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The wasp family Spathiopterygidae in mid-Cretaceous amber from Myanmar (Hymenoptera: Diaprioidea)

Famille des guêpes Spathiopterygidae de l'ambre du Crétacé moyen de Birmanie (Hymenioptera : Diaprioidea)

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ABSTRACT

The extinct parasitoid wasp family Spathiopterygidae is recorded for the first time from the mid-Cretaceous amber deposits of northern Myanmar, often referred to as Burmese amber. The family was previously known only from three species in Spanish (Albian) and New Jersey (Turonian) ambers, representing an otherwise western Eurasia/eastern North America distribution. The discovery of a new genus and species, *Diaspathion ortegai* Engel and Huang, gen. et sp. nov., reveals a novel combination of traits seemingly intermediary between the Albian and Turonian taxa. Comparisons are made between the known species and a revised key to genera is provided, along with some general remarks about challenges facing the study of fossil parasitoid wasps.

Mots clés :
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RÉSUMÉ

La famille des Spathiopterygidae, guêpes parasitoïdes qui n'existent plus, a été enregistrée pour la première fois dans les dépôts d'ambre du Crétacé moyen du Nord de la Birmanie, souvent appelés « ambre birman ». La famille n'était préalablement connue qu'à partir de trois

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espèces dans l'ambre espagnol (Albien) et dans l'ambre du New Jersey (Turonien), représentant une distribution autre que celle de l'Europe occidentale et de l'Est de l'Amérique du Nord. La découverte des nouveaux genre et espèce *Diaspathion ortegai* Engel et Huang gen. et sp. nov. révèle une nouvelle combinaison de traits semblant intermédiaires entre les taxons albien et turonien. Des comparaisons sont effectuées entre les espèces connues et une clé révisée est fournie pour les genres, avec des remarques générales sur les défis offerts par l'étude des guêpes parasitoïdes fossiles.

1. Introduction

In the various Mesozoic ambers of the world, there are a few lineages of minute parasitoid wasps that are hallmarks of the Cretaceous and although each has living relatives in the modern era, they are wholly unique in their own rights. Each family, with one exception, is known only in fossiliferous resins, largely given that their diminutive proportions require high preservational fidelity in order to adequately recognize their features. Some of the more widely known examples are the Serphitidae, Alavarommatidae, and Gallorommatidae, all belonging to the Bipetiolarida of the Proctotrupomorpha and closely allied to the Mymarommatidae (Brues, 1937; Kozlov and Rasnitsyn, 1979; McKellar and Engel, 2011a; Ortega-Blanco et al., 2011a,b). The latter two families are placed in the same superfamily with mymarommatids and appear to represent step-wise branches in the evolution of this clade (Gibson et al., 2007), while the former is presently classified in a separate but sister superfamily (Grimaldi and Engel, 2005; McKellar and Engel, 2011a). Another remarkable example is those species of the Stigmaphronidae and Radiophronidae (Ceraphronoidea), which analogously represent an apparent gradual branching from the lineage producing the Megaspilidae and Ceraphronidae (Ortega-Blanco et al., 2011c). With a few minor exceptions, these families are known from deposits spanning from the Early into the Late Cretaceous. Alongside these more familiar groups, another family of tiny wasps, this time of the Diaprioidea, is the recently discovered Spathiopterygidae (Engel et al., 2013). Spathiopterygids are apparently related to the enigmatic living Maamingidae, today known only from New Zealand (Early et al., 2001, 2002). As is the case for all of these extinct families, their biologies remain unknown. The mymarommatoid families Alavarommatidae and Gallorommatidae were likely egg parasitoids, as has been hypothesized for Mymarommatidae (Yoshimoto, 1984). Given the diversity of possible hosts among living megaspilids and ceraphronids it is impossible to even remotely hypothesize possible victims of stigmaphronids and radiophronids, although their particularly high diversity among the Spanish fauna might suggest that their hosts are among the more common of inclusions therein, such as Diptera (Ortega-Blanco et al., 2011c), but we are aware that simple frequent occurrence does not represent evidence of biological association. Ascertaining the hosts of spathiopterygids is even more challenging given the complete absence of biological data for their living relatives among the Maamingidae.

Species of Serphitidae are broadly distributed across the Cretaceous, with species in Spanish, Burmese, New Jersey, Canadian, Siberian, and French ambers (Brues, 1937; Engel, unpubl. data; Engel and Perrichot, 2014; Engel et al., 2011; Kozlov and Rasnitsyn, 1979; McKellar and Engel, 2011a, 2012; Ortega-Blanco et al., 2011a); Gallorommatidae are known from Myanmar, New Jersey, and France (Engel, unpubl. data; Engel and Grimaldi, 2007; Ortega-Blanco et al., 2011b; Schlüter, 1978); Stigmaphronidae are documented in Spanish, Burmese, New Jersey, Canadian, Siberian, and Alaskan resins (Engel and Grimaldi, 2009; McKellar and Engel, 2011b, 2012; Muesebeck, 1963; Ortega-Blanco et al., 2011c), and some Berriasian- to Aptian-aged compressions from Siberia and Mongolia, respectively (Rasnitsyn, 1991); while Alavarommatidae and Radiophronidae are presently recorded only from Spain (Ortega-Blanco et al., 2010, 2011b). Fossils of the living families Mymarommatidae, Megapsilidae, and Ceraphronidae are known largely from the Tertiary (Alekseev, 1995; Brues, 1940; Engel, 2013; Gibson et al., 2007; Ortega-Blanco et al., 2011b; Peñalver and Engel, 2006; Szabó and Oehlke, 1986), with a few Late Cretaceous records of megaspilids (Alekseev and Rasnitsyn, 1981; Engel, unpubl. data; McKellar and Engel, 2011b; Perrichot, pers. comm.). The recently discovered Spathiopterygidae were hitherto known from Spanish and New Jersey ambers (Aguiar et al., 2013; Engel et al., 2013), (Table 1) but herein we report on the discovery of the family from the mid-Cretaceous deposits of northern Myanmar.

2. Material and methods

During sorting of extensive samples of amber from the mid-Cretaceous (Albian–Cenomanian: Grimaldi et al., 2002; Shi et al., 2012) deposits of northern Myanmar, a single individual of the family was recovered. The inclusion was discovered in a deep reddish-orange piece of amber and initially was obscured from the left side of the wasp. The wasp was separated carefully from the remaining inclusions by trimming with a fine water-fed saw and the resulting chip was finely polished close to the specimen, so that it could be examined under both compound and stereomicroscopes (Figs. 1 and 2a). The individual is exceedingly well preserved and despite various particulates in the amber, is not generally obscured from view. There are minor fracture planes around the apices of the wings (which at first give them a fringed appearance), but these do not detract from observing the structures. The right antenna, particularly the more apical flagellomeres, has separated from the amber slightly along an internal