LETTER

Offspring or phoronts? An alternative interpretation of the "kite-runner" fossil

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Briggs et al. report on an intriguing specimen from the Silurian Herefordshire Lagerstätte of England (1). Tethered to this specimen, which is undoubtedly an arthropod, were 10 smaller animals that the authors conclude are the specimen's offspring, and hence the find is purportedly a unique and ancient form of brood care. This interpretation attracted a great deal of media interest.

Briggs et al. (1) consider and reject the possibility of these smaller individuals being phoretic/epizoans/parasites, but their consideration only extends as far as crustaceans. There are tantalizing parallels between the Silurian fossil and the deutonymphs of Uropodina mites. These mites have evolved a suite of adaptations for dispersing between patchily distributed microhabitats (e.g., dung, carrion, decaying wood) (2), one of which is the secretion of a long, anal pedicel that attaches them very firmly to the body of a winged insect (e.g., a dung beetle) that is able to disperse to new habitat (3). These deutonymphs, with their long pedicel, bear a striking resemblance to the Silurian fossil.

The relatively large number of small individuals associated with the Silurian fossil is one reason why Briggs et al. (1) reject them as epizoans. The authors state that "[*Aquilonifer*] is unlikely to have tolerated the presence of so many drag-inducing epizoans" (1). Deutonymphs are known to travel in groups and they are often found in profusion on a suitably vagile host. Frequently, one deutonymph is attached next to the other, even if other beetle body parts are free of mites (3). Indeed it has even been shown that phoretic deutonymphs prefer places already infested by deutonymphs (4). The impact of these passengers on the flying ability of a beetle is unknown, but it must be at least as significant as the impact of tethered phoronts on the swimming ability of an aquatic host.

One other feature of the *Aquilonifer* fossil that points to a phoretic interpretation is the location of the tethered individuals. If they were genuinely offspring, you would expect them to be clustered in one area to limit their impact on the parent's swimming/foraging abilities. Instead, the tethered individuals are scattered across the body of *Aquilonifer*, which is very similar to mite deutonymphs.

Although there are no known crown-group arachnids of the same age as this *Aquilonifer* fossil, mites are known from the early Devonian and there are certainly marine mites (5). Regardless, the Briggs et al. (1) study would have undoubtedly benefited from a comparison of the Silurian fossil and a greater range of phoronts.

1 Briggs DEG, Siveter DJ, Siveter DJ, Sutton MD, Legg D (2016) Tiny individuals attached to a new Silurian arthropod suggest a unique mode of brood care. *Proc Natl Acad Sci USA* 113(16):4410–4415.

2 Bajerlein D, Witaliński W, Adamski Z (2013) Morphological diversity of pedicels in phoretic deutonymphs of Uropodina mites (Acari: Mesostigmata). *Arthropod Struct Dev* 42(3):185–196.

3 Bajerlein D, Witaliński W (2014) Localization and density of phoretic deutonymphs of the mite Uropoda orbicularis (Parasitiformes: Mesostigmata) on *Aphodius* beetles (Aphodiidae) affect pedicel length. *Naturwissenschaften* 101(4):265–272.

4 Faasch H (1967) Beitrag zur Biologie der einheimischen Uropodiden Uroobovella marginata (C. L. Koch 1839) und Uropoda orbicularis (O. F. Müller 1776) und experimentelle Analyse ihres Phoresieverhaltens. *Zool Jahrb Abt Syst* 94:521–608.

5 Hirst S (1923) On some arachnid remains from the Old Red Sandstone (Rhynie chert Bed, Aberdeenshire). *Annals and Magazine of Natural History* (Series 9) 12:455–474.

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