2007 (2008). The Journal of Arachnology 35:551–553

SHORT COMMUNICATION

THE MIOCENE WHIPSCORPION *THELYPHONUS HADLEYI* IS AN UNIDENTIFIABLE ORGANIC REMAIN

Jason A. Dunlop: Museum für Naturkunde der Humboldt-Universität zu Berlin, Invalidenstraße 43, D-10115 Berlin, Germany. E-mail: jason.dunlop@museum.hu-berlin.de

O. Erik Tetlie: Department of Geology and Geophysics, Yale University, P.O. Box 208109, New Haven, Connecticut 06520-8109, USA

ABSTRACT. The putative fossil whipscorpion *Thelyphonus hadleyi* Pierce 1945 (Arachnida: Uropygi) from the middle to late Miocene Monterey Formation of Cabrillo Beach, San Pedro, California is reassessed. It is shown here to be nothing more than a fortuitously shaped stain on the rock, apparently partly algal in nature. The fossil record of whipscorpions can thus be restrained to six Pennsylvanian and one Cretaceous species.

Keywords: Uropygi, fossil, taxonomy, Monterey shale, Cabrillo Beach

Whipscorpions (Arachnida, Uropygi) are a distinctive group of arachnids characterized by robust, subraptorial pedipalps, a slender first pair of legs and an opisthosoma ending in a long, flagelliform whip-like telson. The catalogue of Harvey (2003) recognized a single family containing 103 extant species distributed throughout the tropics of Africa, Asia, and the Americas. Various aspects of their biology were summarized by Haupt (2000) and references therein. The fossil record of the group extends back to the Pennsylvanian of North America and Europe and these Coal Measures fossils were recently revised by Tetlie & Dunlop (in press). Six valid species in four genera were recognized. Five of them resolve as a grade, basal to the extant crown-group Thelyphonidae. Specifically, the earliest fossils apparently lack the projecting apophyses seen in modern whip scorpions which give their pedipalps a distinctly more chelate appearance. The sixth Coal Measures species may belong to the stem-group of Schizomida (schizomids), sharing with this group aspects of carapace morphology (Dunlop & Horrocks 1996) and pedipalps that operate in a more vertical rather than horizontal plane. A single Mesozoic whipscorpion has been recorded from the Early Cretaceous Crato Formation of Brazil. Fully modern-looking, with the pedipalpal apophyses defining the crown-group (e.g., Dunlop & Martill 2002, fig. 4b), these fossils can be assigned with some confidence to Thelyphonidae. Indeed their size—the largest carapace is over 30 mm long—and their biogeographical distribution in the Americas suggest a fossil genus closely related to the extant *Mastigoproctus* Pocock 1894.

This leaves only one further fossil whipscorpion in the literature, *Thelyphonus hadleyi* Pierce 1945, described from the mid to late Miocene (between 15 and 10 Ma) Monterey Formation of Cabrillo Beach, San Pedro, California. Listed by Petrunkevitch (1955), Harvey (2003), and Tetlie & Dunlop (unpubl. data), a particular problem is its assignment to *Thelyphonus* Latreille 1802, a genus restricted today to South-East Asia (cf. Harvey 2003). Intuitively, one would expect it to belong to, or be close to, an American genus such as *Mastigoproctus*. Furthermore, the original description is inadequate and contains only a rather unconvincing photograph, which the author (p. 8) stated "...gives better detail than a description can." Here, we restudy the holotype and only known specimen which, in fact, cannot even be identified as an arachnid.

TAXONOMY

incertae sedis fossil

Fig. 1.

Thelyphonus hadleyi Pierce 1945:7–8, plate 5; Petrunkevitch 1955:120; Harvey 2003:73–74.

Material examined.—Holotype and only known specimen of *T. hadleyi*, Natural History Museum of Los Angeles County, holotype number 2504 (a previous number used by Pierce is A6 paleontology records S9008). From the Carbrillo Beach shore at San Pedro, California, USA. Neogene, mid to late Miocene, Monterey Formation. E.E. Hadley, November 1944.

Description.—Total length 20.5 mm; "opisthosoma" ca. 8 mm long with maximum width of

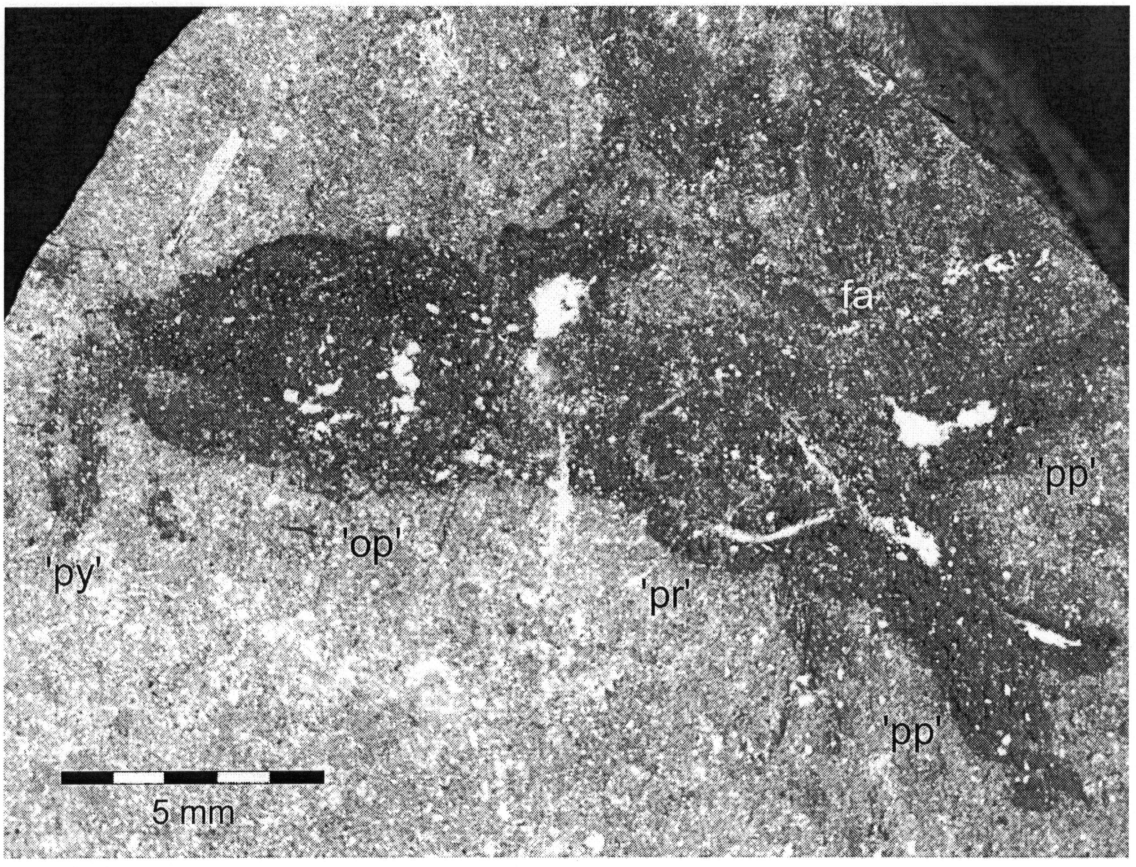

Figure 1.—Holotype and only known specimen of *Thelyphonus hadleyi* Pierce 1945 from the Miocene Monterey Formation of Cabrillo Beach, California. Originally assigned to the whipscorpions (Uropygi), but in fact *incertae sedis* organic remains that cannot be taxonomically assigned. At least some parts of the fossil represent filamentous algae. Abbreviations: fa, filamentous algae; "op," putative opisthosoma; "pp," putative pedipalps; "pr," putative prosoma; "py," putative pygidium.

4.5 mm; "pygidium" ca. 4 mm long, 1.5 mm wide; "prosoma" ca. 6 mm long and 4.5 mm wide, crossed by two algal strains resembling legs; two "pedipalps" (ca. 5 mm long) present in front of "prosoma."

Remarks.—LACMIP 2504 appears to represent nothing more than a fortuitously shaped stain on the rock, formed around fossils of filamentous algae. Towards the "anterior" end there are diverging structures, which one could interpret as pedipalps while "posteriorly" it vaguely resembles the abdomen of a whip scorpion with a "pygidium" turned almost at right angles, but no telson (Fig. 1). A dark area adjacent to the "carapace" is demonstrably a mass of filamentous algae. Two of the algal strains from this area cross the "carapace" and vaguely resemble two legs on the right side. The two "pedipalps" in front of the "carapace" are a different type of filamentous algal remain. This is also the case for the "carapace," "abdomen," and a roughly triangular unidentified fossil adjacent to the "carapace." These parts of the specimen have a darker color, and frequently express white mineralizations (Fig. 1). They were evidently more robust, organic remains than the filamentous algae. However, there are other similar fossil fragments with these white mineralizations on the rest of the surface of the same bedding plane. One of these in particular is highly likely to be algal or microbial in origin.

Overall, this specimen is organic in nature, but there is nothing to indicate an arachnid. No convincing details of, say, segmentation or the characteristic first leg and pedipalp morphology in a whipscorpion are preserved. Indeed, the Monterey Formation from which the fossil originates is a marine sequence (e.g., Buckeridge & Finger 2001; Saul & Stadum 2005). The flora and fauna of this shale is dominated by the microfossil groups foraminifera, radiolaria, diatoms, and macrofossil groups like filamentous algae, cetaceans, sirenians, pinnipeds, fish, birds, ostracod crustaceans, bivalves, gastropods, bryozoans, polychaetes, leaves, and woody plant debris (Buckeridge & Finger 2001). Limited bioturbation and a predominance of pelagic nekton over benthic organisms suggest a low-oxygen

environment prevailed during much of the middle Miocene. Although the presence of terrestrial flora suggests a whip scorpion could potentially be fossilized in the Monterey shale, this locality has not yielded, for example, a rich insect fauna which would normally be much more common than arachnids. We suggest that *T. hadleyi* is an *incertae sedis* fossil that cannot be assigned to any particular group. It should be excluded from the arachnid fossil record. Thus the only genuine fossil whipscorpions are those from the Pennsylvanian and Cretaceous mentioned above.

ACKNOWLEDGMENTS

We thank Harry Filkorn (Natural History Museum of Los Angeles County) for the loan of the holotype. OET is supported by the Norwegian Research Council grant 166647/V30.

LITERATURE CITED

Buckeridge, J.S. & K.L. Finger. 2001. First record of a fossil verrucid barnacle in California-*Verruca digitalis* sp. nov. (Cirripedia: Thoracica) from the Late Miocene. Journal of Crustacean Biology 21:443–449.

Dunlop, J.A. & C.A. Horrocks. 1996. A new Upper Carboniferous whip scorpion (Arachnida: Uropygi: Thelyphonida) with a revision of the British Carboniferous Uropygi. Zoologischer Anzeiger 234:293–306.

Dunlop, J.A. & D.M. Martill. 2002. The first whipspider (Arachnida: Amblypygi) and three new whipscorpions (Arachnida: Thelyphonida) from the Lower Cretaceous Crato Formation of Brazil. Transactions of the Royal Society of Edinburgh: Earth Sciences 92:325–334.

Harvey, M.S. 2003. Catalogue of the Smaller Arachnid Orders of the World. CSIRO Publishing, Collingwood, Victoria, Australia. 385 pp.

Haupt, J. 2000. Biologie der Geißelskorpione (Uropygi Thelyphonida). Memorie della Società Entomologica Italiana 78:305–319.

Latreille, P.A. 1802. Histoire naturelle, generale et particulière, des Crustacés et des Insectes, Volume 7. Dufart, Paris.

Petrunkevitch, A.I. 1955. Arachnida. Pp. 42–162. *In* Treatise of Invertebrate Paleontology, Part P, Arthropoda 2 (R.C. Moore, ed.). Geological Society of America and University of Kansas Press, Lawrence, Kansas.

Pierce, W.D. 1945. A fossil whiptail scorpion from Cabrillo Beach. Bulletin, Southern California Academy of Sciences 44:7–8.

Pocock, R.I. 1894. Notes on the Thelyphonidae contained in the collections of the British Museum. Annals and Magazine of Natural History (6) 14:120–124.

Saul, L.R. & C.J. Stadum. 2005. Fossil argonauts (Mollusca: Cephalopoda: Octopodida) from Late Miocene siltstones of the Los Angeles basin, California. Journal of Paleontology 79:520–531.

Received 12 March 2007, revised 28 April 2007.