



Hyptia deansi sp. nov., the first record of Evaniidae (Hymenoptera) from Mexican amber

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Abstract

Hyptia deansi sp. nov. represents the first record of Evaniidae (Hymenoptera) from Lower Miocene to Upper Oligocene Mexican amber, Simojovel, Chiapas, Mexico and is described based on a well preserved female specimen. Phylogenetically relevant morphological characters are discussed with reference to fossil and extant genera of Evaniidae. The new fossil is placed in the extant New World genus *Hyptia* Illiger 1807, based on the presence of just a single fore wing cell, the absence of tubular veins M+CU, 1CUa, 1Cub, and the presence of 11 flagellomeres.

Key words: amber, fossil, Lower Miocene, Upper Oligocene, Mexico, systematic palaeontology, Evanioidea

Introduction

Most Mexican amber originates from mines around Simojovel, Chiapas, Mexico. The amber-bearing strata extend from the Balumtun Sandstone of the Lower Miocene to the La Quinta Formation of the Upper Oligocene (Poinar & Brown 2002), with ages ranging from 22.5–26 Myr (Berggren & Van Couvering 1974). However, because the amber is found in secondary deposits, these dates only provide a minimum age.

Mexican amber remains relatively poorly studied, although Solórzano Kraemer (2007) recently provided an extensive account of the insect inclusions, including a list of undescribed specimens from many insect orders and families. Although over 650 hymenopteran inclusions are known, relatively few of these have been described (see Solórzano Kraemer 2007 for details). Solórzano Kraemer (2007) also indicated that an evaniid is known to occur as an inclusion, but to date, no evaniids have been described from Mexican amber.

Ensign or hatchet wasps (family Evaniidae) are distinctive solitary predators on cockroach eggs in oothecae. They have a hatchet-shaped metasoma with a tubular petiole and a shortened, laterally compressed gaster (*sensu* abdominal segments posterior to abdominal segment 2—Hymenoptera Anatomy Consortium 2012). The fauna comprises about 650 species concepts in 22 extant and 12 fossil genera (Deans 2005; Deans et al. 2012). Several species have been described from Mesozoic ambers ranging from the Early to Late Cretaceous (e.g., Rasnitsyn 1975; Basibuyuk et al. 2000a, 2000b; Basibuyuk & Rasnitsyn 2002; Deans et al. 2004; Engel 2006), in addition to relatively modern species in Tertiary ambers (e.g., Brues 1933; Nel et al. 2002a, 2002b; Sawoniewicz & Kupryjanowicz 2003)—see Table 1. Several other evaniids have been described from non-amber deposits, mostly early to late Cretaceous (see Table 1), while *Procretevania pristina* Zhang & Zhang 2000, from the Upper Jurassic Yixian formation of Beipiao, Western Liaoning, is the oldest fossil evaniid to date.

Herein we provide the description of a new species of Evaniidae from Mexican amber and contribute to the knowledge of the Miocene/Oligocene diversity of parasitoid wasps

Materials and methods

The amber specimen was immersed in 50% glycerol in distilled water and images were taken using a Visionary

Digital BK plus imaging system with a Canon EOS 5D Mark II 21.1 megapixel camera. Images were produced using Zerene Stacker, Zerene Systems LLC, software and cropped and resized in Photoshop CS5.

TABLE 1. List of fossil genera and species of Evaniidae. * = amber inclusion; † = extant genus; # = Holotype deposited in Gdańsk collection, lost during World War II (Sawoniewicz & Kupryjanowicz 2003).

Taxa	Formation and locality	References
<i>Botsvania cretacea</i> Rasnitsyn & Brothers 2007	Lower Upper Cretaceous (Turonian), Orapa, Botswana	Rasnitsyn & Brothers 2007
* <i>Cretevania alcalai</i> Peñalver, Ortega-Blanco, Nel & Delclòs 2010	Early Cretaceous (Albian), Province of Burgos, Spain	Peñalver et al. 2010
* <i>Cretevania alonsoi</i> Peñalver, Ortega-Blanco, Nel & Delclòs 2010	Early Cretaceous (Albian), Province of Burgos, Spain	Peñalver et al. 2010
<i>Cretavania concordia</i> Rasnitsyn & Jarzembowski 1998	Lower Cretaceous, Purbeck and Wealden, Clockhouse Brickworks, Surrey, England	Rasnitsyn & Jarzembowski 1998; Zhang et al. 2007; Peñalver et al. 2010
* <i>Cretevania cyrtocerca</i> (Deans 2004)	Lower Cretaceous, probably Valangian-Hauterivian to lowermost Aptian, Mdeyrij-Hammana, Caza Baabdah, Mouhafatiz Jabal Loubnan, Lebanon	Deans et al. 2004; Zhang et al. 2007; Peñalver et al. 2010
<i>Cretevania exquisita</i> (Zhang, Rasnitsyn, Wang & Zhang 2007)	Lower Yixian Formation of the Huangbanjigou locality, Beipiao, western Liaoning, China.	Zhang et al. 2007; Peñalver et al. 2010
* <i>Cretavania major</i> Rasnitsyn 1975	Upper Cretaceous, Cenomanian, Taimyr, Siberia, Russia	Rasnitsyn 1975; Zhang et al. 2007; Peñalver et al. 2010
* <i>Cretavania minor</i> Rasnitsyn 1975	Upper Cretaceous, Cenomanian, Taimyr, Siberia, Russia	Rasnitsyn 1975; Zhang et al. 2007; Peñalver et al. 2010
* <i>Cretavania minuta</i> Rasnitsyn 1975	Upper Cretaceous, Cenomanian, Taimyr, Siberia, Russia	Rasnitsyn 1975; Zhang et al. 2007; Peñalver et al. 2010
<i>Cretavania meridionalis</i> Rasnitsyn 1975	Lower Cretaceous, ?Berremian-Aptian, Bon-Tsagan, Mongolia	Rasnitsyn 1991; Zhang et al. 2007; Peñalver et al. 2010
* <i>Cretevania montoyai</i> Peñalver, Ortega-Blanco, Nel & Delclòs, 2010	Early Cretaceous (Albian), Province of Burgos, Spain	Peñalver et al. 2010
<i>Cretevania pristina</i> (Zhang & Zhang 2000)	Upper Jurassic Yixian formation of Beipiao, Western Liaoning, China	Zhang & Zhang 2000; Peñalver et al. 2010
* <i>Cretevania rubusensis</i> Peñalver, Ortega-Blanco, Nel & Delclòs 2010	Early Cretaceous (Albian), Province of Burgos, Spain	Peñalver et al. 2010
<i>Cretevania vesca</i> (Zhang, Rasnitsyn, Wang & Zhang 2007)	Lower Yixian Formation of the Huangbanjigou locality, Beipiao, Western Liaoning, China.	Zhang et al. 2007; Peñalver et al. 2010
* <i>Eoevania magnifica</i> Nel, Waller, Hodebert & De Ploëg 2002	Lowermost Eocene amber, Le Quesnoy, Oise Department, Paris basin	Nel et al. 2002b; Zhang et al. 2007
*† <i>Evaniella eocenica</i> Sawoniewicz & Kupryjanowicz 2003	Eocene Baltic amber	Sawoniewicz & Kupryjanowicz 2003
* <i>Grimaldivania ackermani</i> Basibuyuk & Rasnitsyn 2000	Upper Cretaceous (Turonian), Sayreville, New Jersey, USA	Basibuyuk et al. 2000a; Zhang et al. 2007
* <i>Grimaldivania mckimorum</i> Engel 2006	Raritan Formation, Turonian, New Jersey, USA	Engel 2006
* <i>Iberoevania roblei</i> Peñalver, Ortega-Blanco, Nel & Delclòs 2010	Escucha Formation, Lower Cretaceous (Albian), Province of Burgos, Spain	Peñalver et al. 2010
* <i>Lebanevania azari</i> Basibuyuk & Rasnitsyn 2002	Uppermost Neocomian beds in contact with Lower Aptian beds, Jezzine, South Lebanon	Basibuyuk & Rasnitsyn 2002; Zhang et al. 2007
* <i>Mesevania swinhoi</i> Basibuyuk & Rasnitsyn 2000	?Upper Cretaceous, Hukawng Valley, Myanmar (Burma)	Basibuyuk et al. 2000b; Zhang et al. 2007

continued on next page.

TABLE 1. (continued)

Taxa	Formation and locality	References
* <i>Newjersevania casei</i> Basibuyuk, Quicke & Rasnitsyn, 2000	Upper Cretaceous (Turonian), Sayreville, New Jersey, USA	Basibuyuk et al. 2000a; Zhang et al. 2007
* <i>Newjersevania nascimbenei</i> Basibuyuk & Rasnitsyn 2000	Upper Cretaceous (Turonian), Sayreville, New Jersey, USA	Basibuyuk et al. 2000a; Zhang et al. 2007
* <i>Parevania brevis</i> Brues 1933	#Baltic amber	Brues 1933
* <i>Parevania producta</i> Brues 1933	#Baltic amber	Brues 1933
* <i>Parevania remanea</i> Brues 1933	#Baltic amber	Brues 1933
<i>Praevania sculpturata</i> Rasnitsyn 1991	Lower Cretaceous, ?Berremian-Aptian, Mongolia	Rasnitsyn 1991; Basibuyuk et al. 2002
* <i>Protoparevania lourothi</i> Deans 2004	Lower Cretaceous, probably Valangian-Hauterivian to lowermost Aptian, Mdeyrij-Hammana, Caza Baabdah, Mouhafatiz Jabal Loubnan, Lebanon	Deans et al. 2004; Zhang et al. 2007
* <i>Semaemyia dominicanus</i> (Nel Delclòs & Azar 2002)	Late Early Miocene through early Middle Miocene, Dominican Republic	Nel et al. 2002a
* <i>Sorellevania deansi</i> Engel 2006	Cretaceous, latest Albian, Myanmar (Burma)	Engel 2006; Peñalver et al. 2010

Systematic Palaeontology

Superfamily: Evanioidea Latreille, 1802

Family: Evaniidae Latreille, 1802

Genus: *Hyptia* Illiger, 1807 [See Deans 2005 for full taxonomic history.]

Type species: *Evania petiolata* Fabricius, 1798 by monotypy.

Diagnosis. Antennae with 11 flagellomeres (although several undescribed *Hyptia* have 10 flagellomeres – Deans pers. comm.); notauli apparently absent in most species; fore wing venation reduced, single complete cell contained by tubular veins (costal cell – see Deans & Huben 2003; Fig 17); M+CU variable in length or reduced and portion of 1CUa and 1CUB may be present; hind tarsomeres not elongated into spines; ovipositor not exerted.

Comments: *Hyptia* Illiger 1807 currently comprises about 50 species, as well as several subspecies, and is restricted to the New World, occurring in Canada, USA and Mexico, Central America and the Caribbean, and much of South America, while it is most speciose in the Neotropics (Deans 2005; Deans et al. 2012).

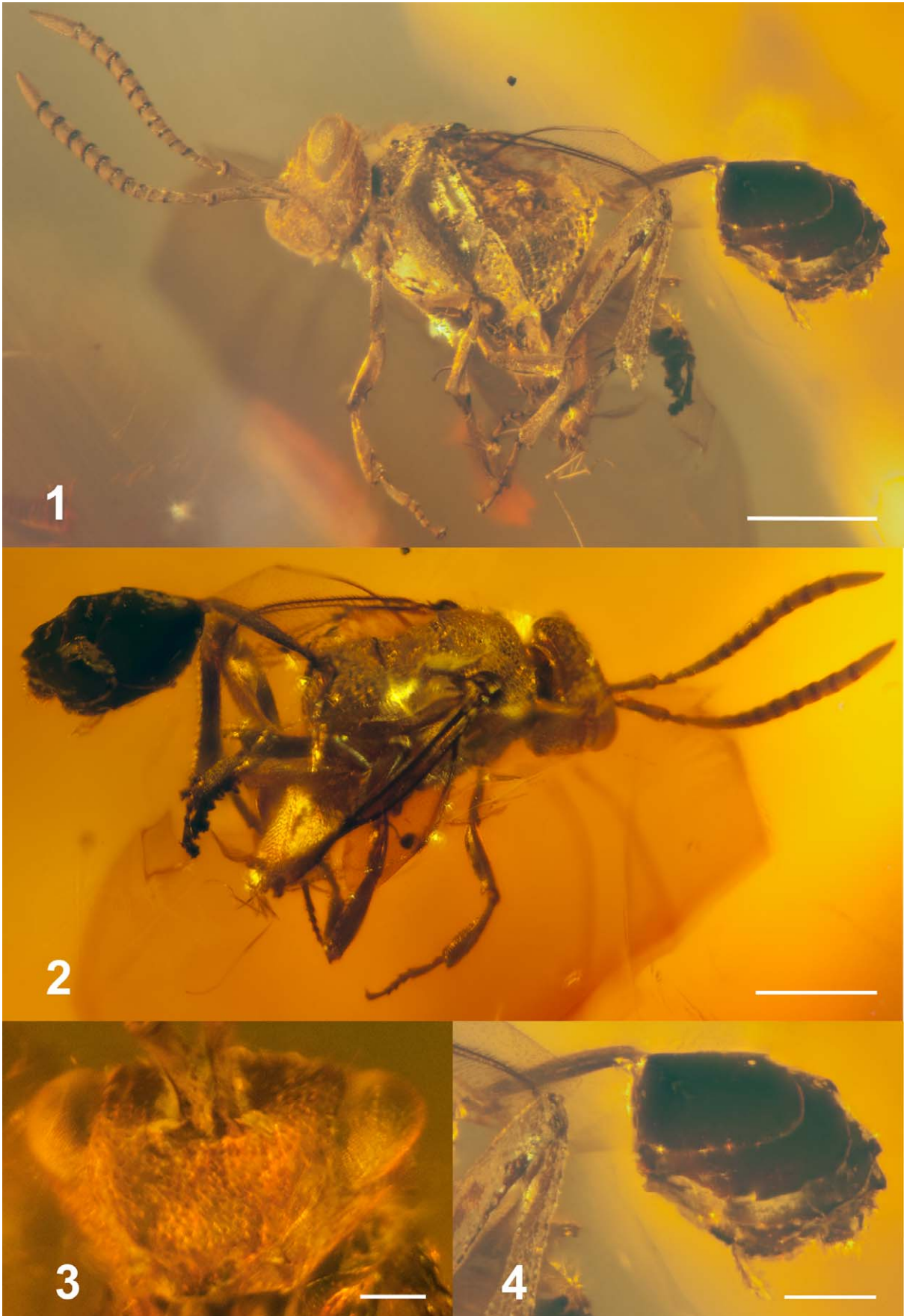
Hyptia deansi, Jennings, Krogmann and Mew, sp. nov.

Figures 1–4.

Holotype: Specimen in amber from Simojovel, Chiapas, Mexico. Lower Miocene to Upper Oligocene. State Museum of Natural History Stuttgart SMNS MX-440.

Etymology. The species epithet is named in honour of Andy Deans, North Carolina State University, who has done much to revive interest in the Evaniidae.

Diagnosis. Female fully winged and of small body size (total length 5.55 mm); body brown except for black metasoma, petiole black in first quarter, apical margins of flagellomeres 1–10 black, giving antenna a banded appearance. Head 0.80 mm, mesosoma 2.50 mm, metasoma 2.61 mm; head 1.60× as wide as long; vertex 0.15× head width; compound eye half as long as head, distance between eyes 0.77 mm; distance of lateral ocellus to compound eye 0.17 mm; occipital carina broad, complete; malar space 0.83× height of compound eye; face and clypeus punctate, frons and vertex rugose-punctate; clypeus not swollen medially; antennae inserted at mid-line of eye, toruli almost touching; distance from torulus to eye 0.37 mm; antennae with 11 flagellomeres; scape 0.69 mm in



FIGURES 1–4. *Hyptia deansi*, Jennings, Krogmann and Mew, **sp. nov.** (1), lateral habitus (left side); (2) lateral habitus (right side). Scale bars (1,2) = 1 mm; (3) frontal head; (4) lateral metasoma. Scale bars (3) = 2.5 mm; (4) = 0.5 mm.

length; pedicel slightly longer than wide, 0.17 mm in length, first flagellomere 0.14 mm in length; flagellomeres slightly longer than wide, except apical flagellomere 0.35× as long as wide. mesoscutellum and scutellum punctate; notauli percurrent, each notaulus indicated by a row of punctures in slight depression; propodeum areolate; petiole long and thin, 0.73× length of the remaining metasoma (i.e. the gaster); gaster elliptical. Fore wing venation reduced, only C and Sc+R present. Hind wing obscured basally, only vein C apparent, with four distal hamuli. Legs elongate; fore coxae about 2× distance between mid and hind coxae, pretarsal claws short, slender, simple, arolium present. Ovipositor short, straight, 0.21× length of metasoma.

Discussion

Hyptia deansi sp. nov. has a long petiole in comparison with the gaster length (see Figs 1, 2, 4), a character state common to most fossil evaniids (see, for example, Basibuyuk et al. 2002; Peñalver et al. 2010). Of the fossil evaniid genera described to date, only *Botsvania* Rasnitsyn & Brothers 2007, *Grimaldivania* Basibuyuk & Rasnitsyn 2000, *Protoparevania* Deans 2004, and *Sorellevania* Engel 2006, have a short petiole, which is about half or less the length of the gaster. However, all of these taxa have a more-or-less complete fore wing venation.

Most extinct evaniid genera apparently have long ovipositors, often curved and up-turned (see, for example, Peñalver et al. 2010). *Hyptia deansi* sp. nov., however, has a short ovipositor (see Fig. 4), a character state shared only with *Botsvania* and *Grimaldivania*, although it should be pointed out that several other fossil taxa, mostly impression fossils, are lacking an ovipositor or that some are probably males. Both *Botsvania* and *Grimaldivania*, however, have a relatively complete fore wing venation (see, for example, Rasnitsyn and Brothers 2007; Basibuyuk et al. 2000a; Zhang et al. 2007; Engel 2006; Basibuyuk et al. 2010).

Also the majority of fossil evaniids have a relatively complete fore wing venation (see, for example, Basibuyuk et al. 2002; Deans et al. 2004; Rasnitsyn & Brothers 2007; Peñalver et al. 2010). The greatest reduction in fossil wing venation is exhibited by the Miocene evaniid *Semaemyia dominicanus* (Nel, Delclòs & Azar), which is characterized by only three enclosed cells (Nel et al. 2002a). The fore wing venation of *H. deansi* is even further reduced, with just a single cell (costal), a derived character state which was previously unknown from the fossil record but is present in extant *Hyptia* and *Decevania* (Deans & Huben 2003). *Decevania*, however, has 8 flagellomeres, whereas *H. deansi* has 11 flagellomeres, a character state shared with most extant *Hyptia* (and most other extinct evaniids). The fore wing venation of *H. deansi* is most similar to extant *Hyptia* species in the absence of tubular veins M+CU, 1CUa, 1CUB (Deans & Huben 2003, Fig. 17), which are present in *Decevania* (Deans & Huben 2003, Fig. 1).

Although, the new fossil has notauli, which are apparently lacking in most extant *Hyptia* (Deans & Huben 2003), we place the new species in *Hyptia* mainly based on the apomorphic fore wing venation and the other characteristics discussed above.

Basibuyuk et al. (2002) carried out a phylogenetic analysis of extant and fossil evaniids based on 24 morphological characters and concluded that the preservation state of the examined fossils did not provide enough characters to unravel their phylogenetic relationships to extant taxa. Peñalver et al. (2010) expanded the matrix of Basibuyuk et al. (2002) only in terms of new fossil taxa and yielded a partly resolved tree. It is hoped that in the future more complete and well preserved fossils, such as *H. deansi*, become available, which would allow to code and score further morphological characters which are urgently needed for a more thorough analysis of the internal phylogeny of Evaniidae.

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