and one-half times vein width; 1r-m confluent with 1m-cu; 2m-cu apparently gently curved; marginal cell apex feebly truncate and appendiculate; length of first submarginal cell approximately equal to combined lengths of second and third submarginal cells; second submarginal cell not narrowed anteriorly; anterior border of second submarginal cell approximately three-quarters length of that of third; anterior border of third submarginal cell approximately one-half length of posterior border. Metasoma unmodified, acarinarium absent.

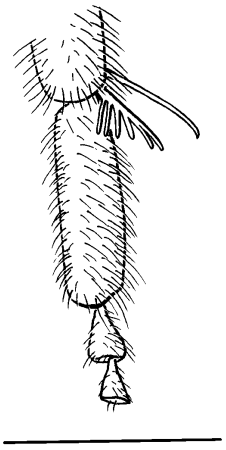

Figure 2. *Oligochlora marquettorum* Engel & Rightmyer sp. nov.; female holotype. Metatibial apex, metabasitarsus (with tibial spurs), and metatarsomeres 2 and 3. Scale bar = 1 mm.

Clypeus with coarse, faint punctures separated by less than a puncture width, integument otherwise faintly imbricate. Supraclypeal area as on clypeus except punctures fainter. Face below level of antennal sockets as on clypeus except punctures becoming more defined, slightly smaller, and more separated towards level of antennae; face

above level of antennal sockets with minute, well defined, nearly contiguous punctures. Gena minutely punctured, punctures separated by about a puncture width. Pronotal dorsal surface and pronotal lobe weakly imbricate; lateral surface becoming more faintly imbricate, blending to smooth integument. Mesoscutum with faint, moderately sized punctures becoming more well defined on lateral and posterior borders, punctures separated by less than a puncture width, integument otherwise imbricate; tegula faintly imbricate and impunctate; scutellum and metanotum imbricate and impunctate. Pleura with coarse, faint punctures separated by less than a puncture width; metepisternum imbricate and impunctate with transverse striae on dorsal third. Basal area of propodeum as on scutellum; lateral surface weakly imbricate and impunctate. Terga and sterna faintly imbricate.

Mandible, apex of clypeus, and antenna, brown. Head metallic green with blue or coppery highlights. Mesosoma as on head, except tegula and legs brown. Wing membrane hyaline; wing veins dark brown. Terga brown with metallic green and matte red highlights; sterna brown.

Mandible sparsely pubescent (1 OD) on inner and outer surfaces, hairs apparently simple. Clypeus lacking pubescence except apical margin and distal half with apparently simple hairs (1 OD). Supraclypeal area without pubescence. Remainder of face sparsely pubescent (1 OD), hairs apparently simple. Hairs of gena like those of face except becoming shorter and thinner. Pronotum sparsely pubescent, apparently simple (1 OD). Mesoscutum, tegula, scutellum, and metanotum as on pronotum except hairs becoming progressively more dense towards metanotum; metanotal hairs longer (1.5 OD) and minutely branched. Pleura with moderately dense pubescence, hairs apparently simple and becoming longer ventrally (1.5–2 OD). Pubescence of posterior surface of propodeum appearing moderately dense (1 OD), hairs simple. Terga with moderately dense pubescence, becoming progressively longer and slightly more dense towards distal end of metasoma (1–2.5 OD), hairs simple; T5 very densely pubescent, with longest hairs towards distal margin, hairs minutely branched.

A description of the male cannot be given, as no fossil specimen has yet been found.

3.1.3. Type material

The type material is as follows. Holotype: female (Figs 1–3), Miocene Dominican amber, DR-14-1484, deposited in the Department of Entomology, American Museum of Natural History, New York. Paratype: female, same piece of amber as holotype (Fig. 3).

3.1.4. Preservation

The bees are preserved together in a single piece of Dominican amber. The piece is roughly rhomboid in shape with numerous flow lines and bubbles. The bees lie at either end of the piece and close to the surface. Both are relatively well preserved, with some damage to the wings in both and minor

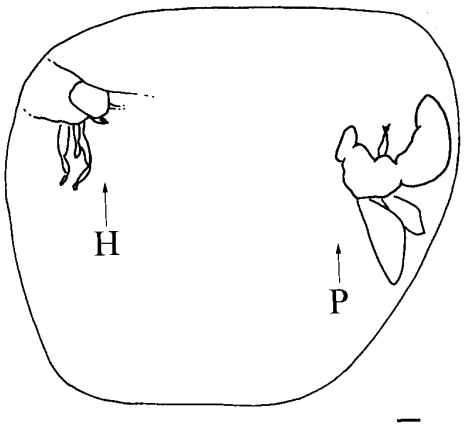

Figure 3. Sketch of the amber piece (AMNH, DR-14-1484) with the position of the holotype (H) and paratype (P) indicated. Scale bar = 1 mm.

damage to the upper left portion of the compound eye in the holotype (Fig. 1). The relative positions of the holotype and paratype are indicated in Figure 3. Owing to the numerous flow lines and fracture planes, photographs of the specimens are difficult to interpret and so were not included here.

3.1.5. Etymology

The specific epithet honors George Edward and Jennie Smith Proskine Marquette, grandparents of the junior author.

Résumé – Une nouvelle abeille augochlorine dans l'ambre du Tertiaire en République dominicaine (Hymenoptera, Halictidae). Une nouvelle espèce d'abeille du genre *Oligochlora* Engel a été trouvée dans l'ambre du Miocène en République dominicaine. *Oligochlora marquettorum* Engel & Rightmyer n. sp. est décrite à partir de deux femelles conservées dans un même bloc d'ambre. La nouvelle espèce se distingue facilement de toutes les autres espèces par la combinaison suivante de caractères : acarinarium absent du premier tergum métasomal, angle pronotal latéral obtus, plaque basitibiale fortement ridée sur tout le pourtour, surface basale du propodeum présentant une structure imbriquée, bord pronotal latéral arrondi, dimensions corporelles supérieures à celles des autres espèces d'*Oligochlora*. Cest la quatrième espèce connue de ce genre éteint.

Apoidea / Miocène / *Oligochlora* / paléontologie / espèce éteinte / taxonomie

Zusammenfassung – Eine neue augochlorine Biene in tertiärem Bernstein aus der Dominikanischen Republik (Hymenoptera: Halictidae). Eine neue Art der augochlorinen Bienengattung *Oligochlora* Engel entstammt dem miozänen Bernstein der Dominikanischen Republik. *Oligochlora marquettorum* Engel & Rightmyer sp. nov. wurde anhand von zwei in einem einzelnen Bernsteinstück eingeschlossenen Weibchen beschrieben. Die neue Art kann von allen anderen Arten anhand der folgenden Merkmalskombination unterschieden werden: Das Acarinarium fehlt auf dem ersten metasomalen Tergum, der laterale Winkel des Pronotums ist stumpf, die basitibiale Platte ist an allen Rändern stark gerändert, der basale Bereich des Propodäums ist dachziegelartig strukturiert, der seitliche Rücken des Pronotums ist gerundet und die Körpermaβe sind gröβer als bei den anderen Arten von *Oligochlora*. Dieses ist die vierte bekanntgewordene Art dieser ausgestorbenen Gattung.

Apoidea / Miozän / *Oligochlora* / Paläontologie / ausgestorbene Gattung / Taxonomie

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