1998. The Journal of Arachnology 26:120–123

RESEARCH NOTE

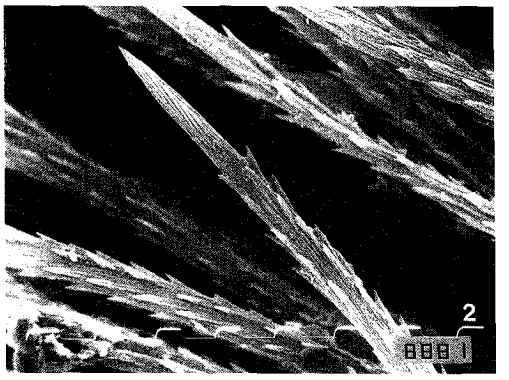
NOTES ON THE SYSTEMATICS OF THE LITTLE KNOWN THERAPHOSID SPIDER *HEMIRRHAGUS CERVINUS*, WITH A DESCRIPTION OF A NEW TYPE OF URTICATING HAIR

The presence of urticating hairs as a tarantula defense mechanism is so far restricted to the New World Theraphosidae. The irritation caused by these hairs has been known since Bates (1863) but not formally characterized until Cooke et al. (1972) described four types of abdominal urticating hairs. Marshall & Uetz (1990) described a fifth type of urticating hair from *Ephebopus* sp. which is found on the prolateral surface of palpal femur, rather than the abdomen. The defensive behavior involved in the release of abdominal urticating hairs was studied in detail by Pérez-Miles & Prandi (1991) in the Theraphosinae *Phrixotrichus mollicoma* (Ausserer 1875) (previously *Grammostola mollicoma*) and by Bertani & Marques (1995/96) in several species of Theraphosinae and Aviculariinae.

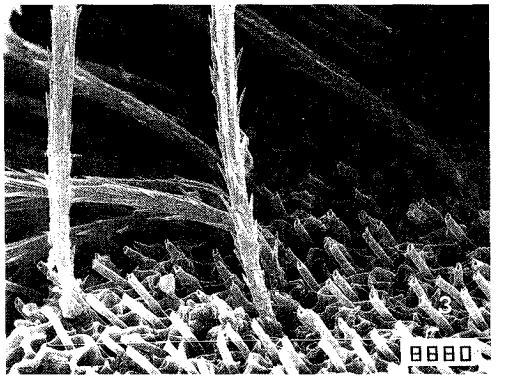
Urticating hairs and the associated releasing behavior was used by Pérez-Miles (1992, 1995) and Pérez-Miles et al. (1996) to elucidate phylogenetic relationships in the Theraphosinae and related groups. Since defensive abdominal movements are present only in the Aviculariinae and Theraphosinae, this was interpreted as a synapomorphy, supporting their sister group relationship (Pérez-Miles et al. 1996). However, Theraphosinae shed small urticating hairs while Aviculariinae (except *Ephebopus* Simon 1892) employ larger urticating hairs by direct contact with the potential predator. Considering the differences in morphology and release mechanisms of the urticating hairs in the Aviculariinae versus the Theraphosinae, their independent acquisition was proposed (Pérez-Miles 1995; Pérez-Miles et al., 1996; Bertani & Marques 1995/96). The different location of urticating hairs of *Ephebopus* also suggests their independent evolution (Bertani & Marques 1995/96).

Hemirrhagus cervinus (Simon 1891) has a distinct pad of urticating hairs on the dorsal surface of the abdomen. Scanning electron microscopy revealed that they differ in morphology and arrangement from known types of theraphosid urticating hairs. *H. cervinus*, the type species of the genus, is only known from the holotype specimen. The genus has a controversial systematic position. Raven (1985) considered it as a Theraphosidae *incertae sedis*. Smith (1994) recommended suspending the genus because he thought the type lost. Only The International Commission on Zoological Nomenclature has power to suppress a name, ICZN art. 79. The female holotype of *Hemirragus cervinus*, from Mexico, deposited at the Museum National d'Histoire Naturelle de Paris, is available and was examined. To minimize the damage to the type, a small area (less than 1 mm^2) of the dorsal surface of the abdomen bearing hairs was removed for study by SEM and some loose hairs were observed by light microscopy. Other characters were studied by a stereoscopic microscope, drawings were made with the aid of a camera lucida. Considering the size and morphology of abdominal urticating hairs in *H. cervinus*, the releasing mechanism seems to be as in Theraphosinae (hair flicking–airborne dispersal). The presence of such urticating hairs lead me to propose the placement of *H. cervinus* in the Theraphosinae.

Abdominal hair morphology.—Scanning electron micrographs reveal straight, stout fusiform barbed hairs, acutely pointed at both ends (Figs. 1–4). The length of these hairs is 0.315 ± 0.021 mm (mean ± 1 SD, n = 30 hairs). Hair barbs are subtriangular but not homogeneous in size, and slightly longer on the distal region. Barbs, present on the proximal



Figures 1, 2.—Scanning electron micrographs of abdominal hairs of *Hemirrhagus cervinus*. 1, Structure of the urticating hairs, hair field partially ablated showing arrangement of the hairs (Scale = 0.2 mm); 2, Close up of the distal portion of an urticating hair (Scale = 0.02 mm).



Figures 3, 4.—Scanning electron micrographs of abdominal hairs of *Hemirrhagus cervinus*. 3, Close up of the cuticle showing the basal part of attached hairs and ablated hair sockets (Scale = 0.2 mm); 4, Close up of the basal end of some loose urticating hairs, showing the acute basal tip out of the socket (Scale = 0.02 mm).

80% of the hair, are obliquitous with respect to the hair axis (40°), and orientated with their tips towards the hair distal end (Fig. 2). A slight inflection of approximately 5–10° was observed in the axis of some hairs, near the proximal bases.

Abdominal hairs are attached in distinctive insertion sockets on the cuticle (Fig. 3). The sockets are cylindrical and the bases of the hairs are held in them until the hair is released. The region of the hair that is located in the socket is not barbed and has a very sharp tip (Fig. 4).

SYSTEMATICS

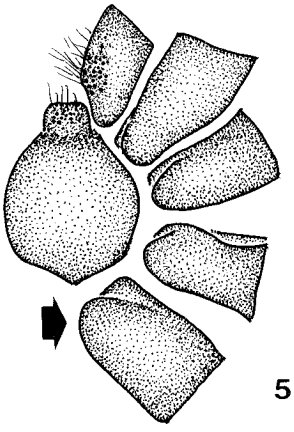
Hemirrhagus cervinus (Simon 1891)

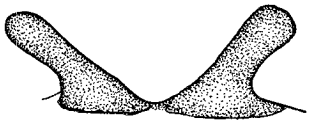
Cratorrhagus cervinus Simon 1891:330; F. Pickard-Cambridge 1899:41; *Hemirrhagus cervinus* Simon 1903:926; Strand 1907:16, 1912:175; Petrunkevitch 1911:71, 1928:78; Roewer 1942:231; Raven 1985:116; Smith 1994:185.

Holotype.—Female from Mexico, without locality data, deposited in Museum National d'Histoire Naturelle, Paris, #756, examined.

Diagnosis.—Differs from other Theraphosidae by the presence of urticating hairs of the type described here (Figs. 1–4), in the coxae with a retrolateral-ventral heel (Fig. 5), and in the morphology of the spermathecae (Fig. 6). It differs from the Aviculariinae in the different morphology of the scopulae (not laterally extended), scopular hairs (not widely spatulate), and urticating hairs.

Comments.—Morphological and positional evidence presented here suggests that the defensive function and urticating effect of abdominal hairs of *H. cervinus* is similar to those found in other New World theraphosids. Hair flicking seems likely to be the shedding mechanism, considering their small size (0.315 mm, length) and their presumed low





Figures 5, 6.—Structures of the holotype of *Hemirrhagus cervinus*. 5, Ventral view of labium, sternum and left coxae showing the retrolateral projection on coxae of all legs (arrow shows this feature only on coxa of fourth leg); 6, Spermathecae, ventral view.

weight in comparison with larger (0.5–1.5 mm, length), heavier urticating hairs from arboreal Avicularíinae (Bertani & Marques 1995/96) which rely on contact, not airborne dispersal.

Both distal and basal ends of the hair are sharp, but the orientation of the barbs suggests that the penetration tip is the basal end. The orientation of the barbs and the socket morphology of type V hairs (from fig. 2 of Marshall & Uetz 1990) led me to assume that the penetrating end lies proximally, which agrees with Bertani & Marques (1995/96). A proximal position of the penetrating tip was also indicated for hairs of type II (Cooke et al. 1972; Bertani & Marques 1995/96); but considering the differences in morphology, arrangement, and shedding mechanisms with *Hemirrhagus*, that similarity is interpreted as nonhomologous.

The type of abdominal hairs found on *H. cervinus* is morphologically similar to those of *Ephebopus*, but shorter. Also the socket is narrower and the main difference is their location on the body. For these reasons abdominal hairs of *Hemirrhagus* cannot be considered as homologous to the palpal hairs of *Ephebopus*. These facts suggest that the urticating hairs found in *Hemirrhagus* are of a 6th, previously undescribed, type.

Hemirrhagus, traditionally placed in Ischnocolinae (Ischnocoleae of Simon 1903, in Ischnocolinae by Roewer 1942), and was considered as Theraphosidae *incertae sedis* by Raven (1985). The examination of the type and the study of some features lead me to propose the placing of *Hemirrhagus* in the Theraphosinae.

Hemirrhagus cervinus has abdominal urticating hairs, which are only found in Theraphosinae and Avicularíinae. *H. cervinus* does not have wide scopulae, lacks spatulate scopula hairs, and lacks the heavy, contact urticating hairs as they occur in the Avicularíinae. Also, leg spines are absent or scarce in Avicularíinae, but are present in *H. cervinus*. All these facts argue against its inclusion in the Avicularíinae. Pérez-Miles et al. (1996) proposed the abdominal defensive movements as synapomorphic of Avicularíinae plus Theraphosinae. Since *H. cervinus* is only known from the type, this could not be tested. However, the presence of abdominal urticating hairs suggests such behavior. If this hypothesis is correct then its inclusion in Theraphosinae seems to be the best placement, at least until the male is described. The spermathecal morphology is compatible with the proposed placement. Also the coxae of legs with retrolateral projection indicated by Smith (1994) is here confirmed in the type, and interpreted as a generic apomorphy.

ACKNOWLEDGEMENTS

I am grateful with Dr. Christine Rollard (MHNP) for the loan of the specimen and with Lic. Patricia Sarmiento (UNLP) for the SEM operation. Thanks to F.G. Costa and R.M. Capocasale for the critical reading of the manuscript. I acknowledge S. Marshall, R. Wolff, J. Berry and P. Sierwald for their valuable cricticisms and suggestions.

LITERATURE CITED

Bates, H.W. 1863. The Naturalist on the river Amazons. Vol. 1, John Murray, London, Pp. 160–162.

Bertani, R. & O.A.V. Marques. 1995/96. Defensive behaviors in Mygalomorph spiders: release of urticating hairs by some Avicullariinae (Araneae, Theraphosidae). Zool. Anz., 234:161–165.

Cooke, J.A.L., V.D. Roth & F.H. Miller. 1972. The urticating hairs of theraphosid spiders. American Mus. Nov., 2498:1–43.

Intern. Comm. Zool. Nomen.. 1985. Intern. Code Zool. Nomen., 3rd ed., Intern. Trust Zool. Nomen., London, 338 pp.

Lucas, S., P.I. da Silva, Jr. & R. Bertani. 1991. The genus *Ephebopus* Simon, 1892. Description of the male of *Ephebopus murinus* (Walckenaer), 1837. (Araneae, Theraphosidae, Aviculariinae). Spixiana, 14(3):245–248.

Marshall, S.D. & G.W. Uetz. 1990. The pedipalpal brush of *Ephebopus* sp. (Araneae, Theraphosidae): Evidence of a new site for urticating hairs. Bull. British Arachnol. Soc., 8(4):122–124.

Pérez-Miles, F. 1992. Análisis cladístico preliminar de la subfamilia Theraphosinae (Araneae, Theraphosidae). Bol. Soc. Zool. Uruguay, 7:11–12.

Pérez-Miles, F. 1995. Revisión y análisis cladístico de la subfamilia Theraphosinae (Araneae, Mygalomorphae, Theraphosidae). Ph.D. thesis, Universidad de la República, Montevideo.

Pérez-Miles, F., S.M. Lucas, P.I. da Silva, Jr. & R. Bertani. 1996. Systematic revision and cladistic analysis of Theraphosinae (Araneae: Theraphosidae). Mygalomorph, 1:33–66.

Pérez-Miles, F. & L. Prandi. 1991. El comportamiento de emisión de pelos urticantes en *Grammostola mollicoma* (Araneae, Theraphosidae): un análisis experimental. Bol. Soc. Zool. Uruguay, 6:47–53.

Raven, R.J. 1985. The spider infraorder Mygalomorphae (Araneae): cladistics and systematics. Bull. American Mus. Nat. Hist., 182:1–180.

Smith, A.W. 1994. Tarantula spiders, Vol. 2. Tarantulas of the U.S.A. and Mexico. Fitzgerald Publ., London, 196 pp.

Fernando Pérez-Miles: División Zoología Experimental, Instituto de Investigaciones Biológicas Clemente Estable, Av. Italia 3318, 11600 Montevideo, Uruguay; and Sección Entomología, Facultad de Ciencias, T. Narvaja 1674, 11200 Montevideo, Uruguay

Manuscript received 15 May 1996, accepted 5 March 1997.