

NEW GENUS AND FIRST RECORD OF HYBOTINAE
(DIPTERA: EMPIDOIDEA: HYBOTIDAE) IN MIDDLE MIOCENE
DOMINICAN AMBER

**Nuevo género y primer registro de Hybotinae (Diptera: Empidoidea: Hybotidae)
en ámbar dominicano del Mioceno medio**

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ABSTRACT

A new fossil genus of the family Hybotidae is described, based on male and female specimens. The new genus is monotypic: *Syneproctus caridadi* **gen. et sp. nov.** It belongs to the subfamily Hybotinae and shares some characters with the extant genera *Syneches* Walker, 1852, *Stenoproctus* Loew, 1858 and *Chillcottomyia* Saigusa, 1986; however, the differences, principally in the wing venation (shortened cua cell, horizontal m-cu crossvein) and sclerotized mouthparts, support the description of a new genus. This is the first description of a new taxon of the subfamily Hybotinae from specimens preserved in Dominican amber.

Keywords: Dominican amber, new genus and species, *Syneches*, *Stenoproctus*, *Chillcottomyia*.

RESUMEN

Se describe un nuevo género de la familia Hybotidae, basado en especímenes de ambos sexos. El nuevo género comprende una única especie: *Syneproctus caridadi* **gen. et sp. nov.** Pertenece a la subfamilia Hybotinae y comparte algunos caracteres con los géneros actuales *Syneches* Walker, 1852, *Chillcottomyia* Saigusa, 1986 y *Stenoproctus* Loew, 1858; sin embargo, las diferencias, principalmente en la venación alar (celda cua corta, vena transversa m-cu horizontal), y aparato bucal esclerotizado respaldan la descripción de un nuevo género. Esta es la primera descripción de un nuevo taxon de la subfamilia Hybotinae a partir de especímenes preservados en ámbar dominicano.

Palabras clave: ámbar dominicano, nuevo género y especie, *Syneches*, *Stenoproctus*, *Chillcottomyia*.

INTRODUCTION

Empidoid flies are abundant in amber, copal, resin and are readily trapped in field actuatoraphonomic research using sticky traps (Solórzano-Kraemer *et al.*, 2018). Individuals of the family Hybotidae are relatively common in amber, principally in Cretaceous and Eocene ambers with species described from Spanish, Burmese and Baltic ambers (Penney, 2010). From Miocene amber only the subfamily Tachydromiinae (Diptera, Empidoidea, Hybotidae) has been reported in Mexican and Dominican ambers (Solórzano-Kraemer *et al.*, 2005).

The new genus is embedded in Dominican amber, which originated from Miocene (20 to 15 my) resin (Iturralde-Vinent & MacPhee, 1996; Iturralde-Vinent, 2001; Iturralde-Vinent & MacPhee, 2019). The plant source of the fossil resin is considered to be a representative of the genus *Hymenaea* Linnaeus, 1753, the fossil species *Hymenaea protera* Poinar, 1991, which is closely related to extant *H. verrucosa* Gaertner, 1791, from east Africa and Madagascar.

The new genus herein described belongs to the subfamily Hybotinae on the basis of the holoptic female, stout and obliquely projecting proboscis, wing broad with two veins emitted from wing cell dm and prosternum isolated and separated from the proepisternum (Sinclair & Cumming, 2006). The subfamily Hybotinae is today known from the Dominican Republic with three genera recorded: *Euhybus* Coquillett, 1895, *Neohybus* Ale-Rocha & Carvalho, 2003 and *Syneches* Walker, 1852. *Neohybus* is restricted to Neotropical Americas (Ale-Rocha & Rafael, 2004), whereas *Euhybus* has been recorded beyond the New World, but the definition of the genus needs to be re-examined (Sinclair & Cumming, 2017). *Syneches* is cosmopolitan in distribution and broadly dispersed with approximately 189 species described (Menezes & Ale-Rocha, 2016). Most species of *Syneches* occur in tropical regions. In America, the genus is widespread from southern Canada, to the south of Brazil and the Antilles (Wilder, 1974; Menezes & Ale-Rocha, 2016). The Hybotinae are predaceous flies living in various forest habitats, with adults capturing prey during flight (Sinclair & Cumming, 2017).

OBJECTIVE

- To increase the knowledge of the Caribbean paleoentomofauna based on the study of new and uncommon insect specimens preserved in Miocene Dominican amber, as is the case of the first description herein of a new fossil taxon of the subfamily Hybotinae from this amber.

MATERIALS AND METHODS

The pieces of amber with the three specimens described herein (Fig. 1) were acquired from private collections, and at least one amber piece (MNHNSD FOS 17.01) was collected in La Toca mine belonging to La Toca Formation, dated as early middle Miocene (Iturralde-Vinent & MacPhee, 1996). The other piece, having two fly specimens, originates from the Dominican Republic, from La Toca Formation but of unknown mine (SFM Be 12428). The specimens are preserved in two pieces of yellow–red amber with some impurities and one of them contains syninclusions. The pieces were cut, polished and embedded in Araldit 2020 to avoid future oxidation. The specimens were examined under a Nikon SMZ1000 stereomicroscope. Photographs were taken using a digital camera attached to a Nikon SMZ25 microscope. Drawings were made using a camera lucida attached to the Nikon SMZ1000 stereomicroscope.

The terminology follows Cumming and Wood (2017). Abbreviations of morphological features: ad = anterodorsal; av = anteroventral setae; bm = basal medial cell; br = basal radial cell; cerc = cercus; CuA = anterior branch of cubital vein; cua = anterior cubital cell; CuA+CuP = anterior branch of cubital vein + posterior branch of cubital vein; d = dorsal bristles; dc = dorsocentral bristles; dm = discal medial cell; epand = epandrium; h = humeral crossvein; hypd = hypandrium; M_1 , M_4 = medial veins; m-cu = medial-cubital crossvein; pd = posterodorsal; pv = posteroventral; R_1 , R_{2+3} = radial veins; Rs = radial sector; Sc = subcostal vein; st = sternite; sur = surstylus; tg = tergite; v = ventral setae.

One of the amber pieces (Fig. 1C) was donated by Jorge Caridad to the Museo Nacional de Historia Natural “Prof. Eugenio de Jesús Marcano”, Santo Domingo, Dominican Republic (labelled MNHNSD FOS 17.01).

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RESULTS

Systematic Palaeontology

Order Diptera Linnaeus, 1758

Family Hybotidae Meigen, 1820

Syneproctus gen. nov.

(Figs. 1–2)

Type species: Syneproctus caridadi sp. nov., here designated. Monotypic genus.

Etymology. The name *Syneproctus* is a combination of *Syneches* and *Stenoproctus* Loew. The gender is masculine.

Diagnosis. Head hemispherical and holoptic in both sexes, eyes bare, frontally flattened and inflated, making the head wider than its height (from anterior view); postpedicel tapered with apical arista-like stylus; mouthparts stoutly sclerotized and slender, narrow and apically pointed, without pseudotracheae; palpus slender, much shorter than labrum with long apical setae; thorax highly arched; hind femur enlarged and spinose beneath; wings broad, with distinct pterostigma; Rs elongate, arising in proximal half of cell br; m-cu crossvein horizontally orientated; vein CuA+CuP not reaching the wing margin; cell cua shorter than cell bm; CuA slightly arched; cell dm enlarged, longer and broader than basal cells; male terminalia nearly symmetrical, lacking articulated surstyli, rotated 45° to the right.

Syneproctus caridadi sp. nov.

(Figs. 1–2)

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Diagnosis. Pterostigma more than 3 times as long as wide, filling apical 0.3 of cell r_1 . Veins R_{4+5} and M_1 not distinctly convergent apically. Hind femur swollen and bearing spine-like ventral setae mounted on short protuberances, the first seven on finger-like ventral tubercles, the other 11 on short elevations.

Diagnosis. Pterostigma 3 veces más largo que ancho, llenando apicalmente 0.3 de la celda r_1 . Venas R_{4+5} y M_1 no claramente convergentes apicalmente. Fémur posterior hinchado y con setas ventrales emergiendo de protuberancias cortas, las primeras siete de tubérculos ventrales en forma de dedos, las otras once de elevaciones cortas.

Holotype (male). DOMINICAN REPUBLIC. SMF Be 12428a and *Allotype (female)* SMF Be 12428b. Housed at Senckenberg Forschungsinstitut und Naturmuseum (Frankfurt, Germany). The holotype and allotype are present in the same amber piece, close together and in the same resin (amber) flow (layer) indicating spatial and temporal co-occurrence. Syninclusions: one Hymenoptera covered with micro bubbles, one male of Diptera: Psychodidae: Trichomyiinae, one male of Diptera: Chironomidae, and one Acari.

Paratype (female). DOMINICAN REPUBLIC. MNHNSDFOS 17.01. Housed at Museo Nacional de Historia Natural “Prof. Eugenio de Jesús Marcano”. Without associated syninclusions.

Description

Holotype (male). Body length 4.25 mm. Head: Eyes flattened dorsally and upper facets enlarged. Ocellar triangle elevated, bare and shiny; bearing 2 long ocellar bristles; postocular setae short and proclinate. Antenna placed at middle of head; scape and pedicel subcylindrical; pedicel larger than scape, with distal ring of setae; postpedicel pointed, bilaterally symmetrical, elongate, basally swollen, 0.15 mm length, 0.07 mm width; arista-like stylus terminal, 0.7 mm length, 2-articulated, basal article very short (Fig. 2C). Proboscis shorter than head. Palpus with 3 apical setae, second seta shorter and apical seta as long as palpus. Thorax: Scutum, scutellum and pleura shiny with some fine microsetae. Pronotum long with 1 strong marginal seta and 2 slender setae. Scutum rounded dorsally, greatly convex, with sparse slender setae; setae of prescutellar disc long and strong; acrostichal setulae and dorsocentral setulae uniserial; 1 supra-alar seta strong; scutum with pattern of color showing 4 black lines. One pair of apical scutellar spine-like bristles and 3 weak lateral bristles, two about 1/4 length of apical pair and one in middle of two small ones about 1/2 length of apical pair. Legs clothed in slender and long setae, denser in tarsomeres. Fore femur slightly wider than mid femur. Fore tibia darker than mid and hind tibiae. Hind tibia geniculate at base. Outstanding bristles: Fore tibia with 2 av, 1 ad, 3 pv and 1 pd not reaching apex of corresponding tarsomere 1. Fore tarsomere 1 with 1 long, posterior, robust preapical seta not extending beyond apex of fore tarsomere 2. Mid tibia with 2 long robust av, 2 ad, 2 pv and 1 pd. Mid tarsomere 1 with 1 long posteroventral bristle near base, almost reaching base of tarsomere 2. Hind tibia with long simple setae and row of 18 v shorter tuberculated spines. Hind tarsomere without spines, with dense short setae. Pulvilli all of same length. Hind femur thickened, 4.6 times as long as wide; with one seta at apical quarter, 1 ad near apex; row of 7 av long spines; row of 18 v shorter tuberculated spines, tubercles more conspicuous on distal half. Wing (Fig. 2A): 3.8 mm length. Pterostigma more than 3 times as long as wide, light brown, filling apical 0.3 of cell r_1 . Sc running very close to R_1 and fading away. R_{4+5} and M_1 not distinctly convergent apically. Cell dm large with short M_4 . Abdomen: broad, apparently flattened dorsoventrally. All tergites with long setae. Segment 8 rotated 45°. Terminalia: Epandrium with medially directed subapical pointed process (Fig. 2D); apex of epandrium (surstylus) tapered, medially directed with slender, pointed tooth-like apex. Hypandrium distinctly longer than wide, narrowed towards tip. Phallus difficult to observe but seems thin and acute (Fig. 2B).

Paratype (female). Similar to male. Body length 4.76 mm. Legs: Hind trochanter with 2 robust posteroventral distal bristles. Hind femur as thickened as in male, 4.6 times as long as wide with 1 d seta at apical quarter, 1 ad near apex; row of 9 av long spines, basal seta shorter and not as strong as other 8 av; row of 18 v shorter tuberculated spines (Fig. 2E). Terminalia: as in Fig. 2F.

Etymology. The species name caridadi is a dedication to the Dominican family Caridad, owners of the World Amber Museum in Santo Domingo.

Remarks. To find male and female specimens of the same species is rather uncommon in the fossil record. In the amber piece SMF Be 12428, the male (Holotype), (Fig. 1, A, B and D), and female (Allotype; Fig. 1, A, E) are preserved together. They appear head to head, not in copula position but originally in the same resin layer. Present in this amber piece there are other syninclusions; however, these were trapped at different times, thus in different resin layers. We consider the exemplars conspecific because they share all the relevant morphological characters and only the few differences they show could be considered of sexual dimorphism. We choose to describe the paratype female and not the allotype because of the favorable position of the specimen in the piece of amber that allow much better visibility and presentation of the characters. However, all the relevant characters have been observed in both specimens.

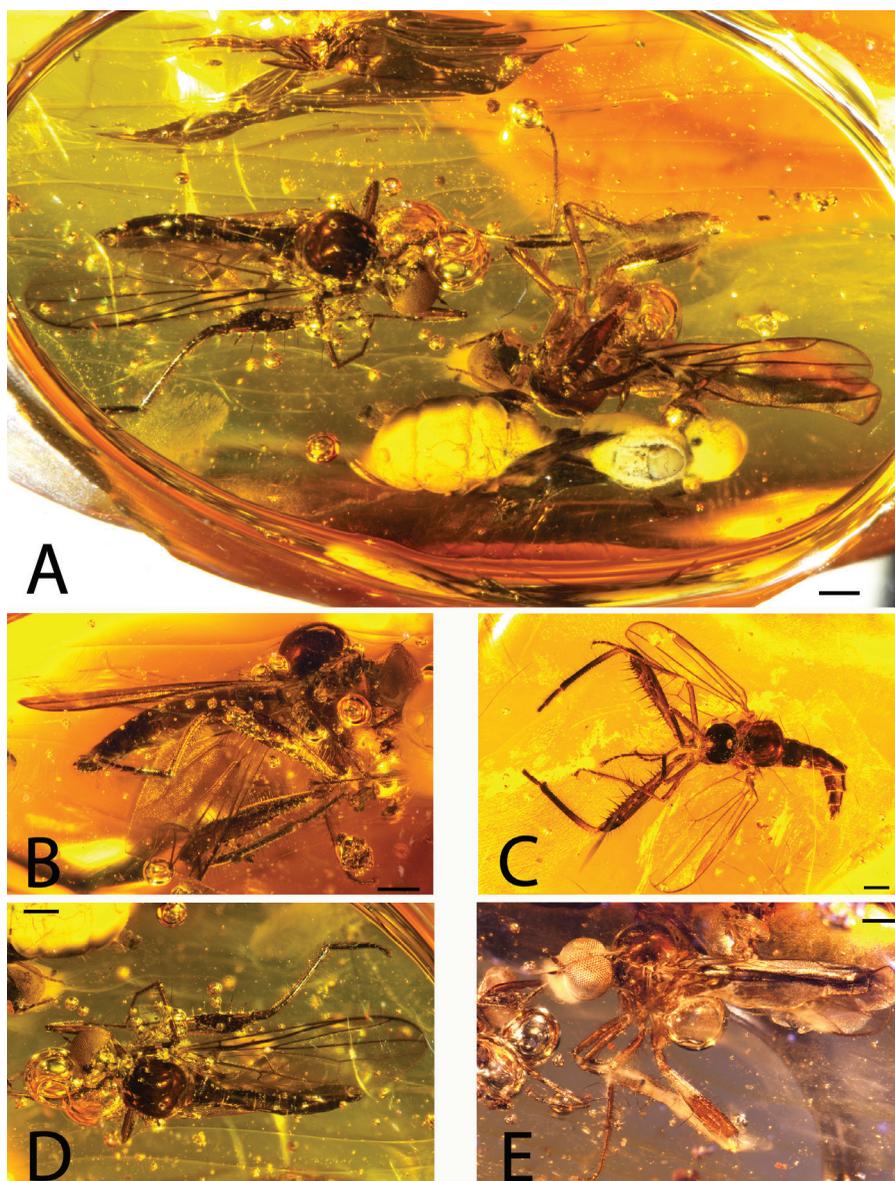


Figure 1. Photographs of *Syneproctus caridadi* gen. et sp. nov. (Empidoidea, Hybotidae). A, SMF Be 12428, general view of the amber piece with the holotype (♂; right) and the allotype (♀; left) very close to each other. B and D, holotype (♂) SMF Be 12428a, habitus in different views. C, paratype (♀) MNHNSD FOS 17.01, habitus. E, allotype (♀) SMF Be 12428b habitus. Scale bars = 0.5 mm.

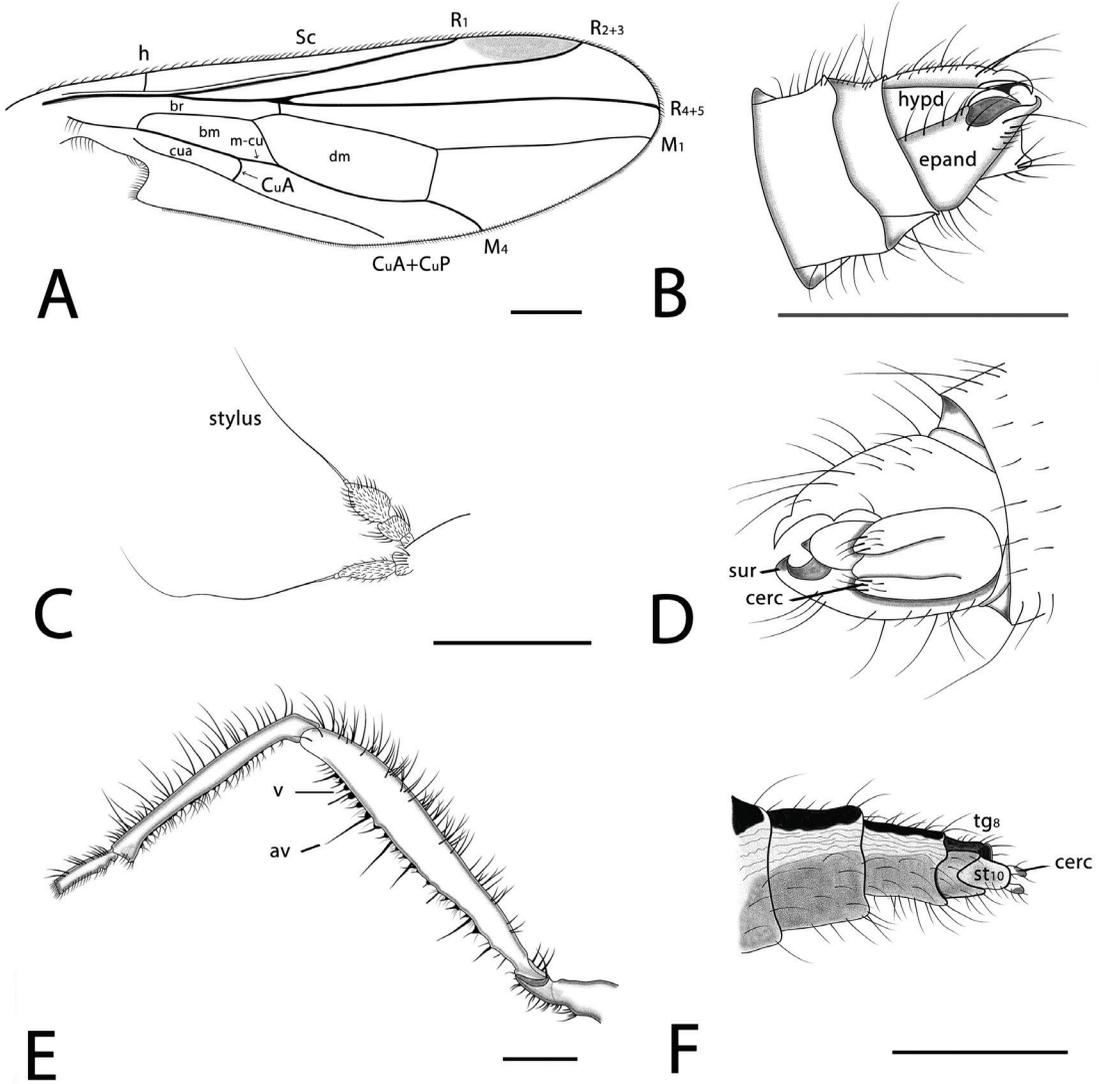


Figure 2. Camera lucida drawings of the major anatomical features of *Syneproctus caridadi* gen. et sp. nov. (Empidoidea, Hybotidae). A–D, holotype (♂) SMF Be 12428a. A, wing. B, terminalia in dorsal view. C, antennae. D, terminalia in ventral view. E–F, paratype (♀) MNHNSD FOS 17.01. E, detail of the hind leg. F, terminalia in ventral view. Scale bars = 0.5 mm.

DISCUSSION

In the key to genera of Neotropical Hybotinae by Ale-Rocha and Carvalho (2003), the new genus runs to *Syneches*. *Syneproctus* **gen. nov.** is distinguished from *Syneches* by the more tapered postpedicel, horizontally orientated crossvein m-cu and cell cua much shorter than cell bm. In *Syneches*, the postpedicel is apically oval, m-cu is obliquely positioned and cell cua is long, extending beyond cell bm. The wing venation of the new genus is more like that of the Afrotropical genus *Stenoproctus* Loew, 1858. The nearly horizontally orientated crossvein m-cu creates a straight line connection between cells bm and dm, and the shortened cell cua is somewhat similar to *Stenoproctus* (see Sinclair & Cumming, 2017, fig. 20). But unlike *Stenoproctus*, with its more membranous proboscis and presence of pseudotracheae, the proboscis of *Syneproctus* **gen. nov.** is stout and heavily sclerotized and *Syneches*-like. Species of the new genus were probably predaceous on the basis of the piercing like proboscis shared with other genera of Hybotinae. The new genus is also very similar to *Chillcottomyia* Saigusa, 1986, known from the Afrotropical and Oriental regions (Sinclair & Cumming, 2017), which is characterized by pubescent eyes (short ommatrichia), slender hind femora and mouthparts similar to *Stenoproctus*. *Syneproctus* **gen. nov.** differs by having bare eyes, enlarged hind femora and *Syneches*-like proboscis.

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Additional information and declarations

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