

The pedipalpal brush of *Epehebopus* sp. (Araneae, Theraphosidae): evidence of a new site for urticating hairs

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Summary

Theraphosid spiders of the genus *Epehebopus* Simon possess a distinctive pad of hairs on the distal prolateral surface of the pedipalpal femur. Captive specimens were observed to shed these hairs during defensive displays by bringing the pedipalps down across the basal segments of the chelicerae. Scanning electron microscopy revealed that these hairs are similar in structure to the abdominal urticating hairs found on other New World theraphosids. Mice experimentally exposed to *Epehebopus* hairs were found to engage in comfort behaviours significantly more when exposed to these pedipalpal hairs than when exposed to abdominal hairs. The discovery of a new type of urticating hair in a unique location extends the known range of urticarial defences in the Theraphosidae.

Introduction

Many theraphosid spiders have long been known to possess an urticarial defence. Early naturalists, e.g. Bates (1863), described a burning, itching sensation associated with the handling of specimens. It was not until the work of Cooke *et al.* (1972) that the phenomenon was investigated. They described four distinct types of urticating hairs from theraphosids in museum collections. Whereas many New World species examined possessed these hairs, they failed to find them on species from the Old World.

The theraphosid genus *Epehebopus* Simon has three described species; *E. murinus* (Walckenaer) and *E. violaceus* Mello-Leitão from Brazil, and *E. fossor* Pocock from Ecuador (Petrunkevitch, 1911; Bonnet, 1956). Specimens of *E. murinus* are also known from Guyana (Cooke *et al.*, 1972). Cambridge (1896) briefly described their natural history in the vicinity of Santarem, Brazil. *Epehebopus* lacks the abdominal urticating hairs described for other New World theraphosids, but is known to possess a pad of hairs on the prolateral surface of the distal portion of the pedipalpal femur (Raven, 1985). Captive specimens engaged in defensive displays were observed to shed these pedipalpal hairs in a manner similar to that of other species shedding abdominal urticating hairs. In this study, we examine the possible adaptive significance of the pedipalpal brush of *Epehebopus* sp.

Material and Methods

Live specimens of *Epehebopus* were collected between 1981 and 1988 in French Guiana in the Kaw Mountains and in the vicinity of Saül and St. Laurant-

du-Maroni. While it was not possible to determine the species used in the present study, they resemble the *E. murinus* figured in Cambridge (1896). Specimens of *Epehebopus* collected in French Guiana have been deposited in the collection of the American Museum of Natural History (New York). Specimens were found living in silk-lined burrows which had a silk collar at the entrance that usually incorporated vegetable debris. Burrows were located along road banks as well as in the forest. These burrows were often aggregated, especially at road bank sites.

In order to determine the mechanism of hair shedding, observations were made of the defensive behaviour of captive specimens. The field of hairs was examined on exuviae and preserved material under a dissecting microscope. The hair field was dissected from dried exuviae, sputter-coated with gold, and scanning electron micrographs were made.

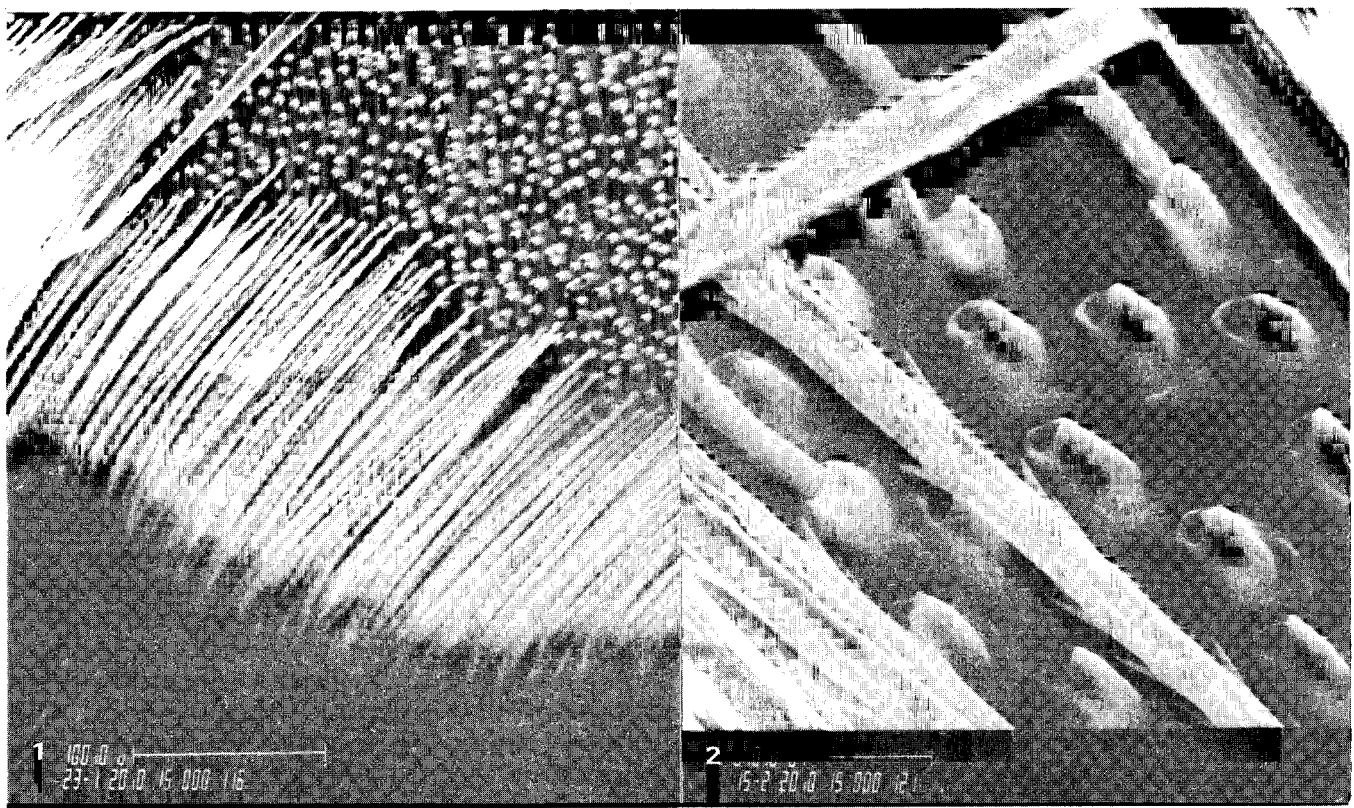
The role in defence of *Epehebopus* pedipalpal hairs was tested using laboratory mice (*Mus musculus*). Ten mice were selected from a laboratory colony and randomly assigned to two groups of five. Samples of the pedipalpal hairs were scaled off exuviae, and non-urticarial body hairs were collected by shredding the abdominal skins from the same sample of exuviae (these body hairs did not readily scale off the cuticle as did the pedipalpal hairs). The mice were exposed to hairs by inducing them to crawl head-first down a plastic tube which had a sample of the hairs in the end. They were withdrawn after ten seconds, and their behaviour was videotaped. Tapes were later replayed, and behaviours analysed by counting the bouts of comfort behaviours exhibited in the 12-minute period following exposure. These behaviours were 'scratch', where the hind feet were used to scratch the lateral areas of the body; and 'groom', where the tongue and forelegs were used to preen the body surface. Licking was not scored if it was used in association with 'scratch', when the mice would lick the hind foot between bouts of scratching. A 'bout' was defined as any continuous expression of 'scratch' or 'groom', and was considered terminated when the mouse switched to another behaviour.

Results

When provoked, *Epehebopus* will readily rear up and strike out with the pedipalps and first two pairs of legs, extending the fangs. This frontal display is visually enhanced by the broad, spatulate tarsi and metatarsi as well as the often iridescent chelicerae. Captive specimens at a low level of provocation were observed to bring the pedipalps down across the basal segments of the chelicerae in a brief scrubbing motion. The result of this was a puff of hairs being released in a manner similar to that of other species releasing abdominal urticating hairs.

Gross examination of the hair field revealed that the hairs are orange-gold in colour, in distinct contrast to the surrounding, dark, more typical hairs. In several of the specimens examined the brush hairs were partially ablated, probably due to defensive hair shedding.

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Figs. 1-2: Scanning electron micrographs of the pedipalpal brush of *Ephebopus*. **1** Structure of the individual hairs, and a view of the hair field partially ablated showing the dense, uniform array of urticating hairs. **2** Close-up of the cuticle showing the site of attachment, with attached hairs and ablated sockets.

Scanning electron micrographs of the hairs reveal short, stout, barbed shafts in a densely packed, uniform array attached by insertion in sockets on the cuticle (Figs. 1, 2). These pedipalpal hairs readily scale off both exuviae and preserved specimens in a way totally unlike any other hairs found on *Ephebopus*, and consistent with the behaviour of urticating hairs on other species. The hairs do not break along the shaft, but have a consistent break-off point, as described for other urticating hair types by Cooke *et al.* (1972).

Mice exposed to the pedipalpal hairs exhibited comfort behaviours significantly more often than mice exposed to the abdominal hairs (total frequency, mean frequency per 12-minute period \pm one standard deviation: pedipalpal hairs; 'scratch', 206, 41.2 ± 15.5 , 'groom', 158, 31.6 ± 6.8 ; abdominal hairs; 'scratch', 16, 3.2 ± 2.0 , 'groom', 79, 15.8 ± 5.8 ; chi-square test on hair type versus behaviour, $\chi^2 = 47.52$, $df = 1$, $p << 0.005$).

These behaviours differed qualitatively as well as quantitatively. The mice exposed to the abdominal hairs groomed less frequently, but when they did groom they tended to groom for longer periods of time. The mice exposed to the pedipalpal hairs exhibited fragmented grooming sequences, initiating and terminating bouts of 'scratch' and 'groom' more often, as if in response to a specific stimulus, apparently the urticarial action of the pedipalpal hairs.

Discussion

Behavioural and morphological evidence presented here suggests that *Ephebopus* uses pedipalpal urticating hairs in defence. While the natural predators of these spiders remain unknown, the fact that exposure to the pedipalpal brush hairs of *Ephebopus* significantly increased the frequency of comfort behaviours exhibited by laboratory mice is strong evidence for their urticarial action. Moreover, the defensive behaviour of *Ephebopus* is similar in a number of ways to the defensive hair-shedding behaviour of other theraphosid species possessing abdominal urticating hairs. As in other theraphosids, hair-shedding in *Ephebopus* is associated with defensive leg movements and rearing displays. Like abdominal urticating hairs, hairs from *Ephebopus* pedipalps are actively shed by mechanical means, involving the passage of appendages across specific fields of hairs. The hairs shed during defensive behaviour by *Ephebopus* are similar in structure and break-off mechanisms to typical theraphosid urticating hairs.

The array of urticating hair types seen in the New World Theraphosidae is remarkable for its diversity, as well as the contrast it provides to the Old World species, which appear not to possess them. The occurrence of four distinct types, as recorded by Cooke *et al.* (1972), indicates that a variety of selective advantages may account for possession of such defences. The discovery

of a fifth type on *Epehebopus* sp., in an entirely novel location, extends the range of known theraphosid urticarial defences even further. Given the unique location of these hairs, it may be fruitful to re-examine the Old World species for urticating hairs on body regions other than the abdomen.

Acknowledgements

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Nomenclatural Notes

The following applications have been received by the International Commission on Zoological Nomenclature and were published in *Bull.zool.Nom.* 46(3) on 29 September 1989 (Case 2662) and 46(4) on 19 December 1989 (Case 2637). Comments or advice are invited for publication in *Bull.zool.Nom.* and should be sent to the Executive Secretary, ICZN, c/o The Natural History Museum, Cromwell Road, London SW7 5BD.

Case 2662 *Aphonopelma* Pocock, 1901 (Arachnida, Araneae): proposed precedence over *Rhechostica* Simon, 1892. By H. W. Levi & O. Kraus.

Abstract. The purpose of this application is the conservation of the generic name *Aphonopelma* Pocock, 1901, a widely used name of large American theraphosid spiders, whose species are commonly used as experimental animals and are also sold in pet stores. The name is threatened by an essentially unused senior subjective synonym, *Rhechostica* Simon, 1892.

Case 2637 *Buthus vittatus* (currently *Centruroides vittatus*; Arachnida, Scorpionida): proposed recognition of Wood (1863) as author of the specific name and designation of a neotype, and *Centrurus hentzi* (currently *Centruroides hentzi*) Banks, 1904: proposed conservation of the specific name. By S. A. Stockwell & H. W. Levi.

Abstract. The purpose of this application is the stabilisation of names of North American scorpions which have in the past been misidentified. Say (1821) is commonly cited as the author of *Centruroides vittatus*, a Texas species, but he gave the name *vittatus* to the Florida scorpion now known as *C. hentzi* Banks, 1904. The Texas species was described by H. C. Wood (1863), who misidentified it as *Scorpio carolinianus* Beauvois, 1805 and gave *Buthus vittatus* Say in synonymy.

Editor