Zootaxa 3681 (4): 405–412
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3681.4.5
http://zoobank.org/urn:lsid:zoobank.org:pub:F68AE86E-29A9-47D3-89F6-2B98FD90B68A

A New Genus of Highly Specialized Ants in Cretaceous Burmese Amber (Hymenoptera: Formicidae)

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Abstract

A new genus of ants, *Zigrasimecia* Barden and Grimaldi, is described for a new and uniquely specialized species, *Z. tonsora* Barden and Grimaldi n.sp., preserved in Cretaceous amber from Myanmar. The amber is radiometrically dated at 99 myo. *Zigrasimecia* is closely related to another basal genus of ants known only in Burmese and French Cretaceous amber, *Sphecomyrmodes* Engel and Grimaldi, based in part on the shared possession of a comb of pegs on the clypeal margin, as well as mandible structure. Highly specialized features of *Zigrasimecia* include extensive development of the clypeal comb, a thick brush of setae on the oral surface of the mandibles and on the labrum, and a head that is broad, flattened, and which bears a crown of blackened, rugose cuticle. Mouthparts are hypothesized to have functioned in a unique manner, showing no clear signs of dentition representative of "chewing" or otherwise processing solid food. Although all ants in Burmese amber are basal, stem-group taxa, there is an unexpected diversity of mouthpart morphologies and probable feeding modes.

Key words: Myanmar, Aptian-Cenomanian boundary, mouthparts, feeding behaviors, ants

Introduction

Among the nearly 13000 species of described ants are a handful of rare and enigmatic taxa from the Cretaceous. While molecular-clock dating analyses suggest that crown-group ants diverged from their wasp-like ancestors between 115–135 (Brady *et al*. 2006) and 140–168 million years ago (Moreau *et al*. 2006), the oldest definitive ant fossils are approximately 100 myo, despite numerous older insect-yielding deposits (Nel *et al*. 2004). In amber deposits where ants are found, formicid inclusions from the Upper Cretaceous comprise between <1 and 3% of the total number of individual insects (LaPolla *et al*. 2013), a palpable contrast to much younger Miocene deposits where ant prevalence is as high as 24–36% (Grimaldi and Engel 2005; Dlussky and Rasnitsyn 2007). While younger amber deposits typically contain species that are readily placed in extant lineages (Dlussky and Rasnitsyn 2003), only one species of crown-group ant (a formicine) has been definitively identified before the Campanian (Grimaldi and Agosti 2000). The rest of the, proposed stem-group, Cretaceous taxa possess an array of unique morphologies that renders them unrecognizable with regard to modern groups and their relationship to living species is poorly explored. Ants from the Upper Cretaceous therefore act as valuable portholes, providing otherwise unknowable details at a critical time in the history of these small insects that now dominate terrestrial environments across the world.

Fossil ants are typically identified on the basis of key diagnostic characters such as the metapleural gland, petiole, and an enlarged antennal scape. While the possession of one individual character does not imply that the insect in question is indeed a member of crown-group or stem-group ants, different combinations of the presence and absence among these characters have been the basis for taxonomic assignment. The metapleural gland, visible as a small opening on the posterior region of the mesosoma, is now known to function as a form of toxic defense and sanitation (Yek and Mueller 2011). Although it has been lost in many extant species, it is not present in any other groups of insects, and therefore is probably the most reliable defining character of ants. The vast majority of Cretaceous ants have been placed in the extinct subfamily Sphecomyrminae, their placement owing largely to this

Accepted by J. Longino: 14 May 2013; published: 24 Jun. 2013