

## A harvestman penis in amber

In this paper, my co-authors and I described a remarkable fossil specimen of a harvestman which belongs to the arachnid order Opiliones. It was discovered in Burmese amber which comes from Myanmar in South-east Asia and dates back about 99 million years to the mid-Cretaceous period. The arthropods preserved in this amber would have crawled under the feet of the dinosaurs. Our new fossil belongs to an extinct species which we had recognised earlier in 2005 and named *Halitheres grimaldii*.

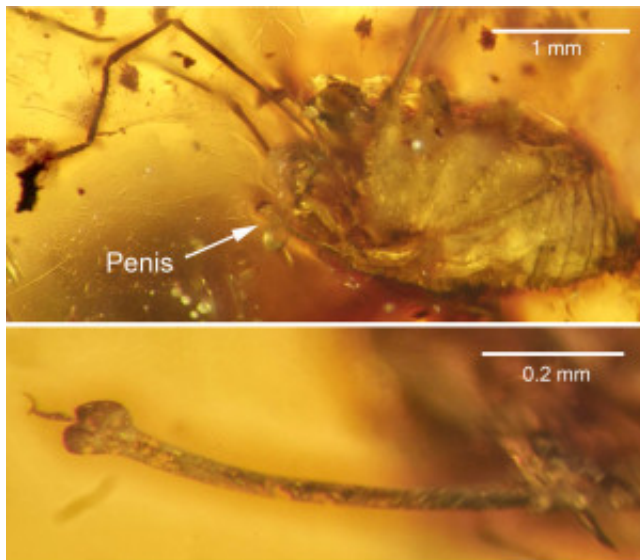


Fig. 1. The fossil harvestman arachnid, *Halitheres grimaldii*, from the 99 Million year old Burmese amber of Myanmar. This remarkable specimen preserves the penis (above: arrowed) with a distinctive heart-shaped tip (below) unlike that seen in any living harvestman.

Yet there had always been a problem with this distinctive-looking amber species. It has large eyes and long legs and distinct patterns of raised bumps all over the body. Yet it was difficult to say to which group of living harvestmen our fossil was most closely related. We originally thought it belonged to a modern family called Nemastomatidae, but other harvestmen experts disagreed and suggested that we might be looking at a new, extinct family. The problem was that we couldn't see the penis.

This seems like a strange thing to say, but male harvestmen do have a penis which they use for transferring sperm directly into the female reproductive tract. Normally this penis is tucked inside the male's body and is only extended out during mating. For this reason it's very rare to find this structure in a fossil and it had never been seen in *Halitheres grimaldii* or any other harvestman in amber. This is a shame, because the structure of the penis tip is often quite complex and can tell

you a lot about which group of harvestmen you are looking at. In fact harvestmen workers often say that the penis is more important for identifying these animals than the rest of the body!

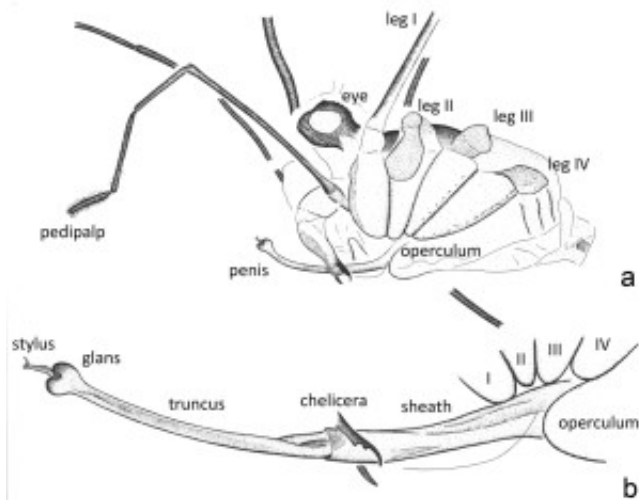


Fig. 2. Explanatory drawing of the same specimen.

Thus we were quite excited when in 2015 an amber collector contacted us and said he had a harvestman from Burmese amber with an outstretched penis. As soon as we saw this it was pretty obvious that we were dealing with another specimen of *Halitheres grimaldii*; this time revealing features both of the genitalia. The penis in this fossil has a flattened, somewhat heart-shaped tip with a small protruding stylus: the part through which the sperm would have been ejected. We also realised that the fine structure of this fossil penis was quite different to that seen in members of the family Nemastomatidae. The new specimen confirmed the fact that we are probably looking at a new, extinct family of harvestmen and allowed us for the first time to define a fossil group using genital anatomy as well as the shape of the body; exactly as you would do with a living species.

Why the fossil was preserved in this way is not completely clear. There is no female in the same piece of amber so it doesn't look like the harvestman was trying to mate. Perhaps the process of entrapment in the sticky resin caused the animal to struggle, increase its blood pressure and force the penis out? The exact circumstances of its demise remain a mystery. Yet it is an important find for piecing together harvestman evolution. Combining our fossil with recent advances in the study of the family tree for living harvestmen suggests that many of the typical long-legged species we find today, belonging to the suborders Eupnoi and Dyspnoi, originally evolved from large eyed-ancestors. Our fossil is an extinct member of the Dyspnoi group which probably branched off early from the living members. The large eyes and several details of the mouthparts in *Halitheres grimaldii* fit neatly into this evolutionary scenario.

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## **Publication**

[Penis morphology in a Burmese amber harvestman.](#)

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