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First fossil Micropholcommatidae (Araneae), imaged in Eocene Paris amber using X-Ray Computed Tomography

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Abstract

We apply Very-High-Resolution X-Ray Computed Tomography (VHR-CT) to a minute fossil spider (~1 mm long) from Eocene amber of the Paris Basin, France. We demonstrate that the newly described genus and species of Micropholcommatidae, *Cenotextricella simoni*, retains excellent details of the somatic and male pedipalpal morphology that allows unqualified comparison with extant species. Thus, in addition to calibrating the tree of life, such fossils can now be incorporated into cladistic matrices and their resultant phylogenies. This is the first fossil record of the family Micropholcommatidae, extending the known geological range of the family by 53 million years (lowermost Eocene) and that of the symphytognathoid clade by approximately 5–9 million years.

Key words: Cenozoic, new species, palaeontology, spider, Symphytognathoidea, Textricellinae

Introduction

Some neontologists criticize palaeontology in their belief that preservation of fossils is inadequate in terms of the important taxonomic characters they reveal (see Grimaldi *et al.* 2000). For example, Wanless (1984) considered a small number of Baltic amber spiders in his review of the salticid spider subfamily Spartaeinae, but emphasized the taxonomic inferiority of many amber specimens as originally preserved. The novel application to fossils of existing imaging technologies, designed for non-palaeontological purposes, is yielding remarkable results (Grimaldi *et al.* 2000; Polcyn *et al.* 2002; Alonso *et al.* 2004; Siveter *et al.* 2004; Ascaso *et al.* 2004; Tafforeau *et al.* 2006), although in some cases, these methods destroy the specimen (Siveter *et al.* 2004). Very-High-Resolution X-Ray Computed Tomography (VHR-CT) (Grimaldi *et al.* 2000; Polcyn *et al.* 2002; Alonso *et al.* 2004; Henderickx *et al.* 2006; Dierick *et al.* 2007) provides a non-destructive, minimum preparation method for imaging minute morphological details, including internal morphology, and generates 3-dimensional reconstructions that can be sectioned and viewed from multiple angles (essentially permitting digital 'dissection' of the specimen within the amber). Here we apply VHR-CT to a spider bioinclusion in ~53 million-year-old Eocene Paris amber (Nel *et al.* 1999; Nel 2004) and show that the specimen is preserved with life-like fidelity, revealing sufficient detail of palpal morphology for phylogenetic comparison with extant taxa, thus demonstrating that such fossils are not as taxonomically sub-standard as previously thought.

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